DAUGAVPILS UNIVERSITĀTE
DAUGAVPILS UNIVERSITY

DAUGAVPILS UNIVERSITĀTES ZINĀTŅU DAĻA
SCIENCE DEPARTMENT OF DAUGAVPILS UNIVERSITY

DAUGAVPILS UNIVERSITĀTES JAUNO ZINĀTNIEKU ASOCIĀCIJA
DAUGAVPILS UNIVERSITY ASSOCIATION OF YOUNG RESEARCHERS

DAUGAVPILS UNIVERSITĀTES 58. STARPTAUTISKĀS ZINĀTNISKĀS KONFERENCES RAKSTU KRĀJUMS

PROCEEDINGS OF THE 58th INTERNATIONAL SCIENTIFIC CONFERENCE OF DAUGAVPILS UNIVERSITY

A. DAĻA. DABASZINĀTNES

PART A. NATURAL SCIENCES

DAUGAVPILS UNIVERSITĀTE
AKADĒMISKAIS APGĀDS „SAULE”
2016

Apstiprināts Daugavpils Universitātes Zinātnes padomes sēdē 2016. gada 15. decembrī, protokols Nr. 17. /
Approved in the meeting of Daugavpils University Science Council on December 15, 2016; minutes No 17.

Zuģicka I. sast. *Daugavpils Universitātes 58. starptautiskās zinātniskās konferences rakstu krājums. A. daļa "Dabaszinātnes" = Proceedings of the 58th International Scientific Conference of Daugavpils University. Part A "Natural Sciences"*. Daugavpils: Daugavpils Universitāte, 2016.

Daugavpils Universitātes 58. starptautiskās zinātniskās konferences Programmas komiteja / Programme Committee of the 58th International Scientific Conference of Daugavpils University

Daugavpils Universitātes 58. starptautiskās zinātniskās konferences Rīcības komiteja / Organizing Committee of the 58th International Scientific Conference of Daugavpils University

Atbildīgā par izdevumu / Responsible for the Edition:

Inese Zuģicka (inese.zugicka@du.lv)

ISSN 2500-9842
ISSN 2500-9850
ISBN 978-9984-14-778-9

Daugavpils Universitātē docētāju un studējošo zinātniskās konferences notiek kopš 1958. gada. Konferencēm ir starpdisciplinārs raksturs un tajās piedalās gan studējošie, gan docētāji, gan arī ievērojami zinātnieki no dažādām pasaules valstīm. Daugavpils Universitātes 58. starptautiskās zinātniskās konferences pētījumu tematika bija ļoti plaša – eksaktās, humanitārās, izglītības, mākslas un sociālo zinātņu jomās.

Zinātnisko rakstu krājumā ***Daugavpils Universitātes 58. starptautiskās zinātniskās konferences rakstu krājums = Proceedings of the 58th International Scientific Conference of Daugavpils University*** apkopoti 2016. gada 14.–15. aprīlī konferencē prezentētie materiāli.

Daugavpils Universitātes 58. starptautiskās zinātniskās konferences rakstu krājums tiek publicēts 3 daļās: A. daļa. *Dabaszinātnes*; B. daļa. *Sociālās zinātnes*; C. daļa. *Humanitārās zinātnes*.

The annual scientific conferences at Daugavpils University have been organized since 1958. The themes of research presented at the conferences cover all spheres of life. Due to the facts that the conference was of interdisciplinary character and that its participants were students and outstanding scientists from different countries, the subjects of scientific investigations were very varied – in the domains of exact sciences, the humanities, education, art and social sciences.

The results of scientific investigations presented during the conference are collected in the collection of scientific articles ***Proceedings of the 58th International Scientific Conference of Daugavpils University.***

Proceedings of the 58th International Scientific Conference of Daugavpils University are published in three parts: part A. *Natural sciences*; part B. *Social Sciences*; part C. *Humanities.*

SATURS / CONTENTS

VIDES ZINĀTNES / ENVIRONMENTAL SCIENCES

BIOLOĢIJA / BIOLOGY

VESELĪBAS ZINĀTNES / HEALTHY SCIENCES

DATORZINĀTNES / COMPUTER SCIENCES

VIDES ZINĀTNES / ENVIRONMENTAL SCIENCES

QUALITY OF WATER SUPPLY NETWORK RELIABILITY

Marina Tarasenko[1], Janis Zvirgzds[2]
[1] University of Latvia, 19 Raina Blvd, Riga, Latvia, LV-1586
marina.tarasenko@inbox.lv
[2] Riga Technical University, Kipsalas street 6B/6A, Riga, Latvia, LV-1048
Janis.zvirgzds@rtu.lv

Abstract

Quality of water supply reliability

Key words: *water supply network, urban underground infrastructure, pipe failures*

Water supply network is one of the most important parts of the city structure and human life. Taking into account the underground environment, networks of subsurface utilities are hard to inspect, and activities of network monitoring are limited. At the same time, quality of water supply largely depends on the availability of reliable information about the precise position of network constituent parts and surrounding environment.

Transmission of precise data about accidents or failures in water pipelines into geographical information system is a significant part for better understanding of underground environment processes and it's correlations with accidents.

Failure counting on water pipelines, different activities of monitoring, precise positioning of failure and available information about natural and anthropogenic soil conditions make a better background for understanding environmental processes and failure causes and may provide better quality of water supply network.

Kopsavilkums

Kvalitatīva ūdens apgādes drošība

Atslēgas vārdi: *ūdens apgādes tīkli, ūrbānā pazemes infrastruktūra, avāriju notikumi*

Ūdensapgādes tīkli ir viena no vissvarīgākām pilsētas struktūras daļām. Ņemot vērā pazemes vidi, tādus tīklus ir grūti apsekot, vai tīklu monitoringa pasākumi ir ierobežoti. Tajā pašā laikā, ūdnes apgādes drošība lielā mērā ir atkarīga no kvalitatīvas informācijas pieejamības par tīklu pozīciju, sastāvdaļām un apkārtējo vidi.

Precīzu datu pārraide par bojājumu, jeb avāriju notikumiem uz ūdens apgādes tīkliem uz ģeogrāfiskās informācijas sistēmām ir ievērojama daļa labākai saprašanai par pazemes procesiem un to saistību ar avārijām.

Avāriju uzskaite uz ūdens apgādes tīkliem, dāžādi monitoring pasākumi, precīza avārijas pozicionēšana un pieejama informācija par dabīgiem un antropogēniem grunts apstākļiem veido labāku priekštatu par pazemes procesiem, avāriju iemesliem un var nodrošināt kvalitatīvu ūdens apgādi.

Introduction

Every city is covered with urban underground infrastructure including gas, heat, electricity, and water supply networks which spread through the entire territory of the city. Water supply network is a vital urban constituent necessary for satisfying basic human needs and ensuring functionality of the city.

Requirements are high for qualitative water. Urban environment structures need water supply without interruption, which means that the water systems must operate without interruption as well (Cubillo *et al.* 2014; Jeewon *et al.* 2015).

Water supply infrastructure consists of several functional parts such as buildings, structures, and networks (Cubillo *et al.* 2014). One of the fundamental prerequisites for high-quality water supply is a timely renewal and maintenance of the constituent parts (Tuhovčak *et al.* 2014). This renewal mainly depends on full and accurate information on the pipe network. Since the pipes are located in the underground and occupy a large area, they are the least controllable part of the water

supply network. Networks consist of several interconnected sections, which are made of different materials and include pipes with various diameters, as well as pipes in the underground are located at different depths. In addition, taking into account a variety of underground environment properties (geological, hydrogeological, tectonic, etc.), it can be argued that generally each part of the network is subject to different loads. Therefore, it is difficult to accurately determine the operating condition of a pipe. All these factors make an adequate assessment of network condition quite complicated.

Historically, water supply network data has been accumulated over long periods of time (decades). Data in archives was stored in plans, charts, maps, etc. In this way the data was difficult to manage and, with the beginning of the new digital era development, the storage system was changed. Today, a digital data management system allows the performance of a large number of tasks simultaneously (Cubillo *et al.* 2014; Николаев *et al.* 2013). Geographic information systems easily deal with spatial and attributive data, allowing their storage, maintenance, modification, and analysis, as well as carrying out simulations and forecasts (Jeewon *et al.* 2015; Dziedzic *et al.* 2013; Mair *et al.* 2013; Sitzenfrei *et al.* 2013; Николаев *et al.* 2013; Мазурова *et al.* 2013; Дубровский 2015; Антонович *et al.* 2014).

International practice shows examples in a variety of water supply network data collection methods, including traditional methods: mapping, photogrammetry, GPS surveying, etc. Recently, alternative data collection methods have been evolving, such as usage of detectors with the inertial measuring unit (IMU), data collection using the Internet of Things (IoT), GPRS technology, as well as use of automated flow measurement systems, etc. (Dehua *et al*. 2012; Fernandez-Pato *et al.* 2014; Rezai *et al.* 2015; Sala *et al.* 2013). The data is processed in different types of GIS that are individually tailored to each city (Hongwei *et al.* 2011; Jeewon *et al.* 2015; Merchant *et al.* 2013; Покровский 2015). Analysis methods of the accumulated information are often chosen depending on the region, historical data structure, available financial and technical resources, as well as in accordance with existing legislation and requirements. Risk assessment often uses the technologies which are essentially based on the Indexing system method (Hongwei *et al.* 2011).

Having studied the general international experience, it became clear that the quality of water supply reliability is largely connected with the accumulated information about the underground networks and their condition (Solomakhina *et al.* 2015). In each city the processing software is selected and adapted individually, data storage methods differ, and so do the further processing and analysis capabilities. All processes depend on the development stage of the geographical information systems and technologies applied in a given area. There is no single algorithm, as there are no identical historical backgrounds, operating conditions, or technological capabilities. At the same time it is significant to actively seek for opportunities of building such water supply network management systems (GIS) that would allow to perform the assessment of network functionality

and damage risk (Cubillo *et al.* 2014; Jeewon et al. 2015; Tuhovčak et al. 2014; Fernandez-Pato *et al.* 2014; Rezai *et al.* 2015; Solomakhina *et al.* 2015; Sitzenfrei *et al.* 2013; Дубровский 2015).

Network fault causes are widely described in literature, the main causes among the described ones are: construction defect, improper construction, poor quality pipes, improper connection fasteners, corrosion, mutual influence of bad communications, etc. There are both natural and natural-anthropogenic influencing forces. Natural forces include geological and hydrogeological conditions (Покровский 2015) and climate and temperature fluctuations, as well as biological and chemical soil conditions may have a negative impact on the pipes in the ground. It is more complicated to evaluate the natural-anthropogenic effects in a given area, in particular, on the city scale. The existing cones of influence may change the hydrogeological regimes. Dynamic load may affect the pipes which are located in the load influence areas, resulting in soil compaction or dilution. Static pressures caused by the weight of city's structures induce local or even city-scale depression funnels (Имансакипова 2014). Other service lines located next to water supply systems also have their negative effect on the network, which may include thermal effect from heating mains (Solomakhina 2015), chemical effects from the adjacent drainage networks or stray current impact from the electricity supply networks, which can also increase aggressiveness of the ambient underground environment corrosion. Historical building has its own effect, as a long history of a city's existence forms a complex cultural layer, which is considered to be the most difficult type of soil for performing forecasts. Thus, there is a large number of impacting forces that are specific to a particular territory; furthermore, the conditions and influencing forces may be arranged very unevenly even within the area of one city. Looking at the diversity and the complex nature of the affecting factors, it can be supposed that the underground water supply networks are exposed to many circumstances, and the assessment of one or even two factors will have little effect on the damage risk assessment (Maslak *et al.* 2015; Алексеенко *et al.* 2014; Верещака *et al.* 2011). That is why it is important to compare the theoretical or modeled failure risks with the real disruption events.

Another important issue is storing accident data. GIS systems make it easy to solve, however, in order to be able to perform data analysis later, the data needs to be accumulated over a long period of time.

Materials and methods

Accident data collection in the city of Riga has been taking place for quite a long time. Historical information has been accumulated in the form of charts with the only purpose to complete and implement changes in the plans, diagrams, and maps. Later on, with the development of databases and maintenance tracking systems, the data on accidents and failures, details of reconstructions performed, times and causes of events has been stocked in tabular form.

Implementing GIS development, strategies are gradually formed, which contribute not only to the systematic and orderly completion of graphical and attributive data on water supply networks, but also to accumulation of event statistics (Мазурова *et al.* 2013; Дубровский 2015; Антонович *et al.* 2014).

The strategy described below can be considered as an intermediate stage, which would today allow us to store information about events and performed reconstructions, as well as accident causes.

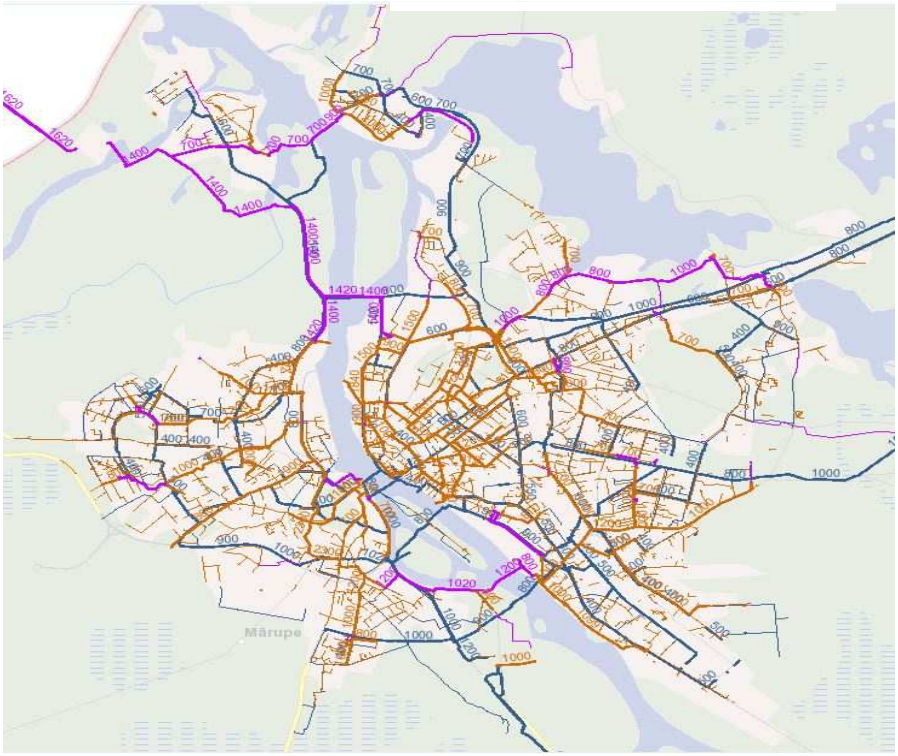


Figure 1. **Riga water supply and sewerage networks**

The extension of the water supply network of the city of Riga consists of: water pipes — 1,423.1 km and sewerage network - 1,141.8 km (2015 data) (Fig.1). The age of the network varies a lot — older networks may be more than 100 years old. Network materials are usually cast iron, steel, concrete, ceramics, and pvc. Diameters are very different as well: ranging from D1200, D1800 to D20. Installation depths also vary: depth of water pipes is typically below freezing point, i.e. networks are arranged not less than 1.5-1.7 meters below surface. Sewerage depths may range from fairly shallow, but the deepest wells might be located at almost 7 meters underground.

Riga's territory contains areas with conditions unfavorable for construction, with high groundwater levels and where the cultural layer constitutes 5-10 meters. Mostly the territory is sandy, also mineral mud layers can be found. Crystalline bedrock may have fractures that go through urban areas, so in theory, the seismic conditions are interesting as well. Riga territory is a subject to floods, there is also a depression funnel which began to develop in the '60s and reached

its maximum spread in the '70s. It is diminishing nowadays, the aquifer is changing however the city's territories are still subject to the funnel's effect.

As in any city, there are areas and highways in Riga with busy traffic, where dynamic loads impact the urban areas. There are also places with recently built heavy constructions that create static load on the environment.

Overall, looking at the Riga city conditions, it may be concluded that the circumstances are sufficiently complex for network operation and the abovementioned factors could have a significant impact on the water supply network.

The existing GIS system is able to cope with the assessment of failure, accident, and damage dynamics, however its current development stage will allow to accumulate accident data only over a longer period of time. Besides, it is clear that a successful evaluation of the territory requires statistical analysis of data accumulated over several years. Therefore, accident data flow formation is the primary task that needs to be completed, and later on, after accumulating data it would be possible to assess the accident dynamics.

In effort to provide accident data ingress into the GIS it was necessary to address the issues related to the development of the accident data flow system.

Accident data storage stages include: field work – emergency liquidation as such, event photo fixation, documenting of reconstructions – input of data in the database, taking measurements – event reconstructions mapping with accurate surveying techniques (GPS surveying). The cause of an accident is defined by an expert at the moment of reconstruction. Geographically linked information is supplemented with precise measurements and also includes accident identification number, date of the event, reconstruction executors, the substance of the accident and its cause. At the same time, the data on the water supply network visible stage is adjusted if necessary.

In addition to the information from the data storage system, which came into operation in 2015, also data from historical databases of accidents had been processed. Overall, approximately 70,000 records on the water supply network and 25,000 records on the sewerage network were found during the period of 2002-2012. Most of this data was dismissed and classified as inadequate for the aim of the study – i.e. only particular records were selected pointing to external influences on the networks. Records on man-inflicted damage, as well as records on other construction works not related to accidents were removed from the survey data. As a result 15,000 entries on sewerage networks and 25,000 records on water supply networks remained and could be used for the study. These records were summarized and automatically and manually inserted in a coded form into the GIS system applying geographical reference.

Results

During this stage of the research work the data on water supply system accidents in 2015 (Figure 2.) and the data during the period from 2002 to 2012 (Figure 3.) on water supply system and sewerage system was collected.

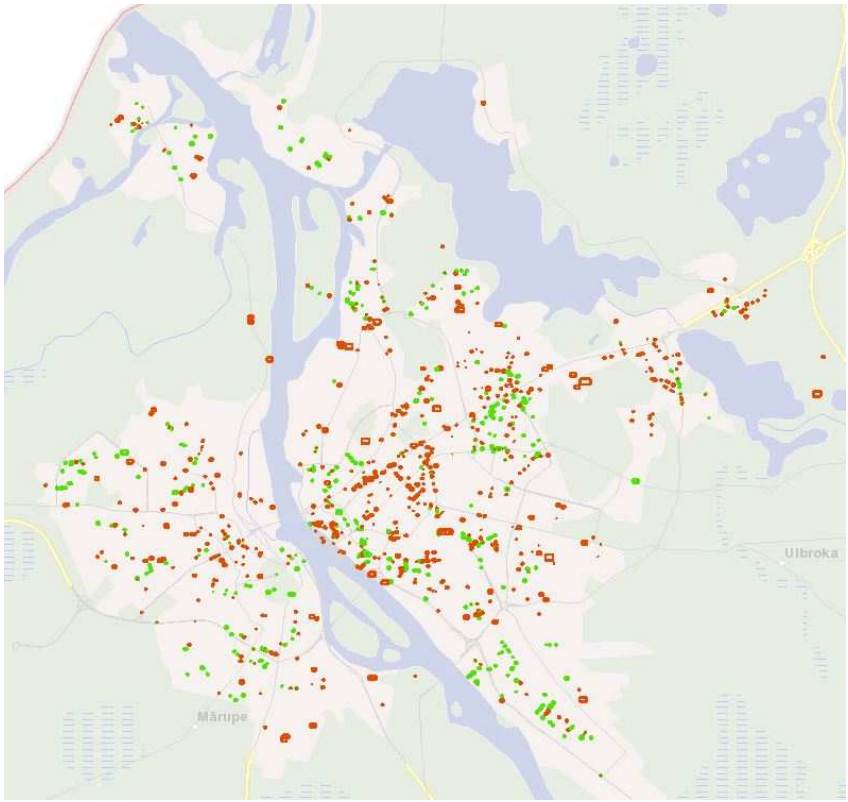


Figure 2. **Riga water supply accidents during 2015**

Summarizing the information on the period from 2002 to 2012 it was found out that the nature of accidents at sewerage and water supply networks varies. In sewerage pipelines and wells there were typically collapses, leakages, and blockages (mostly). At the same time in water supply network pipes, fittings, and wells there were damages (or leakages), deformations, tears, collapses, and freezing.

The different nature of accidents is associated with a variety of operating modes and pecularities of operation: sewerage pipelines are pressure-free, but the water pipes are exposed to the effects of water pressure.

Discussion

Performing selection of accident events and creating the data layer, a number of problems was identified and solutions were searched with the aim to solve these problems.

Providing accident data stream for the GIS environment, as well as simultaneous network data supplementation is complicated because of the lack of mutual interdepartmental communication, as it is vital to combine the results of the expert's work with the surveyor's tasks and coordinate them with the GIS operator. For the accident's final result to reach the end user, it is important to ensure

an understandable communication between these specialists, as well as a precise movement of data, where the information is constantly updated and orderly entered into the system, introducing strict control.

Processing the data from previous years (2002-2012 years period) it became clear that the following problems existed: incompletely filled databases – the events were not geographically linked using coordinates; the causes of accidents were not stated or not detected. Emergency cases were combined with other, simultaneous maintenance works – as a result the amount of data became huge and difficult to view. Ultimately it is difficult to perform data selection and clearly identify the causes of accidents. The accident nature should be described better, introducing additional scale for detection of accident causes.

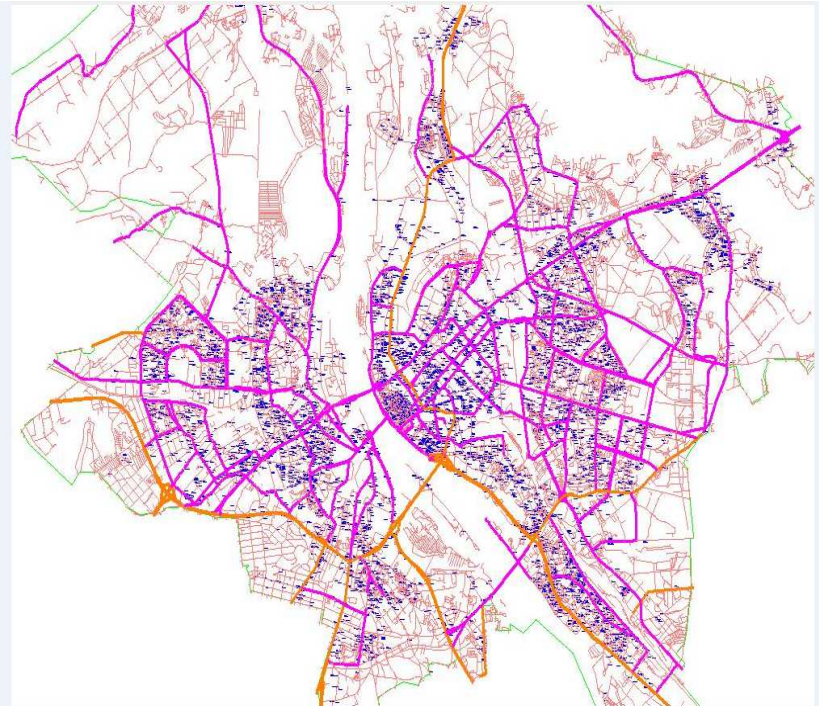


Figure 3. **Riga water supply and sewerage networks accidents during period 2002-2012**

The following possible solutions are offered to solve the problems described above: GIS system should be used for data storage applying orderly attributive information binding; the possible causes of accidents should be clearly defined from the outset; in order to acquire reliable results only those water supply network parts should be used, where the network parameters are clearly known; automatic data input using a single identification number for the entire period of accident event processing until the final input into the GIS system.

For the best results the people involved should be educated and proposed to use a single system of common standards.

Conclusions

The issue of water supply accident data storage could be easily resolved by using GIS systems. Providing correct data on the course of events and ensuring its input in the system, as well as adhering to the strategy chosen would allow to store information for longer periods. Thus it would also be possible to process data from previous periods, preparing them in an appropriate form.

Stored data can be grouped by selected characteristics and in the future diverse analysis can be performed on this data. Using modeling variations it would be possible to make comparison with the real situations.

By gradually accumulating data on urban underground environmental conditions it might be possible to identify areas with increased probability of accidents and thus it would be possible to try to find out the real reasons for the accidents.

Even without extensive analysis, based solely on statistical data collection, it would be possible to identify the areas of increased aggressiveness, take preventive measures, and adopt recommendations.

References

Alves Z. Muranho J., Albuqerque T., Ferreira A., 2013. Water distribution network's modeling and calibration. A case study based on scarse inventory data. In: *12th International Conference on Computing and Control for the Water Industry*, CCWI2013.Procedia Engineering 70(2014) pp31-40.

Cubillo F, Perez P. 2014. Water Distribution System Risk Assessment Method. In*: 16th Conference on Water Distribution System Analysis*, WDSA 2014, Procedia Engineering 89 (2014), pp. 355-362.

Dehua Wei, Pan Liu, Bo Lu, Zeng Guo, 2012. Water Quality Automatic Monitoring System Based on GPRS Data Communications. In: *2012 International Conference on Modern Hydraulic Engineering*. Procedia Engineering 28(2012) pp 840-843.

Dziedzic R.M., Karney B.W., 2013. Integrating data for water demand management. In: *12th International conference on Computing and Control for the Water Industry*, CCWI2013. Procedia Engineering 70(2014) pp583-591.

Fernandez-Pato J., Carcia-Navarro P., 2014. A pipe network simulation model with dynamic transition between free surface and pressurized flow. In: *12th International Conference on Computing and Control for the Water Industry*, CCWI 2013. Procedia Engineering 70(2014) pp641-650.

Hongwei Li, Mou Lv, Song Ye, 2011. The research and Practice of Water Quality Safety Evalutation for Ji Nan urban Water Supply System. In: *Procedia Environmental Sciences 11* (2011) pp 1197-1203.

Jeewon Seo, Moonsoo Koo, Kibum Kim, Jayong Koo, 2015. A Study on the Probability of Failure Model Based on the Safety Factor for Risk Assessment in a Water Supply Network. In: *13th Computer Control for Water Industry Conference*, CCWI 2015. Procedia Engineering 119(2015), pp 206-215.

Mair M., Rauch W., Sitzenfrei R., 2013. Improving incomplete water distribute system data. In: *12th International Conference on Computing and Control for the Water Industry*, CCWI2013. Procedia Engineering 70(2014) pp1055-1062.

Maslak Viktor, Nasonkina Nadiya, Sakhnovskaya Viktoria, Gutarova Marina, Antonenko Svetlana, Darya Nemova, 2015. Evaluation of Technical Condition of Water Supply Networks on

Undermined Territories. In: *International Scientific Conference Urban Civil Engineering and Municipal Facilities.* SPbUCEMF2015. Procedia Engineering 117 (2015) pp980-989.
Merchant A., Mohan Kumar M.S., Ravindra P.N., Vyas P., Manohar U., 2013. Analitics driven water management system for Bangalore city. In: *12th International Conference on Computing and Control for the Water Industry*, CCWI2013. Procedia Engineering 70(2014) pp1137-1146.
Rezai Hossein, Ryan Bernadette, Stoianov Ivan, 2015. Pipe failure analysis and impact of dynamic hydraulic conditions in water supply networks. In: *13th Computer Control for Water Industry Conference,* CCWI2015. Procedia Engineering 119(2015) pp 253-262.
Sala D., Kolakowski P., 2013. Detection of leaks in a small-scale water distribution network based on pressure data-experimental verification. In: *12th International Conference on Computing and Control for the Water Industry*, CCWI2013. Procedia Engineering 70 (2014) pp1460-1469.
Sitzenfrei Robert, Moderl Michael, Rauch Wolfgang, 2013. Automatic generation of water distribution systems based on GIS data. In: *Environmental Modelling and Software 47* (2013) pp138-147.
Solomakhina Nina, Watzke Michael, Marechal Francois, Bercher Silvio, Lamparter Steffen, Hubauer Thomas, 2015. Modelling and analysis technicues for multimodal utility networks. In: *6th International Building Physics Conference,* IBPC2015. Energy Proceda 78 (2015) pp3397-3402.
Tuhovčak L, Tauš M., Kučera T., 2014. The Assessment of the Technical Condition of the Water Distribution Systems. In: *16th Conference on Water Distribution System Analysis,* WDSA 2014. Procedia Engineering 89 (2014) pp1420-1427.
Алексеенко Н.А., Медведев А.А., 2014. Возможности картографирования антропогенного влияния на особо охраняемые природные территории. In: *Известия высших учебных заведений. Геодезия и аэрофотосьемка*. №4, 2014, стр. 52-58.
Антонович К.М., Ганагина И.Г., Косарев Н.С., Косарева А.М., 2014. О надежности сетей постоянно действующих базовых станций. In: *Известия высших учебных заведений. Геодезия и аэрофотосьемка.* №4/С, 2014, стр. 30-36.
Верещака Т.В., Качаев Г.А., 2011.Топографические карты в системе экодиагностики территории: оценка антропогенных воздействий. In: *Известия высших учебных заведений. Геодезия и аэрофотосьемка*. №5, 2011, стр. 54-64.
Дубровский А.В., 2015. Возможности применения геоинформационного анализа в решении задач мониторинга и моделирования пространственных структур. In: *Известия высших учебных заведений. Геодезия и аэрофотосьемка.* №5/С, 2015, стр. 236-242.
Захаревич М.Б., Ким. А.Н., Матьянова А.Ю. *Повышение надежности работы систем водоснабжения на основе внедрения безопасных форм организации их эксплуатации и строительства.* Учебное пособие
Имансакипова Ботакоз, 2014. *Мониторинговые исследования деформаций инженерных сооружений на основе результатов геодезических наблюдений*. Диссертация. Алматы, Казахстан. 2014. Стр.10-28.
Конотопов А.И., 2013 Пространственная информация как составляющая инновационного потенциала. In: *Известия высших учебных заведений. Геодезия и аэрофотосьемка*. №4, 2013, стр. 94-97.
Мазурова Е.М., Огиенко С.А.,2013. Отображение геодезических данных в ArcGIS. In: *Известия высших учебных заведений. Геодезия и аэрофотосьемка*. №5, 2013, стр. 34-42.
Николаев В.Н., Макарьин И.В., 2013. Преодоление информационных барьеров при создании геоинформационной продукции. In: *Известия высших учебных заведений. Геодезия и аэрофотосьемка*. №4, 2013, стр. 76-80.
Покровский В.Д., 2015. *Исследование процессов подтопления урбанизированных территорий с использованием геоинформационных технологий* (На примере города Томска). Диссертация. Томск. Россия. 2015. Стр.82-116. СПбГАСУ. Санкт-Петербург. Россия. 2011. Стр. 7-42.
https://www.rigasudens.lv/par-mums/darbiba/udensapgade/
https://www.rigasudens.lv/par-mums/darbiba/kanalizacija/

BIOLOĢIJA / BIOLOGY

EVALUATION ECOLOGICAL AND GENETIC ASPECTS OF PRODUCTIVITY AND RESISTANCE TO POWDERY MILDEW OF COMMON FLAX

Inga Stafecka[1,2], Dace Grauda[3], Veneranda Stramkale[1,2]
[1] Agricultural Science Centre of Latgale, Kulturas sq. 1, Vilani, Vilanu distr., Latvia Ph.: +371 29465044, e-mail: strzin@apollo.lv
[2] Institute of Agricultural Resources and Economics, Research Centre of Priekuli, Zinatnes Street 2, Priekuli, Priekulu distr., Latvia ph :+371 64130162 e-mail: pr_sel@apollo.lv
[3] Institute of Biology, University of Latvia, Miera Street 3, Salaspils, Latvia; ph.: +371 67945435, e-mail: andra@email.lubi.edu.lv; dace@email.lubi.edu.lv; izaks@email.lubi.edu.lv

Abstract
Key words: *flax, genetic resource, powdery mildew, stem yield*
Flax (*Linum usitatissimum* L.) is a traditional and valuable multipurpose source crop. Natural fibers have received much attention for the last decade. Flax fiber is used mainly for textiles and yarns, and recently interest has also been focused on non-textile applications, and it has high prospective for use in Latvia. The decisive role at the yield productivity of the plant is determined genotypically, which includes ecological plasticity and resistance in relation to pathogens population as the ability to respond to variable weather conditions. In this case agronomically important traits, such as stem yield, bast content, vegetation period and resistance to diseases were evaluated for 24 Latvian origin flax varieties and lines and standard variety 'Vega 2'. Investigation has been carried out over the period 2010-2015 in the Agricultural Scientific Centre of Latgale on field trials. The significant impact of ecological factors on flax yield were observed. In 2015, by evaluating disease diversity of flax, the highest severity index of powdery mildew (*Oidium lini* Ŝkoric) with value in range from 1 until 34 % was found out. A resistant variety 'Rezekne' was identified by evaluating powdery mildew resistance level with area under the disease progress curve (AUDPC).

Kopsavilkums
Atslēgvārdi: *lini, ģenētiskie resursi, īstā miltrasa, salmiņu raža*
Latvijā lini (*Linum usitatissimum* L.) ir, tradicionāli audzēti, daudzfunkcionāli un vērtīgi kultūraugi. Pēdējos gados palielinās dabīgās šķiedras izmantošana dažādās tekstīlijās, līdzi ar to palielinās arī linu šķiedras izmantošanas potenciāls. Genotipam, kurš ietver sevī ekoloģisko plastiskumu un izturību attiecībā uz patogēnu populāciju, un mainīgiem laika apstākļiem, ir izšķiroša loma auga ražas produktivitātē. Šajā pētījumā 24 Latvijas izcelsmes linu šķirnēm, līnijām un standarta šķirnei 'Vega 2' tika analizēti agronomiski svarīgas pazīmes: salmiņu raža, lūksnes saturs, veģetācijas perioda garums un izturība pret slimībām. Novērojumi tika veikti Latgales Lauksaimniecības zinātnes centrā lauka izmēģinājumos no 2010. līdz 2015. gadam. Rezultātā novērota būtiska ekoloģisko faktoru ietekme uz linu ražu. 2015. gadā izvērtējot linu izturību pret slimībām, tika konstatēts, ka visvairāk bojājumu radīja miltrasa (*Oidium lini* Ŝkoric) (bojājuma pakāpes indekss konstatēts no 1 līdz 34%). Izmantojot AUDPC analīzi tika identificēta pret miltrasu rezistenta linu šķirne 'Rezekne'.

Introduction

The Linum genus contains about 180 different species spread across the six continents (Sveinsson *et al.* 2014). Some of these species have been exploited by man since at least the upper Palaeolithic period when wild flax fibres were used by hunter gatherers to make cords (Kvavadze *et al.* 2009). Common flax (*Linum usitatissimum* L) was then domesticated during the Neolithic era and became one of the earliest cultivated plants used for weaving (Zohary and Hopf 2004) but also as an oil source (Oomah 2001). Since then, commercial flax has been progressively selected to optimize stem content in cellulose-rich phloem fibres (bast fibres) and/or seed oil naturally rich in omega-3 alphalinolenic acid (ALA) (Chantreau *et al.* 2015). Flax breeding in Latvia started in 1923.

After World War II, flax growing was not considered as an important task for the region, and, therefore, the flax area in the country was gradually reduced. In 1970, flax breeding in Latvia was cancelled (Rashals and Stramkale 1998). Fibre flax breeding was started in Latvia again in 1992 (Grauda *et al.* 2004).

Nowadays the new potential applications of flax fibres are under investigation, which may contribute to renewing flax sowing areas. The spectrum of flax fibre prospective applications is astoundingly wide, from biocomposites, by biofuels, special paper production, bioremediation for biomedical applications (Powell *et al.* 2002; Czemplik and Szopa 2009; Szopa *et al.* 2009; Skórkowska-Telichowska *et al.* 2011; Czemplik *et al.* 2011; Ververisa *et al.* 2004; Ekblad *et al.* 2005; Jhala AJ, Hall 2010). Thanks to its composition, flax fibre has the highest liquid absorption among natural fibres and it is biologically active, which is by far the greatest advantage over cellulosic cotton fibres (Preisner *et al.* 2014). In terms of mechanical performance, flax fibers are the strongest of the natural fiber family.

Powdery mildew (PM), caused by the obligate biotrophic ascomycete ***Oidium lini*** Skoric, is a common, widespread, and easily recognized foliar disease of flax present in most growing areas worldwide (Gill, 1987; Aly et al. 2012). Early PM infections may cause severe defoliation and reduce both yield and seed quality (Beale, 1991). The pathogen infects all the aboveground flax organs including stems, leaves, flowers and capsules (Hussein et al. 2011). Currently, field evaluation is the only reliable method to distinguish flax genotypes with PM resistance.

In quantitative resistance, where differences in level of resistance are usually less distinct, measuring disease progress is important for understanding plant–pathogen interaction. Disease typically starts at a low level, gradually increasing in incidence and/or severity over time. Progress of disease on plants is usually observed several times during pathogen epidemics. Extent of disease is assessed at each observation using scales that are based on disease incidence, severity, or a combination of both. To combine these repeated observations into a single value, Van der Plank (chapter 12 of literature citation 13) proposed calculating the area under the disease progress curve (AUDPC) (Simko & Piepho 2011).

The aim of this study was to determine the effect of precipitation on stem yield depending on the variable weather condition and resistance to powdery mildew of 25 flax varieties and lines.

Materials and methods

Field experiments

Investigation has been carried out over the growing season's 2010-2015 in the Agricultural Science Centre of Latgale in Latvia out at the field trial. Experimental material for the present study consisted of 24 flax lines of Latvian origins, varieties and all results were compared with standard variety 'Vega 2'.

Evaluated flax varieties and lines

'Altgauzen', 'Rezeknes', 'Rota I', 'Rota II', 'Ruda I' (Latvia origin varieties),

'S13/5-7/5-93', 'S32/4-8-93', 'S53/8-3-93', 'S64-17-93', 'T11-6/2-15-94', 'T11-13/3-1-94', 'T25/5-33/12-8-94', 'T29-36/10-5-94', 'T29-36/7-1-94', 'T31-40-94', 'T36-26/4-8-94', 'K47-17/11-1-95', 'K47-17/11-6-95', 'L2-14/6-97', 'L11-11/10-97', 'L11-11/11-97', , 'L19-6/15-97', 'L23-26/3-97', 'L26-47/1-97' (Latvia origin lines) and 'Vega2'(ST) (Lithuania origin variety).

Each variety and line was noted stem yield in each harvested parcel area.

Powdery mildew (PM) was assessed in 1 m^2 plots of flax, every seven days till flax pulling by observing 30 plants and by estimating the disease severity and incidence. PM incidence was estimated by visual symptoms. The affected plant parts were stored in a wet chamber, and after emergence of mycelium the samples were examined with light microscope. Per cent of affected plants was estimated and disease severity was recorded following a five-point scale: 0 – healthy plants; 1 – weakly affected; 2 – moderately affected; 3 – heavily affected; 4 – very heavily affected or dead plants. Disease severity index was calculated by applying the following formula (1):

$$\mathrm{I} = \frac{\sum(\mathrm{ab}) \times 100}{\mathrm{A} \cdot \mathrm{S}} \qquad (1)$$

Where I – disease severity index %, a – number of infected plants, b – degree of infection, A – total number of plant samples (healthy and infected), S – the highest degree of infection (Лошакова, Крылова and Кудрявцева, 2000).

The combine these repeated observations into a single value have been calculated the area under the disease progress curve (AUDPC) by applying the following formula (2):

$$AUDPC = \sum_{i=1}^{n-1} \frac{y_i + y_{i+1}}{2} \times (t_{i+1} - t_i) \qquad (2)$$

Where y_i is an assessment of a disease (percentage) at the ith observation, t_i is time (in days) at the ith observation, and n is the total number of observations (Van der Plank, 1963; Simko & Piepho, 2011).

Meteorological conditions

Agro-meteorological conditions were determined by ADCON installed meteorological stations which are connected to the computer program Dacom Plant Plus. This facility provides information in direct nearby field trials.

Data analysis

Microsoft Excel program was used to statistically process the data. The data analysis tools used were Descriptive Statistics and Correlation tests. This study was carried out to determine the

effect of significant and not significant relationship between stem yield and precipitation of flax genotypes. Evaluated severity index and AUDPC of powdery mildew were detected flax genotypes resistance level.

Results and discussion

The testing period included years with diverse weather conditions, which was reflected by the large variation of average stem yields for flax. After the correlation analysis were found out positive relationship between moisture content and stem yield all flax varieties and lines (Fig. 1). The highest relationship correlation value was obtained from flax variety of 'Rota I' (r=0.78), which most notably stem yield depends on the amount of high humidity during the growing season. The most valuable relationships showed flax line of 'T36-26/4-8-94' (r=0.15), with the lowest dependence on precipitation and the relatively high average stem yield and higher bast content (Fig. 2.).

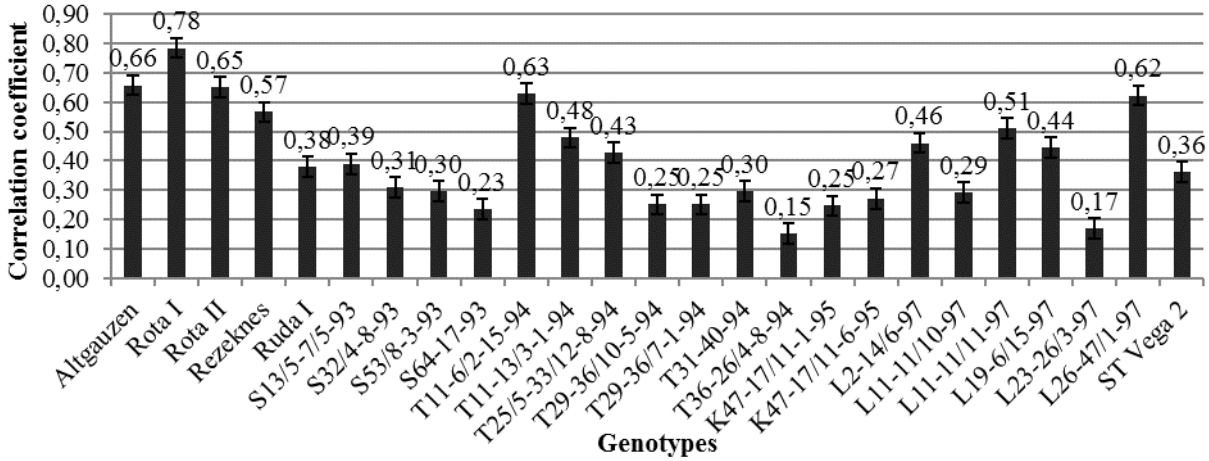


Figure 1. **Correlation coefficient between stem yield and precipitation for flax varieties and lines (* − correlation significant at p≤0.05)**

According to the results in period from 2010 until 2015 highest stem yield was obtained in 2012 from all flax genotypes. Evaluating the period in 2012 from germination until full flowering of flax was characterized by high moisture content (102 – 152 mm) from May to July. Unlike in 2014 was obtained the lowest stem yield. This vegetation period was characterized by rapid drop of moisture from June to July (72.60 – 25.20 mm) and rapid increase of moisture in August (124.80 mm), which significantly affected the lower stem yield. By Nykter, (2006) in order to obtain the best flax crop results, the weather conditions should be stable from germination to the end of flowering. Also in this case, we obtain a similar result by the total amount of moisture in 2014 ranks second after 2012, but its rapidly changing moisture content significantly affected the lower stem yield. Therefore, by evaluating the moisture effects on the stem yield it is also important to take into account the variability of moisture during the growing season. The results showed that the genotypic valuable flax linen has 'S13/5-7/5-93' taking into account the changing conditions during the vegetation period, correlation results as well as higher stem yield (589.33g m^{-1}).

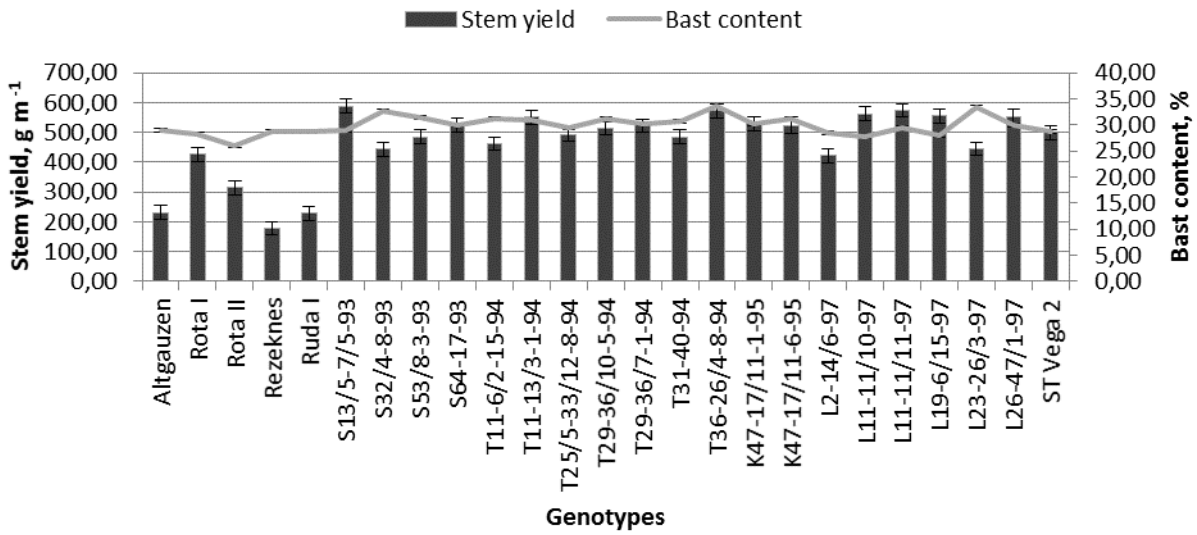


Figure 2. **2010-2015 stem yield (g m^{-1}) for varieties and lines of flax**

By analyzing the effects of the diseases in 2015 one of the highest severity index from other casual agents have been powdery mildew. First symptoms of powdery mildew were observed on flax leaves after the end of flowering. At early stage the lesions are small, and do not encircle the stem.

According to Beale, (1991), Saharan and Saharan, (1994) powdery mildew requires living tissue for growth and reproduction and thrives in high humidity and moderate temperature environments, although the symptoms observed in different environments allude to the presence of different races of the pathogen.

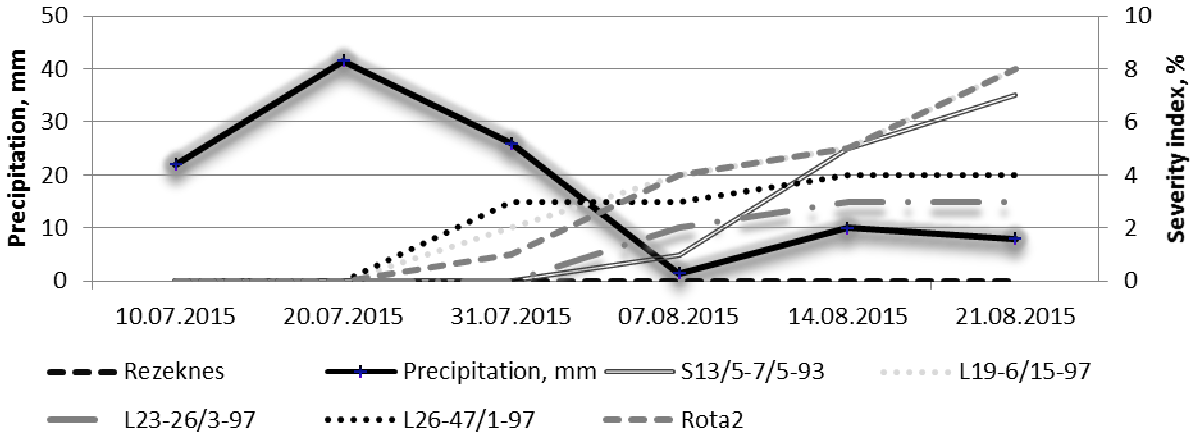


Figure 2. **The influence of precipitation on the severity index of powdery mildew with lowest value for flax lines and varieties in 2015**

In this case, according to weather observations precipitation increases after flowering stage in July and rapidly declines in the beginning of August. By evaluating the appearance of powdery mildew variable moisture content is affected by favorable conditions for disease development and

spread. By Mansour, (1998) currently, all commercially grown flax cultivars are susceptible to the disease, although field observations indicated that some experimental lines were more susceptible than others. Although, according of Rashid and Duguid, (2005) classical genetic studies identified several resistant cultivars, in the European cultivars Atalante and Linda.

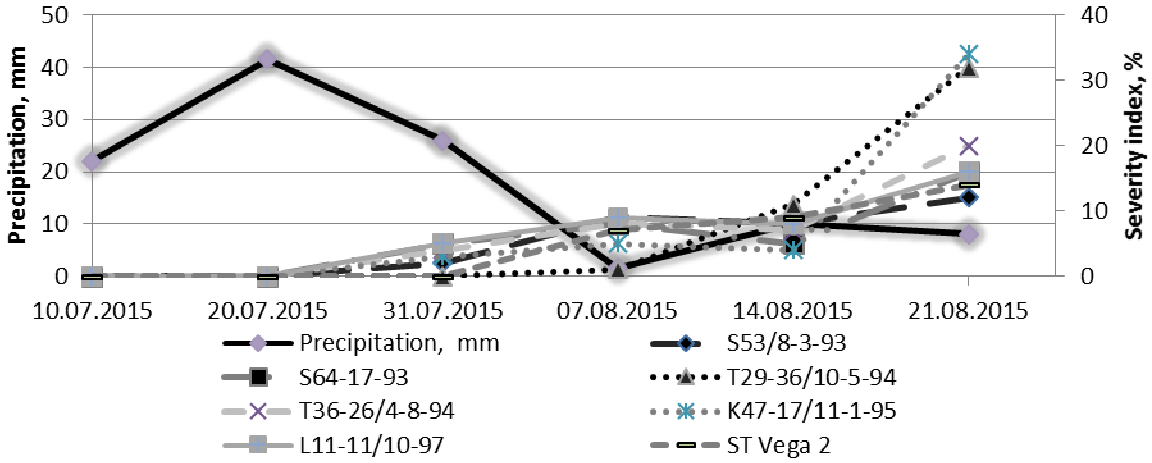


Figure 3. **The influence of precipitation on the severity index of powdery mildew with higher value for flax lines and varieties in 2015**

After observations only the variety of 'Rezekne' was resistant to powdery mildew throughout the growing season. Other value of severity index ranging from 1% to 34% depending on the genotype (presented on Fig.3 and 4). The data was noted severity index of powdery mildew with low susceptibility level of flax line 'L23-26/3-97' range from 2 % until 3%. The highest susceptibility has flax line 'K47-17/11-1-95' with rapid increases severity index from 3 % until 34% in growing period.

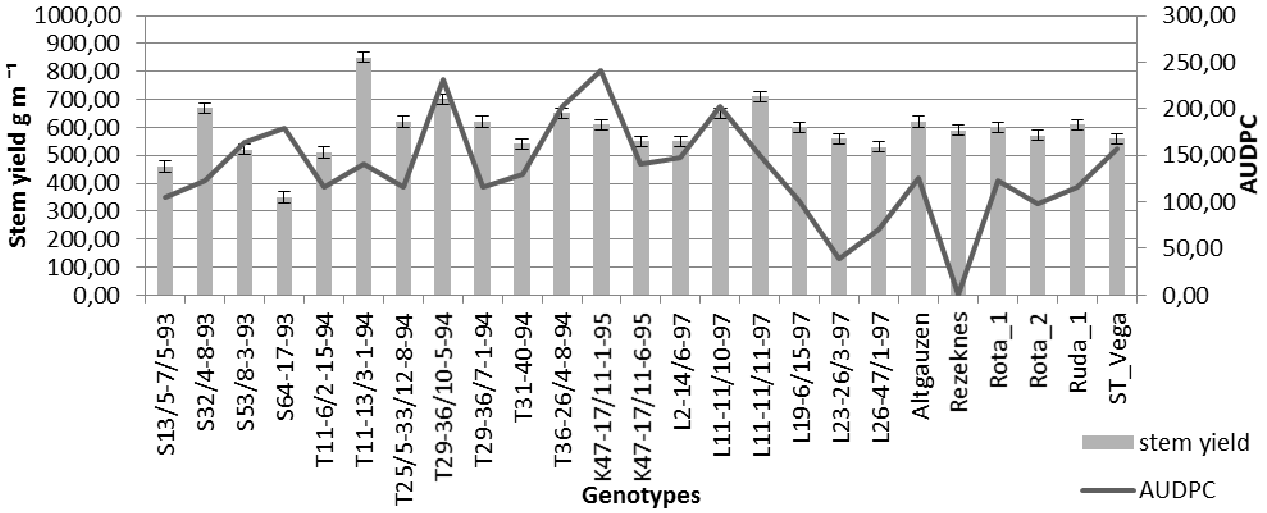


Figure 4. **The 2015 stem yield and AUDPC value for flax lines and varieties**

All flax varieties and lines obtained result are presented in Figure 5. By evaluating AUDPC values detected higher resistance to causal agent flax lines of 'L23-26/3-97', 'L26-47/1-97' and

variety 'Rota I'. Higher tendency to infection of PM were lines 'K47-17/11-1-95', 'T29-36/10-5-94' and 'L11-11/10-97'. It cannot be argue that flax lines and varieties genetic resistance affects the stem yield increase in this case take into account the genotype characteristics as well as other pathogens. Continue to make follow-up studies for this genotypes, which take into account the changing weather conditions and variable levels of natural inoculum.

Conclusions

Overall, the higher stem yield for all lines and variety flax is obtained in moisture weather. According to the results expressed ecological plasticity has line of 'S13/5-7/5-93' which specifically adapted variable weather conditions. Experimental evidence suggests that from all flax varieties and lines the most resistant to powdery mildew is the variety of 'Rezekne'. The results criteria are important for the choice of potential new varieties in future.

Acknowledgements

The project "Preservation gene pool of flax" was financial support by the Latvian Ministry of Agriculture.

References

Aly, A.A., Mansour M.T.M. , Mohamed H. , and Abd Elsalam K.A. 2012. Examination of correlations between several biochemical components and powdery mildew resistance of flax cultivars. *Plant Pathol. J.* 28:149–155.doi:10.5423/PPJ.2012.28.2.149

Beale R.E. 1991. Studies of resistance in linseed cultivars to *Oidium lini* and *Botrytis cinerea*. *Aspects Appl. Biol.* 28:85–90.

Chantreau M., Chabbert B., Billiard S., Hawkins S. and Neutelings G. 2015. Functional analyses of cellulose synthase genes in flax (Linum usitatissimum) by virus-induced gene silencing *Plant Biotechnology Journal* (2015) 13, pp. 1312–1324.

Gill. K.S. 1987. Linseed. Publications and information division, *Indian Council of Agricultural Research, New Delhi. p*. 386.

Czemplik M., Boba A., Kostyn K., Kulma A., Mituła A.M., Wróbel-Kwiatkowska M., Zuk M., Szopa J., Skórkowska-Telichowska K. 2011. Flax engineering for biomedical application. In Book Flax engineering for biomedical application. Edited by Komorowska MA, Olsztynska-Janus S. INTECH;:407–434. doi:10.5772/13570 url: http://www.intechopen. com/books/biomedicalengineering-trends-research-and-technologies/flaxengineeringforbiomedical-application.

Czemplik M., and Szopa J. 2009. Optimizing biomedical and industrial products development based on flax. *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources*, 4(062):1–10.

Ekblad C., Pettersson B., Zhang J., Jernberg S., Henriksson G. 2005. Enzymaticmechanical pulping of bast fibers from flax and hemp. *Cellulose Chem Technol*, 39:95–103.

Grauda D., Stramkale V., Rashal I. 2004. Evaluation of Latvian flax varieties and hybrids. *Proceedings in Agronomy*, No. 6, p. 159-165.

Hussein E.M., Mansour M.T.M., Hassan Maggie E.M., Elkady Eman A., and Kasem K. K. 2011. Use of serology, SDS-PAGE, and RAPD analysis to evaluate resistance of flax to powdery mildew *Egypt. J. Agric. Res.*, 89 (1).

Jhala A.J., Hall L.M. 2010. Flax (Linum usitatissimum L.): current uses and future applications. *Aust J Basic Appl Sci*, 4:4304–4312.

Kvavadze, E., Bar-Yosef, O., Belfer-Cohen, A., Boaretto, E., Jakeli, N., Matskevich, Z. and Meshveliani, T. 2009. 30 000-year-old wild flax fibers. *Science*, 325, 1359.

Oomah, B.D. 2001. Flaxseed as a functional food source. *J. Sci. Food Agric*. 81, 889–894.

Лошакова Н. И., Крылова Т. В., Кудрявцева Л. П. 2000. Методические указания по фитопатологической оценке устойчивости льна-долгунца к болезням. – Москва,– 52 с.

Mansour, M.T.M. 1998. Pathological studies on powdery mildew of flax in A.R.E. Ph.D. *Thesis, Zagazig Univ*., Moshtohor, 148 p.

Nykter M. 2006. Microbial quality of hemp (*Cannabis sativa* L.) and flax (*Linum usitatissimum* L.) from plants to thermal insulation. ACADEMIC DISSERTATION. Helsinki, Finland. (http://ethesis.helsinki.fi/julkaisut/maa/maaja/vk/nykter/microbia.pdf)17.03.2016.

Powell T, Panigrahi S, Ward J, Tabil LG, Crerar WJ, Sokansanj S. 2002. Engineering Properties of Flax Fiber and Flax Fiber-Reinforced thermoplastic in Rotational molding. In Book Engineering Properties of Flax Fiber and Flax FiberReinforced thermoplastic in Rotational molding. Saskatchewan, Canada: ASAE, The Sosciety for engineering in agricultural, food and biological systems.

Preisner M., Anna Kulma A., Zebrowski J., Dymińska L., Hanuza J., Arendt M.,Starzycki M., and Szopa J., 2014. Manipulating cinnamyl alcohol dehydrogenase (CAD) expression in flax affects fibre composition and properties. *BMC Plant Biology*, 14:50 http://www.biomedcentral.com/1471-2229/14/50

Rashal I., Stramkale V., 1998. Conservation and use of the Latvian flax genetic resources. Proceedings of the Symposium “Bast Fibrous Plants Today and Tomorrow. Breeding, Molecular Biology and Biotechnology beyond 21th century”, 28-30 September 1998. St. Petersburg, Russia. Natural Fibres, iss. 2, p. 56-58.

Rashid, K., and S. Duguid. 2005. Inheritance of resistance to powdery mildew in flax. *Can. J. Plant Pathol*. 27:404–409. doi:10.1080/07060660509507239

Saharan G.S., and Saharan M.S. 1994. Studies on powdery mildew of linseed caused by ***Leveillula taurica*** (Lev.). *Indian J. Mycol. Plant Pathol*. 24:107–110.

Simko I., and Piepho H.P. 2011. The Area Under the Disease Progress Stairs: Calculation, Advantage, and Application. *Analytical and Theoretical Plant Pathology* Vol. 102, No. 4, pp. 381 – 389.

Skórkowska-Telichowska K., Czemplik M., Kulma A., Szopa J. 2011. The local treatment and available dressings designed for chronic wounds. J Am Acad Dermatol, 10:117–126.

Sveinsson S., McDill J., Wong G.K., Li J., Li X., Deyholos M.K. and Cronk Q.C. 2014. Phylogenetic pinpointing of a paleopolyploidy event within the flax genus (Linum) using transcriptomics. *Ann. Bot*. 113, 753–761.

Szopa J., Wróbel-Kwiatkowska M., Kulma A., Zuk M., Skórkowska-Telichowska K., Dymińska L., Mączka M., Hanza J., Zebrowski J., Preisner M. 2009. Chemical composition and molecular structure of fibers from transgenic flax producing polyhydroxybutyrate and mechanical properties and platelet aggregation of composite materials containing these fibers. *Compos Sci Technol*, 69:2438–2446.

Van der Plank, J. E. 1963. Plant Diseases: Epidemics and Control. *Academic Press, New York.*

Ververisa C., Georghioua K., Christodoulakisa N., Santasb P., Santasb R. 2004. Fiber dimensions, lignin and cellulose content of various plant materials and their suitability for paper production. *Ind Crops Prod*, 19:245–254.

Zohary D. and Hopf M. 2004. Domestication of Plants in the Old World. *New York: Oxford University Press.*

VESELĪBAS ZINĀTNES / HEALTHY SCIENCES

BRISTOW-LATARJET AND BANKART: A COMPARATIVE STUDY OF SHOULDER STABILIZATION TREATMENT IN HOSPITAL OF TRAUMATOLOGY AND ORTHOPAEDICS IN RIGA

Toms Arcimovičs, Laura Ozoliņa, Elīza Sālījuma
Rīga Stradiņš University, Dzirciema street 16, Rīga, Latvia, LV-1007
tomsarc@gmail.com

Abstract

Bristow-Latarjet and Bankart: A Comparative Study of Shoulder Stabilization Treatment in Hospital of Traumatology and Orthopaedics in Riga

Key words: *Bankart; Bristow-Latarjet; recurrent instability; anterior instability*

Anterior shoulder dislocation is commonly complicated by recurrent instability, which occurs in up to 60% of all patients. Arthroscopic Bankart (AB) and open Bristow-Latarjet (B-L) procedures are both viable surgical options for recurrent traumatic anterior instability of the shoulder joint. Both restores stability to the shoulder - the AB procedure repairs tear in the labrum with anchors and B-L provide shoulder stability with coracoid transfer to glenoid.

The aim of the study is evaluate and compare the clinical and functional results of patients who underwent AB and open B-L surgery for symptomatic instability in Hospital of Traumatology and Orthopedics, Riga, Latvia, in period 2009 - 2015.

20 AB and 46 B-L patients treated for recurrent anterior glenohumeral instability were retrospectively identified from six surgeons' practices. 15 patients (75%) from AB group, whose average age was 28.27 (SD 8.55) years, and 35 patients (76%) from B-L, whose average age was 29.32 (SD 11.12) years, were evaluated. Primary outcome measures were the WOSI, Constant Scale, satisfied rate and redislocation or subluxation rate.

Average WOSI score was 79.85 (SD 11.62) for AB and 79.89 (SD 12.08) for B-L shoulders. Average Constant score was 94.85 (SD 6.59) for AB and 94.32 (SD 5.76) for B-L patients. Redislocation or subluxation after the first operation occurred in 3 of 15 (20%) of AB group and 1 of 35 (2.85%) B-L shoulders.

Results were better after the B-L repair than after AB repairs done with anchors with respect to postoperative stability and subjective evaluation.

Kopsavilkums

Bristow - Latarjet un Bankart: Pleca stabilizācijas operāciju metožu salīdzinājums Valsts Traumatoloģijas un Ortopēdijas slimnīcā Rīgā

Atslēgvārdi: *Bankart; Bristow-Latarjet; atgriezenisks pleca mežģījums, priekšējā nestabilitāte*

Priekšējais pleca mežģījums līdz pat 60 % pacientu mēdz komplicēties ar atgriezenisku pleca nestabilitāti. Gan artroskopiska Bankart (AB), gan vaļēja Bristow - Latarjet (B-L)- abas ir sekmīgas operācijas metodes, lai novērstu atgriezenisku nestabilitāti pleca locītavā. AB metodes rezultātā pleca stabilitāte tiek atjaunota sašujot traumēto *labrum* ar enkuriem, savukārt vaļējas B-L operācijas laikā nestabilitāti novērš ar *coracoidea* izauguma nostiprināšanu pie glenoīda priekšējās virsmas.

Darba mērķis bija izvērtēt un salīdzināt klīniskos un funkcionālos rezultātus starp artroskopiski un vaļēji operētiem pacientiem veikta pleca stabilizācijas operācija Valsts Traumatoloģijas un Ortopēdijas slimnīcā, Rīgā, Latvijā, laika posmā no 2009. - 2015. gadam.

20 AB un 46 vaļēja B-L pacienti tika retrospektīvi atlasīti no sešu ārstu praksēm. Klīniski tika izmeklēti 15 pacienti (75 %) no AB grupas, kuru vidējais vecums bija 28.27 (SD 8.55) gadi, un 35 pacienti no vaļējas B-L grupas , kuru vidējais vecums bija 29.32 (SD 11.12) gadi. Pacienti tika izmeklēti pēc WOSI un Constant klīniskajām skalām un redislokācijas skaita pēcoperācijas periodā.

Vidējā WOSI vērtība AB pacientiem bija 79.85 (SD 11.62) un 79.89 (SD 12.08) pacientiem pēc B-L operācijas metodes. Vidējais Constant skalas vērtība AB pacientiem bija 94.85 (SD 6.59) un 94.32 (SD 5.76) pacientiem pēc B-L operācijas. Redislokācijas vai subluksācijas pēc pirmās operācijas skāra trīs no 15 (20 %) AB grupas pacientiem un vienu no 35 B-L grupas pacientiem (2.85 %). Funkcionālie rezultāti abās grupās bija līdzīgi, bez statistiski nozīmīgas atšķirības, savukārt redislokācijas skaits pēc pirmās operācijas statistiski zemāks bija B-L grupas pacientiem, nekā AB grupas.

Introduction

The shoulder is the most flexible joint in the human body with the biggest range of motion (Quillen *et. al.* 2004). Due to its wide range of motions, shoulder also is the most often dislocated joint in our body (Antunes *et. al.* 2016). Frequently dislocations are related with shoulder injury from trauma. Glenohumeral joint dislocations affect around 1.7% of the population. Glenohumeral joint dislocations commonly are anterior shoulder dislocations, around 95% from all cases while other 5% are posterior shoulder dislocations. Usually shoulder instability occurs in young 20 - 30 years old males that are practicing in contact sports like hockey, rugby and others (Nagata *et. al.* 2016).

In 60% of all cases, first dislocation can complicate with recurrent instability in shoulder joint. It is due to dislocation episode that changes shoulder biomechanics. In dislocation situation humeral head can cause avulsion of the glenoid anterior labrum that is known as a Bankart lesion. If the Bankart lesion progresses, it can cause wider humeral head movements in all positions, causing recurrent instability. Another common injury that can evolve from dislocation episode is Hill Sachs lesion that is impression fracture to the humeral head and can occur up to 90% of all recurrent dislocation patients. Hill Sachs fracture arises when humeral head is damaged by glenoid cortical bone in dislocation situation. The impacting force on humeral head is so high that can cause humeral head fracture and soft tissues injury, which also leads to recurrent dislocations (Gia *et. al.* 2016).

Shoulders with no surgical treatment are with higher incidence of degenerative arthritis diagnose in long term period than shoulders which are treated with one of many surgery methods. There are many researches that also show correlation between higher instability episodes and higher arthropathy development. That is the main reason why early surgical treatment of instability is crucial and not only improves patient life quality, but also is decreasing the incidence of degenerative joint disease development (Gia *et. al*. 2016).

Recurrent anterior shoulder dislocation can be treated surgically by open or arthroscopic methods. Open Bristow - Latarjet surgery is coracoid bone block transfer surgery in which coracoid process is attached with screws fixation to the anterior - inferior glenoid rim. In this surgery stabilization is achieved by a “triple locking” effect of the coracoid bone transfer, capsule and ligament from biceps muscle (Bessiere *et. al.* 2013).

In comparison, arthroscopic Bankart surgery stabilization is restored with Bankart lesion repair, which is focused on restoring labral and capsular ligamentous structures with anchor fixation technique (Maiotti *et. al.* 2015).

In Hobby et al. systematic review study, mean recurrence after arthroscopic Bankart repair with suture anchors were 8.9%, but rate with Bristow - Latarjet procedures were 6.8% of all cases (Hobby *et. al.* 2007).

To compare and evaluate the clinical and functional results of patients who underwent arthroscopic Bankart and open Bristow - Latarjet surgery for symptomatic instability, we performed a comparative retrospective research.

Material and methods

20 arthroscopic Bankart and 46 Bristow-Latarjet patients treated for recurrent anterior glenohumeral instability were retrospectively identified from six surgeons' practices in Hospital of Traumatology and Orthopedics, Riga, during period from 2009 to 2015.

15 patients (75 %) from AB group, whose average age was 28.27 (SD 8.55) years with mean follow up time 30.14 (SD 14.54) months were clinically evaluated. Etiology of first instability episode for 8 patients (72.7 %) was sports trauma. Time from first instability episode till operation – 39.57 (SD 41.39) months.

30 patients (65%) from BL group, whose average age was 29.32 (SD 11.12) years, with mean follow up time 21.0 (SD 17.27) months were clinically evaluated. Etiology of first instability episode for 18 patients (60 %) was sports trauma. Time from first instability episode till operation – 48.82 (SD 63.68) months.

Patients were clinically investigated with Western Ontario Shoulder Instability score, Constant scale with Katolik *et. al.* normalization score and redislocation or subluxation rate. The Western Ontario Shoulder Instability score questionnaire contains 21 questions that are divided into four domains - physical symptoms, sport/recreation/work function, lifestyle function and emotional function. On each question patient can answer from 0 to 100 (where 0 is best but 100 is worst result) and total score consists from 0 till 2100 points. Score is presented as percentage of a normal healthy shoulder, where 100% is shoulder without deficit, but 0% is full deficit. Western Ontario Shoulder Instability score can be used to evaluate patient-reported outcome, which is subjective indicator (Salomonsson *et. al.* 2009).

While Constant scale is subjective/objective score, in which pain in shoulder, daily activity level, arm strength and range of motion including forward elevation, external rotation, abduction and internal rotation of the shoulder is evaluated. In this scale 100 points are maximum score that represents no complains about shoulder, while 0 points are showing weak outcome result. In this research Katolik *et. al.* recommendation for Constant score normalization to better compare these results, because strength level of the normal shoulder can be varied between different gender and age groups (Katolik *et. al.* 2005).

In this research authors asked patients about shoulder recurrent dislocation episodes after surgery. We defined recurrent instability as at least one episode of recurrent dislocation or subluxation.

In this study authors investigated 51% or 21 of all patients' after surgeries radiological images that were not older than one month.

The obtained data were collected and analyzed using statistical software IBM SPSS Statistics 20.0. To compere these two groups we used Student T-test. A significance level of $p < 0.05$ was selected for analysis.

Results

Average Western Ontario Shoulder Instability score was 79.85 (SD 11.62) for arthroscopic Bankart group and 79.89 with standard deviation (SD 12.08) for open Bristow - Latarjet group. No significant differences were found between these two groups.

In arthroscopic Bankart group four domains mean results were: physical symptoms 81.85 (SD 12.45), sport/recreation/work function 75.71 (SD 20.13), lifestyle function 76.28 (SD 16.71) and emotional function result 79.57 (SD 17.24).

In Bristow - Latarjet group four domains mean results were: physical symptoms 84.82 (SD 9.81), sport/recreation/work function 74.85 (SD 16.39) lifestyle function 72.0 (SD 20.67) and emotional function result 78.96 (SD 22.27). No significant differences were found between two groups.

Average Constant score was 94.85 (SD 6.59) for arthroscopic Bankart group and 94.32 (SD 5.76) for open Bristow - Latarjet group patients. No significant differences were obtained between these two groups.

Redislocation or subluxation after the first operation occurred three of 11 (27.3 %) arthroscopic Bankart group patients, with average age 30.3 years. In follow up time mean Constant score was 93.2 and Western Ontario Shoulder Instability 74.1 points. Only one of 31 (3.33 %) Bristow - Latarjet patients had redislocation or subluxation after the first operation - 21 years old patient, with Constant 92.0 and 75.5.

In Bristow - Latarjet group were three patients with previous failed arthroscopic Bankart surgery. Patients' average age in follow up were 21.3 years, with average Constant 92.0 and Western Ontario Shoulder Instability 75.5 score.

In arthroscopic Bankart group for one patient developed complication - adhesive capsulitis. Patient was treated with non - surgical methods, in follow up - 26 years old, with Constant 90.0 and Western Ontario Shoulder Instability 80.0. Total complication rate in arthroscopic Bankart group was 36.3%.

In Bristow - Latarjet group one patient developed - coracoid process fracture with no dislocation. Patient in follow up time was 42 years old, with Constant 84.0 and Western Ontario Shoulder Instability 52.0. No surgical treatment for patient was needed. Total complication rate in open Bristow - Latarjet group was 6.6%.

Discussion

Traumatic anterior shoulder instability is very common problem, especially for young, sports active people. Handoll *et. al.*, Gia. *et. al.*, Nagata *et. al.* and other authors in their studies admit that surgery for recurrent shoulder instability is the best option (Handoll et. al. 2004). But when doctor with patient needs to choose between arthroscopic or open surgery, the situation and decision becomes more complicated. Antunes *et. al.* in his study writes that arthroscopic Bankart surgery main advantages over open surgery are less postoperative pain, less loss of external rotation, smaller scar due to tiny incisions and opportunity to identify more detailed diagnose (Antunes *et. al.* 2016). Interestingly, many authors' like Gia *et. al.*, Sisto *et. al.* reports about Bristow - Latarjet surgery states that open technique is at greater risk of complications compared with Bankart repairs. However, our study didn't observed such relevance, actually we found out opposite.

In open Bristow - Latarjet group total complication rate was 6.6%, while in arthroscopic Bankart group was 36.3 % with significant difference between both results. The small number of patients in arthroscopic Bankart group affects the results. The small number of patients we can explain with the fact that arthroscopic surgeries in our hospital are in stage of development, because the learning curve for doctors is much longer with arthroscopic method in comparison of open surgery.

Shoulder instability recurrence in our study after Bankart surgery is much higher 27.3 % than in Bristow - Latarjet group 3.3 %, although results after Constant and Western Ontario Shoulder Instability are very similar with no significant difference.

We believe that big difference between those two groups can be explained with wrong patient selection for arthroscopic surgery. There are no doubts that arthroscopic surgery is more popular over open surgery on these days. Advantage for arthroscopic patients is that they can stay in the hospital for a much shorter period after surgery, which is one of the main reasons why so many doctors and patients want to choose exactly this method.

However, not always arthroscopic treatment was an ideal solution in the approach of shoulder instability, mainly because of the high failure rate that was reported in earlier studies (Sisto *et. al.*). Young patients that are sports active are at risk group for recurrent shoulder instability after stabilization surgery. In our study we investigated seven patients who were with recurrence instability after first surgery. The mean age for these patients were 24.3 years and six of them were sports active (Sisto *et. al.* 1998).

Arthroscopy is developing due to new anchors, scopes and better screen resolutions, but still it can't compete in fixation strength with open Bristow - Latarjet technique right now (Horner *et. al.*

2016). Triple locking effect of the coracoid bone transfer in Bristow - Latarjet still is best option for patients that are in risk group, especially, if external rotation lost after surgery isn't so important.

Conclusions

- Rate of recurrent instability in arthroscopic Bankart group was significantly higher than in Bristow - Latarjet group.
- Patients who failed arthroscopic Bankart were young males, sports active.
- Both techniques provide good functional results with Constant and Western Ontario Shoulder Instability scores.
- Arthroscopic Bankart repair should be done only for carefully selected patients.

References

Antunes J., Mendes A., Prado M. et. al. 2016. Arthroscopic Bankart repair for recurrent shoulder instability: A retrospective study of 86 cases. In: *Journal of Orthopaedics*. VOL 13, pp. 95–99.

Bessiere-C., Trojania C., Pélégrib C. et. al. 2013. Coracoid bone block versus arthroscopic Bankart repair: A comparative paired study with 5-year follow-up. In: *Orthopaedics & Traumatology: Surgery & Research*. VOL 99, pp. 123–130.

Gia An V., Sivakumar B., Phan K. et. al. 2016. A systematic review and meta-analysis of clinical and patient-reported outcomes following two procedures for recurrent traumatic anterior instability of the shoulder: Latarjet procedure vs. Bankart repair. In: *Journal of Shoulder and Elbow Surgery*; DOI: 10.1016/j.jse.2015.11.001

Handoll H., Almaiyah M., Rangan A. 2004. Surgical versus non-surgical treatment for acute anterior shoulder dislocation. In: *Cochrane Database of Systematic Reviews*. DOI: 10.1002/14651858.CD004325.pub2.

Hobby J., Griffin D., Dunbar M. et. al. 2007. Is arthroscopic surgery for stabilisation of chronic shoulder instability as effective as open surgery? In: *The Bone & Joint Journal*. DOI: 10.1302/0301-620X.89B9.18467

Horner N., de Sa D., Heaven S. et. al. 2016. Indications and outcomes of shoulder arthroscopy after shoulder arthroplasty. In: *Journal of Shoulder and Elbow Surgery*. VOL. 25, pp. 510–518.

Katolik L., Romeo A., Cole BJ. et. al. 2005. Normalization of the Constant score. In: *Journal of Shoulder and Elbow Surgery*. VOL 14, pp. 279-85.

Maiotti M., Russo R., Zanini A. et. al. 2015. Arthroscopic Bankart repair and subscapularis augmentation: an alternative technique treating anterior shoulder instability with bone loss. In: *Journal of Shoulder and Elbow Surgery*. DOI: 10.1016/j.jse.2015.09.025.

Nagata H., Thomas W., Woods D.2016. The management of secondary frozen shoulder after anterior shoulder dislocation – The results of manipulation under anaesthesia and injection. In: *Journal of Orthopaedics*. VOL 13, pp. 100–105.

Quillen D., Wuchner M., Hatch R. 2004. Acute Shoulder Injuries In: *American Family Physician*. VOL 70, pp. 1947-1954.

Salomonsson B., Ahlström S., Dalén N. et. al. 2009. The Western Ontario Shoulder Instability Index (WOSI): validity, reliability, and responsiveness retested with a Swedish translation. In: *Acta Orthop*. DOI: 10.3109/17453670902930057

Sisto D., Cook D. 1998. Intraoperative decision making in the treatment of shoulder instability. In: *Arthroscopy: The Journal of Arthroscopic & Related Surgery*. VOL 14, pp. 389–394.

A COMPARISON OF ARTERIAL BLOOD GAS AND SERUM GLUCOSE LEVEL IN FIRST–TIME AND RECURRENT DIABETIC KETOACIDOSIS: PEDIATRIC POPULATION

Dace Barkeviča[1], Elza Slaputra[1], Dr.med. Arta Bārzdiņa[2]
[1] Rīga Stradiņš Univeristy, Dzirciema street 16, Riga, Latvia, LV-1007
dace.barkevica@inbox.lv, elza.salputra@gmail.com
[2] Children's Clinical Univeristy hospital, Vienības gatve 45, Riga, Latvia, LV-1007
arta.barzdina@me.com

Abstract
***Key words**. Type 1 diabetes. Diabetic ketoacidosis*
Diabetic ketoacidosis (DKA) is the most common and serious acute complication of diabetes and is characterized by elevated serum glucose level>11 mmol/l, decreased blood pH level <7.3 and/or serum bicarbonate level <15 mmol/l with coexisting ketonemia and ketonuria. In about 30% of pediatric patients DKA may be the initial presentation of a new–onset T1D, but mostly DKA occurs as recurrent cases in the same subject.
The aims of the study were to identify severity of DKA, pH, pCO_2, HCO_3^- and serum glucose level peculiarities between patients with first-time DKA and recurrent DKA sequences and analyze correlations between pH and pCO_2, HCO_3^- and serum glucose levels.
A retrospective study was conducted, involving patients admitted to Children's Clinical University Hospital Pediatric Intensive Care Unit with DKA, divided into two groups – first–time DKA (n= 75) and recurrent DKA group (n=75), excluding patients with acute intercurrent illnesses. Data was analysed using IBM SPSS Statistics 23.
In the recurrent DKA group, severe DKA occurred in 59% vs. 48% in the first-time DKA group. Median pH value – 7.09 – and HCO_3^- value – 4.2 mmol/L – in the recurrent DKA group was lower than in the first–time DKA group pH – 7.16 and HCO_3^- 5.4 mmol/L; $p<0.05$. pCO_2 values had no significant differences between the groups; p=0.133. In the recurrent DKA group, serum glucose level median value – 24.4 mmoo/L – was higher than in the first–time DKA group, median value – 20.2 mmol/L; p=0.028. In both study groups, a mild, statistically significant correlation between pH and serum glucose level was observed ($p<0.05$) and the correlations between pH and pCO_2 and pH and HCO_3^- were statistically significant ($p<0.001$).
To conclude, severe DKA was observed more frequently and lower pH and HCO_3^- and higher serum glucose levels were seen in the recurrent DKA group. Serum glucose levels and pH levels were reversely related and pH and pCO_2 and pH and HCO_3^- were positively related in both study groups.

Kopsavilkums
***Atslēgvārdi**: 1.tipa diabēts. Diabētiska ketoacidoze*
Diabētiskā ketoacidoze (DKA) ir biežākā un nopietnākā akūtā diabēta komplikācija, tās raksturojošie lielumi ir paaugstināts seruma glikozes līmenis >11 mmol/L, samazināts asins pH <7,3 un/vai bikarbonāts <15 mmol/L ar līdzāspastāvošu ketonēmiju un ketonūriju. Apmēram 30% pediatrisko pacientu DKA var būt 1. tipa cukura diabēta izpausme, taču biežāk redzamas atkārtotas DKA epizodes vienam pacientam.
Pētījuma mērķi bija noskaidrot DKA smaguma pakāpes un salīdzināt pH, pCO_2, HCO_3^- un seruma glikozes līmeņus pacientiem ar pirmreizēju DKA un atkārtoām DKA, kā arī analizēt korelācijas starp pH un pCO_2, pH un HCO_3^-, pH un seruma glikozes līmeni.
Retrospektīvā pētījumā tika analizēti dati no Bērnu klīniskās universitātes slimnīcas pacientiem, kas stacionēti Intensīvās terapijas klīnikā ar DKA. Pacienti tika iedalīti divās grupās – pirmreizēja DKA (n=75) un atkārtotas DKA grupa (n=75), izslēdzot pacientus ar akūtām saslimšanām. Dati tika analizēti, izmantojot SPSS 23 programmu.
Smaga DKA biežāk tika novērota atkārotas DKA grupā 59% vs. 48%. Atkārtotas DKA grupā mediānā pH vērtība bija 7.09 un HCO_3^- vērtība – 4,2 mmol/L, kas bija zemākas kā pirmreizējas DKA grupā – pH=7,16 un HCO_3^- =5,4 mmol/L, $p<0,05$. pCO_2 vērtībām nebija statistiski nozīmīgu atšķirību starp grupām, p=0,133. Atkārtotas DKA grupā mediānais glikozes līmenis 24,4 mmol/L bija augstāks kā pirmreizējas DKA grupā – 20,2 mmol/L, p=0,028. Abās grupās vāja, statistiski ticama korelācija tika novērota starp pH un seruma glikozes līmeni ($p<0,05$), tāpat korelācijas starp pH un pCO_2 un pH un HCO_3^- bija statistiski ticamas ($p<0,001$).
Secinājumi – atkārtotas DKA grupā smaga DKA bija biežāk, kā arī tika novērotas zemākas pH un HCO_3^- un augstākas seruma glikozes vērtības. Abās pētāmajās grupās pH un seruma glikozes līmenis bija apgriezti saistīti, pH un pCO_2 un pH un HCO_3 vērtības bija pozitīvi saistītas.

Introduction

Globally, the incidence of type 1 diabetes is increasing by 3 – 5% per year (Atkinson 2016). Despite the increasing medical care, DKA remains the most serious acute complication of type 1 and, occasionally, type 2 diabetes (Randall 2011). In Europe and the United States of America, estimated incidence of DKA as a first manifestation of type 1 diabetes is 15 – 70%, with children under the age of 5 years being at the highest risk. The wide variation in incidence is influenced by the accessibility of medical care and frequency of diabetes in the given population. In established type 1 diabetes, the risk of developing DKA is 1 – 10% per patient per year (Steel 2009). DKA is the most frequent diabetes–related cause of death in children. The majority of DKA–related deaths in children result from cerebral oedema (Glaser 2008). Cerebral oedema is the most serious complication of DKA in children. Although it is a rare complication, which occurs in only 0.5 – 1% children with DKA, cerebral oedema is the major cause of morbidity and mortality. Most commonly it occurs in children with new–onset type 1 diabetes with DKA and it rarely occurs in patients older than 20 years (Drugs & Therapy Perspectives 2009). Cerebral oedema has a high mortality rate (21 – 24%) and up to 15 – 26% of survivors are left with permanent neurological damage (Wolfsdorf *et al.* 2006).

DKA is a result of a resistance or an absolute or relative deficiency of insulin and is characterized by increased serum glucose level > 11 mmol/L, decreased venous pH < 7.3 and/or serum bicarbonate < 15 mmol/L with coexisting ketonemia and ketonuria (Wolfsdorf et al. 2014). Risk factors for new–onset DKA and recurrent DKA differ; risk factors for new–onset DKA are related to lower knowledge about diabetes and it's initial symptoms or difficulties to access medical care. DKA in newly diagnosed cases also includes younger age (especially < 2 years), lack of family history of type 1 diabetes or lack of awareness of diabetes. On the other hand – most often the reason for recurrent DKA is noncompliance with insulin therapy, which may be due to, for example, low family cohesion and, therefore, deficient support for the child or psychiatric (including eating) disorders of the patient. Risk factors for DKA in patients with established type 1 diabetes also include previous episodes of DKA, poor metabolic control of diabetes, challenging social and family circumstances, peripubertal and adolescent age (especially in female patients), failures in insulin pump therapy and limited access to medical care (Jefferies *et al.* 2015).

Despite insulin therapy and increasing medical care, compared with the general population, life expectancy for people with diabetes is reduced due to potentially fatal acute complications such as diabetic ketoacidosis and hypoglycemia, as well as long–term complications. Life expectancy of a person with type 1 diabetes is likely to be reduced by 20 years (Spinks 2013).

Material and methods

A retrospective study analyzing medical information from patients aged one month to 18 years admitted to Children's Clinical University Hospital Pediatric Intensive Care Unit with diabetic ketoacidosis from January 1st, 2009 to December 31st, 2015, excluding patients with acute intercurrent illness or exacerbation of a chronic illness. Laboratory tests such as serum glucose level, pH, HCO_3^- and pCO_2 were collected. Patients and laboratory studies were divided into two groups – first–time DKA group (n=75) and recurrent DKA group (n=75). In both groups, such measurements as serum glucose level, pH, pCO_2 and HCO_3^- were obtained.

Definitions of DKA: mild (pH < 7.3; bicarbonate < 15 mmol/L); moderate (pH < 7.2; bicarbonate < 10 mmol/L) severe (pH < 7.1; bicarbonate < 5 mmol/L).

Data was analyzed using IBM SPSS Statistics 23. Test of normality (*Kolmogorov – Smirnov* and *Shapiro – Wilk*) was used to determine if the data was normally distributed. Descriptive statistics (median, interquartile range) was used to describe values of data which was not normally distributed. Test of frequencies was used to describe the groups. *Mann – Whitney U* test and *ANOVA* were used to determine the difference and the significance of the difference between the two groups. Correlations between 2 variables were tested with *Spearman's rho* test.

Results

From all of the patients included in the study, 13% were admitted to hospital with mild DKA, 34% with moderate and 53% with severe DKA. In the first–time DKA group, on admission 20% had mild, 32% – moderate and 48% – severe DKA, in comparison, in the recurrent DKA group, on admission only 5% of patients had mild and 59% had severe DKA (see fig.1). The difference in severity of DKA in both groups was statistically significant; p=0.025.

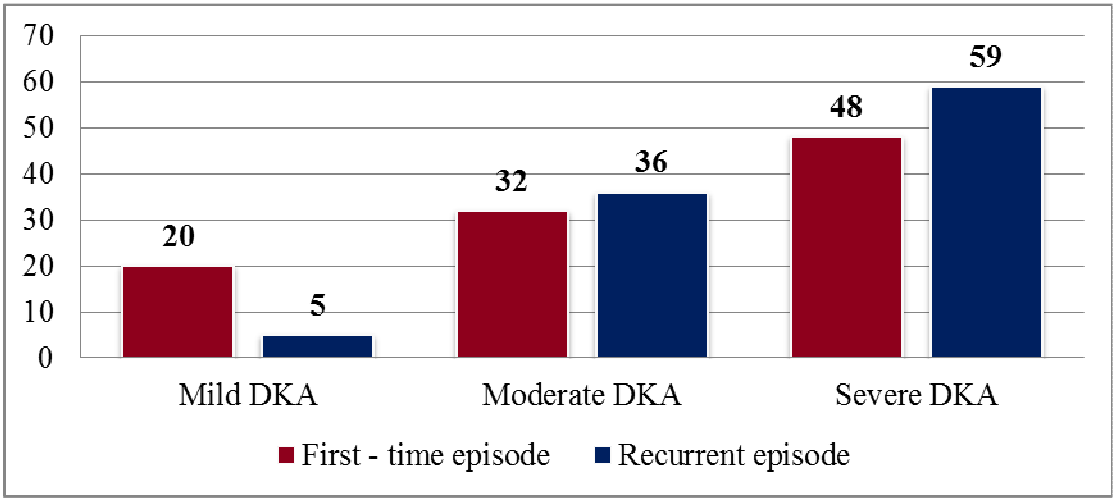


Figure 1. **DKA severity comparison in first–time and recurrent DKA group**

On admission, median serum glucose level in the recurrent DKA group – 24.4 mmol/L (IQR 18.5 – 29.3) – was higher than the first–time DKA group median serum glucose value – 20.2

mmol/L (IQR 25.3 – 25.5) –, although the highest ever recorded serum glucose value of 50.6 mmol/L was observed in the first–time DKA group. The difference in median serum glucose levels between the groups was statistically significant, p=0.028.

Median pH level in the recurrent DKA group – 7.10 (IQR 7.01 – 7.18) – was lower than in the first–time DKA group – 7.16 (IQR 7.07 – 7.24) –, difference between the two groups was significant, p=0.005. The lowest recorded pH value in the first – time DKA group was 6.85, in the recurrent DKA group – 6.72.

Median pCO_2 level in the first–time DKA group attained 16.0 mmHg (IQR 12.9 – 22.0), in the recurrent DKA – 15.8 (IQR 12.0 – 19.0)–, there were no statistically significant differences found between the both groups.

Median HCO_3^- level in the recurrent DKA group reached 4.2 mmol/L (IQR 3.1 – 6.5), median HCO_3^- level in the first–time DKA group – 5.4 mmol/L (IQR 3.7 – 8.7), the difference in median HCO_3^- levels between the two groups was statistically significant, p=0.029.

A weak negative correlation between pH and serum glucose level (see fig. 2) was observed both in the first–time DKA group – *Spearman's rho* correlation coefficient r= -0.267, p=0.021 – and in the recurrent DKA group – r= -0.282, p=0.014.

First–time DKA group. **Recurrent DKA group.**

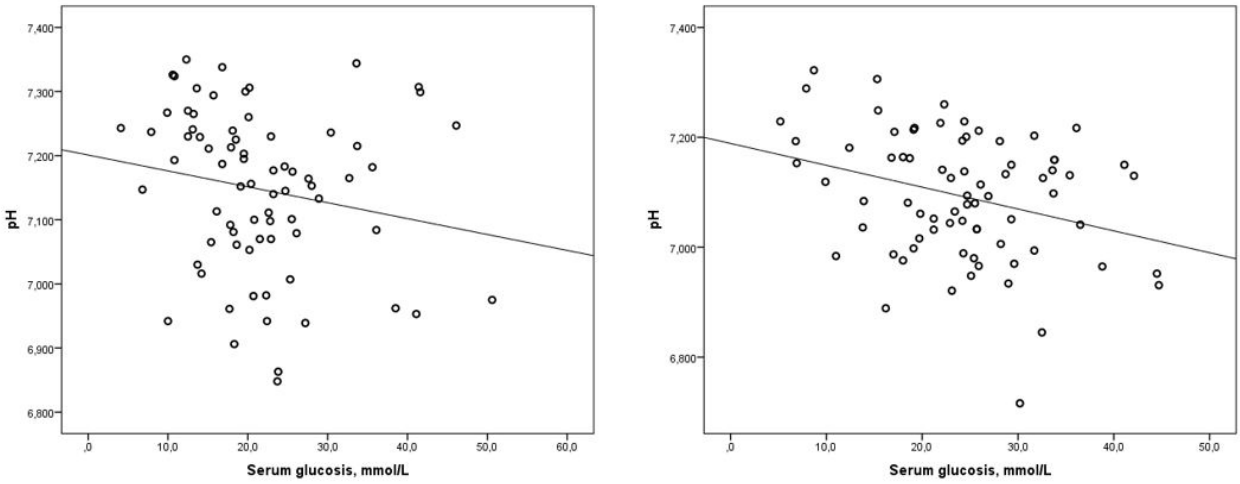


Figure 2. **Correlation between pH and serum glucose level.**

A moderate uphill correlation between pH and pCO_2 was observed in both groups (see fig. 3), in the first time – DKA group – *Spearman's rho* r= 0.639 –, in the recurrent DKA group – *Spearman's rho* r= 0.549 –, and strong correlation between pH and HCO_3^- was found in both study groups, in the first–time DKA group *Spearman's rho* r= 0.891, in the recurrent DKA group *Spearman's rho* r= 0.843 (see fig.4). Correlations between pH and pCO_2 and pH and HCO_3^- in both study groups were statistically significant; p<0.001.

First–time DKA group. **Recurrent DKA group.**

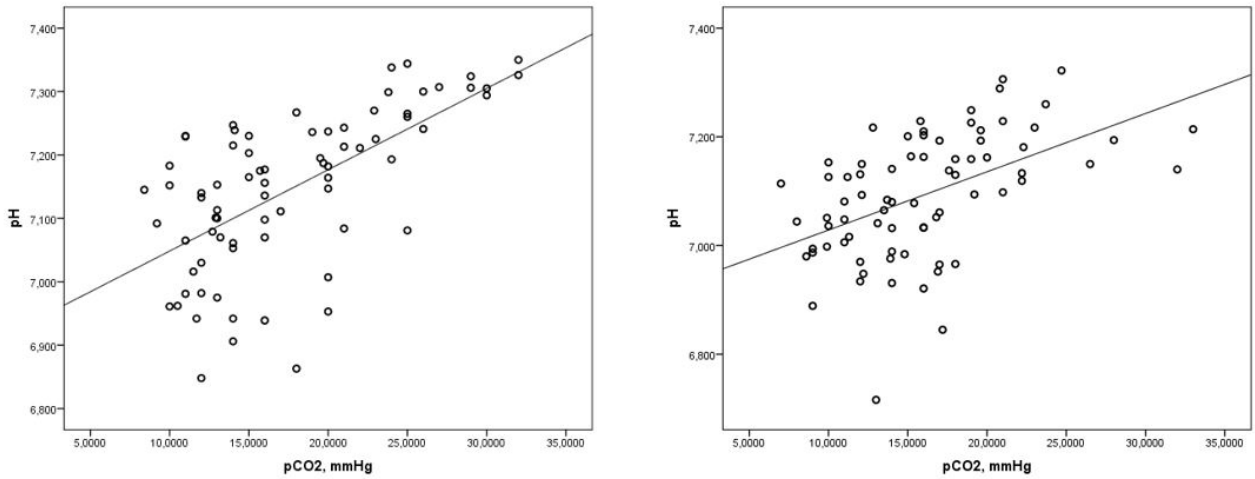
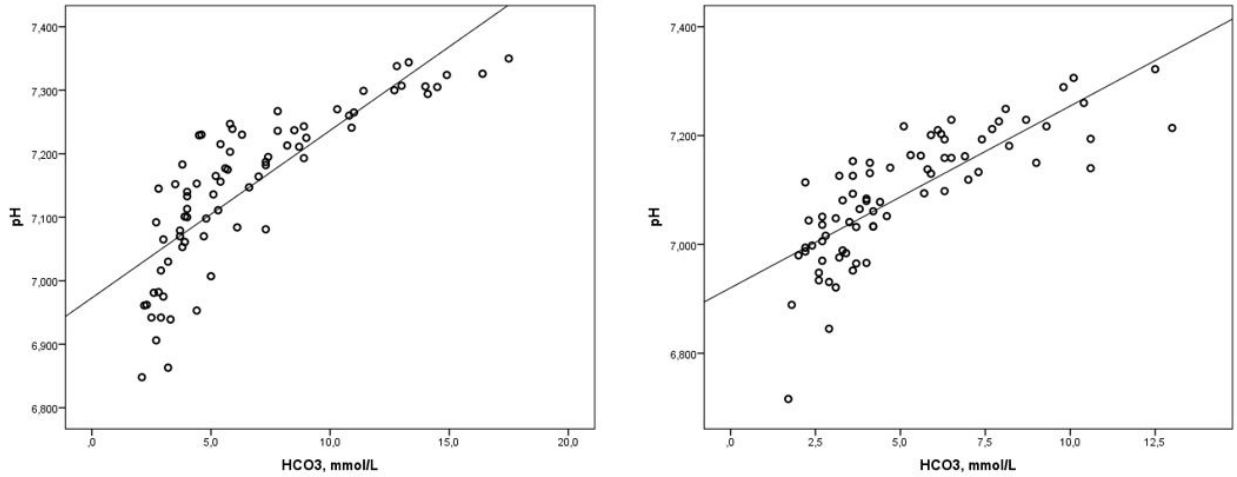


Figure 3. **Correlation between pH and pCO_2.**



First–time DKA group. **Recurrent DKA group.**

Figure 4. **Correlation between pH and HCO_3^-.**

Discussion

This retrospective study shows the characteristics of DKA in a pediatric tertiary care center intensive care unit. Local guidelines recommend to admit a patient with DKA to the intensive care unit, if it is a child with DKA as the first manifestation of new–onset diabetes mellitus until age 5, ph < 7.1, if there is a suspicion of cerebral edema or the patient is in comatose state. All patients in this study were diagnosed with type 1 diabetes.

Patients with diabetes are susceptible to DKA under several stressful conditions, such as trauma, surgical intervention, or infection which is the most common precipitating reason for DKA, occurring in 30 – 50% of cases (Jackman et al 2015). Other precipitating factors are psychological stress, poor metabolic control, insulin therapy omission and previous episodes of DKA (Wolfsdorf et al 2014). Patients with infections or alcohol abuse, previous or during the admission to hospital, were excluded from the study cohort. In the first–time DKA group, the main reason for

development of DKA supposedly is poor comprehension of initial symptoms of diabetes mellitus – such as polidypsia, poliuria and nocturia, and weight loss – and missed or delayed diagnosis of diabetes is most often an issue. On the other hand, – in those with established diabetes, insulin omission, whether deliberate or unintentional, is the most common precipitation factor for DKA.

Of the newly diagnosed patients, 80% met the criteria for either moderate or severe diabetic ketoacidosis, in the recurrent DKA group, 95% of patients were hospitalized with moderate or severe DKA. Research suggests poorer long-term outcomes in newly diagnosed patients who present in DKA (Mortensen *et al.* 2010). In a research conducted in Canada, degree of acidosis was more severe in newly diagnosed patients compared to pre–existing diabetes (Jackman 2015). Most likely, the reason for more severe ketoacidosis in the recurrent DKA group is poorer socioeconomic status in the country, lower family cohesion and access to medical care. DKA can also impact the child's mental development and cognitive function. Many biochemical changes occur within the brain at the time of DKA and, after resuscitation, more so in younger patients and more severe acidosis, which is associated with poorer delayed memory recall and poorer sustained and divided attention after 6 months (Cameron 2015). To determine if severe DKA in patients admitted to Children's Clinical University Hospital, Latvia, is truly more common in the recurrent DKA group, a further study analyzing biochemical parameters and clinical symptoms of all hospitalized patients with DKA, not only those admitted to intensive care unit, should be conducted, as well as analyzing the influence of age, sex, education, socioeconomic status and other factors on diabetes control.

Since severe DKA was more frequently observed in the recurrent DKA group, lower median pH and HCO_3^- levels were discovered as well. In Jackman's (2015) study, lower HCO_3^- level was discovered in the newly diagnosed patients, although they did not find statistically significant differences in the mean pH values between the newly diagnosed patients and pre–existing patients with DKA.

On admission, higher median serum glucose level in the recurrent DKA group was observed, and a weak negative correlation between pH and serum glucose level in both study groups. The pathogenesis of DKA includes increase of serum glucose level due to contraregulatory hormone, such as cortisol, glucagon, growth hormone and cateholamines, induced gluconeogenesis and glycogenolysis (Steel 2009). Higher glucose level may indicate longer duration of decompensation of diabetes, although osmotic diuresis and glucosuria occurs in all patients with DKA and the patient might have used insulin to lower serum glucose level before hospitalization, therefore serum glucose should not be used as an approximate indicator for severity of DKA.

Metabolic acidosis is characterized by a primary reduction in the serum concentration of bicarbonate, a secondary decrease in the arterial partial pressure of carbon dioxide, and a reduction in blood pH (Kraut 2010). Both correlations between the pH and HCO_3^- and pH and pCO_2 show the metabolic acidosis and it is a compensatory mechanisms – as both HCO_3^- and pCO_2 levels are decreased and pH is lowered markedly, decompensated acidosis is present in patients with DKA on admission.

Limitations of this study: as this was a retrospective study, there is likely missing data and some factors may be underrepresented because data was not collected in a prospective manner. This study also represents only those patients who were admitted to Children's Clinical University Hospital' Intensive Care Unit; to obtain more precise data, a multicenter study throughout Latvia should be conducted.

Main recommendations:

- To prevent DKA as the initial manifestation of new–onset diabetes, more awareness should be put on recognition of the signs and symptoms of diabetes to improve earlier diagnosis of diabetes mellitus.
- The main cause of recurrent DKA is insulin therapy omission, which is theoretically preventable in all patients with type 1 diabetes. Families and patients need special education to understand how DKA occurs, and preventative strategies, including psychosocial and psychological assessment should be developed for patients at risk.

Conclusions

Diabetic ketoacidosis still remains a serious issue in the pediatric population. Severe DKA occurs more frequently in children with established type 1 diabetes. Higher median serum glucose level, as well as lower median pH and HCO_3^- values are observed in recurrent DKA sequences. Statistically significant correlations are discovered between pH and serum glucose level, HCO_3^- and pCO_2 in both study groups.

References

Atkinson, M. A. 2016. Type 1 Diabetes Mellitus. In: Melmed, S., Polonsky, K. S., Larsen, P. R., Kronenberg, H. M *Williams Textbook of Endocrinology*. Thirteenth edition, Philadelphia: Elsevier Saunders, pp. 1451–1477.

Cameron, F. J. 2015. The Impact of Diabetes on Brain Function in Childhood and Adolescence. In: *Pediatric Clinics of North America*, N 4, vol. 62, pp. 911–927.

Glaser, N., Kuppermann, N. Baren, 2008. Diabetic Ketoacidosis. In: J. M., Rothrock, S. G., Brennan, J. A., Brown, L. *Pediatric Emergency Medicine*. Philadelphia: Elsevier Saunders, pp. 759–763.

Jackman, J., Chafe, R., Albrechtsons, D. et al. 2015. Delayed diagnosis and issues with pump usage are the leading causes of diabetic ketoacidosis in children with diabetes living in Newfoundlend and Labrador, Canada. In: *BMC Research notes*, N 1, vol. 8, pp. 1–5.

Jefferies, C. A., Nakhla, M., Derraik J. G. B. et al. 2015. Preventing diabetic ketoacidosis. In: *Pediatric Endocrinology and Diabetes*, N 4, vol. 62, pp. 857–871.

Kraut, J. A., Madias, N. E. 2010. Metabolic Acidosis: Pathophysiology, Diagnosis and Management. [skatīts 24.04.2016]. Pieejams (Accessed): http://www.medscape.org/viewarticle/718583

Mortensen, H. B., Swift, P. G., Holl, R. W. et al. 2010. Multinational study in children and adolescents with newly diagnosed type 1 diabetes: association of age, ketoacidosis, HLA status, and autoantibodies on residual beta-cell function and glycemic control 12 months after diagnosis. In: *Pediatric Diabetes*, N 4, vol. 11, pp. 218–226.

Randall, L., Begovic, J., Hudson, M. et. al. 2011. Recurrent Diabetic Ketoacidosis in Inner – City Minority Patients. In: *Diabetes Care*. Vol. 34 no. 9, pp. 1891–1896.

Spinks, J. J., Mann, N., P 2013. Improving the long – term outlook for children with diabetes mellitus. In: *Pediatrics and Child Health*, N 4, vol. 23, pp. 168–173.

Steel, S., Tibby, S., M., 2009. Pediatric diabetic ketoacidosis. In: *Continuing Ediucation in Anesthesia, Critical Care & Pain*, N 6, vol. 9, pp. 194–199.

Treating diabetic ketoacidosis in children requires careful management of fluid, electrolytes and insulin, 2009. In: *Drugs & Therapy Perspectives*, N 3, vol. 25, pp. 14–17.

Wolfsdorf, J. I., Allgrove, J., Craig, M. E., Edge, J., Glaser, N. et al. 2014. Diabetic ketoacidosis and hyperglycemic hyperosmolar state. In: *Pediatric Diabetes*, N 20, vol. 15, pp. 154–179.

Wolfsdorf, J., Glaser, N., Sperling, M., A. 2006. Diabetic Ketoacidosis in Infants, Children, and Adolescents. In: *Diabetes Care*, vol. 29, pp. 1150–1159.

PERVELANCE OF OBESITY IN MALE AND FEMALE POPULATION WITH ELEVATED CARDIOVASCULAR RISK IN LATVIA

Janis Blumfelds
Rigas Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1009
blumfelds_91@inbox.lv

Abstract

Prevalence of Obesity in male and female population with elevated cardiovascular risk in Latvia

Key words: *Obesity, body mass index, cardiovascular disease, cardiovascular risk*

Introduction: Obesity is associated with an increased risk of cardiovascular disease incidence and mortality. In many countries, a reduction in major risk factors such as high blood cholesterol, high blood pressure and smoking habits has been achieved, yet body weight have tended to increase.

Aim: Aim of the study was to evaluate obesity levels in patients with elevated cardiovascular risk and to compare them between genders, and with patient activity and dietary habits.

Materials and methods: Based on presence of moderate to very high cardiovascular risk, 120 patients were invited to participate in this study. During interview data about patient weight, height, physical activity and dietary habits were collected. The data were processed using MS Excel and SPSS software. Body mass index was calculated and all data were analyzed using descriptive statistics, crosstabs, Chi square test and independent samples T test.

Results: Mean age was 66 years. Average BMI was 30.1 kg/m^2. Male average BMI was 29 kg/m^2, but female 31.2 kg/m^2 ($p<0.05$). Of all respondents 0.8% (1.7% of male, 0% of female) was underweight, but 18.3% (13.6% of male, 23.0% of female) had normal weight. Overweight was found in 32.5% (40.7% of male, 24% of female) of patients. Obesity was discovered in 48.3% (44.1% of male, 52.5% of female) of participants, of whom 34.2% had class one, 7.5% had class two, but 6.7% had class three obesity. Significant differences of BMI levels in all activity groups were not found. There were no significant differences of BMI when compared in different dietary parameter groups. ($p>0.05$)

Conclusion: Obesity level in patients with cardiovascular risk is high. Only 18.3% of patients have normal body weight. Females are more likely to have normal weight or obesity. Males more often are overweight. Physical activity amount and dietary habits were not associated with different levels of BMI.

Kopsavilkums

Aptaukošanās prevalence vīriešu un sieviešu populācijā ar paaugstinātu kardiovaskulāro risku Latvijā

Atslēgvārdi*: Aptaukošanās, ķermeņa masas indekss, kardiovaskulārā slimība, kardiovaskulārais risks*

Ievads: Aptaukošanās saistās ar paaugstinātu kardiovaskularās slimības incidences un mirstības risku. Vairākās valstīs ir izdevies ierobežot būtiskus riska faktorus kā augstu holesterīna līmeni, augstu asinsspiedienu un smēķēšanas paradumus, kamēr ķermeņa svaram ir tendence pieaugt.

Mērķis: Izvērtēt pacientu ar paaugstinātu kardiovaskulāro risku aptaukošanās rādītājus un salīdzināt tos starp dzimumiem, kā arī ar fiziskās aktivitātes un diētas paradumiem.

Materiāli un metodes: Pamatojoties uz vidēja līdz ļoti augsta kardiovaskulāra riska esamību, piedalīties pētījumā tika aicinātas 120 personas. Intervijas laikā tika ievākti dati par pacientu svaru, augumu, fizisko aktivitāti un diētas paradumiem. Dati tika apstrādāti, izmantojot *MS Excel* un *SPSS* programmatūras. Tika aprēķināts ķermeņa masas indekss, un dati tika analizēti izmantojot aprakstošo statistiku, *crosstabs*, Hī kvadrāta testu un neatkarīgu izlašu T-testu.

Rezultāti: Vidējais vecums bija 66 gadi. Vidējais ĶMI bija 30.1 kg/m^2. Vīriešu vidējais ĶMI bija 29 kg/m^2, bet sieviešu 31.2 kg/m^2 ($p<0.05$). No visiem respondentiem 0.8% (1.7% vīriešu, 0% sieviešu) bija zem svara normas, bet 18.3% (13.6% vīriešu, 23.0% sieviešu) bija normāls svars. Paaugstinātu ķermeņa svaru atrada 32.5% (40.7% vīriešu, 24% sieviešu) pacientiem. Aptaukošanās atklājās 48.3% (44.1% vīriešu, 52.5% sieviešu) dalībnieku, no kuriem 34.2% bija pirmās klases, 7.5% otrās klases, bet 6.7% trešās klases aptaukošanās. Nozīmīgas atšķirības ĶMI līmeņos atkarībā no aktivitātes neuzrādījās. Nozīmīgas atšķirības ĶMI rādītājos neatklājās arī salīdzinot uztura paradumus.

Secinājumi: Aptaukošanās rādītāji pacientiem ar paaugstinātu kardiovaskulāro risku ir augsti. Tikai 18.3% pacientu bija normāls svars. Sievietēm biežāk novēro normālu svaru un aptaukošanos. Vīriešiem biežāk ir paaugstināts svars. Fiziskai aktivitātei un diētas paradumiem nav asociācijas ar atšķirīgiem BMI līmeņiem.

Introduction

Obesity has become serious health associated problem. There are predictions that around year 2030 approximately 20% of entire adult population will be obese (Kelly *et al.* 2008). Obesity is not

only an independent risk factor, but it has association with diabetes, hyperlipidaemia, hypertension and reduced effort tolerance (Grub 2006).

Obesity is strongly associated with increased risk of cardiovascular disease (CVD) incidence and mortality (Kazlauskienė *et al.* 2015) and is a challenging problem for the clinician (Taegtmeyer *et al*. 2008). It has to be noted that CVD is the leading factor of death in Latvia. With reference to Center of disease control and prevention of Latvia, in year 2014 there were 14510 deaths due to CVD in people with 60 years of age or older (Lepiksone *et al*. 2014). In many countries reduction in major risk factors such as high blood cholesterol, high blood pressure and smoking habits has been achieved, yet body weight have tended to increase (Perk *et al.* 2012).

It has been stated previously that weight control is a problem in Latvian population. A study that was carried out found out that normal body mass index (BMI) was only in 28% of general population and as many as 30.6% of respondents had obesity. Body weight differences between both genders also were described, with women having higher prevalence of obesity (Ērglis *et al.* 2008).

According to data prevalence of obesity in many populations is higher in women than in man (Garawi *et al*. 2014). Data also shows that women are in greater risk to develop cardiovascular disease and atherosclerosis due to metabolic syndrome (Kazlauskienė *et al*. 2015). Cardiovascular risk associated with obesity increases even more with age and after menopause (Gutiérrez *et al*. 2015).

Gender difference could be traced to the metabolism of energy-providing substrates (Taegtmeyer *et al*. 2008). It also can be accounted for women arteries tightness but there is a lack of evidence to confirm the statement (Kazlauskienė *et al*. 2015).

Material and methods

120 participants were invited to take part in this study. Criteria for selection were presence of moderate, high or very high cardiovascular risk in the time of inquiry. Cardiovascular risk definitions as described in *European Guidelines on cardiovascular disease prevention in clinical practice* were used. There were no exclusion factors for participants. Data was obtained during interviews using self made questionnaires.

Questionnaires also were based on European *Guidelines on cardiovascular disease prevention in clinical practice* and contained questions about patient's age, gender, weight and height. Patients were also asked how often they take part in 30 minute aerobic physical activities. To evaluate dietary habits respondents were inquired if they limit they salt intake, if they take at least two fruit and vegetable portions a day and if they consume fish at least two times a week. Questionnaire was reviewed and approved by Rigas Stradiņš University ethics committee.

Interviews took place in two general practitioner practices in Ķekava and in cardiology ward in Paul Stradin's Clinical Hospital from December 2015 to January 2016. Permissions to work with patients were obtained.

Body mass index was calculated using formula BMI=kg/m^2. Obesity was defined as BMI>30 kg/m^2, and was divided in three classes (Class one BMI=30-34.9 kg/m^2; class two BMI=35-39.9 kg/m^2; class three BMI>40 kg/m^2). Overweight was defined as BMI=25-29.9 kg/m^2, normal weight as BMI=18.5-24.9 kg/m^2 an underweight as BMI<18.5 kg/m^2.

The data were processed using MS Excel and IBM SPSS statistics 20 software. Statistical analyses and variable data comparisons were carried out. Descriptive statistics were used to analyze frequencies. To compare variables between different groups and to find out level of significance crosstabs function and Chi square test was used. To compare mean values between groups independent samples T test was used. P value of lesser than 0.05 was accepted as significant.

Results

59 males and 61 females participated in this study. Difference between both genders was not significant ($p>0.05$). Mean age of population was 66 years ranging from 40 to 93 years. Average age of male participants was 65.4 (SD±10.4) years opposite to 67.6 (SD±9.3) years in female ($p>0.05$). Average weight of whole population was 86.5 kg, but average height was 170 cm. Male population had average body mass of 91 kg and height of 176.9 cm. Female population had average body mass of 82.1 kg and height of 162.4 cm.

There was significant difference in average body mass index measurements when comparing gender. Male average BMI was 29 (SD±4.1), while female average BMI was as high as 31.2 (SD±6.7) ($p<0.05$).

When BMI of whole population was analyzed it showed that 0.8% of all respondents were underweight, but only 18.3% had normal weight. Overweight was found in 32.5% of respondents. Obesity was discovered in 48.3% of participants, of whom 34.2% had class one, 7.5% had class two, but 6.7% had class three obesity.

Only one male was underweight, therefore he was excluded from statistical analyzes when comparing body weight patterns between genders. Normal body weight was found in 23.0% of women and in 13.8% of men. Greater amount of males were overweight – 41.4% opposite to 24.6% of female. Obesity levels were high in both groups. 52.5% of women and 44.8% of men were obese. The differences between gender were significant ($p<0.05$).

Obesity levels also were compared. Class one obesity was found in 24 (40.7%), class two in 2 (3.4%) and class three in 0(0%) of men. Women had class one obesity in 17 (27.9%), class two in 7 (11.5%) and class three in 8 (13.1%) cases. Statistical analyze was not performed due to insufficient amount of data.

Physical activity level was low. When asked if they participate in 30 minute physical activities only 35% admitted they do it at least 3 times a week. Of all respondents 25% did not take part in such activities at all and only 40% said they have them less than a three times per week. No significant differences between genders were found ($p>0.05$).

Participants who did not partake in 30 minute activities had normal body weight in 12.9%, overweight in 19.4% and obesity in 67.7% of cases. In the group with such an activity level less than three times per week normal weight was found in 17.4%, overweight in 34.8%, but obesity in 47.8% of cases. Seemingly better results were found in patients with aerobic activities at least three times per week – 23.8% had normal weight, 40.5% had overweight and 35.7% were obese. Mean BMI values also were compared between active and inactive respondents. Persons who did not do 30 minute activities had average BMI of 30.8(SD±6.1) opposite to 28.8 (SD±4.6) in those who did them at all. Although it seemed there is difference between activity groups, it was not statistically confirmed ($p>0.05$).

BMI levels were also compared with data about salt, vegetable, fruit and fish consumption. Patients who limited salt intake had normal body weight in 21.9%, overweight in 31.5% but obesity in 46.6% of cases. In comparison, respondents who did not limit salt consumption had obesity in 52.3%, overweight in 36.4% and normal weight in only 11.4% of cases.

Obesity was found in 47.7% of patients who followed recommended fish consumption rates in comparison of 49.3% in those who did not. 44.9% of respondents who ate fruit and 46.7% who ate vegetables at least two times a day were obese. Respondents who did not eat recommended amount of fruit were obese in 54.0% in cases. Those who did not consume recommended amount of vegetables had obesity in 50.8% of cases.

None of dietary habits had statistically proved association with different levels of BMI ($p>0.05$).

Discussion

When acquired results were compared with literature, it could be suggested that prevalence of obesity is significantly higher in population with elevated cardiovascular risk than in general population as it was expected. Ērglis et al reported that in Latvia obesity was found in 30.1% and overweight in 37.7% of general population wile this research had obesity prevalence of 48.3% and overweight prevalence of 32.5% (Ērglis *et al*. 2008). Another study in Netherlands shows even better results. In population of 771 without diagnosed cardio metabolic diseases 37% were overweight and 12% had obesity (Petter *et al*. 2015).

Such a high obesity rates should be considered very carefully, especially in patients with elevated risk of cardiovascular events and mortality. Increase in total mortality for persons with

BMI over 25 kg/m^2 and increase in CVD associated mortality for those with BMI over 30 kg/ m^2 mortality has been observed (Kazlauskienė *et al*. 2015).

It's important to find main reasons for increased prevalence of obesity in patients with higher cardiac risk. It would give chance to address this problem more effectively and in ways specific for those patients.

Data obtained in study also showed difference in obesity prevalence between genders, proving that female have grater obesity rates, while male more often are overweight. Similar results are displayed in other researches. Ērglis et al reports that in Latvia obesity is found in 32.6% of women opposite to 25.6% of men, but overweight in 44.6% of men and 33.7% of women general population (Ērglis *et al*. 2008). There are data that in United States prevalence of obesity could be found in 37.1% of men and 38.4% of women aged 45 to 79 years (Patel *et al.* 2015).

A study in Lithuania also had similar results. Comparing genders, obesity among the women was more frequent. Average BMI was 31.05 kg/m^2 for women and 28.5 kg/m^2 for men (Kazlauskienė *et al*. 2015).

Factors that influence different weight levels between men and women should be found out. It has been suggested that those factors may differ depending of populations geographical localization, social structure and wealth (Garawi *et al.* 2014). That means that even if we acquire similar results with other countries our reasons for gender gap in obesity levels may be different. It would also be beneficial to analyze how weight levels change in different age groups for both genders.

Even if this study did not found association between obesity levels and physical activity amount, it has to be considered there might be one. Petri Wiklund in his review concludes that increases in obesity rates is cannot be associated with decline in daily energy expenditure alone, however exercise can be a part of solution for obesity reduction (Wiklund, 2016). Some studies show significant association between physical activity levels and different weight levels in children (Guntera *et al*. 2015) and adults (Wannera *et al.* 2016) alike.

In this research was found that amount of exercise among persons with elevated cardiovascular risk is low. During interviews patients often admitted that activities cannot be carried out due to the limitations of health or due to lack of time. There are other studies that show lack or regular physical activity among cardiac patients, were only 39% admitted participation in consistent exercise and mentioned similar causes for that (King-Shier *et al*. 2013).

None of described dietary habits proved to be associated with different levels of BMI, however only four product groups were analyzed. Data about fat, sugar, protein and overall energy intake also should have been included and could have been influential on results. Meta-analyze

study described that dietary interventions have the greatest effect on overweight an obesity wile physical activity showed variable results (Stephens 2014).

This study has some limitations. It has to be noted that respondent count was relatively small. Interviews were carried out in Riga and Ķekava which are geographically close to each other, although Paul Stradin's Clinical Hospital admits patients from all the Latvia. Taking that into account there may be inaccuracies when considering results of this research for description of all regions of country.

All the collected weight and height measures were subjective and based on patients answers during interviews. So it has to be considered that there may be possible inaccuracies in presented results.

Responded socio-demographic status was not taken into account but few studies suggest that factors like education, income and others may influence weight levels (Murray *et al*. 2010) (Kim 2015).

Conclusions

1. Obesity level in patients with elevated cardiovascular risk is high – 48.3%. Only 18.3% of patients had normal body weight.
2. There were significant differences in BMI between genders.
3. Females had higher average BMI (31.2 against 29 kg/m^2). Females were more likely to have normal weight (23%), but also had greater obesity levels (52.5%) then men.
4. Males more often were overweight (41.1%) than women, however obesity levels were also high (44.8%).
5. Physical activity and dietary habits were not associated with different levels of BMI, however it could be because of relatively small amount of population.

References

Ērglis, A., Rozenbergs, A., Dzērve, V., et.al. *Latvijas iedzīvotāju kardiovaskulāro un citu neinfekcijas slimību riska faktoru šķērsgriezuma epidemioloģisks pētījums*, 1.ziņojums, 6-9.lpp.

Garawi F., et.al. 2014. Global differences between women and men in the prevalence of obesity: is there an association with gender inequality? In: *European Journal of Clinical Nutrition*, N68, p. 1101–1106.

Grub N.R., Newby D.E. 2006. *Cardiology*, Second edition, Elsevier limited, Ch 12, sec. 1, p. 220–221.

Guntera K.B. et al. 2015. Physical activity levels and obesity status of Oregon Rural Elementary School children, In: *Preventive Medicine Reports*, Volume 2, p. 478-4.

Gutiérrez C.V. et al. 2015. *Overweight obesity and cardiovascular risk in menopausal transition*, Nutr Hosp.;32(4):1603-1608.

Kazlauskienė L., et.al. 2015. *Metabolic syndrome related to cardiovascular events in a 10 year prospective study. Diabetol Metab Syndr*, 7:102.

Kelly T. et al. 2008. *Global burden of obesity in 2005 and projections to 2030*, Int. J. Obes., 32, pp. 1431–1437.

Kim Y. 2016. The long-run effect of education on obesity in the US, In: *Economics & Human Biology*, Volume 21, p.100–109.

King-Shiera K.M. et al. 2013. Understanding the influence of urban- or rural-living on cardiac patients' decisions about diet and physical activity, In: *Descriptive decision modeling, International Journal of Nursing Studies*, Volume 50, Issue 11, p. 1513–1523.

Lepiksone J., Gavare I., Mauriņa A., et.al. 2014. *Slimību profilakses un kontroles cents, Latvijas veselības aprūpes statistikas gadagrāmata*, 16. izdevums, 2. nod., 14–66. lpp.

Murray E.K. et al. 2015. Report Nutrition Content in a National Nutrition Education Program for Low-Income Adults: Content Analysis and Comparison With the 2010 Dietary Guidelines for Americans, In: *Journal of Nutrition Education and Behavior*, Volume 47, Issue 6, p.566–573.

Patel A., Winkel M., Mohammed K. Ali, MK., et.al. 2015. Cardiovascular Mortality Associated With 5 Leading Risk Factors: National and State Preventable Fractions Estimated From Survey Data. Mehta, In: *Annals of Internal Medicine*, N 4 vol. 163, p.245–251.

Perk J., De Backer G., Gohlke H., et.al. 2012. European Guidelines on cardiovascular diseaseprevention in clinical practice, In: *European Heart Journal*, N 33, p. 1635–1701.

Petter J., Reitsma-van Rooijen MM., Korevaar JC., Nielen MMJ., et.al. 2015. *Willingness to participate in prevention programs for cardiometabolic diseases*. BMC Public Health, p. 2–7.

Stephens S.K. et al. 2014. *Improving diet and physical activity to reduce population prevalence of overweight and obesity: An overview of current evidence Preventive Medicine*, Volume 62, p. 167–178.

Taegtmeyer H., et al. 2008. *Obesity and Cardiac Metabolism in Women, Cardiovascular Imaging*, Volume 1, Issue 4. Pages 434–435.

Wannera M. et al. 2016. Associations between domains of physical activity, sitting time, and different measures of overweight and obesity, In: *Preventive Medicine Reports*, Volume 3, p. 177–184.

Wiklund P. 2016. The role of physical activity and exercise in obesity and weight management: Time for critical appraisal, In: *Journal of Sport and Health Science*, doi: 10.1016.

"TORONTO – ALEXITHYMIA SCALE 20" SCORES AMONG PSYCHIATRIC PATIENTS COMPARED TO OTHER INPATIENTS

Laura Bubko[1], Annija Mežmača[1], Inese Jurķāne[1], Zane Lucāne[1], Dr. Artūrs Ancāns[2]
[1] Rīga Stradiņš University, Dzirciema street 16, Rīga, Latvia, LV-1007
bubkolaura@gmail.com
[2] RSU Department of Psychosomatic Medicine and Psychotherapy, Latvia

Abstract

"Toronto – Alexithymia Scale 20" scores among psychiatric patients compared to other inpatients

Key words: *Alexithymia, Toronto-Alexithymia-Scale-20, emotional unawareness, inpatients*

Alexithymia is personality characteristic in which the individual has difficulties to identify and describe their emotions. The main features of alexithymia are emotional unawareness, lack of social attachment and poor interpersonal relating. Studies show that about 8-10% of general population is affected by alexithymia. It is linked with physical and psychiatric comorbidities (Taylor *et al*. 1990; Helmers and Mente, 1999). The aim of the study was to determine Toronto - Alexithymia Scale -20 (TAS-20) scores among psychiatric patients compared to other inpatients. 193 inpatients from different departments of eight hospitals participated in this cross sectional study. Internationally validated TAS 20-item questionnaire by Taylor *et al*. (1994) adapted in Latvian and Russian was used in this research. Statistical data were analyzed using IBM SPSS v.22. Among all inpatients 38 patients were from Department of Psychiatry and Narcology, including 32 males and 6 females with mean age 38 (SD=11) years. Average score on TAS-20 for psychiatric patients was 58.95 (SD=7.7). Among other 155 inpatients 53 were male and 102 female with mean age 63 (SD=16) years. Average score 8 on TAS-20 among other inpatients was 53.5 (SD=13.3). A two-sample *t-test* showed statistically significant relation that on average psychiatric patients showed a 5.5 points higher (95% CI: 2.2-8.8) score on TAS-20 compared to inpatients of other departments ($p<0.01$).

Kopsavilkums

"Toronto-Aleksitīmijas skalas 20" rezultāti psihiatriskā profila pacientiem, salīdzinot ar citu profilu stacionāro pacientu rezultātiem

Atslēgvārdi: *Aleksitīmija, Toronto aleksitīmijas skala 20, stacionārie pacienti*

Aleksitīmija ir personības iezīme, kuras gadījumā cilvēkam ir grūtības identificēt un raksturot savas emocijas. Aleksitīmijai ir raksturīga emociju neapzināšanās, nespēja tās izpaust, kā arī socializācijas grūtības. Pētījumi liecina, ka apmēram 8-10% cilvēku no kopējās populācijas ir aleksitīmija. Turklāt citos pētījumos ir atrasta saistība starp aleksitīmijas esamību un somatiskām un psihiatriskām saslimšanām (Taylor *et al*. 1990; Helmers, Mente 1999). Pētnieciskā darba mērķis bija noteikt Toronto Aleksitīmijas skalas-20 (TAS-20) rezultātus psihiatriskā profila pacientiem, salīdzinot ar pacientiem no citiem profiliem. Pētījumā piedalījās 193 stacionārie pacienti no 8 slimnīcu dažādām nodaļām. Darba ietvaros tika izmantota starptautiski validēta un atzīta Toronto aleksitīmijas skala-20, kas sastāv no 20 jautājumiem (Taylor *et al*. 1994) un ir tulkota latviešu un krievu valodā. Datu statistiskā apstrāde tika veikta izmantojot *IBM SPSS v.22.* No visiem stacionārajiem pacientiem, 38 pacienti bija no Psihiatrijas un Narkoloģijas profila, tai skaitā 32 vīrieši un 6 sievietes, kuru vidējais vecums bija 38 (SD=11) gadi. Vidējais punktu skaits TAS-20 anketā šiem pacientiem bija 58.95 punkti (SD=7.7). Savukārt pārējo 155 stacionāro pacientu vidū 53 bija vīrieši un 102 sievietes ar vidējo vecumu 63 gadi (SD=16). Šiem pacientiem vidējais punktu skaits TAS-20 anketā bija 53.5 (SD=13.3). Divu neatkarīgu izlašu t-tests atklāja statistiski nozīmīgu sakarību, ka pacientiem no psihiatrijas un narkoloģijas profila ir par 5.5 punktiem augstāks rezultāts (95% CI: 2.2-8.8), salīdzinot ar pacientiem no citiem profiliem ($p<0.01$).

Introduction

Alexithymia, also called emotional blindness, is a clinical term first introduced by Peter Sifneos in 1972. The term is rooted in the Greek language, meaning "no words for emotions" (*a*=lack, *lexis*=word, *thymos*=emotions), as it is used to describe the condition of patients who cannot understand their feelings or patients, who are unable to describe their emotions to other people (Muller 2000).

Patients with alexithymia may not only lack the ability to express and describe their feelings, but also lack an understanding of what is causing the feelings. They may have problems with recognizing different types of feelings. Patients with alexithymia could also have a lack of imagination, a narrow style of thinking, problems to recognize facial expressions in others, temporary and detached connection to others. Also, those who experience alexithymia could be hypersensitive to physical stimulations, could have difficulties distinguishing between feelings and the physical sensations of emotional arousal (Taylor *et al.* 1991).

Bermond *et al*. (2007) proposed that alexithymia has two dimensions – cognitive factor and affective factor. The cognitive dimension consists of identifying, interpreting and verbalizing feelings, while the affective dimension consists of reacting, expressing, feeling and imagining. Thus two types of alexithymia can be differentiated – Type I and Type II. However, this paper does not investigate the different types of alexithymia.

Previous research has shown that the prevalence of alexithymia among the general population is approximately 10%, including prevalence among males at approximately 8% and among females at around 2%. A comorbidity with a number of other psychiatric conditions has also been previously found by other researches. The relationship between the severity of alexithymia and age has also been shown to be statistically significant, while the relationship with gender has not (Weiss 2015; Blanchard *et al*. 1981).

There are two most widely used questionnaires for detection of alexithymia – the Bermond-Vorst and Toronto-Alexithymia scale 20-item (TAS-20) questionnaires. This paper uses the TAS-20 questionnaire, which is further described in the methodology part.

Materials and Methods

The aim of the study was to determine TAS-20 scores among psychiatric patients compared to other inpatients. 193 inpatients from different departments of eight hospitals of Latvia participated in this cross sectional study. Patients were from Department of Psychiatry and Narcology, other departments included Department of Cardiology, Department of Oncology, Department of Internal Medicine and Department of Surgery. All patients who participated in this research were chosen randomly, afterwards they were asked to agree to participate in this research by filling the questionnaire. Privacy – voluntary participation, anonymity and data security- was guaranteed for every participant. Every person willing to participate was also informed about the goal and the intention of this research. The study was approved by the local research ethics committee (Rīga Stradiņš University).

Internationally validated TAS-20 questionnaire by Taylor *et al*. (1994) adapted in Latvian and Russian was used in this research. TAS-20 is used worldwide as a valid measurement of alexithymia. It is a self-report scale consisting of 20 questions, which are rated using a 5-point

Likert scale whereby 1 – strongly disagree and 5 – strongly agree. 5 questions of this scale are negatively keyed. Alexithymia is diagnosed when the score equals to or is greater than 61 out of 100. Scores of 52 to 60 indicates possible alexithymia. Equal to or less than 51 points shows non-alexithymia.

The sample consisted of 193 subjects between the age of 16 and 92 years with mean age 59 (SD=18) years, comprising 44% (n=85) men and 56% (n=108) women. Among all inpatients 38 patients were from the Department of Psychiatry and Narcology (patients undergoing Minnesota drug and alcohol addiction recovery program), including 32 male and 6 female patients with mean age 38 (SD=11) years. Among 155 non-psychiatric inpatients 54 were male and 102 female with mean age 63 (SD=16) years.

This study focuses mainly on the descriptive statistics of the mean and frequency distributions of the TAS-20 sum score. For independent samples, t-tests were performed in order to compare continuous data. Categorical data were analyzed for frequency distribution differences by using the $\chi 2$ test. Statistical data were analyzed using *IBM SPSS v.22*.

Results

The mean value of TAS-20 of the total sample was 54.54 (SD=12.6) points. The minimum value was 23 and the maximum was 85. The median for the entire sample was 54.00. The value for the kurtosis was -0.500 (SE=0.348) and for the skewness -0.199 (SD=0.175), resulting in a distribution close to normality.

Average score on TAS-20 for psychiatric patients was 58.95 (SD=7.7) points. Number of patients in each department, mean TAS-20 score and frequency of alexithymia is showed in table 1. Average score of the TAS-20 among other inpatients was 53.5 (SD=13.3) points. The lowest mean score of the TAS-20 was observed in Department of Oncology (50.7±12.8 points).

Table 1. **The mean score of the TAS-20, SD and frequency of patients with and without alexithymia among inpatients in different departments**

Department	Mean TAS-20 score	Standart-Deviation (SD)	Total number of patients	Patients without alexithymia	Patients with alexithymia
Department of Cardiology	55,6	12,3	33	22	11
Department of Internal Medicine	53,4	14,7	48	30	18
Deperatment of Oncology	50,7	12,8	45	33	12
Department of Surgery	55,5	12,8	29	17	12
Department of Psychiatry and Narcology	59,0	7,7	38	23	15
Total	54,5	12,6	193	125	68

A two-sample *t-test* showed statistically significant relation that on average psychiatric patients showed a 5.5 points higher (95% CI: 2.2-8.8) score on TAS-20 compared to inpatients of other departments (p<0.01) (see Fig.1.)

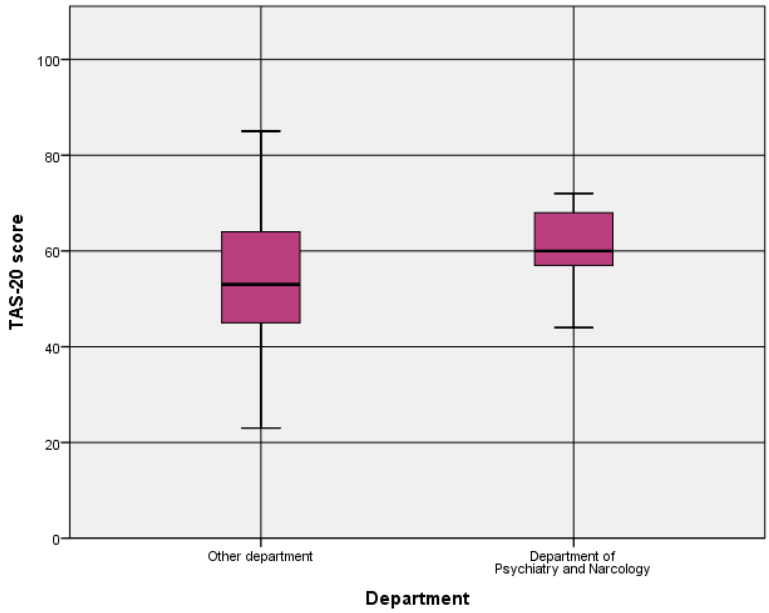


Figure 1. **Mean score of the TAS-20 scale in Department of Psychiatry and Narcology and other departments**

According to the cut-off score in TAS-20 (TAS-20 score more than 61 point), the prevalence of alexithymia in the whole study population was 35.2%. In Department of Psychiatry and Narcology, 15 out of 38 patients (39.5%) had alexithymia. In other departments 53 out of 155 inpatients (34.2%) were diagnosed as alexithymic according to the result in TAS-20. Pearson's chi-squared test, however, did not show statistically significant association between being alexithymic (as a nominal variable according to the cut-off score in TAS-20 scale), and being treated in the Department of Psychiatry and Narcology ($\chi 2$=1.108; Df=1; p=0.29).

No association was found between alexithymia, as a nominal variable, and gender of the patient in Pearson's chi-squared test ($\chi 2$=0.030; Df=1; p=0.86). In addition, as a continuous variable, alexithymia (total TAS-20) was not related to age (r=0.06; p=0.41), nor with the gender of the patient (r=0.10; p=0.19) in Spearman correlation analysis.

Discussion

It has been hypothesized that substance abusers use drugs to help manage unpleasant emotional states, which are experienced as unmanageable because of difficulty in understanding and effectively dealing with those emotions (Taylor *et al.* 1990). Also people with alexithymia tend to be less able to understand and regulate their feelings and emotions properly. There is greater likelihood that emotions can be misinterpreted as being symptoms of illness and therefore people with alexithymia are prone to engage maladaptive regulation strategies such as substance abuse

(Taylor 2000). Other studies made on this field also have found a link between alexithymia and substance abuse, using TAS-20. Studies have reported that prevalence of alexithymia among substance-dependent patients is 41.7% (Lindsay *et al*. 2009), (Haviland *et al.* 1994), 50% (Taylor *et al.* 1990) compared to general population, where prevalence of alexithymia varies from 8-10% (Franz *et al.* 2008).

Our study shows that substance abusers tend to score more points on TAS-20 compared to other inpatients. Also prevalence of alexithymia among patients from Department of Psychiatry and Narcology was 39.5%, which is in an accordance to previous studies on this field.

Conclusions

There is statistically significant difference on TAS-20 scores among psychiatric patients compared to inpatients of other departments. Psychiatric patients on average score 5.5 points more on TAS -20 than inpatients of other departments.

There is no correlation between alexithymia and being in Department of Psychiatry and Narcology or any other department, but using a threshold criterion of ≥61, 35.2% of all inpatients are categorized as alexithymic, which is three times higher result compared to data from other studies about general population.

References

Bermond, B., Clayton, K., Liberova, A., Luminet, O., Maruszewski, T., Ricci Bitti, P. E., & Wicherts, J. (2007). A cognitive and an affective dimension of alexithymia in six languages and seven populations. *Cognition and Emotion*, *21*(5), 1125-1136.

Blanchard, E. B., Arena, J. G., & Pallmeyer, T. P. (1981). Psychometric properties of a scale to measure alexithymia. *Psychotherapy and psychosomatics*, *35*(1), 64-71.

Franz, M., Popp, K., Schaefer, R., Sitte, W., Schneider, C., Hardt, J. & Braehler, E. (2008). Alexithymia in the German general population. *Social psychiatry and psychiatric epidemiology*, *43*(1), 54-62.

Haviland MG, Hendryx MS, Shaw DG, Henry JP. (1994). Alexithymia in women and men hospitalized for psychoactive substance dependance. *Comprehensive Psychiatry* 35:124-128.

Helmers, K, Mente, A. (1999). Alexithymia and health behaviours in helathy male volunteers. *Journal of Psychosomatic research* 47:635-645.

Lindsay, J., & Ciarrochi, J. (2009). Substance abusers report being more alexithymic than others but do not show emotional processing deficits on a performance measure of alexithymia. *Addiction Research & Theory*, *17*(3), 315-321.

Muller, R. J. (2000). When a patient has no story to tell: alexithymia.*Psychiatric Times*, *17*(7), 137-141.

Taylor, G. J., Bagby, R. M., & Parker, J. D. (1990). The alexithymia construct: a potential paradigm for psychosomatic medicine.*Psychosomatics*, *32*(2), 153-164.

Taylor, G.J. Recent developments in alexithymia theory and research. *Canadian Journal of Psychiatry 45:134-142.*

Timoney, L. R., & Holder, M. D. (2013). Measurement of Alexithymia. In *Emotional Processing Deficits and Happiness* (pp. 17-33). Springer Netherlands.

TOTAL HIP REPLACEMENT PREOPERATIVE AND OPERATIVE RISK FACTORS INFLUENCING PROLONGED HOSPITAL STAY AND COMPLICATIONS

Māris Čačs[1], Dr.med, prof. Andris Jumtiņš [2]
[1] Rīga Stradiņš University, Dzirciema street 16, Riga Latvia, LV-1007
maris.cacs@yahoo.com
[2] Department of Orthopaedics, Duntes street 22, Riga, Latvia, LV-1007
Andris.Jumtins@rsu.lv

Abstract

Total hip replacement preoperative and operative risk factors influencing prolonged hospital stay and complications

Key words: *Orthopaedics, complications, total hip arthroplasty, risk factors, osteoarthritis*

Introduction. Total hip arthroplasty is a surgical treatment option that raises the functional level and reduces pain of affected joint. Assessing the risk factors for total hip replacement operation could help to improve the result for the patient, to detect and recognise complications earlier.
Aim. To evaluate postoperative complications after total hip replacement and to determine possible connection with risk factors for patients with prolonged hospital stay.
Materials and methods. The study included all individuals from the Hospital of Traumatology and Orthopaedics in Riga, Latvia who had a total hip arthroplasty performed in the year of 2014. Only patients with hospital time longer than 14 days were included. The data were obtained from medical histories and analysed as a retrospective study Calculations of data were performed by using *IBM SPSS Statistics 22.0 programme*.
Results. A total number of 82 medical histories were analysed and included. The average age of all patients was 71,12 ± 10,80. The gender - 21,0% (N= 17) of them were male and 79% (N= 64) were female. Mean amount of days spent in hospital 16,64 ± 6,78. Mean affected joint flexion (in degrees) was 78 ± 16, extension - 1.7 ± 5 inner rotation - 12 ± 10, outer rotation - 18 ± 10. Affected extremity shortening (cm) – 1,51 ± 1,47. Mean body mass index was 29,43 ± 6.14. Days spent in intensive care unit were 3,6 ± 1,73. Statistically significant connection was between days spent in hospital and male gender ($p<0,05$) There was also a significant connection between heart and cardiovascular disease in anamnesis and days spent in hospital ($p< 0,05$).
Conclusion. The results showed an increased risk of longer hospital stay for male gender of this patients' group. As a significant factor, was observed heart and cardiovascular disease in anamnesis which affects the length of patient's stay in hospital. There were no important differences between goniometric measurements and the complication rate or the length of hospital stay.

Kopsavilkums

Totālas gūžas protezēšanas preoperatīvi un operatīvi riska faktori, to ietekeme uz pagarinātu hospitalizācijas laiku un komplikācijām.

Atslēgvārdi: *Ortopēdija, komplikācijas, totāla gūžas protezēšana, riska faktori, osteoartrīts*

Ievads. Totāla gūžas endoprotezēšana ir viena no veiksmīgākajām operācijām, lai samazinātu pacienta sāpes un uzlabotu funkcionālo stāvokli. Identificējot pagarināta hospitalizācijas laika riska faktorus, būtu iespējams agrāk identificēt pacientus ar komplikācijām, uzlabojot drošību un gala iznākumu stacionēšanas laikā.
Mērķis. Darba mērķis bija novērtēt postoperatīvas komplikācijas pēc totālas gūžas endoprotezēšanas un izvērtēt to iespējamo saistību ar riska faktoriem pacientiem ar pagarinātu hospitalizācijas laikul.
Materiāls un metodes. Pētījums iekļāva visus indivīdus, kam tika veikta totāla gūžas endoprotezēšana Traumatoloģijas un ortopēdijas slimnīcā Rīgā, Latvijā 2014. gada laikā. Tikai pacienti ar hospitalizācijas laiku ilgāku par 14 dienām tika iekļauti. Dati tika iegūti no medicīniskajām vēsturēm un analizēti kā retrospektīvs pētījums. Gadījumi, kad bija primāri kaulu lūzumi bez osteoartrīta cēloņa, netika atlasīti. Datu aprēķini tika veikti izmantojot *IBM SPSS Statistics 22.0* programmu.
Rezultāti. Kopā tika izanalizētas 82 medicīniskās vēstures. Vidējais vecums starp visiem pacientiem bija 71,12 ± 10,80 gadi. Dzimums - 21,0% (N= 17) no viņiem bija vīrieši un 79% (N= 64) bija sievietes. Vidējais slimnīcā pavadīto dienu skaits - 16,64, standartnovirze- 6,60. Vidējā slimības skartās locītavas fleksija (grādos) 78 ± 16, ekstensija - 1.7 ± 5, iekšējā rotācija 90° fleksijā - 12 ± 10, ārējā rotācija 90° fleksijā - 18 ± 10. Ekstremitātes saīsinājums (cm) - 1,51 ± 1,47. Vidējais operācijas asins zudums (ml) bija 421,21 ± 279,02. Vidējais operācijas laiks (min) 94,18 ± 23,15. Pacienti, kas tika stacionēti intensīvās terapijas nodaļā, pavadīja tur vidēji 3,6 ± 1,73 dienas.
Secinājumi. Rezultāti uzrādīja vīriešu dzimumu, kā palielinātu risku ilgākam stacionēšanas laikam atlasītajai pacientu grupai. Kā nozīmīgs faktors tika novērota sirds vai kardiovaskulārā slimība anamnēzē, kas ietekmē pacientu uzturēšanās ilgumu slimnīcā. Netika novērota statistiski ticama saistība starp komplikācijām un goniometriskajiem mērījumiem.

Introduction

Total hip arthroplasty ranks among one of the most successful operations to reduce the pain and to improve the function of hip osteoarthritis. In addition, it is considered to be a safe and cost effective manipulation. There are made more than 1 million arthroplasties in the world every year and it is expected that this number could double over the next two decades. Symptomatic osteoarthritis is as a surgery indication for more than 90% of patients, and its incidence is growing in relation to the aging population and the rapidly increasing number of people with excessive body weight. The expected increase of the hip replacement operations creates the need to better explore the outcome and the need for joint registries, which could allow following up the situation of the implant over time. (White *et al.* 2000; Chang *et al.* 1996: 858; Boyle *et al.* 2012)

Despite the good results, observable complications that affected individuals can lead to a poorer functional outcome, prolonged hospital stays, including a stay in the intensive care unit, increasing costs and overall mortality. In order to improve the outcome of patient, safety of care should be listed as the highest priority. By identifying the risk factors, which cause post-operative complications and prolonged hospitalization time, it is possible to achieve an improvement, because it enables an early identification of these patients.

It is important to differentiate the factors that are linked independently to increased hospital stays and who - with an increased risk of complications. Although, the increase in the number of patients who have undergone hip replacement at the age of more than 65 years, a large part of them are already operated with a pre-existing co-morbidity that may affect the future results. (Soohoo *et al.* 2010)

In order to better evaluate the postoperative outcome, there are created several risk evaluative scales. They enable better preparation for the future treatment and a rehabilitation phase. Depending on the type of the scale and a hospital preparation work, they assess various pre-surgery and intra-surgery factors. The final outcome is determined by the probability of complications, patient mortality and by the assessment of further functional state. Some of these scales are to determine the length of hospitalization and the time spent in intensive care unit. Spontaneous placement in the intensive care is associated not only with increased costs, but also with high patient mortality. (Liu 2012; Shorr 2002)

In order to assess the reasons for an extended time of hospitalization at the hospital of Traumatology and Orthopedics in Riga, the study examined what factors are identified as significant in patients with hospitalization more than 14 days, in the context of the patient's early postoperative complications during hospitalization.

Materials and methods

There were selected patient medical history forms at the Hospital of Traumatology and Orthopedics in Riga for patients who were prescribed during the period from 1 January 2014 to 31 December 2014, with hospitalization length for more than 14 days. Accepted cases have undergone hip replacement surgery, regardless of the operating of the doctor, the type of surgery - with acrylic cement, cementless and hybrid type prostheses. Subsequently, cases with a primary femoral fracture, as well as revision-type operations, were excluded. Study analyzed patients - both women and men, regardless of age.

After carrying out the selection of patients' medical forms, there were collected data from the patients' medical history preoperative checkup. From the patient-related data - the patient's age, sex were noted. Also goniometric indicators - the maximum hip flexion, extension, internal rotation and external rotation in flexion, in degrees were examined. Using patient's weight and height data, the body mass index was calculated. From the patient's inspections and anesthesia card data marked co morbidities were further grouped into the heart, lung, kidney and liver disease groups. Diabetes, arterial hypertension degree, ASA (American anesthesiology association) class were also analyzed. The operation data included the duration operation and the estimated blood loss during surgery. From medical records the information on the total number of days spent in hospital, how many days after joining followed by surgery and days at the intensive care unit were included. The postoperative complications were marked as well as an erythrocyte mass transfusion, transfused units, if used postoperative. Small postoperative complications were also included, which were eliminated during the patient's hospitalization time when they have been recorded in historical records. Anemia was seen as a complication if it matched to supporting laboratory parameters - hemoglobin concentration of less than 118g /L and hematocrit value of less than 35%, including the fact that the correction in the postoperative period was performed using at least one erythrocyte mass transfusion. The complications were included starting from postoperative period till the discharge from hospital.

The data in the study were collected, grouped and analyzed using IBM SPSS Statistics 22.0, Microsoft Word 2013 and Microsoft Excel 2010 software. The necessary calculations were made using descriptive statistical methods, the Mann-Whitney, Pearson's chi-square, Fisher's Exact test, t-test and Pearson correlation (p value <0.05 was accepted as statistically significant).

Results

Recording to Traumatology and Orthopedics Hospital archive's data, there was carried out 891 hip replacement operations, with acrylic cement, cementless and hybrid type prostheses in 2014 (excluding audit type operations). By applying the set selecting conditions (excluding the cases where the patient's diagnosis is a primary fracture of *femur* and viewing only those patients' data,

which have hospitalization time is longer than two weeks) 82 patients' medical history were evaluated (9.2% of the total number, before the application of the selection criteria). When analyzing the study population, the majority of the basic diagnosis was found as a primary osteoarthritis. Secondary osteoarthritis has been found for 3.7% (N = 3) from the individuals. A minority of the patients was mentioned with the main diagnosis - rheumatoid arthritis 2.4% (N = 2), which was observed for younger patients. The youngest individual, who met the study required conditions, was 28 years old. From all the patients - 21.0% (N = 17) were men and 79% (N = 64) women.

The average age of patients was 71.12 ± 10.80 years. For the selected group an average number of days spent in hospital - 16.64. Patients, who stayed in the intensive care unit, spent in average 3.6 ± 1.73 days. The surgery was performed on at 1.22 ± 0.65 hospitalization per day. These manipulations mean blood loss (ml) - 421.21 ± 279.02. The average duration of surgery - 94.18 ± 23.15 (min). The median body mass index - 29.43 ± 6.14. Distribution of pacients by ASA score 42.9% - class I, 54,5% - class II, 2,6% - class III (fig.1.)

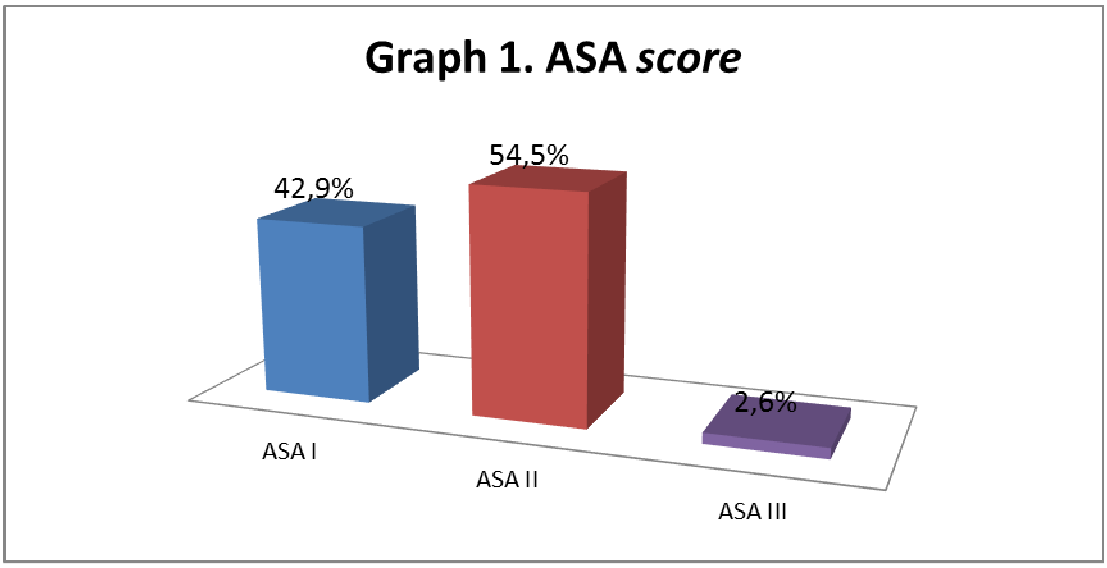


Figure 1. **ASA score**

Comorbidities were divided into categories, depending on the affected organ systems: heart, lungs, kidney and liver diseases which have been detected prior to surgery. From all patients who p enrolled in the study, 67.1% had a heart disease (N = 55). and respectively 32.9% (N = 27) without known pathology. Pulmonary disease was detected in 22% (n = 18) of cases, but not to detect changes - 77.1% (N = 64). Liver abnormalities were detected in 12.2% (N = 10), but from the evaluated medical records 37.8% (N = 31) had a renal disease. Diabetes mellitus was noted in 13.3% (N = 11) of cases.

The risk of complications could be affected not only by the patient but by the health service provider factors. When comparing patients treated in specialized medical centers with patients, who

are being treated in a wide working-field hospitals have a higher overall risk of getting an early complication. (Soohoo et al. 2010) Overall incidence of complications is 5.8% - 6.4%, depending on the literature source. (Huddleston et al. 2010)

For most of the examined patients with prolonged hospitalization time as complication was detected postoperative anemia. It was found in 47.6% (n = 39) cases. (fig.3)

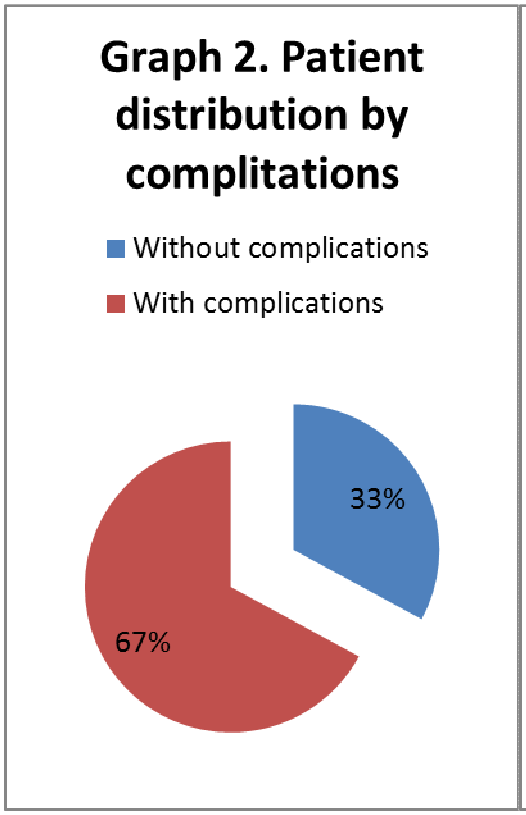


Figure 2. **Patient distribution by complications**

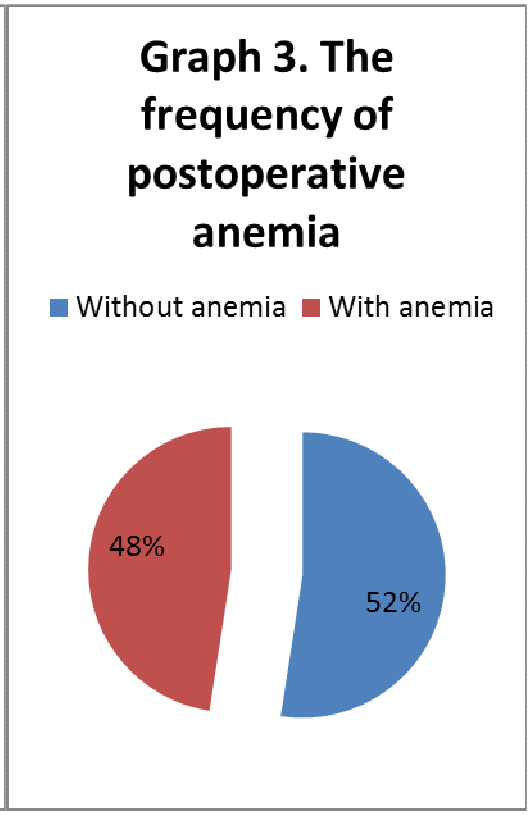


Figure 3. **The frequency of postoperative anemia**

As one of the potential causes could be mentioned a perioperative blood loss, which was noted in 4.9% (N = 4).From local complications, hematoma was found in 9.8% (n = 8) or edema in 8.5% (n = 7) in the area of the wound, which was determined from patient examination or radiological records. Mean complication rate was 67% (including minor complications). (fig 2) A wound revision was required in 2.4% (n = 2) of cases. (fig 4) Major complications of comorbidities were recorded in 14.6% (N = 12).

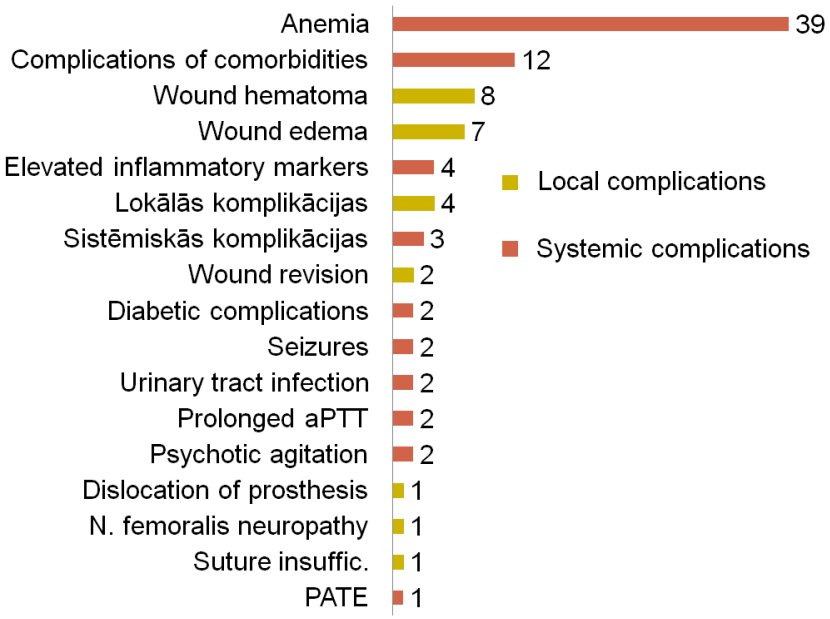


Figure 4. **Complications during prolonged hospitalization time**

From the data collected there was a statistically significant connection between the days spent in hospital and, patients who had a heart or cardiovascular associated comorbidity in anamnesis, with p = 0.01. For other comorbidities (lung, liver, kidney) no effects on the duration of hospitalization time were observed.

In addition, statistically significant correlation observed between days spent in hospital and the male gender, with p = 0.01.

Discussion

Looking at the relationship between complications and the number of days spent at the hospital before operation, from the data obtained result was although not statistically significant, (p = 0.086), but there was a weak trend.

According to the research data, complications relationship with ASA class of compelling statistically significant result was not achieved (p = 0.086). However, compared to other studies ASA first, second and third class is characterized by a higher risk of major complications than the first and second class. (Willis-Owen *et al.* 2010)

Although there was found a relationship between heart disease and the number of days spent in the hospital, compared to the complications, statistically significant result was not observed (p = 0.097).

The study did not show any correlation between body mass index and complications. Looking at other sources, the results did not show a definite answer between the investigated variables. (Willis-Owen *et al.* 2010; Linda *et al.* 2012; James *et al.* 2012).

Conclusions

1. Depending on the source, complication rate varies between 5.8% - 6.4%. The risk of complications is influenced not only by the patient but also by the health service provider factors.
2. From the medical histories of the hospital of Traumatology and Orthopedics, after hip replacement with hospitalization time more than 14 days, complications in the postoperative period, during hospitalization were identified in 67.1% (N = 55) of cases. The most common early complications in this group of patients were anemia, complications of commorbidities, edema and hematoma in the area of the wound.
3. When predicting the possible hospitalization time, attention should be paid to male patients with heart disease in anamnesis, which is associated with an increased length of hospitalization.
4. Although there was a relatively high complication rate, it is due to targeted selection of patients. Further research could be continued, by including more data values and increasing the study population.

References

Boyle MJ, Frampton CM, Crawford HA. 2012. Early results of total hip arthroplasty in patients with developmental dysplasia of the hip compared with patients with osteoarthritis. In: *Journal of Arthroplasty*. 2012 Mar;27(3):386-90. doi: 10.1016/j.arth.2011.06.024. Epub 2011 Aug 19.

Willis-Owen C. A., Konyves A., D. . Martin K. 2010. Factors affecting the incidence of infection in hip and knee replacement,In: *Bone & Joint Journal* Aug 2010, 92-B (8).

Chang R.W., Pellisier J.M., and Hazen G.B.1996. *A cost-effectiveness analysis of total hip arthroplasty for osteoarthritis of the hip*. JAMA 1996; 275: pp. 858.

Huddleston JI.[1], Wang Y., Uquillas C, Herndon JH., Maloney WJ. 2012. Age and obesity are risk factors for adverse events after total hip arthroplasty. In: *Clin Orthop Relat Res.* Feb;470(2):490-6. doi: 10.1007/s11999-011-1967-y.

Huddleston JI., Wang Y., Uquillas C, Herndon JH., Maloney WJ. 2012. Age and Obesity Are Risk Factors for Adverse Events After Total Hip Arthroplasty, In: *Clinical Orthopaedics and Related Research*®, February 2012, Volume 470, Issue 2, pp 490-496.

Linda i. Suleiman, b.s., Gezzer Ortega, m.d., Sharon K. Ong'uti, m.d., m.p.h., Dani O. Gonzalez, b.s., daniel d. Tran, m.d., Aham Onyike, m.d., Patricia L. Turner, m.d., Terrence m Fullum, m.d 2012. Does bmi affect perioperative complications following total knee and hip arthroplasty? In: *Journal of surgical research*, May 1, Volume 174, Issue 1, Pages 7–11.

Liu V., Kipnis P., Rizk N.W., et al 2012. Adverse outcomes associated with delayed intensive care unit transfers in an integrated healthcare system. In: *J Hosp Med*; 7: pp. 224-230.

Shorr A.F.2002. An update on cost-effectiveness analysis in critical care. In: *Curr Opin Crit Care* 2002; 8: pp. 337-343.

Soohoo N. F., Farng E., Lieberman J. R., Chambers L., & Zingmond D. S. 2010. Factors that predict short-term complication rates after total hip arthroplasty. In: *Clinical Orthopaedics and Related Research*, 468(9), 2363–71.

White L.M., Kim J.K., Mehta M., et al 2000. Complications of total hip arthroplasty: MR imaging-initial experience. In: *Radiology*; 215: pp. 254-262.

ALEXITHYMIA AND PATIENTS' SELF-EVALUATION OF PAIN IN HOSPITALS OF RIGA

Lolita Dalbiņa[1], Anastasija Kajandere[1], Kseniya Mishchenko[1], Arta Kočāne[1], Dr. Artūrs Ancāns[2]
[1]Riga Stradins University, Faculty of Medicine, Dzirciema street 16, Riga, Latvia
lolita.dalbina@gmail.com
[2]Riga Stradins University, Department of Psychosomatic Medicine and Psychotherapy, Latvia

Abstract
Key words: *alexithymia, pain, TAS-20, NRS-11, VAS*
Introduction. Alexithymia is a personality trait associated with poor emotional awareness and self-regulation – difficulty identifying and describing feelings, characterized by externally oriented thinking, and a limited capacity for imagination. Alexithymia is linked with weakness of cognitive emotional processing and stronger awareness of somatic sensations. Limited research indicates alexithymia as a risk factor for development of psychiatric and psychosomatic disorders as well as somatic diseases especially associated with chronic pain.
Aim. To detect a possible link between presence of alexithymia and patient's self-evaluation of pain in selected hospitals of Riga.
Materials and methods. 274 patients participated in the study, 7 surveys were incomplete, further analysis was done of 267 surveys. Respondents were 19 to 95 years old (mean 58.18±18.14), 50,6% women and 49,4% men. The presence of alexithymia in patients was assessed by validated Latvian and Russian versions of internationally recognized TAS-20 score. Pain was evaluated by patients with 11-point numeric rating scale (NRS-11) combined with visual analogue scale (VAS), with 0 representing 'the absence of pain' and 10 representing 'the worst pain'. Statistical data was processed in IBM SPSS v22 Statistics.
Results. Study has shown that 35.6% (95 patients) of sample didn't have alexithymia, 27.0% (72 patients) possibly had alexithymia and 37.5% (100 patients) had alexithymia. Kruskall-Wallis test showed that the distribution of pain evaluation is not the same in groups of alexithymic and non-alexithymic patients. Spearman correlation coefficient (-,201) shows that pain positively correlates with alexithymia ($p<0.01$). Patients with alexithymia generally evaluated their pain as worse (mean 5.18±2.48) than patients without alexithymia (mean 3.97 ±2.01).
Conclusion. Alexithymia is linked to higher self-evaluated level of pain.

Kopsavilkums
Atslēgvārdi: *aleksitīmija, sāpes, TAS-20, NRS-11, VAS*
Ievads. Aleksitīmija ir personības iezīme, kam raksturīga vāja emociju apzināšanās un regulācija – grūtības identificēt un aprakstīt emocijas, raksturīgs fokuss uz ārējiem faktoriem, ierobežotas iztēles spējas. Aleksitīmiju saista ar zemāku emociju apstrādi smadzenēs un spēcīgāku somatisku sajūtu apzināšanos. Atsevišķi pētījumi norāda uz aleksitīmiju kā iespējamu riska faktoru psihiatrisku un psihosomatisku saslimšanu, kā arī somatisku slimību, kam raksturīgas hroniskas sāpes, attīstībai.
Mērķis. Noteikt iespējamu korelāciju starp aleksitīmijas esamību un pacienta sāpju pašnovērtējumu vairākās Rīgas slimnīcās.
Materiāli un metodes. Pētījumā piedalījās 274 respondenti, 7 anketas nebija pilnīgas, tālak analizētas tika 267 anketas. Respondentu vecums bija 19 – 95 gadi (vidējais vecums 58.18±18.14), 50,6% respondentu bija sievietes un 49,4% - vīrieši. Aleksitīmijas esamība tika novērtēta ar validētām internacionāli atzītās TAS-20 skalas versijām latviešu un krievu valodā. Sāpes pacienti novērtēja, izmantojot 11-punktu ciparisko vērtēšanas skalu (NRS-11) kombinācijā ar vizuāli analogo skalu (VAS), kur 0 apzīmē "sāpju neesamību" un 10 apzīmē "stiprākās sāpes). Statistiskā datu analīze tika veikta ar IBM SPSS v22 Statistics programmu.
Rezultāti. Pētījumā noskaidrots, ka 35.6% no pacientiem (95 respondentiem) nebija aleksitīmijas, 27.0% no pacientiem (72 respondentiem) bija varbūtēja aleksitīmija un 37.5% no pacientiem (100 respondentiem) ir aleksitīmija. Kruskalla-Vallisa tests parādīja, ka sāpju pašnovērtējuma sadalījums starp aleksitīmijas esamības grupām nav vienāds. Spīrmena korelācijas koeficients (-,201) parāda, ka sāpju intensitāte pozitīvi korelē ar aleksitīmijas esamību ($p<0.01$). Pacienti ar aleksitīmiju vidēji novērtēja savas sāpes kā spēcīgākas (vidēji 5.18±2.48) nekā pacienti bez aleksitīmijas (vidēji 3.97 ±2.01).
Secinājumi. Aleksitīmijas esamība ir saistīta ar augstāku sāpju pašnovērtējumu.

Introduction

The aim of this study was to detect a possible correlation between presence of alexithymia and patients' self-evaluation of pain in selected hospitals of Riga.

The term “alexithymia” and development of alexithymia construct was conceptualized by psychotherapists Nemiah, Freyberger and Sifneos in early 1970’s from the clinical observation of patients with classic psychosomatic diseases who did not respond to psychodynamic psychotherapy. The word has Greek origins, literally meaning “no words for emotions”.

Alexithymia is a personality trait associated with poor emotional awareness and self-regulation: difficulty identifying feelings and distinguishing between feelings and bodily sensations; difficulty describing feelings; externally oriented thinking; limited imaginal capacity. Disturbance in awareness and cognitive processing of affect is associated with over-reporting of physical symptoms, including pain. Another well-reported characteristic of alexithymia is somatosensory amplification. (Glaros 2005: 85-88)

Several theories explaining the mechanism underlying alexithymia’s association with physical illness have been suggested: alexithymia leads to organic disease via physiologic or behavioural mechanisms; alexithymia leads to illness-like behaviours (physical symptoms, disability, and excessive usage of health care) via cognitive or social mechanisms; physical illness leads to alexithymia; both alexithymia and physical illness result from sociocultural or biologic factors. (Kano 2013)

Association between alexithymia and chronic pain syndromes cannot be explained only by hypersensitivity to sensory components of painful conditions. The data gathered from neuroimaging indicates not only hyperactivity in visceral perception areas, but also hypoactivity in pain-processing and regulatory areas. Lack of an emotional regulation system might cause hypersensitivity to aversive bodily sensations and prolonged, pain-related affective reactions such as distress. This could be the possible mechanism underlying the association between alexithymia and chronic pain. (Kano 2013)

With regard to experiencing pain, alexithymics may experience pain more strongly at a primitive perceptual level and may not be able to experience pain at a more abstract, conceptual stage. This suggestion is compatible with the theory of a deficient affect development in alexithymia. (Kano 2013)

A high rate of alexithymia has been reported in association with several medical conditions, such as hypertension, chronic pain, and functional gastrointestinal disorders, as well as psychiatric disorders. The prevalence of alexithymia is approximately 13% in the general population (Salminen 1999: 75-82), whereas a higher rate of alexithymia (approximately 40–60%) is reported among patients with psychosomatic disorders. (Kano 2013)

Materials and methods

A total of 267 patients participated in the study. The survey of patients was performed in various departments (e.g., surgery, gynaecology), of 6 hospitals of Riga – RPNC, RAKUS LOC, RAKUS "Gaiļezers", RAKUS "Linezers", PSKUS and Riga 1st hospital. The data was gathered over the time span of 2 months (from December 2015 until January 2016).

The presence of alexithymia in patients was assessed by validated Latvian and Russian versions of internationally recognized Toronto Alexithymia Scale (TAS-20). The TAS is a 20-item instrument that is one of the most commonly used measures of alexithymia. This is a self-report scale that is comprised of 20 items. Items are rated using a 5-point Likert scale whereby 1 = strongly disagree and 5 = strongly agree. There are 5 items that are keyed negatively (items 4, 5, 10, 18 and 19). The total alexithymia score is the sum of responses to all 20 items. The TAS-20 uses cutoff scoring: equal to or less than 51 = non-alexithymia, equal to or greater than 61 = alexithymia. Scores of 52 to 60 = possible alexithymia. (Bagby 1994: 33-40)

Pain was evaluated by patients with 11-point numeric rating scale (NRS-11) combined with visual analogue scale (VAS), with 0 representing 'the absence of pain' and 10 representing 'the worst pain'. Patients were asked to rate their pain, corresponding with their current pain.

Statistical data was processed in IBM SPSS v22 Statistics.

Results

Respondents were 19 to 95 years old, the mean age of respondents was 58.18 ±18.14. 135 respondents, which constitutes 50.6% of the sample, were women and 132 respondents, which constitutes 49,4% of the sample, were men.

Study has shown that, according to the TAS-20 cut off score of ≥61, 95 patients, which constitutes 35.6% of the sample, didn't have alexithymia, 72 patients, which constitutes 27.0% of the sample, possibly had alexithymia and 100 patients, which constitutes 37.5% of the sample, did have alexithymia.

Kruskall-Wallis test showed that the distribution of pain evaluation is not the same in groups of alexithymic and non-alexithymic patients. Patients in the alexithymia group generally evaluated their pain as worse (mean 5.18±2.48) than patients without alexithymia (mean 3.97 ±2.01). In the patient group with possible alexithymia mean score of self-reported pain was 4.93±1.97.

Spearman correlation coefficient (-,201) shows that pain positively correlates with alexithymia ($p<0.01$).

Discussion

The findings of this study are supported by similar studies that have been described in the international scientific literature.

The findings of studies described in literature demonstrate that higher levels of alexithymia are associated with a higher level of self-evaluated pain and increased risk of suffering from chronic pain. (Lumley 2007; Kreitler 2001: 13-38)

Another research has shown that patients with chronic pain have higher levels of alexithymia than healthy control subjects, and alexithymia is associated with over-reporting of physical symptoms. Research has also demonstrated an association between alexithymia and increased pain intensity and sensitivity in laboratory studies of experimentally induced pain and in a community sample of individuals undergoing venepuncture for blood donation. (Katz 2009: 299-305; Nyklicek 2000: 471-475; Putterman 2001: 138-139; Sivik 1993: 130-136)

However, several limitations of our study must be emphasized. First of all, the use of TAS-20 questionnaires as the standard method for evaluating the presence of alexithymia might be less appropriate than clinical or structured interviews rating alexithymia (Haviland 2000: 385-392). Secondly, a larger sample of patients, including patients with psychiatric disorders, should be studied, for the results to be more reliable. Thirdly, the sample should be divided in groups taking into consideration the age and gender of the patients to avoid the results being influenced by these criteria.

Conclusions

Alexithymia is positively correlated with higher level of self-reported pain. Such results might be explained by stronger awareness of somatic symptoms in the alexithymic patients, which leads to the tendency to notice and report physical symptoms rather than psychological disturbances.

Acknowledgements

This study was conducted within Riga Stradiņš University Psychosomatic Medicine and Psychotherapy Student Interest group with the guidance of Dr. Artūrs Ancāns.

References

Bagby R. M., Parker J. D. A., Taylor G. J. 1994. *The twenty-item Toronto Alexithymia Scale-I. Item selection and cross-validation of the factor structure.* In: *Journal of Psychosomatic Research*, Vol. 38, pp. 33-40.

Glaros A.G, Lumley M.A. 2005. *Alexithymia and pain in temporomandibular disorder*. In: *Journal of Psychosomatic Research*. Vol. 59(2), pp. 85-8. [skatīts 20.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/pubmed/16186003?dopt=Abstract*

Haviland MG, Warren WL, Riggs ML. 2000. *An observer scale to measure alexithymia*. In: *Psychosomatics*. Vol. 41(5), pp. 385-392. [skatīts: 21.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/pubmed/11015624*

Kano M., Fukudo S. *The alexithymic brain: the neural pathways linking alexithymia to physical disorders.* In: *Biopsychosocial Medicine*. 2013;7:1. [skatīts: 26.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3563604/#B3*

Katz J., Martin A.L., Page M.G., Calleri V. 2009. *Alexithymia and fear of pain independently predict heat pain intensity ratings among undergraduate university students.* In: *Pain Research and*

Management. Vol. 14(4), pp. 299–305. [skatīts: 26.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2734517/*

Kreitler S., Niv D.: *Pain and alexithymia: the nature of a relation.* In: *The Pain Clinic*. 2001, Vol. 13, pp. 13-38. [skatīts: 23.04.2016.] Accessed: *http://www.tandfonline.com/doi/abs/10.1163/ 15685690152385745*

Lumley M.A., Neely L.C., Burger A.J. 2007. *The Assessment of Alexithymia in Medical Settings: Implications for Understanding and Treating Health Problems*. In: *Journal of Personality Assessment*, Vol. 89(3). [skatīts: 26.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/ pmc/articles/PMC2931418/*

Lumley M.A., Stettner L., Wehmer F. 1996. *How are alexithymia and physical illness linked? A review and critique of pathways.* In: *Journal of Psychosomatic Research*. Vol. 41(6), pp. 505-518. [skatīts: 23.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/pubmed/9032714*

Makino S., Jensen M.P., Arimura T., Obata T., Anno K., Iwaki R., Kubo C., Sudo N., Hosoi M. 2013. *Alexithymia and chronic pain: the role of negative affectivity.* In: *The Clinical Journal of Pain.* Vol. 29, pp. 354-361. [skatīts: 25.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/pubmed/23183262*

Nyklícek I., Vingerhoets AJ. : *Alexithymia is associated with low tolerance to experimental painful stimulation.* In: *Pain*. 2000. Vol. 85(3), pp. 471-475. [skatīts: 26.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/pubmed/10781921*

Putterman E., Byrne N., Ditto B. 2001 *Alexithymia and symptom reporting following blood donation.* In: *Psychosomatic Medicine*., Vol.63, pp. 138-139.

Salminen JK, Saarijärvi S, Äärelä E, Toikka T, Kauhanen J. 1999. *Prevalence of alexithymia and its association with sociodemographic variables in the general population of Finland.* In: *Journal of Psychosomatic Research*, Vol. 46(1), pp. 75-82. [skatīts: 20.04.2016.] Accessed: *http://www.ncbi.nlm.nih.gov/pubmed/10088984*

Sivik T. 1993. *Alexithymia and hypersensitivity to touch and palpation*. In: *Integrative physiological and behavioural science: the official journal of Pavlovian society*. Vol. 28(2), pp. 130-136. [skatīts: 20.04.16.] Accessed: *http://www.ncbi.nlm.nih.gov/pubmed/8318437*

CLINICAL AND LABORATORY CHARACTERISTICS OF HIGH AND LOW RISK GROUP PATIENTS WITH INFLUENZA HOSPITALISED IN RIGA EAST UNIVERSITY HOSPITAL STACIONARY "INFECTOLOGY CENTER OF LATVIA" DURING THE 2014/2015 INFLUENZA SEASON

Lauma Dobelniece
Rīga Stradiņš university, Dzirciema street 16, Riga, Latvia, LV - 1007
lauma.dobelniece@gmail.com

Abstract

Clinical and laboratory characteristics of high and low risk group patients with influenza hospitalised in Riga East University Hospital stacionary "Infectology Center of Latvia" during the 2014/2015 influenza season

Key words: *Influenza virus, high-risk group patients, influenza complications, influenza type A*

Influenza is a viral infection that manifests with high fever, myalgia, cough, headache, sore throat and fatigue. It is classified as type A, B or C. Patients from high-risk groups (children, pregnant women, patients with chronic diseases, immunodeficiency or elderly) more frequently have complications and worsening of previous health problems. The aim of this study was to find high-risk patients and compare with low-risk group patients their average illness duration, hospitalization length, vaccination status, complications and types of influenza virus. A retrospective analysis was done of the medical history data of 250 inpatients with influenza in "Infectology Center of Latvia" during the 2014/2015 influenza season. 217 of all patients were laboratory confirmed with influenza virus RNA in nasopharyngeal smear using real-time PCR. 185 (86%) patients were in high-risk group – 49 patients were ≥ 65 years old, 125 had chronic diseases, 11 were women during their pregnancy. In high-risk group complications occurred in 51.5% cases, while in low-risk – 44.7%. The average duration of illness in high-risk patients – 7.6 days (SD±4.7), low-risk – 6.88 (SD±3.4). Mean hospitalization length in high-risk group was 5.11 days (SD±4.0), low-risk – 3.97 (SD±2.5). In total, 2 patients were vaccinated and did not show any complications. Type A virus was the most frequent – 82% in low-risk, 78% in high-risk cases.

Kopsavilkums

Augsta un zema riska grupas pacientu, kas stacionēti Rīgas Austrumu klīniskās universitātes slimnīcas stacionārā "Latvijas Infektoloģijas centrs" ar diagnozi gripa 2014./2015. gada gripas sezonas laikā, klīniskais un laboratoriskais raksturojums

Atslēgvārdi: *gripas vīrusinfekcija, augsta riska grupas pacienti, gripas komplikācijas, A tipa gripas vīruss*

Gripa ir akūta vīrusa infekcijas slimība, kam raksturīga temperatūras paaugstināšanās, vispārēja intoksikācija, klepus, sāpēs muskuļos, galvassāpēs un nogurums. Izšķir trīs tipus – A, B un C. Paaugstināta riska grupas pacientiem (bērniem, grūtniecēm, cilvēkiem vecumā > 65 gadiem, ar hroniskām saslimšanām vai imūnsupresiju) biežāk novēro komplikācijas vai jau esošo slimību paasinājumu. Pētījuma mērķis bija salīdzināt augsta un zema riska grupas pacientu vidējo slimības un hospitalizācijas ilgumu, vakcinācijas statusu, komplikācijas un atrast biežāko gripas vīrusa ierosināto tipu. Tika izpētītas 250 "Latvijas Infektoloģijas centrā" stacionēto pacientu medicīnas vēstures ar diagnozi gripa 2014./2015.gada gripas sezonā. 217 pacientiem diagnoze bija uzstādīta, konstatējot gripas vīrusa RNS nazofaringeālajā iztriepē. 185 (86%) pacienti bija augsta riska grupā – 49 pacientu bija vecāki par 65 gadiem, 125 - hroniskas saslimšanas, 11 - grūtnieces. Augsta riska grupas pacientiem komplikācijas – 51.5% gadījumu, zema riska – 44.7%. Vidējais slimības ilgums augsta riska pacientiem – 7.6 dienas (SD±4.7), zema riska – 6.88 (SD±3.4). Vidējais stacionēšanas ilgums augsta riska grupā – 5.11 dienas (SD±4.0), zema riska – 3.97 (SD±2.5). Kopumā 2 pacienti bija vakcinējušies pret gripu šajā sezonā, abiem slimība noritēja bez komplikācijām. Gripas vīrusa A tips bija dominējošais – 82% zema riska grupā, 78% - augsta riska.

Introduction

Influenza, commonly known as "the flu" is an acute viral infectious disease caused by an influenza virus. It has three types affecting people – type A, B and C (WHO 2014). Influenza type A can cause significant disease and can infect humans and also other species, type B – generally causes milder disease and is limited to humans, but influenza type C usually causes sporadic cases (CDC 2015; Vīksna *et al*. 2011: 72).

In Latvia, seasonal influenza viruses cause annual epidemics peaking during winter season and can affect anybody in any age group (WHO 2014). Typically influenza manifests with high fever, myalgia, cough, headache, sore throat and fatigue (ECDC 2015; Vīksna *et al*. 2011: 73).

Most people recover from fever and other symptoms within a week without requiring medical attention. Influenza is not presented as deadly disease, but in some cases it causes severe illness or death, especially in people at high risk (WHO 2014).

The high-risk group patients are – children, adults aged 65 years or older, pregnant women, patients with chronic diseases (COPD, asthma, cardiovascular, endocrine diseases etc.) or immunodeficiency (Dolin 2016). Patients from high-risk groups more frequently have complications and worsening of previous health problems, which, in severe cases, can even lead to lethal outcome (SPKC 2015). The most common influenza complications are pneumonia, bronchitis, sinusitis, pulmonary edema, otitis, but in rare cases myocarditis, meningitis or encephalopathy could develop. For pregnant women there is a high risk of spontaneous abortion or premature birth (Vīksna *et al.* 2011: 73).

Influenza diagnostics is based on clinical, epidemiological and laboratory examination. It is possible to use several laboratory methods for influenza virus detection (Beers *et al.* 2003*)*. Depending on which type of test is used, preferred respiratory samples for influenza testing include nasopharyngeal or nasal swab, nasal wash or aspirate. Diagnostic tests available for influenza include viral culture, serology, rapid antigen testing, polymerase chain reaction (PCR), immunofluorescence assays, and rapid molecular assays (CDC 2015).

Antiviral medicines that are used to treat or prevent the influenza include oseltamivir, zanamivir, and peramivir. Two other antiviral medicines, rimantadine and amantadine, were used in the past but are generally no longer effective because most influenza viruses are now resistant to them. Antiviral treatment is most effective for seasonal influenza when it is taken within the first 48 hours of flu symptoms. Antibiotics are not useful for treating influenza, because it is a viral disease. Antibiotics should only be used if there is a bacterial complication such as bacterial pneumonia, otitis, sinusitis etc. (Dolin 2016).

It is a vaccine preventable disease, but since the influenza virus evolves rapidly, every year a new vaccine is developed (ECDC 2015). Vaccination significantly reduces the prevalence of influenza virus, as well as the morbidity and mortality of it. The recommendations anticipate to repeat the vaccination annually, especially for high-risk group patients.

The aim of this study was to find high-risk patients and compare with low-risk group patients their average illness duration, hospitalization length, vaccination status, complications, laboratory characteristics and types of influenza virus, based on the information in their medical records.

Material and Methods

During this research a retrospective analysis was done on medical history data of 250 inpatients with influenza hospitalized during the period December – March of 2014/2015 influenza season in Riga East university hospital stationary "Infectology Center of Latvia". Patients in this research were included randomly. Data were processed using MS Excel.

Results

Medical history data of 250 patients with influenza were analysed during this study. 217 of them were laboratory confirmed with influenza virus RNA in nasopgaryngeal smear using real-time PCR, but 33 patients had their diagnosis based only on clinical and epidemiological background. 175 (81%) of all laboratory confirmed cases showed type A influenza virus, but 42 (19%) – type B. The peak incidence of type A virus was from December until February, in total, 93% of all analysed cases during these months, but the highest morbidity with influenza type B occurred in March – 85%.

Among all patients 140 (56%) were female, but 110 (44%) – male. The mean age of all patients – 54.4 years (SD ± 21.6). The average duration of illness of all patients was 7.3 days (SD ± 4.2), while mean hospitalization length – 4.9 days (SD ± 3.6).

185 (86 %) patients were in high-risk group – 49 (26.4%) patients were ≥ 65 years old, 125 (67.5%) had chronic diseases, 11 (6%) were women during their pregnancy. The average duration of illness in high-risk patients – 7.6 days (SD±4.7), while in low-risk – 6.88 (SD±3.4). Mean hospitalization length in high-risk group was 5.11 days (SD±4.0), low-risk – 3.97 (SD±2.5). In 102 (55.1%) high-risk group cases complications were observed – 2 (1.9%) patients were treated in the ICU, in 49 (48%) cases pneumonia was diagnosed clinically and radiologically, 37 (36.2%) patients had bronchitis, 6 (5.8%) – sinusitis, 8 (7.8%) patients had deteriorating chronical condition, while in low-risk group complications occurred in 44.5% cases. Among women, who were hospitalized during their pregnancy, complications occurred only in one case, acute bronchitis was diagnosed and treated with amoxicillin.

As antiviral medication, oseltamivir was used in all cases, the average duration of therapy was 5.2 days (SD±0.9), the minimal use of therapy was 2 days, while the longest – 11 days. In cases were complications were observed, antibacterial therapy was added. Most commonly used antibacterial medications were – amoxicillin-clavulanate (38 cases), ceftriaxone (20 cases) and clarithromycin (15 cases). Ceftriaxone and clarithromycin combination was used in 4 cases.

Among both risk groups type A influenza virus was the most frequent – 82% in low-risk, 78% in high-risk cases. 144 (57.6%) of all patients had positive epidemiological anamnesis. Laboratory results show lowered lymphocyte count (< $1.2x10^3$µL) in 161 (64%) cases, other paramethers in

blood tests were not specific. In total, only 2 (0.9%) patients, both in high-risk group, had done the vaccination against influenza virus this season and did not show any complications.

Discussion

Influenza is very important public health problem. It is not presented as deadly disease, but in cases where complications occur, it could be fatal. It affects millions of people every year and causes a lot of illnesses, hospitalizations and large number of deaths globally. CDC estimates that from the 1976-1977 season to the 2006-2007 flu season, flu-associated deaths ranged from a low of about 3,000 to a high of about 49,000 people every year (CDC 2015). Influenza season 2014/2015 is described as severe, but not pandemic influenza season (SPKC 2015). Despite the advances in scientific understanding of influenza viruses, they constantly evolve and mutate, therefore influenza pandemic can start anywhere and anytime in the world (WHO 2015).

According to studies about influenza, lymphopenia is a common feature for seasonal and influenza A infection. It has been blamed for prolonged viral excretion and lower respiratory tract infection (Marekoulias *et al.* 2010).

The immunization strategy for seasonal influenza is aimed to protect high risk group individuals. Referring to the study of ECDC "Priority risk groups for influenza vaccination" in 2008, they concluded, that, for the most part, there are two groups where routine annual immunization is highly recommended, those are persons, who are 65 years and older and people with chronic diseases. But there are two other groups with some good arguments for offering vaccination, those are children and pregnant women, because immunization could, directly and indirectly, protect the newborn.

Not only the high risk group patients are invited to get vaccinated, but also health care workers should not forget that every year they are exposed for the risk of the influenza. Protecting the physical well-being of employees can be another reason to routinely offer influenza vaccination. In the case of health-care workers, health economic arguments might play an additional role, namely ensuring uninterrupted health services during an epidemic (ECDC SIIP Team 2008).

WHO reports, that vaccination is the most effective intervention to reduce the morbidity and mortality of influenza (WHO 2015).

Conclusions

This study show, that patients from high-risk group, comparing with those from low-risk group, have longer duration of illness and hospitalization length. High-risk group patients had more frequent complications, mostly, pneumonia and bronchitis, which led to enhanced use of antibacterial therapy. Influenza virus type A was dominant during the period of December – February, but type B prevalence was in March. Results show, that influenza type A was explicitly dominant type of virus in both risk groups. Vaccination coverage in this study was poor – only

0.9% of all patients, both in high-risk group and did not show any complications. Laboratory characteristics showed lowered lymphocyte levels (< $1.2x10^3\mu L$) in majority of cases, other parameters in blood tests were unspecific. Epidemiological results of this study prove influenza is highly contagious viral disease.

Acknowledgements

I thank my supervisor prof. Baiba Rozentāle, Chief Medical of Riga East University Hospital Stacionary "Infectology Center of Latvia", for research support.

References

Beers M. H. et al. 2003. *The Merck Manual of Medical Information.* Second Home Edition. Merck Research Laboratories, New York, 1907 p.

Centers for Disease Control and Prevention (CDC). Epidemiology and Prevention of Vaccine - Preventable Diseases, 2015 [viewed 28.04.2016.]. Accessed (pieejams): http://www.cdc.gov/vaccines/pubs/pinkbook/flu.htm

Centers for Disease Control and Prevention (CDC). Estimating Seasonal Influenza-Associated Deaths in the United States, 2015 [viewed 28.04.2016.] Accessed (pieejams): http://www.cdc.gov/flu/about/disease/us_flu-related_deaths.htm

Centers for Disease Control and Prevention (CDC). Influenza Signs and Symptoms and the Role of Laboratory Diagnostics, 2015 [viewed 28.04.2016.]. Accessed (pieejams): http://www.cdc.gov/flu/professionals/diagnosis/labrolesprocedures.htm

Centers for Disease Control and Prevention (CDC). People at High Risk of Developing Flu–Related Complications, 2015 [viewed 27.04.2016.] Accessed (pieejams): http://www.cdc.gov/flu/about/disease/high_risk.htm

ECDC SIIP Team. ECDC Guidance. Priority risk groups for influenza vaccination, 2008. [viewed 29.04.2016.] Accessed (pieejams): http://ecdc.europa.eu/en/publications/Publications/0808_GUI_Priority_Risk_Groups_for_Influenza_Vaccination.pdf

European Centre for Disease Prevention and Control (ECDC). Influenza vaccination [viewed 25.04.2016.] Accessed (pieejams): http://ecdc.europa.eu/en/healthtopics/seasonal_influenza/vaccines/Pages/influenza_vaccination.aspx

Merekoulias G., Alexopoulos E.C., Belezos T., Panagiotopoulou E. and Dr. med. Jelastopulu E. 2010. *Lymphocyte to monocyte ratio as a screening tool for influenza* [viewed 26.04.2016.]. Accessed (pieejams): http://www.ncbi.nlm.nih.gov/pmc/ articles/PMC2847387/

Dolin R. 2016. *Influenza symptoms and treatment* [viewed 26.04.2016.] Accessed (pieejams): http://www.uptodate.com/contents/influenza-symptoms-and-treatment-beyond-the-basics

SPKC. *Ko varam sagaidīt valstīs šī gada gripas sezonas laikā?* [viewed 23.04.2016.]. Accessed (pieejams):http://www.spkc.gov.lv/gripa/1284/pasaules-veselibas-organizacija-ko-varam-sagaidit-valstis-si-gada-gripas-sezonas-laika

Vīksna L. un līdzautori 2011. *Infekcijas slimības.* Medicīnas apgāds, Rīga, 589.lpp.

World Health Organization (WHO). Influenza (Seasonal), 2014 [viewed 25.04.2016.]. Accessed (pieejams): http://www.who.int/mediacentre/factsheets/fs211/en/

World Health Organization (WHO). Influenza [viewed 24.04.2016.]. Accessed (pieejams): http://www.who.int/influenza/en/

PREVALENCE OF ALEXITHYMIA AND PATIENTS' SELF-EVALUATION OF WELL-BEING IN HOSPITALS OF RIGA

Laura Dreijere[1], Ernests Pūliņš-Cinis[1], Līga Galvanovska[1], Sergejs Korogodovs[1], Ieva Šmite[1], Madara Kurpniece[1], Artūrs Ancāns[2]
[1]Rīga Stradiņš University, Dzirciema street 16, Rīga, Latvia, LV-1007
dreijere.laura@gmail.com, ernests.pulins@gmail.com, liga.galvanovska@gmail.com, sergejs.korogodovs@gmail.com, ievabiedre@inbox.lv, madarakur@gmail.com
[2]Rīga Stradiņš University, Department of Psychosomatic Medicine and psychotherapy, Kapseļu street 23, Riga, Latvia, a.ancans@gmail.com

Abstract

Prevalence of alexithymia and patients' self-evaluation of well-being in hospitals of Riga

Key words: *alexithymia, TAS-20, well-being, inpatient*

Introduction. Alexithymia is characterized by difficulty identifying feelings, difficulty in describing feelings, externally oriented thinking and a limited imaginal capacity. Alexithymia has a negative correlation with well-being and a positive correlation with depression, anxiety.

Aim. To determine prevalence of alexithymia in hospitals of Riga and to detect possible connection of alexithymia and patients' self-evaluation of well-being of the last month.

Materials and methods. In the study participated patients from 6 hospitals of Riga. Alexithymia was assessed by internationally recognized TAS-20 scale. Well-being was evaluated by patients themselves with visual analogue 11-point numeric rating scale. Statistical data was processed in IBM SPSS v22 Statistics.

Results. In this research we used the analysis of 267 surveys. Age of participants was 19 to 95 (mean 58,18±18,14), 50,6% women and 49,4% men. 37,5% (n=100) have alexithymia (TAS-20 score 67,19±4,66), 26,3% (n=72) possibly have alexithymia, 34,7% (n=95) don't have alexithymia. Self-report of well-being of the last month for alexithymic patiens was 4,02± 2,40, non-alexithymic patients- 5,39±2,01. Kruskall-Wallis test showed that self-report of well-being differs in patients with and without alexithymia ($p<0,01$). Alexithymia has a negative correlation with well-being ($p<0,01$, $r=-0,257$).

Conclusion. Study shows that 37,5% patients of hospitals of Riga have alexithymia and it's connected with lower self-reported well-being of the last month.

Kopsavilkums

Aleksitīmijas prevalence un tās saistība ar pacientu labsajūtu Rīgas slimnīcās

Atslēgvārdi: *aleksitīmija, TAS-20, well-being, pacients*

Ievads. Aleksitīmiju raksturo grūtības identificēt jūtas, grūtības aprakstīt jūtas, ārēji orientēta domāšana un ierobežota iztēle. Aleksitīmijai ir negatīva korelācija ar labsajūtu, pozitīva korelācija ar depresiju, trauksmi.

Mērķis. Noskaidrot aleksitīmijas biežumu Rīgas slimnīcās un tās saistību ar pacientu labsajūtu pēdējā mēneša laikā.

Materiāli un metodes. Tika anketēti 6 Rīgas teritorijā lokalizētu slimnīcu pacienti. Aleksitīmija tika izvērtēta, izmantojot TAS-20 anketu. Pēdējā mēneša labsajūtas novērtēšanai tika izmantota vizuāli analogā 11 vērtību skala. Statistikas dati tika apstrādāti programmā IBM SPSS v22 Statistics.

Rezultāti. Pētījumā tika aptaujāti 267 pacienti. Pētījumā piedalījās pacienti vecumā no 19 līdz 95 gadiem (vidējais vecums 58,18 ± 18,14 gadi), 50,6% sievietes, 49,4% vīrieši. Iegūts rezultāts, ka 37,5% (n=100) pacientu ir aleksitīmija (TAS-20 67,19±4,66), 26,3% (n=72) iespējams ir aleksitīmija un 34,7% (n=95) nav aleksitīmijas. Pacientiem ar aleksitīmiju labsajūtas pašnovērtējums pēdējā mēneša laikā ir 4,02± 2,404, pacientiem bez aleksitīmijas- 5,39±2,012. Kruskall-Wallis testā apstiprināts, ka labsajūtas pašnovērtējums atšķiras pacientiem ar un bez aleksitīmijas ($p<0,01$). Aleksitīmijai ir negatīva korelācija ar labsajūtu ($p<0,01$, $r=-0,257$).

Secinājumi. Pētījumā iegūts, ka 37,5% Rīgas slimnīcu pacientu ir aleksitīmija un tā ir saistīta ar sliktāku labsajūtu pēdējā mēneša laikā.

Introduction

The research is focused on prevalence of alexithymia and patients` self-evaluation of well-being in hospitals of Riga. Results from another study show that prevalence of alexithymia in the general population is diverse - France 5-23%, US 10% [Groot et.al. 1995; Loas et.al. 1995; Taylor 2000].

The study is important because the lack of emotional development of alexithymic can lead to increased sensitivity to physical sensations. This points to a possible link between alexithymia and psychosomatic diseases. Patients with alexithymia often complain of pain, though clinically there is no presence of tissue damage (Lumley *et al.* 2007). Alexithymia has a negative correlation with well-being and a positive correlation with depression, anxiety (Bamonti *et al.* 2010).

Aims:

1. To determine prevalence of alexithymia in patients in hospitals of Riga.
2. To find out whether there is a statistically significant correlation between alexithymia rates and patients' self-evaluation of well-being of the last month.

In this study we want to reveal the significance of personality traits of psycho-emotional regulation and how they impact health state and quality of life in the patients. The understanding about possible links between alexithymia and patients well-being could reduce incidence of psychosomatic diseases.

Material and Methods

In the study participated patients from hospitals of Riga. The hospitals were chosen by the convenience of author group and there was no randomizing in choosing hospitals or patients. Inclusion criterion was that the participant had to be a patient in any of Riga hospitals. Exclusion criteria was being younger than 18 years and being unable to fill out the prepared form. Patients were interviewed in a 2 month period starting in December 2015 and finishing in January 2016.

Alexithymia was assessed by validated Latvian and Russian versions of internationally recognized TAS-20 (Toronto alexithymia scale). In the questionnaire patients answer using a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) (Tull *et al.* 2005). 15 items key positively while 5 items key negatively to control for acquiescent responding. A higher score on the TAS-20 indicates a greater level of alexithymia (Koch *et al.* 2015). Alexithymia cut-off score is 61, score between 52 and 60 shows possible alexithymia and less than 52 shows no alexithymia. (Ueno *et al*. 2014) TAS-20 score shows strong correlation with measures of functional somatic symptoms. (Bagby *et al*. 1988)

Well being was evaluated with visual analogue scale (VAS) combined with 11 point numeric rating scale (NRS), with 0 representing 'the worst' and 10 representing 'the best'. (Aitken 1969; Hjermstad *et al.* 2011)

All the data was analyzed using Statistical IBM SPSS version 22. Descriptive statistics such as frequency and percentage were applied. Kruskall-Wallis test and Spearman's correlation was used to detect difference of well being among groups of alexithymia and to detect possible correlation.

Results

In the study participated 274 patients from 6 hospitals of Riga. 7 surveys were incomplete, so further we analyzed 267 surveys.

Participants (N = 267) were aged from 19 to 95 years (mean 58,18±18,14), 50,6% of them were women and 49,4% men.

The majority (44.5%) of participants were from Pauls Stradins Clinical University hospital (PSKUS), 14.2% patients were from Riga East Clinical University hospital (RAKUS), 13.9% from Riga Psychiatry and Narcology centre (RPNC), 13.1% from Latvian Oncology center (LOC), 7.7% from Riga 1st hospital and 6.6% from hospital "Linezers".

Evaluating TAS-20 score, we got results that 37,5% (n=100) of surveyed patients have alexithymia (TAS-20 score 67,19±4,66), 26,3% (n=72) patients possibly have alexithymia (TAS-20 score 55,42±2,56) and 34,7% (n=95) patients don't have alexithymia (TAS score 40,55±6,81).

Concerning relationships between alexithymia and well-being, results indicate, that the more individuals are able to identify emotions, the better is the self-report of well-being. Moreover, in the same way, the more individuals reported difficulties identifying emotions (TAS), the worse is the self-report of well-being.

Self-report of well-being of the last month for alexithymic patients was 4,02± 2,40, but for non-alexithymic patients- 5,39±2,01. Patients who possibly had alexithymia it was 5,13± 2,5.

We tested the hypothesis that a distribution of well-being is the same across categories of alexithymia by Independent-Samples Kruskal-Wallis Test. Kruskall-Wallis test showed that self-report of well-being differs in patients with and without alexithymia ($p<0,01$).

In this paper we provide an argument that patients with alexithymia evaluated their well-being lower than patients without alexithymia. Alexithymia has a negative correlation with well-being ($p<0,01$, $r=-0,257$).

Discussion

In our research we discovered that prevalence of alexithymia in 6 hospitals of Riga is 37,5%. We surveyed patients from biggest hospitals of Riga and results are statistically significant, so we can accept that prevalence of alexithymia in hospitals of Riga is the same. It is also nearly the same as in the other studies in the world- 40-60% (Taylor *et al.* 1997).

In average population prevalence of alexithymia is approximately 13% (Salminen et.al. 1999), but we see that among inpatients prevalence is three times higher. If we are searching for explanation we should look at definition of alexithymia. Alexithymia is personality construct characterized by inability to identify and describe emotions in the self (Weiss 2015). Alexithymia may be linked with somatization. Somatization is the psychological mechanism whereby psychological distress is expressed in the form of physical symptoms (Hurwitz 2004). People with

alexithymia have trouble to differentiate between sensations, feelings and physical symptoms, also they don't express their feelings and it can lead to somatization. It could explain why in the hospitals prevalence of alexithymia is higher. There is evidence that suggest possible link between somatization and alexithymia (Matilla *et al.* 2008).

Using VAS and NRS patients evaluated their well- being of the last month. In the results we see that alexithymics feel worse than non-alexithymics, there is negative correlation between alexithymia and well-being. Results from another study shows that alexithymia is positively correlated with depression, anxiety, negative affect and anhedonia (Bamonti *et al.* 2010). A lot of researchers find connection between alexithymia and specific diagnosis, for example, patients with chronic obstructive pulmonary disease have strong correlation between alexithymia, depression and anxiety (Tselebis *et al.* 2010); patients with irritable bowel disease have higher alexithymia score, depression and neuroticism (Arun 1998); alexithymia gives big impact of lower quality of life in patients of fibromyalgia (Atagun *et al.* 2012). We can discuss about possible connection between poor well-being with inability express feelings and misunderstanding about body, relationships and events around. Shared conclusion of all studies in this field, independent of the results found, is that patients may benefit from an approach aimed at supporting and fostering the identification and expression of feelings, and at developing and improving coping strategies in the area of social interaction and emotion regulation, especially in order to find alternative strategies to emotional inhibition and avoidance (Gramaglia *et al.* 2016). We can't compare our studies with a lot of surveys because of absence of depression and anxiety questionnaire, also we don't have information about patient's diagnosis. It could be important for further research, especially to get possible connection between somatization disorders, alexithymia and patients well-being.

Conclusions

Study shows that 37,5% of the surveyed patients of hospitals in Riga have alexithymia. Findings of present study provide evidence for association of alexithymia with self-reported well-being. Alexithymia is connected with lower self-reported well-being of the last month. There is negative correlation between alexithymia and self-reported well-being.

The results of this study suggest that alexithymia might be involved in the mechanisms that underlie well-being. It is necessary to continue the prospective study by increasing the number of patients to be able to evaluate alexithymia correlated with well-being objectively.

Acknowledgement

The authors gratefully acknowledge professor Gunta Ancāne for the opportunity to carry out research.

We also would like to thank our advisors, MD Artūrs Ancāns and MD Artūrs Miksons , for support and guidance .

Thanks to Riga Stradiņš University Student Council for financial and technical support.

Particular thanks goes to hospitals- Riga East Clinical University hospital "Gaiļezers", Pauls Stradins Clinical University Hospital, Oncology Centre of Latvia,, Clinical Centre „Linezers", State Ltd. "Riga Psychiatry and Addiction Centre", Riga 1st Hospital which participated in this research and gave our team chance to interview patients.

References

Aitken RC. 1969. Measurement of feelings using visual analogue scales. In: *Proceedings of the Royal Society of Medicine*. 62(10):989-993.

Atagün, M.I, Atagün, Z.B, Evren, C.C, Balaban, O.D.A, Yalçinkaya, E.Y.D, Öneş, K.D. 2012. Mental symptoms are related with impact of the disease and impairment in quality of life in female patients with fibromyalgia. In: *Dusunen Adam*. 25(4):338-344.

Bagby, R.M., Taylor, G.J., Atkinson, L. 1988. Alexithymia: a comparative study of three self-report measures. In: J. Psychosom. Res. 32 (1), 107–116.

Bamonti P.M., Heisel M.J., Topciu R.A., Franus N., Talbot N.L., Duberstein P.R. 2010.Association of alexithymia and depression symptom severity in adults aged 50 years and older. In: *Am J Geriatr Psychiatry*, Jan;18(1):51-6.

Gramaglia C, Ressico F, Gambaro E, Palazzolo A, Mazzarino M, Bert F, Siliquini R, Zeppegno P. 2016. Alexithymia, empathy, emotion identification and social inference in anorexia nervosa: A case-control study. In: *Eating Behaviors*. 22:46-50.

Groot J.M., Rodin G., Olbsted M.P. 1995. Alexithymia, depression, and treatment outcome in bulimia nervosa. In: *Compr Psychiat* 36(1):53-60.

Hjermstad M., Fayers P., Kaasa S. et al. 2011. Studies Comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for Assessment of Pain Intensity in Adults: A Systematic Literature Review. In: *Journal Of Pain & Symptom Management*. June 2011;41(6):1073-1093.

Hurwitz T.A. 2004. Somatization and conversion disorder. In: *Can J Psychiatry*. 2004 Mar;49(3):172-8.

Koch A., Kleiman A., Conrad R. et al. 2015. Factorial structure of the 20-item Toronto Alexithymia Scale in a large sample of somatoform patients. In: *Psychiatry Research*. February 28, 225(3):355-363.

Loas G., Fremaux D., Otmani O., Verrier A. 1995. Prevalence of alexithymia in a general population. Study in 183 "normal" subjects and in 263 students. In: *Ann Med Psychol*. 153(5): 355-357.

Lumley M.A., Neely L.C., Burger A.J. 2007. The Assessment of Alexithymia in Medical Settings: Implications for Understanding and Treating Health Problems. In: *J Pers Assess*. Dec; 89(3): 230–246.

Mattila A.K., Kronholm E., Jula A., Salminen J.K., Koivisto A.M., Mielonen R.L., Joukamaa M**.** 2008. Alexithymia and somatization in general population. In: *Psychosom Med*. Jul;70(6):716-22.

Priti A. 1998. Alexithymia in irritable bowel syndrome. In: *Indian J Psychiatry*. Jan-Mar; 40(1): 79–83.

Salminen J.K., Saarijärvi S., Äärelä E., Toikka T., Kauhanen J. 1999. Prevalence of alexithymia and its association with sociodemographic variables in the general population of Finland. In: *J Psychosom Res*. Jan;46(1):75-82.

Taylor G.J. 2000. Recent developments in alexithymia theory and research. In: *Can J Psychiatry*. 45:134–142

Tselebis A., Kosmas E., Bratis D., Moussas G., Karkanias A., Ilias I., Siafakas N., Vgontzas A., Tzanakis N. 2010/ Prevalence of alexithymia and its association with anxiety and depression in a sample of Greek chronic obstructive pulmonary disease (COPD) outpatients. In: *Annals of General Psychiatry*, Apr;9(1):16.

Tull M., Medaglia E., Roemer L.2005. An investigation of the construct validity of the 20-item Toronto alexithymia scale through the use of a verbalization task. In: *Journal Of Psychosomatic Research*. August 2005;59(2):77-84.

Ueno M., Maeda M., Komaki G. 2014. Different subgroups of high-scorers on the TAS-20 based on the big five personality traits. In: *Personality & Individual Differences*. October 2014;68:71-76.

THE PROGNOSTIC VALUE OF GLASGOW COMA SCALE FOLLOWING TRAUMATIC BRAIN INJURY IN PAEDIATRIC PATIENTS

Roberts Gobergs[1], Dr. med. Arta Bārzdiņa[2]
[1]Rīga Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1007
roberts.gobergs@gmail.com
[2]Children's Clinical University Hospital, Vienības gatve 45, Riga, Latvia, LV-1004
arta.barzdina@me.com

Abstract

The prognostic value of Glasgow coma scale following traumatic brain injury in paediatric patients

Key words: *Glasgow coma scale, Glasgow outcome scale, head trauma, neurologic outcome, prognostic value*

The Glasgow coma scale (GCS) is a diagnostic tool widely used for prompt assessment of the neurological status in patients with various conditions, including head trauma. It provides useful information to emergency department physician and in many cases influences the initial management of the patients, however the usefulness of GCS as a prognostic tool is seemingly obscure.

The aim of the study was to determine whether the GCS score at admission can serve as predictor of outcome following head trauma in children.

Materials and methods. In retrospective study data from Children's Clinical University hospital inpatient medical documentation were investigated. Patients with head trauma of variable severity, hospitalised during time period from 2004 to 2014, were selected from the intensive care unit registry. The receiver operating characteristics (ROC) curve were used to determine the threshold value of GCS with the highest sensitivity and specificity for predicting a poor outcome.

Results. In total, 199 patients with median age of 8 years (IQR 3 – 12) were subjected to analysis. 35.2% of patients (n=70) had suffered severe, 18.1% (n=36) moderate and 42.7% (n=85) minor head trauma. For 4% of patients (n=8) there were no documented initial GCS assessment. The area under the ROC curve was .825 (CI 95% .598 – 1.000) for the GCS to predict a poor outcome, and the observed threshold value was 6.

Conclusion. The GCS can be used for prediction of poor neurologic outcome in paediatric head trauma patients reasonably accurately.

Kopsavilkums

Glāzgovas komas skalas prognostiskā nozīme bērniem ar traumatisku galvas smadzeņu bojājumu

Atslēgvārdi: *Glāzgovas komas skala, Glāzgovas iznākuma skala, galvas trauma, neiroloģiskais iznākums, prognostiskā nozīme*

Glāzgovas komas skala (GCS) ir plaši pielietots diagnostisks rīks ātrai pacienta neiroloģiskā stāvokļa novērtēšanai dažādu klīnisko situāciju, tai skaitā, galvas traumas (GT), gadījumā. Tā sniedz neatliekamās medicīniskās palīdzības ārstam noderīgu informāciju par pacientu un daudzos gadījumos ietekmē ārsta rīcību. Tomēr GCS nozīme pacienta prognozes izvērtēšanā ir neskaidra.

Pētījuma mērķis bija noskaidrot, vai GCS var kalpot kā rīks neiroloģiskā iznākuma prognozēšanai bērniem ar GT.

Materiāli un metodes. Tika veikts retrospektīvs pētījums, kurā iekļauti dažādas smaguma pakāpes GT pacienti, stacionēti laika periodā no 2004. līdz 2014. gadam, kas tika izvēlēti no intensīvās terapijas pacientu reģistra. *Receiver operating characteristics* (ROC) līkne tika izmantota, lai noteiktu GCS sliekšņa vērtību ar augstāko paredzamo jutību un specifitāti slikta neiroloģiska iznākuma (nāve vai pastāvīgs veģetatīvs stāvoklis) prognozēšanai.

Rezultāti. Kopā 199 pacientu ar madiāno vecumu 8 gadi (IQR 3 – 12) dati tika pakļauti analīzei. 35.2% no pacietiem (n=70) bija guvuši smagu, 18.1% (n=36) vidēji smagu un 42.7% (n=85) vieglu GT. 4% pacientu (n=8) neiroloģiskais novērtējums pēc GCS medicīniskajā dokumentācijā nebija norādīts. Laukums zem ROC līknes GCS slikta neiroloģiska iznākuma prognozēšanai bija .825 (CI 95% .598 – 1.000), ar sliekšņa vērtību 6 balles.

Secinājums. Izmantojot GCS, ir iespējams pietiekami precīzi prognozēt neiroloģisko iznākumu pediatriskiem GT pacientiem.

Introduction

Trauma is a common medical problem among paediatric population, accounting for approximately 9 million hospital visits of children under the age of 15 in Europe annually (EuroSafe 2014). Head trauma accounts for a substantial portion of them being one of the most

common injuries in childhood. Traumatic brain injury (TBI) is a significant cause of childhood death and physical and cognitive disability (Heegaard and Biros 2014), and thus poses an important public health issue. Timely evaluation and management is essential to avoid secondary injury to the central nervous system tissue and achieve the best possible outcome in these patients. The Glasgow coma scale (GCS) is one of the most commonly used scoring systems to describe the level of consciousness in patients with various conditions, including head trauma. It provides useful information to emergency department physician and in many cases influences the initial management of the patients, however the applicability and usefulness of GCS as a prognostic tool is not clear.

The GCS score of 8 or less indicates a severe head trauma and demands for an immediate and appropriate intervention, however regarding the outcome this is not an accurate predictor of a significant permanent neurologic consequence to the injury in paediatric population. There is quite extensive literature available concerning the outcome of severe head trauma in children. With papers published from decades ago till the recent past there is considerable inconsistency in the reported GCS values for the prediction of an adverse outcome in said patients. Some studies have demonstrated an excellent recovery in children with the initial GCS score equal or greater than 5 (Bruce *et al.* 1978; Chung *et al.* 2006). In contrast some authors have observed an increased risk of death with GCS score lower than 7 (Cantais *et al.* 2001). The ability to predict the outcome reasonably accurately is important for selective management of the most severely injured patients and to assess the usefulness of various treatment options. Furthermore, it might aid in the evaluation of the quality of patient care.

The Glasgow Outcome Scale (GOS) is widely used as a measuring tool for the neurologic outcome following TBI. It allows for the grading of the outcome into one of the five categories: dead, persistent vegetative state, severe disability (conscious but disabled), moderate disability (disabled but independent) and good recovery (Jennett and Bond 1975). The quite broad definitions of the categories used in the GOS may limit the sensitivity of the scale to detect minor neurologic deficits (Willis *et al.* 2006). Nevertheless, its ease and applicability to wide range of patient age underlines the usefulness of the GOS.

The aim of this study was to assess the usefulness of the GCS for predicting a poor neurologic outcome (defined as death or persistent vegetative state) in trauma patients with traumatic brain injury in Children's Clinical University hospital (CCUH).

Materials and methods

The design of our research is a retrospective case-control study. We obtained and analysed data from inpatient medical documentation of patients with head trauma of variable severity treated in CCUH in Riga during time period from 2004 to 2014. In total 215 patients were selected from

the paediatric intensive care unit (PICU) registry based on discharge diagnosis of traumatic brain injury, skull fracture, intracranial haemorrhage, polytrauma. Patients without history of recent head trauma and patients, who were transferred from regional hospital more than 12 hours after the injury were excluded.

The GCS was used to evaluate the severity of the head trauma at the admission to the emergency department. The GCS values of 8 or less were considered to indicate severe, 9 to 12 – moderate, and 13 or more – mild head trauma. The GOS was applied to assess the neurological outcome at the hospital discharge. As a routine use of GOS is not practised in CCUH, the appropriate GOS value was determined in a retrospective manner based on the clinical information provided in the inpatient medical documentation. Based on the estimated GOS assessment at discharge the patients were divided in to three groups, values of 2 or less were considered to be poor, 3 – average, and 4 or more – good neurologic outcome. The initial assessment of the severity of head trauma were analysed separately and compared in patients with poor, average and good neurologic outcome. The data were analysed using IBM SPSS Statistics 23 and Microsoft Excel. Tests of normality were used to assess the distribution of data, and the results were expressed as mean (standard deviation) or median (inter quartile range 25^{th} to 75^{th} percentile) as appropriate. Kruskal-Wallis H test and Mann-Whitney U test were used to determine the statistical significance of difference observed comparing groups of patients, and cross-tabulations were used to calculate the relative risk. The receiver operating characteristics (ROC) curve were used to determine the threshold value of GCS with the highest sensitivity and specificity for predicting a poor outcome. Spearman's rank correlation coefficient for GCS score at admission and GOS score at discharge were determined. The significance threshold was set at .05.

Results

Of the 215 patients initially selected, 92.6 percent (n=199) were subjected to detailed analysis. The median age of the study group was 8 years (IQR 3 – 12; range – 2 months to 17 years). Severe head trauma had suffered 35.2% (n=70) of the patients, 18.1% (n=36) – moderate and 42.7% (n=85) – mild head trauma. For 4% of the patients (n=8) there were no documented initial GCS assessment. The neurologic outcome was evaluated to be poor in 3.5% (n=7) of the patients, average in 11.6% (n=23), and good in 84.9% (n=169) of the patients.

In 6 of the 7 patients with poor and in 69.6% (n=16) of the patients with average neurologic outcome the initial GCS evaluation indicated severe head trauma, however only in 28.4% (n=48) of the patients with good neurologic outcome the same was true. The median GCS scores at the admission to the emergency department in patients with poor, average and good neurologic outcome were accordingly 3.5 (IQR 3.5 – 6.0), 6.0 (IQR 4.5 – 8.0) and 12.5 (IQR 8.0 – 14.0).

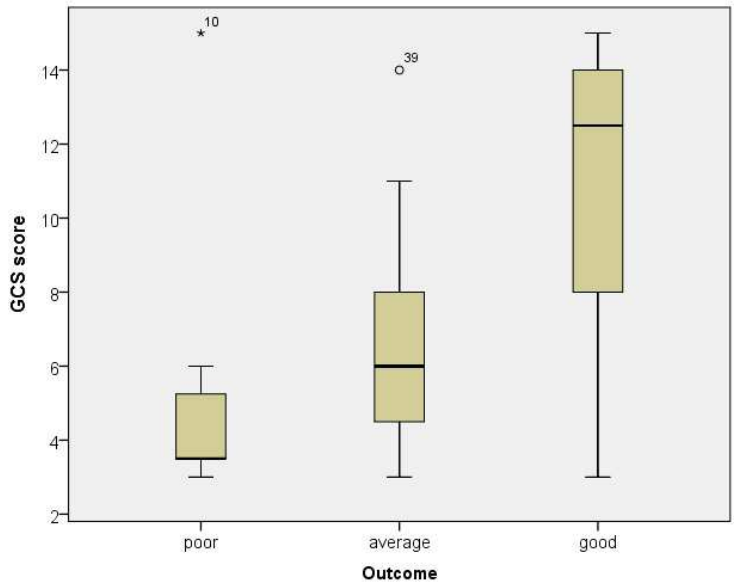
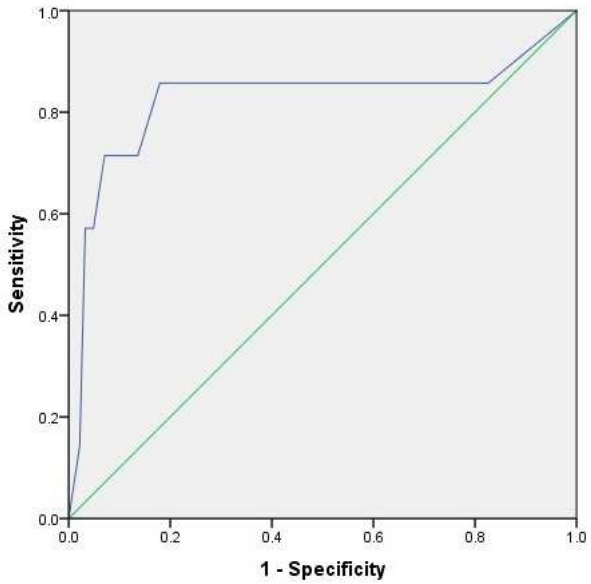


Figure 1. **GCS scores among head trauma patients with variable neurologic outcome. GCS score assessed at the admission to the hospital; outcome measured based on the patient medical information at the hospital discharge using GOS; poor outcome correspond to GOS values 1 and 2, average to GOS 3 and good to GOS 4 and 5**

Kruskal-Wallis H test detected a statistically significant difference between these values ($p<.001$). However, the difference in median GCS scores in patients with poor and average neurologic outcome did not show statistical significance on Mann-Whitney U test ($p=.104$). The area under the ROC curve was .825 (CI 95% .598 – 1.000) for the GCS to predict a poor outcome, and the observed threshold value was 6.



Fiure. 2. **GCS scores among head trauma patients with variable neurologic outcome. GCS score assessed at the admission to the hospital; outcome measured based on the patient medical information at the hospital discharge using GOS; poor outcome correspond to GOS values 1 and 2, average to GOS 3 and good to GOS 4 and 5**

The relative risk of poor neurologic outcome in patients with the initial GCS assessment of 6 or less was 22.46 (CI 95% 2.78 – 181.11) compared to those with the initial GCS score of 7 or more. There was a moderate and statistically significant correlation between GCS score at the admission to the emergency department and GOS values of neurologic outcome at hospital discharge (Spearman's rank correlation coefficient .556; p<.001).

Discussion

The GCS is instrumental in early evaluation of patient with traumatic brain injury and decision making in the emergency department setting. Furthermore, we found in our study, it may serve as a useful tool for predicting the neurologic outcome in these patients.

The observations made in our study are similar to those reported previously. A recent study (Baratloo *et al.* 2016) compared the predictive value of GCS and the Full Outline of Unresponsiveness (FOUR) score in multiple trauma patients and concluded that both are similarly useful for predicting the outcome of trauma patients admitted to the emergency department. The area under the ROC curve for GCS assessment at the time of admission for predicting death was .85 (CI 95% .77 – .93) and for predicting death or disability – .91 (CI 95% .85 – .97), however the patient age ranged 1 to 80 years old. A report from Kaunas University of Medicine in Lithuania (Grinkeviciūte *et al.* 2007) demonstrated an increased risk of death in paediatric severe head trauma patients presenting with GCS score equal or lower than 5 compared to those with GCS score of 6 to 8 with odds ratio 7.5. The area under the ROC curve for GCS for predicting death was .74.

The high incidence of severe and moderate head trauma observed in the study is most probably owing to the fact that the patients were selected from the PICU registry and does not reflect the relative incidences of head trauma severity among general population. That being said, mild head trauma by itself is not an indication for PICU admission at all, however in this study polytrauma patients with head trauma of any severity were included and likely compose the majority of the mild head trauma patients. Non-head injuries, such as injuries of the spine, might certainly affect the assessment by GCS and GOS, however they were not taken into account in the study.

A major setback in our study was the lack of documented evaluation of neurologic outcome (by GOS) in head trauma patients at hospital discharge. The appropriate GOS values were determined during the study based on information provided in patient medical documentation. This was accomplished by meticulous investigation of the physiotherapist protocols, self-care notes, epicrisis and discharge documentation of each patient. The credibility of data acquired in said approach is questionable at best, nevertheless this was in our opinion the most acceptable method of measuring the neurological outcome in the given situation. The described limitations of data

acquisition were also the reason for the use of GOS instead of GOS-Extended or GOS-Extended Paediatric Revision. The reader should also note, that the neurologic outcome at hospital discharge particularly in paediatric population might not coincide with the outcome at 3 and 6 months after the injury (van der Sluis *et al.* 1997). This was the reason for assigning the severely disabled patients to a separate – average neurologic outcome – group.

It is occasionally quite challenging for a physician to determine the GCS score in a paediatric head trauma patient, which results in an undesirable practice to note an interval of GCS score in the medical documentation. This is especially confusing in cases, when the recorded GCS score does not allow to distinguish between sever and moderate head trauma. For the purpose of this study the recorded assessment of interval 8 to 9 in GCS was assumed to indicate moderate head trauma, as in the best response observed in the patient.

Conclusion

The GCS can be used in PICU for prediction of poor neurologic outcome in paediatric head trauma patients reasonably accurately.

Disclosure

The authors have indicated they have no financial relationships relevant to this article to disclose.

References

Baratloo A., Shokravi M., Safari S., Aziz A.K. 2016. Predictive value of Glasgow coma score and full outline of unresponsiveness score on the outcome of multiple trauma patients. *Archives of Iranian medicine.* Vol.19(3), pp. 215-220.

Heegaard W.G., Biros M.H. 2014. Head injury. In: Marx J.A., Hockberger R.S., Walls R.M. eds. *Rosen's Emergency Medicine. ed. 8th*. Philadelphia, PA: Saunders. Chapter 41, pp. 339-367.e4

Bruce D.A., Schut L., Bruno L.A. *et al.* 1978. Outcome following severe head injuries in children. *Journal of Neurosurgery.* Vol.48, pp. 679-688.

Cantais E., Paut O., Giorgi R. *et al.* 2001. Evaluating the prognosis of multiple, severely traumatized children in the intensive care unit. *Intensive Care Medicine.* Vol.27(9), pp. 1511-7.

Chung C.Y., Chen C.L., Cheng P.T. *et al.* 2006. Critical Score of Glasgow Coma Scale for Pediatric Traumatic Brain Injury. *Pediatric Neurology.* Vol. 34(5), pp. 379-87.

EuroSafe. 2014. In: Injuries in the European Union, Report on injury statistics 2010-2012. Amsterdam.

Grinkeviciūte D.E., Kevalas R., Saferis V. *et al.* 2007. Predictive value of scoring system in severe pediatric head injury. *Medicina (Kaunas).* Vol. 43(11), pp. 861-9.

Jennett B., Bond M. 1975. Assessment of outcome after severe brain damage. A practical scale. *The Lancet.* March 1, 1975, pp. 480-484.

Van der Sluis C.K., Kingma J., Eisma W.H. *et al.* 1997. Pediatric polytrauma: short-term and long-term outcomes. *Journal of Trauma: Injury, Infection, and Critical Care.* Vol.43, pp. 501-6.

Willis C.D., Gabbe B.J., Butt W. *et al.* 2006. Assessing outcomes in paediatric trauma populations. *Injury.* Vol.37(12), pp. 1185-96.

COMPLETE BLOOD COUNT, SERUM BIOCHEMISTRY PANEL AND COAGULATION TESTS POSSIBLE CORRELATION WITH ENDOSCOPIC ESOPHAGEAL VEIN ASSESSMENT

Elīna Goida [1], Līga Vasariņa [1], Igors Gailevičs [1], doc. Aleksejs Derovs [2]
[1] Rīga Stradiņš University, Dzirciema Street 16, Riga, Latvia, eliinagoida@gmail.com, l.vasarina@gmail.com, igor.gailevich@gmail.com
[2] Riga Stradins University, Department of Internal Medicine, Riga East Clinical University Hospital, Gastroenterology, hepatology and nutrition clinic, Latvia

Abstract

Complete blood count, serum biochemistry panel and coagulation tests possible correlation with endoscopic oesophageal vein assessment

Key words: *liver cirrhosis, esophageal varices, portal hypertension, anemia*

Introduction: Multiple etiology can indicate different liver damage levels in the meantime drawing attention to possible development of esophageal varicose veins. To evaluate the necessity of endoscopy it is important to assess the functional parameters of the liver based on laboratorial tests.

Aim: To assess laboratory diagnostic parameters of liver cirrhosis patients and to identify possible correlation with varicose veins in the esophagus.

Methodology: Retrospective analysis of liver cirrhosis patients' medical records which have undergone upper endoscopy in period from 01.01.2010 till 30.11.2015. The analysis was carried out by data from patient medical cards examining - *Ery, Hb, PLT, Ley, ALAT, ASAT, ALP, **GGT**, serum albumin, PT* and *INR*- at Riga, Clinical centre "Gaiļezers" archive.

Results: 166 liver cirrhosis patient histories with upper endoscopy reports were analysed. 55(31%) of all patient were female and 111 (66.9%) male; average patient age – 54.22 (SD= 13.79). Patient distribution by underlying etiology was following: unspecified – 55 (33.1%), HCV - 34 (20.5 %), HCV + toxic gen. - 23 (13.9%), VHB - 5 (3%), toxic - 48 (28.6%), VHC + VHB – 1 (0.6%). Endoscopy results: esophageal varices (I, II, I-II, II-III, III-IV grades) in 137 (82.5%) patients. I grade EV extensions diagnosed to 26 (15.5%) patients, with I - II grade 30 (18.1%), with II grade 32 (19.3%), II - III grade 24 (14.5%), III - IV grade 3 (3.2%), IV grade 1 (0.5%). There was a statistically significant correlation between the Ery count and endoscopic EV varices (p= 0.009), Hb and extended EV varices (p= 0.002).

Conclusions: It was found that the lower the Ery count and Hb level is, the greater the degree of expansion of EV.

Kopsavilkums

Asins aina, bioķīmisko marķieru, koagulācijas faktoru iespējamā korelācija ar paplašinātām barības vada vēnām

Atslēgas vārdi: *aknu ciroze, paplašinātas barības vada vēnas, portālā hipertensija, anēmija*

Ievads: Dažādu etioloģisko faktoru iedarbības rezultātā attīstās hroniski aknu bojājumi, kas veicina barības vada vēnu attīstību. Lai izvērtētu augšējās endoskopijas nepieciešamību, ir svarīgi novērtēt aknu funkcionālos rādītājus.

Metodoloģija: Retrospektīva medicīnisko karšu analīze stacionārā "Gaiļezers", pacientiem ar aknu cirozi un veiktu augšējo endoskopiju, laika periodā 01.01.2010-30.11.201. No medicīniskās dokumentācijas tika analizēts: Ery, Hb, PLT, Leu skaits; ALAT, ASAT, SF, GGT, seruma albumīns; protrombīns un INR; augšējās endoskopijas dati.

Rezultāti: Tika analizētas 166 pacientu medicīniskās kartes – 55 (31%) sievietes un 111(66.9%) vīrieši. Vidējais pacientu vecums 54.22 gadi (SD= 13.79). Pacientu sadalījums pēc aknu cirozes etioloģijas: nezināmas etioloģijas 55 (33.1%), HCV - 34 (20.5%), HCV+ toksiskas ģenēzes - 23 (13.9%), VHB - 5 (3%),toksiskas ģenēzes – 48 (28.6%), VHC+ VHB - 1(0.6%). Paplašinātas barības vada vēnas (PBVV) (I, II, I-II, II-III, III-IV pakāpes) tika konstatētas 137 (82.5%) pacientiem. I pakāpes PBVV konstatēja 26 (15.5%) pacientiem, I - II pakāpes 30(18.1%), II pakāpes 32 (19.3%), II - III 24 (14.5%), III - IV pakāpes 3 (3.2%), IV pakāpes 1 (0.5%). Tika atrasta statistiski ticama korelācija starp eritrocītu skaitu (p=0.009), hemoglobīna skaitu (p=0.002) un paplašinātām barības vada vēnām.

Secinājumi: Jo zemāks Er un Hb skaits, jo augstākas pakāpes paplašinātas barības vada vēnas.

Introduction

In Latvia in 2012, the death rate from liver cirrhosis for women reached 11.1 and for men 29.1 on 100 000 inhabitants. (http://apps.who.int/gho/data/node.main.A1092?lang=en) The liver cirrhosis is the final stage of fibrosis, which can develop from many chronic liver diseases like chronic viral hepatitis C and B, toxic effects (alcohol, medication), Wilson disease, and primary

biliary cirrhosis. (www.mayoclinic.org/diseasesconditions/cirrhosis/basics/definition/con-20031617) The liver cirrhosis can be compensated and decompensated. The more common life-threatening complication could be spontaneous bacterial peritonitis, cardiomyopathy, hepatorenal syndrome, portal vein thrombosis, hepatocellular carcinoma, esophageal varicose vein (EVV) bleeding. Endoscopic esophageal vein (EV) diagnostic nowadays is a gold standard for cirrhotic patients', however, taking into consideration the workload in hospital Endoscopy department and financial aspects, it is important to determine criteria under which the necessity of esophagogastroduodenoscopy could be evaluated. (Danilāns 2013; Tolman *et al.* 2012)

Esophageal veins develop as a result of portal hypertension. As a result of high hydrostatic pressure in the portal system the blood congestion is developed. Then the body tries to find additional paths for portal pressure reduction. The pressure depends on the amount of blood supply and return. In case of congestion development and the blood pressure raise to the critical level there is a possibility the blood circulation direction will change. Additionally, there is one more vein that takes part in esophageal and stomach varices vein development – *v. coronaria ventriculi*. The bleeding occurs from varicose vein nodules not from the vein itself. The nodules are developed when the pressure in the portal system rises above 10mmHg (millimeter of mercury). The risk of bleeding occurs when pressure is above 12mmHg. It helps to decrease portal hypertension and collects congested blood from *v. portae*. Approximately 10-30% of all upper gastrointestinal bleeding is associated with esophageal vein node bleeding. (Danilāns 2013; Lejnieks *et al.* 2012) The most common risk factors are (www.worldgastroenterology.org/guidelines/global-guidelines/esophageal-varices/esophageal-varices-english):

1. High blood pressure in *v. portae* >10mmHg, considering that in initial endoscopy not to find a varicose vein.
2. The change from small to large oesophageal vein- decompensated liver cirrhosis *CTP (Child-Pugh B/C*), alcoholic cirrosis, during upper endoscopy presence of red wale marks.
3. Initial esophageal vein bleeding- large varices >5mm, high *CTP* or/and *MELD* score, alcohol consumption, high pressure in *v. portae* >16mmHg, coagulopathy.

The bleeding occurs from esophageal vein nodules, not from veins itself. It develops as a result of irregular expansion in the vessel lumen. It is very hard to stop bleeding when the blood pressure has risen above 20 mmHg. Even in cases when the bleeding has been successfully stopped in 89% of cases repeated bleeding occurs within one week and 64% of cases new blood vessel nodule ruptures occur. The nodules develop in esophageal mucosal veins. Usually, the vein nodule rupture will be in the direction of lumen. Small nodule bleeding can take place without any clearly noticeable symptoms. However we need to take in consideration those small vein nodules in 8% of all cases can develop into large nodules (above 5mm). It is essential to determine direct and indirect

possible upper gastrointestinal bleeding symptoms. The direct symptoms are vomiting with "coffee ground" or fresh blood, melena; the indirect symptoms are decreased count of erythrocytes, haemoglobin, hypovolemia, patients complain about tiredness, loss of consciousness, dizziness.

First of all it is necessary to consider the treatment in Intensive care. If there are any indications that point to acute esophageal vein bleeding it is important to apply vasoactive medication that should be continued for 5 days and combination with endoscopic therapy. Most common therapy is Somatostatin, Vasopressin or synthetic analogues. Vasopressin is always used in combination with Nitro-glycerine 40g/min. The dose can be increased up to 400g/min by maintaining controlled blood pressure level above 90mmHg. In Western Europe Terlipressin is lately more widely used for esophageal vein bleeding therapy, however in Latvia it is not available as part of standard treatment due to financial aspects. Endoscopic therapy should be applied not later than 12 hours after hospitalization. This will allow to locate the source of bleeding and determine the amount of bleeding and apply necessary therapy - ligation or sclerotherapy. Antibacterial therapy is recommended. It should be started right after hospitalization. The first line antibacterial medication is *Norfloxacinum* (400 mg *per os* two times a day in seven day period) or *Ciprofloxacinum* (500mg *per os* two times a day in seven day period or 400 mg two times a day intravenously for patient in coma). *Ceftrioxonum* (1 g a day intravenously in seven day period) for patients with decompensated liver cirrhosis in cases there are indications regarding resistance against *Quinolone* or there has been *Quinolone* based therapy before. In cases when there is a massive and life threating bleeding and the above described therapy is not effective balloon type tamponade (Sengstaken - Blakemore or Minnesot tube) is used. Mainly this is a short term solution, usually not longer than 24 hours. Applicable also before transjugular intrahepatic portosystemic shunt (TIPS). Decision to implement TIPS is based on consillium that consist of gastroenterologist, surgeon and radiologist. This procedure is used for patents with high risk of previously described medication therapy failure. Mainly these are patients with decompensated liver cirrhosis. (Danilāns, Derova *et al.* 2016; Maxine *et al.* 2016)

Materials and methods

Retrospective and descriptive analysis of liver cirrhosis patients' medical records which have undergone upper endoscopy from 1st January, 2010 till 30th November, 2015 in stationary "Gaiļezers" with diagnosis K74.6 (SSK-10). Selection of patients was done using computer program "Ārstu birojs". The analysis is based on following criteria: patient age, gender, length of stay in hospital, liver cirrhosis etiology, and patient with diagnose K74.6 (SSK-10) and upper endoscopy, older than 18 years, without *exitus letalis* in hospitalized time. Erythrocyte (Ery), haemoglobin (Hb), platelet (PLT), white blood cell (Leu), alanine aminotransferase (ALAT),

aspartate aminotransferase (ASAT), gamma- glytamiltrasnferase (GGT), alkaline phosphatase (ALP), albumin level, International normalized ratio (INR), prothrombin levels were examined.

Endoscopic esophageal varices classification:

I grade - Minimally elevated veins above the esophageal mucosal surface

II grade - Tortuouse veins occupying less than 1/3 of the esophageal lumen

III grade - Occupaying more than 1/3 of the esophageal lumen

Patient excluding criteria – paediatric patient, patients which have undergone transjugular intrahepatic portosystemic shunt (TIPS), esophageal vein ligation or sclerotherapy, diagnosed hepatocellular carcinoma, pregnant women and patients who have undergone chemotherapy. Data has been compiled and statistically processed in IBM SPSS 20.0. As a result an original report and database was created.

Results

Overall, 166 liver cirrhosis patients medical records with upper endoscopy reports were analysed. 55 (31%) of them female and 111 (66.9%) male; average patients' age – 54.22 years (SD=13.79). Patient distribution by underlying etiology was as following: unspecified - 55 (33.1%), HCV - 34 (20.5 %), HCV + toxic - 23 (13.9%), VHB - 5 (3%), toxic - 48 (28.6%), VHC + VHB -1 (0.6%). Endoscopy results indicate that esophageal varices (EV) (I, II, I-II, II-III, III-IV grades) were detected in 137 (82.5%) patients. I grade EV extensions were diagnosed in 26 (15.5%) patients, with I-II grade – 30 (18.1%), with II grade 32 (19.3%), II-III grade 24 (14.5%), III-IV grade 3 (3.2%), IV grade 1 (0.5%). 29 (17.5%) patients of 166 liver cirrhosis patients have no esophageal varices. There was a statistically significant correlation between the erythrocyte count and the endoscopic esophageal varicose vein presence ($p = 0.009$) ($r= -.208$), hemoglobin and extended EV ($r= - .225$) ($p=0.002$). It was found that the lower the erythrocyte count and hemoglobin level is the greater degree of expansion of EV is present. Statistically significant positive trends were observed between PLT and EV grades ($p=0.07$).

Discussion

By evaluating European data the toxical genesis (alcohol), chronic viral hepatitis C and B are one of the most common causes of the liver cirrhosis. Also in this research the author has detected that the most common etiology of liver cirrhosis is toxical genesis (29%), chronic viral hepatitis C (20%) and B (3%). In 33% of all cases etiology was not identified. The reason for that could be inaccurately collected anamnesis in hospital. In several researches erythrocytes and haemoglobin association with the liver cirrhosis (Gonzalez-Casas 2009; Qamar 2009) (Amir et al. 2009; Gonzalea-Casas et al. 2009) has been described, however, there are no researches in which the possible correlation between erythrocytes, haemoglobin and varicose esophageal veins is described. The *World Gastroenterology Organisation Global Guidelines* (*WGOGG)* advises prophylactic

endoscopy at least once a year or once in two years for patients with the I and II grade of esophageal varices, which are smaller than 5 mm and which are minimally elevated above the esophageal mucosal surface. WGOGG recommends to perform the upper endoscopy each year and to apply medical treatment to patients with the III and IV grade esophageal varices. Even though in 29 (17.5%) patients from 166 esophageal varices were not diagnosed the WGOGG recommends to perform upper prophylactic endoscopy at least once in three years. However, if the decompensated liver cirrhosis has developed the upper endoscopy has to be performed immediately. The level of thrombocytes is mentioned as one of the factors which could possibly predict esophageal varices grade and bleeding (Ying 2012). In the research platelet rates had statistically positive tendencies with varicose veins in the esophagus, however, research should be carried out for a longer period of time and prospectively, so it would be possible to draw statistically more precise conclusions.

Conclusion

1. The most common liver cirrhosis etiological factors were toxicity and Hepatitis C virus.
2. Erythrocytes and haemoglobin rates statistically significantly correlated with varicose veins in the esophagus. This may indicate about chronic or acute bleeding from gastrointestinal tract.
3. Platelet rates have statistically positive tendencies with varicose veins in the esophagus.
4. Research should be carried out for a longer period of time and prospectively, so it would be possible to draw statistically more precise conclusions.

References

Danilāns A. 2013. Hroniskas aknu slimības, 3. grāmata, Aknu ciroze, pp. 15-37., 221., 191.

Lejnieks J., Keišs B., Rozentāle V., Sondore I., Tolmane A. 2012. *Klīniskā medicīna* 2. grāmata, Rīga, Zvaigzne, pp. 615-617.

Tolmane I. *Aknu ciroze. Biežākie iemesli, diagnostika, ārstēšana*.[skatīts 06.02.2016]. Pieejams: http://www.infekcija.lv/wp-content/uploads/2015/08/aknu-ciroze_doctus.pdf

Latvijas Gastroenterologu Asociācijas darba grupa Anatolijs Danilāns, Jeļena Derova, Anda Jansone, Aldis Puķītis, Daiga Šantare, Juris Pokrotnieks, Gastroenteroloģijas atbalsta biedrība, *Vadlīnijas* / Ārsta rīcība gremošanas trakta augšdaļas akūtas asiņošanas gadījumā, [tiešsasaiste]- [skatīts 04.02.2016]. Pieejams: www.gastroenterologs.lv/lv/vadlinijas/arsta-riciba-gremosanas-trakta-augsdalas-akutas-asinosanas-gadijuma.html

Amir A. Qamar, Norman D. Grace 2009. *Abnormal hematological indices in cirrhosis*; Can J Gastroenterol. Jun; 23(6): pp 441–445.

Chang M.H., Sohn J.H., Kim T.Y., Son B.K., Kim J.P., Jeon Y.C., Han D.S. 2007. Non-endoscopic predictors of large esophageal varices in patients with liver cirrhosis; Korean J Gastroenterol. Jun;49(6): pp376-383.

Li Ying, Xiao Lin, Zuo-Liu Xie, Yuan-Ping Hu, Ke-Qing Sh. 2012. Performance of Platelet Count/Spleen Diameter Ratio for Diagnosis of Esophageal Varices in Cirrhosis: A Meta-Analysis; In: *Digestive Diseases and Sciences*; Vol 57, Issue 6, pp 1672-1681.

Maxine A., Papadaksis S.J., McPhee, Michael W.R. Abow Kompli 2016. *Current Medical Diagnosis & Treatment*, 55 edition, pp 687.

Mayo Clinic. *Diseases and Conditions, Cirrhosis Definition* [skatīts 03.03.2016]. Pieejams: www.mayoclinic.org/diseasesconditions/cirrhosis/basics/definition/con-20031617

Gonzalez-Casas R., Jones E.A., Moreno-Otero R. 2009. Spectrum of anemia associated with chronic liver disease; In: *World J Gastroenterol*. Oct 7; 15(37): pp 4653–4658.

World Gastroenterology Organisation Global Guidelines, Esophageal Varices, 2014.[skatīts 04.03.2016]. Pieejams: www.worldgastroenterology.org/guidelines/global-guidelines/esophageal-varices/esophageal-varices-english

World Global Organization (Age-standardized death rates, liver cirrhosis (15+) by country), [skatōts 03.03.2016]. Pieejams: http://apps.who.int/gho/data/node.main.A1092?lang=en

EPIDEMIOLOGICAL STUDY OF OCCUPATIONAL EAR, NOSE AND THROAT DISEASES IN LATVIA 2005-2014

Kristina Karganova
Rīga Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1007
kristina.karganova@gmail.com

Abstract

Epidemiological Study of Occupational Ear, Nose and Throat Diseases in Latvia 2005-2014

Key words. *Noise-induced hearing loss, chronic laryngitis, chronic pharyngitis*

The data about 2302 employees with occupational ENT diseases were obtained from the Latvian State Register of Patients with Occupational Diseases 2005-2014. 1423 or 61.8% of all the registered employees with occupational ENT diseases were males and 879 or 38.2% were females. Totally 2562 cases of occupational ENT diseases were registered: 1514 cases or 59.1% of all the registered cases of occupational ENT diseases were in males and 1048 cases or 40.9% were in females. The most frequently registered occupational ENT diseases in both genders were: noise effects on inner ear, chronic laryngitis and chronic pharyngitis.

Incidence of noise effects on inner ear, chronic laryngitis and chronic pharyngitis per 100000 of employees in each gender in Latvia in corresponding year the highest was in 2009 and 2010: noise effects on inner ear – 51.03 and 55.89 cases in male employees/17.53 and 18.08 cases in female employees; chronic laryngitis – 5.75 and 5.71/12.46 and 11.38; chronic pharyngitis – 2.53 and 3.23/12.25 and 10.94, respectively. Then incidence decreased reaching in 2014 21.89 cases per 100000 male employees and 6.72 cases per 100000 female employees for noise effects on inner ear, 1.14 and 3.36 for chronic laryngitis and 0.23 and 1.57 for chronic pharyngitis, respectively.

The significant decrease of incidence shows that the modern methods used for occupational protection and prophylaxis are effective, however, additional efforts are needed for control of intensive noise level.

Kopsavilkums

Arodetioloģijas ausu, kakla un deguna slimību epidemioloģisks pētījums Latvijā 2005.–2014. gadam

Atslēgas vārdi. *Trokšņa izraisīts dzirdes zudums, hronisks laringīts, hronisks faringīts*

Dati par 2302 reģistrētiem nodarbinātajiem ar ausu, kakla un deguna (LOR) arodsaslimšanām laika periodā 2005.-2014. gadam tika iegūti no Latvijas arodslimnieku reģistra. 1423 nodarbinātie jeb 61.8% no visiem reģistrētajiem nodarbinātajiem ar LOR arodsaslimšanu bija vīrieši un 879 jeb 38.2% bija sievietes. Kopumā tika reģistrēti 2562 LOR arodsaslimšanas gadījumi: 1514 gadījumi jeb 59.1% no visiem reģistrētajiem LOR arodsaslimšanas gadījumiem bija vīriešiem un 1048 jeb 40.9% bija sievietēm. Biežāk reģistrētās LOR arodsaslimšanas abos dzimumos bija: trokšņa ietekme uz iekšējo ausi, hronisks laringīts un hronisks faringīts.

Trokšņa ietekmes uz iekšējo ausi, hroniska laringīts un hroniska faringīta incidence uz 100000 nodarbināto katrā dzimumā Latvijā atbilstošajā gadā visaugstākā bija 2009. un 2010. gadā: trokšņa ietekme uz iekšējo ausi – attiecīgi 51.03 un 55.89 gadījumi vīriešiem/17.53 un 18.08 gadījumi sievietēm; hronisks laringīts – 5.75 un 5.71/12.46 un 11.38; hronisks faringīts – 2.53 un 3.23/12.25 un 10.94. Turpmāk incidence samazinājās, sasniedzot trokšņa ietekmei uz iekšējo ausi - 21.89 gadījumus uz 100000 vīriešu dzimuma nodarbināto un 6.72 gadījumi uz 100000 sieviešu dzimuma nodarināto; hroniskam laringītam – attiecīgi 1.14 un 3.36 un hroniskam faringītam - 0.23 un 1.57.

Izteiktais gadījumu skaita samazinājums norāda, ka modernās darba aizsardzības un profilakses metodes ir efektīvas, lai gan joprojām papildus uzmanība ir nepieciešama intensīva trokšņa līmeņa kontrolei.

Introduction

In 2015 62.0% of the residents of Latvia were of working age from them 72.8% were employed in various economic activities sectors (Centrālā statistikas pārvalde 2016). Most of these employees for various duration of time were exposed to potentially hazardous levels of dust, different chemical substances, physical factors, including noise, biological, mechanical, ergonomic and psychosocial factors. Ear, nose and throat (ENT) diseases include many conditions that are commonly diagnosed by general practitioner and form a part of occupational diseases.

One of the 10 leading occupational diseases worldwide is noise induced hearing loss (NIHL) (Soltanzadeh *et al.* 2014). It is a complex disorder where both exposure to hazardous noise level and

genetic predisposition play a part (Ladou *et al.* 2014). The significance of noise induced effect on inner ear structures lays in the fact that this damage is irreversible. Until this day no pharmacotherapy has been developed to minimize or reverse this damage. However, if a proper preventive methods are used the damaged of inner ear structures can be avoided and the hearing preserved (Stucken *et al.* 2014).

NIHL is of sensorineural nature, mostly bilateral, and progressive while the exposure to noise continues (Metidieri *et al.* 2013), although not reaching total hearing loss (Flint *et al.* 2015). It occurs as a result of a constant and prolonged mechanical trauma to the sensory epithelium of the cochlea, especially stereocilia of inner and outer hair cells (Ladou *et al.* 2014). The damage of inner ear structures most rapidly progresses during the first 10–15 years of exposure to intensive noise levels, thereafter the damage progresses at much-reduced rate (Flint *et al.* 2015). All the initial changes – vascular, chemical and metabolic – are mostly reversible given a time. This is called *temporary threshold shift (TTS).* Sometimes it can take up to several hours for the hearing to return, however, once the sensory cells have been destructed and replaced with scar tissue, *permanent threshold shift (PTS)* and hearing impairment occurs (Ladou *et al.* 2014). Usually NIHL starts in 3, 4 and 6 kHz frequencies, most severely occurring in 4 kHz frequencies, and extending toward lower frequencies if the exposure continues (Ladou et al. 2014, Soltanzadeh *et al.* 2014).

Occupational chronic laryngitis and chronic pharyngitis are far less frequently diagnosed conditions than NIHL. In Moscow region, Russia from 70 000 workers and peasants only 355 cases (0.47%) of chronic laryngitis were registered (Chumakov *et al.* 2002).

Upper airways are the first barrier which meets inhaled irritants, dust and aeroallergens, therefore it is logical to assume that inflammation of at least some extent exist in the upper aerodigestive tract – nose, oral cavity, pharynx and larynx. Chronic laryngitis commonly in singers and lecturers might be caused due to constant voice overuse as well (Ladou et al. 2014). The symptoms of chronic laryngitis and chronic pharyngitis mostly start gradually, over a time of exposure to hazardous factors and last for several months, (Dworkin 2008), sometimes years. Employees complain of a mild pain in the back of the pharynx, temporal, mostly reversible dysphonia, persistent or episodic cough, *globus* sensation (Ladou *et al.* 2014). Erythema and swelling of the upper aerodigestive tract is minimal, however due to chronicity of the exposure and the evoked inflammation eventual fibrosis, scarring and necrosis might occur (Dworkin 2008).

The purpose of the research is to examine and analyze incidence of occupational ENT diseases by gender among employees in Latvia between 2005 and 2014.

Material and methods

The data about employees with occupational ENT diseases between 2005 and 2014 were obtained from the Latvian State Register of Patients with Occupational Diseases. Further this data was analyzed using *MS Excel* mathematical and statistical functions to identify:

- The most commonly registered occupational ENT diseases in both genders.
- The dynamics of the appearance of most commonly registered occupational ENT diseases in both genders.
- The most frequent branches of economic activity where employees with occupational ENT diseases of both genders worked in.

Results

In total data about 2302 employees with occupational ENT diseases were obtained: 1423 male employees (61.8% of all the registered employees with occupational ENT diseases) and 879 female employees (38.2%). The average age at the time of registering occupational ENT diseases in male employees was 57.2 and the mode age 59, whilst in female employees the average age was 54.0 and the mode age 56.

Between 2005 and 2014 2562 cases of occupational ENT diseases were registered: 1514 in male employees (59.1% of all the registered cases of occupational ENT diseases) and 1048 in female employees (40.9%). The majority of the registered employees had one occupational ENT disease: 1333 male employees (93.7% of all the registered male employees with occupational ENT diseases) and 721 female employees (82.0% of all the registered female employees with occupational ENT diseases) (Figure 1).

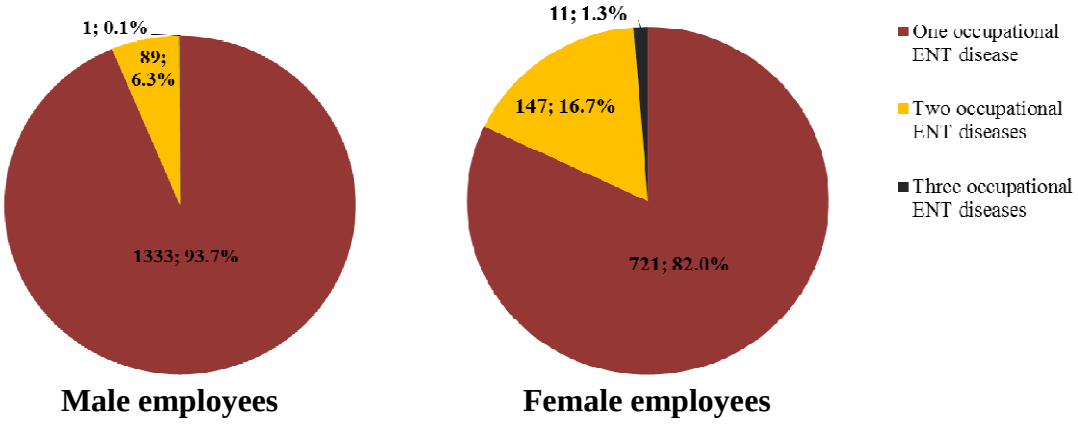


Figure 1. **The number of registered occupational ENT diseases per one employee in Latvia 2005-2014 (absolute number of patients, %)**

Most of the registered occupational ENT cases in male employees came from those employed in transport, storage and communication (495 cases (32.7% of all the registered cases of occupational ENT diseases in male employees / 94.8% of all the registered cases of occupational

ENT diseases in the corresponding economic activity sector)); manufacturing (403 cases (26.6%/38.2%)) and construction sectors (199 cases (13.1%/85.8%)) (Figure 2), by contrast female workers with occupational ENT diseases most commonly were employed in manufacturing (653 cases (62.3% of all the registered cases of occupational ENT diseases in female employees / 61.8% of all the registered cases of occupational ENT diseases in the corresponding economic activity sector)) and education sectors (147 (14.0%/87.5%)) (Figure 3).

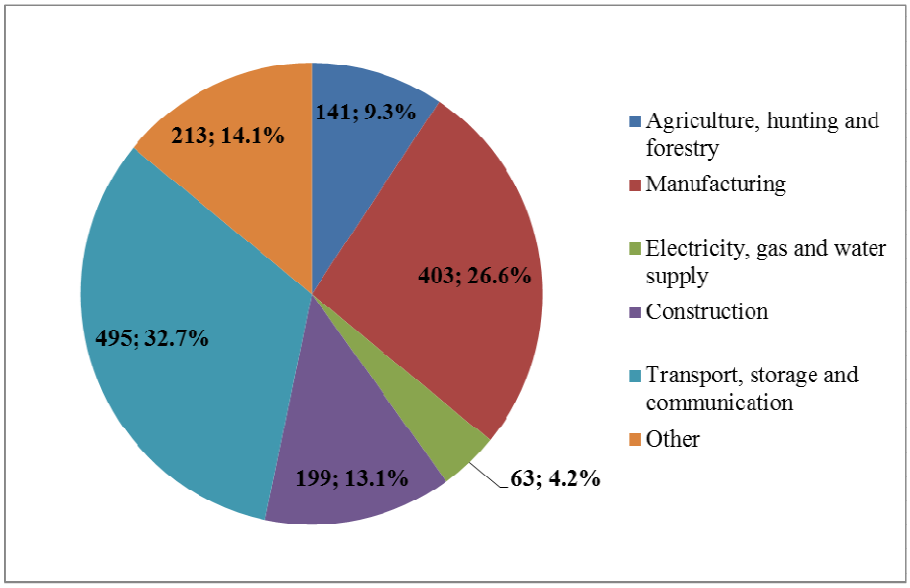


Figure 2. **The registered cases of occupational ENT diseases in economic activities sectors in Latvia in male employees 2005-2014 (absolute number, %)**

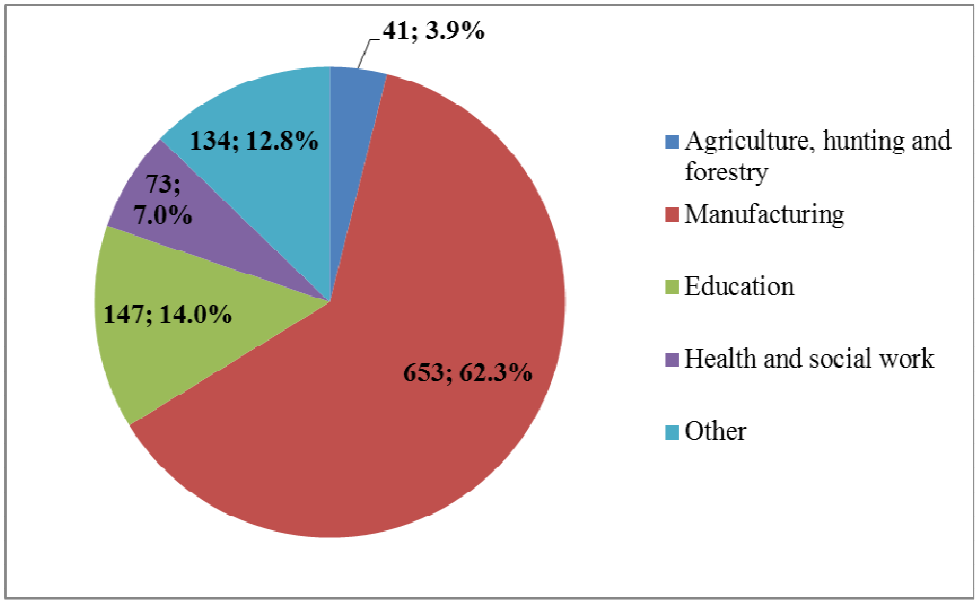


Figure 3. **The registered cases of occupational ENT diseases in economic activities sectors in Latvia in female employees 2005-2014 (absolute number, %)**

The most commonly registered occupational ENT diseases in both male and female employees were:

- noise effects on inner ear (1307 cases in male employees / 392 cases in female employees);
- chronic laryngitis (103/277 cases);
- chronic pharyngitis (73/248 cases) (Figure 4).

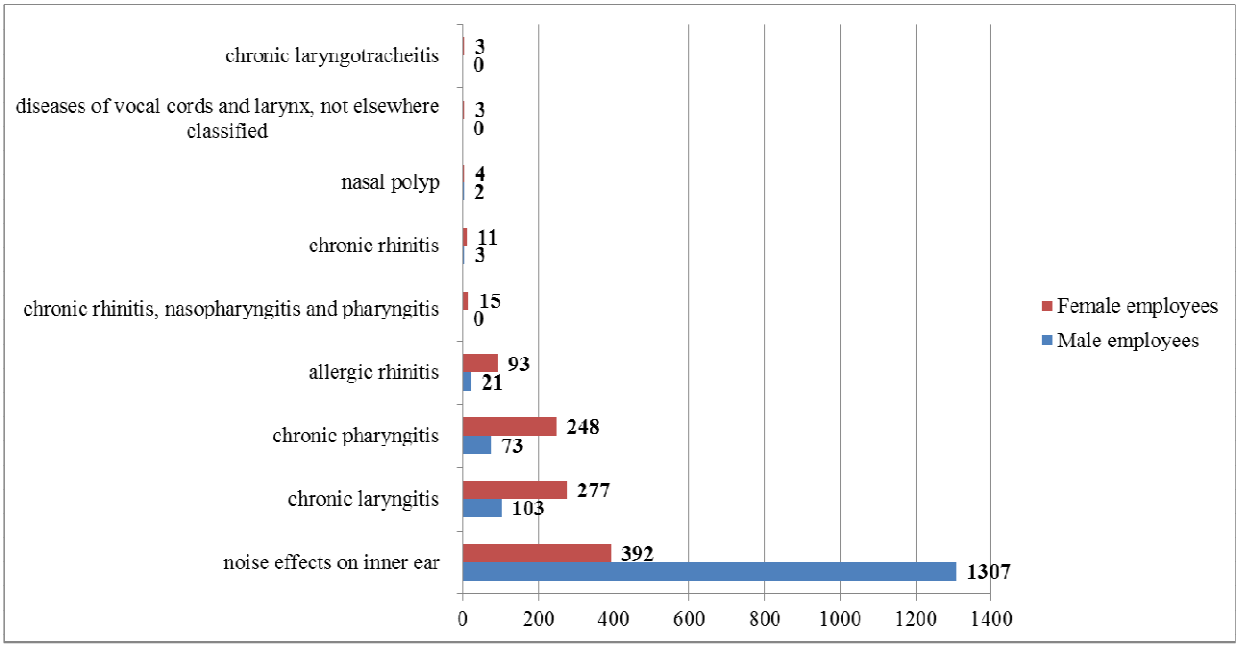


Figure 4. **Number of cases of occupational ENT diseases in employees in each gender in Latvia 2005-2014**

The majority of the registered cases of occupational ENT diseases were noise effects on inner ear - 1699 cases (66.3% of all the registered cases of occupational ENT diseases): 1307 cases in male employees (76.9% of all the registered cases of noise effects on inner ear / 86.3% of all the registered cases of occupational ENT diseases in male employees) and 392 cases in female employees (23.1% of all the registered cases of noise effects on inner ear / 37.4% of all the registered cases of occupational ENT diseases in female employees). Most frequently occupational noise effects on inner ear were registered in male workers employed in transport, storage and communication (467 cases (35.7% of all the registered cases of noise effects on inner ear in male employees / 94.3% of all the registered cases in male employees in corresponding economic activity sector)); manufacturing (318 cases (24.3%/78.9%)) and construction sectors (166 cases (12.7%/83.4%)), whereas female workers most commonly were employed in manufacturing sector (309 cases (78.8% of all the registered cases of noise effects on inner ear in female employees / 47.3% of all the registered cases in female employees in manufacturing sector).

Incidence of noise effects on inner ear per 100 000 employees in each gender in Latvia both in registered male and female employees the highest was in 2009 and 2010: 51.03 and 55.89 cases per 100 000 male employees, respectively, and 17.53 and 18.08 cases per 100 000 female employees.

Afterwards a drop in incidence occurred and starting from 2012 in male employees and 2011 in female employees incidence became more or less the same as it was before 2009. In female employees in 2014 6.72 cases per 100 000 female employees were registered and it is for 2.31 case more than in 2013, however data to conclude that the incidence of noise effects on inner ear in female employees is increasing is not enough and further investigation is necessary (Figure 5).

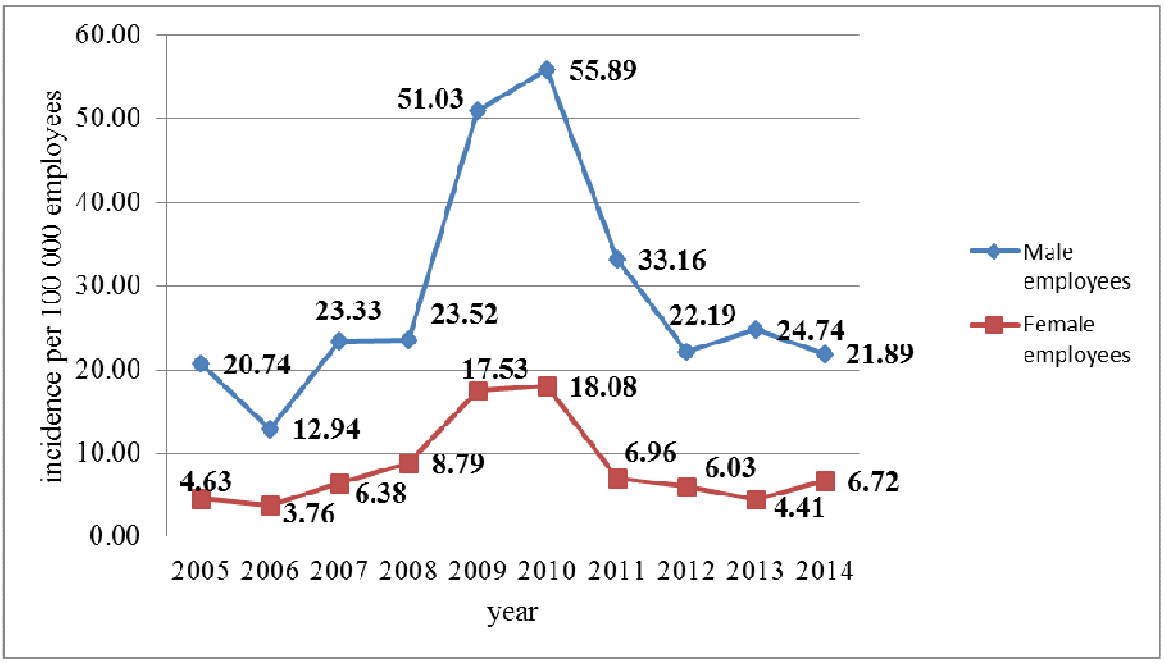


Figure 5. **Incidence of noise effects on inner ear in employees in Latvia 2005-2014 (number of cases per 100 000 employees)**

The second most frequently registered occupational ENT disease in both male and female employees were chronic laryngitis: 103 cases in male employees (27.1% of all the registered cases of chronic laryngitis / 6.8% of all the registered occupational ENT cases in male employees) and 277 cases in female employees (72.9% of all the registered cases of chronic laryngitis / 26.4% of all the registered cases of occupational ENT diseases in female employees). Registered male employees with chronic laryngitis most frequently were employed in manufacturing (34 cases (33.0% of all the registered cases of chronic laryngitis in male employees / 8.4% of all the registered cases of occupational ENT diseases in male employees in the corresponding economic activity sector)); construction (21 case (20.4%/10.6%)) and transport, storage and communication sectors (18 cases (17.5%/3.6%)), whereas female employees with chronic laryngitis most frequently were employed in education (117 cases (42.2% of all the registered cases of chronic laryngitis in female employees / 79.6% of all the registered cases of occupational ENT diseases in female employees in the corresponding economic activity sector)) and manufacturing sectors (107 cases (38.6%/16.4%)).

Analyzing incidence of chronic laryngitis similar tendencies as in the case of noise effects on inner ear arise. Throughout the analysed period incidence of chronic laryngitis in female employees was higher than in male employees. The highest incidence was in 2009 and 2010 both in male and female employees: 5.75 and 5.71 per 100 000 male employees, respectively, and 12.46 and 11.38 cases per 100 000 female employees. Afterwards a steep decrease ensued reaching 1.14 cases per 100 000 male employees and 3.36 cases per 100 000 female employees in 2014 (Figure 6).

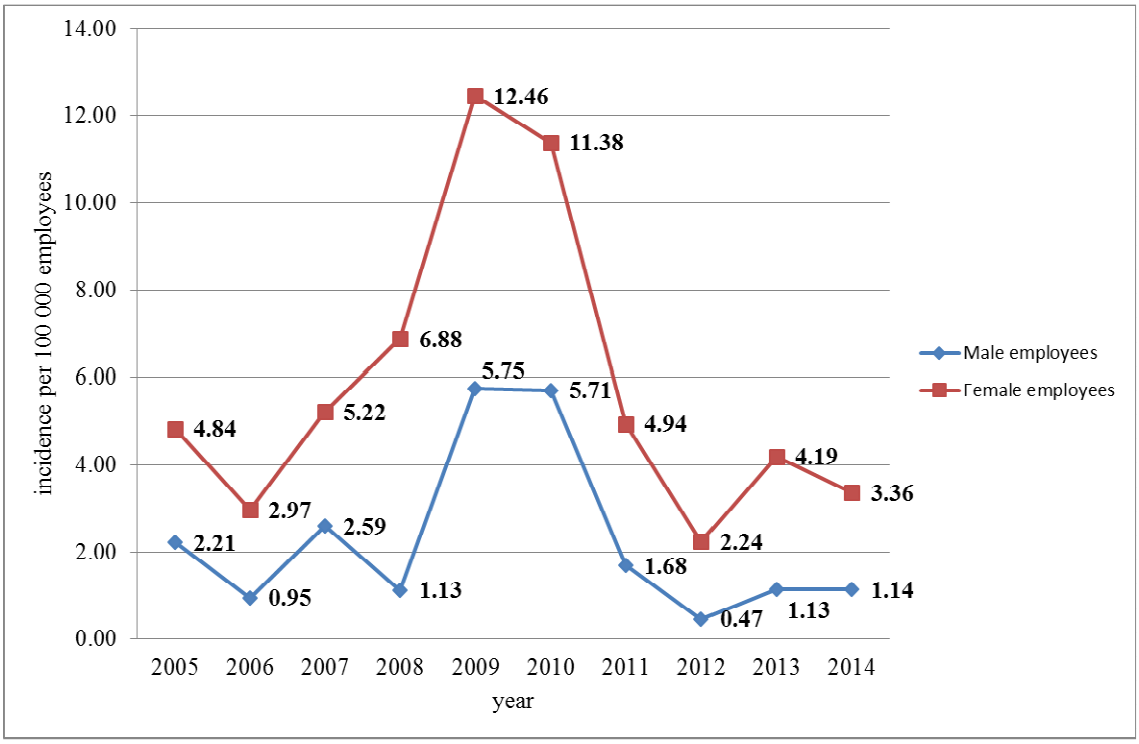


Figure 6. **Incidence of chronic laryngitis in employees in Latvia 2005-2014 (number of cases per 100 000 of employees)**

Between 2005 and 2014 the third most commonly registered occupational ENT disease was chronic pharyngitis: 73 cases in male employees (22.7% of all the registered cases of chronic pharyngitis / 4.8% of all the registered cases of occupational ENT diseases in male employees) and 248 cases in female employees (77.3% of all the registered cases of chronic pharyngitis / 23.7% of all the registered cases of occupational ENT diseases in female employees). Most frequently chronic pharyngitis was registered in male workers employed in manufacturing (35 cases (47.9% of all the registered cases of chronic pharyngitis in male employees / 8.7% of all the registered cases of occupational ENT diseases in the corresponding economic activity sector)) and construction sectors (11 cases (15.1%/5.5%)). Majority of cases of chronic pharyngitis in female employees came from manufacturing sector (174 cases (70.2% of all the registered cases of chronic pharyngitis / 26.6% of all the registered cases of occupational ENT diseases in female employees in manufacturing sector).

Analyzing incidence of chronic pharyngitis it was noted that no peek in incidence in male employees occurred. Throughout the analysed period incidence of chronic pharyngitis in male

employees fluctuated with a tendency to lower and in 2014 reached 0.23 cases per 100 000 male employees. By contrast, incidence of chronic pharyngitis in female employees has a peek in 2009 when 12.25 cases per 100 000 female employees were registered and it is followed by a rapid drop. In 2014 incidence increased more than twice comparing with 2013 reaching 1.57 cases per 100 000 female employees (Figure 7).

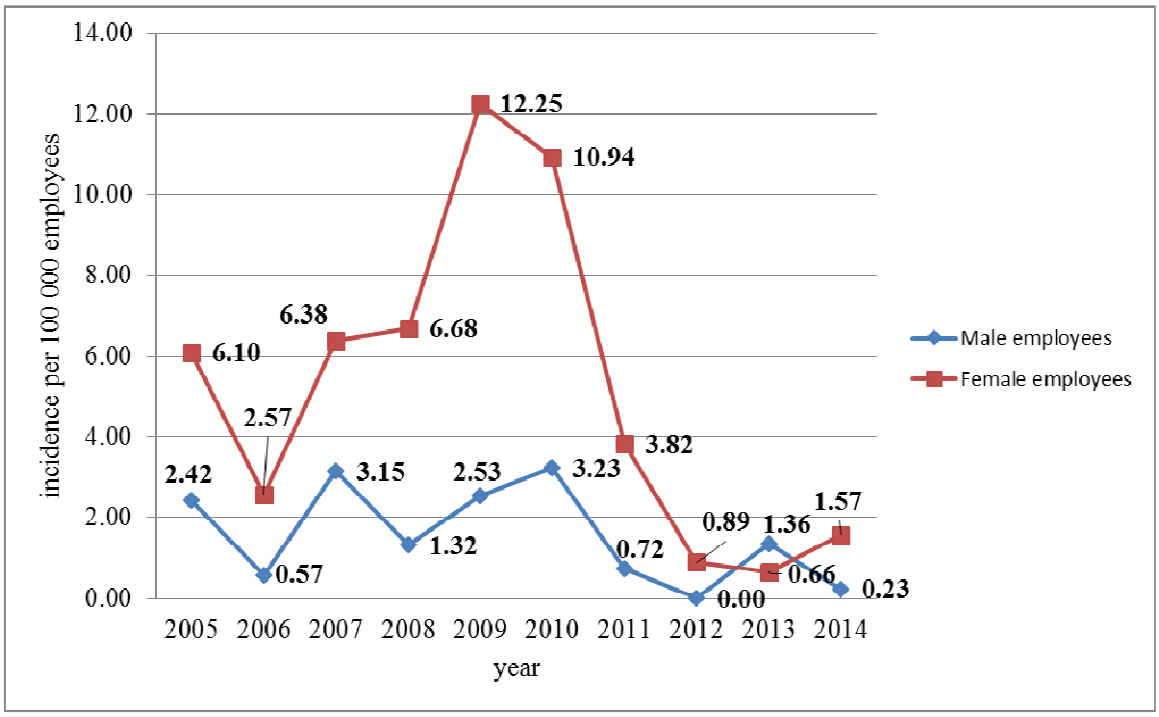


Figure 7. **Incidence of chronic pharyngitis in employees in Latvia 2005-2014 (number of cases per 100 000 employees)**

Discussion

The aim of this study was to illustrate the dynamics of occupational ENT diseases within last 10 years in Latvia and based on this knowledge make adjustments in current occupational health and environmental medicine practice and conduct further studies and analysis if needed.

The study showed that the majority of occupational ENT cases were noise effects on inner ear. Moreover, most frequently they were registered in male workers employed in transport, storage and communication; manufacturing and construction sectors. These are only registered cases, however, part of the employees have not sought help of occupational therapist due to various reasons. One of them might be the fact that noise induced hearing loss occurs gradually, frequently employee might not even notice that his/her hearing has decreased until significant damage to inner ear structures has occurred. Even *TTS* after which hearing gradually returns given a time eventually might lead to permanent hearing loss (Stucken *et al.* 2014).

The dynamics of incidence of noise induced effects on inner ear in Latvia demonstrate high occurrence in 2009 and 2010. In 2008 *economic crisis* occurred when significant numbers of employees were dismissed from their jobs. Such tendencies continued in the following two years as

well, therefore it is logical to assume that these peeks in incidence most probably are due to economic instability in the country, rather than increased occurrence of occupational ENT diseases. Overlooking the peek in incidence shows that occurrence of noise effects on inner ear during the analysed period has not increased but stayed rather even in both male and female employees, however, in male employees' incidence was significantly higher.

This study does not demonstrate whether those employees who were diagnosed with NIHL regularly used hearing protecting methods. Studies about NIHL demonstrate that use of hearing protecting measures reduce abnormal findings in audiograms (Pelegrin *et al.* 2015) and decrease the risk of hearing loss (Verbeek *et al.* 2014). Moreover, a study has demonstrated that hearing loss by each dB, increases risk for work related injury and hospitalization (Girard *et al.* 2015), therefore implementation of noise preventing methods in a workplace is of paramount importance (Stucken *et al.* 2014).

Epidemiological studies about occupational chronic laryngitis and chronic pharyngitis are lacking, however, those studies that can be found are of 50s and 60s. This study demonstrates that occurrence of chronic laryngitis and chronic pharyngitis although fluctuates has not increased within last years (when disregarding peek in 2009 and 2010) and has stayed higher in female rather than male employees. Further studies to evaluate the use of personal protective methods for airways along with duration of exposure to volatile chemical compounds, dusts and aerosols would be beneficial.

Conclusions

- The most frequently registered occupational ENT disease in both male and female employees was noise effect on inner ear.
- The decrease of incidence in noise effects on inner ear, chronic laryngitis and chronic pharyngitis shows that the modern methods used for occupational protection and prophylaxis are effective.
- Special attention is still needed for the control of intensive noise level.

Acknowledgement

I would like to express a special gratitude to Jelena Reste ,MD/PhD for the provided guidance and advice when conducting the research.

References

ISG18. *Iedzīvotāju skaits un īpatsvars līdz darbspējas, darbspējas un virs darbspējas vecuma grupās statistiskajos reģionos, republikas pilsētās un novados gada sākumā pēc dzimuma. 2011-2015*. Rīga: Centrālā statistika pārvalde. [skatīts 20.02.2016.]. Pieejams: http://data.csb.gov.lv/pxweb/lv/Sociala/Sociala__ikgad__iedz__iedzskaits/IS0180.px/table/tableViewLayout1/?rxid=cdcb978c-22b0-416a-aacc-aa650d3e2ce0

Stucken E.Z., Hong R.S. 2014. Noise-induced hearing loss: an occupational medicine perspective. In: *Current Opinion in Otolaryngology & Head and Neck Surgery*. Vol.22(5), Philadelphia, pp. 388-393.

Chumakov F.I., Rogachikova T.A. 2002. [Prevalence and certain characteristics of chronic hyperplastic laryngitis]. In: *Vestnik otorinolaringologii.* (2), Moscow, pp. 31-3. Article in Russian.

Dworkin J.P. 2008. Laryngitis: types, causes, and treatments. In: Otolaryngologic Clinics of North America. Vol.41(2), Philadelphia, pp. 419-436.

Flint P.W., Haughey B.H., Lund V.J., Niparko J.K., Robbins K.T., Thomas J.R., Lesperance M.M. 2015. In: *Cummings Otorynolaryngology. Head and Neck Surgery*. 6th ed. Philadelphia: Elsevier, pp. 153-163; 2319-2335.

Girard S.A., Leroux T., Courteau M., Picard M., Turcotte F., Richer O. 2015. Occupational noise exposure and noise-induced hearing loss are associated with work-related injuries leading to admission to hospital. In: *Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention.* Vol.21(e1), London, pp. e88-92.

Ladou J., Harrison R. 2014. In: *Current Diagnosis & Treatment. Occupational & Environmental Medicine.* 5th ed. New York: McGraw-Hill Medical, pages not mentioned.

Metidieri M.M., Rodrigues H.F., Filho F.J., Ferraz D.P., Neto A.F., Torres S. 2013. Noise-Induced Hearing Loss (NIHL): literature review with a focus on occupational medicine. In: *International archives of otorhinolaryngology*. Vol.17(2), Brazil, pp. 208-212.

Pelegrin A.C., Canuet L., Rodríguez Á.A., Morales M.P. 2015. Predictive factors of occupational noise-induced hearing loss in Spanish workers: A prospective study. In: *Noise Health*. Vol.17(78), London, pp. 343-349.

Soltanzadeh A., Ebrahimi H., Fallahi M., Kamalinia M., Ghassemi S., Golmohammadi R. 2014. Noise Induced Hearing Loss in Iran: (1997-2012): Systematic Review Article. In: *Iranian Journal of Public Health.* Vol.43(12), Tihrān, pp. 1605-1615.

Verbeek J.H., Kateman E., Morata T.C., Dreschler W.A., Mischke C. 2014. Interventions to prevent occupational noise-induced hearing loss: a Cochrane systematic review. In: *International journal of audiology.* Vol.53 Suppl 2, London, pp. 84-96.

ALLERGIC CONTACT DERMATITIS AND TOPICAL METRONIDAZOLE: A CASE REPORT

Lana Kasparane[1], Jana Janovska[2]
[1] Riga Stradins University, Dzirciema street 16, Riga, Latvia, LV-1007
L.Kasparane@gmail.com
[2] Riga Stradins University, Department of Internal diseases, Latvia

Abstract

Allergic contact dermatitis and topical metronidazole: a case report

Key words: *allergic contact dermatitis, metronidazole, rosacea, differential diagnosis, patch test*

The case report demonstrates a 70 year old female, Fitzpatrick's classification I-II skin phototype, with rosacea and no previously history of allergic skin dermatosis with facial skin erythema, oedema, expressed itching and scaling, after a few days of treatment with metronidazole gel. Few days after, exfoliative streptodermia developed. The topical metronidazole treatment was discontinued. For treatment pulse dose of intravenous dexometasone systems, mild topical glucocorticoid cream (*Methylprednisoloni aceponas*) and 5% urea cream were prescribed. As a consequence, after prescribed therapy facial skin condition improved, and streptodermia was treated. Now patient is on observation.

Kopsavilkums

Alerģisks kontaktdermatīts un lokāli lietojams metronidazols: klīniskais gadījums

Atslēgvārdi: *alerģisks kontaktdermatīts, metronidazols, rozācija, diferenciāldiagnozes, patch tests*

Klīniskais gadījums ir par 70 gadus vecu sievieti pēc *Fitzpatrick's* starptautiskās klasifikācijas I-II ādas fototips, kurai anamnēzē ir diagnosticēta rozācija. Paciente bez ādas kontaktdermatītiem un ādas alerģiskām epizodēm anamnēzē, pacientei pēc metronidazola gēla dažu dienu topiskas lietošanas uz sejas attīstījās alerģisks dermatīts ar eritēmu, tūsku, izteiktu niezi un ādas intensīvu nolobīšanos. Pēc dažām dienām pievienojās streptodermija. Lokāla metronidazola terapija tika pārtraukta un paciente saņēma intravenozi deksametazona pulsa terapiju, maigu glikokortikoīdu krēmu (*Methylprednisoloni aceponas*) plānā kārtā lokāli un 5% urea krēmu, pēc kā sejas ādas stāvoklis uzlabojās, streptodermija izārstēta.

Introduction

Rosacea is a common (>16 million Americans, National Rosacea Society 2013), chronic recidivating skin disorder which is characterized with signs and symptoms, including flushing, facial erythema, inflammatory papules and pustules, telangiectasia, oedema, ocular involvement-conjunctivitis, as well as latest stage is development of rhinophyma. (Huynh TT 2013)

Etiology of rosacea is unknown, but there are certain factors that can provoke and influence the course of the disease: genetic predisposition, environmental factors (UV light, sauna), hot/spicy meal, vascular disorders, dermal matrix degradation, and might be linked to *Demodex folliculorum* and *Helicobacter pylori* (Abram *et al.* 2010; Crawford *et al.* 2004).

There are several disease causing factors as ultraviolet radiation (81%), emotional experience (79%), hot season (75%), storm (57%), strenuous exercise (56%), alcohol (52%), cold season (46%), cosmetics (27%), medicaments (15%) and daily diet products (8%). (Abram *et al.* 2010; Crawford *et al.* 2004)

Because it is a chronic skin dermatosis it is impacting quality of life of the patient, as well as, their social communication. Many patients mention communication problems at work, in their marriage, and in social industry (American Academy of Dermatology).

Currently, there is no International protocol for dissolving this disorder (Parodi *et al.* 2011). Overall currently aim of used medication is symptomatic reduction of present symptoms as well as stabilizing its gain. The three topical agents approved by the US Food and Drug Administration (FDA) for the topical treatment of rosacea are metronidazole, azelaic acid, and sodium sulfacetamide-sulfur (Huynh TT 2013).

Contact dermatitis to topically applied metronidazole gel is a rare skin hypersensitive reacted side effect (Madsen *et al.* 2007).

Case report

A 70 year old, Caucasian female, Fitzpatrick's classification type I-II is presented. Anamnesis data confirmed comorbidities as: *Diabetes mellitus* type 2 (with insulin therapy, well compensated), coronary heart disease, primary arterial hypertension stage II (according to *American Heart Association* 2003), hepatosis, condition after cholecystectomy, small extent active hyperaemia, gastropathy, compensated hypothyroidism, demodicosis and rosacea.

Patient with no previous history of allergy was hospitalized because of developed facial dermatitis with erythema, oedema, expressed itching and crusting, after a few days of treatment with 0.75% metronidazole gel. After received treatment in the hospital (dexamethasone intravenously, prednisolone and topical application medication) condition slightly improved - oedema disappeared, erythema decreased. But a few days later after topical medication skin condition recurrent – facial erythema and oedema increased and exfoliative streptodermia with skin desquamation developed as complication (Fig. 1).

The patient was directed for the treatment and follow-up to a dermatologist. The topical metronidazole treatment was discontinued and rosacea was treated successfully with pulse dose of intravenous dexometasone systems, slight topical glycocorticoid cream and 5% urea cream (Fig. 2).

Figure 1. **Allergic contact dermatitis due to metronidazole gel and exfoliative streptodermia**

Figure 2. **Skin condition in generally improved, oedema disappear and erythema, crusting decreased**

Discussion

Pathogenesis of rosacea is heterogeneous and not clear till nowadays. It is associated with several factors. Mechanism of pathogenesis is complex and depends on: natural immunity, vascular disorders, free radicals and proteolytic enzymes exposure to ultraviolet radiation and infectious agents. External factors affecting the natural, innate immunity determine further course of the symptoms and severity of disease manifestations (Crawford *et al.* 2004), as demonstrated in this clinical case, where skin immunosuppression developed in patient with multiple serious co-morbidities.

The most important first step in the treatment of rosacea is the avoidance of triggers. Triggers are both exposures and situations that can cause a flare-up of the flushing and skin changes in rosacea. Principal among these is sun exposure. Rosacea patients must be advised always to apply a nonirritating facial sun block when outdoors. Stress, through autonomic activation, can also increase the flushing. (Aaron *et al.* 2002)

Rosacea should be treated at its earliest manifestations to mitigate progression to the stages of oedema and irreversible fibrosis. (Aaron *et al.* 2002)

Topical metronidazole is considered first-line therapy for stage I and stage II rosacea and used as a topical agent is generally well tolerated, and allergic contact dermatitis developing because of

topically applied metronidazole is rare – only two cases have been published previously (Madsen *et al.* 2007). There have been isolated reports of immediate allergic reactions and urticaria, fixed drug eruptions and acute generalized exanthematous pustulosis due to topical metronidazole. (Madsen *et al.* 2007)

Conclusions

In this case, metronidazole could be an irritating factor for this causing hypersensitivity and allergic reactions, and complications developed due to skin immunosupression. Although is used as a topical agent is generally well tolerated, and allergic contact dermatitis developing because of topically applied metronidazole is rare and only two cases have been published previously (Madsen J. T. *et.al.* 2007). And after three unsuccessful attempts with metronidazole 0.75% gel, which is one of the suggested first line medication, it would be desirable to make diagnostic patch testing.

Acknowledgement

Thank you to Dr. Jana Janovska for supplying the material of case report and photos.

References

Abram K, Silm H, Maaroos HI *et al.* 2010. Risk factors associated with rosacea. *Journal of the European Academy of Dermatology and Venereology, 24:* 565–71.

American Academy of Dermatology. Rosacea: signs and symptoms. [skatīts 30.03.2016]. Pieejams (Accessed): https://www.aad.org/public/diseases/acne-and-rosacea/rosacea

Cohen AF and Tiemstra JD. 2002. Diagnosis and Treatment of Rosacea. *The Journal of the American Board of Family Practice, 15:* 214–7.

Crawford GH, Pelle MT, James WD. 2004. Rosacea: I. Etiology, pathogenesis, and subtype classification. *Journal of the American Academy of Dermatology, 51:* 327–41.

Huynh TT. 2013. Burden of Disease: The Psychosocial Impact of Rosacea on a Patient's Quality of Life. *American Health & Drug Benefits, 6(6):* 348–354.

Madsen JT, Thormann J, Kerre S, *et al.* 2007. Allergic contact dermatitis to topical metronidazole – 3 cases. *Contact Dermatitis, 56:* 364–366.

Parodi A, Drago F, Paolino S, *et al.* 2011. Treatment of rosacea. *Annales de dermatologie et de vénéréologie, 138 3():* S211-4.

FACTORS AFFECTING NEONATAL MORTALITY IN CHILDREN WITH DUCTUS DEPENDENT CONGENITAL HEART DISEASES

Ieva Kravale, Ieva Veinberga
Riga Stradins University, Dzirciema street 16, Rīga, Latvia, LV-1007
kravaleieva16@gmail.com

Abstract

Factors affecting neonatal mortality in children with ductus dependent congenital heart diseases

Key words: *ductus arteriosus, congenital heart disease (CHD), neonatal mortality*

Patients with ductus arteriosus (DA) dependent congenital heart diseases (CHD) will develop life-threatening symptoms after spontaneous closure of the DA in the first days of life. Prenatal diagnosis allows timely initiation of prostaglandin E1 (PGE1) that prevents closure of the DA.

The aim of this study was to identify the factors that affect the neonatal mortality in patients with DA dependent CHD.

A retrospective case-control study was conducted, including patients with ductus dependent CHD presenting to the Children's Clinical University Hospital (CCUH) between 2010 and 2015. Data was collected from patients' medical records and hospitals' computerised information system.

The outcome was documented in 87 of the 92 cases of DA dependent CHD. Death occurred in 21.8% of cases. The time of diagnosis (prenatally vs. postnatally), hospitalisation and PGE1 initiation had no statistically significant impact on the early outcome of the disease. The mean birth weight, height, head and chest circumference was higher in survivors than non-survivors.

Newborns' anthropometrical measurements differed significantly between survivors and non-survivors with DA dependent CHD.

Kopsavilkums

Neonatālo mirstību ietekmējoši faktori bērniem ar arteriālā vada atkarīgām iedzimtām sirdskaitēm.

Atslēgvārdi: *arteriālais vads, iedzimta sirdskaite, neonatālā mirstība*

Pacientiem ar arteriālā vada (DA) atkarīgām iedzimtām sirdskaitēm (ISK) attīstīsies dzīvību apdraudoši simptomi pēc spontānas DA slēgšanās pirmajās dzīves dienās. Prenatālā diagnostika ļauj laicīgi uzsākt prostaglandīna E1 (PGE1) terapiju, kas novērš DA slēgšanos.

Šī pētījuma mērķis bija noskaidrot faktorus, kas ietekmē neonatālo mirstību bērniem ar DA atkarīgām ISK.

Retrospektīvā pētījumā tika iekļauti pacienti ar DA atkarīgām ISK, kuri ārstējušies "Bērnu klīniskajā universitātes slimnīcā" (BKUS) no 2010. – 2015.g. Nepieciešamie dati iegūti no pacientu stacionārajām kartēm un slimnīcas elektroniskās datu sistēmas un analizēti, izmantojot IBM SPSS programmu. Kā statistiski nozīmīgi tika definēti rezultāti, ja $p<0.05$.

Dati par agrīno iznākumu bija pieejami 87 no 92 pacientiem ar DA atkarīgām ISK. Letāls iznākums bija 21.8% gadījumu. Netika atrasta statistiski ticama atšķirība starp prenatālu vai postnatālu diagnostikas laiku, stacionēšanas laiku un PGE1 terapijas uzsākšanas laiku un slimības agrīno iznākumu. Vidējais dzimšanas svars, augums, galvas un krūšu apkārtmērs bija lielāks izdzīvojušajiem pacientiem.

Jaundzimušā antropometriskie rādītāji nozīmīgi atšķiras starp mirušo un izdzīvojušo pacientu grupām bērniem ar DA atkarīgām ISK.

Introduction

Congenital anomalies also known as birth defects, congenital disorders or congenital malformations are the leading cause of infant death in the USA (Mathews *et al.* 2015) and the second leading cause of infant death in the UK (ONS 2015) and Latvia (SPKC 2012), accounting for 20%, 28% and 25% of all infant deaths respectively. Congenital heart disease (CHD) is the most common congenital disorder in new-borns and the leading cause of infant death from a congenital birth defect (Canfield 2006). This pathology affects 0.6% - 1.1% births per year and is a cause in 40% of deaths by major congenital anomalies (Fung *et al.* 2013; Meberg *et al.* 2005; Wen *et al.*

2000; Wren *et al.* 2008). In Latvia 3.3% of live born infants had congenital malformations in 2014 and the most common form was congenital circulatory system pathology (25%) (SPKC 2014).

There are many types of congenital heart defects ranging from simple to very complex that needs immediate diagnostics and therapy for a new born to survive (Hinton 2013). Ductal-dependent congenital heart diseases are a group of heart lesions where patent ductus arteriosus (PDA) is needed 1) to supply pulmonary blood flow 2) to supply systemic blood flow or 3) to allow adequate mixing between parallel circulations. In critical right heart obstructive lesions, PDA is necessary to supply blood flow to the lungs. In critical left heart lesions, PDA supplies systemic circulation; and in parallel circulations (e.g., transposition of the great arteries), bidirectional flow in the PDA allows mixing between oxygenated and deoxygenated circuits (Table 1) (Altman 2015).

Table 1. **The classification of ductal-dependent congenital heart lesions** (Altman 2015)

Ductal-dependent systemic blood flow (left heart obstructive lesions)	**Ductal-dependent pulmonary blood flow (right heart obstructive lesions)**	**Ductal-dependent parallel circulations**
Hypoplastic left heart syndrome (HLHS)	Tetralogy of Fallot with pulmonary atresia	Transposition of the great arteries
Critical aortic stenosis	Pulmonary atresia (PA)	
Coarctation of the aorta (CoA)	Pulmonary atresia with intact ventricular septum (PAIVS)	
Interrupted aortic arch (IAA)	Critical pulmonary stenosis	
	Tricuspidal atresia with PS or PA	
	Single Ventricle Defects with PS or PA	

Because of PDA, some of these patients will be asymptomatic after birth, but will develop symptoms with life – threatening consequences (severe metabolic acidosis, cardiogenic shock, cardiac arrest) after spontaneous closure of the ductus arteriosus, often – already after birth hospitalization discharge (Schultz 2008). Early referral to a pediatric cardiologist and initiation of a treatment should be made to decrease the risk of complications and mortality (Hinton 2013). In most cases the functional closure of DA occurs in the first 24 – 72 hours of life, true anatomic closure, in which the ductus loses the ability to reopen, may take 1 - 2 weeks (Yates 2012). Neonates that has been diagnosed with ductal - dependent CHD prenatally or have symptoms suggestive of CHD postnatally, should receive prostaglandin E1 (PGE1) infusion immediately after the birth, even if the diagnosis of CHD has not yet been confirmed (Hill et al 2015). Timely initiation of prostaglandin E1 (PGE1) prevents closure of the ductus and can be lifesaving in these newborns.

Although diagnostic and treatment options are better now, the proportion being diagnosed with CHD after hospital discharge still remains around 25% (Wren *et al*. 2008). The risk of morbidity and mortality increases when there is a delay in diagnosis (Eckersley et al 2015). Congenital heart defects can be diagnosed during fetal life using echocardiography (Strainic *et al* .2015). There is no routine screening of fetal echocardiography, but it is recommended as a prenatal test for fetuses at a higher risk of CHD than would be expected for the general population (Allan *et al*. 2004). Prenatal diagnosis of ductus dependent anomalies gives the opportunity of planning delivery in qualified birth centre and transport the infant to tertiary centre with expertise in treating CHD, early initiation of PGE1 therapy to maintain the ductus arteriosus and reduction of diagnostic delay after birth. All these measures could decrease mortality in children with DA dependent CHD.

Materials and methods

A retrospective case-control study was conducted, including patients with ductus dependent CHD presenting to the Children's Clinical University Hospital (CCUH) between 2010 and 2015. Necessary data were collected from patients' medical records and hospitals' computerised information system. Data describing newborns at delivery (birth weight, height, head and chest circumference, Apgar score at one minute and five minutes after birth, gestational age at delivery), CHD diagnosis and received medical care (time of diagnosis, time of hospitalisation in tertiary centre (CCUH), time of PGE1 initiation, disease outcome when discharged from hospital) were collected using patients records and then processed in Microsoft Excel and analysed using IBM SPSS Statistics 23 program. The distribution of data was assessed using Kolmogorov-Smirnov test and normally distributed data were described using mean value and standard deviation (STD), data that didn't have normal distribution were described using median value and interquartile range (IQR). To determine differences of various factors in non – survivors (group A) and survivors (group B) ANOVA were used for normally distributed data, Mann-Whitney U test for quantitative and Pearson's Chi square test for qualitative data. The significance threshold was set at 0.05.

Results

The outcome was documented in 87 of the 92 cases of DA dependent CHD. Death occurred in 21.8% of the cases (n=19; 4 without operative treatment, 15 after operative treatment), 78.2% of the new-borns survived to hospital discharge (n=68; 1 without operative treatment, 67 after operative treatment). Factors that could potentially affect the outcome of the disease were analysed (Table 2).

Comparing data describing the newborns at delivery for groups A and B respectively: the mean birth weight was 2929 (±750) g and 3401 (± 638) g, the median Apgar score at one minute was 8 (IQR 7 – 8) and 8 (IQR 7 – 8), the median Apgar score at five minutes was 8 (IQR 8 – 9) and 9 (IQR 8 – 9), the median height – 50 (IQR 47 – 53) cm and 53 (IQR 51 – 55) cm, the median head circumference was 34 (IQR 32 – 35) cm and 35 (IQR 34 – 36) cm, the median chest circumference

was 32 (IQR 30 – 34) cm and 34 (IQR 32 – 35) cm, the median gestational age at delivery – 39 (IQR 38 – 40) and 40 (IQR 39 – 40) weeks. The difference was statistically significant in the mean birth weight (p=0.008), median birth height (p=0.002), head circumference (p=0.019) and chest circumference (p=0.022). However, the difference in the median Apgar score values (p=0.88 and p=0.60) and gestational age (p=0.085) was not statistically significant.

Comparing data describing received medical care, the median age at hospitalisation was second day of life for both groups (IQR 1. – 5.), the median time of PGE1 initiation was first day of life (IQR 1. – 5.) for non – survivors and second day of life for survivors (IQR 1. – 6.), however, the results were not statistically significant (p=0.909 and p=0.258). Survived 75.0% of antenatally diagnosed and 80.4% of postnatally diagnosed patients. There was no significant difference in the outcome between prenatal and postnatal diagnosed patients (p=0.604).

Table 2. **Factors affecting early outcome of DA dependent CHD's**

	Surviviors (n=68)	Non-survivors (n=19)	P value	Number of patients with data available
Mean birth weight, g (SD)	3401 (±638)	2929 (±750)	p=0.008	87
Median Apgar score at 1 min (IQR)	8 (7.-8.)	8 (7.-8.)	p=0.88	83
Median Apgar score at 5 min (IQR)	9 (8.-9.)	8 (8.-9.)	p=0.60	83
Median height (cm) (IQR)	53 (51-55)	50 (47-53)	p=0.002	82
Median head circumference (cm) (IQR)	35 (34-36)	34 (32-35)	p=0.019	75
Median chest circumference (cm) (IQR)	34 (32-35)	32 (30-34)	p=0.022	71
Median age at hospitalisation, days (IQR)	2 (1. – 5.)	2 (1. – 5.)	p=0.909	87
Median time of PGE1 initiation, days (IQR)	1. (1. – 6.)	2. (1.-5.)	p=0.258	86
Median gestational age at delivery, weeks (IQR)	39. (38. – 40.)	40. (39. – 40.)	p=0.085	84
Prenatal diagnosis, %	75%	25%	p=0.549	36
Postnatal diagnosis, %	80.4%	19.6%	p=0.549	51

Our results confirm that the neonatal mortality is affected by the type and severity of a ductal-dependent congenital heart disease. The most common diagnosis of DA dependent CHD's in this study with the outcome can be seen in Table 3.

Table 3. **Prenatal diagnosis and outcome for different types of DA dependent CHD's**

Diagnosis	Patients (n)	Prenatal diagnosis (n)	Deaths (n) (survivors/deaths)
Coarctation of the aorta (CoA)	30	10 (33%)	26/4 (mortality 13%)
Hypoplastic left heart syndrome (HLHS)	11	8 (73%)	4/7 (64%)
Pulmonary/pulmonary valve atresia	7	6 (86%)	6/1 (14%)
Critical pulmonary stenosis	10	5 (50%)	8/2 (20%)
Transposition of the great arteries	13	4 (31%)	10/3 (23%)

Discussion

In this study there was no significant difference detected between prenatally and postnatally diagnosed patients in the early outcome of ductal-dependent congenital heart disease. That might be explained by more severe forms of CHD having been diagnosed prenatally (Oster *et al.* 2013). For example, hypoplastic left heart syndrome (HLHS) has been diagnosed prenatally in 8 of 11 (73%) patients, but coarctation of the aorta (CoA) has been diagnosed prenatally in 10 of 30 (33%) patients. Seven from eleven (64%) HLHS patients died during the time of first hospitalisation, in comparison, only 4 of 30 (13%) CoA patients have died (Table 3). Higher mortality rate in HLHS patients could be explained by more severe changes in hemodynamic and anatomy and difficulties in HLHS management, rather than by prenatal diagnostics. In addition, there was no statistically significant difference in the median age at hospitalisation and time of PGE1 initiation between both groups. Even more, the median PGE1 initiation time was earlier in non-survivors. These results are closely related to the time of diagnosis and can be explained in the same way. These findings should not question the benefits of prenatal CHD diagnosis and early initiation of PGE1 therapy. Several studies have shown, that prenatal diagnostics of CHD decreases pre-operative mortality rate in critical CHD patients (Holland *et al*. 2015), increases survival rate and improves pre-operative condition in CoA patients (Franklin *et al.* 2002) and ameliorates post-operative condition and outcome in HLHS patients (Tworetzky *et al.* 2001).

There were several limitations to this research. Firstly, retrospective study design set substantial limitations on exploring all the necessary data. There was no access to medical records of some patients, so the data were collected only from hospitals' computerised information system. Missing data could have affected the results of this study. Secondly, the small number of deceased patients could affect statistical analysis of the results. Thirdly, the small number of patients did not allow separate analysis of factors affecting outcome for different types of DA dependent CHD. This analyse could provide us with useful information. There is a need for a prospective study on factors

affecting neonatal mortality with more patients and separate analysis for each of the diagnosis of DA dependent CHD's to obtain more precise results.

The acquired difference in the physical characteristics between survivors and non – survivors with median values lower in non - survivors could be explained with intrauterine impact of a severe diseases on the newborn. Although the median values were lower for non – survivors, they were mostly within the normal range.

Conclusions

Birth weight, height, head and waist circumference was a significant predictor of neonatal mortality in children with DA dependent CHD. The time of diagnosis (prenatally vs. postnatally), hospitalisation and PGE1 initiation had no statistically significant impact on the early outcome of the disease. To detect the effect of early diagnosis and treatment, different types of CHD should be studied separately.

Acknowledgement

We would like to express our gratitude to Dr. Lubaua from Childrens' Clinical University Hospital for her advisory and encouragement.

References

Allan L., Dangel J., Fesslova V. et. al. 2004. Recommendations for the practice of fetal cardiology in Europe. In: *Cardiology in the Young*, 14, pp. 109–114.

Altman A. C. 2015. *Identifying newborns with critical congenital heart disease. Up to date*. [skatīts 20.04.2016]. Pieejams (Accessed): http://www.uptodate.com/contents/identifying-newborns-with-critical-congenital-heart-disease

Canfield M. A., Honein M. A., Yuskiv N. et. al. 2006. National estimates and race/ethnic-specific variation of selected birth defects in the United States, 1999–2001. In: *Birth Defects Research Part A: Clinical and Molecular Teratology*, 76, pp. 747–756. doi: 10.1002/bdra.20294.

Eckersley L., Sadler L., Parry E. et. al. 2015. Timing of diagnosis affects mortality in critical congenital heart disease. In: *Archives of disease in Childhood.* pii: archdischild-2014-307691. doi: 10.1136/archdischild-2014-307691. [Epub ahead of print]

Fung A., Manlhiot C., Naik S. et. al. 2013. Impact of prenatal risk factors on congenital heart disease in the current era. In: *Journal of the American Heart Association*, 2, vol. 3, pp. e000064. doi: 10.1161/JAHA.113.000064.

Franklin O., Burch M., Manning N. et. al. 2002. Prenatal diagnosis of coarctation of the aorta improves survival and reduces morbidity. In: *Heart*, 87, vol. 67, pp. e69.

Fyler D. C. Report of the New England Regional Infant Cardiac Program, 1980; 65(suppl):375-461. In: *Talner CNPediatrics*, 102(1 Pt 2):258.

Hill J. A., Kouretas P. C. 2015. Principles of Medical and Surgical Management of the Neonate. Martin R. J., Fanaroff, A. A., Walsh, M. C. ed. In: *Fanaroff and Martin's Neonatal-Perinatal Medicine.* Tenth edition, Philadelphia: Elsevier Saunders, 87, pp. 1275-1291.

Hinton R. B. 2013. Genetic and Environmental Factors Contributing to Cardiovascular Malformation: A Unified Approach to Risk. Editorial. In: *Journal of the American Heart Association,* 2, vol. 3, pp. e000292.2 doi: 10.1161/JAHA.113.000292

Holland B. J., Myers J. A., Woods C. R. jr. 2015. Prenatal diagnosis of critical congenital heart disease reduces risk of death from cardiovascular compromise prior to planned neonatal cardiac surgery: a meta-analysis. In: *Ultrasound in Obstetrics and Gynecology.*, 45, vol. 6, pp. 631-638.

Mathews T. J., MacDorman M. F., Thoma M. E. 2015. Infant mortality statistics from the 2013 period linked birth/infant death data set. In: *National vital statistics reports*. Vol. 64 (9). Hyattsville, MD: National Center for Health Statistics.

Meberg A. L. F., Lindber H., Thaulow E. 2005. Congenital heart defects: The patients who die. In: *Acta Pædiatrica*, 94, pp. 1060–1065.

ONS. Deaths of babies in England and Wales and the factors that may influence their survival. 2013. In: *Statistical bulletin: Childhood, Infant and Perinatal Mortality in England and Wales: 2013. Office for national statistics.* [skatīts 11.04.2016]. Pieejams (Accessed): http://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/childhoodinfantandperinatalmortalityinenglandandwales/2015-03-10#cause-of-infant-deaths

Oster M. E., Kim C. H., Kusano A. S. et. al. 2014. A Population-Based Study of the Association of Prenatal Diagnosis With Survival Rate for Infants With Congenital Heart Defects. In: *American Journal of Cardiology*, 113, vol. 6, pp. 1036-40. doi: 10.1016/j.amjcard.2013.11.066.

Schultz AH, Localio AR, Clark BJ, Ravishankar C, Videon N, Kimmel SE. 2008. Epidemiologic features of the presentation of critical congenital heart disease: implications for screening. In: *Pediatrics*, 4, vol.121, pp. 751.

SPKC. Congenital malformations of newborns breakdown by mother's place of residence. Maternal and infant health care. In: *Statistical yearbook of health care in Latvia 2014*, pp. 281. [skatīts 11.04.2016]. Pieejams (Accessed): http://www.spkc.gov.lv/veselibas-aprupes-statistika/

SPKC. Jaundzimušo un zīdaiņu mirstība. In: *Mātes un bērna veselība, 2012*, pp. 4. [skatīts 11.04.2016]. Pieejams (Available): www.spkc.gov.lv/file.../Fact_sheet_mate_zidainis.pdf

Strainic J., Snyder C. S. 2015. Prenatal Diagnosis of Congenital Heart Disease. Martin R. J., Fanaroff A. A., Walsh M. C. ed. In: *Fanaroff and Martin's Neonatal-Perinatal Medicine.* Tenth edition, Philadelphia: Elsevier Saunders, 82, pp. 1215-1222.

Tworetzky W., McElhinney D. B., Reddy V. M. et. al. 2001. Improved Surgical Outcome After Fetal Diagnosis of Hypoplastic Left Heart Syndrome. In: *Circulation*, 103, pp. 1269-1273, doi:10.1161/01.CIR.103.9.1269.

Wen S. W., Liu S., Joseph K. et. al. 2000. Patterns of infant mortality caused by major congenital anomalies. In: *Teratology,* 61, pp. 342–346. doi:10.1002/(SICI)1096-9926(200005)61:5<342::AID-TERA5>3.0.CO;2-7.

Wren C., Reinhardt Z., Khawaja K. 2008. Twenty-year trends in diagnosis of life-threatening neonatal cardiovascular malformations. In: *Archives of Disease in Childhood. Fetal and Neonatal Edition*, 93, pp. 33-35. doi: 10.1136/adc.2007.119032.

Yates R. W. M. 2012. Cardiovascular disease. Rennie J. M., ed. In: *Rennie and Roberton's Textbook of Neonatology*. Fifth edition, Elsevier Limited, 28, pp. 617-669.

AORTIC ROOT ANEURYSM ASSOCIATED WITH MARFAN SYNDROME: A CASE REPORT

Jānis Lācis[2], Ieva Rancāne[2], Ints Putniņš[1], Artūrs Koris[1], Uldis Strazdiņš[1,2], Romans Lācis[1,2]
[1] Pauls Stradins Clinical University Hospital, Pilsoņu street 13, Riga, Latvia, LV-1002
[2] Rīga Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1007
lacisjanis@inbox.lv

Abstract

Aortic root aneurysm associated with Marfan syndrome: a case report

Keywords: *Marfan syndrome, Aortic root aneurysm, Aortic regurgitation, Bentall procedure, FBN1*

Introduction. Epidemiological data show that the overall incidence of Marfan syndrome is about 2-3 per 10000 individuals making Marfan syndrome one of the most common single-gene malformation syndromes (Chen 2016; Judge *et al.* 2005). About 25% of Marfan syndrome patients are sporadic cases due to new mutations (Judge *et al.* 2005). This is a clinical case report of a 20-year-old Caucasian male who was admitted with severe aortic root aneurysm and secondary aortic regurgitation associated with Marfan syndrome.

Case Presentation. A 20-year-old Caucasian male with Marfan syndrome was hospitalized with complaints of shortness of breath during physical activities. Patient was a 205 cm tall basketball player with a previous medical history of aortic root dilatation although it did not affect his daily activities. Due to increased shortness of breath patient underwent physical examination revealing severe dilatation of the aortic root (5.2 cm) with a secondary aortic regurgitation (II-III). Depending on radiologic and clinical findings patient was diagnosed with Marfan syndrome. Surgical intervention was based on the diagnosis and the clinical presentation.

Conclusions. Due to severe aortic root aneurism and secondary aortic regurgitation patient underwent Bentall procedure showing no short- or long-term complications.

Kopsavilkums

Marfānas sindroms ar aortas saknes aneirismu: gadījuma apskats

Atslēgas vārdi: *Marfāna sindroms, Aortas saknes aneirisma, Aortālā vārstuļa regurgitācija, Bentall tipa operācija, FBN1*

Ievads. Pēc epidemioloģiskajiem datiem Marfāna sindroma incidence ir aptuveni 2-3 gadījumi uz 10000 personām, radot to par vienu no biežāk sastopamajiem viena gēna malformācijas sindromiem (Chen 2016; Judge *et al.* 2005). Aptuveni 25% Marfāna sindroma gadījumu ir sporādiski, kas rodas jaunu mutāciju rezultātā (Judge *et al.* 2005). Šis ir klīniskā gadījuma apskats par 20 gadus veca eiropeīdās rases vīrieti, kurš tika stacionēts dēļ nozīmīgas aortas saknes aneirismas un sekundāras aortālās vārstules regurgitācijas, kas bija radusies Marfāna sindroma rezultātā.

Gadījuma apraksts. 20 gadus vecs eiropeīdās rases vīrietis ar Marfāna sindromu tika hospitalizēts ar sūdzībām par elpas trūkumu fizisku aktivitāšu laikā. Pacients bija 205 cm garš basketbolists ar aortas saknes dilatāciju anamnēzē, taču tas neietekmēja viņa ikdienas aktivitātes. Elpas trūkuma progresēšanas dēļ pacientam tika veikti izmeklējumi, atklājot nozīmīgu aortas saknes dilatāciju (5.2 cm) ar sekundāru aortālās vārstules regurgitāciju (II-III). Balstoties uz radioloģiskajiem un klīniskajiem izmeklējumu rezultātiem, pacientam tika diagnosticēts Marfāna sindroms. Balstoties uz diagnozi un klīnisko ainu, pacientam bija indicēta ķirurģiska iejaukšanās.

Secinājumi. Nozīmīgas aortas saknes aneirismas un sekundāras aortālā vārstuļa regurgitācijas dēļ pacientam tika veikta Bentall tipa operācija, kas sekmējās bez agrīnām vai vēlīnām komplikācijām.

Introduction

Marfan syndrome is a dominant systemic disorder of connective tissue caused by mutations in the extracellular matrix protein fibrillin 1 (FBN1) located on chromosome 15q21.1 (De Backer 2009; Judge *et al.* 2005; Von Kodolitsch *et al.* 2015). It is associated with increased risk of several complications associated with decreased tissue strength. Cardinal manifestations include proximal aortic aneurysm, dislocation of the ocular lens, and long-bone overgrowth (De Backer 2009; Judge *et al.* 2005). Most clinical features are specific to age, and some features may not manifest until relatively late in life, however the mean age of diagnosing Marfan syndrome is 19 years (Chen 2016; Groth *et al.* 2015). Detecting early symptoms of the disease has a high importance in

lowering the chance of life-threatening complications. The main complications associated with cardiovascular system are aortic aneurysms, aortic regurgitation caused by aortic ring dilatation, and aortic dissection, which in case of Marfan syndrome are caused in 6-9 % of all dissections (Erbel *et al.* 2006). Diagnosis was done using the Ghent-2 nosology and a detailed clinical examination (Von Kodolitsch *et al.* 2015).

The aim of this clinical presentation is to report a clinical course of the disease of a 20-year-old patient who underwent Bentall procedure for aortic aneurism and aortic regurgitation, and to show the importance and efficiency of early diagnostics that decrease the chance of developing life-threatening complications.

Case presentation

A 20-year-old Caucasian male who was a basketball player was first seen by a cardiologist during a check up at a sports medical center when he was 16-years-old. At that time patient was diagnosed with mild dilatation of the aortic root (54 mm at the sinus of Valsalva). Patient visited center of cardiology for a check up on the 6th of July, 2015 and on the 27th of January, 2016 he was hospitalized at University allied hospital for an ascending aortic reconstruction. Patient described that the only complaint he had was shortness of breath during physical activities that had developed during the last year. Physical examination revealed him to be 205 cm tall, white man with BMI 25.9. His blood pressure was 160/80 mm of mercury, the pulse was 84 beats per minute, with a regular rhythm. Marfan syndrome was diagnosed using the Ghent-2 nosology in which absence of family history was chosen, although the patient described that his mother has myopia, *pectus carinatum* and aortic aneurysm, she has never been clinically diagnosed with Marfan syndrome that is why absence of family history was chosen (Von Kodolitsch *et al.* 2015). According to the Ghent-2 nosology, to diagnose Marfan syndrome Z-score which shows severity of aortic dilatation had to be ≥ 2 and Systemic score ≥ 7 points (Von Kodolitsch *et al.* 2015). In this case patient's Z-score was 12.69. Characteristic Marfan changes were also present, in which wrist sign was noted, as well as *pectus carinatum*. His fingers were notably long and with increased joint hypermobility, although this was not criteria in the Systemic calculator. He had plain flat foot and thoracic scoliosis with shoulder-blade asymmetry. Skin striae on his left shoulder were noted as well and the patient mentioned he has had severe myopia since age of 9, accordingly Systemic score was 7 points. In years 2013, 2015 and 2016 patient underwent transthoracic and transesophageal echocardiograms during which he was diagnosed with aortic aneurysm and aortic regurgitation. During these years the sinus of Valsalva had a tendency to enlarge and as a result aortic regurgitation had progressed as well (Table 1). In year 2013 patient was diagnosed with mitral valve prolapse which is a very specific sign in Marfan syndrome, but in dynamic it had disappeared and this could have happened

because from year 2015 mild left ventricular hypertrophy had developed which could have caused geometric changes of the heart (Table 1).

Table 1. Echocardiography

	28.06.2013. (TTE)	06.07.2015. (TTE)	27.01.2016. (TEE)
Sinus of Valsalva (mm)	54	58	60
AR	I-II	II-III	II-III
PR	I	I	I
MR	I	0-I	0-I
TR	II	I	I
MV prolapse	6 mm, posterior leaflet	-	-
LV hypertrophy	None	Mild	Mild
EF (%)	-	60	70
EDD (mm)	52	49	54
ESD (mm)	34	37	29

TTE – Transthoracic echocardiography; TEE – Transesophageal echocardiography; AR – Aortic regurgitation; PR – Pulmonic regurgitation; MR – Mitral regurgitation; TR – Tricuspid regurgitation; LV – Left ventricular; EF – Ejection fraction; EDD – End-diastolic diameter; ESD – End-systolic diameter

In 2015 patient underwent computed tomography angiography and it revealed severely dilated bulbus aortae and ascending aortae and slightly hypoplastic aortic arch and fusiform-shaped dilatation of the descending aorta. At the level of sinotubular junction, diameter of the aorta was 5.2x4.5 cm. Putting together all the clinical findings, patient was diagnosed with Marfan syndrome using the Ghent-2 nosology and using echocardiography and computed tomography angiography, severe aortic aneurysm with secondary aortic regurgitation was revealed. According to European Society of Cardiology (ESC) 2014 guidelines, patients diagnosed with Marfan syndrome and maximal aortic diameter ≥50 mm have indications for surgical aortic reconstruction (Erbel *et al.* 2014), therefore on the 28th of January, 2016 patient underwent Bentall procedure. The surgery was performed through mediansternotomy which was followed with vertical pericardiotomy. After occlusion of the ascending aorta cardioplegia and aortotomy was done with resection of the aneurysm and the aortic valve. Coronary arteries were dissected. Replacement of the valve was done using 27 mm carboseal valsalva bileaflet composite graft.

On the 7th post-operative day patient underwent transthoracic echocardiography showing mean pressure gradient of 9 mm of mercury and maximal trans-valvular flow of 1.8 m/s which is a decent valve function. Heart ejection fraction was 60% which is also decent.

Three-month post-hospitalization period underwent with no post-operative complications or other acute events.

Discussion

Considering that Marfan syndrome is a life-threatening disorder associated with cardiovascular involvement, an early diagnosis is important and will provide better overall health for the Marfan syndrome patient (Judge *et al.* 2005). After diagnose of Marfan syndrome, routine echocardiography monitoring of the growth of aortic root is essential to decrease the risk of further development of complications, because the risk for aortic dissection and rupture increases with growth of the aortic diameter, and therefore the dilatation of the aortic root is a highly important prognostic trigger in Marfan syndrome (Judge *et al.* 2005; Von Kodolitsch *et al.* 2015). The rate of growth of the aorta and the absolute size of the aorta should be routinely monitored to define the appropriate time for surgical reconstruction of the aorta (Judge *et al.* 2005). According to ESC 2014 guidelines patients diagnosed with Marfan syndrome have indications for surgical treatment if maximal aortic diameter is ≥50 mm (Erbel *et al.* 2014). In case patients have additional risk factors, including family history of aortic dissection, size increase >3 mm/year, severe aortic regurgitation or desire of pregnancy, a lower threshold of 45 mm can be considered (Erbel *et al.* 2014). Considering that the mean age diagnosing Marfan syndrome is 19 years, all medical specialties should focus on even subtle clinical sings that might indicate possible Marfan syndrome (Judge *et al.* 2005). Early diagnosis should be the goal since life threatening complications are not common in young patients, therefore routine patient monitoring could possibly avoid cases of dissection and sudden death.

Conclusions

Due to severe aortic root aneurysm and secondary aortic regurgitation patient underwent Bentall procedure showing no short- or long-term complications. Early detection of the disease can decrease the chance of life-threatening complication development.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors read and approve the final manuscript.

References

Chen H. 2016. *Genetics of Marfan syndrome.* [skatīts 24.04.2016.] Pieejams (Accessed): http://emedicine.medscape.com/article/946315-overview#a6

De Backer J. 2009. Cardiovascular characteristics in Marfan syndrome and their relation to the genotype. In: *The Belgian Journal of Medicine.* Vol.71(6), pp.335-371.

Erbel R., Aboyans V., Boileau C. *et al*. 2014. ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). In: *European Heart Journal*. Vol.35(41), pp. 2873-2926.
Erbel R., Eggebrecht H. 2006. Aortic dimensions and the risk of dissection. In: *Heart.* Vol.92(1), pp. 137-142.
Groth KA., Hove H., Kyhl K. *et al.* 2015. Prevalence, incidence, and age at diagnosis in Marfan Syndrome. In: *Orphanet Journal of Rare Diseases*. Vol.10, p. 153.
Judge DP., Dietz HC. 2005. Marfan's syndrome. In: *Lancet*. Vol.366(9501), pp. 1965-1976.
Von Kodolitsch Y., De Backer J., Schuler H. *et al.* 2015. Perspectives on the revised Ghent criteria for the diagnosis of Marfan syndrome. In: *Journal of The Application of Clinical Genetics*. Vol.8, pp. 137-155.

PREVALENCE OF ROTATOR CUFF PATHOLOGIES IN AMBULATORY PATIENTS UNDERGOING MRI EXAMINATION IN ONE YEAR PERIOD

Edgars Licis[1], Ardis Platkajis[2]
[1] Riga Stradins University, Dzirciema street 16, Riga, Latvia, LV-1007
edgars.licis@gmail.com
[2] Riga Stradins University Department of Radiology, Hipokrata street 2, Riga, Latvia, LV-1038
ardis.platkajis@rsu.lv

Abstract

Prevalence of rotator cuff pathologies in ambulatory patients undergoing MRI examination in one year period

***Key words**: rotator cuff pathologies, magnetic resonance imaging, prevalence*

Rotator cuff (RC) pathologies are the major cause of the shoulder pain. An exact RC pathology diagnostics is very important to choose a correct therapy. Moreover, magnetic resonance imaging (MRI) is highly accurate diagnostic tool for a full evaluation of the shoulder. This study is a retrospective study of 214 Riga East Clinical University Hospital Diagnostic Radiology Center ambulatory patient shoulder MRI records and images for one-year period from 01.12.2014. till 30.11.2015.

The aim of this study is to analyze a one year period ambulatory patient shoulder MRI examination imaging, results, and differentiate rotator cuff pathologies and clarify prevalence of RC pathologies in different age groups.

There are five most common RC pathologies. Tendinopathies and partial thickness tears were discovered in all age groups, but RC pathologies such as full thickness tears with retractions, full thickness tears without retractions and muscle atrophies and fatty infiltrations occurred only in patients older than 40 years of age.

Prevalence of tendinopathies was high in all age groups and increased by patients' age. Prevalence of partial thickness tears had two peaks: the first peak in patients aged ≤29 years and the second peak in patients aged 60–69 years. The peak prevalence of full thickness tears and muscle atrophies and fatty infiltrations was in patients older than 60 years of age. Overall prevalence of RC pathologies increased with patient age.

Kopsavilkums

Rotatoru manšetes patoloģiju prevalence ambulatoro pacientu vidū, kuriem veikts MR izmeklējums viena gada periodā

***Atslēgvārdi**: rotatoru manšetes patoloģijas, magnētiskās rezonanses izmeklējums, prevalence*

Rotatoru manšetes (RM) patoloģijas ir galvenais cēlonis sāpēm pleca rajonā. Precīza RM patoloģiju diagnostika ir ļoti nozīmīga pareizas terapijas izvēlē. Turklāt magnētiskās rezonanses (MR) izmeklējums ir diagnostiska ierīce ar augstu precīzitāti pilnīgai pleca locītavas izvērtēšanai. Šis pētījums ir retrospektīvs pētījums par Rīgas Austrumu klīniskās universitātes slimnīcas Diagnostiskās radioloģijas centra 214 ambulatoro pacientu veiktajiem pleca locītavas magnētiskās rezonanses (MR) izmeklējumiem viena gada periodā, laika posmā no 01.12.2014. līdz 30.11.2015.

Pētījuma mērķis bija analizēt ambulatoro pacientu pleca locītavas MR izmeklējumu attēlus un rezultātus viena gada periodā, diferencēt RM patoloģijas, un noskaidrot RM patoloģiju prevalenci dažādās vecumu grupās.

Izšķir piecas biežākās RM patoloģijas. Tendinopātijas un cīpslu parciāli plīsumi tika atklāti visās vecumu grupās, bet cīpslu pilna biezuma plīsumi ar retrakciju, bez retrakcijas un muskuļu atrofijas un taukainās infiltrācijas tika atklātas tikai pacientiem vecākiem par 40 gadiem.

Tendinopātiju prevalence bija augsta visās vecuma grupās un paaugstinājās līdz ar pacientu vecumu. Parciālu plīsumu prevalencei bija divi pīķī: pirmais pīķis bija pacientiem ≤29 gadiem un otrais pīķis bija pacientiem 60–69 gadu vecuma grupā. Pīķa prevalence cīpslu pilna biezuma plīsumiem un muskuļu atrofijām un taukainām infiltrācijam bija pacientiem vecākiem par 60 gadiem. RM patoloģiju kopējā prevalence paaugstinājās līdz ar pacientu vecumu.

Introduction

A shoulder pain is the third most common cause of musculoskeletal disorders. Rotator cuff (RC) pathologies are the major cause of the shoulder pain (Bilal 2015). An exact RC pathology diagnostics is highly important to choose a correct therapy. A duly untreated RC damage can cause patient physical incapacity and work disability. The RC pathology diagnostics is based on anamnesis, patient clinical and radiological data. In most cases ultrasonography is used, but in uncertain or complicated cases magnetic resonance imaging (MRI) is used.

The RC comprises the tendinous insertions of four muscles around the humeral head. RC muscles form musculotendinous rotator cuff around the glenohumeral joint (Figure 1). Together, the cuff functions as a mass depressor of the humeral head. The four muscles are: supraspinatus, infraspinatus, teres minor and subscapularis (Agur 2013; Murray 2008).

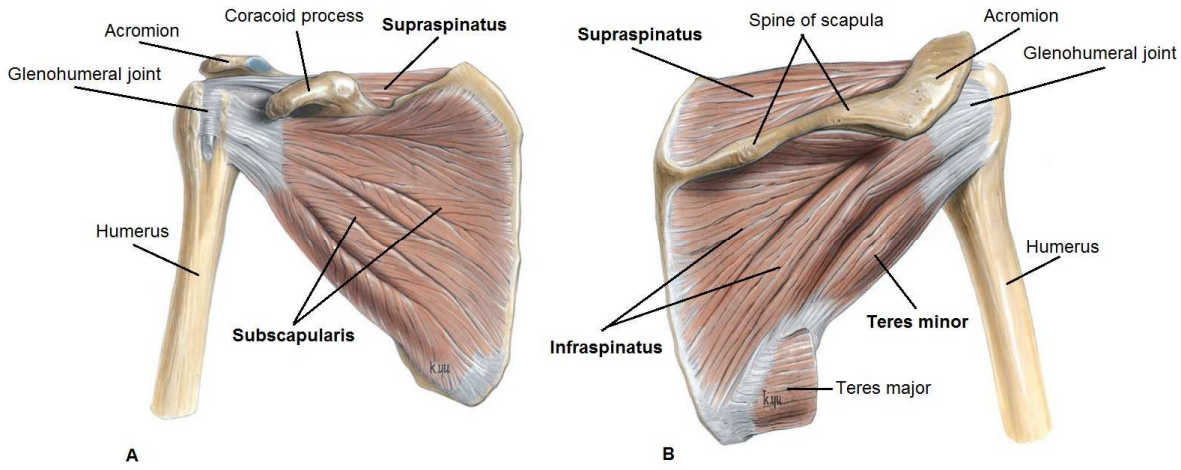


Figure 1. **Rotator cuff anatomy, A – anterior view, B – posterior view** (Agur 2013: 524)

There are five most common RC pathologies: tendinopathy, partial thickness tear, full thickness tear without retraction, full thickness tear with retraction, muscle atrophy and fatty infiltration (Stoller 2004).

Tendinopathy is a broad term that means disease of a tendon and manifests itself as pain in and around tendons. Depending on morphology, tendinopathy is categorized into three subsets: tendinitis, tendinosis and calcific tendonitis. Tendinitis is inflammatory process of tendon. Tendinosis is degeneration of tendon with or without inflammation (Factor 2014). Calcific tendonitis is a self-limiting condition due to deposition of calcium hydroxyapatite within tendons (Muzio 2015).

Partial thickness tear of tendon is an incomplete tear of the rotator cuff when only part of the tendon has torn off the bone. Tendon partial thickness tear can be classified by location (articular, bursal and intratendinous) and the size of the tear (represented as percentage of the tendon thickness torn). If the RC tendons are greater than 50% of tendon thickness torn, then surgical treatment is commonly recommended (Matthewson 2015).

Full thickness tear is condition when the entire tendon has separated from the bone. Tendon full thickness tear can be classified as full thickness tear with or without tendon proximal stump retraction. If there is full thickness tear with retraction, then Patte classification can be used to determine how much proximal stump moved away from distal stump (Weerakkody 2015).

Muscle atrophy and fatty infiltration is condition of the tendon-muscle unit of rotator cuff muscles, characterized by atrophy of muscle fibers, fibrosis, and fatty accumulation within and around the muscles (Osti 2013).

RC pathology is more common after the age of 40 years. The average age of onset is estimated at 55 years. After the age of 60 years, 26% of patients have partial thickness tears, and 28% demonstrate full-thickness tears (Bilal 2015).

In young people (especially throwing athletes, swimmers) RC pathology develop after chronic injuries or glenohumeral joint instability, repetitive stress, and also on torsional forces. And most commonly partial thickness tears are developed (Vanhoenacker 2007). However acute traumatic RC tear is rare, only in 1 – 3% of cases (Murray 2008).

RC pathologies cause in patients after the age of 40 years (average 55 years) are degeneration process in tendons due to chronic overuse and secondary to impingement syndrome. Most commonly tendinopathies are developed, which could progress into tendon partial or full thickness tears due to acute trauma (Stoller 2004; Factor 2014).

RC pathologies in most cases could be managed by non-operative way. But tendon repair is indicated in case of significant partial tearing (>50% of tendon thickness) and full thickness tears (Bilal 2015; Stoller 2004).

If RC tendon repair is not done timely and muscle is not functioning for prolonged time, then irreversible changes are initiated, such as muscle atrophy and fatty infiltration (Matthewson 2015). Increasing muscle atrophy and fatty infiltration stage (50% and more in MRI) is correlated with poorer post-repair return to normal function, thus serving as a possible contraindication for surgical repair (Weerakkody 2015), and patient could develop long-lasting physical incapacity and work disability.

Symptoms in mild and severe RC pathologies are often the same or there are no symptoms. For example, in case of tendinopathy and tendon tear clinical picture is similar – pain over greater tuberosity and deltoid area and inability to sleep on the affected shoulder due to pain (Murray 2008).

Teunis 2014 study results give evidence that RC pathology prevalence is age-related and prevalence is persistently increasing, regardless of symptoms, in the general population and in patients with a dislocated shoulder (Teunis 2014).

MRI is highly accurate diagnostic tool for a full evaluation of the shoulder. MRI allows excellent evaluation of the tendons, muscles, ligaments, capsules, bursa, bone marrow and labrum. It is possible to differentiate most common RC pathologies from simple tendinopathy to full thickness tears, even identify partial thickness tears in MRI (Bilal 2015). Moreover, patient is not subject to radiation exposure during MRI examination, because MRI takes advantage of the

properties of hydrogen protons submitted to a magnetic field and radio frequency waves (Bilal 2015).

With the development of new arthroscopic techniques for treating RC disorders, MRI has played an important role as a noninvasive test for determining which patients may benefit from surgery (Tuite 2015).

According to literature data, MRI has very high sensitivity (84-100%) for RC full thickness tears, however for partial thickness tears sensitivity decreases from greater than 90% in one studies to 17-56% in other studies. For RC full thickness tears MRI specificity range is 77-97% (Tuite 2015).

These pulse sequences are used for evaluation RC condition and differentiation of RC pathologies in MRI: T1 fast spin echo (FSE), T2 FSE, proton density (PD) FSE, fat suppressed (FS) PD FSE, short time inversion recovery (STIR) and gradient echo (GRE) sequences, PD in axial, sagittal, and coronal oblique plains, are acquired in different combinations (Bilal 2015; Stoller 2004).

The aim of this study is to analyze a one year period ambulatory patient shoulder MRI examination imaging, results, and differentiate rotator cuff pathologies and clarify prevalence of RC pathologies in different age groups.

Materials and Methods

This work is a retrospective study of 214 Riga East Clinical University Hospital (RECUH) Diagnostic Radiology Center ambulatory patient shoulder MRI records and images for one year period from 01.12.2014 till 30.11.2015, analysis and summary of information acquired with Microsoft Excel 2010 and IBM SPSS 22 programs. Mean values of the patient age were calculated with standard deviation values according to the format: mean ± SD. Acquired results were correlated with literature data in a discussion part. Overall prevalence of RC pathologies was measured and then a relationship was detected between overall RC pathologies and patient age. Prevalence was measured in five most common RC pathologies: tendinopathies, tendon partial thickness tears, tendon full thickness tears without retraction, tendon full thickness tears with retraction, muscle atrophies and fatty infiltrations. Patients was divided into six age groups: 1) ≤29 years (y); 2) 30–39 y; 3) 40–49 y; 4) 50–59 y; 5) 60–69 y and 6) ≥70 y. Prevalence was expressed as percentage of total shoulder MRI examinations in definite age groups.

Results

In study population men accounted for 44% (n = 94) of patients and women – for 56% (n = 120). The mean age of patients was 53.24 ±14.6 y. Age range was 17–91 y (Figure 2).

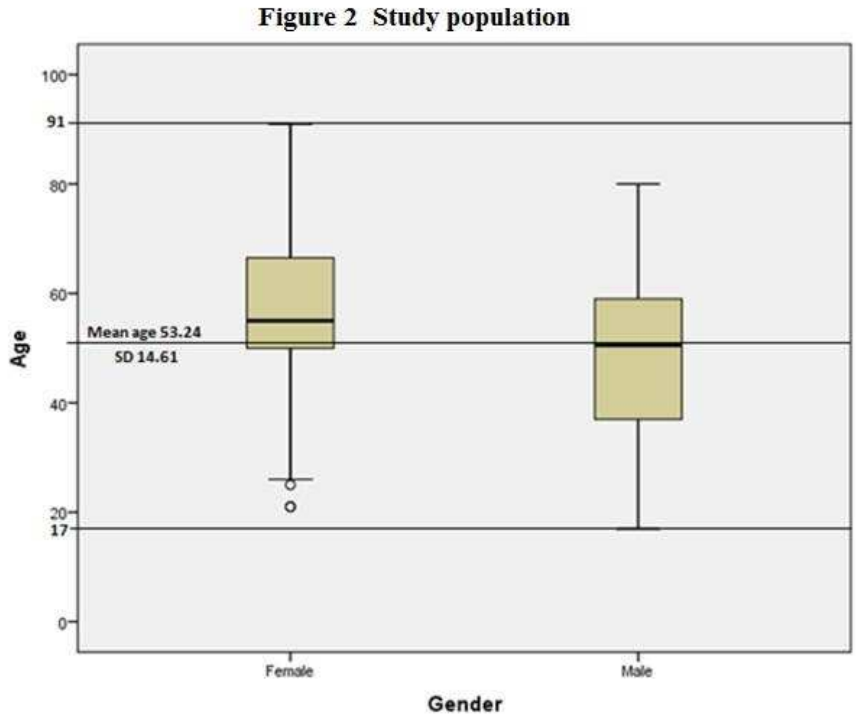


Figure 2. **Study population**

RC pathology was found in 78% (167 of 214) cases of total shoulder MRI examinations in one ear period. Mean age was 56.27 ± 12.86 y, age range was 18–84 y (Figure 3).

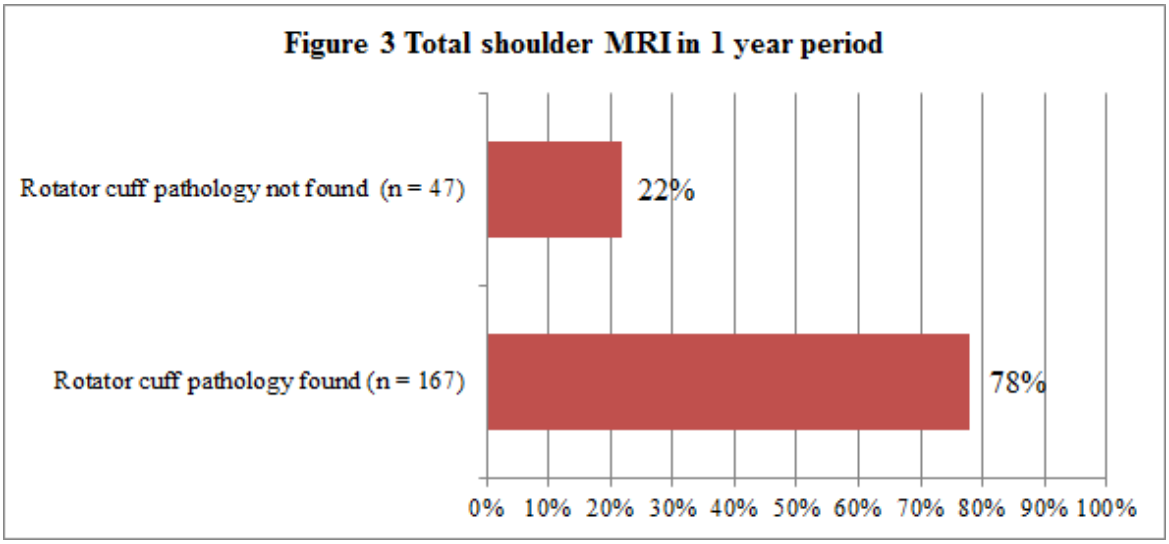


Figure 3. **Total shoulder MRI examinations in one year period**

Figure 4 shows how many MRI examinations were made in definite age group and how many RC pathologies were found in the same definite age groups. According to Figure 4, we can consider that RC pathology count increase by increasing patient age (Figure 4).

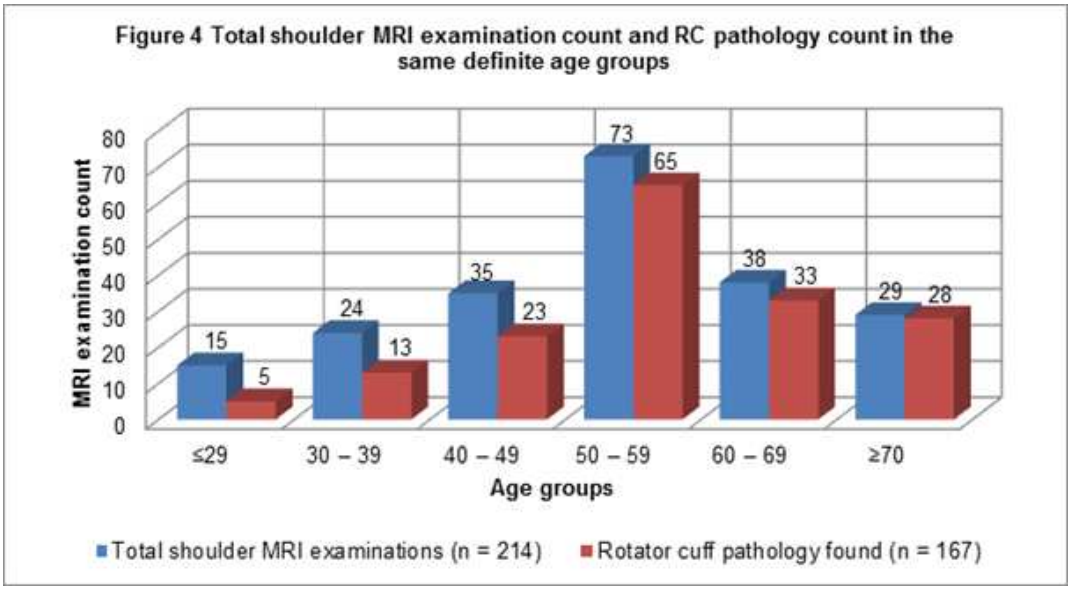


Figure 4. **Total shoulder MRI examination count and RC pathology count in the same definite age groups**

Overall prevalence of RC pathologies increased with age, ranged from 33.33% in patients younger than 29 y and increased to 96.55% in patients older than 70 y ($p < 0.001$ and CI = 0.244-0.517).

Overall prevalence of RC pathologies (Figure 5) in patients aged ≤29 y was 33.33% (5 of 15), in patients aged 30–39 y was 54.17% (13 of 24), in patients aged 40–49 y was 65.71% (23 of 35), in patients aged 50–59 y was 89.04% (65 of 73), in patients aged 60–69 y was 86.84% (33 of 38), but the peak prevalence was in patients aged ≥70 y and was 96.55% (28 of 29).

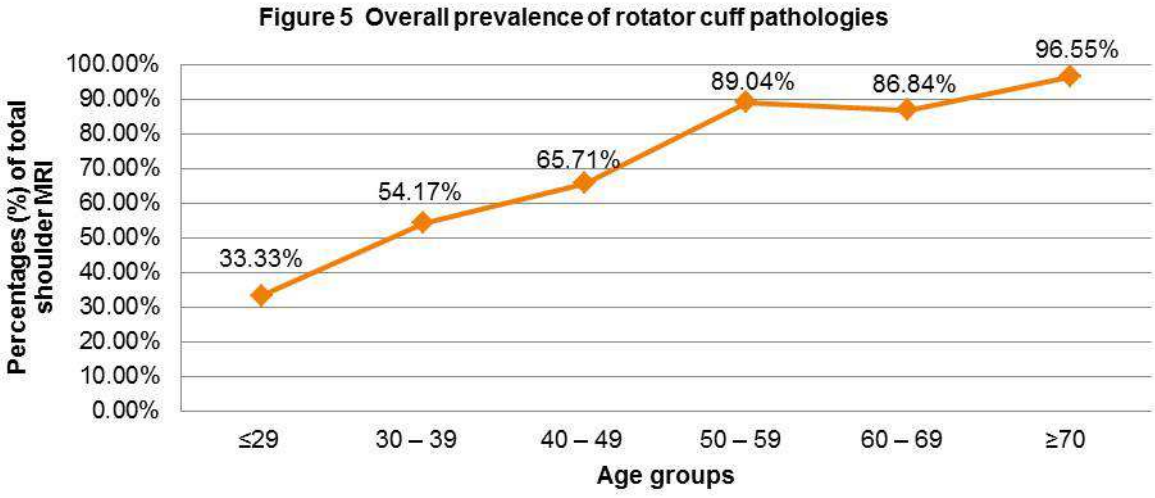


Figure 5. **Overall prevalence of rotator cuff pathologies**

Prevalence of RC tendinopathy (Figure 6) in patients aged ≤29 y was 20% (3 of 15), in patients aged 30–39 y was 50% (12 of 24), in patients aged 40–49 y was 51.43% (18 of 35), in

patients aged 50–59 y was 78.08% (57 of 73), in patients aged 60–69 y was 68.42% (26 of 38), in patients aged ≥70 y was 82.76% (24 of 29).

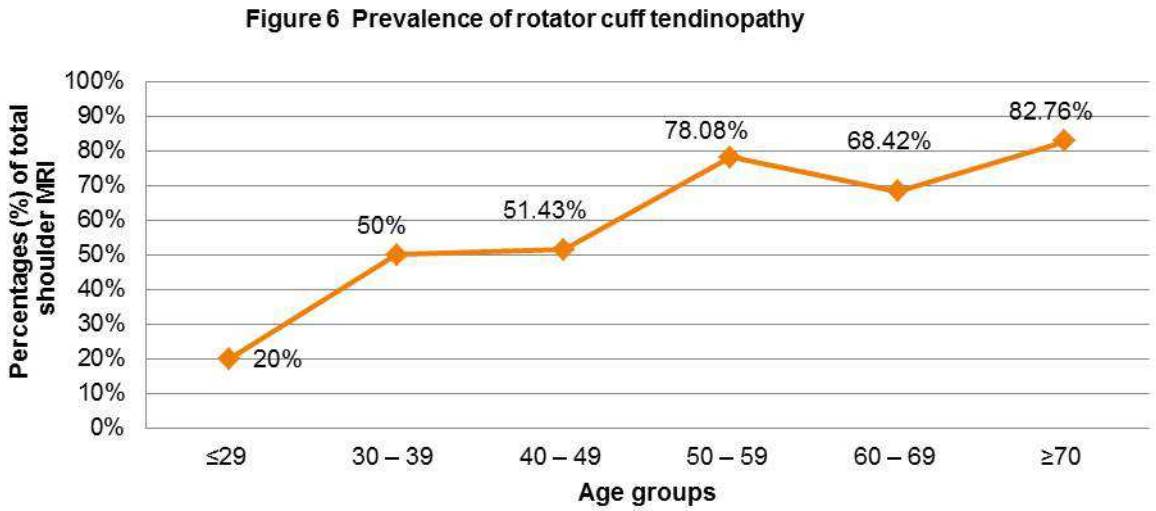


Figure 6. **Prevalence of rotator cuff tendinopathy**

Prevalence of RC partial thickness tear (Figure 8) in patients aged ≤29 y was 13.33% (2 of 15), in patients aged 30–39 y was 4.17% (1 of 24), in patients aged 40–49 y was 14.29% (5 of 35), in patients 50–59 y was 32.88% (24 of 73), in patients aged 60–69 y was 42.11% (16 of 38), in patients aged ≥70 y was 34.48% (10 of 29).

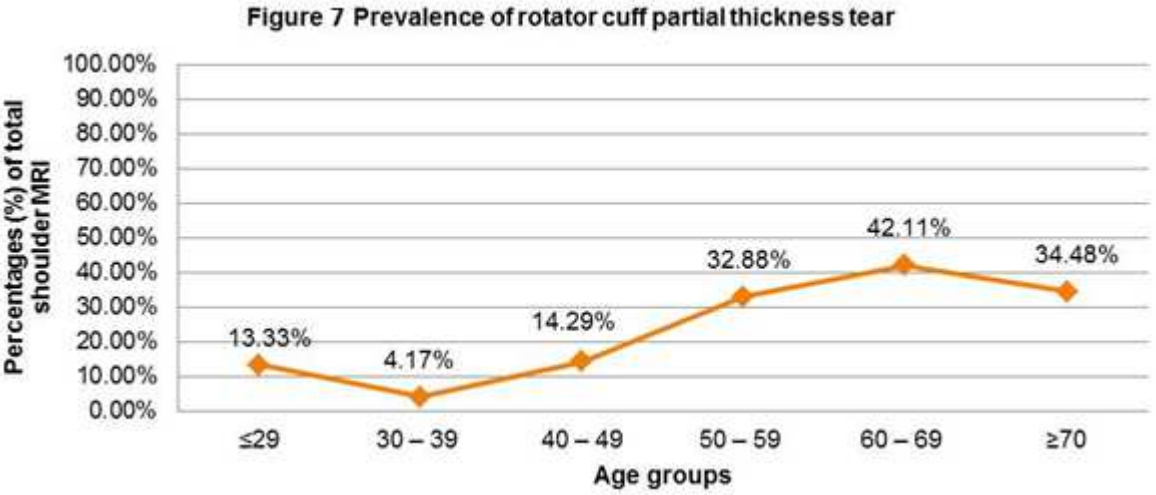


Figure 7. **Prevalence of rotator cuff partial thickness tear**

Prevalence of RC full thickness tear with retraction (Figure 9) in patients aged ≤29 y was 0% (0 of 15), in patients aged 30–39 y was 0% (0 of 24), in patients aged 40–49 y was 5.71% (2 of 35), in patients aged 50–59 y was 0% (0 of 73), in patients aged 60–69 y was 13.16% (5 of 38), in patients aged ≥70 y was 24.14%.

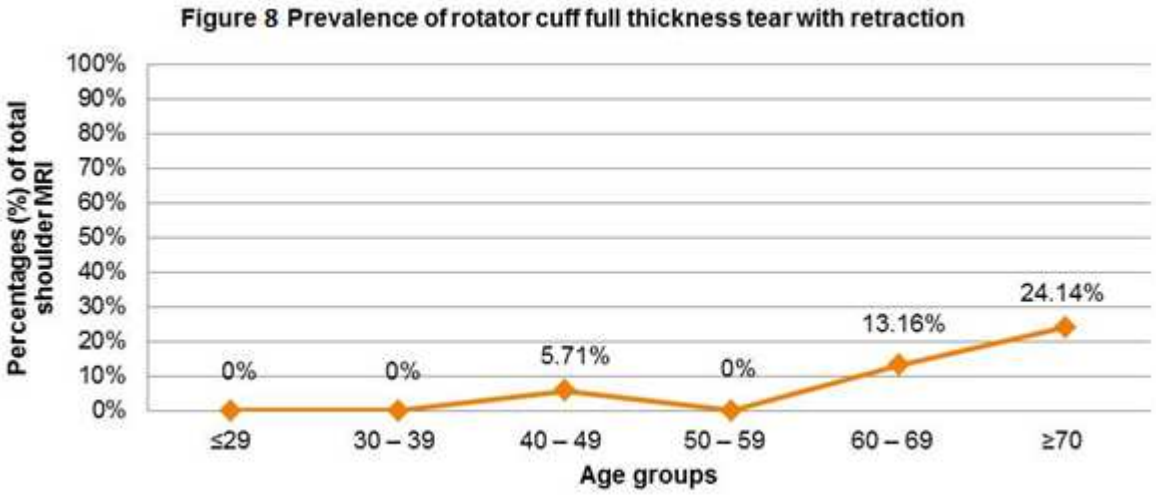


Figure 8. **Prevalence of rotator cuff full thickness tear with retraction**

Prevalence of RC full thickness tear without retraction (Figure 10) in patients aged ≤29 y was 0% (0 of 15), in patients aged 30–39 y was 0% (0 of 24), in patients aged 40–49 y was 2.86% (1 of 35), in patients aged 50–59 y was 2.74% (2 of 73), in patients aged 60–69 y was 26.32% (10 of 38), in patients aged ≥70 y was 10.35% (3 of 29).

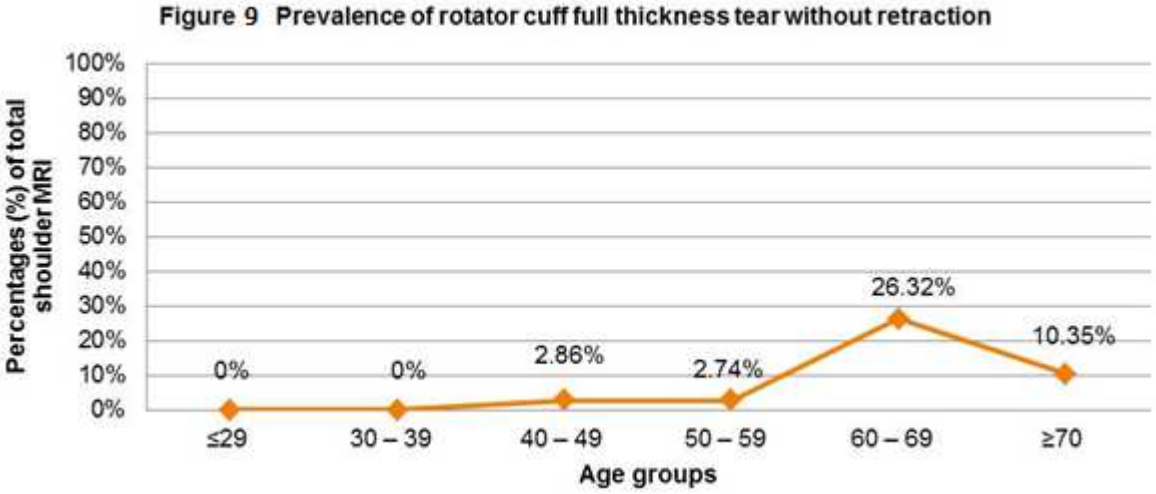


Figure 9. **Prevalence of rotator cuff full thickness tear without retraction**

Prevalence of RC muscle atrophy and fatty infiltration (Figure 11) in patients aged ≤29 y was 0% (0 of 15), in patients aged 30–39 y was 0% (0 of 24), in patients aged 40–49 y was 5.71% (2 of 35), in patients aged 50–59 y was 9.59% (7 of 73), in patients aged 60–69 y was 18.42% (7 of 38) and in patients aged ≥70 y was 41.38% (12 of 29).

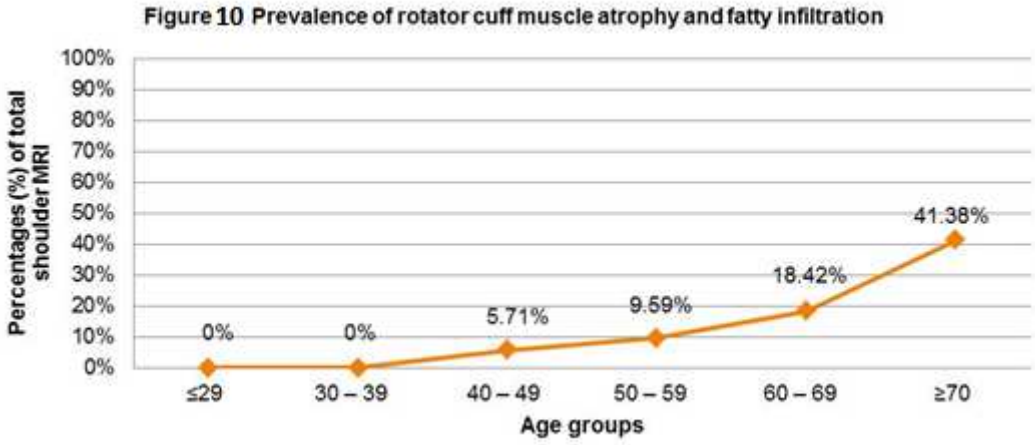


Figure 10. **Prevalence of rotator cuff muscle atrophy and fatty infiltration**

Discussion

RC pathology was found in 78% (167 of 214) cases of total shoulder MRI examinations in one year period. It did not match with Minagawa 2013 study, where RC pathology was found only in 22.1% of study population (147 of 664) (Minagwa 2013). It could be explained with fact that our study population contained symptomatic patients who underwent MRI examinations, but Minagawa 2013 study population was „mass-screening" of both symptomatic and asymptomatic village inhabitants.

In our study overall prevalence of RC pathologies in patients aged ≤29 y was 33.33%, in patients aged 30 – 39 y was 54.17%, in patients aged 40–49 y was 65.71%, in patients aged 50–59 y was 89.04%, in patients aged 60–69 y was 86.84%, in patients aged ≥70 y was 96.55%. But our results only partly matched with Teunis 2014 study, where RC pathology prevalence was relatively lower: overall prevalence in patients aged ≤20 y was 9.7%, in patients aged 20–29 y was 6.9%, in patients aged 30–39 y was 13%, in patients aged 40–49 y was 13%, in patients aged 50–59 y was 19%, in patients aged 60–69 y was 30%, in patients aged 70–79 y was 41%, in patients aged >80 y was 62% (Teunis 2014).

Relationship was found between overall prevalence of RC pathologies with increasing patient age ($p < 0.001$ and CI = 0.244-0.517), and it matches with Teunis 2014 study ($p < 0.001$, CI = 9.6-24) (Teunis 2014).

First RC partial thickness tear peak was in patients aged ≤29 y (13.33%) and it matches with data mentioned in literature. It could be explained with fact that in young age partial thickness tears develop in young athletes with chronic injuries or instability, repetitive stress, and also by torsional forces in throwing athletes (Vanhoenacker 2007). Second RC partial thickness tear peak and full thickness tear peak were in patients older than 60 years of age and it matches with Bilal 2015 study data (Bilal 2015).

Conclusions

Tendinopathies and partial thickness tears were discovered in all age groups. Other RC pathologies such as full thickness tears with retractions, full thickness tears without retractions and muscle atrophies and fatty infiltrations occurred only in patients older than 40 years of age.

Prevalence of tendinopathies was high in all age groups and increased by patients' age. Prevalence of partial thickness tears had two peaks: the first peak in patients aged ≤29 y and the second peak in patients aged 60–69 y. The peak prevalence of full thickness tears and muscle atrophies and fatty infiltrations was in patients older than 60 years of age. Overall prevalence of RC pathologies increased with patient age.

Acknowledgement

The authors would like to acknowledge the RECUH Diagnostic Radiology Center collective for their nice and collegiate attitude.

References

Agur A.M.R., Dalley A.F. 2013. *Grant's Atlas of Anatomy*. Thirteenth Edition. Philadelphia: Wolters Kluwer, pp. 524–525.

Bilal R. H. 2015. *Rotator Cuff Pathology*. *Medscape*. [viewed 29.01.2016] Accessed: http://emedicine.medscape.com/article/1262849-overview#showall

Factor D., Dale B. 2014. *Current concepts of rotator cuff tendinopathy*. *International Journal of Sports Physical Therapy*, 9(2), pp. 274–288.

Matthewson G., Beach C.J., Nelson A.A., et al. 2015. Partial Thickness Rotator Cuff Tears: Current Concepts. In: *Advances in Orthopedics*, 458786.

Minagawa H. et al. 2013. Prevalence of symptomatic and asymptomatic rotator cuff tears in the general population: From mass-screening in one village. In: *Journal of Orthopaedics*, Mar 10(1), pp. 8–12.

Murray J.R.D., Holmes E.J., Misra R.R. 2008. *Musculoskeletal and Trauma Radiology*. Cambridge: Cambridge University Press, pp. 129-132.

Muzio B.D., Datir A. 2015. *Calcific tendinitis. Radiopaedia*. [viewed 26.01.2016] Accessed: http://radiopaedia.org/articles/calcific-tendinitis.

Osti L., Buda M., Buono A.D. 2013. Fatty infiltration of the shoulder: diagnosis and reversibility. *Muscles, Ligaments and Tendons Journal*, Oct-Dec, 3(4), pp. 351–354.

Stoller D.W., Tirman, P.F.J., Bredella M.A. et al. 2004. *Diagnostic imaging, orthopaedics*. Salt Lake City, UT: AMIRSYS, pp. 23-59.

Teunis T., et al. 2014. A systematic review and pooled analysis of the prevalence of rotator cuff disease with increasing age. In: *Journal of Shoulder and Elbow Surgery*, Dec23(12):1913-21.

Tuite M. J. 2015. *Rotator Cuff Injury MRI*. *Medscape*. [viewed 29.01.2016] Accessed: http://emedicine.medscape.com/article/401714-overview#a1.

Vanhoenacker F. M., Maas M., Gielen, J. L. 2007. *Imaging of Orthopedic Sports Injuries*. Springer, pp. 149–167.

Weerakkody Y., Luijkx T., et al. 2015. *Goutallier classification*. *Radiopaedia*. [viewed 02.02.2016]. Accessed: http://radiopaedia.org/articles/goutallier-classification.

Weerakkody Y., Luijkx T. et al. 2015. *Patte classification*. *Radiopaedia*. [viewed 02.02.2016]. Accessed: http://radiopaedia.org/articles/patte-classification.

THE PREVALENCE OF FLATFOOT AND OBESITY AMONG SCHOOL-AGED CHILDREN

Evija Melberga, Inese Jurķāne, Jeļizaveta Tribe, Marija Avota
Rīgas Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1007
evija.melberga@gmail.com, jelizaveta.tribe@gmail.com, inesink@gmail.com

Abstract
Key words: *flatfoot, obesity, school-aged children, podometry, overweight*
Introduction. The foot is an important element of the musculoskeletal system and it's responsible for our mobility and independence. With the increase of body weight increases the weight-bearing pressure on the feet, as a result, causing changes in the footsteps.
Aim. To assess prevalence of flatfoot and obesity among school-aged children.
Material and methods. A prospective study was conducted with children aged 5 - 15 years. A questionnaire and computerized podometric system was used to gather data. The data obtained was processed with MS Excel 2013 program using descriptive statistical methods.
Results. 74 schoolchildren participated in this study, 66.2% (n=49) girls and 33.8% (n=25) boys. The average age was 9.7 ± 2.8 years. Results of the podometry show that 22.97% (n = 17) of children have flatfoot. BMI prevails in 33.78% (n=25) of children who suffer from overweight and obesity. But no linear relationship between obesity and flatfoot was revealed. The prevalence of flatfoot was 28% (n=7) among boys and 20.41% (n=10) among girls. The prevalence of flatfoot decreases significantly with the age: in the group of 5-to-8-year-old children 35.71% (n=10) showed a flatfoot, whereas in the group of 9-to-15-year-old children only 15.21% (n=7).
Conclusions. Childhood obesity is a serious health threat to children, being overweight or obese
contributes to other diseases that limit the quality of life. Podometry is one of the quickest and most effective way to examine the foot.

Kopsavilkums
Atslēgvārdi: *plakanā pēda, aptaukošanās, skolas vecuma bērni, podometrija, palielināta ķermeņa masa*
Ievads. Cilvēka pēda un mugurkauls ir svarīgas balsta un kustību aparāta sastāvdaļas, kam ikdienā jāiztur liela slodze un jānodrošina ķermeņa līdzsvars un kustības. Ar ķermeņa masas pieaugumu palielinās svara nesošais spēks uz pēdām, tā rezultātā radot strukturālas pārmaiņas pēdās.
Mērķis. Novērtēt plakanās pēdas un aptaukošanās izplatību skolas vecuma bērnu vidū.
Materiāli un metodes. Tika veikts prospektīvs pētījums ar bērniem vecumā no 5 - 15 gadiem. Lai iegūtu datus tika izmantota aptaujas anketa un podometrijas izmeklējumi. Iegūtie dati tika apstrādāti ar MS Excel 2013 datorprogrammu, izmantojot aprakstošās statistikas metodes.
Rezultāti. Pētījumā tika iekļauti 74 skolas vecuma bērni, 66,2% (n=49) bija meitenes un 33,8% (n=25) zēni. Vidējais vecums bija 9.7 ± 2.8 gadi.. Podometrijas rezultāti liecina, ka 22,97% (n=17) bērnu ir plakanā pēda. Palielināts ķermeņa masas indekss ir 33,78% (n=25) bērnu, kas cieš no liekās ķermeņa masas un aptaukošanās. Netika atklāta statistiski ticama korelācija starp plakano pēdu un palielinātu ķermeņa masu. Plakanās pēdas izplatība starp zēniem bija 28% (n=7) un starp meitenēm - 20,41% (n=10). Plakanās pēdas izplatība samazinās palielinoties bērna vecumam: 5 - 8 gadus vecu bērnu grupā 35,71% (n=10) ir plakanā pēda, bet vecuma grupā no 9 - 15 gadiem tikai 15,21% (n=7) bērnu.
Secinājumi. Aptaukošanās pieauguma tendence bērnu vecumā ir nopietna sabiedrības veselības problēma, jo palielināta ķermeņa masa veicina citu slimību rašanos, kas ierobežo dzīves kvalitāti. Podometrija ir viens no ātrākajiem un efektīvākajiem veidiem kā izmeklēt pēdas.

Introduction

Children have a very wide range of feet and lower limb development variations, for example, flatfoot, which may be a part of normal child growth and development. (Churgay 1993; Killam 1989). The foot has three arches - two longitudinal arches and one transversal arch. If the arches are not changed, feet's largest support area is on three main points - on the heel and on the base of the I and V metatarsal bone. The foot arches works like shock absorbers which during high load (walking, running, jumping) flatten, thus reducing the impact on the body. (Malgorzata 2010: 150-157).

Abundant subcutaneous fat pad and joint-ligament hypermobility combination determines flatness of infants foot arches. As the child grows, feet's longitudinal arch development occur, therefore asymptomatic flatfoot is considered to be normal part of development until school age. (Fixsen 1998; Staheli 2007).

Flat feet are divided into physiological and pathological groups. Physiological flat feet is flexible and usually is a normal variant. Flexible flatfoot have virtually all infants, the majority of children and around 15% of adults. It is more common in people who walk a lot in shoes, who has increased body weight and those with joint-ligament hypermobility. (Staheli, 2007). With the increase of body weight increases the weight-bearing pressure on the feet, as a result, causing changes in the footsteps. These changes have a negative impact on the medial longitudinal arch functional capabilities, causing the arch hight loss. (Mickle *et al.* 2006).

Studies have shown that children who have walked barefoot a lot, rarely have a flatfoot and foot arches are higher compared to those children who wore narrow shoes. (Temilola *et al.* 2011: 188-192). As well as studies have shown that people with flatfoot often have knee pain, foot injuries and stress fractures. (Omey *et al.* 1999).

Flatfoot is frequently common in childhood, and in the literature its prevalence varies in different studies. (Sullician, 1999: 44-53). Garcia-Rodrigez in 1999 publication writes that prevalence of flatfoot between 4-to-13-year old children is 2.7% (n = 1,181). (García-Rodríguez et al. 1999). In Latvia, Silvija Umbraško after 2005 study concludes that reduced foot longitudinal arches occur in 25-30% of schoolchildren. (Umbraško 2005). Pfeiffer in 2006 study found that children with overweight and obesity are at higher risk to develop flatfoot. (Pfeiffer *et al.* 2006: 634-639).

Rao with co-authors of the study observed that children who wear closed shoes have flatfoot (8.6%) more often than to those who walk without shoes (2.8%). (Rao *et al.* 1992: 525).

Pau with co-authors explored how wearing backpack changes foot pressure distribution in two groups of children - with and without excess body weight. The authors concluded that the pressure distribution on the foot change similar in both groups, but in children with excess body weight pressure on the foot surface was higher. (Pau *et al.* 2015: 634-639).

Overweight and obesity is a serious public health problem in the World Health Organization (WHO) European Region. Most of the disease burden in the European Region are linked directly with the population overweight and obesity, which every year causes more than 1 million deaths and 12 million poor health years of life. Particularly worrying trend is the growth of obesity in children and adolescents. Observe the sustained increase in the prevalence of obesity in children and this figure compared to the 1970s, has increased ten-fold. The epidemic of obesity in adulthood will cause progressive health problems during the next generations. (WHO 2007).

Latvian situation is perhaps not as dramatic as in the US, however, there is a children's overweight population growth trend. According to Sports Medicine State Agency (SMVA) data, in the period from 1997 to 1999, an average of 8.8% of boys were overweight, including obesity. According to the 2001 and 2003rd year, 9% of boys were overweight, including obesity, but in the period from 2004 to 2006, this figure increased to 11.9%. Girls overweight, including obesity, to the above periods, constitute 7.2%, 9.9% and 12.6%. (Selga *et al.* 2008).

Childhood obesity has reached high prevalence in developed countries, but the mechanisms of obesity development is not fully understood, because it has multiple causes. (Dehghan *et al.* 2005).

Material and Methods

Initially we received permission from Riga Primary School No. 7 principal and designed informed consent letter and questionnaire about children's health condition. Their use was approved by the Ethics Committee meeting of the Riga Stradins University.

We sent out total of 127 informed consent letters. After receiving signed parental consent forms, 87 children were included in the study. A questionnaire, where it was possible to indicate several answers, filled out 84 parents. On the day when we performed measurements 10 children were not at school, resulting 74 children were included in the study. Participants made anthropometric measurements (weight, height) with measuring tape and electornic scales, as well as static podometric examination with computerized podometric system *Pad Professional*, that accurately determine foot load changes.

Questionnaires and podometric results were collected and analyzed, and we calculated body mass index. Body mass index was evaluated in accordance with the child's age and gender, according to the World Health Organization BMI percentile value of the distribution tables. Percentile distribution used in this study: <15% - underweight, 15 - 85% - normal body weight 85 - 97% - overweight, > 97% - obesity.

All data were collected and analyzed with MS Excel 2013 and IBM SPSS Statistics 19.0 software programs using descriptive statistical methods (mean, median size and standard deviation).

Results

Of all study participants 66,2% (n = 49) was girls and 33,8% (n = 25) was boys in the age of 5 to 15 years. The average age was 9.7 ± 2.8 years.

In questionaire 78.38% (n=58) denied that their child has ever experienced foot problems. Foot problems in childhood have had 4.05% (n = 3) of children. Currently existing foot problems in the questionnaires noted 17.57% (n = 13) of respondents, the most frequently mentioned was flatfoot.

Feet problems are found in 44.95% (n = 33) of respondents families. 28.38% (n=21) noted that other relatives in their family had flatfoot and 12.16% (n = 9) foot bones deformations. Deformation incidence in siblings was in 4.05% (n = 3) cases.

On a daily basis 50% (n=37) of children wear comfortable sports shoes, 56.76% (n=42) shoes with heel 1-2cm and 12.16% (n=9) choose comfortable shoes with heel 2-4cm. Up to 75.68% (n = 56) of children at home walk without shoes. About a quarter of children are wearing shoes without heels - 28.38% (n = 21), and only 2.70% (n = 2) choose shoes with heel 2-3cm.

Everyday orthopaedic footwear is used by only 5.4% (n = 4) and orthopaedic insoles - by 8.11% (n = 6) of children. 6.76% (n = 5) wear other special shoes. The majority of children on a daily basis is not using any special orthopedic shoes or insoles - 85.14% (n = 63).

When buying children's shoes most of parents try to follow so that they are of good quality and promote proper foot development - 70.27% (n = 52).

Half of children (n = 37) are actively engaged in sports after school, of which the most populars are aerobics - 35.14% (n = 13) and a variety of team sports - 29.72% (n = 11). The average duration of sports activities is 80 minutes a day 2-3 times a week.

Before podometric examination, 16.22% (n = 12) of parents noted in questionnaires that they have noticed visually child’s foot deformations, but only 4 parents had turned to a specialist to do podometric examination. The most common deformities parents had noticed was a flatfoot (n = 8).

Results of the podometry shows that 91.89% (n=68) of children have a hollow foot, overloaded transverse arches - 48.65% (n=36), overloaded heels - 22.97% (n=17), flatfoot - 22.97% (n=17). Asymetric foot weight distribution was observed in 29.73% (n=22) of cases.

The prevalence of flatfoot was 28% (n=7) among boys and 20.41% (n=10) among girls. The prevalence of flatfoot decreases significantly with the age: in the group of 5-to-8-year-old children 35.71% (n=10) showed a flatfoot, whereas in the group of 9-to-15-year-old children only 15.21% (n=7).

Measurements show that 68% (n = 17) boys and 57.14% (n = 28) girls have a normal body weight. Overweight is more common in girls - 26.53% (n = 13), than in boys - 12% (n = 3). Measurments show that 20.27% (n = 15) of children are overweight and 13.51% (n = 10) are obese.

In the age group of 5 to 8 years (n = 36) most of the children have a normal body weight - 72.22% (n = 26). In this age group 13.88% (n = 5) of children are overweight and 8.33% (n = 3) obese. Only 5.55% (n = 2) of children are underweight. In the age group of 9 to 15 years (n = 38) only slightly more than half of children are of normal weight - 52.63% (n = 20). In this age group, 26.32% (n = 10) of children are overweight and 18.42% (n = 7) obese, but only one child is underweight.

Discussion

It is important to choose shoes with good quality and the correct size. Bad shoes can worsen and create new foot problems. Shoes with a filled heel area are recommended. Sole part should be flexible and finger part must be wide, heel must be stable, the preferred height of 2-3 cm. It is important to wear shoes made of breathable material with soft leather or rubber soles with good arch support, as well as to have physical acitvity and maintain a healthy weight. (2015). In this study we found that most parents when buying children's shoes, try to follow up so that they are of good quality and promote proper foot development - 70.27% (n = 52).

Screening of foot problems and it's associated factors helps detect underlying risks influencing the stresses on the foot. Podometry is a quick and effective way to examine the foot and determine foot load changes and deformations, but it is necessary to also assess foot with a dynamic examinations. For example, in children with flat feet it is important to determine whether it is flexible or rigid, which podometry hardware does not determine. Podometrics can be used as an effective screening method for foot load changes, selection of insoles and follow the dynamics of the growing child's foot.

Childhood obesity is a global epidemic, and overweight and obesity rising trends are evident in both developed and developing countries. (Flynn *et al.* 2006: 7-66). In this study we found out that 20.27% (n = 15) of children are overweight and 13.51% (n = 10) are obese. Adolescents which are overweight at the age of 10 to 14 years have a 80% risk to suffer from obesity in adulthood, compared with children under 5 years of age who have a risk of 25%. (Whitaker *et al.* 1997: 869–873). Hoffman and co-authors of the study found that obesity in childhood and adolescence is associated with increased mortality in adulthood. (Hoffmans *et al.* 1988: 749–56).

Wearing inappropriate footwear and lack of attention towards pecularities of child's foot development during it's growth can lead to foot problems. It is important to wear shoes made of breathable material with soft leather or rubber soles with good arch support, as well as to have physical acitvity and maintain a healthy weight.

Screening of foot problems and it's associated factors helps detect underlying risks influencing the stresses on the foot. Podometry is one of the most effective and quickest way to examine the foot.

Conclusions

- Results of the podometry shows that 22.97% (n = 17) of children have a flatfoot.
- Podometry is one of the quickest and most effective way to examine the foot.
- Measurments show that 20.27% (n = 15) of children are overweight and 13.51% (n = 10) are obese.

- Children in the age group of 9-to-15-year-old are more likely to have increased body mass index than in group of 5-to-8-year-old children.

References

AT Latvija. Tehniskās ortopēdijas speciālisti 2015. *Ieteikumi pareizu apavu izvēlei*. [skatīts 21.03.2016.]. Pieejams (Accessed): http://www.labasortozes.lv/lv/noderiga_informacija/raksti/ieteikumi_apavu_izvelei/

Churgay, C. A. 1993. Diagnosis and treatment of pediatric foot deformities. Am Fam Physician, Vol. 47(4), pp. 883-889.

Dehghan, M., Akhtar-Danesh, N., Merchant, A.T. 2005. Childhood obesity, prevalence and prevention. In: Nutrition Journal. Vol. 4.

Fixsen, J. A. 1998. Problem feet in children. In: *Journal of the Royal Society of Medicine*. Vol.91, pp. 18-22.

Flynn, M.A., McNeil, D.A., Maloff, B., Mutasingwa, D., Wu, M., Ford, C., Tough, S.C. 2006. Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations. In: *Obesity Reviews.* Vol.1, pp. 7-66.

García-Rodríguez, A., Martín-Jiménez, F., Carnero-Varo, M., Gómez-Gracia, E., Gómez-Aracena, J., Fernández-Crehuet, J. 1999. Flexible flat feet in children: a real problem? In: *Pediatrics.* 103(6)

Hoffmans, A.F., Kromhout, D., de Lezenne Coulander, C. 1988. The impact of body mass index of 18-year-old Dutch men on 32-year mortality from all causes. In: *Journal of Clinical Epidemiology*, Vol. 41, pp. 749–56.

Killam, P. E. 1989. Orthopedic assesment of young children: developmental variations. In: *Nurse Practitioner*. Vol. 14(7), pp. 27-30, 32-34, 36.

Malgorzata, K. 2010. Distribution of Foot Pressing Forces in a Standing Position of Children and Youth in the Light of Prevention and Correction. In: *Baltic Journal of Health and Physical Activity*, December , pp. 150-157.

Mickle, K.J., Steele, J.R., Munro, B.J. 2006. The feet of overweight and obese young children: Are they flat or fat? Vol. 14(11), pp. 1949-1953.

Omey, M., Micheli, L.J. 1999. Foot and ankle problem in the young athletes. In: *Foot Ankle International*, Vol. 31.

Pau, M., Leban, B., Corona, F., Gioi, S., Nussbaum, M. A. 2015. School-based screening of plantar pressures during level walking with a backpack among overweight and obese schoolchildren. In: *Ergonomics*, Vol. 7, pp. 1-7.

Pfeiffer, M., Kotz, R., Ledl, T., Hauser, G., Sluga, M. 2006. Prevalence of flat foot in preschool-aged children. In: *Pediatrics*, Vol.118(2), pp. 634-639.

Rao, U. B., Joseph, B. 1992. The influence of footwear on the prevalence of flat foot. A survey of 2300 children. In: *The Jouran of Bone and Joint Surgery*. Vol. 74(4), pp. 525-7.

Selga, G., Lāriņš, V., Sauka M. 2008. Liekās ķermeņa masas un aptaukošanās problēma Latvijas skolēniem. In: Doctus. Vol., pp. 20 24.

Staheli, L. T. 2007. Fundamentals of Pediatric Orthopedics. Philadelphia: PA, LWW.

Sullician, J. A. 1999. Pediatric flatfoot: evaluation and management. In: *Journal of the American Academy of Orthopaedic Surgeons.Vol.* 7(1), pp. 44-53.

Temilola, A., Ayoola, A., Abidemi, T., Sunday, A. 2011.Predictive factors for flatfoot: The role of age and footwear in children in urban and rural communities in South West Nigeria. In: *The Foo*. Vol. 21(4), pp. 188-192.

Whitaker, R.C., Wright, J.A., Pepe, M.S. et al. 1997. Predicting obesity in young adulthood from childhood and parental obesity. In: *New England Journal of Medicine*, Vol.337, pp. 869–873

World Health Organization. 2007. „The challenge of obesity in the WHO European Region and the strategies for response." WHO

GENDER, PLACE OF RESIDENCE AND ANXIETY AS FACTORS AFFECTING XENOPHOBIA LEVEL AMONG POPULATION OF LATVIA

Annija Mežmača[1], Laura Bubko[1], Oļegs Plesunovs[2]
[1]Rigas Stradins University, Dzirciema Street 16, Riga, Latvia, LV-1007
annija.mezmaca@gmail.com, bubkolaura@gmail.com
[2]Rigas Stradins University, Department of Psychosomatic Medicine and Psychotherapy, Kapselu Street 23, Riga, Latvia, LV-1046, pmpk@rsu.lv

Abstract

Gender, place of residence and anxiety as factors affecting xenophobia level among population of Latvia

Key words: *Xenophobia, anxiety, gender, residence*

Xenophobia is an irrational fear, hatred and mistrust of foreigners and strangers, mostly in terms of different culture, nationality and race. It is characterized by paranoid suspects of foreigner's evil intentions, which is a type of anxiety. Studies suggest that men are globally more tolerant of immigrants. Also residents of more cosmopolitan regions have lower anti-immigration attitude.

The aim of the study is to determine how gender, place of residence and trait anxiety are affecting level of xenophobia among population of Latvia.

A cross sectional study was conducted among 511 respondents from 18 to 82 years old with mean age 34.2. Respondents were divided into groups based on gender – 29.5% males; 70.5% females; and place of residence – 53% residents of Riga; 47% residents of 22 other cities and 15 districts of Latvia. Xenophobia was measured using 9-item xenophobia scale (score 9 to 54) (Veer, K., *et al.*, 2013), anxiety was measured using The State-Trait Anxiety Inventory (STAI) (score 20 to 80) (Škuškovnika, D, 2004). Statistical data were analyzed using IBM SPSS v.22.

Xenophobia mean ranks between residences: Riga 231.8, other regions 284.3 (Mann-Whitney U test, $p<0.05$). Anxiety mean ranks between residences: $p>0.05$ (Mann-Whitney U test). Xenophobia mean ranks between genders: female 274.0, male 230.6 (Mann-Whitney U test, $p<0.05$). Anxiety mean ranks between genders: female 274.9, male 228.3 (Mann-Whitney U test, $p<0.05$).

Residents of Riga compared to residents of other regions of Latvia have significantly lower xenophobia level. There is no statistically significant difference between level of anxiety in residents of Riga and residents of other regions. Female gender is significant factor linked to higher xenophobia level and higher anxiety level. It can be concluded that higher anxiety can be related to higher xenophobia in terms of gender.

Kopsavilkums

Dzimums, dzīvesvieta un trauksme kā ksenofobijas līmeņa ietekmējoši faktori Latvijas iedzīvotāju vidū

Atslēgvārdi: *Ksenofobija, trauksme, dzimums, dzīvesvieta*

Ksenofobiju var definēt kā iracionālas bailes, naids un neuzticība pret ārzemniekiem un svešiniekiem, visbiežāk attiecībā pret citu kultūru, nacionalitāti un rasi. To var raksturot paranojālas aizdomas pret svešo ļaunajiem nolūkiem, kas ir trauksmes paveids. Pētījumi parāda, ka vīrieši ir vairāk toleranti pret imigrantiem, kā arī iedzīvotāji no kosmopolītiskiem reģioniem ir mazāk negatīvi noskaņoti pret imigrantiem.

Pētījuma mērķis ir noteikt kā dzimums, dzīvesvieta un trauksme kā personības iezīme ir saistīta ar ksenofobijas līmeni Latvijas iedzīvotāju vidū.

Tika veikts šķērsgriezuma pētījums, iekļaujot 511 respondentus vecumā no 18 līdz 82 gadiem ar vidējo vecumu 34.2 gadi. Respondenti tika iedalīti divās grupās balstoties uz dzimumu – 29.5% vīrieši; 70.5% sievietes; un dzīvesvietu – 53% rīdzinieki; 47% iedzīvotāji no 22 citām Latvijas pilsētām un 15 novadiem. Ksenofobija tika mērīta izmantojot 9 apgalvojumu ksenofobijas skalu (9 līdz 54 punkti) (Veer, K., *et al.*, 2013), trauksme tika mērīta izmantojot *The State-Trait Anxiety Inventory (STAI*) (20 līdz 80 punkti) (Škuškovnika, D, 2004). Dati tika analizēti izmantojot *IBM SPSS v.22.*

Ksenofobijas vidējie rangi starp dzīvesvietam: Rīga 231.8, citi reģioni 284.3 *(Mann-Whitney U test, $p<0.05$).* Trauksmes vidējie rangi starp dzīvesvietām: *$p>0.05$ (Mann-Whitney U test).* Ksenofobijas vidējie rangi starp dzimumiem: sievietes 274.0, vīrieši 230.6 *(Mann-Whitney U test, $p<0.05$).* Trauksmes vidējie rangi starp dzimumiem: sievietes 274.9, vīrieši 228.3 *(Mann-Whitney U test, $p<0.05$).*

Rīgas iedzīvotājiem salīdzinot ar citu Latvijas reģionu iedzīvotājiem ir statistiski ticami zemāks ksenofobijas līmenis. Trauksmes rādītajos starp rīdziniekiem un citu Latvijas reģionu iedzīvotājiem nav statistiski ticamas atšķirības. Sievietēm ir statistiski ticami augstāks ksenofobijas un trauksmes līmenis nekā vīriešiem. Līdz ar to var secināt, ka augstāks trauksmes līmenis var būt saistīts ar augstāku ksenofobijas līmeni attiecībā uz dzimumu.

Introduction

Xenophobia may include prejudices, fear, mistrust, hatred, hostility, contempt, disgust and a sense of superiority to the foreign groups, cultures, nations, races (Putnam 2006; Yakushko 2009). It can be characterized by paranoid suspicions against foreigner's evil intentions and will (Utināns 2008).

The current migration crisis in Europe may evoke and increase xenophobic attitude towards immigrants. Studies suggest that men are globally more tolerant of immigrants than women. Other studies suggest that residents of more cosmopolitan regions have lower anti-immigration attitude. It can be connected to theirs more frequent contact with people who have different culture, nationality and race.

From psychodynamic perspective phobia including xenophobia is an anxiety disorder (Gabbard 2005; Utināns 2005). From cognitive behavioral perspective trait anxiety is considered to be relatively stable individual differences in anxiety proneness. Individuals with high trait anxiety are more likely to respond to situations of perceived threat with elevations in state anxiety and evaluate a greater range of stimuli as threatening, have a lower anxiety activation threshold, and feel more intense anxious states (Clark, Beck 2011).

The aim of this study is to determine how gender, place of residence and trait anxiety are affecting levels of xenophobia among Latvian citizens.

Material and Methods

A cross sectional study was conducted in January 2016 among 511 respondents from 18 to 82 years old with mean age 34.2 years old. Selection criteria of respondents were Latvian residents from 18 years old.

Places of residents included 23 cities *(Ainaži, Alūksne, Cēsis, Daugavpils, Ikšķile, Jaunjelgava, Jelgava, Jūrmala, Kandava, Kuldīga, Limbaži, Līvani, Madona, Ogre, Rīga, Salacgrīva, Salaspils, Saldus, Sigulda, Talsi, Tukums, Valmiera, Ventspils)* and 15 districts (*Ādažu, Cēsu, Engures, Inčukalna, Kandavas, Krimuldas, Limbažu, Ogres, Ozolnieku, Pārgaujas, Skrīveru, Tukuma, Tērvetes, Vecpiebalgas, Ventspils)* of Latvia. Questionnaire included such questions as: gender, place of residence, 9-item xenophobia scale, The State-Trait Anxiety Inventory Trait anxiety scale.

Xenophobia was measured using 9-item xenophobia scale (Veer, K., *et al.,* 2013). Cronbach's alpha score is 0.87. The scale includes nine statements and each can be answered with six possible answers. The score of this scale can vary from 9 to 54 points. This scale measures a single aspect of xenophobia, which is the fear that immigrants can cause personal and societal harm (Veer *et al.* 2013).

Trait anxiety was measured using The State-Trait Anxiety Inventory (STAI) (Škuškovnika 2004). Trait anxiety scale. Cronbach's alpha score is 0.86. The scale includes 20 statements and each can be answered with four possible answers. The score of this scale can vary from 20 to 80 points (Škuškovnika 2004).

Statistical data were processed and analyzed using Microsoft Office Excel 2013 and IBM SPSS Statistics 22. Mann-Whitney U test and Kruskal-Wallis test were used in order to assess the differences between the average values and the reliability of these differences in independent groups. The data were considered statistically significant if the significance level was less than 5% ($p < 0.05$). To capture the visual tendencies line graphs were used.

Results

Respondents were divided into groups based on gender – 151 (29.5%) males; 360 (70.5%) females; and place of residence – 271 (53%) residents of Riga; 240 (47%) residents of 22 other cities and 15 districts of Latvia.

Xenophobia mean ranks between residences: Riga 231.8, other regions 284.3 (Mann-Whitney U test, $p<0.05$). Anxiety mean ranks between residences: Riga 244.6, other regions 269.9 (Mann-Whitney U test, $p>0.05$). Differences between mean ranks can be seen in figure 1.

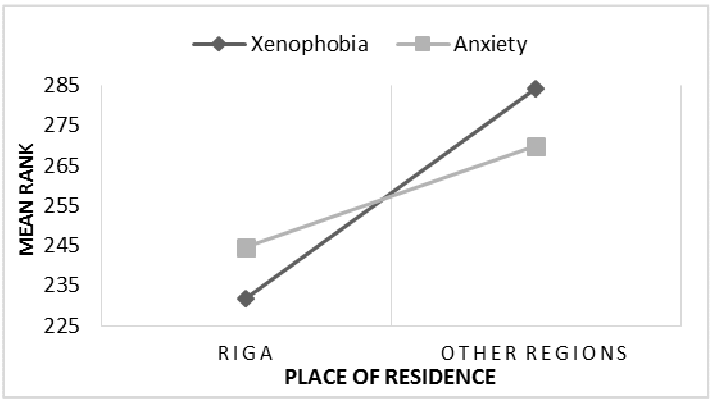


Figure 1. **Mean ranks of xenophobia and anxiety between places of residence**

Xenophobia mean ranks between genders: female 274.0, male 230.6 (Mann-Whitney U test, $p<0.05$). Anxiety mean ranks between genders: female 274.9, male 228.3 (Mann-Whitney U test, $p<0.05$). Differences between mean ranks can be seen in figure 2.

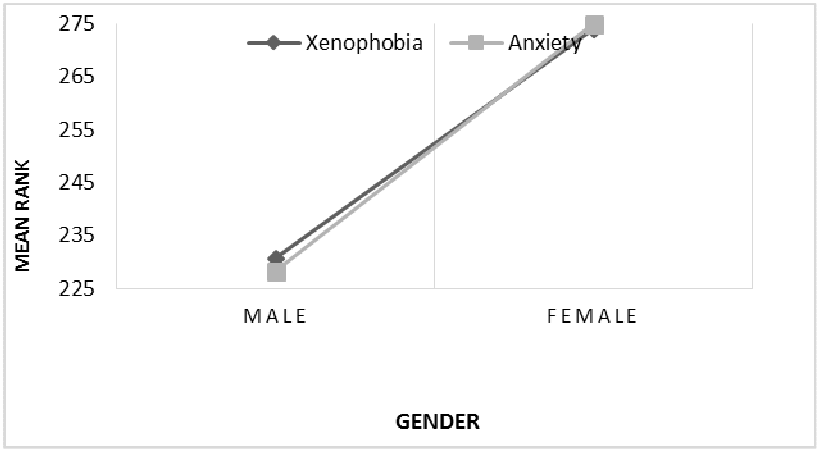


Figure 2. **Mean ranks of xenophobia and anxiety between genders**

Respondents were divided into four research groups: 1. Male from Riga (N=99), 2. Male from other regions (N=52), 3. Female from Riga (N=172), 4. Female from other regions (N=188). Differences between mean ranks can be seen in figure 3.

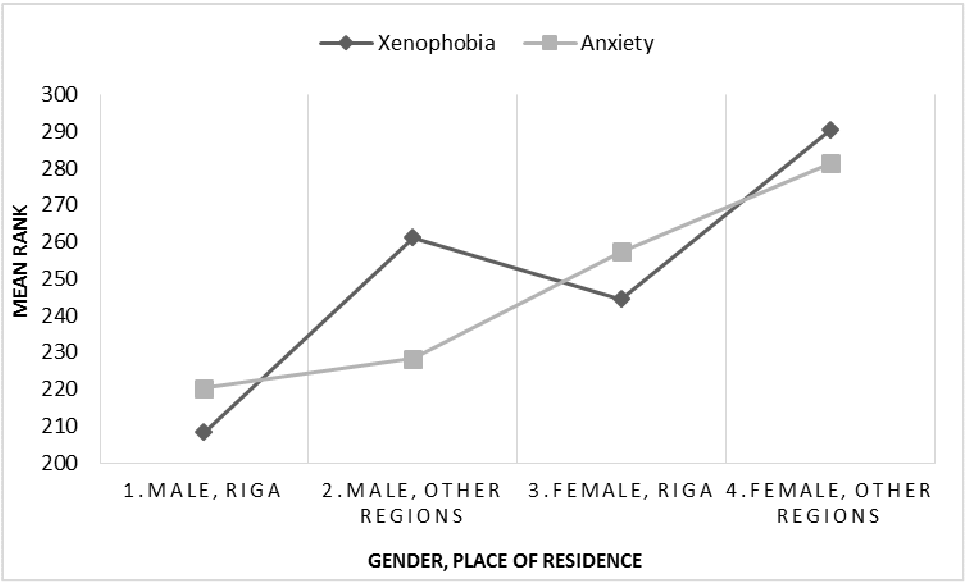


Figure 3. **Mean ranks of xenophobia and anxiety between groups**

Xenophobia mean ranks between research groups: male from Riga 208.23, male from other regions 261.12, female from Riga 244.42, female from other regions 290.33 (Kruskal-Wallis test, $p<0.05$). Anxiety mean ranks between research groups: male from Riga 220.25, male from other regions 228.24, female from Riga 257.29, female from other regions 281.32 (Kruskal-Wallis test, $p<0.05$).

Xenophobia mean rank in group 1 statistically significantly differs from groups 2 and 4. There is a statistically significant difference between groups 3 and 4 (Mann-Whitney U test, $p<0.05$).

Anxiety mean rank in group 1 statistically significantly differs from groups 3 and 4. There is a statistically significant difference between groups 2 and 4 (Mann-Whitney U test, $p<0.05$).

Discussion

Xenophobia level of respondents who live in Riga is statistically significantly lower than of those who live in other regions in Latvia. Level of anxiety is not statistically significantly lower, but there is a visual tendency for it to be lower in respondents who live in Riga than in those who live in other regions of Latvia. It can be linked to the fact that residents of Riga have more experience in contacting with people with different culture, nationality and race. The capital city of Latvia is considered to be more cosmopolitan region than other regions of Latvia. However anxiety level also tend to be lower in respondents who live in Riga. So it cannot be clear if higher level of xenophobia can be linked to the less contact experience with immigrants or persons own trait anxiety level.

Xenophobia level of female is significantly higher than male. These results coincide with previous studies (François, Magni-Berton 2013). Also trait anxiety level of female is significantly higher that male. This suggests that higher level of anxiety can be linked to higher level of xenophobia.

Conclusions

Residents of Riga compared to residents of other regions of Latvia have significantly lower xenophobia level. There is no statistically significant difference between level of anxiety in residents of Riga and residents of other regions. Female gender is significant factor linked to higher xenophobia level and higher anxiety level. It can be concluded that higher anxiety can be related to higher xenophobia in terms of gender.

References

Utināns A. 2005. *Cilvēka psihe. Tās darbība, funkcionēšanas traucējumi un ārstēšanas iespējas*. Rīga: Nacionālais apgāds, 568 lpp.

Utināns A. 2008. *DNS, matrice un cilvēka uzvedība.* Rīga: Medicīnas apgāds, 423 lpp.

Škuškovnika D. 2004. *Spīlbergera trauksmes aptauja* (*The State-Trait Anxiety Inventory /STAI/,* Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

Clark D. A., Beck A. T. 2011. *Cognitive Therapy of Anxiety Disorders. Science and Practice*. New York, NY: Guilford Press, 628 p.

François A., Magni-Berton R. 2013. *Individual Gendered Attitudes toward Immigrants. Evidence from French Survey.* The Social Science Journal, 50: 321-330.

Gabbard G.O. 2005. *Psychodynamic Psychiatry in Clinical Practice. Fourth Edition.* Wasington, DC: American Psychiatric Pub, 629 p.

Putnam R.D. 2007. *E Pluribus Unum: Diversity and Community in the 21st Century: The 2006 Johan Skytte Prize Lecture.* Scandinavian Political Studies 30:137-174.

Veer K., Ommundsen R., Yakushko O., Higler L., Woelders S., Hagen K. 2013. *Psychometrically and qualitatively validating a cross-national cumulative measure of fear-based xenophobia.* Quality & Quantity Vol. 47 Issue 3, p1429.

Yakushko O. 2009. *Xenophobia: understanding the roots and consequences of negative attitudes toward immigrants.* Couns. Psychol.37: 36–66.

COMPLICATIONS IN PRIMARY BILIARY CIRRHOSIS: VARICEAL BLEEDING

Daina Pētersone[1], Zane Straume[1,2], Vita Skuja[1,2], Renija Aleksejeva[1], Brigita Janicka[1], Jurijs Sekretarjovs[1], Anna Proskurina[1], Aleksejs Derovs[1,2]

[1] Rīgas Stradiņa universitāte, Dzirciema street 16, Riga, LV-1007
daina2809@inbox.lv, renijaa@inbox.lv, brigita.janicka@gmail.com, yurij.sekretarjov@gmail.com, anna.proskr@gmail.com

[2] Rīgas Austrumu klīniskā universitātes slimnīca, Hipokrata street 2, Riga, LV-1038
zanestraume@gmail.com, vita@skuja.lv, aleksejs.derovs@gastroenterologs.lv

Abstract

Complications in primary biliary cirrhosis: variceal bleeding

Key words: *primary biliary cirrhosis, complications, gastroesophageal varices, variceal bleeding*

Introduction. The most frequent primary biliary cirrhosis (PBC) complications include portal hypertension features (ascites, gastroesophageal varices (GEV) and variceal bleeding (VB) and hepatic encephalopathy (HE)). The Mayo risk score shows the survival probability of a patient with untreated PBC.

Aim. To analyse PBC complication data in Riga East Clinical University Hospital for patients with confirmed PBC diagnosis and evaluate complication risks using MELD, CTP and Mayo risk score.

Materials and methods. Retrospective medical records study of all PBC patients admitted to Riga East Clinical University Hospital from 2010 to 2015.

Results. 34 patients (33 female and 1 male patient) were admitted 54 times. Statistically significant results were included ($p<0.05$) using Mann-Whitney U test. Patients who presented with more decompensated cirrhosis at the time of PBC diagnosis were diagnosed 3.9 times earlier and were > 65 years old. At the time of hospitalization 44.4% patients had decompensated cirrhosis. 50% of all patients had GEV: 14.7% with VB episodes, 29.4% - ascites, 11.8%- HE, 8.8% - pleural effusion. Patients with VB had 1.8 times higher CTP score and 1.8 times higher Mayo risk score. Patients with HE had 1.4 times higher Mayo risk score than patients without HE.

Conclusions. Older patients (>65 years) had more PBC complications (HE, VB) and were more decompensated at the time of PBC diagnosis. Patients who presented with decompensated cirrhosis were diagnosed earlier. Patients with HE had higher Mayo risk score. Patients with VB in anamnesis had higher CTP and higher Mayo risk score.

Kopsavilkums

Primārās biliārās cirozes komplikācijas: variču asiņošana

***Atslēgvārdi*:** *primārā biliārā ciroze, komplikācijas, gastroezofageālas varices, variču asiņošana*

Ievads. Primārās biliārās cirozes (PBC) biežākās komplikācijas ir portālās hipertensijas sekas: ascīts, gastroezofagālās varices (GEV) ar vai bez asiņošanas (VB), un hepatiskā encefalopātija (HE). *Mayo* riska skala norāda uz izdzīvošanas varbūtību pacientiem ar neārstētu PBC.

Darba mērķis. Analizēt PBC komplikācijas Rīgas Austrumu klīniskās universitātes slimnīcas pacientiem ar pierādītu PBC diagnozi un novērtēt komplikāciju risku ar MELD, CTP un *Mayo* riska skalām.

Materiāli un metodes. Tika apkopoti visu PBC pacientu slimības vēsturu dati, kas stacionēti Rīgas Austrumu klīniskajā universitātes slimnīcā no 2010. līdz 2015. gadam.

Rezultāti. 34 pacienti (33 sievietes un 1 vīrietis) tika stacionēti 54 reizes. Iekļauti tikai statistiski ticami rezultāti ($p<0,05$), izmantojot *Mann-Whitney* U testu. Pacienti ar dekompensētāku cirozi PBC tika diagnosticēta 3,9 reizes ātrāk un vairākums - vecāki par 65 gadiem. Stacionēšanas brīdī 44,4% bija dekompensēta ciroze. Biežākās PBC komplikācijas: GEV - 50% pacientu: 14,7% ar VB anamnēzē, 29,4% - ascīts, 11,8% - HE, 8,8% - izsvīdums pleiras dobumā. Pacientiem ar VB bija 1,8 reizes augstāka CTP skala un 1,8 reizes augstāka *Mayo* riska skala. Pacientiem ar HE noteiktā *Mayo* riska skala bija 1,4 reizes augstāka nekā pacientiem bez HE.

Secinājumi. Pacientiem virs 65 gadiem bija vairāk PBC komplikāciju (HE, VB), un tie bija vairāk dekompensēti PBC diagnosticēšanas brīdī. Pacienti ar dekompensētu cirozi tika diagnosticēti ātrāk. Pacientiem ar HE bija augstāka Mayo riska skala. Pacientiem ar VB anamnēzē bija augstāka CTP un augstāka Mayo skala.

Introduction

Primary biliary cirrhosis (PBC) is a chronic autoimmune inflammatory disease of the liver with a marked female predisposition. PBC is seen in about 100–200 individuals per million. It has an insidious onset and typically affects middle-aged women with a median age of diagnosis of

approximately 50 years (Longo 2011). 5–10% of patients are men (Greenberger 2015). Progressive destruction of intrahepatic bile ducts and cholangiocytes occurs, resulting in chronic cholestasis, portal inflammation and fibrosis that can lead to cirrhosis and, ultimately, to liver failure (Bhandari 2011). PBC disease is characterized by the presence in serum of highly-specific antimitochondrial antibodies (AMAs), which are directed against the E2 subunit of the pyruvate dehydrogenase complex. AMAs are found in up to 95% of patients (Greenberger 2015), and, together with elevated alkaline phosphatase are considered to be gold standard for PBC diagnosis[1]. The disease manifests gradually with symptoms of fatigue, pruritus, upper abdominal discomfort and increased alkaline phosphatase levels on laboratory evaluation. However, more than 50% of patients are asymptomatic at time of diagnosis (Boonstra 2012).

Regardless of the etiology of cirrhosis, the complications and decompensation features are of a little difference (Moreau 2013). Portal hypertension is the most often and significant complicating feature of decompensated cirrhosis. The three primary manifestations of portal hypertension are gastroesophageal varices with risk of hemorrhage, ascites, and hypersplenism. Development of ascites and bleeding from esophagogastric varices signify decompensated cirrhosis. Other features pointing towards decompensation are hepatic encephalopathy (HE), spontaneous bacterial peritonitis (SBP), hepatorenal syndrome. Jaundice, coagulation disorders, and hypoalbuminemia also accompanish decompensated liver cirrhosis and indicate a worse prognosis. Hepatocellular carcinoma is a rare but devastating complication of late stage cirrhosis (Longo 2011).

Ascites is the most common complication of cirrhosis. It only occurs when portal hypertension has developed and is primarily related to an inability to excrete an adequate amount of sodium into urine, leading to a positive sodium balance (EASL 2010).

Bleeding gastroesophageal varices is a potentially life-threatening condition. Over the last decade, it has become common practice to screen known cirrhosis patients with endoscopy to look for esophageal varices (Longo 2011). It is recommended that screening endoscopy for esophageal varices should be performed within 12 months in patients with compensated cirrhosis, and within three months in patients with complicated cirrhosis (Starr 2011). Such screening studies have shown that approximately one-third of patients with histologically confirmed cirrhosis have varices. About one third of patients develop bleeding of varices. The risks of bleeding include the severity of cirrhosis (Longo 2011).

Hepatic encephalopathy (HE) is a brain dysfunction caused by liver insufficiency and/or portosystemic shunting; it manifests as a wide spectrum of neurological or psychiatric abnormalities ranging from subclinical alterations to coma (Grade I – Grade IV) (EASL 2010, AASLD 2014). HE

[1] European Association for the Study of Liver (EASL) Clinical Practice Guidelines. Primary Biliary Cirrhosis: Diagnosis of PBC

arises from gut-derived neurotoxins that are not removed by the liver because of vascular shunting and decreased hepatic mass (Longo 2011). In patients with cirrhosis, fully symptomatic overt HE (OHE) is an event that defines the decompensated phase of the disease, such as variceal bleeding or ascites. The prevalence of OHE at the time of diagnosis of cirrhosis is 10%–14% in general; 16%–21% in those with decompensated cirrhosis, and 10%–50% in patients with transjugular intrahepatic portosystemic shunt (TIPS) (EASL 2010; AASLD 2014).

Hepatorenal syndrome (HRS) is defined as the occurrence of renal failure in a patient with advanced liver disease in the absence of an identifiable cause of renal failure (EASL 2010). HRS occurs in about 10% of patients with advanced cirrhosis or acute liver failure. The pathogenesis includes an increase in renal vascular resistance accompanied by a reduction in systemic vascular resistance (Longo 2011). The diagnosis is one of exclusion of other causes of renal failure. HRS must be differentiated from other known causes of acute kidney injury in cirrhosis: hypovolemia, shock, parenchymal renal diseases, and use of nephrotoxic drugs (EASL 2010).

Hepatocellular carcinoma (HCC) is the most common primary malignancy of the liver. Approximately 70% to 90% of all detected HCC cases occur within an established background of chronic liver disease and cirrhosis of all etiologies. HCC occurs with increased frequency in patients with PBC. The exact frequency is unknown but is estimated to be between 0.7% and 16%. Although HCC screening is widely recommended for patients with cirrhosis, the current practice guidelines for PBC by the AASLD do not include specific recommendations for HCC surveillance (Silveira 2008).

Knowledge of prognosis is of vital importance in the management of patients with PBC, both for planning treatment (particularly for timing liver transplantation) and for counseling patients. The Mayo model is the most widely used prognostic model of PBC to date, as it has been extremely accurate at predicting patient prognosis (Lindor 2009; Prince 2002; Jacob 2008). The highly predictive Mayo risk scale includes: patient age, bilirubin, albumin and prothrombin time, as well as clinical features such as edema and diuretic therapy (Jacob 2008). Model for End-Stage Liver Disease (MELD) and Child-Turcotte-Pugh (CTP) are widely used for predicting end-stage liver disease mortality in cirrhosis patients. CTP formula includes levels of bilirubin, albumin and INR, and assesses presence of clinical features such as ascites and hepatic encephalopathy. MELD score requires only creatinine, bilirubin and INR levels (Kim 2013).

Based on the literature review results, a research was performed to analyse PBC complications in population of Latvia, using data from Riga East Clinical University Hospital – a 6 clinic, 2270-bed medical center, from 2010 to 2015.

Aim of this study

To analyse PBC complication data in Riga East Clinical University Hospital for patients with confirmed PBC diagnosis, and evaluate complication risks using MELD, CTP and Mayo risk score.

Materials and Methods

Retrospective clinical records review study of all PBC patients admitted to Riga East Clinical University Hospital. The study included adult patients hospitalized with a diagnosis of PBC for the period from 1 January 2010 till 31 December 2015. The study method was quantitative research questionnaires. An originally created study protocol, containing more than 35 parameters, was completed for each patient. Protocol includes demographic data - age, sex, frequency of hospitalization, etc., laboratory analyzes and the results of examinations, including US, CT, ascites puncture, esophagoscopy etc., objective examination and medical history data, including history of bleeding episodes, subjective complaints, etc. Protocols have been approved by RSU Ethics Committee and by Riga East Clinical University Ethics Committee. MELD, CTP and Mayo risk scores were used for risk predicting. Mayo risk score is created for assessing prognosis particularly in PBC patients. CTP is used for liver cirrhosis patients; it shows prognosis and survival. Each patient information was obtained from medical documentation; data was entered MS Excel database using study protocol with consecutive statistical analysis using IBM SPSS 20.0.

Results

34 patients, 33 (97%) female and 1 (3%) male patient, were admitted 54 times. During the time of five years, hospitalization rates were growing each year, mostly due to new cases of PBC diagnosis. Mean age of patients was 60.97 ± 10.4 years. Mean duration of hospital stay was 6 ± 5.4 days. At the time of PBC confirmation 5 (11.7%) patients had decompensated cirrhosis. Older (>65 years) PBC patients were more decompensated at the time of PBC diagnosis ($U = 217.5$, $z = -2.015$, $p = 0.044$, $r = 0.27$). At the time of hospitalization 24 (44.4%) patients had decompensated cirrhosis (Table 1). Positive, statistically significant statistical correlation was found between MELD score and time required for PBC diagnosis: patients who presented with decompensated cirrhosis were diagnosed 3.9 times earlier comparing to the patients who were compensated at the time of PBC diagnosis confirmation ($U = 218$, $z = -2.006$, $p=0.045$, $r = 0.28$). Ascites ($U = 113.5$, $z = -2.593$, $p = 0.01$, $r=0.35$), hepatic encephalopathy (HE) ($U = 69$, $z = -2.070$, $p = 0.038$, $r =0.28$), variceal bleeding ($U = 4$, $z = -3.094$, $p = 0.002$, $r=0.69$) and anaemia ($U = 202.5$, $z = -2.702$, $p = 0.007$, $r=0.36$) was more frequently found in older (>65 years) patients. Ascites was observed in 16 (29.4%) of all hospitalization cases, pleural effusion in 4 (7.4%) cases, hepatic encephalopathy (HE) in 6 (11.1%) cases: 5 (9.2%) – stage I, 1 (1.8%) – stage II. Ascites was treated in 9 (56.2%) of cases with diuretic therapy, and in 4 (25%) of cases with albumin transfusion, always combined with diuretic therapy. All patients with pleural effusion were treated with diuretics. In all cases, HE

presented with mental status, mood and behaviour changes, and in one case flapping tremor was observed. In 2 (33.3%) cases HE was treated by isolated trigger factor correction, in 3 (50%) – trigger factor correction and lactulose, and 1 (16.7%) case was not treated (the only case with Grade II HE). Patients with HE had 1.4 times higher Mayo risk score than patients without HE (U = 21, z = -1.975, p = 0.048, r=0.35). Esophagogastroduodenoscopy (EGDS) was performed in 24 (70.6%) of patients. Gastroesophageal varices (GEV) were found in 17 (50%) of all patients. 3 (17.7%) have had one variceal bleeding (VB) episode, 1 (5.9%) – two VB episodes and 1 (5.9%) – five VB episodes in anamnesis. Statistically significant difference was found in CTP score levels and Mayo risk score levels between patients with and without VB in anamnesis. Patients with VB had 1.8 times higher CTP score (U = 0, z = -2.449, p = 0.014, r=0.87) and 1.8 times higher Mayo risk score (U = 4, z = -2.843, p = 0.013, r=0.79). None of the patients had hepatorenal or hepatopulmonary syndrome.

Table 1. **Characteristics of patients in compensated and decompensated cirrhosis state**

Parameters	Compensated state (n=30)	Decompensated state (n=24)	p value
Age *	60,07 ±9,10 n=30	69,75 ±11,17 n=24	,002
Age of suspicion *	54,81 ±11,30 n=27	64,83 ±13,65 n=24	,007
Age of diagnosis *	58,74 ±9,47 n=27	65,96 ±14,04 n=24	,044
MELD score †	9,00 (7,00-12,00) n=18	11,00 (8,50-12,50) n=23	,125
CTP score †	5,00 (5,00-7,00) n=8	9,00 (9,00-10,00) n=12	,001
Mayo risk score †	4,00 (3,00-5,00) n=15	7,00 (5,50-8,00) n=16	,000

* - Mean value with standard deviation

† - Median with interquartile range (IQR)

Discussion

In our study, a small number of patients in one clinical centre was analysed, thus no conclusion about disease incidence and prevalence can be made. Further investigations with greater number of patients are needed. Working with medical documentation, it was observed that medical records were incomplete, previous history was uncertain and many information missing. Primary biliary cirrhosis diagnostics, treatment and complication prophylaxis often was not conducted according to guidelines.

Cirrhosis patient management guidelines recommend that screening endoscopy for esophageal varices should be performed within 12 months in patients with compensated cirrhosis, and within three months in patients with complicated cirrhosis (Starr 2011). In our study almost one third patients have never been screened for varices. Still, GEV were found in 50% of all patients. It means 70% of all endoscopically screened patients in comparison to literature data – 30-50% (Levy 2007; Longo 2011). Possible explanation would be that many patients, especially elderly, where diagnosed on a late decompensated stage of the disease. Average age of our patients was 61 years, in comparison with average age of patients form other research data – 54-58 years (Kim 2016; Levy 2007; Xu 2016). Furthermore, in our study average Mayo risk score in patients with endoscopically proved esophageal varices was 5 points, when score > 4.5 points is associated with increased risk for development and bleeding of varices (Levy 2007).

Mayo score is very highly predictive for worse prognosis (AASLD 2009; Jacob 2008; Levy 2007; Prince 2002). As our study shows, Mayo risk score is higher in patients with other independent risk indicators such as hepatic encephalopathy and variceal bleeding, which corresponds with literature data.

Conclusions

1. Older patients (>65 years) had more PBC complications (ascites, hepatic encefalopathy, variceal bleeding, anaemia) and were more decompensated at the time of PBC diagnosis.
2. Patients who presented with decompensated cirrhosis were diagnosed earlier.
3. Patients with hepatic encephalopathy had higher Mayo risk score.
4. Patients with variceal bleeding in anamnesis had higher CTP and higher Mayo risk score.

Acknowledgements

The present study was carried out in Riga East Clinical University Hospital, Gastroenterology, Hepatology and Nutrition clinic.

References

Bhandari B.M., Bayat H., Rothstein K.D. 2011. Primary Biliary Cirrhosis. In: *Gastroenterology Clinics of North America*, Vol. 40 (2), pp. 373-386.

Boonstra K., Beuers U., Ponsioen C.Y. 2012. Epidemiology of primary sclerosing cholangitis and primary biliary cirrhosis: a systematic review. In: *Journal of Hepatology*, Vol. 56 (5), pp. 1181–1188.

European Association for the Study of the Liver. 2010. Clinical practice guidelines on the management of ascites, spontaneous bacterial peritonitis, and hepatorenal syndrome in cirrhosis. In: *Journal of Hepatology*, Vol. 53 (3), pp. 397–417.

Greenberger N.J., Blumberg R.S., Burakoff R. 2015. *CURRENT Diagnosis & Treatment: Gastroenterology, Hepatology, & Endoscopy, 3rd Ed*. McGraw Hill Education. Chapter 52: Primary Biliary Cirrhosis.

Jacob D.A., Bahra M., Schmidt S.C. et. al. 2008. Mayo risk score for primary biliary cirrhosis: A useful tool for the prediction of course after liver transplantation? In: *Annals of Transplantation,* Vol. 13 (3), pp. 35-42.
Kim H.J., Lee H.W. 2013. Important predictor of mortality in patients with end-stage liver disease. In: *Clinical and Molecular Hepatology,* Vol. 19 (2), pp. 105–115.
Lindor K.D., Gershwin M.E. et. al., 2009. Primary Biliary Cirrhosis. AASLD Practice Guidelines. In: *Hepatology,* Vol. 50, (1), pp. 292-293.
Longo D.L., Fauci A.S., Kasper D.L. et. al. 2011. *Harrison's Principles of Internal Medicine, 18th edition*. USA, McGraw-Hill Professional Publishing, Chapter 308.
Moreau R., Jalan R., Gines P. et. al. 2013. Acute-on-Chronic Liver Failure Is a Distinct Syndrome That Develops in Patients With Acute Decompensation of Cirrhosis. In: *Gastroenterology,* Vol. 144 (7), pp. 1426-1437.
Practice Guideline by the European Association for the Study of the Liver and the American Association for the Study of Liver Diseases: Hepatic Encephalopathy in Chronic Liver Disease 2014. In: *Journal of Hepatology*, Vol. 61 (3).
Prince M., Hetwynd A., Newman W. et. al. 2002. Survival and Symptom Progression in a Geographically Based Cohort of Patients with Primary Biliary Cirrhosis: Follow-up for Up to 28 Years. In: *Gastroenterology*, Vol. 123 (4), pp. 1044-1051.
Silveira M.G., Suzuki A., Lindor K.D. 2008. Surveillance for Hepatocellular Carcinoma in Patients with Primary Biliary Cirrhosis. In: *Hepatology*, Vol. 48 (4), pp. 1149–1156.
Starr S.P., Raines D. 2011. Cirrhosis: Diagnosis, Management, and Prevention. In: *American Family Physician*, Vol. 84 (12), pp. 1353-1359.
Levy C., Zein C.O., Gomez J. 2007. Prevalence and predictors of esophageal varices in patients with primary biliary cirrhosis. In: Clinical Gastroenterology and Hepatology, Vol. 5 (7)
54 – Xu P., Li L., Li G. 2016. Natural history of primary biliary cirrhosis. In: Turkish Journal of Gastroenterology, Vol. 27. P. 345.
57 – Kim K.A., Ki M., Choi H.Y. 2016. Population-based epidemiology of primary biliary cirrhosis in South Korea. In: Alimentary pharmacology & therapeutics. Vol. 43(1).

ASA SCORE AND SHORT TERM RESULTS IN COLORECTAL CANCER SURGERY

Roberts Rumba[1], Andrejs Vanags[1], Ilze Strumfa[1], Maris Pavars[2], Sergejs Lebedjkovs[2]
1Rīga Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1007
2 Pauls Stradins Clinical University Hospital, Pilsoņu str.13, Riga, Latvia, LV-1002
Roberts_Rumba@live.com

Abstract

ASA score and short term results in colorectal cancer surgery

Key words: *ASA score, colorectal cancer, surgery, short term results*

Introduction. American Society of Anesthesiologists (ASA) score is a simple tool for preoperative evaluation of surgical patients. It was introduced in 1963 and has been widely used and studied since then. Research suggest association between ASA score and several perioperative parameters. However, there is considerable inconsistency in patient evaluation between anesthesiologists, therefore the practical value of ASA score is questionable.

Aim. The aim of this study is to compare short-term outcomes of surgically treated colorectal cancer patients by ASA score.

Materials and methods. A retrospective analysis of 119 patients with colorectal cancer (CRC) treated at a university hospital was performed. Patients were divided in two groups – ASA 1-2 (n=78) vs ASA 3 or higher (n=41). Demographic data (age, gender) and perioperative measures (operative time, postoperative complications and hospital stay) were compared between the two groups. Statistical analysis was performed using SPSS version 23; differences were considered significant if $p<0.05$.

Results. Patient age (p=0.75) and gender (p=0.57) did not differ between the two groups. There were no statistically significant differences between ASA 1-2 and ASA 3 or higher groups with respect to operative time (median, 130 min [interquartile range (IQR) 110-165] vs 140 min [IQR 110-180]; p=0.69). Complication rate showed no significant differences and was 10.4% in ASA 1-2 group and 14.6% in ASA 3 or higher group (p=0.56). Hospital stay also did not vary significantly (median, 9 days [IQR 7-11] in both groups; p=0.90).

Conclusion. Higher ASA score was not associated with worse short-term results in CRC surgery patients in particular institution, contrary to findings in several studies on this topic. Misinterpretation of ASA score by anesthesiologists is the most likely cause, indicating a need for further evaluation of interrater reliability and practical value of this assessment tool.

Kopsavilkums

AAS skalas saistība ar īstermiņa rezultātiem kolorektālā vēža ķirurģiskā ārstēšanā

Atslēgas vārdi: *AAS skala, kolorektālais vēzis, ķirurģiskā ārstēšana, īstermiņa rezultāti*

Ievads. Amerikas Anesteziologu savienības (AAS) klasifikācija ir vienkārši lietojams līdzeklis pacientu novērtēšanai pirms operācijas. Tā tika ieviesta 1963. gadā, un kopš tā laika ir gan plaši lietota, gan rūpīgi pētīta visā pasaulē. Pētījumi norāda uz AAS skalas saistību ar vairākiem būtiskiem perioperatīviem raksturlielumiem. Tomēr anesteziologu starpā pastāv ievērojamas atšķirības pacientu pirmsoperācijas novērtēšanā un AAS skalas interpretācijā, kas liek apšaubīt tās praktisko nozīmi.

Mērķis. Pētījuma mērķis bija salīdzināt īstermiņa rezultātus ķirurģiski ārstētiem kolorektāla vēža pacientiem ar atšķirīgiem AAS klasifikācijas rādītājiem.

Materiāli un metodes. Tika veikta retrospektīva pacientu vēsturēs esošo datu analīze 119 pacientiem ar kolorektālo vēzi, kuri operēti universitātes slimnīcā. Pacienti tika iedalīti divās grupās – AAS klase 1-2 (n=78) un AAS klase ≥ 3 (n=41). Demogrāfiskie dati (vecums, dzimums) un perioperatīvie raksturlielumi (operācijas ilgums, pēcoperācijas komplikācijas un hospitalizācijas ilgums) tika salīdzināti starp abām grupām. Datu statistiskai analīzei tika izmantota SPSS 23 programma, atšķirības starp grupām tika pieņemtas par statistiski ticamām, ja $p<0,05$.

Rezultāti. Pacientu vecums (p=0,75) un dzimums (p=0,57) abās grupās neatšķīrās. Operācijas ilgums starp AAS 1-2 un AAS ≥ 3 grupām statistiski ticami neatšķīrās (mediāna, 130 min [starpkvartiļu intervāls (SKI) 110-165] *vs* 140 min [SKI 110-180]; p=0,69). Pēcoperācijas komplikācijas konstatēja 10,4% pacientu AAS 1-2 grupā un 14,6% pacientu AAS ≥ 3 grupā, un atšķirības nebija statistiski ticamas (p=0,56). Arī hospitalizācijas ilgums būtiski neatšķīrās (mediāna, 9 dienas [SKI 7-11] abās grupās; p=0,90).

Secinājumi. Pretēji vairākās publikācijās minētiem secinājumiem, augstāki AAS skalas rādītāji nebija saistīti ar sliktākiem īstermiņa rezultātiem pacientiem ar kolorektālo vēzi, kuri tika operēti konkrētajā klīnikā. Ticamākais iemesls ir kļūdaina anesteziologu veiktā pacientu novērtēšana un klasifikācijas interpretācija. Tas norāda uz nepieciešamību smalkāk analizēt un salīdzināt vairāku anesteziologu veikto pacientu novērtējumu un dalījumu AAS klasēs, kas ļautu spriest par šīs skalas praktisko nozīmi.

Introduction

American Society of Anesthesiologists (ASA) physical status classification system was introduced in 1963 in an effort to stratify patients according to their overall health status before surgery. This would allow predicting the risk of general anesthesia and assisting in preoperative planning, intraoperative monitoring and postoperative care leading to better outcomes. It has to be noted that this classification is based on subjective assessment of patient's general physical status (Daabis 2011).

In the original version, all patients were classified as being ASA I-V according to their overall health (Leung *et al*. 2011):

I – Normal healthy patient;

II – Patient having mild systemic disease that does not limit activity;

III – Patient with severe systemic disease and limitation of activity but without incapacitation;

IV – Patients with incapacitating systemic disease which is a constant threat to life;

V – Moribund patients who are not expected to survive 24 hours with or without surgery.

However, several changes have been made and the latest version of this classification was approved by the ASA House of Delegates on October 15th, 2014. In this variant, class V patients are defined as moribund who are not expected to survive without operation (*versus* with or without operation). There is also a class VI – declared brain dead patient whose organs are being removed for donation. Prefix "E" denotes emergency surgery (Sankar *et al*. 2014).

Colorectal cancer is the second most common cancer in Europe both by incidence and cancer related death rates (Ferlay *et al*. 2013). Surgery is currently the only potentially curative treatment. Vast majority of the patients who develop colorectal cancer and undergo surgery for this reason are in the sixth to seventh decade of their lives. Age is also a factor that influences survival, with worse 5-year relative survival documented in elderly patients (Holleczek *et al*. 2015). The risk of any adverse outcomes in senior patients is increased if ASA score is 3 or higher (Kirchhoff *et al*. 2010). Due to these factors, ASA class determination is an essential tool in preoperative evaluation of the patient, because, although age *per se* might not determine outcome, most people have some degree of health impairment by the time they reach the aforementioned age.

Aside from being used by anesthesiologists in preoperative setting, ASA class is also useful for policy making, evaluation of performance in audits, decision making regarding resource allocation and patient comparison in clinical research (Daabis 2011). Therefore, it is necessary to determine if ASA class correlates with short-term results after surgery for colorectal cancer patients, before we can draw conclusions that could improve perioperative care.

Materials and methods

A retrospective analysis of medical records from 119 patients with colorectal cancer treated at a university hospital from 2013-2016 was performed. All procedures were performed by two surgeons with vast experience in colorectal surgery. Both open and laparoscopic procedures were included. Patients were divided in two groups – ASA 1-2 (n=78) vs ASA 3 or higher (n=41). Demographic data (age, gender) and perioperative measures (operative time, postoperative complications and hospital stay) were compared between the two groups. Exclusion criteria were non-adult patients, emergency operations and benign or premalignant colorectal lesions. Microsoft Excel was used for data gathering. Statistical analysis was performed using SPSS Statistics version 23. Kolmogorov – Smirnov test was used to determine normal distribution. Because the data was not normally distributed, comparison was performed using medians and, depending on the data, Mann-Whitney U test was used for nonparametric values and Chi-square test for nominal and ordinal values. Differences were considered statistically significant if $p<0.05$.

Results

Among 119 patients included in the study, there were 47.8% (n=57) females and 52.1% (n=63) males. The median age for all patients was 67 years, ranging from 27 to 88 years. Distribution in ASA classes was the following: ASA I – 5.9% (n=7), ASA II – 59.7% (n=71), ASA III – 31.9% (n=38), ASA IV – 2.5% (n=3). It has to be noted that these were elective operations and no emergency cases were included. Comparison of demographic data between the two groups is illustrated in Table 1.

Table 1. **Comparison of demographic data between ASA 1-2 and ASA ≥3 group**

	ASA 1-2 (n=78)	ASA ≥3 (n=41)	P
Age, years			0.75
Median (range)	66 (36-88)	68 (27-86)	
Gender, count (percentage)			0.57
Female	39 (50.0%)	18 (43.9%)	
Male	39 (50.0%)	23 (56.1%)	

Median operative time was 130 min [interquartile range (IQR) 110-165] in ASA 1-2 group and 140 min [IQR 110-180] in ASA ≥3 group, with differences being non-significant (p=0.69). The comparison in shown in Figure 1.

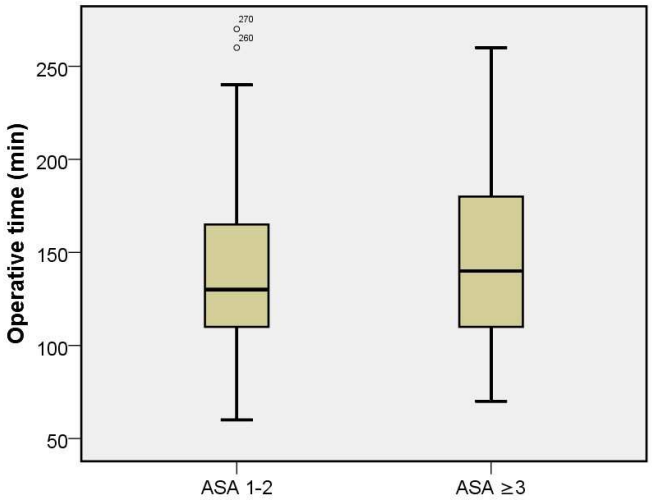


Figure 1. **Comparison of operative time between ASA 1-2 and ASA ≥3 group**

Among all 119 patients, 14 (11.9%) had postoperative complications. There were no statistically significant differences in complication rates between ASA 1-2 group (10.4%) and ASA ≥3 (14.6%) group (p=0.56). The spectrum of complications varied from the more common – surgical site infections, postoperative atelectasis, to less frequent – urinary retention, bowel perforation (Fig. 2.).

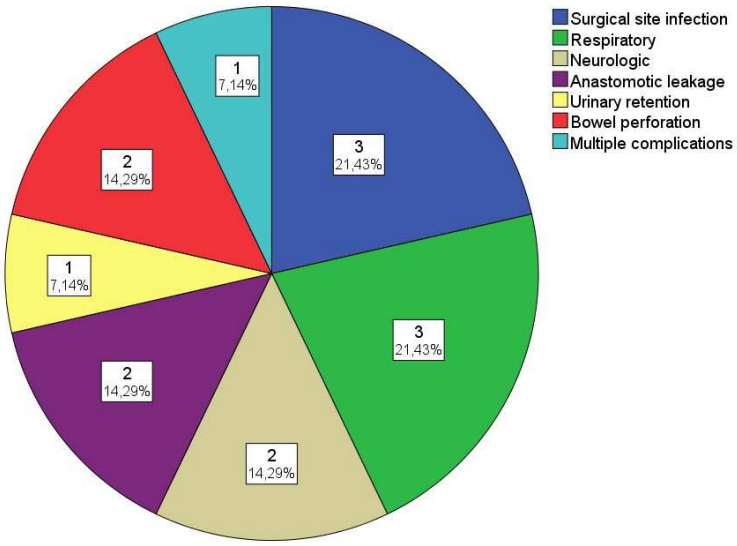


Figure 2. **Spectrum of complications for all patients included in the study**

Interestingly, length of hospital stay also did not differ significantly between patients with lower and higher ASA scores, contrary to what was expected. Median hospital stay was 9 days in both groups (IQR 7-11; p=0.90). However, the lowest hospital stay of 3 days was observed in ASA 1-2 group (Fig. 3.).

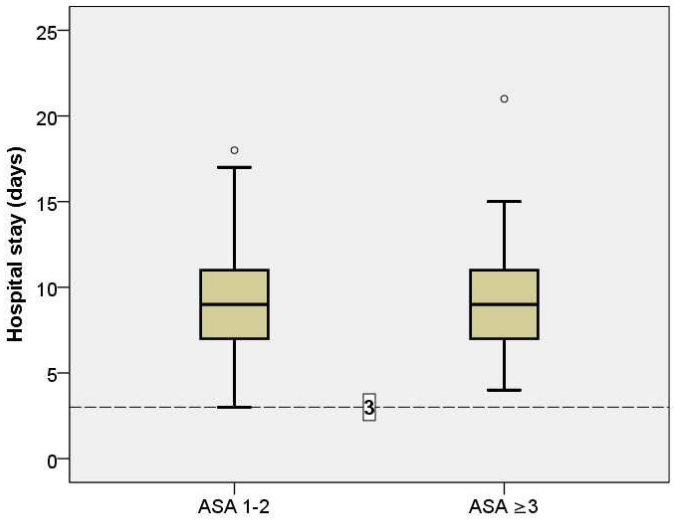


Figure 3. **Hospital stay in ASA 1-2 and ASA ≥3 group**

One death occurred in ASA 1-2 group. The patient had stage IV disease and brain metastases. No conversions were needed in laparoscopic operations.

Discussion

Numerous articles have reported association between ASA class and perioperative complications and outcomes (Daabis 2011). One of the more recent studies found that after standardization based on the type of procedure, ASA class is an independent predictive factor of post-operative complications and mortality (Heckett *et al*. 2015). Bouassida *et al*. found that for elderly patients (≥70 years) among many standard risk factors, only ASA class and emergency surgery were associated with mortality. Regarding colorectal cancer surgery, ASA class IV-V was shown, among other factors, to predict the need for perioperative blood transfusions in patients with colorectal cancer. Patients who received transfusions had ASA III or higher in 75% of the cases, whereas patients who did not need transfusions were estimated as ASA III or higher in 53% of the cases (Halabi *et al*. 2013).

There are several different scoring systems developed for the prediction of morbidity and mortality after colorectal cancer surgery (POSSUM, CR-POSSUM, ACPGBI CRC *etc*.). Recent comparison between them illustrated that ACPGBI CRC was effective as a tool to predict mortality after colorectal cancer surgery, and that ASA and Dukes classifications included in this scoring system contributed to this success. This led the authors to suggest an inclusion of ASA and Dukes classifications in the development of new mortality prediction scoring systems (Cengiz *et al*. 2014).

In addition to morbidity and mortality, ASA class has been shown to correlate with operative time, length of hospital stay and infection rates following genitourinary, heart and gastrointestinal surgery (Daabis 2011), and is also an independent predictive factor for conversion in laparoscopic

procedures – conversion rate was 2.3% in ASA I, 9% in ASA II and 13.8% in III-IV patients (Kirchhoff *et al*. 2010).

Despite the aforementioned, we found no association between higher ASA class and operative time, postoperative morbidity, mortality and length of hospital stay. None of the laparoscopic procedures were converted to open so we cannot draw conclusions regarding the association between ASA class and conversion rate.

Considerable variability has been reported among different anesthesiologists in the evaluation of the same patient. Large scale multicenter study (Cuvillon *et al*. 2011) investigated this problem, and found that there was only moderate agreement among different specialists who were asked to determine ASA physical status class for any particular patient. In addition, coexisting diseases like hypertension, renal insufficiency or obesity were associated with less correct grading. ASA has published a set of examples for each class that could potentially increase the precision of grading.

An earlier Finnish study used questionnaires about ten hypothetical patients to assess reliability of ASA classification between members of the Finnish Society of Anesthesiologists. They found significant variability between specialists in this regard, and concluded that this should always be kept in mind when using ASA class for clinical or research purposes. Surprisingly, one of the ten hypothetical patients was assigned to all five ASA classes (Ranta *et al*. 1997). Findings by Sankar *et al*. (2014) were more positive. In their study of more than ten thousand patients, they performed a comparison of ASA class assessment between anesthesiologists in preoperative clinic and operative theater. Their results showed that 67% of patients were assigned to the same ASA class in clinic and operative theater, and 98.6% of assessment pairs were within one ASA class of each other. These data come from a quaternary-care teaching hospital, so they have to be interpreted with respect to this factor.

There seems to be a discrepancy between different studies in terms of the role and prognostic value of ASA classification. One of the proposed reasons for this is that the understanding of this evaluation tool and its interpretation varies among specialists. Another reason is the inherently subjective nature of this system which is obviously more prone to error than objective scores.

Conclusions

We conclude that higher ASA class was not associated with worse short-term results in colorectal cancer patients in the particular institution. That is contrary to findings in many large-scale studies on this topic, which state clear correlation with several perioperative parameters. The most probable cause for this is misinterpretation of ASA classification system by anesthesiologists. This probability, however, has to be verified and requires further research. That will allow us to analyze and perhaps coordinate the understanding of ASA classification by different specialists, so we can benefit from this time-honored and useful tool.

References

Bouassida M., Charrada H., Chtourou M. F., Hamzaoui L., Mighri M. M., Sassi S., Azzouz M. M., Touinsi H. 2015. Surgery for colorectal cancer in elderly patients: How could we improve early outcomes? In: *Journal of Clinical and Diagnostic Research*. Vol. 9(5), pp. 4–8.

Cengiz F., Kamer E., Zengel B., Uyar B., Tavusbay C., Unalp H. R. 2014. Comparison of different scoring systems in patients undergoing colorectal cancer surgery for predicting mortality and morbidity. In: *Indian Journal of Cancer*. Vol. 51(4), pp. 543–548.

Cuvillon P., Nouvellon E., Marret E., Albaladejo P., Fortier L. P., Fabbro-Perray P., Malinovsky J. M., Ripart J. 2011. American Society of Anesthesiologists' physical status system: a multicentre Francophone study to analyse reasons for classification disagreement. In: *European Journal of Anaesthesiology*. Vol. 28(10), pp. 742–747.

Daabiss M. 2011. American Society of Anesthesiologists physical status classification. In: *Indian Journal of Anaesthesia*. Vol. 55(2), pp. 111–115.

Ferlay J., Steliarova-Foucher E., Lortet-Tieulent J., Rosso S., Coebergh J. W., Comber H., Forman D., Bray F. 2013. Cancer incidence and mortality patterns in Europe: Estimates for 40 countries in 2012. In: *European Journal of Cancer*. Vol. 49(6), pp. 1374–1403.

Halabi W. J., Jafari M. D., Nguyen V. Q., Carmichael J. C., Mills S., Pigazzi A., Stamos M. J. 2013. Blood transfusions in colorectal cancer surgery: incidence, outcomes, and predictive factors: an American College of Surgeons National Surgical Quality Improvement Program analysis. In: *The American Journal of Surgery*. Vol. 206(6), pp. 1024–1033.

Heckett N. J., De Oliviera G. S., Jain U. K., Kim J. Y. S. 2015. ASA class is a reliable independent predictor of medical complications and mortality following surgery. In: *International Journal of Surgery*. Vol. 18, pp. 184–190.

Holleczek B., Rossi S., Domenic A., Innos K., Minicozzi P., Francisci S., Hackl M., Eisemann N., Brenner H. 2015. On-going improvement and persistent differences in the survival for patients with colon and rectum cancer across Europe 1999–2007 – Results from the EUROCARE-5 study. In: *European Journal of Cancer*. Vol. 51(15), pp. 2158–2168.

Kirchhoff P., Clavien P. A., Hehnloser D. 2010. Complications in colorectal surgery: risk factors and preventive strategies. In: *Patient Safety in Surgery*. Vol. 4, pp. 5.

Leung E., McArdle K., Wong L. S. 2011. Risk-adjusted scoring systems in colorectal surgery. In: *International Journal of Surgery*. Vol. 9(2), pp. 130–135.

Ranta S., Hynynen M., Tammisto T. 1997. A survey of the ASA physical status classification: significant variation in allocation among Finnish anaesthesiologists. In: *Acta Anaesthesiologica Scandinavica*. Vol. 41(5), pp. 629–632.

Sankar A., Johnson S. R., Beattie W. S., Tait G., Wijeysundera D. N. 2014. Reliability of American Society of Anesthesiologists physical status scale in clinical practice. In: *British Journal of Anaesthesia*. Vol. 113(3), pp. 424–432.

CHARACTERISTICS OF ACUTE KIDNEY INJURY IN NEWBORNS WITH PERINATAL ASPHYXIA AND THERAPEUTIC HYPOTHERMIA TREATMENT

Elza Salputra[1], Ilze Meldere[1,2], Dace Barkeviča[1]
[1] Riga Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1007
elza.salputra@gmail.com, dace.barkevica@inbox.lv
[2] Children's Clinical University Hospital, Vienības gatve 45, Riga, Latvia
ilze.meldere@rsu.lv

Abstract

Characteristics of acute kidney injury in newborns with perinatal asphyxia and therapeutic hypothermia treatment

Key words: *Acute kidney injury, therapeutic hypothermia, perinatal asphyxia, neonatal, definition, pH level, base deficit*

Introduction. The incidence of moderate and severe perinatal asphyxia requiring therapeutic hypothermia (TH) in developed countries is about 1 in 1000 live births. Kidneys are among the most often damaged organs and acute kidney injury (AKI) might be an independent risk factor in neonatal morbidity and mortality.

Aims. To ascertain if the characteristics of newborns with or without AKI differ.

Materials and methods. In a retrospective study data from a secondary and a tertiary health care facility was obtained using patient medical records. Patients treated with TH were included. Patients were divided into groups of AKI (n=11) and no AKI (n=48) based on modified Acute Kidney Injury Network criteria. The outcomes in the two groups were compared.

Results. Female sex was associated with a greater incidence of AKI – 63.6% (AKI) vs. 29.2% (no AKI) (p=0.042). There were no statistically significant differences between the groups in gestational age, birth weight, and mode of delivery, presence of a perinatal event or the geographic location of birth, use of vasopressors, blood product transfusions, gentamycin, vancomycin or mode of TH.

There were significant differences in the pH levels in the first hour of life - 6.795 (IQR 6.693-6.866) vs. 6.957 (6.830-7.099), p=0.021 and in the base deficit on the 24th hour of life – -10.20 (IQR -11.65 - -7.95) vs. -6.20 (-7.65 - -4.10), p<0.001.

Conclusions. The characteristics of neonates with AKI are similar to those with no AKI.

Kopsavilkums

Akūtas nieru mazspējas raksturojums asfiksijā dzimušiem ar terapeitisko hipotermiju ārstētiem bērniem

Atslēgvārdi: *Akūta nieru mazspēja, terapeitiskā hipotermija, perinatāla asfiksija, jaundzimušais, pH līmenis, bāzu deficīts*

Ievads. Smagas un vidēji smagas perinatālās asfiksijas (PA), kam indicēta terapija ar terapeitisko hipotermiju (TH), biežums attīstītajās valstīs ir viens uz 1000 dzīvi dzimušo. Nieres ir vienas no biežāk skartajiem orgāniem un akūta nieru mazspēja (ANM) varētu ietekmēt jaundzimušo mirstību un saslimstību.

Mērķis. Noskaidrot, vai atšķiras demogrāfiskie, perinatālie un hospitālā etapa dati bērniem ar un bez ANM.

Materiāli un metodes. Retrospektīvā pētījumā iekļauti 59 jaundzimušie ar PA un TH, kas stacionēti vienā sekundārās un vienā terciārās aprūpes iestādē. Pacienti sadalīti divās grupās – ar (n=11) un bez (n=48) ANM – balstoties uz modificētiem *Acute Kidney Injury Network* kritērijiem. Rzeultāti salīdzināti starp grupām.

Rezultāti. ANM biežāk diagnosticēta sieviešu dzimuma pacientiem – 63,6% ANM grupā un 29,2% grupā bez ANM (p=0,042). Netika atrasta statistiski ticama atšķirība starp grupām gestācijas vecumā, dzimšanas svarā, dzemdību veidā, nelabvēlīga perinatālā notikuma biežumā un dzimšanas vietā, vazopresoru un asins transfūziju pielietojumā, gentamicīna un vankomicīna terapijas biežumā vai hipotermijas veidā. Statistiski ticama atšķirība tika atrasta asiņu pH līmenī pirmajā dzīves stundā – 6,795 (IQR 6,693-6,866) vs. 6,957 (6,830-7,099), p=0,021 -, un bāzu deficīta līmenī TH 24. stundā - -10,20 (IQR -11,65 - -7,95) vs. -6,20 (-7,65 - -4,10), p<0,001.

Secinājumi. Demogrāfiskie, perinatālie un hospitālā etapa dati ir līdzīgi bērniem ar un bez ANM.

Introduction

Perinatal asphyxia (PA) and associated complications are a cause of high mortality and morbidity in the surviving neonates. The incidence of severe and moderately severe PA varies between one and six per 1000 live-births in the developed countries and up to 20 per 1000 live-

births in developing countries. (Latvijas Neonatologu biedrība 2012; McGuire 2007; Tanigasalam *et al*. 2015)

The aetiology of PA is variable, and, as the name implies, asphyxia may arise before, during or after labour. The significance of this pathology lies in its complications which affect virtually all organs and their systems. Moderately severe and severe PA is the cause of disrupted gas exchange in the blood with subsequent hypoxaemia, hypercapnia and acidaemia. The result of hypoxaemia and ischaemia is a multi-organ injury with kidneys, myocardium, gastrointestinal tract, lungs and liver being involved. (Adcock & Stark 2016)

Hypoxic ischaemic encephalopathy (HIE) is a syndrome characterized by pathological neurological findings in the asphyxiated mature or slightly premature newborn. (Groendaal & de Vries 2015) It is associated with high mortality and long term neurological morbidity. (Juraša *et al* 2014; Adcock & Stark 2016)

Therapeutic hypothermia (TH) is the only evidence based method of treatment in the asphyxiated newborn that decreases the mortality and morbidity rates in newborns with PA and moderate to severe HIE. (Jacobs *et al*. 2013; Wu 2016)

Acute kidney injury (AKI) is amongst the most frequent complications of PA – 12 to 72 percent of asphyxiated newborns suffer from this state. (Alaro *et al*. 2014; Durkan & Alexander 2011; Kaur *et al*. 2011; Selewski *et al*. 2013) This vast variability of frequency of AKI is due not only to differences in the socioeconomic state of various countries and regions but also a lack of one clear definition of AKI in newborns. The struggle with creating a definition is due to lack of a marker of renal function that would reflect only the level of decrease in the neonate's renal function and only in the case of a pathology. (Durkan & Alexander 2011) The definitions in use currently – Acute Kidney Injury Network (AKIN), Paediatric Risk, Injury, Failure, Loss, End Stage Renal Disease (pRIFLE) and Kidney Disease: Improving Global Outcomes (KDIGO) – are based on evaluating the serum creatinine (SCr) level and urine output.

The SCr level is not an excellent marker of renal function in the newborn as it largely reflects the mother's SCr level up to 72 hours after birth. (Durkan & Alexander 2011) Urine output does not show the degree of kidney injury objectively as well, as the decrease in urine output is delayed. (Kaur *et al*. 2011) Furthermore, AKI in the asphyxiated newborn is non-oliguric in up to 50 percent of cases. (Adcock & Stark 2016; Durkan & Alexander 2011) Neutrophil gelatinase associated lipocalin, interleukin-18, kdney injury molecule 1 and cystacin C are being researched as possible markers of AKI in newborns. (Durkan & Alexander 2011)

Aims

The aim of this research was to obtain data on the patients demographic characteristics (gestational age, sex, birth weight), perinatal period (mode of delivery, geographical location of

birth, clinically identifiable sentinel event, presence of seizures in a six hour period after birth, pH levels in blood, base excess) and received treatment (nephrotoxic antibacterial therapy, blood product transfusions, inotropes). These characteristics would then be compared between patients with AKI or without AKI.

Materials and methods

In this retrospective study newborns with PA and TH treatment in Children's Clinical University Hospital, Riga, Latvia and Riga Maternity Hospital, Latvia from June 2012 until August 2015 were included. The medical documentation of these newborns was researched. The data concerning mortality, days of hospitalization in the Neonatal Intensive Care Unit, days of hospitalization altogether and duration of mechanical ventilation was gathered. Additional data gathered included the demographics of newborns and the therapy used – gestational age, sex, birthweight, mode of delivery (Caesarean section vs. vaginal delivery), geographical location of delivery, clinically identifiable sentinel event during delivery, presence of cramps during the six hours after birth, blood pH and base excess in the 60 minutes after birth, Apgar score at the end of the first, fifth and tenth minute after birth, use of nephrotoxic antimicrobials (gentamycin, amikacin, vancomycin), blood product transfusions, vasopressors.

The results of serum creatinine tests were recorded. It has been implied in recent publications on AKI in newborns that the SCr levels be tested according to this scheme: base level, hours 24, 48, 72 of TH, days 5, 7 and 10 of hospitalization and levels on discharge. (Sarkar *et al*. 2014; Selewski *et al*. 2013) Neither of the hospitals this study was conducted in used such schemes so the available results of SCr levels were adjusted to correspond to a set hour; hence the timing of the available SCr tests do not correspond to the above mentioned scheme accurately.

AKI was diagnosed based on modified Acute Kidney Injury Network (AKIN) criteria and the population divided into two groups – patients with AKI (n=11) and no AKI (n=48). The modified AKIN criteria are shown in table 1.

Table 1. **Modified AKIN criteria** (Selewski *et al*. 2013)

AKI stage	Criteria
Stage 1	Rise in SCr level of 0.3 mg/dl or 150-200% of base level
Stage 2	Rise in SCr level 200-300% of base level
Stage 3	Rise in SCr ≥ 300% of base level, SCr 2.5 mg/dl or dialysis

Data was analysed using *Microsoft Excel* and *IBM SPSS Statistics 22*. The normality of data was determined using the Kolmogorov-Smirnov test. Descriptive statistics (median, interquartile range) was used to describe the population. The differences between the two groups were

determined using the Mann-Whitney and Fisher's Exact test. The threshold of significance was set at p=0.05.

Results

From June 2012 until August 2015 69 newborns with severe or moderately severe HIE after PA received TH. Fifty-nine newborns for whom it was possible to diagnose AKI based on modified AKIN criteria were included in this study.

The frequency of AKI in this study was 18.6% (n=11). There number of patients in each AKIN stage (I, II and III) were seven, two and two, respectively.

Of the 59 newborns 64.4% (n=38) were male and 35.6% (n=21) were female. The median gestational age was 40 (IQR 39-41) weeks. The median birthweight was 3740 (IQR 3220 - 4000) grams. There was no statistically significant difference between patients with AKI and those with no AKI in gestational age – 40 (IQR 37-41) weeks vs. 40 (IQR 37-42) weeks, p=0.888, – and birthweight – 3550 (IQR 2300-4206) grams vs. 3760 (IQR 2470-4800) grams, respectively. There was a statistically significant difference in sex – AKI was more frequent among females – 63.6% vs 29.2%, p=0.042, RR=3.17 (95% CI = 1.05-9.58).

Caesarean section was the mode of delivery in 25.4% (n=15) of cases. There was no statistically significant difference between the two groups – 45.5% vs. 20.8%, p=0.126, respectively. A clinically identifiable perinatal sentinel event was found in 52.5% (n=31) of cases. The most frequent sentinel perinatal event was difficult delivery. There were additional eight cases of meconium stained amniotic fluid – a sign of foetal distress. There was no statistically significant difference between the two groups in frequency of a perinatal event – 54.5% vs. 52.1%, p=0.883. The recorded sentinel perinatal events are shown in figure 1. The geographical location of birth was Riga in 45.8% of cases. There was no statistically significant difference in location of birth between the two groups – 54.5% vs. 43.8%, p=0.517.

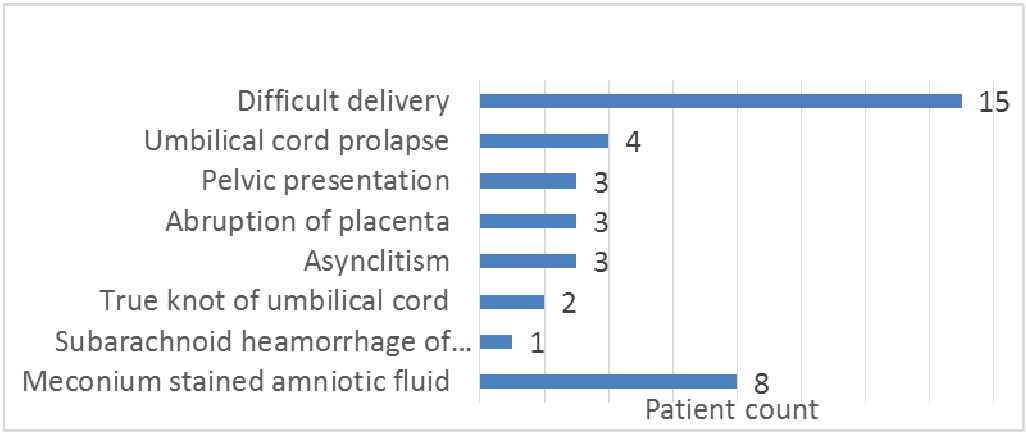


Figure 1. **Recorded sentinel perinatal events**

In the first 60 minutes of life a blood sample was drawn of arterial, venous or capillary blood for the detection of blood pH level and base deficit level. The levels were detected again on the 24th hour of life or TH. There was a statistically significant difference between the two groups in the pH level in the first hour – 6.795 (IQR 6.693-6.866) vs. 6.957 (6.830-7.099), p=0.021, and in the level of base deficit on the 24th hour – -10.20 (IQR -11.65 - -7.95) vs. -6.20 (-7.65 - -4.10), p<0.001.

The presence of seizures in the first six hours of life detected either clinically or based on amplitude integrated electroencephalography was noted 38.6% (n=22) of cases. There was no statistically significant difference between the two groups – 30.0% vs. 40.4%, p=0.725.

A vasopressive therapy was needed in 86.4% (n=51) of cases. There was no statistically significant difference between the groups – 90.9% vs. 85.4%, p=1.

Transfusions of blood products was needed in 59.3% (n=35) of cases and fresh frozen plasma was used most often. There was no statistically significant difference between the groups – 63.6% vs 58.3%, p=1.

The nephrotoxic antimicrobials gentamycin or amikacin were used in 67.8% (n=40) of cases and did not differ significantly between the two groups – 45.5% vs. 72.9% of cases, p=0.149. Vancomycin, also a nephrotoxic drug, was used in 6.8% (n=4) of cases and did not differ significantly between the groups as well – 9.1% vs. 6.2% of cases, p=0.572.

The mode of therapeutic hypothermia used more frequently was whole body cooling – 78% (n=46) of cases. The mode of therapeutic hypothermia did not differ significantly between the two groups – whole body cooling was used in 72.7% and 79.2% of cases, respectively, p=0.693.

Discussion

Of the 59 newborns included in this study, AKI was found in 18.6% (n=11) of cases. This incidence differs significantly from data of other studies of AKI in newborns with therapeutic hypothermia, were the incidence of AKI was found to be 32 to 39 percent. (Sarkar *et al*. 2014; Selewski *et al*. 2013; Tanigasalam *et al*. 2015) The difference might be attributable to the design of the study. This retrospective study was limited to the data available in the medical documentation of the patients and the recorded laboratory test results. As it was mentioned in the Materials and methods section, the serum creatinine levels were not detected according to a strict scheme.

Only the newborns in whom AKI could be diagnosed according to the modified AKIN criteria were included in this study. Four newborns with an early death (two in the first 24 hours of life and two until the 48th hour of life) were excluded because the serum creatinine level was not detected at all or was detected only once therefore precluding the evaluation of increase of the SCr level. It is possible to assume that these four newborns may have had AKI as well, as AKI correlates with the severity of HIE and HIE correlates with the death rate. (Askenazi *et al*. 2012; Jetton & Askenazi 2012; Kaur *et al*. 2011)

Although frequency of seizures six hours from birth, vasopressor therapy and blood transfusions were not found to be increased in patients with AKI, other studies have found that the frequency of these entities is increased in patients with AKI. Also, the base deficit was more pronounced in the study by Selewski *et al*. and the pH levels did not differ significantly. (Selewski *et al*. 2013) Conversely, it was found in our study that the base deficit levels varied on the 24th hour of TH between the two groups and the pH levels were significantly different in the first 60 minutes of life.

The frequency of use of nephrotoxic antibacterial therapy did not differ significantly between the two groups. To further analyse AKI in this setting the blood levels of these drugs should be monitored. (Taketomo 2015)

Conclusions

The incidence of acute kidney injury in asphyxiated newborns and therapeutic hypothermia treatment, when assessed using the modified Acute Kidney Injury Network criteria, is lower in Latvia when compared to other studies. The characteristics – demographic data, perinatal data and some aspects of the therapy used – did not differ between patients with acute kidney injury and those with no acute kidney injury. A prospective study should be conducted to evaluate the asphyxiated newborns with therapeutic hypothermia treatment and AKI, and the serum creatinine levels should be evaluated according to a set scheme. The blood levels of nephrotoxic antibacterial drugs should be evaluated in all newborns. The early recognition of AKI is imperative in successful treatment and halting the progression of kidney injury.

References

Adcock L.M., Stark A.R. 2016. Systemic effects of perinatal asphyxia. In: *UpToDate, Post T.W.* (Ed), UpToDate, Waltham, MA. Accessed: 1/3/2016.

Alaro D., Bashir A., Musoke R., Wanaiana L. 2014. Prevalence and outcomes of acute kidney injury in term neonates with perinatal asphyxia. In: *African Health Sciences*. 14(3), 682-688. Available at: doi: 10.4314/ahs.v14i3.26 [accessed 2/3/2016].

Askenazi D.J. 2012. Do children with acute kidney injury require long-term evaluation for CKD? In: *American Journal of Kidney Diseases*. 59(4), 478-480. Available at: doi: 10.1053/j.ajkd.2012.01.007 [accessed 11/3/2016].

Durkan A.M., Alexander R.T. 2011. Acute kidney injury post neonatal asphyxia. In: *The Journal of Pediatrics*. 158(2 Suppl), e29-e33. Available at: doi: 10.1016/j.jpeds.2010.11.010 [accessed 2/3/2016].

Groenendaal F., de Vries L.S. 2015. Hypoxic-Ischemic Encephalopathy. In: *Fanaroff and Martin's Neonatal-Perinatal Medicine*. 10th ed. Martin R.J., Fanaroff A.A., Walsh M.C. Philadelphia, PA :Elsevier/Saunders, 2015: 904-926.

Jacobs S.E., Berg M., Hunt R., Tarnow-Mordi W.O., Inder T.E., Davis P.G. Cooling for newborns with hypoxic ischaemic encephalopathy (Review). The Cochrane Database of Systematic Reviews. 2013, 1. Available at: doi: 10.1002/14651858.CD003311.pub3 [accessed 28/03/2016].

Jetton J.G., Askenazi D.J. 2012. Update on acute kidney injury in the neonate. In: *Current Opinion in Pediatrics*. 24(2), 191-196. Available at: doi: 10.1097/MOP.0b013e32834f62d5 [accessed 13/3/2016].

Juraša A., Stanke S., Sviridova D., Bļodniece I., Purviņa J., Dzelzīte S., Kviļūna D. 2014. Jaundzimušo terapeitiskā hipotermija – jauna hipoksiski ishēmiskas encefalopātijas ārstēšanas iespēja. In: *Latvijas Ārsts*. 2014 (11), 32-39.

Kaur S., Jain S., Saha A., Chawla D., Parmar V.R., Basu S. *et al*. 2011. Evaluation of glomerular and tubular renal function in neonates with birth asphyxia. Annals of Tropical Paediatrics. 31(2), 129-134. Available at: doi: 10.1179/146532811X12925735813922 [accessed 14/3/2016].

Latvijas Neonatologu biedrība. Klīniskās rekomendācijas hipotermijas uzsākšanai jaundzimušajiem ar hipoksiski išēmisku encefalopātiju. 2012. gada novembris. Pieejams: http://www.neonatologi.lv/wp-content/uploads/2010/01/Hipotermijas-uzs%C4%81k%C5%A1anas-rekomend%C4%81cijas.pdf

McGuire W. Perinatal asphyxia. BMJ Clinical Evidence. 2007, 7, 320. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2943784/ [accessed 04/03/2016].

Sarkar S., Askenazi D.J., Jordan B.K., Bhagat I., Bapuraj J.R., Dechert R.E. *et al*. 2014. Relationship between acute kidney injury and brain MRI findings in asphyxiated newborns after therapeutic hypothermia. Pediatric Research. 75, 431–435. Available at: doi:10.1038/pr.2013.230 [accessed 5/32016].

Selewski D.T., Jordan B.K., Askenazi D.J., Dechert R.E., Sarkar S. 2013. Acute kidney injury in asphyxiated newborns treated with therapeutic hypothermia. In: *The Journal of Pediatrics*. 162(4), 725-729.e1. Available at: doi: 10.1016/j.jpeds.2012.10.002 [accessed 10/3/2016].

Taketomo C.K. 2015. *Pediatric and Neonatal Dosage Handbook.* 22nd ed. Hudson, Ohio, Lexi-Comp, Inc; 965-969.

Tanigasalam V., Bhat V., Adhisivam B., Sridhar M.G. 2015. Does therapeutic hypothermia reduce acute kidney injury among term neonates with perinatal asphyxia? - a randomized controlled trial. In: *The Journal of Maternal-Fetal & Neonatal Medicine*. Early Online: 1–4. Available at: DOI: 10.3109/14767058.2015.1094785 [accessed 5/3/2016].

Wu Y. 2016. Clinical features, diagnosis, and treatment of neonatal encephalopathy. In: *UpToDate, Post T.W.* (Ed), UpToDate, Waltham, MA. Accessed: 2/3/2016.

WHO IS AT GREATER RISK OF MYOCARDIAL INFARCTION IN CASE OF RHEUMATOID ARTHRITIS?

Evija Stumbra Stumberga
Riga Stradins University, Dzirciema street 16, Riga, Latvia, LV-1007
evijastumbra@inbox.lv

Abstract
Key word: *Rheumatoid arthritis, cardiovascular disease, myocardial infarction, carotid artery intima media thickness*
Patients with rheumatoid arthritis (RA) are at greater risk of developing coronary heart disease than the general population.
This study investigated whether the atherosclerotic lesions in brachiocephalic vessels, carotid intima-media thickness (CIMT), cardiovascular(CV) risk factors, smoking, as well as level of disease activity and severity is associated with the risk of developing myocardial infarction(MI) in patients with RA. Therefore a case–control study was performed within the prospective cohort of patients with RA. Cases were patients who developed their first MI after diagnosis of RA; controls were patients with RA without MI. Cases and controls had similar RA disease duration. Traditional and disease –specific risk factors for MI were collected. The data was analysed using logistic regression analysis.
Our results showed that cases of MI were mostly females despite the fact that we included both sexes. The predicted risk of developing MI in females RA patients was higher than males, increasing in case of smoking.
Primary arterial hypertension and older age of patients were associated with MI in RA patients.
Other traditional and disease specific risk factors, as well as atherosclerotic changes of brachiocehalic vessel walls, CIMT were not good predictors of MI in RA patients in our study.

Kopsavilkums
Kuriem pacientiem ar reimatoīdo artrītu ir palielināts miokarda infarkta risks?
Atslēgas vārdi: *Reimatoīdais artrīts, kardiovaskulārās slimības, miokarda infarkts, arteria Carotis Intima Media*
Pacientiem ar reimatoīdo artrītu ir lielāks kardiovaskulāro notikumu risks kā pārējai populācijai.
Pētījumā tika mēģināts noskaidrot kādi no jau zināmiem kardiovaskulāriem un aterosklerozes riska faktoriem varētu veicināt miokarda infarkta attīstību pacientiem ar reimatoīdo artrītu, izvērtējot brahiocefālo asinsvadu aterosklerotiskās izmaiņas, *a.carotis intima* media biezumu, tradicionālos kardiovaskulāros risk faktorus, smēķēšanu, kā arī reimatoīdā artrīta procesa aktivitāti. Prospektīvā kohorta pētījumā tika iekļauti pacienti ar reimatoīdo artrītu, izvērtējot reimatoīdā artrīta pacientus ar un bez miokarda infarkta ar vienādu reimatoīdā artrīta slimības periodu. Datus statistiski analizēja pēc loģistiskās regresijas metodes.
Rezultāti apstiprināja, ka pacienti ar miokarda infarktu pamatā bija sieviešu dzimuma, kaut iekļautas bija abu dzimumu pacientu grupas. Paredzamais risks miokarda infarkta attīstībai sieviešu dzimuma reimatoīdā artrīta pacientēm bija lielāks kā vīriešu, kas palielinājās tām pacientēm, kuras bija nikotīna atkarīgas un regulāri smēķēja.
Reimatoīdā artrīta pacientiem primāra arteriāla hipertensija, vecums korelēja ar miokarda infarkta attīstību.
Aterosklerotiskās izmaiņas brahiocefālos asinsvados, *a.carotis intima media*, citi tradicionālie un reimatoīdam artrītam specifiskie riska faktori reimatoīdā artrīta pacientiem neveicināja palielinātu miokarda infarkta attīstību risku pētījuma populācijai.

Introduction

Rheumatoid arthritis (RA) is a chronic inflammatory disease, that affects 0.5-1% of the adult population. Considerable evidence indicates that patients with RA have an increased incidence of cardiovascular (CV) morbidity and mortality in both men and women (Sangha 2000).

Despite improvement in early disease detection and more powerful biological disease modifying antirheumatic drugs (DMARDs) the mortality gap between RA and non RA population is still widening. Several early risk evaluation pogramms have been implemented and introduced lately, but non of them have reach their aim in helping shed light in early risk detection and prevention (Van Doornum 2002).

Some hypotheses have been generated to explain increased risk of CV events, including conventional vascular risk factors, inflammation itself which could promote the development of atheroscleotic plaques or increase their vulnerability and accelerated thrombosis (Assous 2007; Mc Entegart 2001; Warrington 2005).

Thus, classical scoring systems that are used to estimate cardiovascular risk in general population might not be sufficient to determine risk in patients with inflammatory rheumatic conditions.

Guidelines by the European League Against Rheumatism (EULAR) emphasize a need to determine early signs of atherosclerosis in high-risk patients, so that primary and secondary prevention strategies and effective cardiovascular protective therapies may be implemented (Peters 2009; Peters 2010; Stamatelopoulos 2009).

An imaging test that quantifies atherosclerotic burden and can be integrated with existing risk stratification paradigms could be a very useful clinical tool. Measurement of carotid intima- media thickness (CIMT) with B mode ultrasound is a noninvasive and highly reproducible technique for detecting and quantifying subclinical and clinical atherosclerosis.

Several large, prospective epidemiologic and interventional studies have shown that CIMT accurately identifies prevalent and incident cardiovascular disease, independent of traditional risk factors.

We therefore performed a case-control sudy in a cohort of patients with RA matched by gender and disease duration to verify whether CIMT, atherosclerotic changes of brachiocephalic vessels, traditional CV risk factors and smoking as well as RA disease activity and severity influences exscess cardiovascular disease CVD in patients with RA.

Material and Methods

Patients

This was a case-control study nested in a prospective cohort of patients with RA that started in 2011.

Consecutive patients who fulfilled the 2010 criteria for RA, with disease duration > 6 weeks and without prior disease –modifying antirheumatic drug use, were included in the study.

Comprehensive information on comorbidities (including CVD) and the course of the disease was regularly collected and stored in an electronic database. We had access to the medical files of each patient including the periods before and after diagnosis of RA, so the registration of comorbidities and medical events was complete.

Cases for this study were patients who developed a first MI after the diagnosis of RA or developed a first-time episode of unstable angina (UA) . Cases were selected if the diagnosis of MI or UA was made by cardiologist. The presence of ischaemic symptoms, ECG changes and raised

cardiac enzyme levels were verified from the patient's medical records. Cases with UA were selected if the presence of multiple coronary vessel disease was confirmed by angiography indicating a need for bypass surgery or percutaneous transluminal coronary angioplasty. Controls were selected randomly from the cohort of patients with RA, aiming to have similar disease duration (exposition time to inflammation) for cases and controls.

Assessment of disease activity, severity and seropositivity

In the cohort, disease activity was prospectively assessed using the DAS28.

The DAS28 is a measure of disease activity in rheumatoid arthritis. DAS stands for 'disease activity score' and the number 28 refers to the 28 joints that are examined in this assessment DAS 28, it is calculated from the 28-tender joint count, 28-swollen joint count, C-reactive protein and the patient's global assessment of disease related general health on a visual analogue scale. Disabiliy was assessed using the disability index of the Health Assessment Questionnaire (HAQ).

Disease severity was assessed using X-ray proved erosions in small hand and feet joints, musculosceletal sonography of synovial joints, as well as performed joint replacment surgery .

In addition, other variables were gathered including rheumatoid factor (RF) status, anti CCP satus - seropositivty.

Assesment of cardiovascular risk factors

Traditional cardiovascular risk factors were obtained including male gender, obesity, hypertension, diabetus mellitus, smoking, dyslipidaemia with high triglicerde levels, low serum High density lipoprotein(HDL) and high LDL levels. Lipids were assesed from serum samples. The atherogenic index was caculated. It is defined as the base 10 logarithm of the ratio of plasma trigliceride to high density lipoprotein cholesterol

Body mass index (BMI) was calculated from height and weight at baseline. Diabetus mellitus was regarded as present if the diagnosis was made before the event or censoring. Hypertension was regarded as present if the diagnosis was made and antihypertensive medication was prescribed before the event or censoring.

Information on smoking history and ocurence of cardiovascular disease (coronary heart disease, heart failure, stroke transient ishaemic attack) was assessed in entry visits and obtained from medical records or patients.

Carotid ultrasound imaging

All study participants underwent carotid ultrasonography, which was performed by an eperienced research sonographer. Carotid arteries haemodynamic parameters were measured using high resolution B-mode, M-mode and Doppler-mode ultrasound. The carotid arteries were imaged with an 8.0-10 Mhz linear array ultrasound transducer GE Vivid 7 carotid ultrasound programm. The standardized protocol was used to optimize and acquire images of the common, bifurcation,

and internal segments of each carotid artery. In brief, participants were studied in the supine position with slight hyperextension of the neck. Both extracranial carotid arterial systems were extensively scanned in multiple planes to optimize identification of atherosclerosis, which was defined as discrete plaque protruding into the lumen at least 50% beyond the diameter of the surounding wall. Doppler interrogation was performed to evaluate the presence of significant (≥50% lumen diameter) reduction. Intima media thickness was measured from end-diastolic (minimum dimension) M-mode images of the far wall of the distal common carotid artery. Intima-media thickness was not measured in a location containin plaque. Mean values of right and left intima-media thickness were presented. Reproducibility of intima-media thickness and detection of plaques has been well documented

All ultrasound examinations were performed by a single sonographer.

Statistical analysis

Cases of MI and controls were compared by disease activity varibles and risk factors using the Mann-Whitney U test (for continous variables) or the X^2 test(for dichotomous variables).

Results

There were 87 patients (females 82%) with RA at the moment of case and control selection. They ranged in age from 31-84 years. Twenty four patients were selected as cases, had suffered MI and had surgical intrvention after the diagnosis of RA. 63 controls were randomly selected. The case and control group were matched by disease duration and gender Fisher's exact test (p=1.000). The mean disease duration did not statistically differ between case and control groups, the median of RA disease duration was 3.5(0.4-10) years vs 2.0 (1.0-7.0) p= 0.495.

Patients with MI were mostly females (83%), aged 64.5 (± 10.6) years despite the fact that study cases and controls were matched by gender (p=1.000). Patients with MI were significantly older compared to control RA patients respectively 64.5± 10.61 vs 58.51 ±12.34 (p=0.039) and have suffered from primar arterial hypertension (p= 0.042). We found that patients with MI have suffered from Primar Arterial Hypertension (PAH) in 83% of cases, but in the control group-60.3%.

We did not find a statistically significant association with MI cases with BMI, atherogenity index, and diabetus mellitus (p>0.05).

Cases and controls had comparable age of beginning of RA complaints respectivey 57.83±15.59 vs 53.57 ±14.06 (p=0.198)

Although smoking history and or duration did not differ statistically significantly between cases and controls Pearson Chi-Square test (p=0.808), about 37.5% of cases were smokers of them 30 % were females. The risk of MI in RA women was 3.91 odds ratio (OR). In female patients, who smoked it was 1.36.

From cardiovascular events stroke developed in 8.3% of cases and 9.5% of controls Fisher's exact test (p=1.000).

Observing activity and severity of our patients, we acknowledged that seropositivity was found in 91.7%, while erosions in small joints in 62.5% of cases without statistical diference Fisher's exact test (p=0.501) and Pearson Chi – Square test (p=0.149)

Interestingly, 91.7% of RA cases with MI and 96.8 % of non-MI controls had detectable synovitis in musculosceletal ultrasound Fisher's exact test (p=0.304). High RA disease activity (DAS28 above 4.17) was observed in 46% of patients with MI. Joint replacement surgery was necessary in 8.3% of MI cases and 14.3% control patients Fisher's exact test (p= 0.720).

After performing neurosonological examinations no statistically significant difference in CIMT *dx et sin* between MI cases and controls could be found (p=0.973) vs (p=0.665). Furthermore, atherosclerotic lesions were not more pronounced in RA patients with versus without MI (p=0.626).

Altogether 54.2% patients with MI had atherosclerotic plaques in brachiocephalic vessels resulting in <50% luminal stenosis, while 12.5% of patients had plaques causing >50% lumen obstruction.

Discussion

Several case control studies have been performed to predict and explain the risk of MI in patients with RA, analysing the power of inflammation activity in rheumatoid arthritis, collecting traditional and disease–specific risk factors for MI and calculating time-averaged disease activity score (DAS 28). Some studies (Radovits 2009; Chung 2005) have paid attention just to duration of activity of rheumatoid arthritis, because it is believed that systemic inflammation seems to have an important effect on the generation of atherosclerosis and CVD. However neither disease duration (exponation time to inflammation), disease activity over time (higher time averaged disease activity) nor disease severity (joint replacement surgery, multiple erosions) according to the results of our study, was found to have a positive relationship (p>0.05).

Despite that, more classical risk factors in several other studies and age as well as PAH in patient cohort was proved to be associated with increased cardiovascular events like MI.

It is believed that women with rheumatoid arthritis have have high rates of non fatal myocardial infarction, even in the absence of traditional risk factors for atherosclerosis. In this study was able to obtain that the risk of MI in RA women was higher than males; this risk was augmented by smoking.

Another disease-related factor that may mediate atherosclerosis is the presence of autoimmunity or immune dysregulation. It is believed that patients with rheumatoid arthritis (RA) who are seropositive for RF have a higher risk of CV events and mortality than seronegative

patients with AR (Godson, 2002). In this cohort we could not find predisposition to MI in seropositive patients.

It is widely accepted that the early carotid arterial wall disease is a useful predictor of the risk of both ischemic stroke and coronary heart disease (Radovits 2009). Commonly used, the CIMT measurements become the useful predictors of the risk of cerebrovascular and cardiovascular events. Despite the fact that CIMT has been shown to predict the development of CV events in RA, we could not prove the association between atherosclerotic changes of arterial wall and CV events.

Conclusion

To sum up the results of this study was found that older age and primary arterial hypertension affect the risk of MI in RA patients independenty from other traditional and disease specific risk factors. Therefore disease duration, activity, severity, atherosclerotic plaques, CIMT as well as BMI, AIP and Diabetus mellitus may not be the best choice for CV risk prediction of RA patients. What is more, females with RA are at greater risk for develping MI, aggravated by smoking.

Our preliminary results indicate that additional research is necessary to further investigate the relationship between RA patients and CV risk.

Acknowledgment

The author acknowledge the assistance given by consultants Silva Seņkāne, Ieva Salmane and Prof. H.Mikažane at the Riga Stradin's University.

References

Assous N. 2007. Cardiovascular disease in Rheumatoid arthritis: single-center hospital based cohort study in France.In: *Joint Bone Spine*. VOL. 74, United Kingdom, PP. 66-72.

Chung C.P. et al. 2005. Increased coronary artery atherosclerosis in rheumatoid arthritis: relationship to disease duration and cardiovascular risk factors.In: *Arthritis Rheum*. Vol. 52, USA, pp. 3045-3053.

Godson N.J, Wiles N.J. et al. 2002. Mortality in early inflammatory polyarthritis: cardiovascular mortality is increased in seropositive patients.In: *Arthritis Rheumatism*. Vol. 46, USA, pp. 201-209.

Mc Entegart A. 2001. Cardiovascular risk factors, including thrombotic variables, in a population with rheumatoid arthritis. In: *Rheumatology*. VOL. 40, Canada, PP. 640-644.

Peters M.J. et al. 2009. Does rheumatoid arthritis equal diabetes mellitus as an independent risk factor for cardiovascular disease? A prospective study.In: *Arthritis Rheumatism*. Vol. 61, USA, pp. 1571-15.

Peters M.J. et al. 2010. EULAR evidence-based recommendations for cardiovascular risk management in patients with rheumatoid arthritis and other forms of inflammatory arthritis.In: *Annals of Rheumatic Diseases*. Vol. 69, United Kingdom, pp. 325-331.

Radovits B.J. et al. 2009. Disease activity as a risk factor for myocardial infarction in rheumatoid arthritis.In: *Ann Rheum Dis*. Vol. 68, United Kingdom, pp. 1271-1276.

Sangha O. 2000. Epidemiology of Rheumatic Diseases. In: *Rheumatology*. VOL. 39 (SUPPL. 2), Canada, PP. 3-12.

Stamatelopoulos K.S. et al. 2009. Atherosclerosis in rheumatoid arthritis versus diabetes:a comparative study. In: *Arteriosclerosis, Thrombosis, and Vascular Biology*. Vol. 29, USA, pp.1702-1708.

Van Doornum S. 2002. Accelerated atherosclerosis :an extraarticular feature of Rheumatoid arthritis? In: *Arthritis Rheumatology*. VOL. 46, USA, PP. 862-873.

Rheumatoid arthritis is an independent risk factor for multi-vessel coronary artery disease:a case control study. In: *Arthritis Research & Theraphy*. VOL. 7, United Kingdom, PP. 984-991.

SYMPTOMS OF DEPRESSION IN CONNECTION WITH FREQUENCY OF ALCOHOL USE AMONG PATIENTS IN THE UNIT OF ADDICTION DISORDERS IN RIGA CENTRE OF PSYCHIATRY AND ADDICTION DISORDERS

Jeļizaveta Tribe[1], Jeļena Vrubļevska[2], Sarmīte Skaida[2]
[1] Riga Stradins University, Dzirciema street 16, Riga, Latvia, LV–1007
jelizaveta.tribe@gmail.com
[2] Riga Stradins University, Department of Psychiatry and Narcology, Tvaika street 2, Latvia, LV–1005

Abstract

Symptoms of depression in connection with frequency of alcohol use among patients in the Unit of Addiction Disorders in Riga Centre of Psychiatry and Addiction Disorders

Key words: *Alcohol use disorder, alcoholics, alcohol, alcohol unit, depression*

Introduction: Alcohol use disorder is a chronic relapsing disease and affects many patients worldwide. (Gilpin et al. 2008.). Numerous studies have shown a high rate of comorbidity between alcohol use disorder and depression. (Soyka et al. 1996.).

The aim was to asses drinking habits and symptoms of depression among patients in Riga Centre of Psychiatry and Addiction Disorders.

Methods: Overall 72 male and female inpatients treated in the unit of Addiction Disorders with diagnosis codes F10.0, F10.2, F10.8 (ICD-10) were included in the study. Three questionnaires were administered. Crosstabulation with multiple variables, Fisher's Exact Test, Mann – Whitney U Test were applied ($p<0.05$).

Results: Of all the patients 62,5% (N=45) were male and 37,5% (N=27) were female with the exact diagnoses. The mean age of all patients was 47,0 ± 12. The most frequently was used vodka - in 65,3% (N=47) of cases. Mean daily alcohol unit was 15,3 ± 9,8. Each day five alcohol units drunk 70,8% (N=51) of all the patients, and ten alcohol units drunk 51,4% (N=37) of all the patients. Mean age when patient first drank five alcohol units in single drinking occasion was 22,5 ± 9,3. Depressive episodes in the past were found in 40,3% (N=29) and recurrent episodes were found in 18,1% (N=13) of patients.

Conclusion: Depression affects many people with alcohol use disorders. Further studies are necessary to determine the causal effects between alcohol use disorders and depression.

Kopsavilkums

Depresijas simptomi saistībā ar alkohola lietošanas biežumu VSIA Rīgas psihiatrijas un narkoloģijas centra Narkologijas dienesta palīdzības stacionāra pacientiem

Atslēgas vārdi*: alkohola lietošanas traucējumi, alkohols, alkohola deva, depresija*

Ievads: Alkohola atkarība ir hroniska, recidivējoša slimība, kas ievērojami maina galvas smadzeņu darbību (Gilpin et al. 2008.). Zinātniskajā literatūrā tiek uzsvērta cieša korelācija starp alkohola lietošanas traucējumiem un depresiju (Soyka et al. 1996.).

Darba mērķis bija izvērtēt alkohola lietošanas paradumus VSIA Rīgas psihiatrijas un narkoloģijas centra (RPNC) Narkoloģijas dienesta palīdzības stacionāra pacientiem un to saistību ar depresijas epizodēm.

Metodes: Pētījumā tika iekļauti 72 pacienti, gan sievietes, gan vīrieši ar diagnozēm F10.0, F10.2, F10.8. (SSK-10). Interviju veikšanai tika izmantotas trīs anketas. Tika izmantots Fišera precīzais tests ar noteikto p vērtību un Mann – Whitney U tests ($p < 0.05$)

Rezultāti: No visiem pacientiem 62,5 % (N=45) bija vīrieši un 37,5 % (N=27) bija sievietes. Vidējais vecums bija 47,0 ± 12,0 gadi. Visbiežāk pacientu vidū tika lietots degvīns – 65,3% (N=47) gadījumu. Vidējā dienas deva bija 15,3 ± 9,8. Piecas alkohola devas katru dienu izdzēra 70,8% (N=51) pacientu, savukārt desmit alkohola devas - 51,4% (N=37) pacientu. Vidējais vecums, kad pirmo reizi izdzēra piecas devas vienā iedzeršanas reizē, bija 22,5 ± 9,3 gadi. Depresija pagātnē konstatēta 40,3% (N=29) pacientu un atkārtotas epizodes 18,1% (N=13) pacientu.

Secinājumi: Ar depresiju saskaras liela daļa pacientu ar alkohola lietošanas traucējumiem. Ir nepieciešams izvērtēt depresijas simptomus katram pacientam ar alkohola lietošanas traucējumiem, kā arī noteikt alkohola atkarības primāru cēloni.

Introduction

There are numerous studies performed of high rate of comorbidity between depression and alcohol use disorder (Sher 2009). Lifetime alcohol problems occur in a third of individuals with

depression (Bulloch *et al.* 2012; Sullivan *et al.* 2005). Chronic alcohol use leads to depressed mood and vice versa (Ward *et al.* 2012.). It is not easy to determine which problem comes first, in addition one of disorders might not be recognized at all thereby it ends up with treatment failure (Main *et al.* 1985). There is a hypothesis that comorbidity may be due to common underlying predisposing factors such as genetic factors or social and environmental characteristics (Cassidy *et al.* 1988; Gormley *et al.* 2004; Cooper *et al.* 1998; Mickelson *et al.* 1997). Another hypothesis is that individuals with depression use substances as self-medication thus leading to substance abuse and dependence development (Brennan *et al.* 1995). Another explanation is that withdrawal from alcohol can cause depressive symptoms such as sleep disturbances, lack of energy, loss of appetite etc. (Simpson *et al.* 1992).

Prevalence of alcohol use disorders in Latvia is 7,7% (14.3% for men and 2.5% for women) while consumption of pure alcohol per capita among drinkers only is 18,1 L. Prevalence of heavy episodic drinking among drinkers only is 30.9% (40,9% males, 21,2% females) (WHO 2010).

Point prevalence of depression among general Latvian population is 6,7%. Women and people older than 55 years suffer from depression more often. Life dissatisfaction and pure health condition increases the risk of depression (Rancans *et al.* 2013).

Material and Methods

The study included 72 patients of Unit of Addiction Disorders of Riga Centre of Psychiatry and Addiction Disorders. All patients with diagnosis codes F10.0, F10.2, F10.8 (ICD-10) were included. Only one diagnosis was possible. As a research tool three questionnaires were used. Face-to face interviews in patient's native language (Latvian, Russian) were held from June 2015th till October 2015th.

Questionnaire of sociodemographic data included information about gender, education level, marital status, occupation, socio-economic status. Habits of alcohol usage were assessed with Composite International Diagnostic Interview (CIDI). The interview included questions about type of used beverages, quantity of consumpted daily alcohol, frequency of consumption of five and ten alcohol units, type of received treatment and satisfaction with treatment. To assess depression episodes in the past, participants were interviewed using The Mini International Neuropsychiatric Interview 6.0., Depression module. It consists of two screening questions corresponding to the main criteria of the disorder and seven diagnostic questions. If patient met at least 5 criteria (when patient was sober) and it caused significant problems at home, at work, socially or at school, it was marked as depressive episode in the past.

Statistical analysis was made with IBM SPSS 22.00 program. Descriptive statistics, Fisher's exact test and Mann Whitney U-test were applied to data. The results were considered statistically significant if $p < 0.05$

Results

The study included 72 patients. The mean age of all the patients was 47,0 ± 12,0 years. The mean length of education was 12,3 ± 2,3 years.

Description of the sociodemographic characteristics are presented in Table 1.

Table 1. **Sociodemographic characteristics of the total sample size (N=72)**

Gender	Male	Female				
	62,5%	37,5%				
Education	Basic	Unfinished secondary	Secondary	Vocational	Unfinished high	High
	11,1%	13,9%	11,1%	36,1%	8,3%	19,5%
Marital status	Had never been married	Married, lives together	Married, lives separately	Divorced	Widowed	Civil marriage
	27,8%	26,4%	5,6%	19,4%	2,8%	18,1%
Occupation	Employed	Self-employed	Student	Housewife	Retired	Unemployed
	51,4%	15,3%	1,4%	5,6%	9,7%	16,7%
Socio-economic status	High	Medium	Low			
	20,8%	54,2%	25,0%			

Mean daily alcohol unit was 15,3 ± 9,8 units. One alcohol unit is 12g of pure alcohol or 40ml of 40% alcohol (SPKC). Up to 65,3% (N=47) of patients the most frequently consumpted vodka, in 27,8% (N=20) it was beer, in 25,0% (N=18) it was wine and cocktails(14%) and other beverages (whiskey, cognac, balsam) only in 15,3% (N=11) of cases (Figure 1).

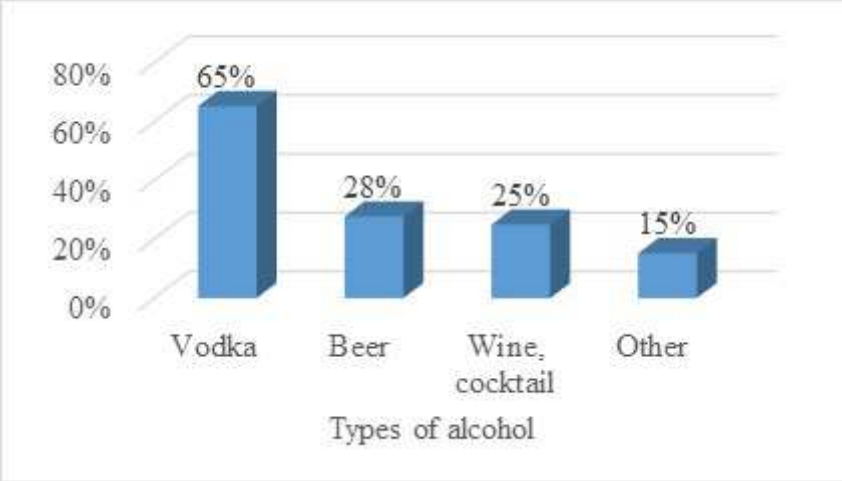


Figure 1**. Types of consumpted alcohol beverages**

Over the last 12 month five alcohol units every day consumpted 70,8% (N=51) of patients, three – four times per week 19,4% (N=14) of patients, one – two times per week and one – three times per month 2,8% (N=2) of patients and less than once a month 4,2% (N=3) of patients (Figure 2). Mean age when patients first drunk five alcohol units in one drinking occasion was 22,5 ± 9,3 years.

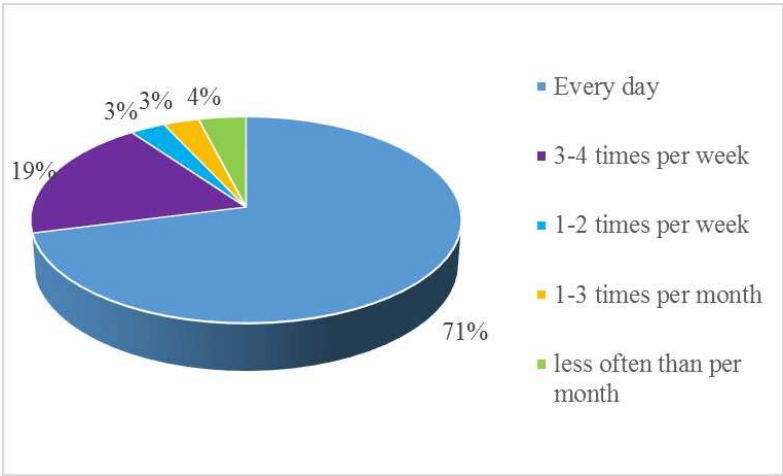


Figure 2.**Consumption of five alcohol units**

Over the last 12 month ten alcohol units every day consumpted 51,4 % (N=37) of patients, three – four times per week and one – two times per week 13,9% (N=10) of patients, one – three times per month 9,7% (N=7) of patients, less than once a month 8,3% (N=6) and only 2,8% (N=2) of patients didn't consume ten alcohol units at all (Figure 3).

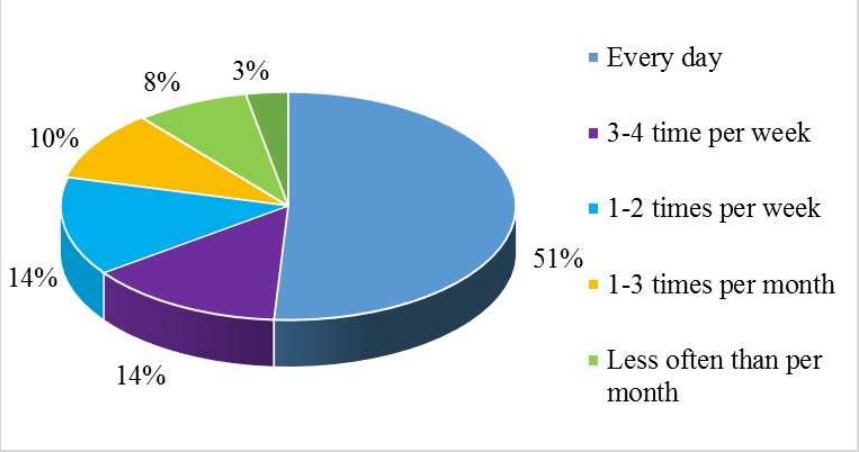


Figure 3. **Consumption of ten alcohol units**

To the question what kind of therapy patient received, 91,7% (N=66) answered they underwent detoxication procedure, 84,7% (N=61) received a consultation from the doctor, 58,3% (N=42) received an advice from family or doctor, 20,8% (N=15) underwent group therapy and only

13,9% (N=) visited psychotherapeutic session. Satisfied with outcome of therapy was 79,2% (N=57) of patients.

Depressive episodes in the past were found in 40% (N=29) and recurrent episodes were found in 18% (N=13) of patients (Figure 4). There were no statistically significant correlation between depressive episodes in the past and alcohol consumption frequency and quantity.

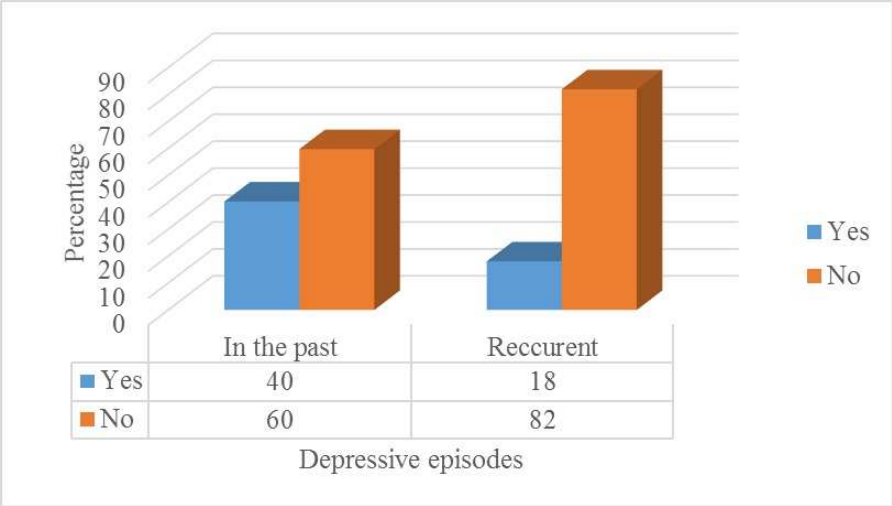


Figure 4. **Depressive episodes in the past**

Depressive episodes in the past correlates with negative feedback on therapy outcome. Patients with depressive episodes in the past were satisfied with therapy in 62,1% (N=29) of cases and unsatisfied in 37,9% (N=11) of cases. Patients without depressive episodes in the past were satisfied with therapy outcome in 90,7% (N=39) and unsatisfied in 9,3% (N=4) of cases. (p=0.006) (Figure 5).

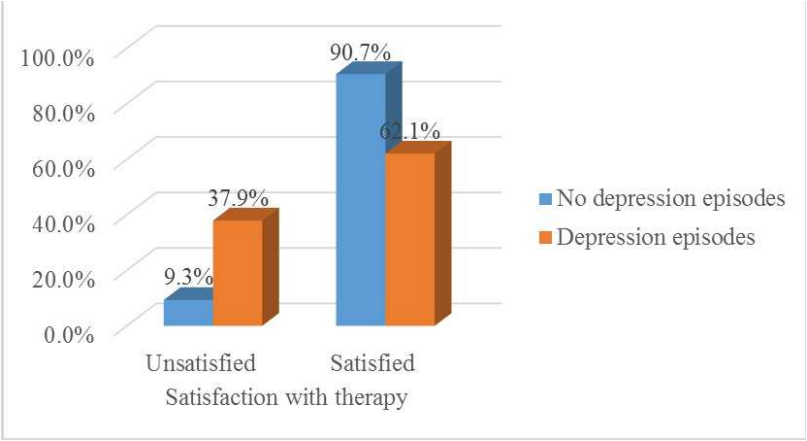


Figure 5. **Depressive episodes in the past and satisfaction with therapy**

Discussion

The aim of this study was to asses data about habits of alcohol usage and to determine whether there are correlations with depressive episodes in the past. This study was based on three questionnaires.

It is known that low education level is associated with more frequent alcohol misuse and alcohol dependence (Crum *et al.* 2005). In this study the mean length of education among all patients was 12,3 ± 2,3 years. However statistically significant correlation between lower education level and more frequent consumption of five or ten alcohol units or higher consumption of daily dose was not found. Prevalence of alcohol use disorder is higher among workers in the construction, manufacturing and agriculture (Harford *et al.* 1988.; Hodgins *et al.* 2009.; Kim *et al.*2008). In this study most patients had vocational education. It would be useful to explore different professions in the general population and their relationship with alcohol use disorders.

Unmarried individuals have alcohol use disorders more often then married (Crum et al. 2005). In this study most patients have been never married and 19,4% were divorced. Statistically significant correlation between lonely lifestyle and greater alcohol consumption was not found.

Job loss and unemployment status correlates with alcohol misuse and alcohol dependence (Catalano *et al.* 1993; Popovici *et al.* 2013). In this study only 26,4% of patients were unemployed. This difference might be explained by a lack of treatment motivation in those who are unemployed therefore employed individuals are seeking for help more often. It could be proven by performing a new study about treatment motivation among employed and unemployed individuals who have alcohol use disorder.

Low socioeconomic status correlates with more frequent alcohol misuse and alcohol dependence (Pampel *et al.* 2010). It is considered as one of coping mechanisms with everyday stress (Biddle *et al.* 1990). In this study only 25% of individuals had low socioeconomic status. By extending the total sample size we could get more accurate results.

The symptoms of depression are common among patients with alcohol use disorder. Alcohol use disorder contributes development of depression and vice versa (Boden *et al.* 2011). However individuals with depression do not consume greater amount of alcohol (Bulloch *et al.*2012.).In this study 40,3% of patients met criteria for depressive episode in the past however statistically significant correlation between depressive episodes in the past and greater or more frequent alcohol consumption was not found. Clinical evaluations on presence of depression for all patients who have alcohol use disorders are needed. Further studies are necessary to determine the causal effects between alcohol use disorders and depression

Conclusions

1. Most inpatients with diagnosis codes Dg. F10.0, F10.2, F10.8 have vocational education, have lonely lifestyle, medium socioeconomic status and employed patients are twice more than unemployed.
2. Most inpatients with diagnosis codes Dg. F10.0, F10.2, F10.8 most frequently consume vodka, up to 90% of patients at least twice a week consume five alcohol units and up to 50% of patients – ten alcohol units.
3. Low socio–economic status correlates with higher and more frequent alcohol consumption.
4. Depression affects many people with alcohol use disorders although we did not find statistically significant correlation with alcohol consumption frequency and quantity.

References

Biddle J.E., Hamermesh D.S. 1990. *Sleep and the allocation of time.* J. Polit. Econ. 98: 922–943.
Boden J.M., Fergusson D.M. 2011. *Alcohol and depression.* Addiction. 106: 906–914.
Brennan K.A., Shaver P.R. 1995. Dimensions of adult attachment, affect regulation, and romantic relationship functioning. In: *Personality and Social Psychology Bulletin* 21: 267-283.
Bulloch A., Lavorato D., Williams J., Patten S. 2012. Alcohol consumption and major depression in the general population: the critical importance of dependence. Depress.Anxiety. 29: 1058–1064.
Cassidy J, Kobak R.R. 1988. Avoidance and its relationship with other defensive processes. In: Clinical implications of attachment. Edited by Belsky J, Nezworski T. Hillsdale, NJ, Erlbaum, pp 300-323.
Catalano R., Dooley D., Wilson G., Hough R. 1993. Job Loss and Alcohol Abuse: A Test Using Data from the Epidemiological Catchment Area Project. In: *Journal of Health and Social Behavior*. 34(3): 215–225.
Cooper M.L, Shaver P.R., Collins N.L. 1998. Attachment styles, emotion regulation, and adjustment in adolescence. In: *Journal of Personality and Social Psychology* 74: 1380-1397.
Crum R.M., Chan Y.F., Chen L.S., Storr C.L., Anthony J.C. 2005. Incidence rates for alcohol dependence among adults: prospective data from the Baltimore Epidemiologic Catchment Area Follow-Up Survey, 1981-1996.In: *J Stud Alcohol*. ;66(6):795-805.
Crum R.M. Helzer J.E., Anthony J.C. 1993. Level of education and alcohol abuse and dependence in adulthood: a further inquiry. In: *Am J Public Health.* 83(6): 830-7.
Gormley B. 2004. Application of adult attachment theory to treatment of chronically suicidal, traumatized women. In: *Psychotherapy: Theory, Research, Practice, Training. The American Psychological Association* Summer 2004; 41(2): 136-143.
Harford T.C., Parker D.A., Grant B.F., Dawson D.A. 1998. Alcohol use and dependence among employed men and women in the United States in 1988. Alcohol. Clin. Exp. Res. 1992; 16 (2): 146–148.
Hodgins D.C., Williams R., Munro G. 2009. Workplace responsibility, stress, alcohol availability and norms as predictors of alcohol consumption-related problems among employed workers. Subst. Use Misuse. 44 (14): 2062–2079.
Kim J.H., Lee S., Chow J., Lau J., Tsang A, Choi J., Griffiths S.M. 2008. Prevalence and the factors associated with binge drinking, alcohol abuse, and alcohol dependence: a population-based study of Chinese adults in Hong Kong. Alcohol Alcohol. 43 (3): 360–370.
Main M., Kaplan N., Cassidy J. 1985. Security in infancy, childhood, and adulthood: A move to the level of representation. In: *Monographs of the Society for Research in Child Development*. Edited by Bretherton I, Waters E,1985; 50: 66-104.

Mickelson K.D., Kessler C., Shaver P.R. 1997. Adult attachment in a nationally representative sample. In: *Journal of Personality and Social Psychology* 73: 1092-1106.
Pampel F. C., Krueger P.M., Denney J. T. 2010. Socioeconomic Disparities in Health Behaviors, Annu Rev Sociol. 36: 349–370.
Popovici I., French M.T. 2013. Does Unemployment Lead to Greater Alcohol Consumption? Ind Relat (Berkeley). 52(2): 444–466.
Rancans E., Vrublevska J., Snikere S., Koroleva I, Trapencieris M. 2014. The point prevalence of depression and associated sociodemographic correlates in the general population of Latvia. In: *Journal of Affective Disorders*. 156: 104–110.
Sher L. 2009. Comorbiditiy of Depression and Alcohol Use Disorders, Nova, 5–12 p.
Simpson J.A., Rholes W.S., Nelligan J.S. 1992. Support-seeking and support-giving within couple members in an anxiety-provoking situation: The role of attachment styles. In: *Journal of Personality and Social Psychology*, 62: 434–446.
Spkc*: Slimību profilakses un kontroles centrs.* Buklets: alkohola devas.
Sullivan L.E., Fiellin D.A., O'Connor P.G. 2005. The prevalence and impact of alcohol problems in major depression: a systematic review. Am. J. Med. 118: 330–341.
Ward M.C. Garlow S. 2012. Chapter 225. Mood and Anxiety Disorders. In: *McKean SC, Ross JJ, Dressler DD, Brotman DJ, Ginsberg JS. eds.* Principles and Practice of Hospital Medicine. *New York, NY: McGraw-Hill,*.: http://accessmedicine.mhmedical.com.db.rsu.lv/content.aspx?bookid= 496&Sectionid=4130421.
Who.: World Health Organization 2014. Alcohol consumption: levels and patterns: http://www.who.int/substance_abuse/publications/global_alcohol_report/profiles/lva.pdf?ua=1

ECTOPIC PREGNANCY

Līga Vasariņa[1], Elīna Goida[1], Dr. med. Līga Puksta-Gulbe[1,2]
[1]Rīga Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1007
l.vasarina@gmail.com, eliinagoida@gmail.com
[2] Latvian Oncology Centre, Hipokrata street 4,Riga, Latvia
liga.puksta@gmail.com

Abstract

Ectopic pregnancy

Key words: *ectopic, pregnancy, risk factors, therapy*

Introduction. Ectopic pregnancy is pregnancy that develops outside endometrium of the normal uterine cavity, it cannot develop fully in those places and is considered to be life-threatening to women. The most common place, where it occurs is fallopian tube (98%). In remaining 2 %, it occurs in ovaries, abdominal cavity, cervix, intraligamentous, intersticial or in places after uterus surgery.

Aim. To find out how many cases of ectopic pregnancy has occurred in Ltd "RECUH" stationary "Gaiļezers" from 2010 to 2014, how many of them rare forms were. To compare risk factors, diagnostic and management of ectopic pregnancies in Ltd "RECUH" and worldwide.

Methodology. This research work is retrospective and descriptive. The medical records of patients, who were hospitalized in Ltd "RECUH" with diagnosis ectopic pregnancy were included. This research covers the time period from 1.01.2010 to 31.12.2014. Data were processed using MS Excel 2010.

Results. In time period there were 571 women hospitalized with diagnosis fallopian tube pregnancy and 29 with rare forms of ectopic pregnancy. Average patients age - 30,77 years (SD 5,576). The following risk factors were described: age 35 and more - 26,8% ; prior caesarean section - 14,5%; prior abortions 50,2%; prior sexually transmitted infections 20%; prior ectopic pregnancies 14,3%; prior abdominal or pelvic surgery 29%.

Only rare forms of ectopic pregnancy (11 interstitial pregnancies; 8 caesarean section scar; 7 ovarian; one intraligamentary pregnancy) and their diagnostics were described in detail. Therapy in most cases was chosen to be surgical.

Conclusions. Risk factors, complaints, objective signs of the patients with ectopic pregnancy of Ltd "RECUH" stationary "Gaiļezers" mostly matches with scientific literature. Part of the factors could not be evaluated, because they (for example, smoking), were not mentioned in all medical records.

Kopsavilkums

Atsēgas vārdi: *ārpusdzemdes, grūtniecība, riska faktori, terapija*

Ievads. Ektopiska grūtniecība ir grūtniecība, kas attīstās ārpus normālā dzemdes dobuma endometrija. Šajās vietās tā nevar attīstīties pilnīgi un tiek uzskatīta par dzīvību apdraudošu stāvokli sievietei. Biežākās vietas, kur ārpusdzemdes grūtniecība tiek konstatēta, ir olvadi (98%). Atlikušajos 2 % gadījumu apaugļotais oocīts implantējas olnīcās, vēdera dobumā, dzemdes kaklā, intraligamentāri, intersticiāli vai vietās pēc dzemdes operācijām.

Mērķis. Noskaidrot cik daudz un kādas lokalizācijas ārpusdzemdes grūtniecības konstatētas SIA "RAKUS" stacionārā "Gaiļezers" laika posmā no 2010. līdz 2014. gadam. Salīdzināt riska faktorus, diagnostiku un terapiju ar ārzemju literatūrā aprakstīto.

Metodoloģija. Šis pētījums ir retrospektīvs un aprakstošs. Pētījumā iekļautas SIA "RAKUS" stacionētās pacientes ar diagnozi ārpusdzemdes grūtniecība laika periodā no 1.01.2010. līdz 31.12.2014. Dati tika apstrādāti, izmantojot datorprogrammu MS Excel 2010.

Rezultāti. Apskatītajā laika periodā SIA "RAKUS" stacionēta 571 sieviete ar diagnozi olvada grūtniecība un 29 ar reto formu ārpusdzemdes grūtniecībām. Vidējais pacienšu vecums – 30,77 (SD 5,576). Tika aprakstīti sekojoši riska faktori: vecums 35 gadi un vairāk – 26,8% no pacientēm; anamēzē ķeizargrieziena operācija – 14,5%; anamnēzē aborts vai vairāki – 50,2%; anamnēzē seksuāli transmisīvās infekcijas – 20%; anamnēzē ārpusdzemdes grūtniecības – 14,3%; iepriekšējas vēdera dobuma vai mazā iegurņa operācijas (neskaitot ķeizargrieziena) –29%.

Tikai retās ārpusdzemdes grūtniecības (11 intersticiālas, 8 ķeizergrieziena rētas, 7 olnīcu, viena intraligamentāra grūtniecība) tika aprakstītas detalizētāk (iekļaujot diagnostiku, sūdzības iestājoties, objektīvo atradni). Terapija lielākajā daļā gan reto, gan olvadu grūtniecību izvēlēta ķirurģiska.

Secinājumi. Riska faktori, sūdzības un objektīvā atradne pacientiem ar ārpusdzemdes grūtniecību SIA "RAKUS" stacionārā "Gaiļezers" lielākoties sakrīt ar ārzemju literatūras datiem. Daļa riska faktoru nevarēja tikt izvērtēti, jo tie (piemēram, smēķēšana) nebija minēti vairumā medicīnisko dokumentāciju.

Introduction

Ectopic pregnancy is pregnancy that develops outside endometrium of the normal uterine cavity, pregnancy cannot develop fully in those places and it is considered to be life-threatening to women. Ectopic pregnancies make 2-3% from all pregnancies [9]. The most common place, where it occurs is fallopian tube (98% of all ectopic pregnancies). In remaining 1-2%, it occurs elsewhere – in *ovaries*, *abdominal* cavity, *cervix*, *intraligamentous*, *interstitial*, in *vesicovaginal* space or in places after *uterus* surgery.[1] In year 2014 there were 21 446 newborns in Latvia and on every 1000 newborns were 18,4 ectopic pregnancies [11]. That means – approximately 394 ectopic pregnancies. At the same year there were also 8550 abortions. That means, 70,4% of all pregnancies ends with child-birth, 28,3% with abortion and 1,3% - with ectopic pregnancy. Ectopic pregnancy compose a small, but important part of all pregnancies. In some cases its development is related with preventable risk factors. Ectopic pregnancy also is considered to be life-threatening to women and to increase risk for recurrent ectopic pregnancy or infertility[2].

Every woman at the reproductive age should consider pregnancy as diagnosis, even if the symptoms does not raise suspicions about it. Ectopic pregnancy can manifest itself with various symptoms, part of which can be similar to other illnesses.

NICE guidelines *(The National Institute for Health and Care Excellence (NICE) clinical guideline)* summarize the frequency of symptoms and objective findings in the case of ectopic pregnancy, no matter to precise localization[5]. The most common symptoms are lower abdominal pain (93 %), *amenorrhea* (73 %) or late menstruation and vaginal bleeding (with/without clotting) (64 %). Rarely described symptoms – dizziness, fainting or *syncope*, sensitive chest, gastrointestinal symptoms – vomiting/*diarrhea*, shoulder tip pain, urinary tract infection symptoms. Possibility that there are no symptoms and specific pregnancy is a case find occurs in less than 10% of all the cases.

The most common objective signs of ectopic pregnancy that can be recognized at the time of abdominal palpation and vaginal investigation: *abdominal* tenderness (78 %); positive *peritoneal* sign (40 – 75 %); painful *cervical* deviation (40 – 75 %); *pelvic* tenderness (91 %); *adnexal* sensitivity (82 %); enlarged *uterus* (20 – 40 %); palpable masses at the *adnexal* regions and *pelvis* (< 20 %) [5].

Previously mentioned guidelines recommend to determine the level of human chorionic gonadotropin (hGC) in serum for all women in reproductive age, who have been hospitalized with any of previously mentioned complaints. The level of hCG indicates the existence of pregnancy, but it does not show the localization of pregnancy. It is pointed out that transvaginal ultrasonography is the most significant medical examination for determining the localization of pregnancy [5,7].

There are certain risk factors that are related with ectopic pregnancy development. The most commonly mentioned risk factors are - age above 35 years; history of ectopic pregnancies (10-

20%); tubal ligation or reconstruction after ligation; history of gynaecological or abdominal operations; *salpingitis isthmica nodosa;* pelvic inflammatory diseases (13-79%); history of medical abortions; intrauterine contraceptive system at the time; assisted fertilization; smoking; history of *diethylstilbestrol* exposure. All sexually active women are exposed to the risk of ectopic pregnancy, even without previously mentioned risk factors.

Therapy in the case of ectopic pregnancy is either expectant, surgical or per oral *methotrexate* therapy (MTX). It is chosen for each case individually, considering the condition of patient, objective findings and the morals of patient.

Tactics of expectant management is acceptable if hCG < 1000 IU/L. MTX therapy is chosen in the cases where patient does not have strong pain; ectopic pregnancy tissue size is less than 35 mm; fetal heartbeat is not detected; serum hCG < 1500 IU/L; *Madhra* et al, 2014, allow the usage of methotrexate if hCG is from 1500 to 5000 IU/L (at Ltd "Riga East Clinical University Hospital" (RECUH)) MTX therapy is allowed if hCG < 5000); if *intrauterine* pregnancy is not proven; if the further observation will be possible; if there are no liver and/or kidney dysfunction. Surgical tactic is chosen if the MTX therapy is contraindicated for the patient; if the patient is haemodynamically unstable or if the patient refuses MTX therapy [5,6]. Also in cases where the precise localization of pregnancy has not been determined at the time of examination.

As mentioned previously, the most common place for ectopic pregnancy to develop is fallopian tube. In approximately 78 % of fallopian tube pregnancy, fertilized oocyte implants in ampular part of fallopian tube. Ovary pregnancy occurs in 0,15 – 3 % of all ectopic pregnancies [1]. This pregnancy is commonly mistaked with corpus luteum cyst. If diagnosed late, it can rupture and implant secondary in abdominal cavity. In case of ovarian pregnancy, women usually have not had any problems with fertility. Interstitial pregnancy (1 – 3 % of ectopic pregnancies) is pregnancy that develops in *interstitial* part of fallopian tube. It is the place, where pregnancy can develop up to 16 weeks. In these cases it is related to *uterus* rupture and massive blood loss.[3,7] Implantation of fertilized *oocyte* can also happen in scar of previously performed caesarean section. *Caesarean* section scar pregnancy is related to threat of *uterus* rupture and mostly is indication for hysterectomy. *Caesarean* section is performed at lower part of *uterus*, that can not contract as sufficiently as body of uterus, that is why it is related to higher risk of massive *haemorrhage*. *Caesarean* section scar pregnancy occurs in 1 of 1800 pregnancies [12]. Incidence of *cervical* pregnancy is less than 1% of all ectopic pregnancies. This is the pregnancy, that is the most related with previous *cervical* and *uterine* cavity *curettage* (both due to abortions and other reasons, like dysfunction bleeding). Intraligamental pregnancy is pregnancy that develops in *ligamentum latum uteri,* it is frequently diagnosed just at time of surgery. In some cases it can develop to full term pregnancy.

Aim

To find out how many cases of ectopic pregnancy has occurred in Ltd "RECUH" stationary "Gaiļezers" from 2010 to 2014, how many of them rare forms were. To compare risk factors, diagnostic and management of ectopic pregnancies in Ltd "RECUH" and worldwide.

Methodology

This research work is retrospective and descriptive. Medical records of patients, who were hospitalized in Ltd "RECUH" stationary "Gaiļezers" with diagnosis O 00.0 – O 00.9 (ICD-10) [10], were analysed. The medical records covered the time period from 1.01.2010 to 31.12.2014. Selection of patients were done by using computer program "Ārstu birojs". In this research the following diagnosis were included: fallopian tube, ovarian, *interstitial*, *caesarean* scar, *cervical* and *intraligamentary* pregnancies. Data were processed using MS Excel 2010.

Results

In time period there were 600 women hospitalized with diagnosis ectopic pregnancy, 571 of them with fallopian tube pregnancy and 29 with rare forms of ectopic pregnancy. In 42% cases ectopic pregnancy was located in left fallopian tube, in 52% - in right, in 1% it was not possible to determine the localization because tubal abortion had already happened and in 5% localization was rare (11 cases of interstitial pregnancy, 8 – of *caesarean* scar pregnancy, 7 of *ovarian* pregnancy and one case of *intraligamentary* pregnancy).

Average patients age - 30,77 years (SD 5,576). The following risk factors were described:

- older than 35 years - 161 (26,8%) of patients;
- history of *caesarean* section - 87 (14,5%);
- history of abortions 302 (50,2%);
- history of sexually transmitted infections 120 (20%);
- history of ectopic pregnancies 85 (14,3%);
- prior *abdominal* or *pelvic* surgery 174 (29%)
- IUCD at the time of ectopic pregnancy 25 (4,2%)
- ectopic pregnancy after use of "morning after pill" 19 (3,2%)

None risk factors were mentioned in 74 (12,3%) cases.

Only rare forms of ectopic pregnancy and their diagnostics were described in detail. There were analysed 11 medical records of *interstitial* pregnancy; 8 medical records of *caesarean* scar pregnancy; 7 records of *ovarian* pregnancy and one case of *intraligamentary* pregnancy.

The most common complaints at the time of hospitalization were: *amenorrhea* (22 out of 29); vaginal bleeding or spotting (18 out of 29) and lower *abdominal* pain (15 out of 29). Other complaints were not mentioned.

At the time of physical examination abdominal tenderness was detected in 27 cases; 11 of them also positive *peritoneal* sign. Palpable tenderness in the *adnexal* region – in 25 cases. Enlarged *uterus* at the time of vaginal examination or surgical therapy was detected in 17 cases. Fetal heartbeat was visualized in 5 cases. In 8 cases ectopic pregnancy was the result of unsuccessful contraception.

Surgical therapy was chosen for most of the cases (25 cases), in 8 cases *hysterectomy* was performed. *Cervical* and *uterus* cavity curettage was successfully performed in 2 cases of *caesarean* scar pregnancy and in one case of *cervical* pregnancy. Successful MTX therapy was used in a case of an *interstitial* pregnancy.

Surgical therapy was also chosen for the most cases of fallopian tube pregnancy that is in 75% (447 cases). The most commonly performed operations were *salpingectomy* or *salpingotomy*. MTX therapy was successfully used in 17% (99) of all cases, that means, hCG level in dynamics decreasing. MTX therapy was unsuccessful in 1,7% (10) cases and was followed by laparoscopic *salpingectomy*. No therapy was not needed in 2,2% (13) cases, because tubal abortion had already happened at the time of diagnosis of pregnancy or at the time of expectant management.

Discussion

It was concluded, that risk factors does not differ between fallopian tube pregnancies and rare forms of ectopic pregnancies. Most commonly mentioned risk factors in literature as age, prior *abdominal* or *pelvic* surgeries, prior abortions, history of sexually transmitted infections, were also mentioned in medical records of patients at Ltd "RECUH" [4,9]. The authors of this paper think that exact number of none-risk cases are less than 74, because in the most of medical records there were not mentioned such risk factors as smoking and the number of sexual partners.

Complaints at emergency room and objective finding was only described for rare forms of ectopic pregnancies. The most common complaints, both in literature and Ltd "RECUH" were – *amenorrhea*, vaginal bleeding or spotting and lower abdominal pain [4,9]. Objective finding also do not contradict the data available in foreign literature.

Therapy at Ltd "RECUH" has been carried out according to indications and can be viewed as successful. All patients survived, including those who were hospitalized in haemodynamically unstable condition.

Conclusions

Risk factors, complaints and objective signs of the patients with ectopic pregnancy of Ltd "RECUH" stationary "Gaiļezers" mostly matches with scientific literature. Risk factors are the same for fallopian tube and rare ectopic pregnancies. Research should cover longer period of time or should be prospective before it could be used to draw statistically significant conclusions.

Part of the factors could not be evaluated, because they (for example, smoking) were not mentioned in all medical records, meaning that medical records should be filled-in with more care and detail if they are to be used in scientific researches.

In the time period from 2010 to 2014, at Ltd "RECUH" stationary "Gaiļezers" there were hospitalized 571 women with fallopian tube pregnancy,11 with *interstitial* pregnancy, 8 with *caesarean* scar pregnancy, 7 with ovarian pregnancy and one case of *intraligamentary* pregnancy – so by percentage rare forms of ectopic pregnancy are 5,09 %. The obtained data shows that rare forms of ectopic pregnancies are more common than it is mentioned in literature (1-2%), but these results are not statistically plausible because of the small number of cases.

It would be important to educate people about potential risk factors for ectopic pregnancies that can be avoidable like age, sexually transmitted infections, *caesarean* section without medical indications, abortions and also smoking.

References

Badr Sanaa, Ghareep Abdel-Naser, Abdulla Lamya M., Hassanein Rabei 2013. Ectopic pregnancy in uncommon implantation sites. In: *The Egyptian Journal of Radiology and Nuclear Medicine,* 44, 121-130.

Chestnut, David H.et al 2014. *Chestnut`s Obstetric Anesthesia: Principles and Practice Fifth Edition*. Elsevier Limited 340-357.

Fylstra D.L. 2012. Ectopic pregnancy not within the (distal) fallopian tube: etiology, diagnosis, and treatment. In: *American Journal of Obstetrics and Gynecology*, 206 (4), 289-299.

Lentz Gretchen, Lobo Rogerio A, Gershenson David, Katz Vern L. 2012. *Comprehensive Gynecology 6th Edition* Philadelphia: Mosby, 361–381.

Lumsden Mary Ann un autoru kolektīvs 2012. *NICE Clinical Guidelines. Ectopic pregnancy and miscarriage: Diagnosis and initial management in early pregnancy of ectopic pregnancy and miscarriage*. Iegūts no: http://www.nice.org.uk/guidance/cg154/evidence [sk. 19.12.2015.].

Madhra Mayank, Horne Andrew W. 2014. Ectopic pregnancy. In: *Obstetrics, Gynaecology and Reproductive Medicine*, 24 (7), 215–220.

Moawad Nash S., Mahajan Sangeeta T., Moniz Michelle H., Taylor Sarah E., Hurd William W. 2010. Current diagnosis and treatment of interstitial pregnancy. In: *American Journal of Obstetrics and Gynecology*, 202 (1), 15–29.

Phupong Vorapong, Lertkhachonsuk Ruangsak, Triratanachat Surang, Sueblinvong Thanasak 2003. Pregnancy in the broad ligament. In: *Archives of Gynecology & Obstetrics*, 268 (3), 233–235.

Shaw R. W., Luesley D., Monga Ash K. 2011. *Gynaecology, Fourth Edition.* Elsevier Limited, 363–365.

SSK – 10 klasifikācija – Kodu tabulsaraksts un skaidrojumi. Iegūts no: http://www.spkc.gov.lv/ssk10/indexa239.html?p=%2F#g_ [sk. 4.03.2016].

Statistikas dati par dzemdībām un jaundzimušajiem Latvijā Iegūts no: http://www.csb.gov.lv/category/tagi/Dzimst%C4%ABba [sk. 19.12.2015.].

Tsai Shih-Wei, Huang Kuan-Hui, Ou Yu-Che, Hsu Te-Yao, Wang Chen-Bin, Chang Ming-Shan, Li Ko-Hsin, Kung Fu-Tsai. *Low-lying-implantation ectopic pregnancy: a cluster of cesarean scar, cervico-isthmus, and cervical ectopic pregnancies in the first trimester.* Teiwanese Journal of Obstetrics and Gynecology, 2013, 52, 505-511.

ETIOLOGY OF OTOGENIC MENINGITIS IN PAULS STRADINS CLINICAL UNIVERSITY HOSPITAL

Linda Veidere[1], Gunta Sumeraga[1,2]
[1] Rīga Stradiņš University, Dzirciema street 16, Riga, Latvia, LV-1007
veiderelinda@gmail.com
[2] Pauls Stradins Clinical University Hospital, Latvia, gunta_sumeraga@inbox.lv

Abstract

Etiology of otogenic meningitis in Pauls Stradins Clinical University Hospital

Key words: *acute otitis media, chronic otitis media, meningitis*

Introduction: meningitis is one of the most frequent intracranial complications of otitis media. The incidence of complications of otitis media in the developed countries has decreased, it remains a problem in the developing countries.

Aim: to evaluate the characteristics of patients, to find out the most frequent etiology – acute or chronic otitis media – in cases of bacterial meningitis due to acute or chronic otitis media in P. Stradins Clinical University Hospital.

Materials and methods: a retrospective study of 47 patients' records with bacterial meningitis due to acute or chronic otitis media who were hospitalized in P. Stradins CUH in the period of January 1st 2006 to December 31st 2015. Patients with post-traumatic meningitis were excluded.

Statistical analysis was conducted using SPSS 23.0 software ($p<0.05$).

Results: 47 patients – 61.7% male (n=29) and 38.3% female (n=18). Mean age – 56 years (±16), mean hospital stay – 19 days (±10). 78.7% had acute otitis media (n=37). No difference between gender and etiology of meningitis – acute or chronic otitis media ($p=0.065$). Positive lumbar puncture culture was found in 21.3% (n=10), most frequently found pathogen – *S.pneumoniae* (80.0%, n=8). Positive culture of the middle ear contents in 27.7% (n=13), most frequently – *S.pyogenes* and *Staphylococcus* (23.1%, n=3). Mortality – 17.0%, with no difference between mortality and etiology ($p=0.667$).

Conclusions: In the majority of recent studies, the main etiology of intracranial complications is chronic otitis media. Our study shows that acute otitis media was the main cause of otogenic meningitis.

Kopsavilkums

Otogēna meningīta etioloģija Paula Stradiņa Klīniskajā universitātes slimnīcā

***Atslēgvārdi*:** *akūts vidusauss iekaisums, hronisks vidusauss iekaisums, meningīts*

Ievads: meningīts – viena no biežākajām intrakraniālajām vidusauss iekaisuma komplikācijām. Tā incidence attīstītajās valstīs ir samazinājusies, taču joprojām ir aktuāla problēma attīstības valstīs.

Darba mērķis: noskaidrot pacientu raksturojošās īpašības, biežāko etioloģiju – akūts vai hronisks vidusauss iekaisums – pacientiem, kuri stacionēti P. Stradiņa Klīniskajā universitātes slimnīcā ar bakteriālu meningītu, kas radies akūta vai hroniska vidusauss iekaisuma dēļ.

Materiāli un metodes: retrospektīvā pētījumā izmantotas 47 pacientu slimības vēstures, kuri tikuši stacionēti P.Stradiņa Klīniskajā universitātes slimnīcā ar akūtu bakteriālu meningītu akūta vai hroniska vidusauss iekaisuma rezultātā no 2006.gada 1.janvāra līdz 2015.gada 31.decembrim. Pacienti, kuriem otogēns meningīts attīstījās galvaskausa traumas rezultātā, pētījumā netika iekļauti. Datu statistiskai apstrādei izmantota SPSS 23.0 programma ($p<0,05$).

Rezultāti: 47 pacieni – 61,7% vīrieši (n=29) un 38,3% sievietes (n=18). Vidējais vecums – 56 gadi (±16), vidējais stacionēšanas ilgums – 19 dienas (±10). 78,7% pacientu bija akūts vidusauss iekaisums (n=37). Nav atšķirības starp pacienta dzimumu un meningīta etioloģiju – akūts vai hronisks vidusauss iekaisums ($p=0,065$). Pozitīvs likvora uzsējums 21,3% (n=10), visbiežāk – *S.pneumoniae* (80.0%, n=8). 27.7% pozitīvs vidusauss satura uzsējums (n=13), visbiežāk – *S.pyogenes* un *Staphylococcus* (23.1%, n=3). Letāls iznākums – 17,0%, nav saistība starp otogēna meningīta etioloģiju un mirstību ($p=0,667$).

Secinājumi: lielākajā daļā jaunāko pētījumu noskaidrots, ka otogēns meningīts biežāk attīstās pacientiem ar hronisku vidusauss iekaisumu. Šajā pētījumā meningīts biežāk attīstījās akūta vidusauss iekaisuma dēļ.

Introduction

After the development of an effective antibiotics and medical technologies the incidence and the prevalence of complications of otitis media has significantly decreased in the developed countries, but it remains an actual problem in the developing countries (Patel et al. 2014).

Mostafa et al (2009) described that nowadays the complications of otitis media are found in 15.5% of cases, mostly in the cases of chronic otitis media, and with overall mortality about 1.42%.

Currently the intracranial complications occur in 4% of otitis media cases (Ciobra *et al.* 2007) and 80% of these complications are due to chronic otitis media (Penido *et al.* 2015). Meningitis and cerebral abscess are the most frequently found intracranial complications (Penido et al. 2005).

The three main pathways that result in the intracranial complications of otitis media are hematogenous spread, direct extension through the bony erosion or preformed pathways, and thrombophlebitis of local perforating veins (Mattingly *et al.* 2016).

An acute otitis media develops in a previously healthy ears and the infection spreads contiguously into the mastoid. Given the lack of a granulation tissue and a bone erosion, the infection spreads either hematogenously or through the direct extension via preformed pathways such as the Mondini's malformation or an enlarged vestibular aqueduct, trauma from previous surgery, or prior temporal bone fractures (Mattingly *et al.* 2016).

A chronic otitis media is characterized by the persistent mastoid and middle ear inflammation and infection. Continued inflammation results in the granulation tissue formation and bony destruction. The infection spreads through direct extension via bony erosion from the cholesteatoma or osteitis, or possibly through the preformed pathways (Mattingly *et al.* 2016).

Mortality from the intracranial complications has decreased from 75% in the pre-antibiotics era to 5-34% nowadays (Viswanatha *et al*. 2013). In addition latest studies show that mortality from the intracranial complications is higher in cases of chronic otitis media with cholesteatoma (Penido *et al.* 2015). In 58% of cases the patients have a combination of a different intracranial complications, mostly – cerebral abscess and meningitis (Jung *et al.* 2005).

In cases of acute otitis media, the intracranial complications develop more rapidly and are diagnosed earlier and treated more effectively. But in cases of chronic otitis media, the complications develop in a longer time period and are harder to diagnose and treat (Penido *et al.* 2015).

Meningitis is one of the most frequently found intracranial complications, it is found in 62% of cases (Konsolov *et al.* 2001). *Felisati et al* (2004) and *Mostafa et al* (2008) observed that the otogenic meningitis is more common in children and young adults. And it mostly develops due to chronic otitis media (Konsolov *et al.* 2001). However, in some of the latest studies, researchers found out that the otogenic meningitis had developed mostly due to acute otitis media (Ibrahim *et al.* 2010).

Despite the effective antibacterial treatment the mortality from the otogenic meningitis is 5%-19% (Prasad *et al.* 2013). And permanent neurological deficit occurs in 25.8%, hearing loss in 47.8% of cases (Penido *et al.* 2015).

In the majority of cases otogenic meningitis is caused by the same microorganisms as acute or chronic otitis media – *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Moraxella catarrhalis* (Lee 2012).

In the recent studies a positive cerebrospinal fluid bacterial culture is found in 18-75% of cases. The rate of positive culture results is affected by the previous antibacterial treatment and laboratory resources (Geyik *et al.* 2002).

Penido et al (2015) observed that *Proteus mirabilis, Enterococcus*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Klebsiella* were the most common microorganisms in cases of otogenic meningitis due to the chronic otitis media. Nevertheless, in the cases of acute otitis media – *Streptococcus pneumoniae, Haemophilus* and *Staphylococcus*.

The primary treatment of the otogenic meningitis is broad-spectrum antibiotics and intravenous corticosteroids produce favorable prognosis. The pre-antibiotic era practice of performing mastoidectomy within the first 24h nowadays is not recommended. The emergency surgery is indicated only in a cases of the coalescent mastoiditis or with worsening and/or neurological manifestations after 48h of the initiation of drainage and high dose antimicrobial therapy. If necessary the otologic surgery should be performed only after the patient is neurologically stable (Prasad *et al.* 2013).

Materials and methods

A retrospective study using 47 patients' medical records with bacterial meningitis due to the acute or chronic otitis media who were hospitalized in the Pauls Stradins Clinical University Hospital during the period of January 1st 2006 to December 31st 2015.

Patients younger than 18 years and with a post-traumatic meningitis were excluded.

The statistical analysis was conducted using IMB SPSS 23.0 software and $p<0.05$ was considered statistically significant. The descriptive statistics, T-test and Spearman's correlations were used.

Results

There were 47 patients – 61.7% male (n=29) and 38.3% female (n=18). But there was no statistically significant difference between the genders (p=0.109).

The patients most frequently were hospitalized in the years 2012 and 2015 – eight patients, followed by the year 2013 (n=7). In the years 2006, 2008 and 2011 there were 5 patients, in 2014 there were 4 patients, in 2009 – 3 patients and in year 2007 – 1 patient (see Fig.1).

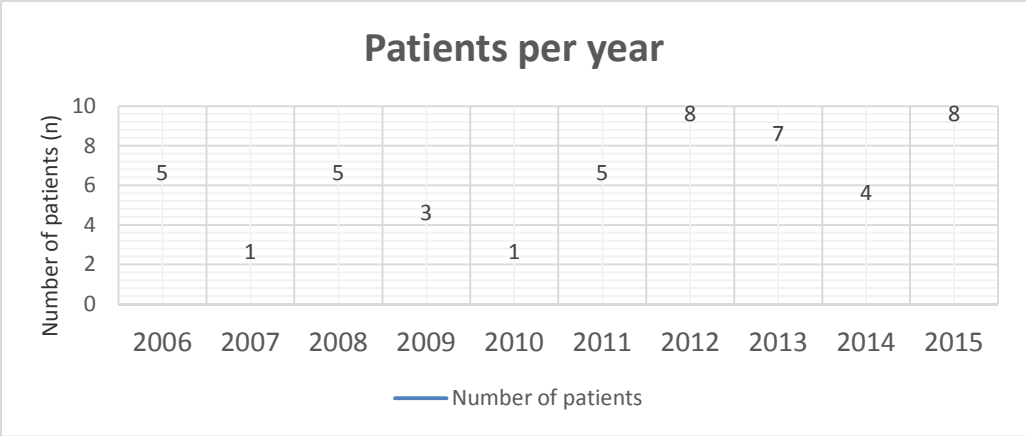


Figure 1. **Hospitalized patients per year**

Most frequently patients were hospitalized in the April – 14.9% (n=7). 10.6% of patients were hospitalized in the June, July, October and November (n=5), 8.5% in February and December (n=4), 6.4% in January, March and May (n=3), 4.3% in September (n=2) and 2.1% in August (n=1) (see Fig.2). There was no statistically significant difference between the months of hospitalization (p=0.065).

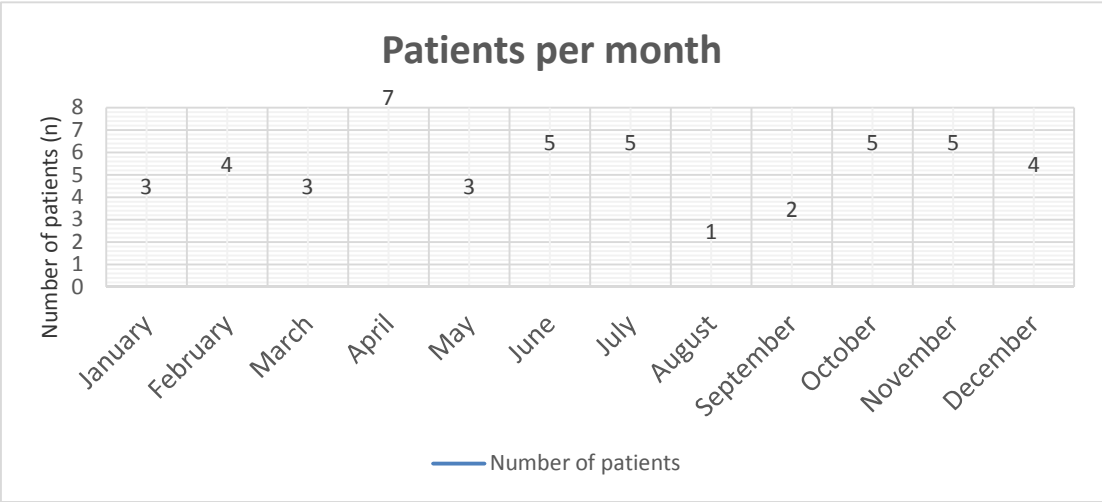


Figure 2. **Hospitalized patients per month**

The mean age of the patient was 56 years (±16) and it is statistically significant that female patients were older (p=0.047). The mean age of the female patients was 62 years, male – 52 years.

The average days that patient spent in the hospital was 19 days (±10).

In 78.7% of cases meningitis had developed due to an acute otitis media (n=37), 21.3% – due to chronic otitis media (n=10) (see Fig.3). But there was no statistically significant difference between the etiology of meningitis – acute or chronic otitis media – and the gender of the patient (p=0.065).

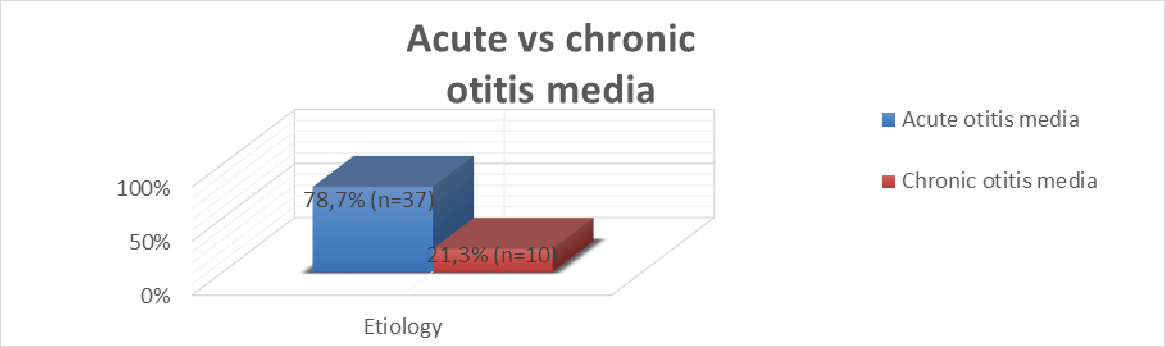


Figure 3. **Etiology of meningitis – acute vs chronic otitis media**

61.7% of patients had otitis media of the right ear (n=29), 34.0% – of the left ear (n=16) and in 4.3% of cases – bilateral otitis media (n=2).

For diagnostic purposes lumbar puncture was performed in 95.7% of cases (n=45) and positive cerebrospinal fluid bacterial culture was found in 21.3% of cases (n=10). In 80.0% *Streptococcus pneumoniae* was found (n=8), in 10.0% – *Streptococcus pyogenes* (n=1) and in 10.0% – *Staphylococcus epidermidis* (n=1).

In 27.7% there was a positive culture of the middle ear contents (n=13). The most frequently found pathogens were group A β hemolytic *Streptococcus pyogenes* (23.1%, n=3) and methicillin-sensitive coagulase negative *Staphylococcus* (23.1%, n=3). In 7.7% – *Pseudomonas stutzeri* (n=1), in 7.7% – methicillin-sensitive *Staphylococcus aureus* and methicillin-sensitive coagulase negative *Staphylococcus* (n=1), in 7.7% – *Streptococcus pneumoniae* (n=1), in 7.7% – *Moraxella phenylpyruvica* (n=1), in 7.7% – *Staphylococcus auricularis* (n=1), in 7.7% – *Klebsiella pneumoniae* (n=1), in 7.7% – *Enterococcus faecium* and methicillin-sensitive coagulase negative *Staphylococcus* was found (n=1) (see Fig.4).

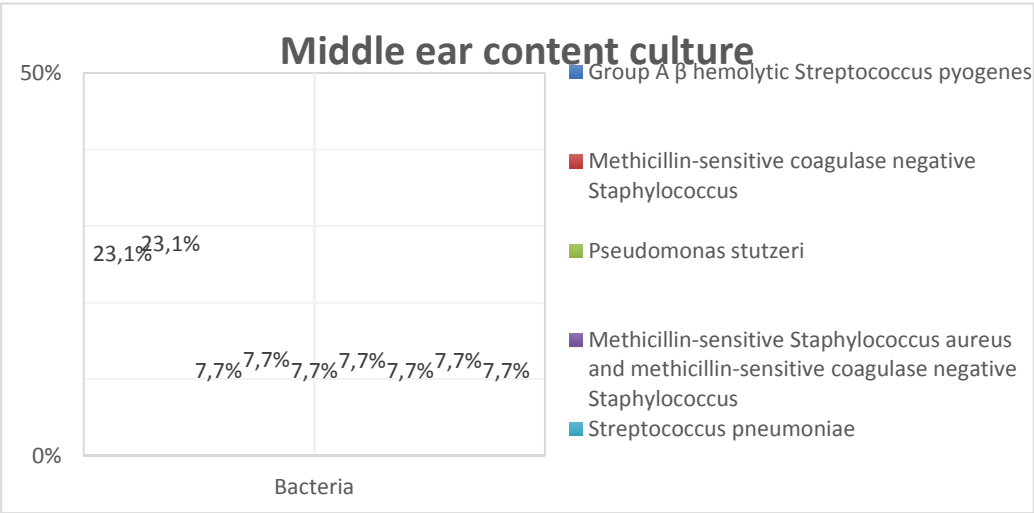


Figure 4. **The middle ear content bacterial culture results**

There was no statistically significant difference between the pathogen found in the cerebrospinal fluid and in the contents of the middle ear (p=1.000). Also, there was no difference in the results from the cerebrospinal fluid (p=1.000) or from the contents of the middle ear (p=0.885) and the etiology of the meningitis – acute or chronic otitis media.

There were 8 lethal cases in this study – 17.0%. Patients who died, spent an average 23 days in the hospital (IQR 3.3-38.0).

The etiology of the meningitis – acute or chronic otitis media – had no implication to the mortality from the disease (p=0.667). And there was no statistically significant difference between the results of the cerebrospinal fluid culture (p=1.000) or contents of the middle ear (p=0.538) and the mortality of otogenic meningitis.

Discussion

The incidence of intracranial complications of the otitis media in the world has significantly decreased in the past years thanks to the effective antibacterial treatment. The aim of this study was to determine the incidence of otogenic meningitis in Pauls Stradins Clinical University Hospital in the past ten years, to compare the results to the world data, and to evaluate the situation in Latvia.

During the past ten years, there were 47 cases of otogenic meningitis in Pauls Stradins Clinical Univeristy Hospital. The results in a recent study by *Konsolov et al* (2001) were similar – in the years 1990-2000 there were 34 cases of otogenic meningitis in the University Hospital of Plodviv, Bulgaria. The incidence was slightly higher in the study by *Geyik et al* (2002) in the Dicle University Hospital in Turkey – there were 56 cases of otogenic meningitis in a ten year period. On the contrary, *Felisati et al* (2004) observed that in the University of Milan in Italy in the past ten years there were no cases of otogenic meningitis in the adult population. It has been proven that the development level of a country impacts the incidence of otogenic meningitis. The incidence is higher in the developing countries than in the developed countries. The status of a country determines the development level and the availability of the healthcare as well as the patients' socio-economic status, which also influences the incidence of otogenic meningitis. Latvia, Bulgaria as well as Turkey are in the list of developing countries.

Leskinen and Jero (2005) observed that incidence of otogenic meningitis in Helsinki in Finland is 0.026 cases in 100 000, while *Ibrahim, Cheang and Nunez* (2010) in Bristol in United Kingdom observed that incidence is 0.42 cases in 100 000. To compare these data to the data obtained from Pauls Stradins Clinical University Hospital, we can use the data about Latvia's population in the middle point of this study since the majority of emergency otologic surgeries in Latvia are performed in the Department of Otorhinolaryngology in Pauls Stradins Clinical University Hospital. In the year 2011 the population of Latvia was 2 230 000 and the average

incidence of otogenic meningitis by the results of this study is 4.7 cases per year. From that we can calculate that the annual incidence of the otogenic meningitis in Latvia is 0.21 cases in 100 000.

Otogenic meningitis mostly affects children and young adults and only in rare cases – older people (Budenz *et al*. 2015). In a study by *Geyik et al* (2002) there were 56 patients with otogenic meningitis, 38 males and 18 females. The average age of the patient was 25.8 years. Data from Pauls Stradins Clinical University Hospital are similar – during the past ten years there were 47 cases of otogenic meningitis, from which 61.7% were males (n=29) and 38.3% females (n=18). But the average age of the patient was higher – 56 years (±16). We must add that in the study by *Geyik et al* (2002) there were included patients in the age from 14 to 65 years, but in this study – from 18 to 83. It is possible that the patients in this study are older because the average age of the Latvia's population increases every year. And older people tend to seek medical help delayed and in some cases it is not available at all, it all together promotes the development of the complications. And older patients more frequently have other comorbidities. All these factors influence the development of the disease, its' course and the development of different complications.

The majority of the twentieth century's studies suggests that in an adult population otogenic meningitis more often develops due to chronic otitis media (Konsolov *et al.* 2001). But *Leskinen and Jero* (2005) in a study in Helsinki University Hospital observed that all cases otogenic meningitis was caused by acute otitis media. *Ibrahim, Cheang and Nunes* (2010) in a study in Bristol also observed that otogenic meningitis had developed only due to acute otitis media. The predominance of an acute otitis media as a causative factor may be due to the improvements in the surgical management of the chronic otitis media, or due to the increase of a complicated acute otitis media in adult cases. The improvement of the surgical management of the chronic otitis media is suggested by the absence of patients with surgically treated chronic otitis media in the meningitis cases (Ibrahim et al. 2010). In the study carried out in Pauls Stradins Clinical University Hospital otogenic meningitis developed due to acute otitis media in 78.7% (n=37) of cases and only in 21.3% (n=10) of cases due to chronic otitis media. In a cases of acute otitis media, the meningitis develops due to hematogenous spread of the infection. Another possible reason for the development is the characteristics of the causative microorganism – the pathogenicity and the antibacterial sensitivity, but there were no data about the antibacterial sensitivity in this study. And it was also observed that the results of the cerebrospinal fluid (p=1.000) and the middle ear content (p=0.538) bacterial culture had no effect on the mortality.

In the world data positive cerebrospinal fluid bacterial culture is found in 18-75% of cases, it is associated with a previous antibacterial treatment and the laboratory capacity (Budenz et al. 2015). In the Pauls Stradins Clinical University Hospital a positive cerebrospinal fluid culture was found in 21.3% of cases (n=10), in 80% of cases *Streptococcus pneumoniae* was found. Positive

middle ear content culture was found in 27.7% of cases (n=13) and group A beta hemolytic *Streptococcus pyogenes* was found in 23.1% of cases (n=13) and methicillin-sensitive coagulase negative *Staphylococcus* was also found in 23.1% of cases (n=13). *Penido et al* (2015) observed that the patients with intracranial complications due chronic otitis media most frequently had *Proteus mirabilis*, *Enterococcus, Pseudomonas aeruginosa, Staphylococcus aureus* and *Klebsiella*. But patients with acute otitis media – *Streptococcus pneumoniae*, *Haemophilus* and *Staphylococcus*. Although in this study the results of bacterial culture are similar to other studies, there was no connection between the microbe found in the middle ear content (p=0.885) or cerebrospinal fluid (p=1.000) and the etiology of meningitis – acute or chronic otitis media.

Despite the fact that the incidence of otogenic meningitis has decreased thanks to the effective antibacterial treatment, mortality is still high – 13% (Osma *et al.* 2000). In some studies, it reaches up to 41% (Geyik *et al.* 2002). The mortality in Pauls Stradins Clinical University Hospital is similar to the world data – 8 cases or 17%.

Conclusions

The incidence of the otogenic meningitis in Pauls Stradins Clinical University Hospital is higher by comparing to other countries.

The average age of the patient in Pauls Stradins Clinical University Hospital is higher than in the studies carried out in other countries where otogenic meningitis is more common in children and young adults.

In this study otogenic meningitis mostly developed due to acute otitis media, unlike in other countries.

A positive bacterial culture results are similar in this study and data from other countries. Most frequently found microorganisms were *Streptococcus pneumoniae*, *Streptococcus pyogenes* and *Staphylococcus*, which is similar to the other studies.

Mortality from otogenic meningitis is still high and it is similar worldwide.

References

Budenz C.L., El Kashlan H. K., Shelton C. et al. 2015. Complications of Temporal Bone Infections. In: Flint P. W., Haughey B.H., Lund V. et al. *Cummings Otolaryngology. Head and Neck Surgery,* 6th ed. Philadelphia: Elsevier, 2156-2176.

Ciorba A., Berto A., Borgodzoni M. et al. 2007. Pneumocephalus and meningitis as a complication of acute otitis media: case report. In: *Acta Otorhinolaryngologica Italica,* 27:87-89.

Felisati G., Di Berardino F., Maccari A. et al. 2004. Rapid evolution of acute mastoiditis: three case reports of otogenic meningitis in adults. In: *Am J Otolaryngol,* 25(6):442-446.

Geyik M. F., Kokoglu O. F., Hosoglu S. et al. 2002. Acute bacterial meningitis as a complication of otitis media and related mortality factors. In: *Yonsei Medical Journal,* 43(5): 573-578.

Ibrahim S. I., Cheang P. P., Nunez D. A. 2010. Incidence of meningitis secondary to suppurative otitis media in adults. In: *The Journal of Larynogology & Otology,* 124:1158-1161.

Jung T.T.K., Hunter L.L., Alper C.M. et al. 2005. Recent advances in otitis media. 9. Complications and sequelae. In: *The Annals of otology, rhinology & laryngology. Supplement,* 194:140-160.

Konsolov S., Jovchev I., Pazardzhikliev D. et al. 2001. Intracranial otogenic complications. In: *Balkan Journal of Otology & Neuro-otology*, 3:101-102.
Lee K..J. 2012. Infections of the temporal bone. In: Lee K.J. *K.J. Lee's Essential otolaryngology, head & neck surgery*, 10th ed. United States of America: The McGraw-Hill books, 300-337.
Leskinen K., Jero J. 2005. Aute complications of otitis media in adults. In: *Clin. Otolaryngol*, 30:511-516.
Mostafa B. E., El Fiky L. M., El Sharnouby M. M. 2009. Complications of suppurative otitis media: still a problem in the 21st century. In: *ORL J Otorhinolaryngol Relat Spec*, 71(2):87-92.
Osma U., Cureoglu S., Hosoglu S. 2000. The complications of chronic otitis media: report of 93 cases. In: *The Journal of Laryngology and Otology*, 114:97-100.
Patel K. M., Almutairi A., Mafee M. F. 2014. Acute otomastoiditis and its complications: Role of imaging. In: *Operative Technoques in Otoloaryngology*, 25:21-28.
Penido N. O., Borin A., Suguri V. M. et al. 2005. Intracranial complications of otitis media: 15 years of experience in 33 patients. In: *Otolaryngol Head Neck Surg*: 132 (1): 37-42.
Penido N. O., Chandrasekhar S. S., Borin A. et al. 2015. Complications of otitis media – a potentially lethal problem still present. In: *Braz J Otorhinolaryngol.* Iegūts no: http://dx.doi.org/10.1016/j.bjorl.2015.04.007 [sk. 19.01.2016].
Prasad S. C., Shin S. H., Russo A. et al. 2013. Current trends in the management of the complications of chronic otitis media with cholesteatoma. In: *Curr Opin Otolaryngol Head Neck Surg*, 21 (5): 446-454.
Viswanatha B., Kaseeruddin K. 2013. Neurotologic complications of otitis media with cholesteatoma. In: *Journal of Neurology and Epidemiology*,1: 20-30.

STROKE PATIENTS' RELATIVES SATISFACTION EVALUATION OF REHABILITATION SERVICES IN FURTHER REHABILITATION STAGE

Jana Višņevska[1], Madara Vasile[2], Baiba Koševare[2], Inese Kokare[2]
[1]LatviaUniversity, Raiņa bulvāris 19, Riga, Latvia, LV-1586
jalazz@inbox.lv
[2]Pauls Stradins Clinical University Hospital,Physical Medicine and Rehabilitationcenter, Pilsoņu street 13, Riga, Latvia, LV-1002
madara.vasile@gmail.com, kosevare@gmail.com, kokaretcm@yahoo.com

Abstract

Stroke patients'relatives satisfaction evaluation of rehabilitation services in further rehabilitation stages

Key Words: *rehabilitation, stroke, opinion of patients` relatives,physiotherapy, PSCUH*

A stroke is a clinical syndrome characterized by rapidly developing clinical symptoms and / or signs of focal and at times global loss of cerebral function with symptoms lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin (WHO).Stroke is the most common cause of disability and holds the third place as the cause of death, behind heart disease and tumors. 208.1/100 000 Latvian inhabitants died from cerebrovascular diseases in 2010whilein 2014 244.5/100 000.In this research were used data from PSCUH neurology clinic which held information about patients with stroke diagnosis. Study was realized by questionnaire method calling each relative. All data were gathered and analyzed using MS Excel program.100respondentswere questioned. 12 patients had died, 25 respondents didn't pick up, 6 refused to talk.After discharge from the hospital 31% received referral for home rehabilitation, 60% to the NRC "Vaivari", 2% to the RC "Jaunķemeri", 5% to the Sigulda Hospital rehabilitation center and 2% to other rehabilitation institution.With NRC "Vaivari" provided services 77% (24) were satisfied, 23% (7) were not.With home rehabilitation services satisfied was everyone who receives it.Currently 46% do not participate in rehabilitation, but 61% of them would be willing to do so.In conclusion,the most common received referral was to the NRC „Vaivari". Currently kinsfolk's involvement in the rehabilitation process is not sufficient however they would be willing to take part after training.

Kopsavilkums

Insulta pacienta piederīgo apmierinātības izvērtējums ar rehabilitācijas pakalpojumiem tālākajā rehabilitācijas posmā

Atslēgvārdi: *rehabilitācija, insults, pacienta piederīgo viedoklis, fizioterapija, PSKUS*

Insults ir klīnisks sindroms, kas raksturojas ar straujas attīstības gaitas fokālu neiroloģisku deficītu, kas ilgst vairāk kā 24 stundas vai izraisa nāvi un irvaskulāras izcelsmes. Insultsir biežākais invaliditātes iemesls un ieņem trešo vietu kā mirstības cēlonis uzreizaiz sirds slimībām un audzējiem. No cerebrovaskulārajām slimībām Latvijā 2010. gadā miruši 208.1/100 000 iedzīvotāju, bet jau 2014. gadā no cerebrovaskulārajām slimībā miruši 244.5/ 100 000 iedzīvotāju.Pētījuma materiāls ir PSKUS Neiroloģijas klīnikas pacienti ar diagnozi insults. Pētījumā tika veikta telefona intervija ar anketēšanas metodi. Pētījuma rezultāti tika statistiski analizēti, izmantojot programmu Excel.Tika aptaujāti 100 respondenti. 13 pacienti miruši, 25 respondenti necēla klausuli, 5 atsakās no sarunas. Izrakstoties no stacionāra 31% saņēma nosūtījumu mājas rehabilitācijai, 60% saņēma nosūtījumu uz NRC „Vaivari", 2% uz RC „Jauķemeri", 5% uz Siguldas slimnīcas rehabilitācijas nodaļu, 2% uz citām rehabilitācijas iestādēm.NRC „Vaivari" sniegtie pakalpojumi apmierināja 24 jeb 77%, neapmierināja 7 jeb 23%. Ar mājas rehabilitācijas sniegto pakalpojumu apmierināti bija visi, kas to saņēma. Šobrīd 46% neiesaistās rehabilitācijā, bet no tiem 61% būtu gatavs to darīt. Secinām, ka visbiežāk nozīmētā tālākā rehabilitācija ir NRC „Vaivari".Šobrīd piederīgo iesaiste rehabilitācijas procesos nav pietiekama, taču viņi būtu gatavi to darīt pēc apmācības.

Introduction

Stroke is clinical syndrome consisting of rapidly developing clinical signs of focal disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin (WHO). Stroke is the most common cause of disability and holds the third place as the cause of death behind heart disease and tumors. 208.1/100 000 Latvian inhabitants died from cerebrovascular diseases in 2010 while in 2014 244.5/100 000 (spkc 2015). This number has a tendency to increase.

Rehabilitation is an independent medical specialty that provides patients with the development of physical and cognitive function, activitiesand with modification of personal and environmental factors. Thus rehabilitation contains prevention, diagnosis, treatment and rehabilitation direction for people who has disease which are modifying their functionality and coexisting conditions in all age groups (Hāznere u.c. 2009).

The aim of rehabilitation is to ensure that patient after illness or injury has the greatest possible independence, optimal economic and social living conditions, to shorten the time of patients' treatment in a hospital institution, thereby increasing the quality of treatment and reducing the society expenses and present consequences of injury.

Rehabilitation is provided by multidisciplinary team which consists of physical medicine and rehabilitation doctor, physiotherapist, occupational therapy, audio speech therapist and psychologist. It is important to involve patients` relatives in this multidisciplinary work that helps to motivate and provide continuity of rehabilitation (Hāznere u.c. 2009).

Even in the case of an optimal stroke treatment, including thrombolysis, less than one third of patients recover completely.

The rehabilitation of stroke patients have a number of tasks - improve the patient`s physical and cognitive status, to ensure maximum independence of patients` functionality, helping the patient to return to his family and society, and to provide best possible life quality. There is no well-defined early rehabilitation start-up time, however, several studies indicate that multidisciplinary rehabilitation must be started in stroke unit at first days after the stroke. Typically, the first 24 hours is recommended peace regime, patients are monitored and rehabilitation starts as soon as the patient's general condition allows it (LNB 2015).

Rehabilitation should be continued for one year after discharge from the hospital, gradually increasing the duration and intensity of classes.The most common complications of stroke, which affects the efficiency of rehabilitation is after stroke depression, pain and spasticity. At least one-third of patients, who have experienced a stroke, suffer from depression, regardless of the ischemic focus localization.

Considering expenses that need to be made to reduce consequences of stroke, creating burden for society, it is important to choose potential candidates appropriately to ensure that limited health care recourses is used properly. Although many patients may benefit from intensive rehabilitation, it is not cost-effective to offer rehabilitation treatment in hospital for those whose needs can be assured in an outpatient treatment or in home rehabilitation.

A good functional status before the stroke is an important prerequisite for sending patients to acute inpatient rehabilitation. Severity of neurological deficit and degree of disability after a stroke

when patient is discharged from primary hospital is important predictors for discharge planning after a stroke.

When planning the rehabilitation program for the future, the factors (which are taken into account in selecting the candidates) affecting it are: age, independence before the stroke, the higher level of mobility, pelvic organ function control (urinary incontinence), social support (Vētra u.c. 2015).

Functional status evaluation is mandatory to be able to decide on the future rehabilitation plans. Functional status assessment is based on ICF principles, using standardized measurements. Evaluation takes place on the third day and before signing out from hospital and is recorded in patient medical card. NIHSS, Barthel Index, Functional independence measure (alpha-FIM), Mini–mental state examination (MMSE), Fugl-Meyer upper limb evaluation, visual analogue scale (VAS) is used for evaluation. In addition Motor Assessment Scale (MAS), modified Rankin Scale (mRS), Neglect Scale (Alberts test) can be use (Vētra u.c. 2015).

For a patient to be sent to hospital for further rehabilitation patient must fit for following criteria: NIHSS 6-13, Barthel Index5-14, Mobility Scale 15 - 30, the modified Rankin scale 3-4, functioning disorders must be credible, 24-hour medical supervision is necessary during rehabilitation, the patient is medically stable, the patient is able to actively participate in the program and a number of rehabilitation specialists are required for functioning disorder reduce, then the patient is more likely to benefit from the program. There must be clearly defined rehabilitation program aims in order to start inpatient rehabilitation (ESO 2008).

NRC „Vaivari” offered inpatient rehabilitation is country funded, but there are also possibility to receive inpatient rehabilitation in Sigulda hospital rehabilitation department, RC "Jaunkemeri", Bikernieku hospital rehabilitation department, etc.Unfortunately, in these institutions inpatient rehabilitation is entirely on patients' finance.

For those patients whose condition is not suitable for in-patients rehabilitations and/ or whose health condition is worse, state-financed home rehabilitation are offered, however if rehabilitation potential is insufficient, long-term care in a care institution is assign. For receiving home rehabilitation patients must fit following criteria: patient must be motivated, medically stable, patient modified Rankin scale is 4 (5), Mini–mental state examination over 18, Barthel Index is 2-14, NIHSS is 6-13, the scale of mobility after a stroke is 6-15(RCP London 2012). Not only patient must be motivated, but also the patients` relatives should be, this factor is playing big role in rehabilitation process. Patients receive home rehabilitation at their home where after rehabilitation doctor recommendatory appropriate specialists are sent.

Patient must fit following criteria when deciding on the transfer of the patient to care institution: modified Rankin scale 5, NIHSS more then 13, Mini–mental state examination under 17, Barthel index from 0 to 5 as well as patient must be medically stable (Lindsayet al 2008).

A patient whose state of health is better than inpatient rehabilitation criteria is recommended for outpatient rehabilitation.

Material and methods

This study is retrospective.In this research were used data from PaulsStradinsClinical University Hospital neurology clinic which held information about patients with stroke diagnosis who received rehabilitation services in time window from 1 August till 31 October. Study was realized by questionnaire methodcalling each relative. All data were gathered and analyzed using MS Excel program.

Results

100 respondents were questioned. From in this study included patients 55 were women and 45 men, in the age group from 36 to 76 and more. 75% of patients were 66 years old andolder. 13 patients had died, 25 respondents didn't pick up, 5 refused to talk. After discharge from the hospital 31% received referral for home rehabilitation, 60% to the NRC “Vaivari”, 2% to the RC “Jaunķemeri”, 5% to the Sigulda Hospital rehabilitation center. 44% of patients received two or more referrals for further rehabilitation in various rehabilitation centers.

18% (11) of the patients waited in the queue to the NRC “Vaivari” up to one month, 28% (17) were waiting for 2-3 months, 4% (2) waited longer than 3 months, 13% (8) are still waiting (21.01.2016.) and 37% (22) refused from this service. With NRC “Vaivari” provided services were satisfied77% (24), but 23% (7) were not.

56% (15) refused from the home rehabilitation, 11% (3) are still waiting (21.01.2016.) and 33% (9) waited up to a month. All (100%) respondents,whose relative (patient) received home rehabilitation services,admitted that this service was useful.

4% received a referral for the rehabilitation in RC "Jaunķemeri" which is a fee service.On the issue of satisfaction for service respondents replay positively.5% received referral for the rehabilitation in Sigulda Hospital rehabilitation unit which also is a fee service and the half of those who have used this service where satisfied.

Currently 46% relatives do not participate in rehabilitation, but 61% of them would be willing to do so after proper training. 75% of relatives who lives together with patients told that they are engage in the rehabilitation process as far as possible, but from those relatives who visited patient once a week admitted that only 33% are engage in rehabilitation process.

Discussion

The fact that a referral is provided does not mean, that it is used. Possible causes for this kind of situation might be death of patient, worsening or improvement of patient's health state and emotional state of patient– after stroke depression (Monnin *et al.* 2002).

Due to national co-financing the most common provide referrals are to NRC "Vaivari" and home rehabilitation. That result in waiting in long queue. RC "Jaunķemeri" and Sigulda Hospital rehabilitation center are paid services, accordingly smaller amount of referrals are given, therefore it is difficult to evaluate satisfaction with these provided services.

Dissatisfaction with provided services of NRC "Vaivari" could be explained by illusion, that there will be instant improvement after rehabilitation process. Unfortunately there are times when it`s no possible to restore patients functionality fully.

Home rehabilitation was the most common referral from which pacients had refused or claimed that there was no such referral. Possible causes might be: alack of information provided for relatives about this service or that also family doctor don`t has enough information about this service.

In 2016 a study on stroke patients relatives' satisfaction with the PSCUH provided services in acute rehabilitation phase was made. Results showed that 75% where satisfied with received services. Considering that in this work we find out that 77% are satisfied with provided services, we can infer that patients' relatives are satisfied with both the acute care of stroke patients and the later rehabilitation phase (Monnin *et al.* 2002).

In 2012, Canada, Ontario region a similar study was made, which included 396 patients which were chosen as potential candidates for inpatient rehabilitation (Williams *et al.* 2012). From those 147 (37,1%) were approved as suitable for inpatient rehabilitation andfrom these 147 patients 111 (75%) were transferred to inpatient rehabilitation unit. Remaining 249 (62.9%) patients were not considered as candidates. Majority (80%) of them had experienced a mild stroke and were send home or severe disability after the stroke and where sent directly to the long-term care.On the contrary in our research for the further rehabilitation were sent 60%, what is almost twice as much. That shows that criteria after which patients are chosen for rehabilitation possibilities should be reconsidered.

Conclusions

- The most common received referral was to the NRC "Vaivari".
- Majority of patients who had received referral for home rehabilitation refused from it or claimed that there was no such referral; it could be explained by the lack of information about this service.

- Currently kinsfolk's involvement in the rehabilitation process is not sufficient however they would be willing to take part after proper training.

References

Hāznere I., Zandersone I., Aršauska I. 2009. *Fizikālās un rehabilitācijas medicīnas māsas pamatspecialitāte*, mācību materiāli. Nacionālais apgāds. 151.-158. lpp.

Latvijas neirologu biedrība 2013. *Cerebrāla infarkta prehospitālās aprūpes, diagnostikas un akūtas ārstēšanas klīniskās vadlīnijas.* Rīga, 14., 57.-58. lpp.

Vētra A., Mihejeva I., Tanenberga I. 2015. *Pacientu atlase rehabilitācijai pēc insulta*. LĀRA, 19.02.2015.

Slimības profilakses un kontroles centrs 2015., Mirstība_par_2014. [tiešsaiste]. Rīga, – [atsauce 04.01.2016.]. Pieejams: http://www.spkc.gov.lv/veselibas-aprupes-statistika/

Williams D. et al 2012. Determining the Need for In-Patient Rehabilitation Services Post-Stroke: Results from Eight Ontario Hospitals. In: *HEALTHCARE POLICY* Vol. 7 No. 3.

Eiropas (ESO) 2008. gadā publicētās un 2009. gadā labotās vadlīnijas išēmiska insulta un tranzitoras išēmiskas lēkmes ārstēšanai. The European Stroke Organization (ESO) Executive Committee and the ESO Writing Committee. [tiešsaiste], [atsauce 04.12.2015.] Pieejams: http://www.esostroke.org/recommendations.php?cid=9

Lielbritānijas Karaliskās Ārstu Koledžas Nacionālās klīniskās insulta vadlīnijas 2012. 4th edition. London: Royal College of Physicians.

Monnin D., Perneger Th.V. 2002. Scale to measure patient satisfaction with physical therapy [tiešsaiste]. Switzerland, – [atsauce 07.01.2016.]. Pieejams: http://www.ptjournal.apta.org/content/82/7/682.full

Lindsay P., Bayley M., Hellings C., Hill M., Woodbury E. Phillips S. 2008. Heart & Stroke Foundation. Canadian Best Practice Recommendation for Stroke Care. [tiešsaiste]. Kanāda, – [atsauce 04.12.2015.] Pieejams: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2586332/

DATORZINĀTNES / COMPUTER SCIENCES

RELATIONAL AND DOCUMENT DATABASE SYSTEMS: ANALYSIS AND COMPARISON

Jurgita Lieponienė, Lukas Šlenderis
Laisvės 23, LT-35200 Panevėžys, Lithuania
jurgita.lieponiene@panko.lt, lukas.slenderis@panko.lt

Abstract
***Key words**: database, relation database, document database, experimental research, MongoDB, OracleXE*
Rapid development of information technologies puts forward new requirements to data storage, processing and management. Social networks, web 2.0, web 3.0 technologies, cloud computer technologies require certain means enabling effective management of unstructured information dataflow. As an alternative to relational databases NoSQL database management systems become more and more popular. This is the newest generation of database management systems that has emerged over the past decades. NoSQL databases are non-relational databases that have not got established standards yet; most often data are stored in data structures or documents.
This article presents differences between the relational database – *Oracle XE* and NoSQL database management system, the document database – *MongoDB.* Theoretical comparison criteria includes data model, data structure, scheme, scalability, query language, transactions. The experimental research compares the performance of relational and non-relational databases namely *Oracle XE*, and *MongoDB* by executing complex queries on a large set of data that is available in document-based mode and is converted to *Oracle XE* tables.

Introduction

Increasing competition of companies and organizations encourages companies to invest in introducing new data storage and management technologies. Constantly growing data flows of the Internet and business applications, changing structure of processed data affect the search for alternative data storage, processing and management technologies. Created in 1970 relational data model and the first emerged relational databases caused revolution at the database market (Berg *et al* .2013). The creation of relational databases became the breakthrough in the data storage and recovery sphere because it allowed managing huge amounts of data reliably and quickly. Relational databases enabled storage, processing and management of huge structured data files.

Although more than forty years have passed and relational databases still occupy the major part of the database market, as an alternative to relational databases NoSQL database management systems are becoming more and more popular. According to the data of the research conducted by the international market research and analysis company *International Data Corporation*, the amount of created and repeated per year data will increase up to 40 zettabytes by 2020, i.e. 50 times more than it was in 2010. In order to ascertain the advantages and disadvantages of relational and document databases processing rapidly growing data flows the research was conducted.

The objective of the research: to conduct the comparative analysis of relational and document databases, to assess by means of experiment the possibilities of data selection, renewal and removal within relational and document databases.

The tasks of the research:

1. To review the most popular database management systems.
2. To conduct the comparative analysis of relational and document databases.
3. To introduce the results of the conducted experimental research during which *Oracle XE* and *MongoDB* database management systems were tested.

The method of the research. In the course of the examination of the most popular database management systems the results of the researches conducted by international companies were analysed. Besides, the comparative analysis of relational and document databases was conducted by studying technical documentation of relational and document database management system and by analysing research results published in scientific articles. For the assessment of the possibilities of data selection, renewal and removal within relational and document databases, *Oracle XE* and *MongoDB* database management systems were tested by experiment.

The Review of the Most Popular Databases

It is difficult to find an information system, modern Internet solution that would not use one or the other database. At the moment the market suggests some few different database management systems, but all of them can be divided into two big groups: relational and NoSQL databases (Shalini, Dhamodharan 2014). The Internet system DB-Engines created by the Austrian IT consulting company for the evaluation of database management systems constantly carries out the search of new databases, makes an assessment of the popularity of various databases offered at the market.

For the assessment of the popularity of databases DB-Engines uses the following criteria: how many times a database management system was mentioned on different Internet websites, in technical discussions; popularity of a system in social networks is assessed, and the number of system job offers is evaluated. In March of 2015 DB-Engines system assessed 299 database management systems. Table 1 shows the list of 10 most popular database management systems marked by DB-Engines according to the data from March of 2016. The statistics provided in the table illustrates that relational database management systems dominate among the top 10 database management systems. Number one database management systems: Oracle, MySQL and Microsoft SQL Server. By the number of scored points these systems are significantly ahead of other popular database management systems in the list. The most popular NoSQL type databases: MongoDB, Cassandra, Redis. These systems represent document, wide column and key-value databases.

Table 1. **The Most Popular Database Management Systems (DB-Engines, March 2016)**

Rank	Database Management Systems	Database Model	Score
1.	Oracle	Relation DBMS	1472.01
2.	MySQL	Relation DBMS	1347.71
3.	Microsoft SQL Server	Relation DBMS	1136.49
4.	MongoDB	Document store	305.33
5.	PostgreSQL	Relation DBMS	299.62
6.	DB2	Relation DBMS	187.94
7.	Microsoft Access	Relation DBMS	135.03
8.	Cassandra	Wide column store	130.33
9.	Redis	Key-value store	106.22
10.	SQLite	Relation DBMS	105.77

The below given diagram includes the generalized assessment of the popularity of database management systems made by *DB-Engines* system according to the used data model. The diagram data show that relational databases remain the most popular systems (81,7 perc.). Document databases are considered to be the most popular among NoSQL type databases (6,6 perc.); search databases (3,4 perc.), key-value (3,4 perc.) and wide column databases (2,9 perc.) become more popular.

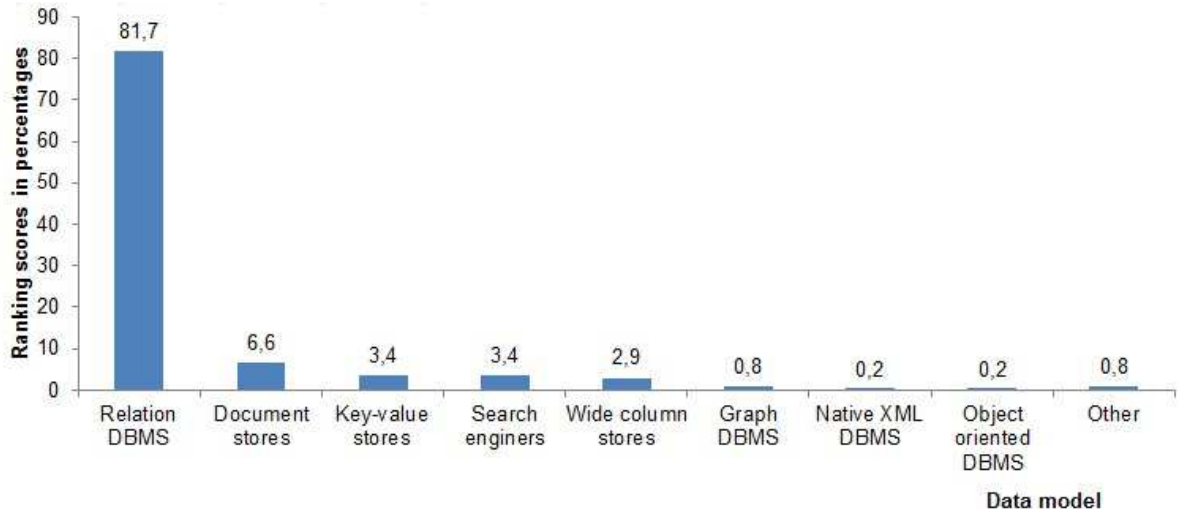


Figure 1. **Database Popularity Broken Down by Database Model (DB-Engines, March 2016)**

Research data show that relational databases remain the most popular database management systems. New-generation NoSQL databases become more popular. Document databases are considered to be the most popular among NoSQL databases.

Comparative Analysis of Relational and Document Databases

The aim of this comparative analysis is to investigate document databases in comparison with relational database approach in terms of data model, data structure, scheme, scalability, query language, transactions. The below provided table represents the generalized results of the

comparative analysis of relational and document databases. The comparison of databases is executed on the ground of the results of the researches conducted by A. Faraj, B. Rashid, T. Shareef, J. Kaur, H. Kaur, G. Sahib, M. Mohamed, O. Altrafi, M. Ismail, A. Nayak, A. Poriya, D. Poojary, R. P. Padhy, M. R. Patra, S. Ch. Satapathy, M. Shalini, S. Dhamodharan, N. Sharma, J. Charu, M. Chauhan, K. Thi Yar, K. M. Lar Tun.

Table 2. **Comparative Analysis of Relational and Document databases**

No	Criteria	Relation Databases	Document Databases
1.	Data model	Relation data model	Document data model
2.	Data structure	Database structures data into tables and rows (records).	Structures data into collections of documents
3.	Scheme	Fixed Scheme Each record conforms to fixed scheme.	Flexible Scheme Each document could have different or the same fields.
4.	Scalability	Scaling is vertical. More data means a bigger server	Scaling is horizontal, meaning across servers.
5.	Consistency	In relational database Consistency means that all users see the same version of data after the transaction. Thus, relational database provides better consistency than no-relational database (Faraj et al, 2014).	In Document database „Eventual Consistency“ means that there is no guarantee for reads and writes after the transaction for all entities in the database will be immediately consistent (Faraj et al, 2014).
6.	Query language	SQL	Query language depends on database
7.	Transactions	The vast majority of relational databases are ACID compliant.	Document Databases sacrifice ACID compliancy for performance and scalability

Relational Database (RDB) which based on the relational model has been architected more than 30 years ago mainly to serve business data processing since then it has become the best option for storing information that range from financial records, personal data and much more (Mohamed et al 2014). Relational databases (RDB) appeared when mathematical discipline – relational algebra – was applied in order to ensure data integrity (Makčinskas 2013). This data storage model ensures data integrity – following standard forms, information is separated into smaller units and relations (connections) are used. M. Shalini and S. Dhamodharan emphasise that relational database transactions possess qualities that ensure the reliability of transactions. These qualities of transactions are called ACID qualities: atomicity, consistency, isolation, durability. Atomicity is an ability of database to ensure that all the actions of the transaction or none of them would be executed. Consistency is the keeping of the permanent state of the database before the start of the transaction and after its finish. Isolation is a possibility to separate an executed transaction from

other processes. Durability is the ensuring that if a message concerning successfully executed transaction was received, the results of transaction cannot disappear in themselves. The problem with relational model is that it has some scalability issues that is performance degrades rapidly as data volumes increases (Nayak *et al*. 2013). The main disadvantage of relational databases is that these databases are not suitable for distributed systems (Shalini, Dhamodharan 2014). Relational databases are oriented towards data integrity, so the distribution of this model is made owing to data accessibility (Padhy *et al.* 2011). Strict ensuring of data integrity does not allow systems to be easily distributed, and this means that automatic system scalability and accessibility become a very complicated and expensive task of the infrastructure (Makčinskas 2013). Relational database can be scaled just vertically, because entire database has to be hosted in a single server. This is necessary in order to ensure reliability and continuous availability of data (Sharma et al 2015). NoSQL databases were designed to scale horizontally. Instead of increasing power of one single server we just need to add more server instances to get the expected power (Sharma *et al.* 2015).

Document databases are one of the non-relational categories of databases (Faraj et al 2014). Document databases store data and organize them as document collections, instead of structured tables with uniform sized fields for each record (Yar *et al.* 2014). Document databases are used for the storage, management and processing of structured and semi-structured data. In document databases data are stored in the document collection. Separate documents are considered equivalent to the records of relational database (Faraj *et al.* 2014). The scheme of document databases is flexible and replaceable (Kaur, Sahib 2013). In document collection documents of various structures can be stored. Document databases perfectly solve the tasks of data accessibility and distribution (Makčinskas 2013). However, document databases are not suitable to store data connected by relations (Faraj *et al.* 2014).

The results of experimental research

The experimental research tested document database *MongoDB* and relational database *Oracle XE*. In order to conduct the experiment 4 test data sets were generated using DTM Data Generator for JSON tool. The first set of test data contains *10000 records*, the second – *50000 records*, the third – *250000 records* and the fourth – *1250000 records*, provided in JSON format. Four test databases created and data sets generated in *MongoDB* database management system are imported to *MongoDB* database using commands prompt tool. Automatically generated data describe city information: provide *city name, city geographical position, number of residents, state, country, the continent where a city is situated*.

In order to conduct the experiment four test schemes are created in the *Oracle XE* database management system to which automatically generated and converted to XML format test data are imported. Test data are entered into one data base table. Whereas the experiment compares the

advantages and disadvantages of relational and document databases, relational data model is created in *Oracle XE* database management system using SQL DDL statements (Fig. 2). Using data insertion statement INSERT INTO relational data model is filled in with the data of a test table.

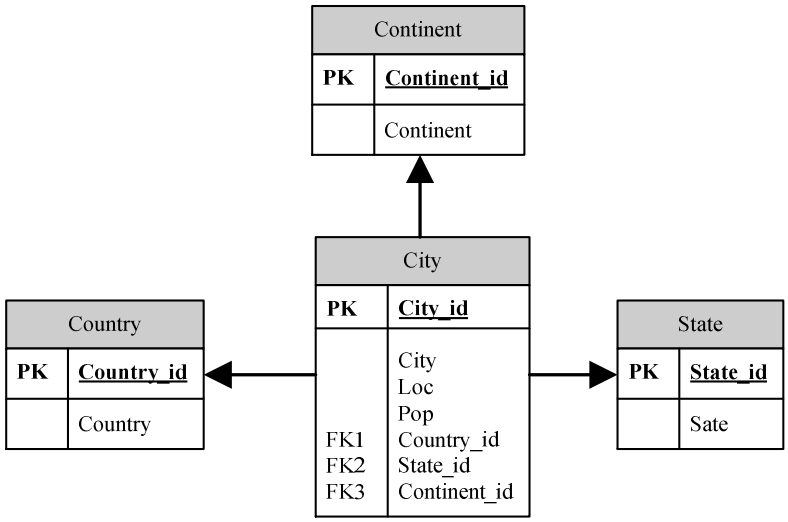


Figure 2. **Relational database structure**

In order to conduct the experimental testing *RozorSQL* tool is used. By means of this tool queries in both *Oracle XE*, and *MongoDB* test databases are executed. The duration of query execution is recorded in query execution log file. Each test query is executed 10 times; by generalizing the results of the experimental research the average of query execution is calculated. The experiment starts from the selection query execution. Selection criterion is made using restrictions for the city population. In the test databases the field forming selection criterion is not indexed. Testing results are provided in figure 3. The number of selection query return records depends on the size of a test database. The bigger a test database is, the more records selection query returns. Testing results show that records selection is more effective in document databases. With increase of the number of records in test databases the difference of query execution time in *MongoDB* and *Oracle XE* databases becomes apparent.

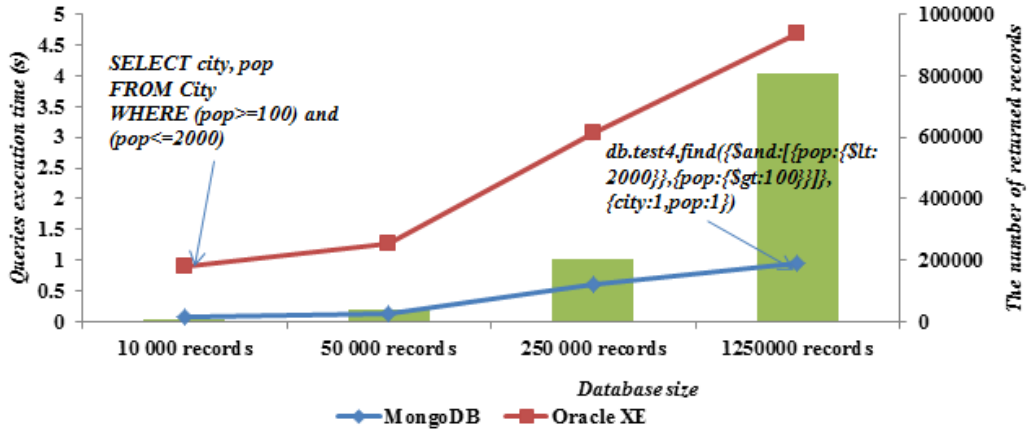


Figure 3. **Execution of Select Queries in not Indexed Databases**

By continuing the experiment the field of test databases, used to form a query criterion, is indexed. In indexed databases the same selection query as in the first testing case is executed. The below provided figure describes the obtained experiment results. Conducted testing shows that if databases are indexed according to search field data selection remains more effective in document databases. In the indexed MongoDB database query execution time remained almost unchanged, and in Oracle XE system when a query was executed in the second, third and fourth test databases it even increased. The use of indexes in the relational database was not effective because the executed selection request returned more than 80,0 percent of records of test databases. For more effective use of indexes in a documentary database the indexing of selected fields was necessary.

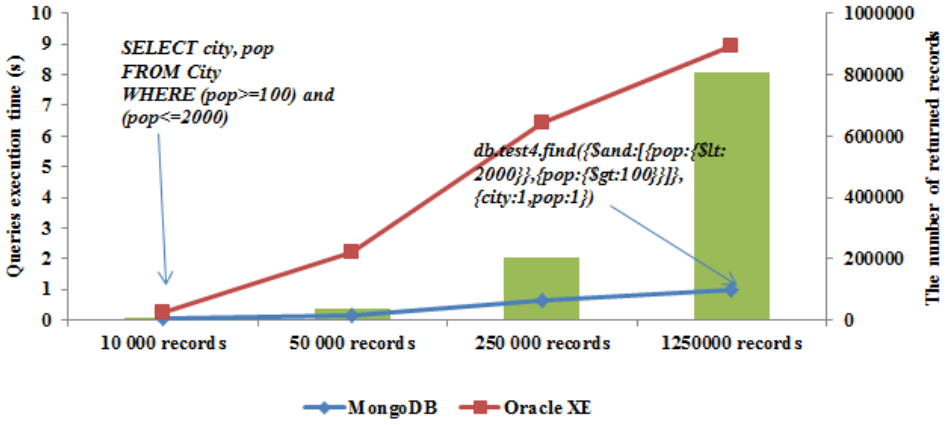


Figure 4. **Execution of Select Queries in Indexed Databases**

Experimental testing goes on executing in test databases calculating request which calculates the number of cities (towns) in one country. Testing results are given in figure 5. The number of calculating query return records does not depend on the size of test database; in all test databases the query returns the same number of records. The results of the conducted experiment show that calculating query execution time is shorter in relational databases. The different of query execution time in document and relational databases becomes apparent when the number of the records of test databases increases.

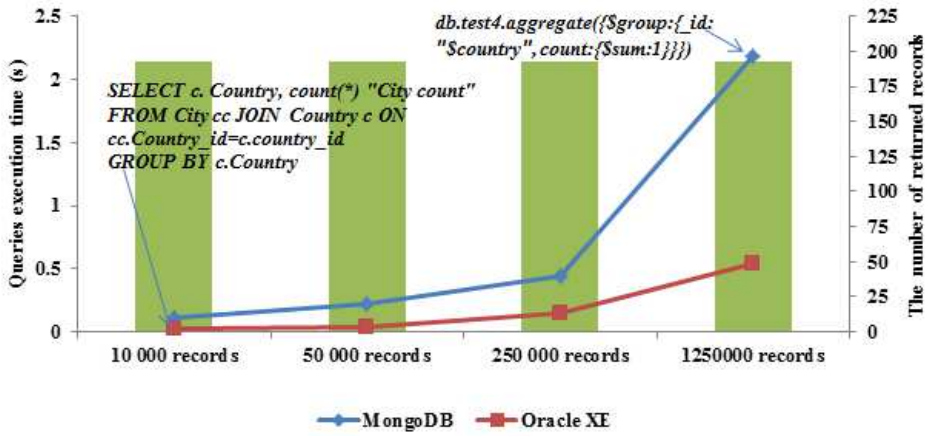


Figure 5. **Execution of Aggregate Queries in Databases**

Experimental testing goes on executing in test databases data update request which changes the number of Lithuania city populations. Testing results are given in figure 6. The number of changed records depends on the size of a test database. In the first test database 300 records are changed, in the second – 1377, in the third – 7158 and in the fourth – 28500 records. Although update query execution time in document and relational databases is very similar, data change query is executed slightly more quickly in document databases as well as in case of data selection query. By evaluating the obtained experiment results it can be observed that data update query in document databases is executed in simple structure document. The experiment does not use built-in documents. In the relational database data change is executed using inner query.

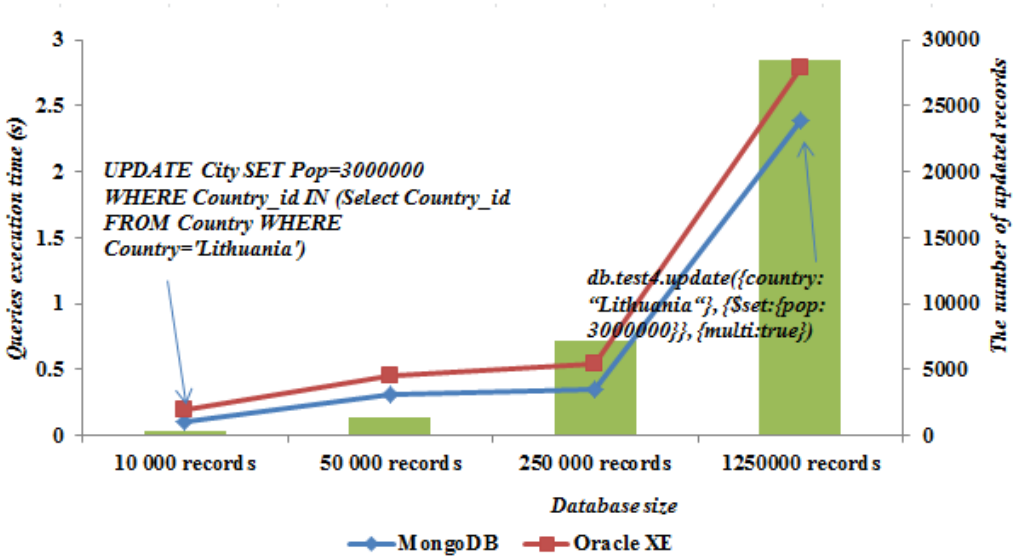


Figure 6. **Execution of Update Queries in Databases**

In the last testing case data delete query is executed. This query deletes records about Lithuania cities (towns) from test databases. Testing results are provided in figure 7. As in case of data update query the number of deleted records depends on the size of a test database. Comparing the duration of data deletion and data update requests it was noticed that in both relational and document databases data deletion query are executed longer. By analyzing the results of the conducted experiment it has emerged that data deletion request execution time is slightly shorter in document databases. Whereas only simple structure documents are used during the experiment and data deletion query execution time in relational and document databases differs only a little, it is impossible to conclude in which databases these queris are executed more effectively.

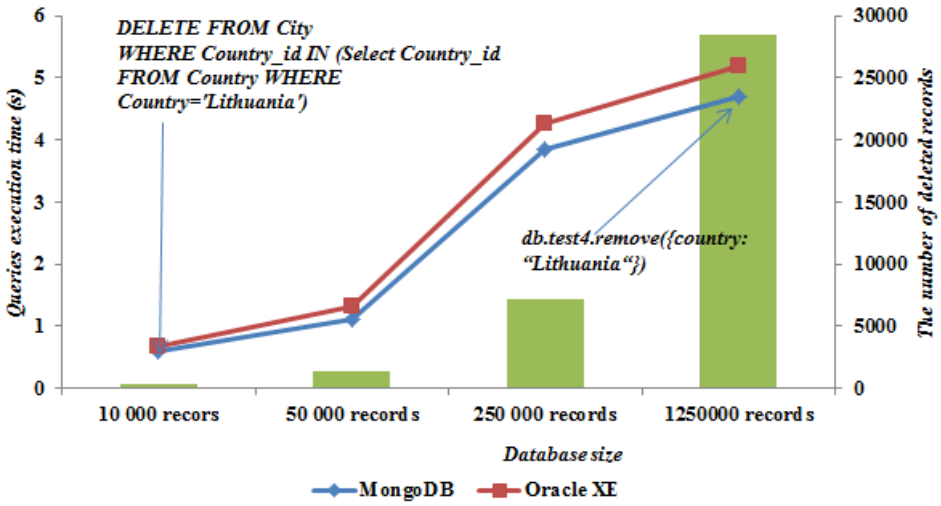


Figure 7. **Execution of Delete Queries in Databases**

The conducted experimental research showed that data selections are executed more effectively in document databases; however data calculation query execution time is shorter in relational databases. Data update and deletion query execution time in relational and document databases is very similar. To continue the experiment it is necessary to conduct testing in document databases documents structures of which use built-in documents, to conduct testing in distributed document and relational databases.

Conclusions

The results of the conducted research can be summarized with a help of below provided conclusions:

The analysis of the results of the researches conducted by international companies shows that relational database management systems head the top ten of the most popular database management systems. Among NoSQL databases the most popular are document databases.

The comparative analysis of relational and document databases showed that these systems differ in data model used, flexibility of schemes, supported database standards, used queries language, features of transactions, data distribution opportunities.

The experimental testing of the document database *MongoDB* and relational database *Oracle XE* showed that document databases are more superior in the course of selection queries, however, calculated queries are faster in relational databases. Data change and delete queries are similar in both databases. In future it is planned to expand the testing of relational and document databases, exploring execution of different queries in document databases with embedded documents, as well as testing the execution of queries in distributed relational and document databases.

References

Berg K., Seymour T., Coel R. 2013. History of Databases. In: *International Journal of Management and Information Services*, 25–31.

Database Usage in the Public and Private Cloud: Choices and Preferences 2014. Retrieved March 15, 2015, from http://cdn2.hubspot.net/hub/308645/file-1019852449-pdf/Assets/ebook/Data_Usage_in_the_Public_and_Private_Cloud_ebook.pdf

DB-Engines Ranking. 2015. Retrieved March 15, 2015, from http://db-engines.com/en/ranking

Faraj A., Rashid B., Shareef T. 2014. Comparative Study of Relational and Nonrelations database performances using ORACLE and MONGODB systems. In: *International Journal of Computer Engineering and Technology (IJCET)*, 5(11), 11-22.

Kaur J., Kaur H., Sahib G.A. 2013. Review on Document Oriented and Column Oriented Databases. In: *International Journal of Computer Trends and Technology*, 4(3), 338–344.

Makčinskas, T. (2013). Jau skęstame duomenyse, o norime vis daugiau. *BDC NEWS*, 10, 1-3.

Mohamed M., Altrafi O.G., Ismail M.O. 2014. Relational vs. NoSQL Databases: A Survey. In: *International Journal of Computer and Information Technology*, 3(3), 598-601.

Nayak A., Poriya A., Poojary D. 2013. Type of NOSQL Databases and its Comparison with Relation Databases. In: *International Journal of Applied Information Systems (IJAIS)*, 5(4), 16-19.

Padhy R.P., Patra M.R., Satapathy S.Ch. 2011. RDBMS to NoSQL: Reviewing Some Next-Generation Non-Relational Database's. In: *International Journal of Advanced Engineering Sciences and Technologies*, 11(1), 15-30.

Shalini M., Dhamodharan S. 2014. Performance and Scaling Comparison Study of RDBMS and NoSQL (MongoDB). In: *An international journal of advanced computer technology*, 3 (11), 1270-1275.

Sharma N., Charu J., Chauhan M. 2015. Comparative Study of Distributed, Scalable, & High Performance NoSQL Databases. In: *International journal in IT and Engineering*, 3 (1), 28-35.

THI Yar, K., LAR Tun, K. M. (2014). Data Relationship Query in Relational DB, NoSQL DB and Graph DB. In: *International Journal of Computer Applications*, 105(17), 31-37.

E-LEARNING IN PEDAGOGICAL PRACTICES

Nataliya Pavlova[1], Nayden Nenkov[1], Krasimir Harizanov[1], Jelena Badjanova[2]
[1] Konstantin Preslavsky University of Shumen, 115 Universitetska Str., 9712 Shumen, Bulgaria
natalia_1@abv.bg, naydenv@shu-bg.net, kr.harizanov@abv.bg
[2] Daugavpils University, 13 Vienības Street, Daugavpils, Latvia, LV-5401
jelena.badjanova@du.lv

Abstract
Key Words: *e-learnig, lesson, platform, education, teacher, student*
This paper presents new opportunities for applying e-learning in pedagogical practices. It studies the attitude of both regular and part-time students regarding e-learning at university. The investigated group of students uses methodological platform developed by Harizanov and Pavlova for creating lesson plans in Mathematics and Informatics used in their teaching practice at schools. The study describes some of the main features of the electronic system developed due to the needs of teachers, students and university lecturers. The focus is on some recommendations about the structure and content of the students' pedagogical training in the studied group. An exemplary lesson is suggested in the paper.

Kopsavilkums
Atslēgvārdi: *e-mācības, stunda, platforma, izglītība, skolotājs, students*
Rakstā tiek piedāvātas jaunas iespējas e-mācību izmantošanai pedagoģiskā praksē. Tiek pētītas pilna un nepilna laika studējošo attieksmes pret e-mācībām universitātē. Pētījuma dalībnieki izmanto Harizanova un Pavlovas metodoloģisko platformu matemātikas un informātikas stundu plānu veidošanai savā pedagoģiskajā praksē. Pētījumā aprakstītas skolotāju, studējošo un universitātes pasniedzēju vajadzībām atbildošas, īpaši izstrādātas elektroniskas sistēmas galvenās iezīmes. Tiek akcentēti ieteikumi studējošo pedagoģiskās sagatavošanas struktūras un satura pilnveidei pētījuma dalībnieku grupā. Tiek piedāvāta paraugstunda.

Introduction

With their quick technical development computers, mobile and communication technologies gradually became indispensible both in everyday life and in education. Contemporary classrooms are equipped with technical devices and software, giving the teacher the opportunity to use innovative approaches in the educational process. An active learning paradigm as the constructivism "finds its materialization in the design of various information and communication technologies and the approaches to their integration" (Peycheva-Forsyte 2010) in a regular, standard classroom.

Integrating e-learning in higher education had proved its advantages and hence it is preferred in students' training. The variety of opportunities for organizing e-courses and their implementation through synchronous, asynchronous or blended learning stimulate more students at their admission stage and those who were left off to continue their education. Creating courses of lectures, seminars and lab exercises gives the lecturer some clarity how to organize the information for uploading. Depending on the features of the chosen educational platform and the specificity of the subject studied, contemporary courses can "have adaptive characteristics in terms of students' learning style, which allows offering educational content and activities that best fit the learning style of every learner" (Dureva 2007).

Many universities both in Bulgaria and abroad built digital centers where students and employers can learn and teach respectively in comfortable environment. At *Konstantin Preslavsky* University of Shumen there has been a Distance Learning Centre since 2013. It provides materials for a number of courses in different subjects. There students can work at their own pace, receive advice from their teachers, solve problems of self-study and knowledge control. Research among the students at Shumen University (Pavlova, Harizanov, Aliev, Eminov 2016.) showed that 20 % of them would like certain subjects to be taught entirely electronically, 60% of the students expressed their desire to combine classroom leaning and e-learning. Practical training cannot be entirely electronic but the organization of the teaching practice can be assisted by a web platform developed for this particular purpose.

The subjects from the methodological module are related to pre-service teacher training of BA and MA students and some of them are entirely practically oriented. For their subjects Observation, Current Pedagogical Practice and Pre-graduation Teaching Practice students prepare and present methodological lesson-plans which show their knowledge of methodology and school courses and their pedagogical and psychological maturity.

This article presents a platform based on the constructivist approaches accounted for in (Dewey 1916; Glasersfeld 1984; Honebein, Duffy , Fishman 1993; Vygotsky 1930).

Aim

The aim of the study is to present an innovative platform for organizing the pedagogical training of future teachers.

Materials and Methods

To analyze the needs of the main types of users of the platform (students, teachers and methodologists) we use the following methods – survey, observation and discussion. The research is carried out with BA and MA students majoring at the Faculty of Mathematics and Informatics; mentors associated with the Faculty of Mathematics and Informatics and methodologists of all specialties, which involve teacher training at Shumen University.

Results

Methodologists

The first stage of the system design was examining an expert group consisting of methodologists – members of the methodological council at Shumen University (N=18). This group participated in a discussion and took part in a survey. The results revealed the characteristics and features of the methodological web platform necessary to meet their criteria. A great number of the methodologists are ready to use the e-methodological platform to organize their seminars with students (Figure 1). In the discussion it turned out that some of the methodologists worry about the time necessary to communicate via the platform.

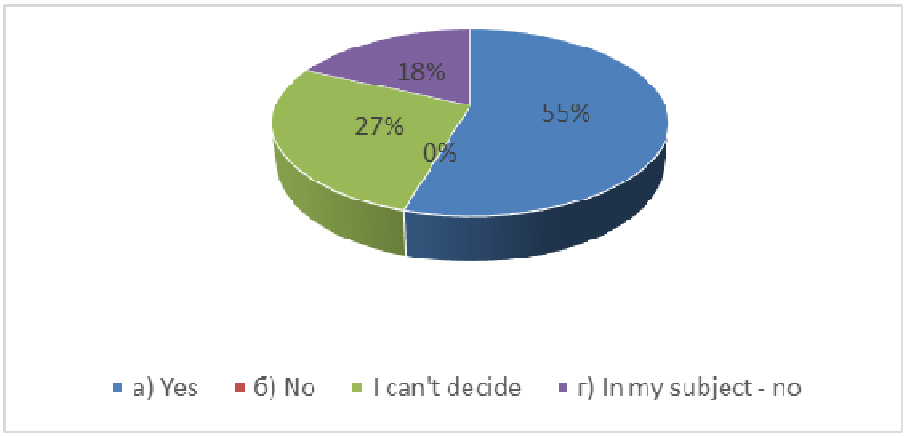


Figure 1. **Needs for developing a web platform**

The main requirements for the technical characteristics of the platform summarized after the survey of the methodologists are the following:

- Current editing of lesson-plans – 70%;
- Usage of exemplary plans and fragments – 60%;
- Lesson-plans presented in tables – 55%
- Lesson-plans presented as scenarios – 45%

The results shown in (Figure 2) were unexpected, i.e. a considerable number of the people who took part in the survey did not want the resources of the platform to be freely accessible on the Internet. During the discussion it became clear that the main reasons for the results are due to the authors' wish to preserve their copyright and their fears that some unsuitable lessons might be uploaded.

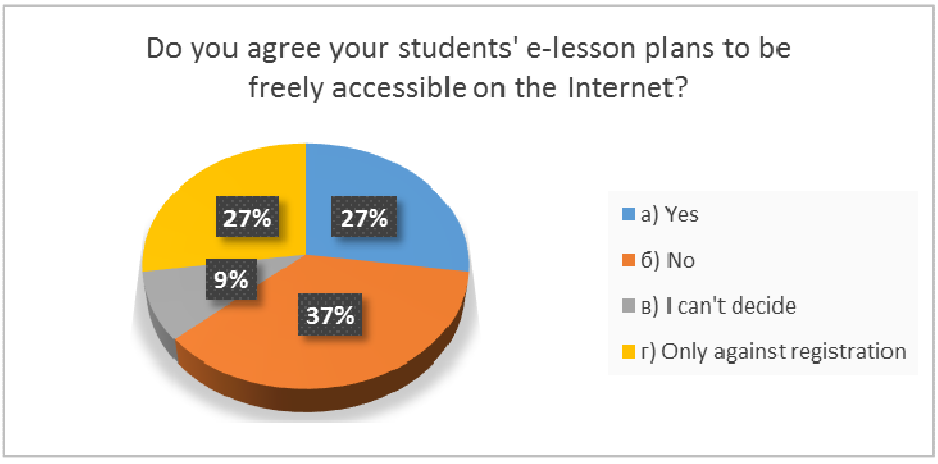


Figure 2. **Sharing on the Internet**

Teachers

A survey was carried out with teachers (N=47) of Mathematics, Informatics and IT (Pavlova, Harizanov, 2014), some of them are also mentors at Shumen University. The results of the enquiry concerning the use of the web methodological platform in their work showed that 90% of the

participants regard the platform as useful and claim that they would like to learn how to use it. They stated they would devote 2 to 5 hours to training, which would show them in detail its options.

Students

94% of the students (N=32) expressed their positive opinion to use the platform in their practical education. The main requirements about the technical characteristics of the platform suggested by the students in the survey are the following:

- Description of a standard lesson-plan – 84%;
- Free choice regarding the format (a table or a scenario) – 94%;
- An option for choosing from a list of didactic tasks – 84%;
- Instructions – 94%;
- A file with concrete tasks, presentations, etc.– 94%;

Discussion

After the analysis of the survey concerning the users' attitudes and criteria, we highlighted the main characteristics of the web methodological platform. The realization passed two stages with two different text versions, which helped eliminating some of the deficiencies, and following students' recommendations we added some new functions.

The technology chosen for developing the platform isHTML5and CSS3for the design and PHP and MySQL for the functioning and the database. The main characteristics we observed when designing the interface was its dynamics and outlook to be applicable not only to a computer but also to all other contemporary mobile devices (tablets, smart phones, etc.). Figure 3 shows the dependency between the different groups of users organized by the services provided on the web methodological platform (Pavlova, Harizanov 2015).

Figure 3. **The relationship between students, teachers, methodologists in the webplatform**

The methodological webplatform has a number of user groups that are described in detail in the following lines. The **Methodologist's** account develops patterns for the students to prepare their lessons. They can choose to apply several types of schemes within one subject (Figure 4).

Figure 4. **Description of a meta-data on theplatform**

A new function is the associated relationship between the students and their mentors so that they can exchange didactic resources, share lessons, organize synchronous and asynchronous discussion. At all times, irrespectful of the place and mobile technology, the methodologist could check or control the lessons developed by the university students before presenting them to the students at school. Each lesson has its own individual structure as it is shown in Figure 5 with the option for editing each fragment of the lesson content, as well as uploading attached files.

The lessons, when ready, are shared both with the mentor and the methodologist for final recommendations and opinions.

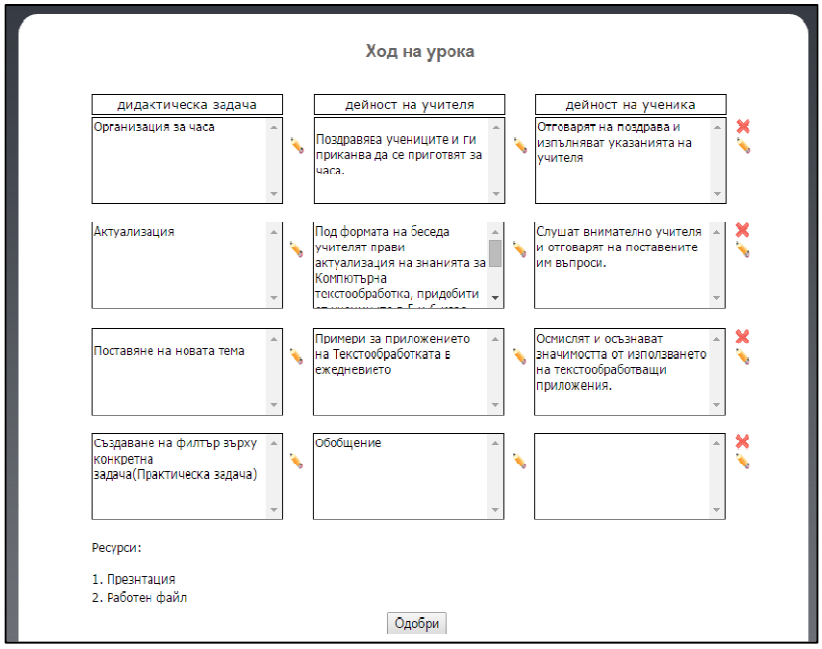


Figure 5. **Modeling thedidactic tasks of a lesson on theplatform**

The **Student** user account is associated mainly with developing methodological lesson-plans with one or more options how it should look. This function is determined in advance by the methodologist, the subjects in which the students can develop lessons and the mentors they can share them with. Each fragment of the lesson is entered into the text web editor Tynimce, which can help changing the style of the text in the lesson (Figure 6).

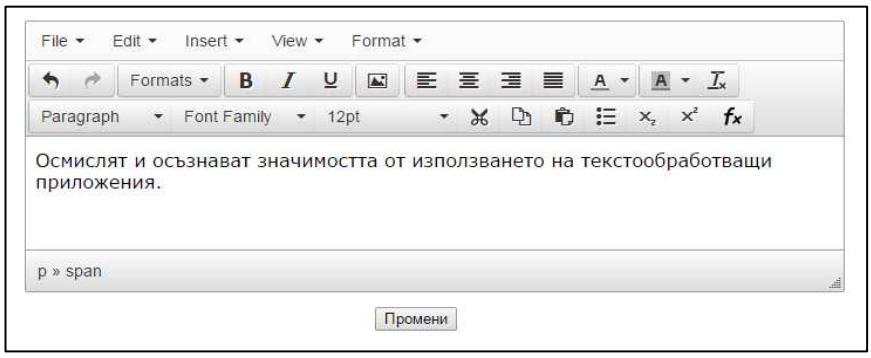


Figure 6. **Tinymcee ditorfor lesson realization**

For their own convenience the methodologists can share exemplary lessons, which can serve as directions for proper work. They can also take part in a discussion during the lesson development (Figure 7) or to send a personal message.

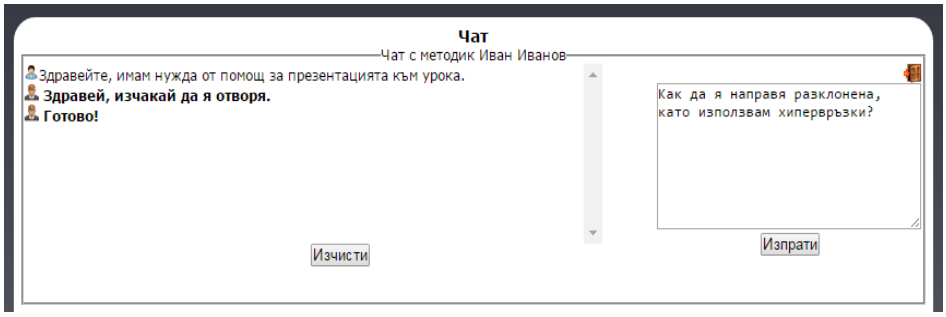


Figure 7. **Conversation in real time**

When the development of the lesson is finished it is shared with a particular methodologist so that it is visible for them and they can make the necessary corrections. If a lesson appears to be unsuitable, it can be deleted from the student's account.

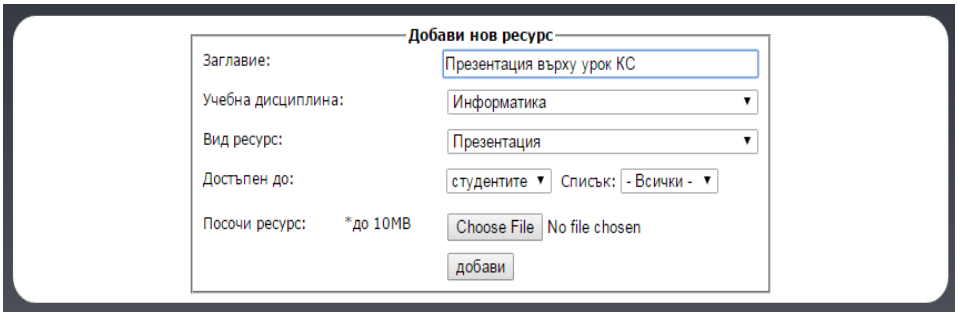


Figure 8. **Adding a new resource**

The **Mentor's** account has a key function in the organization and implementation of the pedagogical practices. Each registered methodologist can contact him/her at any time and give more details related to students' practices. For all the lessons developed and shared by the students-trainees the platform informs the teacher in two ways: via email and by sending a message to his/her account. The function of editing a lesson is also provided in their accounts, in accordance with the methodology, they can enter a particular lesson and edit its content or add a suitable didactic resource (Figure 8).

Conclusions

Contemporary students with their digital needs predetermine the necessity of changes in the education, related to the methods and techniques of teaching. Apart from learning their social lives are related to other challenges which require them to appreciate their time. Using information and communication technologies gives the students the opportunity to take adequate part in distance learning when performing certain activities. This outcome is the reason to implement a web methodological platform facilitating consultation and refinement of the lesson plans in the practical course of the future teachers of Mathematics and Informatics. Presently the studied platform will be approbated in the pedagogical practices of other majors.

Acknowledgement

The research presented in this paper is partially funded by the project of Scientific Foundation of Shumen University RD-08-98/05.02.2016.

References

Dewey J. 1916. *Democracy and education: an introduction to the philosophy of education*, Macmillan, New York.

Glasersfeld E. 1984. An Introduction to Radical Constructivism, In: *Watzlawick, P. (ed.) The invented reality.* Norton: New York.

Honebein P., Duffy T., Fishman B. 1993. *Constructivism and the design of learning environments: context and authentic activities for learning*, *Designing Environments for Constructive Learning*.

McLeod S., Jean Piaget, Accessed: www.simplypsychology.org/piaget.html, [20.11.2015].

Vygotsky L. 1930. *Mind in Society: Development of Higher Psychological Processes*, Harvard.

Pavlova N., Harizanov Kr., Aliev S., Eminov D. 2016. First steps in e-learning. Perspective on teaching practice, SocioBrains. In: *International Scientific Refereed Online Journal SocioBrains*, Issue 17, January 2016, pp. 9-12.

University Press, Accessed: http://www.cles.mlc.edu.tw/~cerntcu/099-curriculum/Edu_Psy/EP_03_New.pdf, [16.11.2015].

Дурева-Тупарова Д. 2007. *Теории за ученето и електронното обучение, Математика и математическо образование*, стр. 356-362.

Пейчева-Форсайт Р. 2010. Електронното обучение – теория, практика, аспекти на педагогически дизайн, In: *Списание на Софийския университет за електронно обучение*, том 3, стр. 135-161.

Харизанов Кр., Павлова, Н. 2014. Платформа за описание на план-конспекти – проблеми и решения, In: *43 Пролетна конференция на СМБ*, Боровец, 2-6 април, стр. 333-339.

Харизанов, Кр., Павлова, Н. 2015. Роль web-платформ в обучении будущих педагогов, In: *Science and Education a New Dimension. Pedagogy and Psychology*, III(19), Issue: 38, стр. 64-67.