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A. DAĻA. DABASZINĀTNES

PART A. NATURAL SCIENCES

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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 61. starptautiskās zinātniskās konferences pētījumu tematika bija ļoti plaša – eksaktās, humanitārās, izglītības, mākslas un sociālo zinātņu jomās.

Zinātnisko rakstu krājumā ***Daugavpils Universitātes 61. starptautiskās zinātniskās konferences rakstu krājums = Proceedings of the 61st International Scientific Conference of Daugavpils University*** apkopoti 2019. gada 11.–12. aprīlī konferencē prezentētie materiāli.

Daugavpils Universitātes 61. 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 61st International Scientific Conference of Daugavpils University.***

Proceedings of the 61st International Scientific Conference of Daugavpils University are published in three parts: part A. *Natural sciences*; part B. *Social Sciences*; part C. *Humanities.*

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ASSESSMENT OF THE QUALITY CRITERIA FULFILLMENT OF THE REHABILITATION PROCESS ACCORDING TO THE PATIENT SATISFACTION QUESTIONNAIRE DATA

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Abstract

Assessment of the quality criteria fulfillment of the rehabilitation process according to the patient satisfaction questionnaire data

Key words: *quality criteria, rehabilitation, PSQ-18, general satisfaction*

Introduction: Patient satisfaction with the provided health care is a significant component of quality assessment and healthcare outcomes. The Patient Satisfaction Questionnaire Short Form (PSQ-18) provide information on seven dimensions of patient satisfaction directed toward their doctors.
Aim: To assess the patient satisfaction with the provided health care in Pauls Stradiņš Clinical University Hospital, outpatient rehabilitation center.
Methods: The questionnaire was distributed to 242 patients who were treated in rehabilitation center during the time period from 16.07.18 until 15.03.19.
Results: Using descriptive statistics methods were analyzed the overall score distribution characteristics. The mean general satisfaction score – 4.25 (SD 0.59), satisfaction with technical quality – 4.29 (SD 0.52), interpersonal manner – 4.46 (SD 0.68), communication – 4.28 (SD 0.60), financial aspect – 3.77 (SD 0.88), time spent with doctor – 4.20 (SD 0.72), accessibility and convenience – 3.69 (SD 0.71).
Conclusions: The results reveal good patient satisfaction with the provided health care.

Kopsavilkums

Rehabilitācijas procesa izpildes kvalitātes kritēriju novērtēšana saskaņā ar pacienta apmierinātības anketas datiem

Atslēgvārdi: *kvalitātes kritēriji, rehabilitācija, PSQ-18, vispārējā apmierinātība*

Ievads: Pacientu apmierinātība ar saņemto veselības aprūpi ir nozīmīga kvalitātes novērtējuma un veselības aprūpes rezultātu sastāvdaļa. Pacienta apmierinātības anketas īsā forma (PSQ-18) sniedz informāciju par septiņām pacientu apmierinātības dimensijām.
Mērķis: Novērtēt pacientu apmierinātību ar sniegto veselības aprūpi Paula Stradiņa Klīniskās universitātes slimnīcā, ambulatorajā rehabilitācijas centrā.
Metodes: Aptaujas anketa tika izdalīta 242 pacientiem, kuri ārstējās rehabilitācijas centrā laika posmā no 16.07.18 līdz 15.03.19.
Rezultāti: Izmantojot aprakstošās statistikas metodes, tika analizēts punktu sadalījums septiņās pacientu apmierinātības dimensijās. Vidējais vispārējas apmierinātības rādītājs – 4,25 (SD 0,59), apmierinātībai ar tehnisko kvalitāti – 4,29 (SD 0,52), ar personāla attieksmi pret pacientu bija 4,46 (SD 0,68), komunikācija – 4.28 (SD 0,60), finansiālais aspekts – 3.77 (SD 0,88), apmierinātība par laiku, kas pavadīts ar ārstu – 4.20 (SD 0,72), pieejamība un ērtība – 3,69 (SD 0,71).
Secinājumi: Rezultāti atklāj labu pacientu apmierinātību ar saņemto veselības aprūpi.

Introduction

Today, we are at an age where health care is scrutinized, not only for the quality of that which we provide but also the satisfaction of those who receive it. Many health care organizations or departments have come under fire due to low patient satisfaction, and this high-lights that holistic patient care is integral (Thayaparan 2013). Social and demographic factors as well as the presence of illnesses affect the formation of patients' attitudes, their satisfaction with healthcare services and their expectations related to these services (Kavalniene 2018).

The practice and system of medicine has evolved over centuries. There are certain significant developments which have taken place in the health systems in recent times. Chief among them are:

a. the establishment of corporate hospitals equipped with the latest facilities
b. the advent of third-party payers (insurance companies, governments, companies, etc.); increasing awareness among patients
c. availability of information through the internet, and higher expectations of patient care, and finally
d. the increasing litigations for unsatisfying results (Prakash 2010).

All these factors have resulted in a challenging profile for the health care industry – away from the traditional concept of a noble profession toward a service industry (Prakash 2010).

Patient satisfaction with the provided health care is a significant component of quality assessment and healthcare outcomes. It is important to be able to identify weaknesses in systems and to aid improvement, thus resulting in better outcomes, both in terms of overall satisfaction with received care, and in terms of recovered health status (Hughes 2008).

To assess patient satisfaction, there are a variety of questionnaires that may be utilized to identify areas of improvement. However, one such questionnaire 'the Patient Satisfaction Questionnaire Short Form (PSQ-18)' has been validated for use in different settings as well as comparing interventions. The PSQ-18 is a short-form version of the 50-item Patient Satisfaction Questionnaire III, including 18 items constructed as statements of opinion that are aggregated into the following seven subscales: 'General Satisfaction', 'Technical Quality', 'Interpersonal Manner', 'Communication', 'Financial Aspects', 'Time Spent with Doctor' and 'Accessibility and Convenience' (Anthony Janahan Thayaparan 2013).

A handful of analytic frameworks for quality assessment have guided measure development initiatives in the public and private sectors. One of the most influential is the framework put forth by the Institute of Medicine (IOM), which includes the following six aims for the health care system (Rockville 2018)

- Safe: Avoiding harm to patients from the care that is intended to help them.
- Effective: Providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and misuse, respectively).
- Patient-centered: Providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions.
- Timely: Reducing waits and sometimes harmful delays for both those who receive and those who give care.
- Efficient: Avoiding waste, including waste of equipment, supplies, ideas, and energy.

- Equitable: Providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status (Rockville 2018).

Each domain is tested through different related questions, which is of substantial benefit when one aims to identify a particular area to improve on. Certainly, general satisfaction has strong correlation with the other domains and thus it is important to improve in all. However, the versatility of a questionnaire allows questions to be tailored to specific domains; one may consider only asking those questions related to communication, to determine whether information has been relayed from physician to patient appropriately and understood well (Hubertus 2009).

Aim

To assess the patient satisfaction with the provided health care in Pauls Stradiņš Clinical University Hospital, outpatient rehabilitation center.

Materials and methods

Instruments were identified by means of a systematic literature review. The aim of the study is to assess and to describe patient satisfaction with the provided health care in Pauls Stradiņš Clinical University Hospital, outpatient rehabilitation center using (PSQ-18) questionnaire which consists out of 18 questions. The questionnaire was distributed to 242 patients who were treated in rehabilitation center during the time period from 16.07.18 until 15.03.19. and had to asses general satisfaction, technical quality, interpersonal manner, communication, financial aspect, time spent with doctor, accessibility and convenience. Each item is accompanied by five response categories (strongly agree, agree, uncertain, disagree, strongly disagree). Data derived from respondents were analyzed statistically.

Results

Using descriptive statistics methods were analyzed the overall score distribution characteristics for the 7 subscales (general satisfaction, technical quality, interpersonal manner, communication, financial aspect, time spent with doctor, accessibility and convenience. Measured on a 5-point scale (1 = lowest satisfaction, 5 = greatest satisfaction).

The mean general satisfaction score was 4.25 (SD 0.59), satisfaction with technical quality was 4.29 (SD 0.52), for interpersonal manner was 4.46 (SD 0.68), for communication 4.28 (SD 0.60), for financial aspect 3.77 (SD 0.88), for time spent with doctor 4.20 (SD 0.72), for accessibility and convenience 3.69 (SD 0.71).

Correlation between general satisfaction and other 6 subscales was measured using Pearson Product-Moment Correlation, it was observed that there is a strong positive relationship between general satisfaction and satisfaction with technical quality (r=0.62), communication (r=0.53), time spent with doctor (r=0.48), accessibility and convenience (r=0.42) and interpersonal manner

(r=0.41), also there was a moderate positive relationship between general satisfaction and satisfaction with the financial aspect (r=0.36).

Discussion

Patient satisfaction is an important and commonly used indicator for measuring the quality in health care. Patient satisfaction affects clinical outcomes, patient retention, and medical malpractice claims. It affects the timely, efficient, and patient-centered delivery of quality health care. Patient satisfaction is thus a proxy but a very effective indicator to measure the success of doctors and hospitals. This article discusses as to how to ensure patient satisfaction in dermatological practice. (Hubertus 2009).

As seen in other literature, obtained data show similar result to other European countries, where similar research was performed to evaluate patient satisfaction. One such research was performed in Netherlands where the Quality of integrated chronic care was measured by patient survey using the Patient Satisfaction Questionnaire Short Form. The convenience sample of 109 people with a chronic illness was derived from the region of Maastricht, the Netherlands, and consisted of 30 persons with chronic obstructive pulmonary disease (COPD), 30 persons with heart failure, 30 persons with arthritis and 19 persons with geriatric disorders. Their research shows similar results of the seven subclasses with median scores on the subscales ranging from 3.75 on the 'General Satisfaction', 'Technical Quality' and 'Accessibility and Convenience' scale to 4.50 on the 'Interpersonal Manner' scale (Hubertus 2009).

Conclusions

The results reveal good overall patient satisfaction with the provided health care, especially in categories such as general interpersonal manner (4.46), satisfaction with technical quality (4.29), communication (4.28), time spent with doctor (4.20), the lowest scores were observed in the categories for financial aspect (3.77), and for accessibility and convenience (3.67).

As the literature indicates general satisfaction has strong correlation with the other domains and thus it is important to improve in all (Prakash 2010).

It was observed that there is a strong positive correlation between general satisfaction and satisfaction with technical quality, communication, time spent with doctor, accessibility and convenience and interpersonal manner, also there was a moderate positive correlation between general satisfaction and satisfaction with the financial aspect.

Results show patient struggle with the financial aspect of rehabilitation, as well as the dissatisfaction with accessibility of rehabilitation concerning the time frame for the beginning of the rehabilitation. In general, the quality criteria of the provided rehabilitation service – patient satisfaction shows the good quality of rehabilitation services and room for improvement in such categories as financial aspect, and accessibility and convenience.

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PROBLEM AREAS IN DIABETES (PAID) SCALE EVALUATION FOR ADOLESCENTS (11–18 YEARS OLD) WITH TYPE 1 OR 2 DIABETES MELLITUS IN LATVIA

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Abstract

Problem areas in diabetes (paid) scale evaluation for adolescents (11–18 years old) with type 1 or 2 diabetes mellitus in Latvia

Key words: *diabetes mellitus, adolescents, problem areas in diabetes (PAID)*

Introduction. According to Latvian Disease Prophylaxis and Control Center, there were registered 91571 patients with diabetes mellitus (DM) in 2017. 682 out of these patients were less than 19 years old. PAID is a 20 item self-report questionnaire that assesses a range of emotional problems related to having type 1 or type 2 DM. Diabetes specific stressors were found to be associated with less adequate self-care and impaired glycemic control (Peyrot et al. (2005)).
Aim. Evaluate PAID score in Latvian adolescent DM patients and search for the association of PAID score with HbA1c (%), Hypoglycemia (times/last week).
Methods. This is a cross-sectional study including 48 adolescent patients, diagnosed with type 1 or type 2 DM, in a single university hospital (2018–2019). Patients were given anonymous PAID questionnaire. To evaluate glycemic control of participants, an anonymous questionnaire of 10 additional questions was designed. Descriptive statistical analysis and Spearman rank correlation was used to evaluate the results.
Results. There were 47 patients diagnosed type 1DM and 1 with type 2DM. The mean age 14.04±2.14 (mean ± SD). Diabetes duration 4.95±4.07 years, 52.1% female and 47.9% male. HbA1c% 11.09%±4.77; Hypoglycemia (times/last week) 2.51±1.70. PAID score was 22.03 ± 13.80. Association between PAID score and HbA1c (%) was not found (r_s=-0.112; p=0.447). Association between PAID score and hypoglycaemia (times/last week) was found (r_s=0.338; p=0.047). Relation of hypoglycaemia (times/last week) and hospitalization times was found (r_s=0.364; p=0.032).
Conclusions. There were 6 patients who scored over 40 points in PAID scale–which indicates that these patients may be at the level of "emotional burnout". Association indicating that patients who had more hypoglycaemia episodes during last week scored higher points in PAID scale was found. There was found an association showing that patients who had more frequent hypoglycaemia episodes last week have been hospitalized more often.

Kopsavilkums

Atslēgvārdi: *cukura diabēts, pusaudži, problēmu jomas diabēta (PAID) aprūpē, glikēmijas kontrole*
Ievads. Slimību profilakses un kontroles centra dati liecina, ka 2017. gadā Latvijā reģistrēti 91 571 pacienti ar cukura diabētu (no tiem 4283 pacienti ar 1. tipa cukura diabētu; 86 639 pacienti ar 2. tipa cukura diabētu; 682 cukura diabēta pacienti jaunāki par 19 gadiem). Diabēta problēmu jomu (PAID, Problem Areas In Diabetes) skala ir individuāli aizpildāms tests ar 20 jautājumiem. PAID skala ir diabēta specifisks instruments, kas mēra izmaiņas psiho-sociālajos un emocionālajos stāvokļos saistībā ar diabētu.
Mērķi. Izpētīt PAID skalas rezultātus pusaudžiem ar cukura diabētu Latvijā un PAID skalas korelāciju ar glikēto hemoglobīnu HbA1c (%), hipoglikēmiju skaitu pēdējās nedēļas laikā.
Rezultāti. Pētījumā piedalījās 47 pacienti ar 1. tipa cukura diabētu un 1 pacients ar 2. tipa cukura diabētu. Vidējais vecums 14.04±2.14 (vidējais ± SD). Diabēta ilgums 4.95±4.07 gadi, 52.1% sievietes un 47.9% vīrieši. HbA1c% 11.09%±4.77; Hipoglikēmija (reizes/pēdējā nedēļā) 2.51±1.70. PAID rezultāti 22.03 ± 13.80. PAID skala nekorelē ar glikēto hemoglobīnu HbA1c (%) (r_s=-0.112; p=0.447). PAID rezultāts korelē ar hipoglikēmiju skaitu pēdējās nedēļas laikā (r_s=0.338; p=0.047). Hipoglikēmiju skaitu pēdējās nedēļas laikā un hospitalizāciju skaits diabēta dēļ korelē (r_s=0.364; p=0.032).
Secinājumi. 6 pacientiem PAID rezultāts bija augstāks par 40 punktiem, kas norāda uz augstu distresa līmeni un iespējamu izdegšanas sindromu saistībā ar diabēta diagnozi, šiem pacientiem būtu nepieciešama īpaša uzmanība. Pacientiem, kuriem pēdējās nedēļas laikā bijis lielāks skaits hipoglikēmijas epizožu ir augstāki PAID rezultāti. Pacientiem, kuriem pēdējās nedēļas laikā bijis lielāks skaits hipoglikēmijas epizožu dzīves laikā biežāk tikuši hospitalizēti saistībā ar diabētu.

Introduction

The incidence and prevalence of diabetes mellitus are increasing, with more than 135 million people affected worldwide (Moore et al. 2003). According to Latvian Disease Prophylaxis and Control Center, there were registered 91571 patients with diabetes mellitus in 2017. 682 out of these patients were less than 19 years old (Latvian Disease Prophylaxis and Control center 2018).

Type 1 diabetes also known as juvenile diabetes, occurs when the body fails to produce insulin. People with type 1 diabetes are insulin-dependent, which means they must take artificial insulin daily to stay alive. Type 2 diabetes affects the way the body uses insulin. While the body still makes insulin, unlike in type 1, the cells in the body do not respond to it as effectively as they once did. This is the most common type of diabetes, according to the National Institute of Diabetes and Digestive and Kidney Diseases, and it has strong links with obesity (Nall 2018).

Interestingly, stress has long been suspected as having important effects on the development of diabetes. More than 400 years ago, the famous English physician Thomas Willis (1621–1675) noted that diabetes often appeared among persons who had experienced significant life stresses, sadness, or long sorrow. More recently, numerous studies have been performed, elucidating the role of emotional stress as a risk factor for the development of type 2 diabetes. The majority of studies focus on depression. However, there is growing evidence that other forms of emotional stress contribute to the development of type 2 diabetes as well (Pouwer 2010). Emotional stress can also be associated with lower self care in diabetes treatment.

PAID is a 20 item self-report questionnaire that assesses a range of emotional problems related to having type 1 or type 2 diabetes mellitus. Diabetes specific stressors were found to be associated with less adequate self-care and impaired glycemic control. (Peyrot et al. 2005) The PAID measure of diabetes related emotional distress correlates with measures of related concepts such as depression, social support, health beliefs, and coping style, as well as predicts future blood glucose control of the patient. The questionnaire has proven to be sensitive to detect changes over time following educational and therapeutic interventions (Snoek, Welch 2006).

There has been no research in Latvia that would review the emotional state of patients with type 1 or 2 diabetes mellitus. This research focused on possibilities to detect how emotional factors can interfere with glycemic control. One of the objectives for this study was to determine if PAID scale could be used in Latvian population.

Aim

Evaluate PAID score in Latvian adolescent diabetes mellitus patients and search for the association of PAID score with HbA1c (%), Hypoglycemia (times/last week).

Materials and methods

This is a cross-sectional study including 48 adolescent patients, diagnosed with type 1 or type 2 diabetes mellitus, in a single university hospital (2018–2019). Patients were given anonymous PAID questionnaire. To evaluate glycemic control of participants, an anonymous questionnaire of 10 additional questions was designed. Descriptive statistical analysis and Spearman rank correlation was used to evaluate the results.

Discussion

There were 47 patients diagnosed type 1 diabetes mellitus and 1 with type 2 diabetes mellitus. The mean age 14.04 ± 2.14 (mean ± SD). Diabetes duration 4.95±4.07 years, 52.1% female and 47.9% male.

The mean level of HbA1c% was 11.09% ± 4.77 – which is more than the value of a normal glycemic control (Fig. 1).

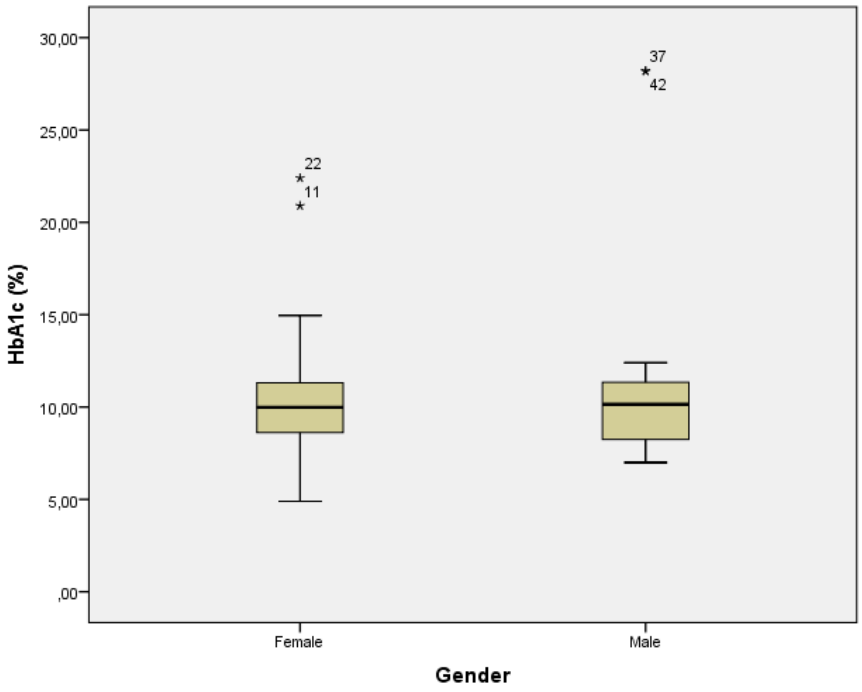

Figure 1. **Glycated hemoglobin levels distribution over gender**

Hypoglycemia (times/last week) 2.51 ± 1.70. Hospitalization times 3.33 ± 2.97 due to diabetes.

PAID score was 22.03 ± 13.80. 6 patients scored over 40 points this indicates that these patients may be at the level of “emotional burnout” and warrant special attention from their healthcare provider. 6 patients scored less than 10 points while having increased glycated haemoglobin levels – this may be indicative of denial (Fig. 2).

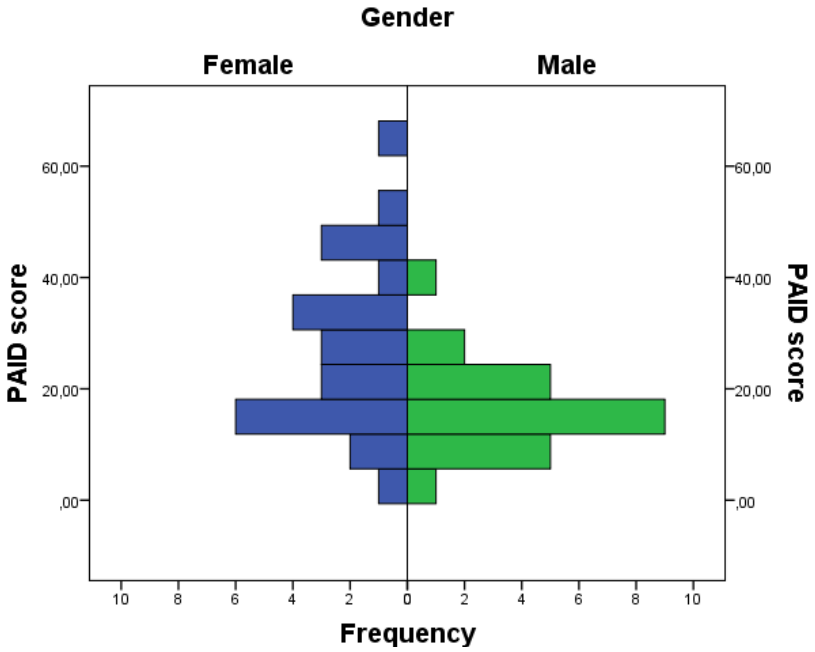

Figure 2. **PAID score distribution over gender**

Almost half of the patients admitted that uncomfortable social situations related to diabetes care was moderate to serious problem in their daily living (Fig. 3).

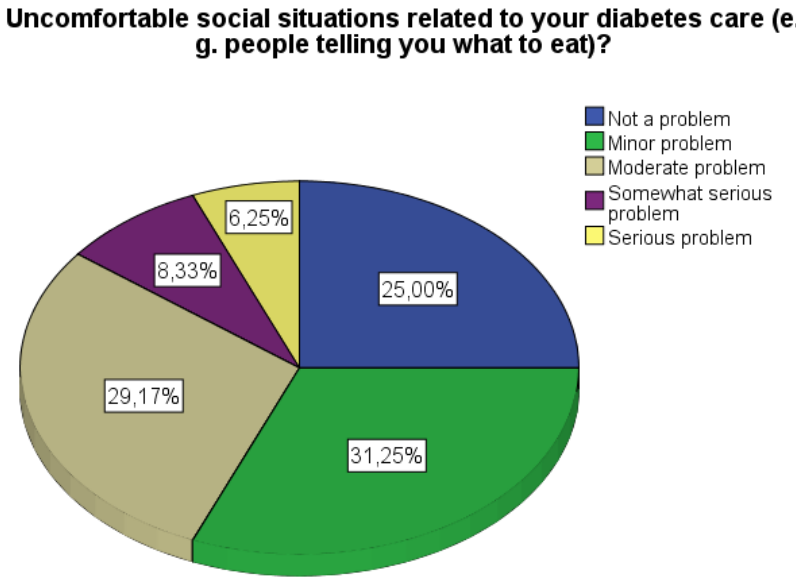

Figure 3. **Distribution of uncomfortable social situations related to diabetes care amongst the participants**

About 80% of patients admit that worrying about low blood sugar reactions is a problem for them (Fig. 4).

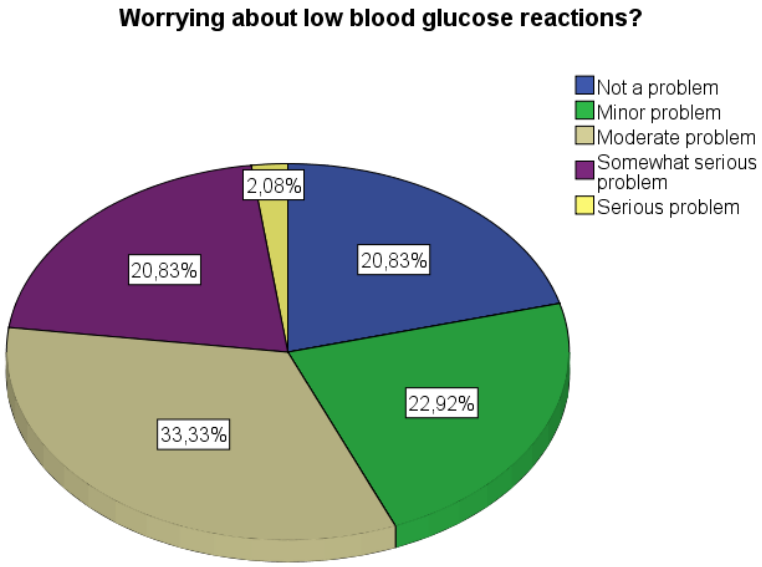

Figure 4. **Distribution of worrying about low blood sugar reactions amongst the participants**

For almost all patients feelings of guilt or anxiety when they get off track with their diabetes management is a problem (Fig. 5).

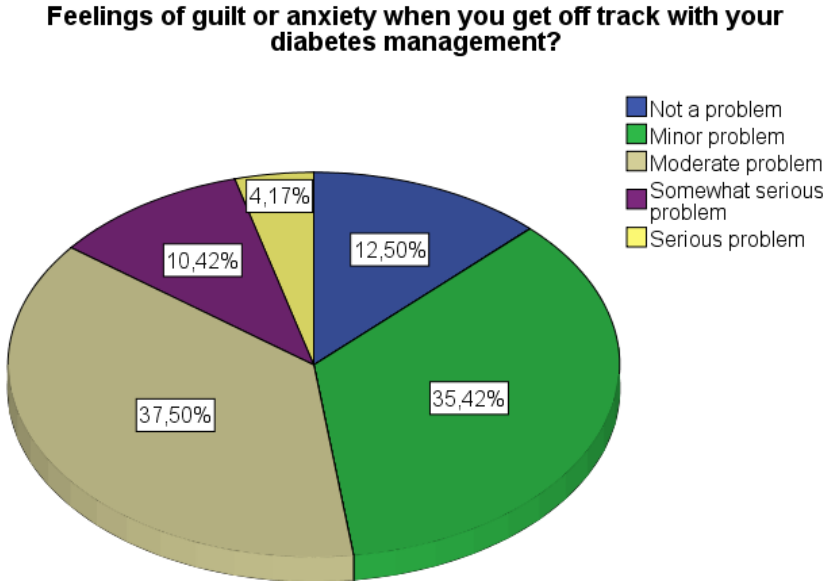

Figure 5. **Distribution of feelings of guilt or anxiety when getting off track with diabetes management amongst the participants**

Relation between PAID score and glycated hemoglobin levels wasn't found (r_s=-0.112; p=0.447). Association between hypoglycaemia times per last week and PAID score was found (r_s=0.338; p=0.047) indicating that patients who had more hypoglycaemia episodes during last week scored higher points in PAID scale (Fig. 6). Relation of hypoglycemia (times/last week) and hospitalization times was found (r_s=0.364; p=0.032).

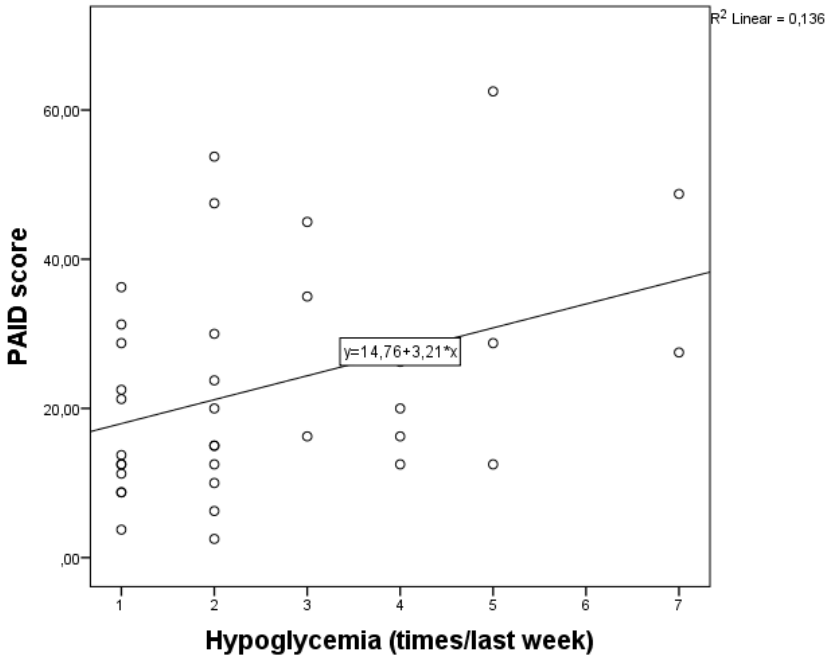

Figure 6. **Association between PAID score and hypoglycemia (times/last week)**

Conclusions

There was no correlation between HbA1c (%) and PAID score. Correlation of PAID score and hypoglycemia episodes of last week was found indicating that patients who had more frequent episodes of hypoglycemia scored higher in PAID scale. Further studies should be done to evaluate PAID scale in other age groups of Latvian population. PAID scale can be a useful tool for healthcare provider to improve the quality of life of diabetes patients.

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PREVALENCE OF PREVENTABLE STROKE RISK FACTORS IN THE LATVIAN POPULATION

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Abstract

Prevalence of preventable stroke risk factors in the Latvian population

Key words: *stroke risk factors*

Introduction. Information on CDC webpage states that up to 80% strokes could be prevented by reducing risk factors. Because of this, it is very important that health care practitioners evaluate and help reduce patient stroke risk by managing stroke risk factors like obesity, elevated blood pressure and diabetes. Regardless of this stroke is one of the main reasons of adult disability and mortality.

Aim. Aim of this study is to determine the prevalence of reducible stroke risk factor in the Latvian population.

Materials and methods. Study was done on 29th October 2018 during "Stroke day" campaign held in Pauls Stradins Clinical University Hospital. This was a cross-sectional study. Group of health care professional measured all participants blood pressure, finger-prick glucose level and body mass index (BMI). From all obtained measurements, 5-year stroke risk was calculated by using Stroke Riskometer™ program. All data was collected and analyzed via SPSS program.

Results. Altogether 103 responses where collected, within these respondents 25 were man and 77 were women. Average age of participants was 66. High blood pressure was detected in 59,8% (n=61), elevated blood pressure was in 19,6% (n=20) and normal in 20,6% (n=21). Glucose level within normal level was in 55,3% (n=39), high glucose level was deteced in 55,7% (n=49). Normal BMI was measured in 22,5% (n=23), but 50% (n=50) of participants were overweight and 27,5% (n=28) were obese. From all respondents 64,1% (n=66) had significant 5 year stroke risk and 35,9% (n=37) was in a low risk for stroke in 5 years.

Conclusion. Half of participants had elevated blood pressure, blood glucose and most of the participants had increased BMI. Bigger emphasis should be put on elevated stroke risk factor reduction.

Kopsavilkums

Insulta modificējamo riska faktoru prevalence Latvijas populācijā

Atslēgvārdi: *insulta riska faktori*

Ievads. Pēc Starptautiskās Slimību profilakses un kontroles centra datiem līdz pat 80% insultu varētu novērst, savlaicīgi mazinot riska faktorus. Tādēļ ir ļoti svarīgi, ka veselības aprūpē strādājošie izvērtē slimības riskus un potenciāli samazina iespēju insulta notikumam, ietekmējot tādus faktorus, kā aptaukošanās, paaugstināts asinsspiediens un cukura diabēts. Neskatoties uz to, insults ir viens no galvenajiem invaliditātes un mirstības cēloņiem pasaulē.

Mērķis. Noteikt insulta modificējamo riska faktoru prevalenci Latvijas populācijā.

Materiāli un metodes. Pētījums tika veikts Paula Stradiņa klīniskajā universitātes slimnīcā kampaņas "Insulta dienas" ietvaros 2018. gada 29. oktobrī. Tika izmantota šķērsgriezuma pētījuma metode. Pētījumu veica veselības aprūpes speciālisti. Visiem pētījuma dalībniekiem tika noteikts asinsspiediens, glikozes līmenis asinīs kā arī ķermeņa masas indekss (ĶMI). Izmantojot programmu "Stroke Riskometer", no iegūtajiem datiem tika izrēķināts 5-gadu insulta risks. Dati tika apstrādāti ar SPSS programmu.

Rezultāti. Kopumā pētījumā piedalījās 103 dalībnieki no kuriem 25 respondenti bija vīrieši un 77 bija sievietes. Dalībnieku vidējais vecums bija 66 gadi. Augsts asinsspiediens tika konstatēts 59,8% (n = 61), paaugstināts asinsspiediens bija 19,6% (n = 20) un normāls asinsspiediens 20,6% (n = 21) respondentu. Glikozes asinīs normālā līmenī bija 55,3% (n = 39), augsts glikozes līmenis tika konstatēts 55,7% (n = 49) respondentu. Normāls ķermeņa masas indekss (ĶMI) tika noteikts 22,5% (n = 23), bet 50% (n = 50) respondentu bija liekais svars un 27,5% (n = 28) respondentu bija aptaukošanās. Kopumā 64,1% (n = 66) respondentu bija ievērojams 5 gadu insulta risks un 35,9% (n = 37) 5 gadu laikā bija zems insulta risks.

Secinājums. Pusei no pētījuma dalībniekiem bija paaugstināts asinsspiediens un glikoze asinīs, kā arī lielākajai daļai dalībnieku bija paaugstināts ĶMI. Lielāks uzsvars būtu jāliek modificējamiem insulta riska faktoriem.

Introduction

Stroke is highly prevalent and common cerebrovascular disorder. According to Centers for Disease Control and Prevention web page, stroke is one of leading cause of death worldwide and it

is also a main cause of long-term adult disability (Benjamin EJ et al., 2017). Stroke risk is higher among elderly, although it can occur at any age. In 2009 34% of hospitalized stroke patients in USA were less than 65 year old (Hall MJ, 2012).

According to Centre of diseases control and prophylaxis collected data in Latvia from 2016 till 2018 most deaths due to stroke was from age 60 and the numbers are slightly decreasing. In 2016 2006 patients died of stroke, in 2017 the number of deaths due to stroke was 1943 and in 2018 it was 1890. Unfortunately, almost each year there are approximately 150 to 200 deaths among patients younger than age of 60 due to stroke.

Nevertheless, the numbers of stroke could be reduced by 80% only by reducing stroke risk factors. Because of this, our study focuses on preventable stroke risk factors among the Latvian population.

Material and Methods

Study was done in 29th October 2018 during "Stroke day" campaign held in Pauls Stradins Clinical University Hospital. This was a cross-sectional study. During a campaign group of health care professional measured all participants blood pressure, finger-prick glucose level and body mass index (BMI). From all obtained measurements, 5-year stroke risk was calculated by using Stroke Riskometer™ program. Further on all data was collected and analyzed via SPSS program

Results

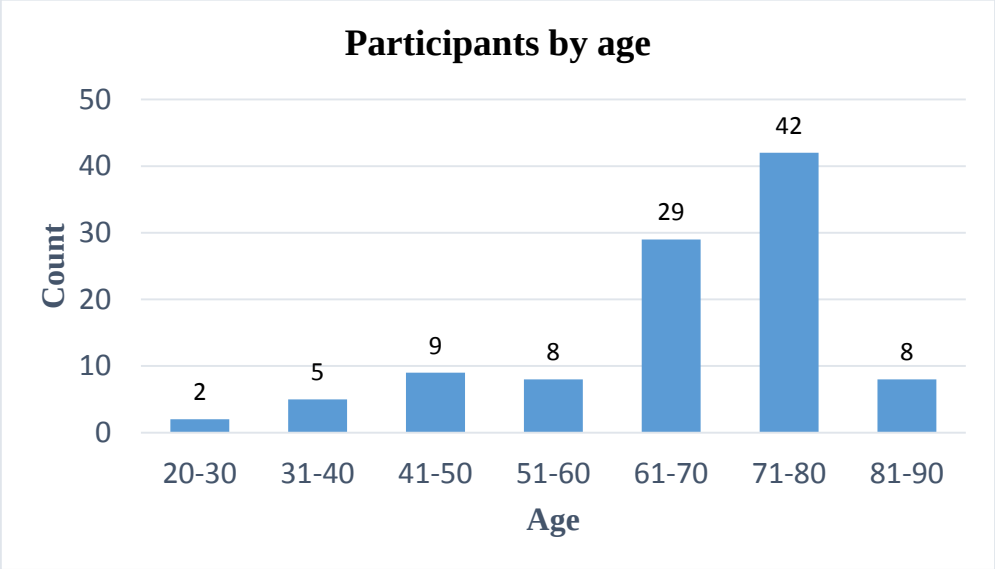

Figure 1

All together, 103 responses where collected. Of all participants 25 were man and 77 were women. Average age of participants was 66. The most of participants was within the age group of 70–80 (Figure 1).

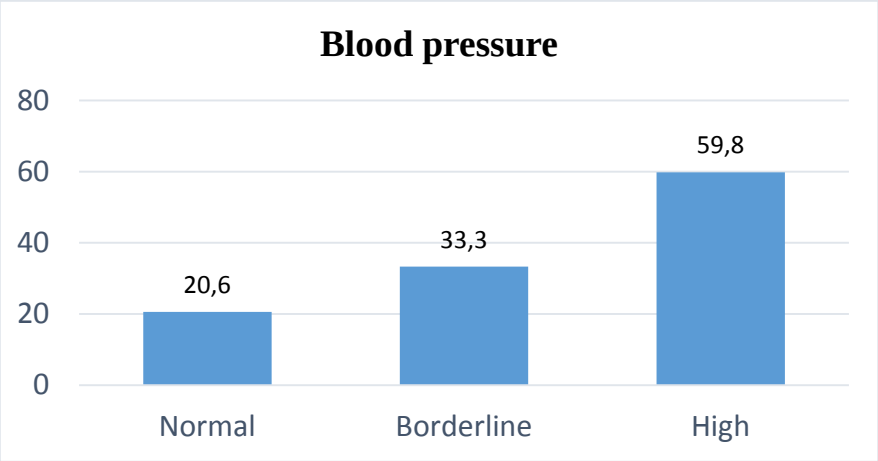

Figure 2

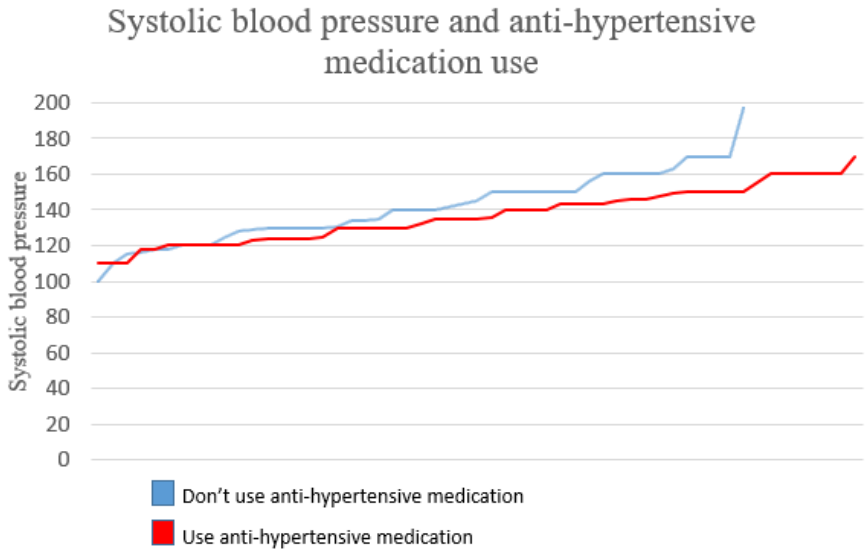

Figure 3

High blood pressure was detected in 59,8% (n=61), elevated blood pressure was in 19,6% (n=20) and normal in 20,6% (n=21) (Figure 2). There was no significant difference in blood pressure measurements among patients using antihypertensive medicine and patients without blood pressure lowering therapy (Figure 3).

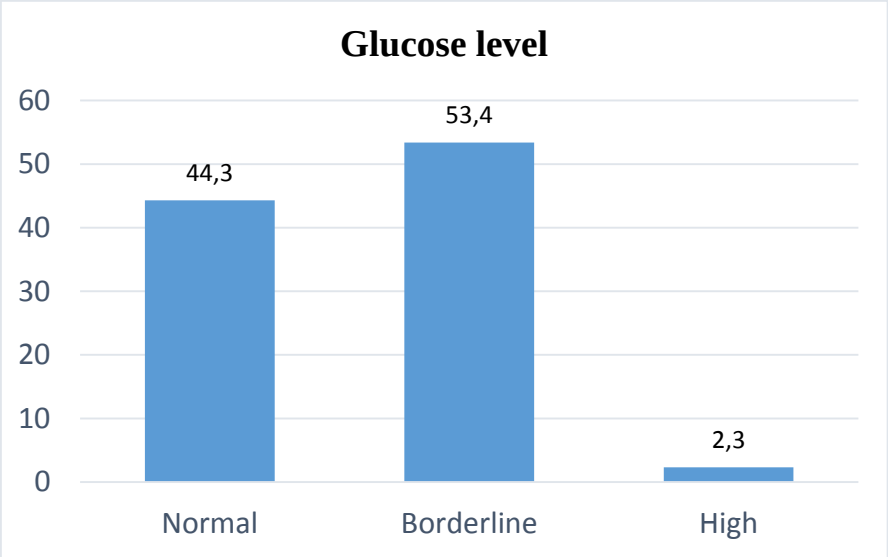

Figure 4

Glucose level within normal level was in 44,3%, high glucose level was detected in 2,3% and in 53,4% glucose tolerance test should be performed to evaluate results (Figure 4).

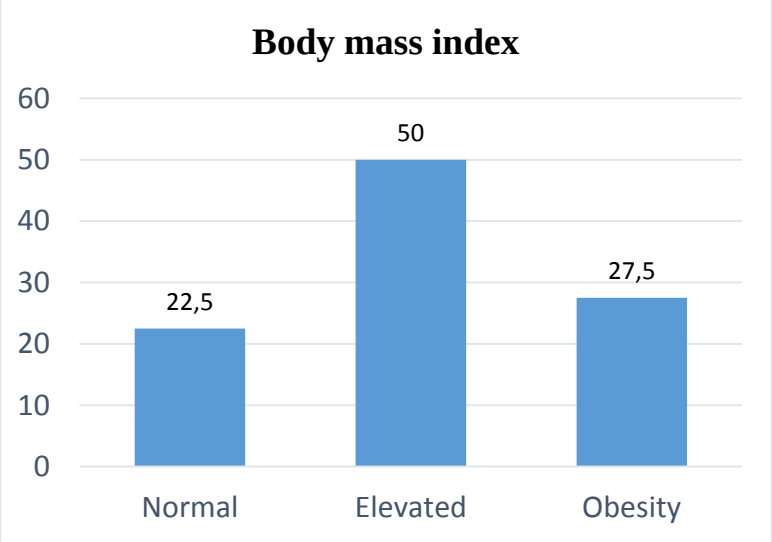

Figure 5

Normal BMI was measured in 22,5% (n=23), but 50% (n=50) of participants were overweight and 27,5% (n=28) were obese (Figure 5).

From all respondents 64,1% (n=66) had significant 5 year stroke risk and 35,9% (n=37) was in a low risk for stroke in 5 years (Figure 6).

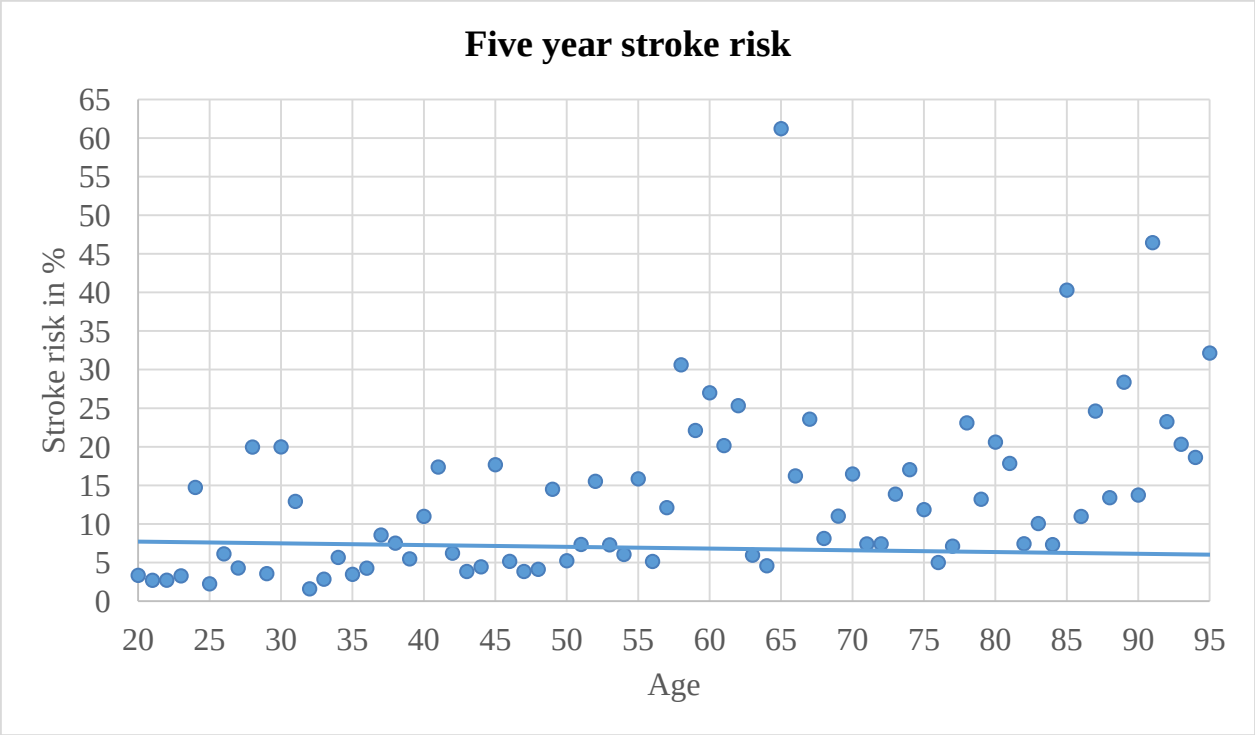

Figure 6

Discussion

In general stoke is cerebrovascular disorder when blood supply to part of the brain is disrupted. These results in abrupt onset of focal neurologic deficits. The clinical manifestation of stroke depends on the area that is supplied by involved blood vessel and can be almost completely revisable if prompt medical care is given within first hours of stroke (Bhat L. et al., 2017).

There are two types of stroke. Most common is ischemic stroke when blood clots or other particles occlude the arteries of the brain. Other type of stroke is a hemorrhagic stroke when a blood vessel bursts causing blood build up in the brain. Nevertheless of type of the stroke, this leads to damage of brain cells (Grotta, James C., et al., 2016).

Risk factors for stroke can be divided in to two categories: modifiable and nonmodifiable factors. Most of modifiable risk factors are associated with health habits and lifestyle-influenced diseases like obesity, smoking. Also certain diseases that are high stroke risk factors can be threated like diabetes, high blood pressure, atrial fibrillation and dyslipidemia. On the other hand nonmodifiable risk factors can not be changed like race, heredity, age, gender and past history of cardiovascular events (Oladiran O., et al., 2019).

Conclusions

This research represents high stroke risks among the Latvian population. Overall preventable stroke risks factors are poorly controlled. Half of participants had elevated blood pressure, blood glucose and most of the participants had increased body mass index. Health care practitioners

should put bigger effort to maintain these risk factors under control and society should be more educated about importance of lifestyle modification.

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WAITING TIMES FOR RHEUMATOLOGY CARE FOR PATIENTS WITH RHEUMATIC DISEASES IN LATVIA

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Abstract

Waiting times for rheumatology care for patients with rheumatic diseases in Latvia

Key words: *wait times, rheumatic diseases, rheumatology care, delays, arthritis*

Introduction. The impact and burden of rheumatic diseases (RD) on overall world population health in terms of death and disability are growing. Timely rheumatology care is crucial because it increases early exposure to treatment, improves patient outcomes, therefore, reduces the global disease burden.

Aim. The aim of this study was to quantify waiting times to primary and rheumatology care.

Materials and methods. First-time rheumatic out-patients were asked to fill out the questionnaire in order to identify sociodemographic characteristics, duration of each phase of the care pathway and reasons for delayed care. Descriptive statistics and nonparametric tests were used to determine differences in wait times in each phase of the care pathway by patients' gender, place of residence and clinical diagnosis.

Results. The total of 45 first-time referral out-patients completed the questionnaires, 34 (75.6%) were female. The mean age at the time of referral was 56.4 (SD 10.8) years. 28 patients (62.2%) were not satisfied with the duration of time from symptom onset to rheumatologist consultation. The main reason for delayed first rheumatology care encounter was: long waiting times (89%). The median wait time from symptom onset to primary care encounter was 30 (IQR 7–90) days, the median waiting time from referral to rheumatologist consultation was 90 (IQR 30–150) days. No statistically significant differences were found in wait times in each phase of the care pathway by gender, place of residence and clinical diagnosis.

Conclusions. Wait times to see a rheumatologist in Latvia exceeded acceptable benchmarks. Therefore, improving timely access is critical and pressing, targeted efforts are needed to improve it.

Kopsavilkums

Gaidīšanas laiks līdz reimatologu aprūpei pacientiem ar reimatiskajām saslimšanām Latvijā

Atslēgvārdi: *gaidīšanas laiki, reimatiskās saslimšanas, reimatologu aprūpe, kavēšanās, artrīts*

Ievads. Kopējā pasaules populācijā reimatisko saslimšanu (RS) ietekme un slogs uz mirstību un nespēju pieaug. Savlaicīga reimatologu aprūpe ir izšķiroša, jo tā paātrina terapijas uzsākšanu, uzlabo pacienta iznākumus, tādejādi samazinot globālo saslimšanas slogu.

Mērķis. Šī darba mērķis bija noteikt gaidīšanas laiku līdz primārajai un reimatologu aprūpei.

Materiāli un metodes. Pirmreizējiem reimatoloģiskajiem ambulatorajiem pacientiem tika lūgts izpildīt anketu, lai identificētu sociodemogrāfiskos raksturlielumus, katra aprūpes ceļa posma ilgumu un iemeslus novēlotai aprūpei. Aprakstošā statistika un neparametriskie testi tika pielietoti, lai noteiktu iespējamās atšķirības gaidīšanas laikos katrā aprūpes ceļa posmā pēc dzimuma, dzīvesvietas un klīniskās diagnozes.

Rezultāti. Kopā 45 pirmreizējie nosūtītie ambulatorie pacienti izpildīja anketas, 34 (75.6%) bija sievietes. Vidējais vecums nosūtīšanas laikā bija 56.4 (SD 10.8) gadi. 28 pacienti (62.2%) nebija apmierināti ar laika ilgumu no simptomu sākuma līdz reimatologa konsultācijai. Vidējais gaidīšanas ilgums no simptomu sākuma līdz primārajai aprūpei bija 30 (IQR 7–90) dienas, vidējais gaidīšanas ilgums no nosūtījuma līdz reimatologa konsultācijai bija 90 (IQR 30–150) dienas. Netika atrasta statistiski ticama atšķirība starp gaidīšanas laikiem katrā aprūpes ceļa posmā pēc dzimuma, dzīvesvietas un klīniskās diagnozes.

Secinājumi. Gaidīšanas laiki, lai tiktos ar raimatologu Latvijā pārsniedza pieņemtos kritērijus. Tādēļ savlaicīgas piekļuves nodrošināšana ir būtiska un steidzama, ir nepieciešamas mērķētas pūles, lai to uzlabotu.

Introduction

The overall impact and burden of rheumatic diseases (RD) are growing (Hoy et al. 2015) (Smith et al. 2014). RD are the fourth biggest reason for death and disability in world population (Global Burden of Disease Study 2013 Collaborators 2015). The approach to the management of different RD, such as rheumatoid arthritis (RA) and others, has changed the prognosis of these diseases. Optimal care for many RD depends on early access to rheumatologists. Evidence shows that early treatment for RA is more effective and is associated with higher remission rates, absence

of radiological progression and less severe disability (Smolen et al. 2014). The diagnosis and therapy vary widely in RD for a number of reasons, including patient delay in presenting to the primary care physician and delay in being seen by a rheumatologist once the referral has been produced by a primary care physician.

The Canadian Rheumatology Association has developed and released consensus-based rheumatology wait time benchmarks for inflammatory arthritis (Table 1). Although benchmarks were not created for all RD (there are no benchmarks for osteoarthritis), they are still a useful tool for my scientific research because there are no such benchmarks created for Latvia.

The aim of this study was to evaluate waiting times for each component of the care pathway (from symptom onset to primary care physician, from referral to rheumatologist consultation and from symptom onset to rheumatologist consultation) by gender, place of residence, clinical diagnosis and compare them with established benchmarks.

Table 1. **Waiting time benchmarks: recommended maximum wait time from referral to rheumatologist consultation** (Canadian Rheumatology Association 2015)

Rheumatoid arthritis, other forms of inflammatory arthritis	4 weeks
Psoriatic arthritis	6 weeks
Spondyloarthritis	3 months
Systemic lupus erythematosus	4 weeks

Materials and methods

This research conducted a cross-sectional study from 2016 to 2017 in the out-patient clinic of Riga East Clinical University Hospital, based on epidemiological survey administered to out-patients who consulted with rheumatologists for the first time in their lives. The epidemiological survey consisted of questions regarding patient's sociodemographic characteristics, symptoms, duration of each phase of the care pathway and reasons for delayed care. All of the patients who consulted with rheumatologists were referred by primary care physicians.

Patients were assigned to 1 of 4 diagnostic categories: osteoarthritis, systemic inflammatory rheumatic diseases (e.g., rheumatoid arthritis), clinical diagnosis not made yet and other diagnosis (e.g., osteoporosis/osteopenia). Descriptive statistics were used to characterize the study population. The wait time was determined overall and for each diagnostic category for each phase of the care pathway: symptom onset to primary care physician, from referral to rheumatologist consultation and from symptom onset to rheumatologist consultation. Shapiro-Wilk test was used to check for the normality of data. Nonparametric tests were used to determine the possible differences in wait times in each phase of the care pathway by gender, place of residence and clinical diagnosis.

Statistical analysis was performed using IBM SPSS Statistics 22, p value<0.05 denoted the presence of a statistically significant difference. Ethics approvals were obtained from ethics committees of Riga East Clinical University Hospital and Riga Stradiņš University.

Results

This study collected data from 45 first-time rheumatic out-patients from 2016 to 2017. Overall, the mean (SD) age at the time of first consultation was 56 (11) years, 76% were women, women to men ratio was 3 to 1. Most of the patients (18 patients [40%]) had secondary professional education, and most of the patients lived outside Riga (28 patients [62%]) (Table 2).

The most frequent diagnoses were osteoarthritis (20 patients [44%]) and systemic inflammatory rheumatic diseases (14 patients [31%]) (Table 2). The most frequent symptom why patients sought help from rheumatologists was joint pain (87%), but the second most frequent symptom was joint stiffness (60%). 28 of the patients (62%) were not satisfied with the duration of time it took them to see a rheumatologist and they wished that they were able to consult with the specialist sooner. The most frequent reason for delayed first care was: long wait times (89%). The second most frequent reason was: not enough specialists close to the patient's place of residence (18%).

Table 2. **Characteristics of subjects**

Characteristic	Number (%) of subjects
Gender	
Women	34 (76)
Men	11 (24)
Education	
Secondary	10 (22)
Secondary professional	18 (40)
Higher	17 (38)
Place of residence	
Riga	17 (38)
Outside Riga	28 (62)
Clinical diagnosis	
Osteoarthritis	20 (44)
Systemic inflammatory rheumatic diseases	14 (31)
Clinical diagnosis not made yet	9 (20)
Other diagnosis	2 (4)

The median waiting time (IQR) for date of referral to rheumatologist consultation was 90 (30–150) days for all patients, but for systemic inflammatory rheumatic diseases group: 105 (30–203) days (Table 3). 29% of the patients from systemic inflammatory rheumatic diseases group were seen by rheumatologist within 30 days, 50% of the patients from the same group were seen by a rheumatologist within 3 months after the referral is given by a primary care physician.

Table 3. **Median waiting time from date of referral to rheumatologist consultation**

Clinical diagnosis	No. of patients	No. (%) seen by rheumatologist within:				Waiting time, days, median (IQR)
		< 30 days (<1 m)	31–90 days (1–3 m)	91–180 days (3–6 m)	> 181 days (> 6 m)	
All patients	45	13 (28.9)	11 (24.4)	15 (33.3)	6 (13.3)	90 (30–150)
Osteoarthritis	20	7 (35.0)	5 (25.0)	7 (35.0)	1 (5.0)	75 (30–150)
Systemic inflammatory rheumatic diseases	14	4 (28.6)	3 (21.4)	4 (28.6)	3 (21.4)	105 (30–203)
Clinical diagnosis not made yet	9	–	3 (33.3)	4 (44.4)	2 (22.2)	120 (75–195)

The longest median waiting time (IQR) from symptom onset to primary care visit was for the systemic inflammatory rheumatic diseases group: 60 (7–113) days. The longest median waiting time (IQR) from symptom onset to rheumatologist consultation was also for the systemic inflammatory rheumatic diseases group: 191 (54–478) days (Table 4).

Table 4. **Median waiting time from symptom onset to rheumatologist consultation**

Variable	All patients n = 45	Osteoarthritis n = 20	Systemic inflammatory rheumatic diseases n = 14	Clinical diagnosis not made yet n = 9
Median waiting time (IQR), days				
Symptom onset to primary care visit	30 (7–90)	30 (7–180)	60 (7–113)	7 (7–45)
Referral to rheumatologist consultation	90 (30–150)	75 (30–150)	105 (30–203)	120 (75–195)
Symptom onset to rheumatologist consultation	180 (67–240)	181 (75–308)	191 (54–478)	150 (109–214)
No. (%) of patients seen by rheumatologist within:				
3 months from symptom onset	12 (26.7)	5 (25.0)	4 (28.6)	1 (11.1)
6 months from symptom onset	11 (24.4)	5 (25.0)	2 (14.3)	4 (44.4)
9 months from symptom onset	13 (28.9)	5 (25.0)	4 (28.6)	4 (44.4)
≥ 12 m from symptom onset	9 (20.0)	5 (25.0)	4 (28.6)	–

No statistically significant differences were found in wait times in each phase of the care pathway by gender, place of residence and clinical diagnosis.

Discussion

Successful early control of RD depends, first, on the patients, who must realize that they have the disease, recognize the signs and symptoms and visit their primary care physicians. A second limitation corresponds to the delay after the referral is given by their primary care physician.

In 2010, Van der Linden et al. assessed the cause of delay for rheumatic patients, classifying the causes into two subgroups: those due to the patients themselves and those associated to primary care physicians. They found that delay was mostly caused by clinical factors, such as atypical joint

involvement, normal laboratory tests at the beginning of the disease (Van der Linden et al. 2010). This study found that patients relatively quickly sought help from primary care physicians after their symptoms appeared. The biggest issue for these delays is long waiting times (second part of the care pathway) that do not allow patients to see specialists sooner.

In 2016, Schmajuk et al. found that a significant portion of patients in the U.S. traveled great distances to consult with a rheumatologist. Many of these patients resided in areas with no or low supplies to rheumatologists, therefore, living in an area with low supply of rheumatologists was a crucial determinant of long travel times and hindered access to rheumatology care. There were no statistically significant differences in waiting times by place of residence, although most of the patients lived outside Riga, so most of them were forced to travel long distances to visit a rheumatologist.

In 2011, Raza et al. determined that the median delay from symptom onset to rheumatologist consultation for patients with rheumatoid arthritis across 10 European centers was 24 weeks (Raza et al. 2011). In this study the median waiting time from symptom onset to rheumatologist consultation was 191 days (27 weeks) for inflammatory rheumatic diseases group which exceeds 24 weeks. It is clear that patient delays are a common issue for many European centers, including Latvia.

There are several limitations to this study. First of all, the sample size is small; therefore, more subjects should be included in this research. Secondly, rheumatoid arthritis was not separated from other systemic inflammatory diseases. It makes it harder to compare this data with other publications because most of them look at diagnostic and therapeutic delays of rheumatoid arthritis. This issue could get resolved after subjects get introduced into this research.

Conclusions

Wait times to see a rheumatologist in Latvia exceeded established benchmarks. Therefore, improving timely access is critical, targeted efforts are needed to improve it. The cause of these delays is in the second part of the care pathway. The biggest issue here is the long wait times that act as a barrier to providing an adequate care. Also, delays in timely consultations may reflect the growing burden on RD relative to rheumatology supply. Ultimately, delays in access to timely care and treatment result in increasing disability for patients as well as increasing costs to healthcare system.

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ASSOCIATION BETWEEN OFFSPRING'S FREQUENCY OF HOSPITALIZATION WITHIN THE LAST YEAR AND PARENTAL EXPOSURE TO EMOTIONALLY TRAUMATIC EVENTS WITHIN THE LAST 3 YEARS

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Abstract

Association between offspring's frequency of hospitalization within the last year and parental exposure to emotionally traumatic events within the last 3 years

Key words: *parental emotional trauma, children's health, hospitalization*

Introduction. If a parent has experienced emotional trauma (ET), then there is a possibility that it will affect offspring's health (Racine et al., 2018). The association between parental ET and offspring's physical health is reflected in several studies (Meinck et al., 2017), but there are no such studies in Latvia.

Aim. To assess the association between offspring's frequency of hospitalization within the last year and parental exposure to emotionally traumatic events within the last 3 years.

Materials and methods. In this cross-sectional study participated 75 parents, 97 children. Study group (SG) included parents whose children had been hospitalized, control group (CG) – whose children had never been hospitalized. SG were interviewed in Children's Clinical University Hospital, CG – in social media. ET were assessed using the Recent Traumatic Events Scale (Pennebaker & Susman, 2013), offspring's hospitalization frequency – using semi-structured questionnaire. All data was analyzed using SPSS and Excel.

Results. Within the last year once to Emergency Department have been admitted 46,7% of children, ≥2 times – 53,3%. 83,3% of children have never stayed in the inpatient ward, 16,6% – stayed there twice. Within the last 3 years 3,3% of parents in SG have not experienced ET, in CG – 20%. 1 ET has been experienced by 26,7% in SG, by 13,3% in CG. ≥2 ET have been experienced by 69,9% of parents in SG, by 66,7% in CG.

Conclusions. In this study, there was no significant association between offspring's frequency of hospitalization within the last year and parental exposure to emotionally traumatic events within the last 3 years.

Kopsavilkums

Pēcnācēju stacionēšanas biežums pēdējā gada laikā un tā saistība ar vecāku piedzīvotajām emocionālajām traumām pēdējo 3 gadu laikā

Atslēgvārdi: *vecāku emocionālās traumas, bērnu veselība, stacionēšana*

Ievads. Ja vecāks ir pieredzējis emocionālu trauma (ET), tad pastāv varbūtība, ka tas ietekmēs bērnu veselību (Racine et al., 2018). Saistība starp vecāku ET un bērnu fizisko veselību ir atspoguļota vairākos pētījumos (Meinck et al., 2017), taču Latvijā šādi pētījumi nav veikti.

Mērķis. Izpētīt saistību starp pēcnācēju stacionēšanas biežumu pēdējā gada laikā un vecāku piedzīvotajām ET pēdējo 3 gadu laikā.

Materiāli un metodes. Šajā šķērsgriezuma tipa pētījumā piedalījās 75 vecāki, 97 bērni. Pētāmā grupā (PG) ietilpa vecāki, kuru bērni ir bijuši stacionēti, kontroles grupā (KG) – kuru bērni nekad nav bijuši stacionēti. PG tika aptaujāta Bērnu klīniskās universitātes slimnīcā, KG – sociālajos tīklos. ET tika noskaidrotas, lietojot *Recent Traumatic Events Scale* (Pennebaker & Susman, 2013), bērnu stacionēšanas biežums – lietojot semi-strukturētu anketu. Dati tika analizēti, izmantojot SPSS un Excell.

Rezultāti. Pēdējā gada laikā uzņemšanas nodaļā 1 reizi tika stacionēti 46,7% bērni, ≥2 reizes – 53,3%. 83,3% bērnu ne reizi netika ievietoti stacionāra nodaļās, 16,6% – tika ievietoti 2 reizes. Pēdējo 3 gadu laikā 3,3% vecāku PG nepiedzīvoja nevienu ET, KG – 20%. 1 ET piedzīvoja 26,7% PG, 13,3% – KG. ≥2 ET piedzīvoja 69,9% vecāki PG, 66,7% – KG.

Secinājumi. Šajā pētījumā netika novērota saistību starp pēcnācēju stacionēšanas biežumu pēdējā gada laikā un vecāku piedzīvotajām ET pēdējo 3 gadu laikā.

Introduction

Nowadays, the children's physical health is widely discussed. A child is emotionally, financially and physically connected with his parents. If a parent has experienced emotionally traumatic events, then there is a possibility that it will affect offspring's health (Lê-Scherban et al., 2018).

In Latvia every day in an Emergency Department of Children's Clinical University Hospital are admitted 200 children (Children's Clinical University Hospital, 2019). In 2017 over 47 thousand of children were placed in the inpatient wards (Central Statistical Bureau of Latvia, 2018). To compare – in United States number of Emergency Department visits per 100 persons: 43.3 (136.9 million). 9% results in hospital admission (CDC/National Center for Health Statistics, 2017).

In the research "The epidemiology of traumatic event exposure worldwide: results from the World Mental Health Survey Consortium" (Benjet et al., 2016) >70% of respondents reported a traumatic event, 30.5% were exposed to ≥4 emotional traumas (ET). As we can see – ET prevalence is high. Unfortunately, there is no data about ET prevalence in Latvia.

There are many studies which show that poor offspring health can be associated with parental ET. Family disadvantage (caregiver AIDS illness and poverty) was associated with increased abusive parenting. Abusive parenting was in turn associated with higher adolescent health risks (Meinck et al., 2017). Holocaust survivors who suffer from PTSD tend to engage in unhealthy behaviour and transmit this behaviour to their offspring, which influences their health and functioning in later years (Shrira, 2019). Mothers with unresolved trauma had insecure attachment themselves and were more likely to have infants with insecure attachmen (Iyengar, 2014).

Many studies about association between parental ET and children's physical health had been conducted in recent years. However, there is a long way to go to find out the link between offspring's physical health and parental ET. One way how to find it is to compare hospitalized and never hospitalized children and their parents.

Aim, materials and methods

The study objective was to assess the association between offspring's frequency of hospitalization within the last year and parental exposure to emotionally traumatic events within the last 3 years.

A cross-sectional study was conducted. In the study participated 75 parents and 97 children. The control group (CG) included 45 parents whose children (n=67) had never been hospitalized due to acute or chronic illnesses. The study group (SG) included 30 parents whose children (n=30) had been hospitalized due to acute or chronic illnesses.

The respondents in the SG were interviewed in an Emergency Department of Children's Clinical University Hospital. The respondents in the CG were interviewed in social media (online).

Parental exposure to emotionally traumatic events was assessed using the *Recent Traumatic Events Scale* from *Childhood Trauma Questionnaire* (Instrument Author: Pennebaker & Susman, 2013). *Recent traumatic event scale* consists of 7 general questions, asking about specific ET experience: 1 – Death of a very close friend or family member; 2 – A major upheaval between respondent and his/her spouse; 3 – A traumatic sexual experience; 4 – Became victim of violence;

5 – Became extremely ill or injured; 6 – A major change in the kind of work respondent do; 7 – Other. If respondent answer, that he/she had ET experience than they need to evaluate how traumatic was that (using a 7-point scale, where 1 = not at all traumatic, 4 = somewhat traumatic, 7 = extremely traumatic) and they need to evaluate how much did they confide in others about this traumatic experience at the time (1 =not at all, 7 = a great deal). Offspring's number of acute and chronic diseases, and frequency of admission to hospital was assessed using semi-structured questionnaire. All data was analyzed using SPSS 22.0 and Excel 2016.

Results

75 respondents' questionnaires were analyzed (Table 1).

Table 1. **Parental and children gender distribution in study group and control group**

		Males, n (%)	Females, n (%)	Total, n
Study group	Parents	5 (16,7)	25 (83,3)	30
	Children	15 (50)	15 (50)	30
Control group	Parents	6 (13,3)	39 (86,7)	45
	Children	36 (53,7)	31 (46,3)	67

Mean age of parents inn SG – 36,2 years (SD: 5,99), in CG – 31,2 years (SD: 5,99). Comparing parental age in SG and CG, there was statistically significant difference (p = 0,00). Mean age of children in SG – 4,9 years (SD: 4,2), in CG – 5 years (SD: 3,9). Comparing children age in SG and CG, there was not statistically significant difference (p = 0,814)

In the SG within the last year once to the Emergency Department has been admitted 46,7% of children, 2 times – 36,6% of children, ≥3 times – 16,7% of children. 83,3% of children have never stayed in hospital, 13,3% of children stayed in hospital once, 3,3% of children – twice (Figure 1).

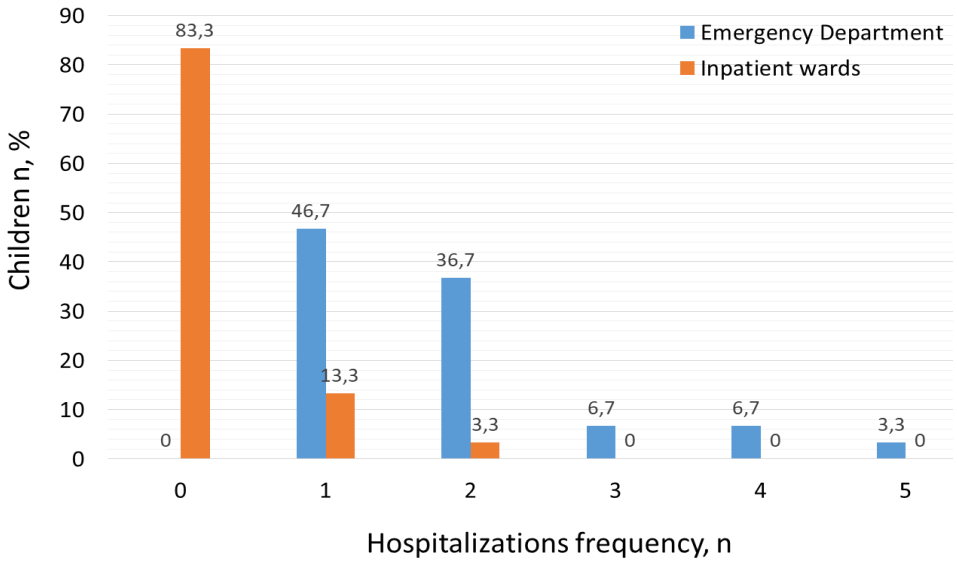


Figure 1. **Offspring's frequency of hospitalization within the last year**

Within the last 3 years 3,3% of parents in SG have not experienced ET, in CG – 20% of parents. 1 ET has been experienced by 26,7% of parents in SG, by 13,3% of parents in the CG. 2 ET have been experienced by 43,3% of parents in SG, by 46,7% of parents in CT. ≥3 ET have been experienced by 26,6% of parents in SG, by 20% of parents in CG (Figure 2 and 3).

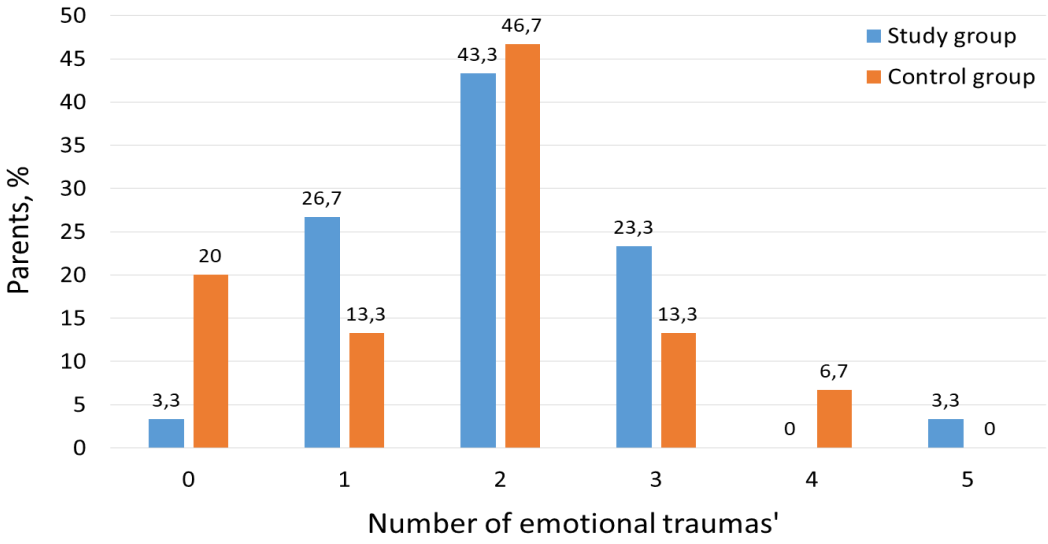


Figure 2. **Number of parental emotional traumas within the last 3 years**

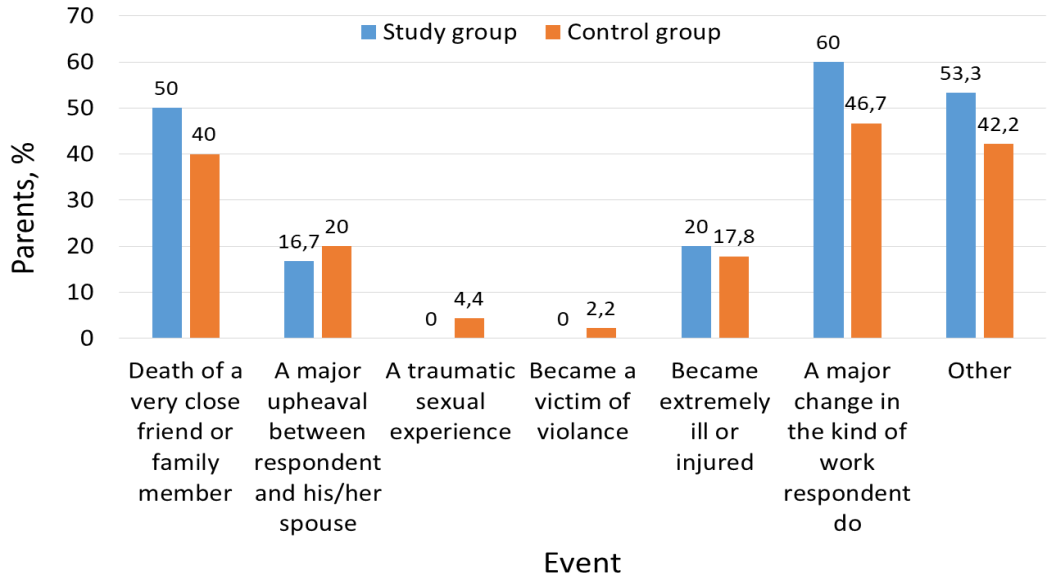
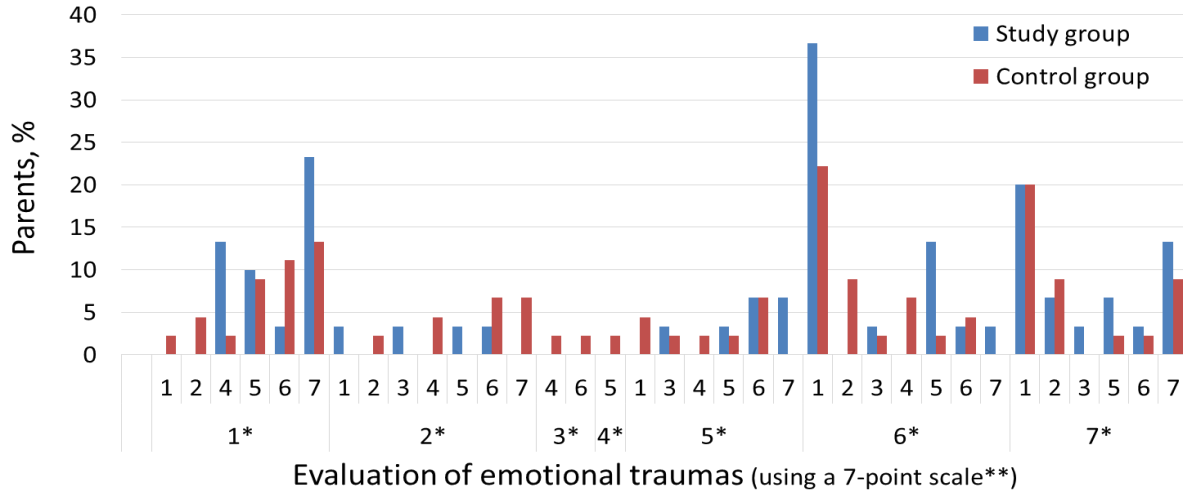


Figure 3. **Types of parental emotional traumas within the last 3 years**

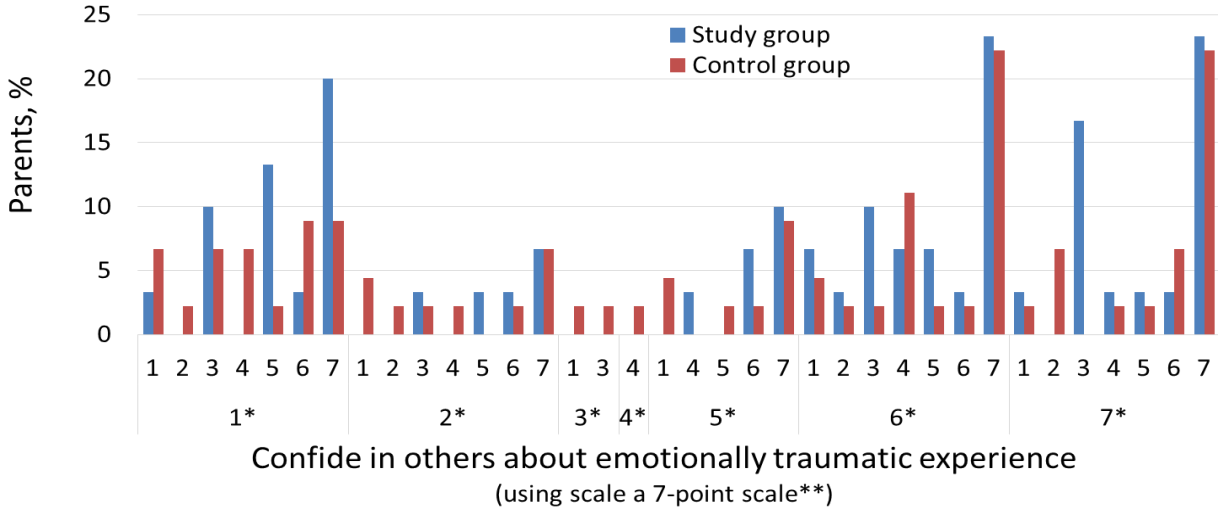
Comparing SG and CG, there were no statistically significant differences in the number of experienced emotional traumas within the last 3 years, in emotional traumas' evaluation (Figure 4) and in confide in others about traumatic experience at the time (Figure 5) ($p > 0,05$).



*
1 - Death of a very close friend or family member
2 - A major upheaval between respondent and his/her spouse
3 - A traumatic sexual experience
4 - Became victim of violence
5 - Became extremely ill or injured
6 - A major change in the kind of work respondent do
7 - Other

**
1 = not at all traumatic
4 = somewhat traumatic
7 = extremely traumatic

Figure 4. **Evaluation of emotional traumas**



*
1 - Death of a very close friend or family member
2 - A major upheaval between respondent and his/her spouse
3 - A traumatic sexual experience
4 - Became victim of violence
5 - Became extremely ill or injured
6 - A major change in the kind of work respondent do
7 - Other

**
1 = not at all traumatic
4 = somewhat traumatic
7 = extremely traumatic

Figure 5. **Confide in others about emotionally traumatic experience at the time**

Discussion

The research data are original because I could not find researches about association between offspring's frequency of hospitalization and parental exposure to emotionally traumatic events.

Although there are many studies which show that poor offspring health can be associated with parental ET (Meinck et al., 2017; Shrira, 2019; Iyengar, 2014).

I suppose that there isn't direct effect of parental traumas on children's health but indirect effects through caregiver mental health distress could be found and we shouldn't forget about that. I suppose that increasing number of participants and dividing participants into multiple age groups could lead to significant association. As well as further studies with more specific inclusion and exclusion criteria are needed.

Data were obtained by using questioners, and that is why it could interfere with results. Although respondents in the CG were interviewed in social media (online) and questions could been misinterpreted. Whereas respondents in SG were interviewed in person and they could ask help if they did not understand something.

Conclusions

1. In this study I didn't found significant association between offspring's frequency of hospitalization within the last year and parental exposure to emotionally traumatic events within the last 3 years.
2. Considering literature data and appeared tendencies in this study, I suppose that increasing number of participants and dividing participants into multiple age groups could lead to significant association.

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PRE-PREGNANCY BMI AND GESTATIONAL WEIGHT GAINS CORRELATION WITH PREGNANCY OUTCOME

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Abstract

Pre-pregnancy BMI and gestational weight gains correlation with pregnancy outcome

Key words: *pre-pregnancy BMI, gestational weight gain, pregnancy complications, delivery outcome, neonatal health*

The purpose of this study is to analyze, how pre-pregnancy body mass index and gestational weight gain affects pregnancy complications, delivery outcome and neonatal health. A total of 1051 medical history cases of pregnant women and neonates who were delivered between January 2016 and December 2016 in Maternity Hospital of Riga were included in this study. SPSS version 23.0 was used for statistical analyses. Women were divided into 4 groups according to the pre-pregnancy BMI and gestational weight gain.

Both pre-pregnancy BMI and gestational weight gain correlated significantly with gestational age at delivery (BMI P = 0,015; GWG P = 0,003), caesarean section (BMI P = 0,001; GWG P = 0,05), uterine dysfunction (P = 0,001), mean neonatal weight (P < 0,001), macrosomia (P < 0,001) and maternal complications during pregnancy, such as gestational hypertension (P < 0,001) and preeclampsia (BMI P < 0,001; GWG P = 0,007). Also pre-pregnancy BMI statistically significantly correlated with gestational weight gain (P = 0,002), labor induction (P = 0,006), progressive fetal distress (P = 0,001), chorioamnionitis (P = 0,004), neonatal clavicle fracture during delivery (P = 0,02), Apgar score at first minute (P = 0,007) and after 5 minutes (P = 0,002) and gestational diabetes (P = 0,001). Gestational weight gain also correlated significantly with preterm birth (P = 0,032) and acute fetal distress (P = 0,005).

Study revealed that pre-pregnancy body mass index and gestational weight gain had significant correlation with pregnancy complications, delivery outcome and neonatal health. The outcome of the birth, the newborn condition, and avoidance of complications during pregnancy can be improved by following and adjusting the pre-pregnancy weight and gestational weight gain.

Kopsavilkums

Pamata ĶMI un svara pieauguma grūtniecības laikā korelācija ar grūtniecības iznākumu

Atslēgvārdi: *pamata ĶMI, svara pieaugums grūtniecības laikā, grūtniecības komplikācijas, dzemdību iznākums, jaundzimušā veselība*

Pētījuma mērķis ir analizēt, kā pamata ķermeņa masas indekss un svara pieaugums grūtniecības laikā ietekmē grūtniecības komplikācijas, dzemdības un jaundzimušā stāvokli. Kopā pētījumā tika iekļauta 1051 Rīgas Dzemdību nama arhīva dzemdētāju un jaundzimušo slimības vēsture laika posmā no 2016. gada janvāra līdz 2016. gada decembrim. Datu apstrādei tika izmantota SPSS 23.0 versija. Grūtnieces tika sadalītas 4 grupās pēc pamata ĶMI un svara pieauguma grūtniecības laikā.

Gan pamata ĶMI, gan svara pieaugums grūtniecības laikā nozīmīgi korelēja ar gestācijas laiku, kurā grūtniecība tika atrisināta (BMI P = 0,015; GWG P = 0,003), ķeizargrieziena veikšanu (BMI P = 0,001; GWG P = 0,05), dzemdes disfunkciju (P = 0,001), vidējo jaundzimušā svaru (P < 0,001), makrosomiju (P < 0,001), kā arī ar mātes komplikācijām grūtniecības laikā – gestācijas hipertensiju (P < 0,001) un preeklampsiju (BMI P < 0,001; GWG P = 0,007). Pamata ĶMI korelēja arī ar svara pieaugumu grūtniecības laikā (P = 0,002), dzemdību indukciju (P = 0,006), progresējošu fetālu distresu (P = 0,001), horioamnionītu (P = 0,004), jaundzimušā atslēgas kaulu lūzumu dzemdību laikā (P = 0,02), Apgares skalas vērtējumu pirmajā minūtē (P = 0,007) un pēc 5 minūtēm (P = 0,002) un gestācijas diabētu (P = 0,001). Svara pieaugums grūtniecības laikā korelēja arī ar priekšlaicīgām dzemdībām (P = 0,032) un akūtu fetālu distresu (P = 0,005).

Pētījums atklāja, ka pamata ĶMI un svara pieaugumam grūtniecības laikā ir statistiski nozīmīgi korelācija ar grūtniecības komplikācijām, dzemdību iznākumu un jaundzimušā stāvokli. Rūpīgi sekojot līdzi un koriģējot pamata ĶMI un svara pieaugumu grūtniecības laikā, var izvairīties no grūtniecības komplikācijām, uzlabot dzemdību iznākumu un jaundzimušā stāvokli.

Introduction

Nowadays there is a tendency for inadequate diet among pregnant women (Fowler 2012) which reduces (Soltani 2017) or on the contrary increases their weight. (Poston 2014), (Chen 2018). Either increased or reduced pre-pregnancy body mass index and weight gain during pregnancy significantly affects pregnancy complications, the outcome of birth and health condition of the

newborn. (Barisic 2017), (Pan 2016), (Enomoto 2016), (Yang 2017), (Robertson 2018), (Yesilcicek Calik 2018).

The purpose of this study is to analyze, how pre-pregnancy body mass index and gestational weight gain affects pregnancy complications, delivery outcome and neonatal health.

Materials and methods

A total of 1 051 medical history cases of pregnant women and neonates who were delivered between January 2016 and December 2016 in Maternity Hospital of Riga were included in this study. Inclusion criteria were nulliparous singleton pregnancies, age eighteen to thirty-nine. Exclusion criteria were pregnancy after assisted reproduction, extragenic pathologies, alcohol, drug use, smoking before pregnancy or during pregnancy, use of teratogenic drugs during pregnancy, history of abortion, no information about women weight in first trimester. Of 1051 medical history cases 839 were normal deliveries, 105 acute caesarean sections, 92 were vacuum – assisted deliveries and 15 medical history cases were preterm birth. In medical history cases of pregnant women in Maternity Hospital of Riga were not information about weight before pregnancy, so pre-pregnancy body mass index was calculated from women weight in first trimester. Women were divided into 4 groups according to the pre-pregnancy body mass index: first group was underweight group with BMI below 18.5 (n = 94 (8.9%)), second group was with normal BMI 18.5–25 (n = 749 (71.3%)), third group was overweight group with BMI 25–30 (n = 164 (15.6%)) and fourth group was obesity group with BMI above 30 (n = 44 (4.2%)). (WHO 2019). Women were also divided in 4 groups according to their gestational weight gain: below 12 kg (n = 344 (32.7%)), 12 to 15 kg (n = 274 (26.1%)), 15 to 18 kg (n = 205 (19.5%)) and above 18 kg (n = 228 (21.7%)). (Yang 2017). For statistical and descriptive data analysis *Microsoft Excel 2010* and *SPSS version 23.0* were used. *Chi – square* tests were used for categorical variables. Also used was *One – way ANOVA* for continuous data. *Binary logistic regression analysis* was used to evaluate the association between the pre-pregnancy body mass index, gestational weight gain and pregnancy complications, delivery outcome and neonatal health. Statistical significance was considered with probability value $P < 0.05$.

Results

Pre-pregnancy body mass index (BMI) correlated significantly with pregnancy complications. Gestational hypertension had association with pre-pregnancy BMI (P<0,001). In the first group of women with body mass index below 18.5, gestational hypertension was not found, in the group of women with normal body mass index (BMI 18.5–25) this pregnancy complication was found in 2.7% of cases. In third group with body mass index 25–30 gestational hypertension was found in 12.2% and in forth group 22.7% of cases. Odds ratio (OR) was 1,239 (P<0,001). Pre-pregnancy body mass index also correlated with gestational diabetes (P=0,001), in the underweight group gestational diabetes was not present, in the group of pregnant women with normal body mass index

it was found in 1.5% of cases, in the third group with BMI 25 – 30 gestational diabetes was 5.5% of women, but in fourth group with BMI above 30 9.1% of women. OR was 1,160 (P<0,001). Preeclampsia had significant correlation with pre-pregnancy BMI (P<0,001), in the first group 3.2% of women had this complication, while in group of women with normal BMI this complication was found in 1.5% of cases. In the third and fourth group this complication occurred 5.5% and 15.9% of cases. OR was 1,171 (P<0,001). Pre-pregnancy BMI also correlated with chorioamnionitis (P=0,004), in the group with BMI below 18.5 2.1% of women had this complication, in the group with normal BMI 7.6% and in third and fourth group 11.6% and 18.2% of women had chorioamnionitis as pregnancy complication. OR was 1,087 (P=0,001). Pre-pregnancy BMI had association with delivery outcome. Pre-pregnancy BMI significantly correlated with mean gestational age at delivery (P=0,015), in the first group mean gestational age was 39,86 ± 1,2 (weeks), in the second group of women this parameter was 40,09 ± 1,3, in the third group it was 40,37 ± 1,2 weeks and in the last group 40 ± 1,3 weeks. Also there was a association with uterine dysfunction (P=0,001), in the group of women with BMI below 18.5 this complication was found in 23.4% of cases, in next group with BMI 18.5–25 it was found 32.4%, in the group with body mass index 25–30 44.5% of cases and in the group with BMI above 30 uterine dysfunction was found 47.7% of cases. Odds ratio was 1,078 (P<0,001). Pre-pregnancy BMI correlated with labor induction (P=0,006), in the group with BMI > 18.5 it was found in 18.1% of women, in group with BMI 18.5–25 20.7%, in third group with BMI 25–30 28.7% and in the fourth group with BMI >30 38.6%. OR was 1,069 (P<0,001). Furthermore acute caesarean section had association with pre-pregnancy body mass index (P<0.001), the bigger BMI the more often acute caesarean section was performed, in the first group it was 3.2%, in the second 8.7%, in the third 16.5% and in the last group 22.7%. OR was 1,122 (P<0,001). Pre-pregnancy BMI correlated with mean neonatal weight (grams) (P<0,001), in the first group mean weight was 3302,77 ± 409,9g, in the second group 3509,77 ± 4555,0g, in the third group 3609,65 ± 487,2 and in the fourth group 3637,84 ± 527,0g. Also it had correlation with macrosomia (neonatal weight above 4000g) (P<0,001), in the group of women with body mass index below 18.5 this complication was found in 3.2% of newborns, in the group with normal body mass index 12.0%, in the overweight group macrosomia was found in 12.0% of neonates and in obesity group with BMI above 30 it was found 27.3% of neonates. OR was 1,116 (P<0,001). Association was also with mean Apgar score at first minute (P=0,007) and after five minutes (P=0,002) (ball). In the group of women with BMI below 18.5 mean Apgar score at first minute was 7,85 ± 0,36, but after five minutes 8,93 ± 0,26, in the second group first evaluation was 7,76 ± 0,53 and after five minutes 8,82 ± 0,47, in the third group mean score at the first minute was 7,67 ± 0,68, after five minutes 8,75 ± 0,58 and in the last group mean Apgar score at the first minute was 7,57 ± 0,70 and after five minutes 8,77 ± 0,42. Pre-pregnancy BMI

significantly correlated with progressive fetal distress (P=0,001). The bigger body mass index the more often progressive fetal distress was found, in the first BMI group this complication was in 4.3% of cases, in second BMI group 4.9%, in the third and fourth group 9.8% and 18.2%. Odds ratio was 1,117 (P<0,001). Lastly pre-pregnancy BMI correlated with neonatal clavicle fracture during delivery (P = 0,02), the most common this complication was in group of women with BMI above 30, it was found in 6.8% of neonates. Odds ratio was 1,123 (P=0,054). (Table 1) (Table 3)

Table 1. **Correlation between pre-pregnancy body mass index and pregnancy complications, delivery outcome and neonatal health**

	Pre-pregnancy BMI (kg/m^2)				
	<18.5 (n=94)	**18.5–25 (n=749)**	**25–30 (n=164)**	**>30 (n=44)**	**P value**
Mean neonatal weight (g)	3302,77 ± 409,9	3509,77 ± 455,0	3609,65 ± 487,2	3637,84 ± 527,0	<0,001
Labor induction (n(%))	17 (18,1)	155 (20,7)	47 (28,7)	17 (38,6)	0,006
Acute caesarean section (n(%))	3(3,2)	65(8,7)	27(16,5)	10 (22,7)	<0,001
Mean gestational age at delivery (weeks)	39,86 ± 1,2	40,09 ± 1,3	40,37 ± 1,2	40 ± 1,3	0,015
Uterine dysfunction (n(%))	22(23,4)	242(32,3)	73(44,5)	21(47,7)	0,001
Progressive fetal distress (n(%))	4(4,3)	37(4,9)	16(9,8)	8(18,2)	0,001
Neonatal macrosomia (n(%))	3(3,2)	90(12,0)	32(19,5)	12(27,3)	<0,001
Gestational hypertension (n(%))	0(0)	20(2,7)	20(12,2)	10(22,7)	<0,001
Gestational diabetes (n(%))	0(0)	11(1,5)	9(5,5)	4(9,1)	0,001
Preeclampsia (n(%))	3(3,2)	11(1,5)	9(5,5)	7(15,9)	<0,001
Chorioamnionitis (n(%))	2(2,1)	57(7,6)	19(11,6)	8(18,2)	0,004
Neonatal respiratory distress (n(%))	0(0)	13(1,7)	6(3,7)	0(0)	0,057
Neonatal clavicle fracture during delivery (n(%))	1(1,1%)	7(0,9)	0(0)	3(6,8)	0,02
Apgar scale at first minute (ball)	7,85 ± 0,36	7,76 ± 0,53	7,67 ± 0,68	7,57 ± 0,70	0,007
Apgar scale after 5 minutes (ball)	8,93 ± 0,26	8,82 ± 0,47	8,75 ± 0,58	8,77 ± 0,42	0,002

Table 2. **Binary logistic regression analysis for association between the pre-pregnancy body mass index and pregnancy complications, delivery outcome and neonatal health**

Pre-pregnancy BMI (kg/m^2)	**OR**	**95% CI**	**P value**
• macrosomia	1,116	1,070 – 1,165	<0,001
• labor induction	1,069	1,030 – 1,108	<0,001
• acute caesarean section	1,122	1,072 – 1,175	<0,001
• uterine dysfunction	1,078	1,043 – 1,116	<0,001
• progressive fetal distress	1,117	1,058 – 1,180	<0,001
• chorioamnionitis	1,087	1,033 – 1,143	0,001
• neonatal clavicle fracture during delivery	1,123	0,998 – 1,264	0,054
• gestational hypertension	1,239	1,169 – 1,315	<0,001
• gestational diabetes	1,160	1,073 – 1,254	<0,001
• preeclampsia	1,171	1,092 – 1,257	<0,001

The second factor that has been studied in this research is gestational weight gain (GWG) during pregnancy and its correlation with pregnancy complications, delivery outcome and neonatal health. GWG had correlation with mean pre-pregnancy BMI (P<0,001), in the first group of women with GWG below 12 kg mean pre-pregnancy BMI was 22,74 ± 4,2, in the second group of women with GWG 12–15 kg it was 22,45 ± 3,7, in the third group with GWG 15–18 mean pre-pregnancy BMI was 21,69 ± 3,0 and in the fourth group with GWG above 18 kg it was 23,07 ± 3,6. Likewise as pre-pregnancy BMI also GWG had an association with gestational hypertension (P<0,001), in the first GWG group this complication was found in 3.2% of women, in the second group 4.4%, in the third group 2,0% and in the fourth group 10,1%. Odds ratio was 1,099 (P<0,001). Also gestational weight gain had correlation with preeclampsia (P=0,007), in the first group with GWG below 12 kg it was found in 1.2% of cases, in the second group with GWG 12–15 kg it was 3.6%, in the third group with GWG 15–18 kg this complication was found in 1.5% of cases, but in fourth group with GWG above 18 kg in 5.7% of cases. Odds ratio was 1,117 (P=0,001). GWG had association with mean gestational age at delivery (P=0,003), in the first GWG group it was 39,95 ± 1,4, in the second GWG group 40,10 ± 1,3, in the third GWG group 40,16 ± 1,2 and in the fourth GWG group mean gestational age at delivery was 40,33 ± 1,0. Uterine dysfunction correlated with gestational weight gain during pregnancy (P=0,001), in the first group of women with GWG below 12 kg it was found in 30.2% of cases, in the second group with GWG 12–15 kg 30.3%, in the group with GWG 15–18 kg 33.2% and in the group with GWG above 18 kg this complication was found in 45.2% of cases. Odds ratio was 1,042 (P=0,001). GWG had association with deep vaginal rupture (P=0,011), in the first group this complication in 10.9% of women, in the second group 4.9% and in third and fourth group 12.6% and 13.3%. GWG also had correlation with preterm birth (P=0,032) and acute caesarean section (P=0,052), the most common preterm birth was in the group of women with GWG below 12 kg – 2.3%, but acute caesarean section was most often performed in group of women with GWG above 18 kg – 14.5%. Odds ratio for preterm birth was 0,895 (P=0,022) and for acute caesarean section 1,043 (P=0,029). GWG also had an impact on neonatal health. GWG correlated with mean neonatal weight (g) (P<0,001), in the first group of women mean neonatal weight was 3302,77 ± 409,9, in the second group it was 3509,77 ± 455,0, in the third group 3609,65 ± 487,2 and in the fourth group 3637,84 ± 527,0. Furthermore, GWG also had correlation with macrosomia (P<0,001), in the first group of women with GWG below 12 kg this complication was found in 9.9% of newborns, in the second group with GWG 12–15 kg it was found 11.7%, in the third group 10.7% and in the fourth group 21.5%. Odds ratio was 1,075 (P<0,001). Association also was with acute fetal distress (P=0,005), the most common this complication was in group of women with gestational weight gain below 12 kg – 13.4%. Odds ratio was 0,959 (P=0,044) (Table 2) (Table 4).

Table 3. **Correlation between gestational weight gain during pregnancy and pregnancy complications, delivery outcome and neonatal health**

Gestational weight gain (GWG) (kg)					
	<12 (n=344)	**12–15 (n=274)**	**15–18 (n=205)**	**>18 (n=228)**	**P value**
Mean pre-pregnancy body mass index (kg/m^2)	22,74 ± 4,2	22,45 ± 3,7	21,69 ± 3,0	23,07 ± 3,6	<0,001
Mean neonatal weight (g)	3376,67 ± 484,2	3509,63 ± 412,6	3550,94 ± 432,3	3684,95 ± 464,9	<0,001
Acute caesarean section (n(%))	31(9,0)	27(9,9)	14(6,8)	33(14,5)	0,052
Preterm birth (n(%))	8(2,3)	5(1,8)	2(1,0)	0(0)	0,032
Mean gestational age at delivery (weeks)	39,95 ± 1,4	40,10 ± 1,3	40,16 ± 1,2	40,33 ± 1,0	0,003
Uterine dysfunction (n(%))	104(30,2)	83(30,3)	68(33,2)	103(45,2)	0,001
Deep vaginal rupture (n(%))	34(10,9)	12(4,9)	24(12,6)	26(13,3)	0,011
Acute fetal distress (n(%))	46(13,4)	15(5,5)	17(8,3)	17(7,5)	0,005
Neonatal macrosomia (n(%))	34(9,9)	32(11,7)	22(10,7)	49(21,5)	<0,001
Gestational hypertension (n(%))	11(3,2)	12(4,4)	4(2,0)	23(10,1)	<0,001
Preeclampsia (n(%))	4(1,2)	10(3,6)	3(1,5)	13(5,7)	0,007

Table 4. **Binary logistic regression analysis for association between the gestational weight gain and pregnancy complications, delivery outcome and neonatal health**

Gestational weight gain (GWG) (kg)	**OR**	**95% CI**	**P value**
• macrosomia	1,075	1,039 – 1,113	<0,001
• acute caesarean section	1,043	1,004 – 1,083	0,029
• uterine dysfunction	1,042	1,017 – 1,068	0,001
• preterm birth	0,895	0,814 – 0,984	0,022
• deep vaginal rupture	1,029	0,988 – 1,072	0,168
• acute fetal distress	0,959	0,921 – 0,999	0,044
• gestational hypertension	1,099	1,043 – 1,157	<0,001
• preeclampsia	1,117	1,048 – 1,192	0,001

Discussion

Our findings in this study suggest that women in the overweight and obese pre-pregnancy body mass index groups have greater risk of developing complications such as gestational hypertension, gestational diabetes, preeclampsia, uterine dysfunction, acute caesarean section, neonatal macrosomia. Also these women have longer mean gestational age, bigger mean neonatal weight and lower Apgar scale evaluation on the first minute and after 5 minutes. Furthermore, women in the GWG group above 18 kg also have higher risk developing gestational hypertension, preeclampsia, uterine dysfunction, acute caesarean section, macrosomia and longer gestational age and lower Apgar scale evaluation. While pregnant women in GWG group below 12 kg have higher risk of preterm birth and developing of acute fetal distress. These findings are important because it helps to understand how inadequate pre-pregnancy BMI and GWG affects pregnancy complications, delivery outcome and neonatal health. It is important for the woman and doctors to follow up with the weight before pregnancy and during pregnancy and if necessary adjust it to

prevent possible complications during pregnancy and delivery. Similar findings were found in other studies, the bigger pre-pregnancy BMI or baseline BMI the greater risk of developing complications during pregnancy. A retrospective study in China including 1 102 women comparing women baseline BMI and GWG between groups also had increased risk of gestational hypertension, gestational diabetes, bigger neonatal weight and macrosomia. Also preterm birth had similar results, the lower GWG pregnancy the higher risks of premature birth. The difference in the study in China was that gestational weight gain during pregnancy was divided by trimesters, what was not done in our study, but could be done in further research. (Yang 2017). Another study in Japan with 97 157 women with singleton pregnancies had similar results with our study – the higher the pre-pregnancy BMI, the higher the incidences of pregnancy-induced hypertension, gestational diabetes, macrosomia and caesarean section. Poor weight gain correlated with a higher frequency of preterm birth. (Enomoto 2016). Our study has limitations, in the study we included only healthy women without known risk factors with age from 18 to 39, to explore how weight without other factors affects pregnancy complications, delivery outcome and neonatal health. For further research it would be important to include greater number of women with other risk factors. It is also important to assume that the included women had unknown risk factors and complications that affected the results in our study. Pre-pregnancy body mass index was calculated from weight in first trimester for more precise results in further research weight should be known before pregnancy.

Conclusions

Study revealed that pre-pregnancy body mass index and gestational weight gain had significant correlation with pregnancy complications, delivery outcome and neonatal health. The outcome of the birth, the newborn condition, and avoidance of complications during pregnancy can be improved by following and adjusting the pre-pregnancy weight and gestational weight gain during pregnancy.

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KNOWLEDGE AND ATTITUDE TOWARDS TOBACCO SMOKING RELATED HEALTH RISKS OF PEOPLE IN HEALTH CARE AND GENERAL POPULATION

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Abstract

Knowledge and attitude towards tobacco smoking related health risks of people in health care and general population

Key words: *public health, smoking, health risk, knowledge*

According to The Tobacco Atlas, in Latvia more than 534'000 adults use tobacco each day with more than 4'700 tobacco related deaths yearly, and the most common causes of death related to tobacco smoke are cardiovascular diseases, chronic obstructive pulmonary disease and various types of cancer. The aim of the research is to evaluate and compare the knowledge of and attitude towards tobacco-smoking related health risks between health care related people (HC) and general population (GP). A questionnaire was created using Google Forms and distributed through social media. The obtained data was analyzed using IBM SPSS Statistics 23 ($p<0.05$ was considered as statistically significant). Knowledge about tobacco related health problems was generally better in HC group (9.34 versus 7.42 of 11, $p= 0.000$), but knowledge about lung diseases ($p=0.188$) and infertility ($p=0.055$) was equivalent between groups. HC group did identify most of the tobacco-smoking related tumor locations better than GP, but knowledge about skin ($p=0.306$) and blood ($p=0.673$) cancer did not differ between groups. HC group did tend to evaluate themselves higher than GP (4.1 versus 3.15 out of 5, $p=0.000$), but HC group more often over evaluated their knowledge than GP (47.8% versus 27% of the cases, $p=0.000$). Both groups in this study were equally concerned about their health risks related to tobacco smoking and no statistically significant differences were found.

Kopsavilkums

Zināšanas un attieksme pret tabakas smēķēšanas izraisītiem veselības riskiem ar medicīnu saistītā populācijā un vispārējā populācijā

Atslēgvārdi: *sabiedrības veselība, smēķēšana, veselības risks, zināšanas*

Saskaņā ar izdevuma *The Tobacco Atlas* datiem Latvijā vairāk nekā 534 000 pieaugušo lieto tabaku katru dienu un katru gadu 4 700 cilvēki mirst no tabakas izraisītām problēmām, kas ir sirs un asinsvadu slimības, hroniska obstruktīva plaušu slimība un dažādi vēžu veidi. Pētījuma mērķis bija novērtēt un salīdzināt zināšanas un attieksmi pret tabakas smēķēšanas izraisītiem veselības riskiem starp dažādām populācijas grupām: ar medicīnu saistītā populācija (HC) un vispārējā populācija (GP). Tika izmantota aptauja Google Forms tiešsaistes lietotnē, kura tika izplatīt ar sociālo tīklu palīdzību. Iegūtie dati tika apstrādāti, izmantojot IBM SPSS Statistics 23 (vērtība $p<0.05$ tika uzskatīta par statistiski nozīmīgu. Zināšanas par problēmām saistībā ar tabakas lietošanu kopumā bija labākas HC grupā (9,34 punkti pret 7,42 punktiem no 11, $p=0,000$), bet zināšanas par plaušu saslimšanām ($p=0,188$) un neauglību ($p=0,055$) bija vienādas. HC grupā labāk atpazina ar tabakas smēķēšanu saistītās vēža lokalizācijas salīdzinājumā ar GP grupu, tomēr zināšanas par ādas ($p=0,306$) un asins ($p=0,673$) vēzi neatšķirās. HC grupas cilvēki augstāk novērtēja savas zināšanas par tabakas smēķēšanas izraisītām veselības problēmām (4,1 pret 3,15 punkti no 5, $p=0,000$), bet HC grupā cilvēki biežāk pārvērtēja savas zināšanas nekā GP grupa (attiecīgi, 47,8% un 27%, $p=0,000$). Abās grupās respondenti bija vienlīdz noraizējušies par saviem riskiem saistībā ar tabakas smēķēšanu saistītām problēmām, un šajā jautājumā netika atrastas statistiski nozīmīgas atšķirības.

Introduction

Tobacco smoking is a worldwide problem that contributes to many economical, social and health-related problems. Many international organizations, including the WHO Framework Convention on Tobacco Control (FCTC), provide comprehensive guidelines for global tobacco control efforts. The FCTC covers all aspects of tobacco control, including tobacco product regulation, advertising, health warnings, price and tax issues, illicit trade (smuggling) and programs for tobacco smoking cessation. (Talhout et al., 2011)

According to The Tobacco Atlas 2017, in Latvia more than 536'000 adults use tobacco every day aged over 15 years old. This contributes to almost one third, or 28%, of the population of Latvia in 2017, and almost half (45%) of the working age population of Latvia in 2017. The statistics also mentions that over 2000 children aged 10–14 years also use tobacco every day in Latvia. As for the gender distribution, 51.8% of all men and 21% women smoke in Latvia according to the data of the Tobacco Atlas of 2017.

The annual death count due to tobacco smoking related problems has reduced during the last seven years thanks to the anti-tobacco smoking campaign in Latvia. According to the Tobacco Atlas 2010 VS Tobacco Atlas 2017 total tobacco smoking related mortality decreased from 4'700 deaths in 2010 to 4'000 deaths in 2017, and tobacco smoking related deaths from 25.8% to 23.05% of male all-cause mortality and from 7.2% to 6.27% of female all-cause mortality. (The Tobacco Atlas 2010, The Tobacco Atlas 2017)

The most common causes of death related to tobacco smoke are cardiovascular diseases, chronic obstructive pulmonary disease and various types of cancer. (Talhout et al., 2011)

Materials and methods

A questionnaire was created using *Google Forms* and distributed by social media.

The questionnaire was divided into three parts. In the first part there were questions about age, sex, education, occupation (health care related or not health care related), smoking status (never smoked, passive smoker, irregular smoker, regular smoker, quit smoking) as well as smoking experience in years and amount of smoked cigarettes daily. In the last two questions, respondents had an opportunity not to indicate the mentioned data. Then the respondents were asked to evaluate their knowledge of tobacco smoking related problems on the scale from 1 to 5 where 1 corresponded to little knowledge and 5 – very informed about tobacco smoking related health problems. The next question was to determine what the main information sources are for the respondents – parents, friends, teachers, media, general practitioners or seeking information through internet resources independently.

The second part of the questionnaire consisted of questions regarding respondent's knowledge of tobacco smoking related problems. In the first section the respondents were asked to indicate which problems are related to tobacco smoking. There were eleven tobacco smoking related problems mentioned and the respondents were to identify which problems are related to tobacco smoking. The following problems were mentioned and were to be identified by the respondents: smell problems, teeth and gum problems, lung diseases, various types of cancer, high blood pressure, myocardial infarction, infertility, high risk of abortions, erectile dysfunction, higher risk of bone fractures and skin problems. The total of 11 points could be obtained in this section.

The second section of part two consisted of various cancer localizations of which the respondents were to choose the ones that are related to tobacco smoking. The following cancer types were provided for evaluation: any cancer type due to passive smoking, central nervous system cancer, pharynx cancer, larynx cancer, lung and airway cancer, oesophagus cancer, intestinal cancer, liver cancer, kidney cancer, urinary tract cancer, prostate cancer, uterus cancer, cervix cancer, breast cancer, muscle cancer, skin cancer, blood cancer. The total of 17 points could be obtained in this section.

In the last part of the survey there was the question about the respondent's personal attitude to tobacco smoking related problems and whether the respondent is concerned about his/her health condition.

The total of 28 points could be obtained from the questions about tobacco smoking related health problems and cancer types caused by tobacco smoking. The collected points for correct answers were correspondingly evaluated with a number from 0 to 5 accordingly to the point count as follows: 0 for 0–2 points, 1 for 3–5 points, 2 for 6–10 points, 3 for 11–18 points, 4 for 19–27 points, and 5 for 28 points. Further, the obtained evaluation and the self-evaluation mark were compared for both general population and health care related people group.

A total of 577 responses were collected through *Google Forms*. The data was afterwards exported to Microsoft Excel tables for further statistical analysis. The statistical analysis was performed using IBM SPSS Statistics 23. The data was analyzed using Mann-Whitney U, Pearson Chi-Square, and Fisher's exact test. The value of $p<0.05$ was considered as statistically significant.

Results

Most of the respondents were not healthcare related people: of 577 respondents 33.3% (n=192) were related to health care (group HC) and 66.7% (n=385) were general population (group GP).

The mean age in both groups was very similar and did not present statistically significant differences. The mean age of HC group was 28.23 years with SD=9.91 years, and in the GP groups the mean age was 27.68 years with SD=9.52. See Table 1 below.

However, gender distribution in both groups differed. There were more women than men in HC group than in the GP group: 83.3% versus 71.2%, where p=0.001. See Table 1 below.

Table 1. **Respondent Profile**

		HC	**GP**
Sex	Male	16.7%	28.8%
	Female	83.3%*	71.2%*
Age	Mean	28.23	27.68
	Range	19 – 85	16 – 69
	SD	9.91	9.52

* p=0.000

There were differences in smoking status between groups as well. There were more people who had never smoked in HC group: 36.5% versus 21.3% in the GP group, where p=0.000. And there were more people who had quit smoking in the GP group: 22.6% versus 13.5% in the HC group, where p=0.000. See Table 2 below.

Table 2. **Respondent Smoking Status**

		HC	GP
Smoking status	Never smoked	36.5%*	21.3%*
	Quit smoking	13.5%*	22.6%*
	Passive smoker	4.1%	9.0%
	Regular smoker	39.7%	38.1%
	Irregular smoker	6.2%	9.0%

* p=0.000

Knowledge about tobacco related health problems was generally better in HC group. In the HC group the mean point count was 9.34 points out of 11 points versus 7.42 points out of 11 points in the GP group, where p= 0.000.

Analyzing and comparing knowledge about specific diseases and problems in the GP group and HC group there were no statistically significant differences between groups in the knowledge of smell problems, teeth and gum problems, various types of cancer, high blood pressure, myocardial infarction, high risk of abortions, erectile dysfunction, higher risk of bone fractures and skin problems. However, knowledge about lung diseases and infertility was equivalent between groups with *p* values 0.188 and 0.055, accordingly.

Analyzing and comparing knowledge about tobacco smoking related cancer locations HC group did identify most of the tobacco-smoking related tumor locations better than GP. There were no statistical correlations found in the respondents' knowledge about any cancer type due to passive smoking, central nervous system cancer, pharynx cancer, larynx cancer, lung and airway cancer, oesophagus cancer, intestinal cancer, liver cancer, kidney cancer, urinary tract cancer, prostate cancer, uterus cancer, cervix cancer, breast cancer, and muscle cancer, and knowledge about skin and blood cancer did not differ between groups with corresponding *p* values of 0.306 and 0.673, accordingly.

When comparing self-evaluation between the groups it was found that HC group did tend to evaluate themselves higher than GP with mean 4.1 points versus 3.15 points out of 5, where p=0.000. However, when comparing self-evaluation marks with actual knowledge measured in points as per method described above HC group more often tended to over-evaluate their knowledge rather than GP group: in 47.8% versus 27% of the cases the self-evaluation mark was higher than the actual knowledge evaluation as per aforementioned method, where p=0.000. See Table 3 below.

Table 3. **Self-Evaluation And Over-Evaluation Ratio for Respondents**

	HC	**GP**
Self-evaluation (points)	4.1 (out of 5)	3.15 (out of 5)
Over-evaluated ratio	47.8%	27%

Both groups in this study were equally concerned about their health risks related to tobacco smoking and no statistically significant differences were found.

Discussion

Several recent studies, for example Xu et al., Zhou et al., indicate that education level, sex and age correlates with better knowledge of tobacco smoking hazards and tobacco smoking related problems although it does not contribute to non-smoker status of the people with higher education. (Xu t al., 2015; Zhou et al., 2015)

In the present research correlations between respondents' education level, sex or age and knowledge level about tobacco smoking related problems was not analyzed although it could have great value for further research.

Another point of interest would be correlations and statistically significant differences comparing information sources for tobacco smoking related problems and actual knowledge of the respondents as this may show the possible contributors to poor anti-tobacco smoking education and provide grounds for further research.

Conclusion

Although in general health care related people did have better knowledge about tobacco-related health risks as well as could identify most of the cancer locations caused by tobacco smoking than the general population, this study shows that the heath care related people knowledge of tobacco smoking related health problems is incomplete and could be improved as they tend to over-evaluate their knowledge level comparing to the general population.

There are also other fields of interest regarding knowledge of tobacco smoking related health problems and its correlations with different parameters of the respondents.

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MEDICATION ADHERENCE, TREATMENT SATISFACTION AND QUALITY OF LIFE AMONG PATIENTS WITH HYPOTHYROIDISM

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Abstract

Medication adherence, treatment satisfaction and quality of life among patients with hypothyroidism

Key words: *medication adherence, hypothyroidism, treatment satisfaction, quality of life, levothyroxine treatment*

Introduction. Hypothyroidism is a common health issue worldwide. Thyroid hormone therapy is significantly associated with improvements in thyroid-related symptoms and in quality of life (QoL), but sometimes patients may be symptomatic despite adequate levothyroxine therapy, which influences both QoL as well as patient satisfaction with treatment. Treatment effectiveness is determined by the efficacy of the treatment agent and the extent of adherence to the treatment. Despite the availability of efficacious interventions, nonadherence to treatment remains a great problem across therapeutic areas.

Objectives: The aim of this observational cross-sectional study was to assess the therapeutic adherence, treatment satisfaction and quality of life of patients on LT4 treatment in outpatient practice.

Methods and materials: In this cross-sectional study were included 41 patients (6 male, 35 female; 22-83 years, mean age 58.9, interquartile range = 32.5), treated with hypothyroidism (41.5% had previous thyroid surgery or radioactive iodine treatment, 53.7% diagnosed with Hashimoto thyroiditis) at Pauls Stradiņš Clinical University Hospital and Riga Eastern University Hospital from November 2018 to January 2019. Patients completed treatment adherence questionnaire, underactive thyroid-specific QoL and treatment satisfaction questionnaires. Thyroid-related symptoms and blood thyroid function tests (TSH and fT4) were assessed. The analysis controlled for patient age, sex, comorbidities status.

Results: More than half of all respondents showed good adherence level, only 9,7% of all patients had poor adherence. All patients were visited general practitioner or endocrinologist with frequency at least 1 time per year. 26,82% of patients had troubles to postpone breakfast, so they took medication just before breakfast, thus this may result with reduced levothyroxine absorption. Patients reported negative influence of hypothyroidism on QoL, especially on weight (65.9%), physical capabilities (63.5%), physical appearance (63.4%), energy (58.5%), working life (53.6%). Despite levothyroxine therapy some patients reported fatigue (68.3%), weight gain (53.6%), dry skin (51.3%), feeling cold (34.2%), poor memory (34.1%) and concentration (31.7%), muscle weakness (24.4%) and aches (7.3%). Good QoL reported 56.1% of respondents, but bad – 22%, the remaining part reported their QoL to be "neither good nor bad". Treatment satisfaction at time of diagnosis was at least two times lower than treatment satisfaction during recent period of few weeks. Patients were most satisfied with convenience of treatment (73.2%) and less satisfied with understanding of their disease (36.6%).

Conclusions: In general, adherence to the levothyroxine (LT4) treatment was good. Patients had poorer QoL if they had several thyroid-related symptoms and multiple medical conditions. In general, main part of patients was satisfied with convenience of treatment. The correlation between serum hormone level (fT4 and TSH) and QoL score was not statistically proved.

Kopsavilkums

Pacientu līdzestība, apmierinātība ar ārstēšanu un dzīves kvalitātes rādītājs hipotireozes pacientiem

Atslēgvārdi: *pacientu līdzestība, hipotireoze, apmierinātība ar ārstēšānu, dzīves kvalitāte, levotiroksīna terapija*

Ievads. Hipotireoze ir plaši izplatīta visā pasaulē. Levotiroksīna terapija ir būtiski saistīta ar vairogdziedzera disfunkciju izraisītu simptomu un vispārējās dzīves kvalitātes uzlabošanos, bet dažreiz pacienti var būt simptomātiski, neraugoties uz atbilstošu levotiroksīna terapiju, kas ietekmē gan dzīves kvalitāti, gan pacientu apmierinātību ar ārstēšanu. Ārstēšanas efektivitāti nosaka ārstēšanas līdzekļa efektivitāte un pacienta līdzestība. Neskatoties uz to, ka ir pieejamas efektīvas ārstēšanas iespējas, slikta līdzestība joprojām ir liela problēma.

Mērķis. Šī šķērsgriezuma pētījuma mērķis bija novērtēt hipotireozes pacientu līdzestību, apmierinātību ar ārstēšanu un dzīves kvalitāti pacientiem, kuri lieto levotiroksīna monoterapiju.

Materiāli un metodes. Pētījumā tika iekļauts 41 pacients (6 vīrieši, 35 sievietes; 22 - 83 gadus veci, vidējais vecums 58.9 gadi, starpkvartīļu intervāls ir 32.5), kuri tika ārstēti sakarā ar hipotireozi (41,5% pēc vairogdziedzera operācijas vai radioaktīvā joda terapijas, 53,7% diagnosticēts Hašimoto tireoidīts) Paula Stradiņa klīniskajā universitātes slimnīcā un Rīgas Austrumu klīniskajā universitātes slimnīcā no 2018. gada novembra līdz 2019. gada janvārim. Pacienti aizpildīja līdzestības, dzīves kvalitātes un ārstēšanas apmierinātības noteikšanas anketas. Tika novērtēti hipotireozei raksturīgie simptomi un vairogdziedzera funkciju testi.

Rezultāti. Vairāk nekā pusei respondentu bija vērojama laba līdzestība, tikai 9,7% tā bija vērtējama kā slikta. Visi pacienti apmeklēja ārstu un veica kontroles analīzes ar biežumu vismaz 1 reizi gadā. 26,82% pacientu bija problēmas atlikt brokastis vismaz uz pusstundu, tāpēc viņi lietoja medikamentu tieši pirms brokastīm, kas varēja izraisīt

levotiroksīna absorbcijas samazināšanos. Pacienti ziņoja par hipotireozes negatīvo ietekmi uz svaru (65,9%), fizisko komponenti (63,5%), fizisko izskatu (63,4%), enerģiju (58,5%), darba laiku (53,6%). Neskatoties uz levotiroksīna terapiju, daži pacienti ziņoja par nogurumu (68,3%), ķermeņa masas pieaugumu (53,6%), sausu ādu (51,3%), aukstuma sajūtu (34,2%), sliktu atmiņu (34,1%) un samazinātām koncentrēšanas spējām (31,7%), muskuļu vājumu (24,4%) un sāpēm (7,3%). Labu dzīves kvalitāti atzīmēja 56,1% respondentu, bet sliktu - 22%, pārējā daļa sniegusi atbildi „ne laba, ne slikta". Ārstēšanas apmierinātība diagnostikas laikā bija vismaz divas reizes zemāka nekā apmierinātība ar ārstēšanu pēdējo dažu nedēļu laikā. Pacienti bija apmierināti ar ārstēšanas ērtumu (73,2%) un mazāk apmierināti ar zināšanām un izpratni par slimību (36,6%).
Secinājumi. Kopumā levotiroksīna (LT4) līdzstība bija vērtējama kā laba. Sliktāka dzīves kvalitāte bija pacientiem ar vairākiem hipotireozei raksturīgiem simptomiem un vairākām blakusslimībām. Visvairāk pacienti bija apmierināti ar terapijas lietošanas ērtumu.

Introduction

Thyroid dysfunction is one of the leading endocrine disorders (Biondi 2012). Hypothyroidism is believed to be a common health issue worldwide (Biondi 2012). Prevalence from 0.3% to 3.7% in the United States and from 0.2% to 5.3% in European countries (Bradley 2009). The mean annual incidence rate of autoimmune hypothyroidism is up to 4 per 1000 women and 1 per 1000 men. The prevalence of hypothyroidism increases with age, thus mean age at diagnosis usually is 60 years. Thyroid dysfunction is a potential risk factor for hypercholesterolemia, cardiovascular disease, osteoporosis, arrhythmia, and neuropsychiatric disease (Biondi 2012)

Medical treatment of hypothyroidism is synthetic hormone therapy with levothyroxine. Levothyroxine is a safe and effective treatment for hypothyroidism after diagnosis. Initial levothyroxine dosage is based on severity of symptoms. The daily replacement dose of levothyroxine is usually 1.6 μg/kg body weight (typically 100–150 μg), ideally taken at least 30 min before breakfast. Individual titration of this drug is necessary to return the patient to a chemically and clinically euthyroid state.

Efficacy of treatment should be evaluated by annual monitoring of the thyroid-stimulating hormone and fT4, fT3.

Thyroid hormone therapy is significantly associated with improvements in thyroid-related symptoms and in general quality of life (QoL), but sometimes patients may be symptomatic despite adequate levothyroxine therapy, which influences both QoL as well as patient satisfaction with treatment (Biondi B 2014). Nowadays, several studies have shown that hypothyroid patients may remain symptomatic despite biochemical euthyroid state achieved with levothyroxine monotherapy (Andrzejczyk 2012).

Aim

The aim of the study was to assess the therapeutic adherence, treatment satisfaction and quality of life in patients on LT4 treatment in outpatient practice. To determine association between hypothyroid-related symptoms in patients, who are receiving levothyroxine treatment, their QoL and treatment satisfaction.

Methods

In this cross-sectional study were included 41 patients (6 male, 35 female; 22-83 years, mean age 58.9, interquartile range = 32.5), treated with hypothyroidism (41.5% had previous thyroid surgery or radioactive iodine treatment, 53.7% diagnosed with Hashimoto thyroiditis) at Pauls Stradiņš Clinical University Hospital and Riga Eastern University Hospital from November 2018 to January 2019. Patients completed semi structured treatment adherence, underactive thyroid-specific QoL and treatment satisfaction questionnaires (Bradley 2009). Thyroid-related symptoms and blood thyroid function tests (TSH and fT4) were assessed.

Results

Adherence

Insufficient understanding of the drug regimen was observed in 29.27% of all respondents - there is a lack of alignment to complete fulfillment of levothyroxine administration due to failure to adhere to the recommended time for taking the medication (at least 30 minutes before breakfast).

The most common cause of dose change mentioned by the respondents was feeling unwell, two of the patients noted that they had increased their dose as symptoms progressed in winter, and one of the respondents stopped taking the medication for one month because of nausea after taking the medicine.

The highest adherence levels were observed in 18 respondents (40.9%) who had followed the instructions given by the doctor. Half (n = 9) of patients with the highest degree of compliance had no co-morbidity, 6 had type 2 diabetes, 1 - osteoarthritis, 1 - glaucoma + primary arterial hypertension, and 1 - pituitary adenoma.

Poorer adherence was associated with two main factors - increasing number of other medical conditions (r = -0,45; p = 0,02) and duration of levothyroxine treatment (r = -0,31; p = 0,04). Main part of patients – 34,1% (n = 14) visited endocrinologist two times per year, 31,7% (n = 13) – four times per year, 19,5% (n = 8) – three times per year un 14,6% (n = 6) – only one time per year (Figure 1).

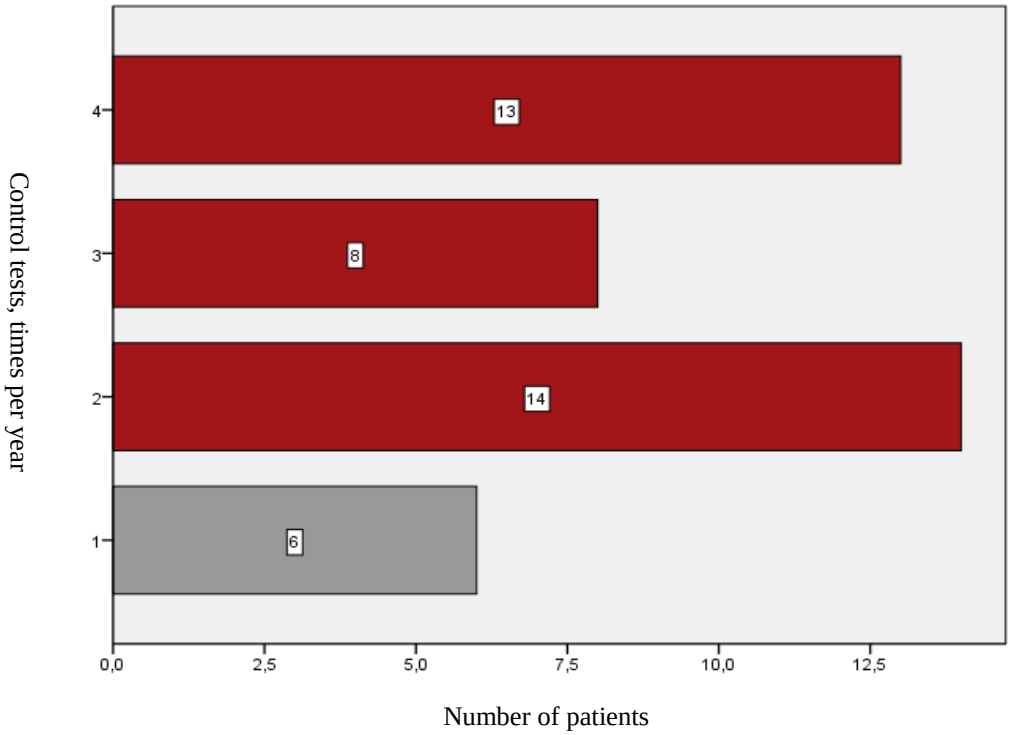

Figure 1. **Hypothyroid patient control tests number per year**

Five respondents had TSH value out of reference range (0.35-4.94), mean TSH value in those pacients was 7,1 mmol/ml. However, fT4 was in reference range (11.5-22.7 pmol/L.) in all patients.

Thyroid functional tests results in study population

	n	Min	Max	Median/ mean	IQR/ S.D.
TSH	11	0.01	8.60	2	IQR 2
fT4	41	9.39	22.80	14.47	S.D. 2.69

Quality of life

Patients reported negative influence of hypothyroidism on main quality of life domains, which were included in questionnaire, especially on weight (65.9%), physical capabilities (63.5%), physical appearance (63.4%), energy (58.5%), working life (53.6%) *(Figure 2)*. Despite levothyroxine therapy some patients reported fatigue (68.3%), weight gain (53.6%), dry skin (51.3%), feeling cold (34.2%), poor memory (34.1%) and concentration (31.7%), muscle weakness (24.4%) and muscle aches (7.3%).

Good QoL reported 56.1% of respondents, but bad – 22%, the remaining part reported their QoL to be "neither good nor bad". Patients were most satisfied with convenience of treatment (73.2%) and less satisfied with understanding of their disease (36.6%).

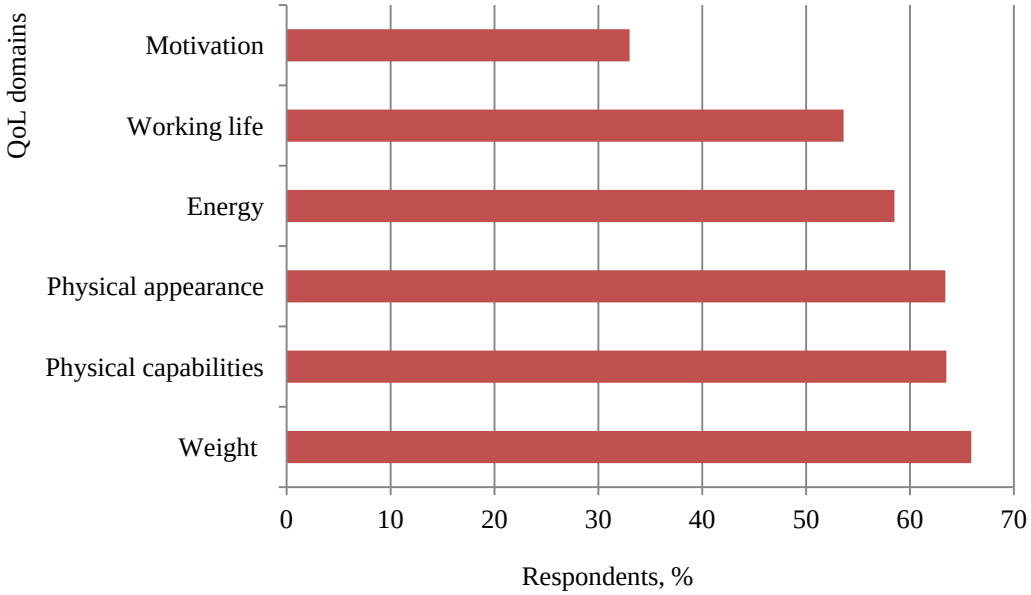

Figure 2. **Hypothyroidism negative influence on QoL main domains**

According to Spearman correlation test, moderate negative correlation was found between the quality of life values and the presence of co-morbidities (r = 0.5; p = 0.007), as well as a positive correlation between the quality of life and patient adherence (r = 0, 38; p = 0.013).

Treatment satisfaction

Mean treatment satisfaction with the current treatment was 34.41 (S.D.±5.89) (score range 0-42). In general, all patients were satisfied with the current treatment (in recent weeks), because none of the respondents received a total score less than 21, which would indicate dissatisfaction with treatment. Present treatment satisfaction is higher than past treatment satisfaction (Figure 2). Most patients were satisfied with convenience of treatment (5.68±0.47; 73.2%), but least with the understanding of the disease (4.05±1.45; 36.6%) and the control of symptoms (4.22±1.78).

Despite levothyroxine therapy some patients reported fatigue (68.3%), weight gain (53.6%), dry skin (51.3%), feeling cold (34.2%), poor memory (34.1%) and concentration (31.7%), muscle weakness (24.4%) and muscle aches (7.3%), only 4 patients were totally asymptomatic.

According to the patient's self-assessment, the satisfaction with treatment at the time of diagnosis was higher among men (Fig. 3). However, in question to determine on patient self-esteem "at the present moment of satisfaction", both women and men responded equally and found that both sexes do not differ statistically significantly in this category (p> 0.05).

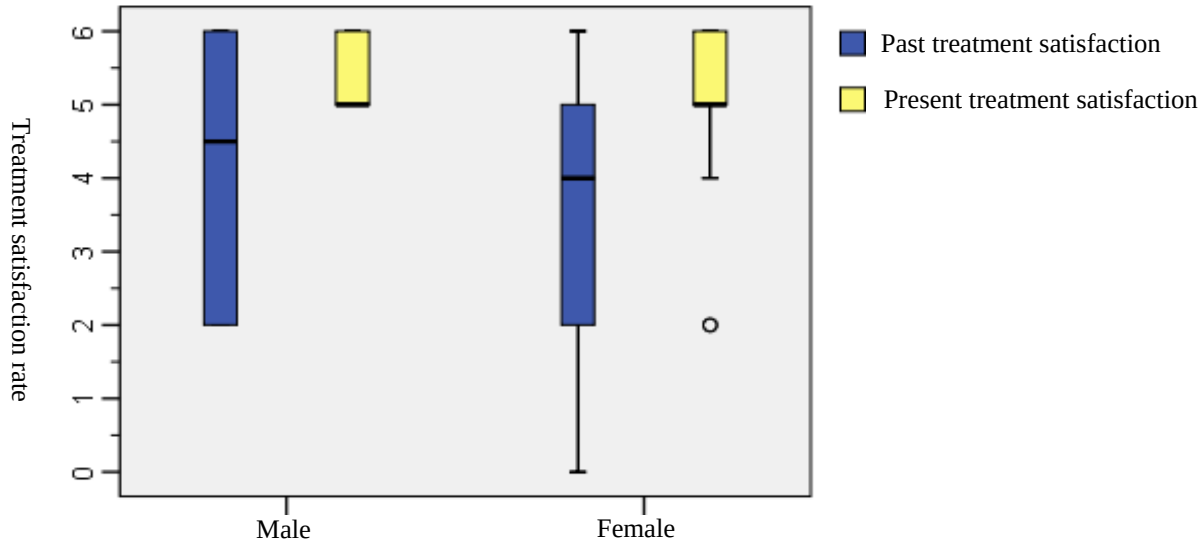

Figure 3. **Treatment satisfaction in hypothyroid individuals**

Conclusions

1. Better adherence to LT4 among patients with hypothyroidism was associated with lower rates of many comorbid diseases and treatment duration
2. Patients had poorer QoL if they had several thyroid-related symptoms and multiple medical conditions
3. In general, main part of patients was satisfied with convenience of treatment
4. The correlation between serum hormone level (fT4 and TSH) and QoL score was not statistically proved

Discussion

The results of this study are similar to those of other studies, which also reported a lack of correlation between serum FT4 and TSH levels and quality of life, as a study in Netherlands showed that the biochemical euthyroid condition does not indicate a better quality of life (Wiersinga 2012). After statistical analysis of the data, it was concluded that the quality of life for the population is more affected by physical appearance, increased weight, physical component and energy level, while a UK study suggests that patients with hypothyroidism suffer more from body discomfort, energy and lack of motivation (Bradley 2009). People suffer the most from the negative effects of hypothyroidism during their working hours, which reduces the capacity of a person to work.

Patients have regularly come to outpatient visits with an average frequency of four months, which is at least twice as high as in the Lebanon study, where the average control rate is every nine

months (El Helou S 2018). More than half of the thyroid laboratory parameters have been within the normal range, indicating a good level of treatment efficacy.

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THE RISK OF DEVELOPING DIABETES FOR POPULATION OF LATVIA IN THE NEXT 10 YEARS

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Abstract

The risk of developing diabetes for population of Latvia in the next 10 years

Key words: *chronic disease, sugar diabetes, risk of getting disease, body mass index, glucose level, lifestyle*

Introduction: According to World Health Organization data, there are more than 422 million people around the world, who suffer from diabetes. One of three people over the age of 18 is overweight, but 1 of 10 is obese. 90% of all the diabetes patients have type 2 diabetes. Amount of those patients has significantly grown in past 10 years. In 2007 in Latvia 58534 people were suffering from this disease, however in 2017 – already 91571. According to WHO data, 9% of all the Europe's health care expenses goes to treatment of diabetic patients.

Study goal: find out how big is the risk of developing type 2 diabetes for population of Latvia.

Materials and methods: As the main instrument of the study was used standard survey form based on questionnaire brought by Public Health Agency of Canada, data compiled and processed using MS Word and Excel tools. Data analysed using descriptive statistical method.

Results: 202 questionnaires were analyzed for this study. During the research were analysed information about patients in the 18–74 age group, data was compiled about body mass, height, body mass index, physical activity presence and eating habits. According to study data, 18% of the interview people have very high risk of developing diabetes, as well as 14% high risk or 1\3 has high risk of getting diabetes. 25% of the patients have high or very high BMI. Women are more often (58%) prone to have high or very high risk of getting diabetes compared to men men (42%). From all of the respondents 61% admit that they do not participate in physical activity every day. Patients in the 18–44 age group do not have risk of developing type 2 diabetes in the next 10 years, however the highest risk of 34% is in the 45–54 age group. In the 55–74 age group risk is in the interval of 24–28%.

Conclusion: People who suffer from type 2 diabetes are relatively young. As well according to compiled data, one of three people in the 45–54 age group have a high or very high risk of developing type 2 diabetes the in next 10 years. Low physical activity and sedentary lifestyle are important risk factors.

Kopsavilkums

Latvijas iedzīvotāju risks saslimt ar cukura diabētu turpmāko 10 gadu laikā

Atslēgvārdi: *hroniska slimība, cukura diabēts, risks saslimt, ķermeņa masas indekss, glikozes līmenis, dzīves veids*

Ievads: Kā liecina Pasaules Veselības organizācijas dati, ar diabētu pasaulē slimo vairāk nekā 422 miljoni cilvēku. Vienam no trīs cilvēkiem vecuma grupā virs 18 gadiem ir virssvars, bet 1 no 10 ir aptaukošanās. 90% no visiem CD pacientiem ir tieši 2. tipa. Desmit gadu laikā šo pacientu skaits ir krietni pieaudzis. Latvijā 2007. gadā ar šo slimību sirga 58534 cilvēku, bet 2017. gadā – jau 91571. PVO dati liecina, ka 9% no visiem Eiropas veselības aprūpes budžeta izdevumiem veido cukura diabēta ārstēšana.

Darba mērķis: noskaidrot cik liels ir risks Latvijas iedzīvotājiem saslimt ar II tipa CD.

Materiāli un metodes: Kā pētījuma instruments tika izmantota standartizēta anketa, kurai par pamatu ņemta Kanādas Veselības aģentūras izstrādātā anketa, dati apkopoti un apstrādāti MS Word un Exel. Datu analīze-ar aprakstošās statistikas metodēm.

Rezultāti: Pētījumā tika izmantotas 202 anketas. Intervēti pacienti vecuma grupā no 18 līdz 74 gadiem, noteikta ķermeņa masa, augums, ķermeņa masas indekss, fizisko aktivitāšu esamība, ēšanas paradumi. Pētījuma dati liecina, ka ļoti augsta riska grupā saslimt ar II tipa cukura diabētu ir 18% cilvēku, bet augsta riska 14%, kas sastāda 1\3 daļu no visiem respondentiem. Pacienti ar augstu un ļoti augstu ĶMI – 25%. Procentuāli vairāk (58%) sieviešu ir augsta un ļoti augsta riska grupā saslimt ar CD, savukārt vīrieši (42%). No visiem respondentiem – 61% atzīmē, ka katru dienu nenodarbojas ar fiziskām aktivitātēm. 18–44 gadus jauniem pacientiem risks turpmāko desmit gadu laikā saslimt ar II tipa cukura diabētu nav, savukārt visaugstākais risks –34%, novērojams vecuma grupā 45–54g. 55–74gadus veciem pacientiem risks svārstās 24–28% robežās.

Secinājumi: II tipa cukura diabēta pacienti ir gados jauni cilvēki. Arī apkopojot datus, katram trešajam cilvēkam vecuma grupā 45–54g ir augsts vai pat ļoti augsts risks turpmākajos10 gados saslimt ar II tipa cukura diabētu. Kā arī fizisko aktivitāšu trūkums un mazkustīgs dzīvesveids ir būtiski riska faktori cukura diabēta attīstībai.

Inroduction

Diabetes is worldwide common disease, and patient count continues to grow fast. Term diabetes mellitus comes from Greek and means fastened sugar excreation with urine. Type 2

diabetes is chronic disease, which is described as cell resistance to insulin and insulin secretion problems in the pancreas. Type 2 sugar diabetes risk factors are: fat distribution mainly in the abdomen, inactivity, family history. High body weight is associated with insulin resistance. High glucose level produce such symptoms as frequent urination, extreme thirst, loss of energy, fatigue, slow healing of wounds and high risk of developing infection. (1;5)

Uncontrolled type 2 diabetes is associated with micro vascular and macro vascular complications that lead to lower quality of life and life expectancy. Type 2 diabetic patients are more prone to experience heart and blood vessel disease or stroke 2 – 4 times often. (4) Death due to heart and blood vessel diseases is 65% more often in diabetic patients comparing to non-diabetic individuals. These are the reasons why diabetic patients with high risk of developing heart disease are group to provide information, follow up and give proper therapy. There are late onset type 2 diabetes complications such as diabetic nephropathy, retinopathy and polyneuropathy. (5)

Type 2 diabetes diagnostic criteria are: polyuria, polydipsia, polyphagia and blood glucose level over 11,1 mmol/L in random sample and/or glucose lever over 7,0 mmol/L after an overnight fast in two samples and/or glucose level over 11,1 mmol/L after oral glucose tolerance test. In addition glycated hemoglobin test can be performed, and it indicates diabetes if glycated hemoglobin is higher than 6,5%. (4;6)

Therapeutic choices are providing to patient information about lifestyle and nutrition, physical activities. Medication includes oral glucose lowering medicines and subcutaneously injected insulin. First medication of choice are biguanides, for example, metformin. Metformin is mainly lowering gluconeogenesis and glycolysis in liver cells, and improving glucose usage in muscle cells. Sulfonilureas are lowering glucose level by stimulating pancreas beta cells to produce more insulin. Thiazolidinediones make body tissues more sensitive to insulin, that way improving glucose intake into muscle cells. DPP-4 inhibitors both increase production of insulin and intake of sugar into cells. Sodium–glucose cotransporter–2 inhibitors (SGLT2 inhibitors) prevent the kidney from reabsorbing glucose back into blood in the proximal canals; instead, glucose is excreted in the urine. SGLT2 inhibitors are taken by injecting active drug subcutaneously. Glucagon-like peptide-1 receptor agonists activates GLP receptors, that causes insulin secretion, lower glucagon secretion, slow down emptying of stomach; combined effects lead to lower appetite. Indications to start insulin therapy are inability to control glucose levels, which is defined as unsatisfactory diabetes compensation, hyperglycemia (glucose level>= 16,7, – 19,4 mmol/L and/or HbA1C>= 10–12%), loss of pancreas ability to produce endogenic insulin. (4)

Materials and methods

Research was performed in from year 2017 till year 2019. It was planned to involve 200 18 – 74 year old participants. Participants involved into research were chosen randomly. Research was performed in three Latvian cities – Riga, Liepaja, Aluksne.

Research instrument was standardized questionnaire, which was based on a questionnaire brought by Public Health Agency of Canada. Data compiled and processed using MS Word and Excel tools. Data analyzed using descriptive statistical method.

Research was performed taking to account the Republic of Latvia law and Helsinki Declaration. All data collected was anonymous, confidential and was used only to purpose of this research. Participants were informed about research by providing an informative letter with a request to participate. Participants were asked to respond questions about themselves, then body weight, height, waist circumference were measured.

Study goal and tasks

Study goal was to find out how big is the risk of developing type 2 diabetes for population of Latvia in the next 10 years. Performed tasks were to collect and analyze data about type 2 sugar diabetes, its risk factors, diagnostics, therapy, make query and collected data analysis, find out the risk of developing type 2 diabetes in the next 10 years. Then compare research data with data available from the other researches worldwide, make conclusion.

Results

During the data collection part of the research 206 individuals were interviewed. 4 questionnaires could not be used, because were not completed properly. Overall 202 questionnaires were used to perform research. Participants were in 18–74 year old group. Body mass and body height were measured, body mass index was calculated, physical activity presence or absence and eating habits were acknowledged.

106 or 53% of participants were women and 96 or 47% were men. Participants could be divided in groups by age: 18–44 year old – 75 or 38%, 45–54 year old 41 or 20%, 55–64 year old – 53 or 26%, 65–74 year old – 33 or 16%. 37% of all the participants or 75 individuals had body mass index <25, 38% or 77 – BMI 25–29, 21% or 42 – BMI 30–34, 4% or 8 – BMI >=35. Being physically active every day declared 78 or 39% of all the participants.

Research showed that 137or 68% of all the participants have low or average risk of developing diabetes in the next 10 years. High risk was acknowledged for 28 or 14% and very high risk for 37 or 18%. Both high and very high risk respondents make 1/3 of all participants.

There are sex differences in high and very high risk of developing type 2 diabetes in next 10 years – women are 38 or 58% and men 28 or 42%. Risk division among men: low or average risk acknowledged for 68 or 71%, high risk for 10 or 10%, very high for 18 or 19%. Risk division

among women: low or average risk acknowledged for 68 or 64%, high risk for 19 or 18%, very high for 19 or 18%.

Research showed that among 18–44 year old group risk to develop type 2 diabetes in ten years is low. But the highest risk – 34% is among 45–54 year old group. In 55–74 year old group risk is between 24% and 28%.

Discussion

For the research we decided to use widely used questionnaire – questionnaire brought by Public Health Agency of Canada and translated it in Latvian. That allowed us to rely on Canada experience in dividing participants into risk groups. Wider research and follow up would provide further information about actual risk of developing type 2 diabetes in ten years particularly in Latvian population, based on data of questionnaire.

Results showing risks, body mass index, eating habits are nearly close to what we could expect according to worldwide data, especially data from developed countries. Surprisingly many people declared to be physically active every day. Interview was voluntary and no data check was performed. Qualitative research could be performed to find out Latvian population believes of what mean being physically active, and which are health friendly daily activities.

Dividing individuals into low/average, high and very high risk group helps to heighten awareness of developing diabetes for particular patients among health care professionals and encourage individuals for self-evaluation. Proper statistics can show real situation in population, ensures health care politicians to support diabetes prophylaxis programs. Providing well understandable information about health status improves population motivation to live healthier lifestyle.

Conclusions

- Type 2 diabetes is worldwide common disease and number of patients continues to grow, and expected to grow in the next 10 years in Latvia, too.
- Overall women have higher risk to develop diabetes comparing to men.
- High BMI, low physical activity and sedentary lifestyle are important risk factors.

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THE PRESCRIPTION AND DURATION OF INSOMNIA PHARMACOTHERAPY IN ENDOCRINOLOGY AND RHEUMATOLOGY PATIENTS IN LATVIA

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Abstract

The prescription and duration of insomnia pharmacotherapy in endocrinology and rheumatology patients in Latvia

Key words: *insomnia, pharmacotherapy, benzodiazepines, benzodiazepine analogues, duration of use, specialist*

Introduction. The prevalence of insomnia in the world has risen, according to experience of USA and New Zealand there are overuse of hypnotics.

Aim. Determine the insomnia pharmacotherapy in Latvia, its duration and what speciality doctor prescribes the medications.

Materials and Methods. This is a crossectional study, including all patients hospitalized in single center university hospital, endocrinology and rheumatology ward during 25.10.2017–30.12.2017, authors made questionnaire, which were used, it was translated into russian. Descriptive statistical analysis and Spearman's rank correlation was applied to evaluate the results.

Results. Data were obtained from 92 respondents, 37% (n=34) were male, 63% (n=58) – female. Mean age 59 ± 17.5 years. Sleep disorders were found in 63% of patients, from which 32.6% chronic insomnia. Most frequently used groups of medications were benzodiazepines and benzodiazpine analogues. The medications were prescribed by: 57% family doctor; 17% neurologist; 10% of patients can not recall; 7% cardiologist; 3% psychiatrist; 3% rheumatologist and 3% narcologist. Only one patient used medications for one week therapeutic course.

Conclusion. More than half (51%) of the patients used medications and in most cases they were prescription drugs (83.3%). Most of the medications were prescribed by family doctors (57%). Most frequently used groups of medications were benzodiazepines and benzodiazpine analogues. 67% of patients did not discontinue the use of medications.

Kopsavilkums

Bezmiega farmakoterapijas nozīmēšana un lietošanas ilgums endokrinoloģijas un reimatoloģijas pacientiem Latvijā

Atslēgvārdi: *bezmiegs, farmakoterapija, benzodiazepīni, benzodiazepīnu analogi, lietošanas ilgums*

Ievads. Bezmiega prevalence pasaulē ir pieaugusi un balstoties uz ASV un Jaunzēlandes pieredzi vērojama miega līdzekļu pārmērīga lietošana, aktuāli noskaidrot situāciju Latvijā.

Mērķis. Noskaidrot bezmiega farmakoterapiju, tās lietošanas ilgumu un speciālistu, kurš nozīmē bezmiega terapiju Latvijā.

Materiāli un metodes. Šķērsgriezuma pētījums, iekļauti Paula Stradiņa Klīniskās universitātes slimnīcas, Endokrinoloģijas un reimatoloģijas nodaļas pacienti, kas atradās nodaļā laika posmā no 25.10.2017 līdz 30.12.2017, pielietota autora veidota anketa, kas tulkota krievu valodā. Rezultātu apstrādei tika izmantota aprakstošā statistiskā analīze un Spīrmena rangu korelācija.

Rezultāti. Pētījumā piedalījās 92 respondentiem. No pētījuma kopējās populācijas 37% (n=34) bija vīrieši, 63% (n=58) sievietes. Vidējais anketēto pacientu vecums ir 59 ± 17.5 gadi. bezmiega problēmas bija 63% pacientu, hronisks bezmiegs bija 32.6% pacientu. Visbiežāk lietotās medikamentu grupas ir bijuši benzodiazepīni un benzodiazepīnu analogi. Medikamentus nozīmējuši: 57% ģimenes ārsts, 17% neirologs, 10% pacients neatceras, 7% kardiologs, 3% psihiatrs, 3% reimatologs un 3% narkologs. Tikai viens pacients lietojis medikamentus 1 nedēļas kursam.

Secinājumi. Vairāk nekā puse (51%) no pacientiem ar bezmiegu lietojuši medikamentus, un lielākā daļa no tiem bijuši recepšu medikamenti (83.3%). Visvairāk medikamentus nozīmēja ģimenes ārsti (57%). Biežāk lietotās medikamentu grupas ir benzodiazepīni un benzodiazepīnu analogi. Medikamentus nepārtrauca lietot 67% pacientu.

Introduction

Sleep is one of the main physiological processes that provide a cognitive process, work and concentration abilities as well the regulation of endocrine system, and the lack of it causes significant loss of functionality. As research shows the prevalence of insomnia has risen today. In a survey from Engalnd from 1993 to 2007 a data was obtained from 20 503 people, aged 16–64 years,

the prevalence of insomnia symptoms has risen from 35.0% to 38.6% and the diagnosis of insomnia has risen from 3.1% to 5.8% (Chawla et al., 2018).

In Latvia for insomnia treatment, zopiclone and zolpidem are available. The prevalence of use for zopiclone is 4.82/1000 and for zolpidem it was 2.72/1000, for other sedatives: triazolam and midazolam – 0.53/1000. However benzodiazepines, which are classified under anxiolytic drugs prevalence was 15.07/1000 (Zāļu Valsts Aģentūra, 2018).

In a study conducted in New Zealand 2013/14 found that Zopiclone is one of the most commonly used drugs 120.2/1000. As well, it was discovered that, taking into account the recommendations, take 1 tablet a day for up to 4 weeks, which means a total of no more than 28 tabs. per patient per month, only 50% of patients received less than 30 tabs per month, 27% received 30–150 tabs. and 23% received in a month above 150 tablets (Best Practice Journal, 2018).

Materials and Methods

This is a crossectional study, including all patients hospitalized in single center university hospital, endocrinology and rheumatology ward during 25.10.2017–30.12.2017, authors made a questionnaire that was used, it was translated into Russian. Data were processed using SPSS IBM v. 19.0 and Microsoft Excel 2019. Descriptive statistical analysis and Spearman's rank correlation was applied to evaluate the results.

Results

Demographic

There were 92 respondents, 37% (n=34) were male and 63% (n=58) were female. Mean age of the patients was 59 ± 17.5 (± SD) years. Sleep disorders were found in 63% of patients, from which 32.6% had chronic insomnia.

Measurements

From all the patients, which had insomnia 51% (n=31) used medications, 20% (n=6) were male and 80% (n=24) were female. The drugs received for insomnia treatment in 83.3% (n=25) were prescription, in 13.3% (n=4) it was non-prescription and in 3.3% (n=1) it was both. The most frequently used drugs was Alprazolam 10.9% (n=10), Zolpidem, Zopiclone and Diazepam was used in 3.3% (n=3) each. Although 6.5% (n=6) of patients did not recall the drugs used in insomnia treatment.

Data obtained about specialists, who prescribed the pharmacotherapy shows: in 57% (n=17) cases a general practitioner prescribed the therapy, in 17% (n=5) neurologist, in 10% (n=3) patient cannot recall, in 7% (n=2) cardiologist, in 3% (n=1) a psychiatrist, in 3% (n=1) rheumatologist and also in 3% (n=1) narcologist (Figure 1).

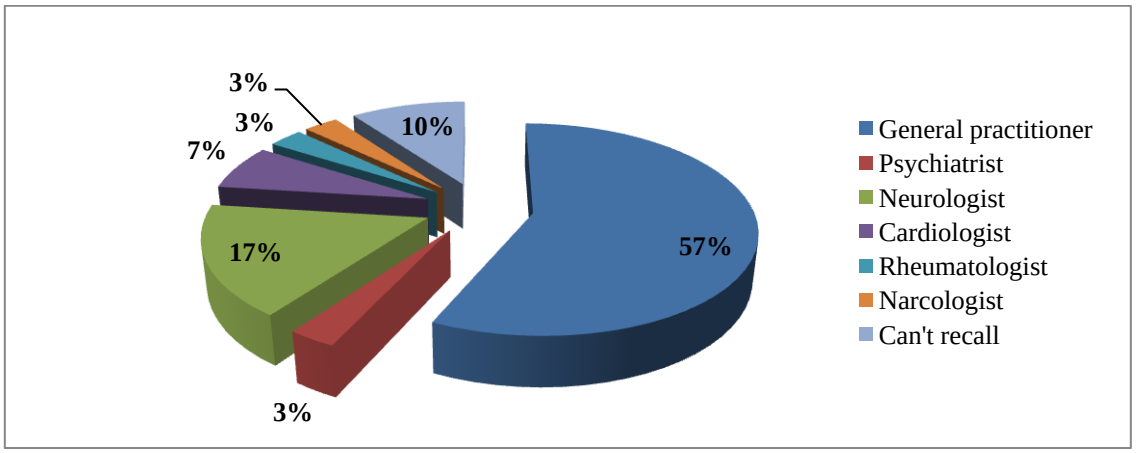

Figure 1. **A specialist, who prescribed the pharmacotherapy**

Drug prescription distribution among specialists show, that general practitioner prescribed the most drugs, the sum of prescriptions was 23 times. In second place was neurologist with a total of 7 prescriptions, than psychiatrist with 3 times and 3 times patient cannot recall the drug which was used for insomnia treatment, than 2 times cardiologist, than rheumatologist and narcologist with a total of 1 prescribed drug (Figure 2).

Nr.	Drug	General practitioner	Psychiatrist	Neurologist	Cardiologist	Rheumatologist	Narcologist	Can not recall
1.	**Zolpidem**	2			1			
2.	**Zopiclone**	3						
3.	**Temazepam**	1		1				
4.	**Clonazepam**	1						
5.	**Diazepam**	2		1				
6.	**Alprazolam**	6	1	1			1	1
7.	**Tanazepam**	1						
8.	**Lorazepam**		1					
9.	**Nozepam**	2						
10.	**Oxazepam**	1						
11.	**Bromazepam**	1		1				
12.	**Quetiapine**		1		1			
13.	**Melatonin**			1				
14.	**ValerianBriz**	1		1				
15.	**Can not recall**	2		1		1		2
	Sum	**23**	**3**	7	**2**	**1**	**1**	**3**

Figure 2. **The frequency of prescribed medications among specialists**

According to duration of use, the patients were divided into groups as follows: used 1 week; used 2 weeks; used continuously; used when needed/irregularly. From the respondents 3% (n=1) used the drug 1 week. 37% (n=11) used the drug continuously and 60% (n=18) used the drug when needed (Figure 3). None of the patients used the drug for a 2 weeks course.

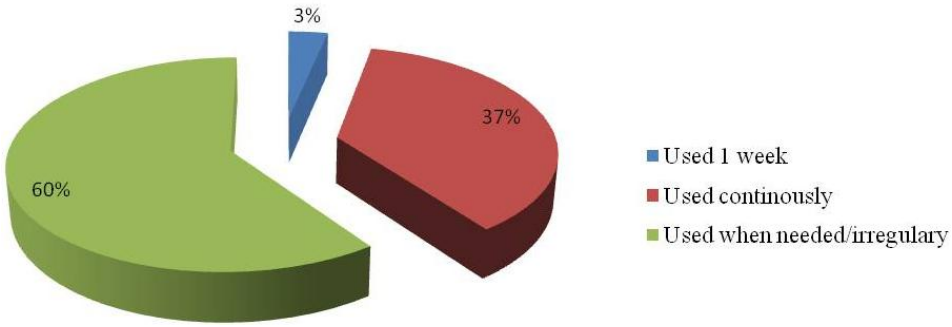

Figure 3. **Duration of pharmacotherapy use**

The data from reasons of pharmacotherapy discontinuation is in 16% (n=5) insomnia stopped, in 17% (n=5) there was a different reason not specified and in 67% (n=20) patients continued to use the pharmacotherapy (Figure 4).

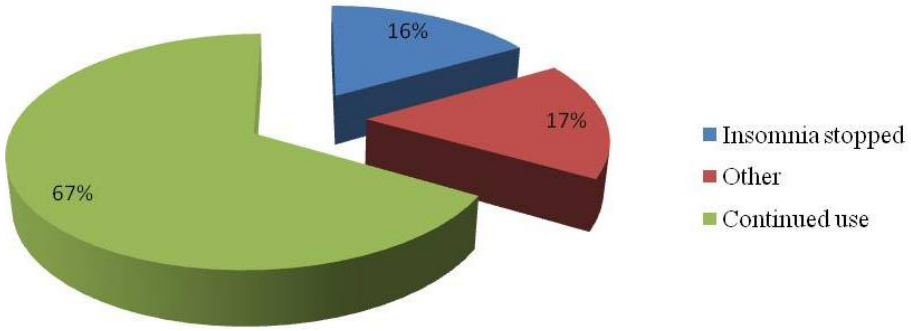

Figure 4. **Discontinuation of medication use**

Discussion

Some studies on the consumption of insomnia pharmacotherapy, benzodiazepines and benzodiazepine derivatives are available in Latvia, but others have not been conducted for pharmacotherapy and duration of chronic insomnia. Duration of use and prescribed medication in chronic insomnia therapy are essential due to the information available in literature that there is a risk of addiction and long-term efficacy has not been demonstrated.

From patients with insomnia, medication was used by more than half of the patients, in 51% of patients and 83.3% of them were prescription, 13.3% non-prescription, and 3.3% were both prescription and non-prescription. This leads to the conclusion that the most popular, however, remain prescription drugs. The most commonly used prescription drugs are Alprazolam 10.9%, followed by Zolpidem, Zopiclone and Diazepam with 3.3%. In the New Zealand in 2013/14 study, it was found that medications for insomnia, Zopiclone, is one of the most commonly used drugs, and it was found that only 50% of patients received the recommended treatment, i.e. 28 tablets, for up to 4 weeks (Best Practice Journal, 2018). The results of the study differ, as the more commonly

prescribed drug was alprazolam and only followed by benzodiazepine analogues specifically designed for the treatment of insomnia.

In 2014, a study was conducted in Latvia summarizing data on the spectrum of medicines prescribed for the treatment of insomnia in 3 pharmacies in Riga. The study did not look whether or not insomnia is chronic. From the data obtained from the study, it can be concluded that the data are similar: the most commonly general practitioner prescribed insomnia medication – 88%, followed by the cardiologist – 5%, further neurologist 4%. This study also shows that 89% of recipes were prescribed for women and 11% for men. The most popular drugs found in this study were zopiclone and alprazolam in women, while men had fenazepam and zopiclone (Bebre et al., 2014). In my study, it was found that family doctors prescribed drugs in 57% of cases, neurologists in 17% of cases, 7% followed by cardiologists, then 3% psychiatrist, rheumatologist and narcologist, while in 10% of cases the patient could not remember what a specialist has prescribed a medicine. 80% of recipes were prescribed for women in my study and 20% for men, which is a similar distribution. From this it can be concluded that women are more likely to turn to a doctor with complaints and receive treatment because, despite 31% of men having insomnia, only 20% received treatment. The results of this practical study on the most popular medicines are similar: alprazolam and then zopiclone, zolpidem and diazepam.

One of the aims of the work was to determine the duration of use of medicines. It was found that only 3% had taken the medication for 1 week, while 37% used it continuously and 60% had used the medication as needed / occasionally. Taking into account the recommendations of the guidelines and the results of the study that the most commonly used drugs are benzodiazepine derivatives and benzodiazepine analogues, patients should have followed a 3–4-week course of treatment in individual countries for a maximum of 6 weeks as these drugs are intended for short-term treatment of insomnia. Long-term use is associated with the development of tolerance and dependence, so they are not recommended for longer use (Unbehaun et al., 2010). The Latvian Sleep Disorder recommendations also contains information that the use of sleep aids should be temporary (up to 4 weeks) (Tērauds et al., 2012).

The study also collected information on whether medication was discontinued and the reason for discontinuation of medication. Where it turned out that 16% of insomnia had gone, 17% had another reason for discontinuing medication, while 67% did not stop taking medication. None of the patients had stopped taking the medication on the recommendation of the treating physician, which was one of the answers. So, most patients continue to use hypnotics, which could be a sign of tolerance, addiction, and ineffective therapy and supervision.

Conclusion

More than half (51%) of the patients used medications and in most cases they were prescription drugs (83.3%). Most of the medications were prescribed by general practitioner (57%). The most frequently used groups of medications were benzodiazepines and benzodiazepine analogues.

67% of patients did not discontinue the use of medications. Only 1 patient used the pharmacotherapy course for 1 week. The most benzodiazepines and benzodiazepine analogues were prescribed by general practitioner.

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THE IMPACT OF ADVERSE CHILDHOOD EXPERIENCES ON THE DEPRESSION AND ANXIETY AMONG MEDICAL STUDENTS FROM RIGA STRADINS UNIVERSITY

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Abstract

The impact of adverse childhood experiences on the depression and anxiety among medical students from Riga Stradins University

Key words: *Anxiety, Depression, Adverse childhood experiences*

Introduction. Medical students are at higher risk for anxiety and depression compared to general population. Research shows that approximately 35% of medical students are suffering from anxiety disorders, as opposed to 12% for general population. Almost 30% of those students suffer from depression or symptoms of depression. Strong correlations were observed between various adverse childhood experiences and later symptoms or diagnosis of depressive and anxiety disorders among medical faculty students.

Aim. To determine the prevalence of anxiety and depression amongst Riga Stradins University students and determine any association with adverse childhood experiences.

Materials and methods. In this cross-sectional study, Riga Stradins University (RSU) medical students from 1st till 6th year were asked to fill a questionnaire electronically on voluntary basis. Questionnaire consisted of demographic data, HADS (Hospital Anxiety and Depression Scale) and ACEs (Adverse Childhood Experiences) test. SPSS v. 22 for Windows was used to perform all statistical analysis.

Results. Altogether 159 RSU medical faculty students submitted their responses. Overall 83% were female, 17% were male students. The prevalence of anxiety disorders was approximately 45% (21% was subclinical, 23% were clinical manifestations). Around 36% of the respondents confirmed that they are suffering from depression (22% – subclinical, 14% clinical depression). Also, 14,5% marked at least 4 adverse childhood experiences. There was statistically significant association between anxiety and adverse childhood experiences score (p=0,023). For women there is a more notable correlation between physical violence in childhood and alert level (p<0,05). There was no statistically significant association between depression and adverse childhood experiences score; however, there were some trends between these results. For females a major correlation between an experienced violence in childhood and depression in adulthood was identified; however, for male respondents such correlation was not observed.

Conclusion. Results of this study showed that there is a high prevalence of anxiety and depression in Riga Stradins University Medical faculty students and there is significant correlation between anxiety and adverse childhood experiences.

Kopsavilkums

Negatīvas bērnības pieredzes ietekme uz depresiju un trauksmi starp Rīgas Stradiņa universitātes medicīnas studentiem

Atslēgvārdi: *Trauksme, depresija, negatīvas bēnības pieredzes*

Ievads. Medicīnas studenti pakļauti augstākam trauksmes un depresijas riskam salīdzinājumā ar vispārējo populāciju. Pētījumi rāda, ka līdz pat 35% medicīnas studentu ikdienā cieš no trauksmes traucējumiem, kamēr vispārējā populācijā tie ir apmēram 12%. Savukārt gandrīz 30% medicīnas student ikdienā cieš no depresijas vai tās simptomiem. Ir atrasta nozīmīga korelācija starp negatīvu bērnības pieredzi un indivīda risku attīstīties trauksmei vai depresijai dzīves laikā.

Mērķis. Noteikt trauksmes un depresijas sastopamību Rīgas Stradiņa universitātes (RSU) medicīnas studentu vidū kā arī to asociāciju ar negatīvām bērnības pieredzēm.

Materiāli un metodes. Šķērsgriezuma pētījums, kurā brīvprātīgi piedalījās pirmā līdz sestā kursa studenti, elektroniski aizpildot anketu. Anketā tika iekļauti vispārīgie jautājumi (vecums, dzimums), Hospitālā trauksmes un depresijas skala (HADS) un Negatīvas bērnības pieredzes tests (ACEs). Datu apstrāde ar SPSS 22 un MS Office.

Rezultāti. Kopumā pētījumā piedalījās 159 RSU Medicīnas fakultātes studenti. 83% no respondentiem bija sievietes, bet 17% – vīrieši. Trauksmes traucējumu prevalence studentu vidū bija apmēram 45% (21% – subklīniski, 23% – klīniski). Savukārt 36% no respondentiem apstiprinājās depresija vai tās simptomi (22% – subklīniski, 14% – klīniski). 14,5% respondentu atzīmēja 4 un vairāk negatīvas bērnības pieredzes. Apstiprinājās statistiski nozīmīga asociācija starp trauksmes līmeni šobrīd un negatīvu bērnības pieredzi (p=0.023). Sieviešu vidū bija izteiktāka korelācija starp piedzīvotu fizisku vardarbību bērnībā un trauksmes līmeni šobrīd (p<0.05). Netika atrasta statistiski nozīmīga asociācija starp negatīvu bērnības pieredzi un depresiju šobrīd, taču iezīmējās tendencies, kas noteica, jo vairāk negatīvas bērnības pieredzes indivīdam, jo augstāks risks attīstīties depresijai pieaugušā vecumā. Sieviešu vidū tika atrasta spēcīga

korelācija bērnībā piedzīvotai vardarbībai un depresijas attīstībai šobrīd; respondent vīriešu starpā šāda korelācija netika atrasta.
Secinājums. Pētījumā iegūtie rezultāti rāda, ka ir augsta trauksmes un depresijas prevalence Rīgas Stradiņa universitātes Medicīnas fakultātes studentu vidū, kā arī ir tika atrasta nozīmīga korelācija starp negatīvu bērnības pieredzi un trauksmes traucējumiem pieaugušā vecumā.

Introduction

Several studies have shown, that medical students are at higher risk of anxiety and depression compared to the general population. These rates of anxiety and depression are different across countries and regions, as well as comparing the year of studying (Rotenstein L. S. et al., 2016).

The main risk factors include the prolonged level of stress in the body due to the emotional and physical load, both in the academic environment and in the clinical training bases. Psychological distress among medical students varies from 21% to 50% (Yusoff M.S. et al., 2012).

Anxiety belongs to the neurotic spectrum disorder, which today is one of the most common mental disorders in the world. According to research data, about 30% of the population is affected by anxiety disorders during the lifetime of general population (Bandelow B. et al., 2015).

Recent studies show, that the prevalence of anxiety among medical students is around 33% to 37%, while the average for general population is 12% (Moutinho I. L. et al., 2017).

The meta analysis, which included 62 728 participants, concluded, that 28% of medical students had depression or depression symptoms. Average prevalence of depression in the population range from 6% to 10% (Puthran R. et al., 2016).

Adverse childhood experiences that an individual has encountered in childhood, can significantly increase the risk of mental illness and the use of various substances in adulthood. Adverse childhood experiences include traumatic events, like emotional, physical, sexual abuse, unhealthy family relationships, alcohol abuse, and psychiatric illnesses for any family member, which the child grew up with. It has been concluded, that medical students with four or more adverse childhood experience points, have a significantly higher risk of mental illness as well as excessive use of substances (Sciolla A. et al., 2019).

The aim of this study is to determine the prevalence of anxiety and depression amongst Riga Stradins University students and determine any association with adverse childhood experiences.

Material and Methods

In this cross-sectional study, Riga Stradins University medical students from 1st till 6th year were asked to fill a questionnaire electronically on voluntary basis. Questionnaire consisted of demographic data, HADS (Hospital Anxiety and Depression Scale) and ACEs (Adverse Childhood Experiences) test. SPSS v. 22 for Windows was used to perform all statistical analysis.

Results

159 medical students from 1st to sixth year participated in the reasearch (83% of the participants were women). The respondents were aged 19 to 32 with the average age of 22

(+2.8SD). Overall the questionnaire was filled in by all students from years 1 to 6th: 34% (n=54) first year students, 15.1% (n=24) second year students, 10.1% (n=16) third year students, 5% (n=8) fourth year students, 14.5% (n=23) fifth year students, and 21.3% (n=34) sixth year students. (Figure 1).

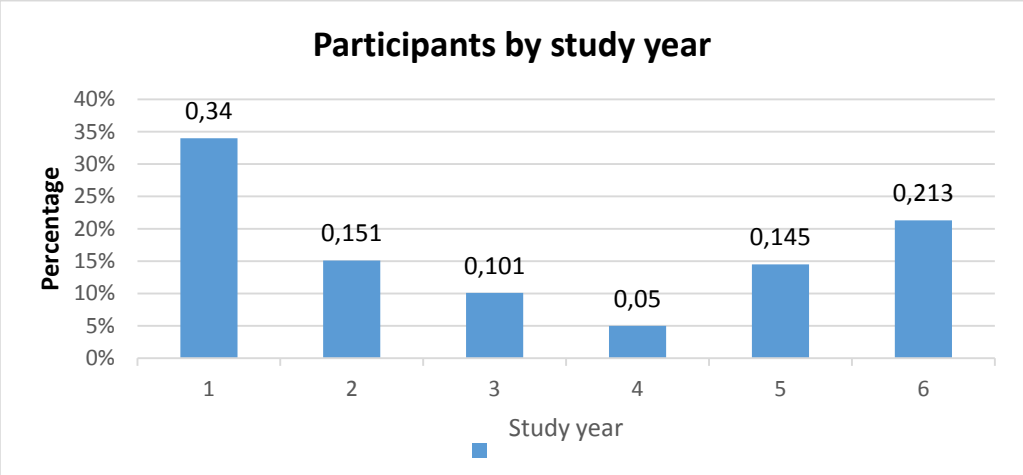

Figure 1. **Participants by study year**

14,5% marked at least 4 adverse childhood experiences (Figure 2).

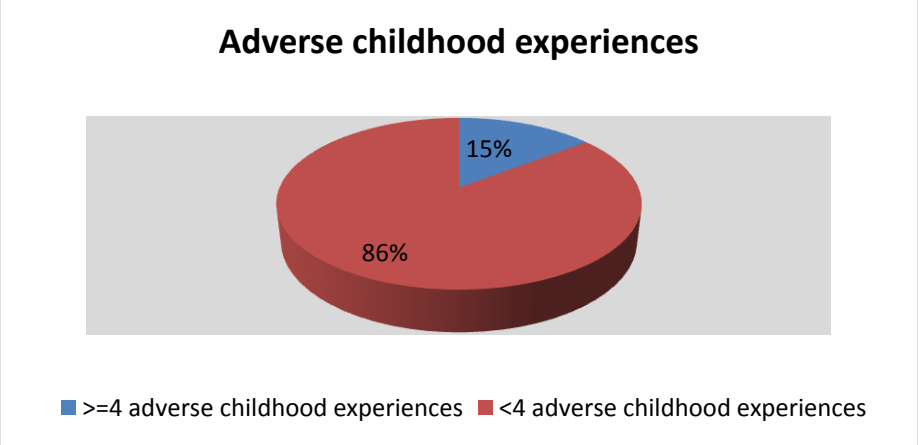

Figure 2. **Adverse childhood experiences**

The prevalence of anxiety and its symptoms among RSU students was 44.7% (n=71). 21.4% (n = 34) of the cases were subclinical but 23.3% (n=37) were clinical (Figure 3).

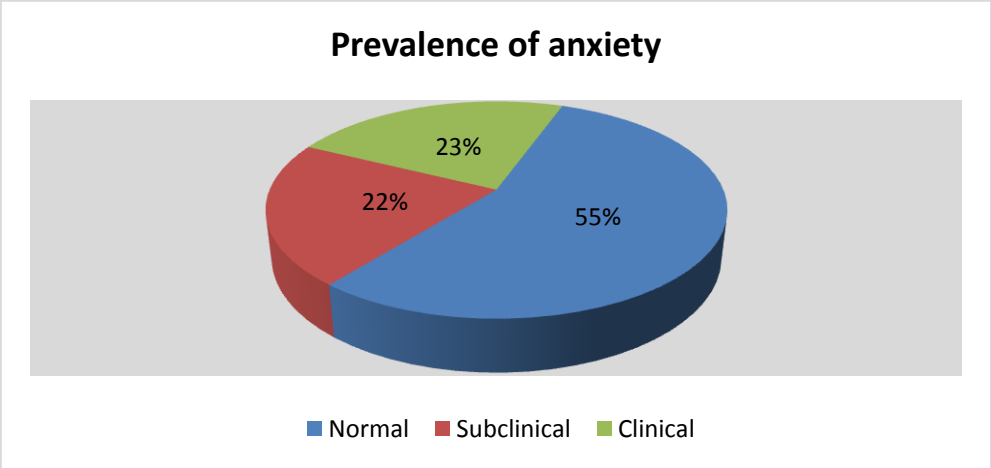

Figure 3. **Prevalence of anxiety**

The prevalence of depression and its symptoms among RSU students was 35.8% (n=57). Subclinical of which were 22.0% (n=35) and 13.8% (n=22) were clinical (Figure 4).

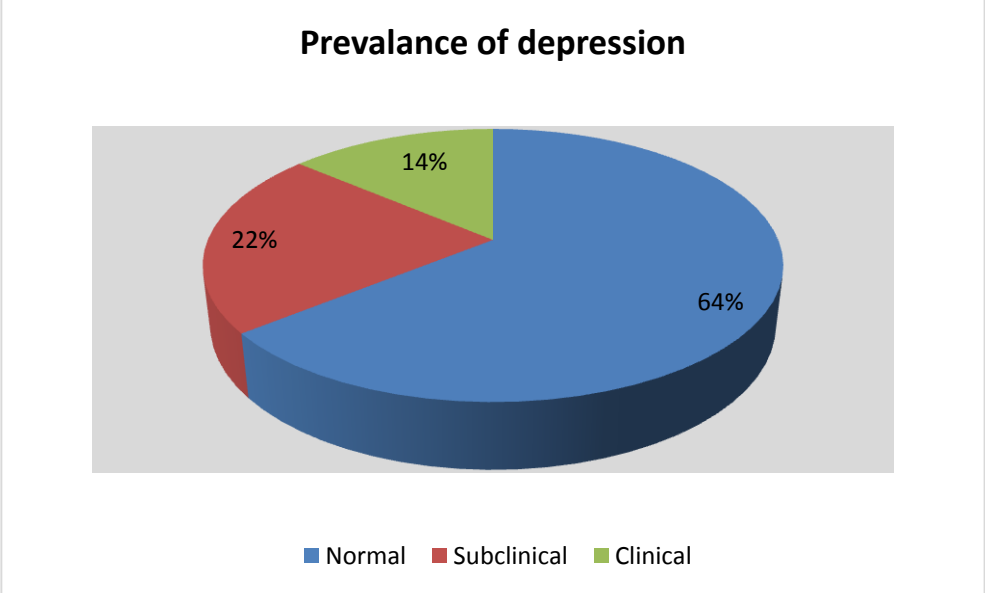

Figure 4. **Prevalance of depression**

There is a statistically significant association between anxiety level and a negative childhood experience. It determines that more negative childhood experience for the students has lead to a higher alert level in adulthood (X2=7.569; p=0.023) (Figure 5).

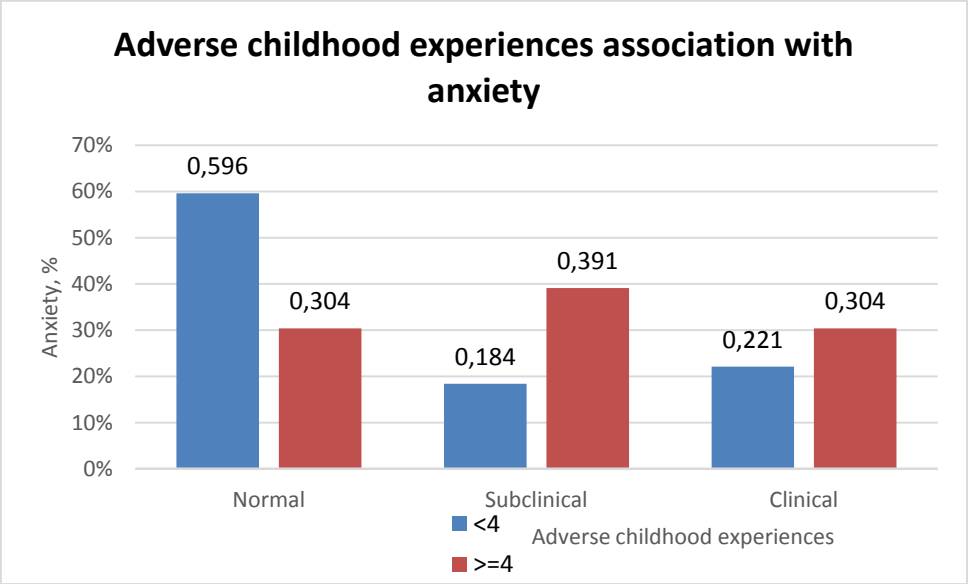

Figure 5. **Adverse childhood experiences association with anxiety**

There are tendencies between depression or its symptoms now and the negative childhood experience of the respondent, but there is no statistically reliable association between these parameters (X2=4.997; p=0.08) (Figure 6).

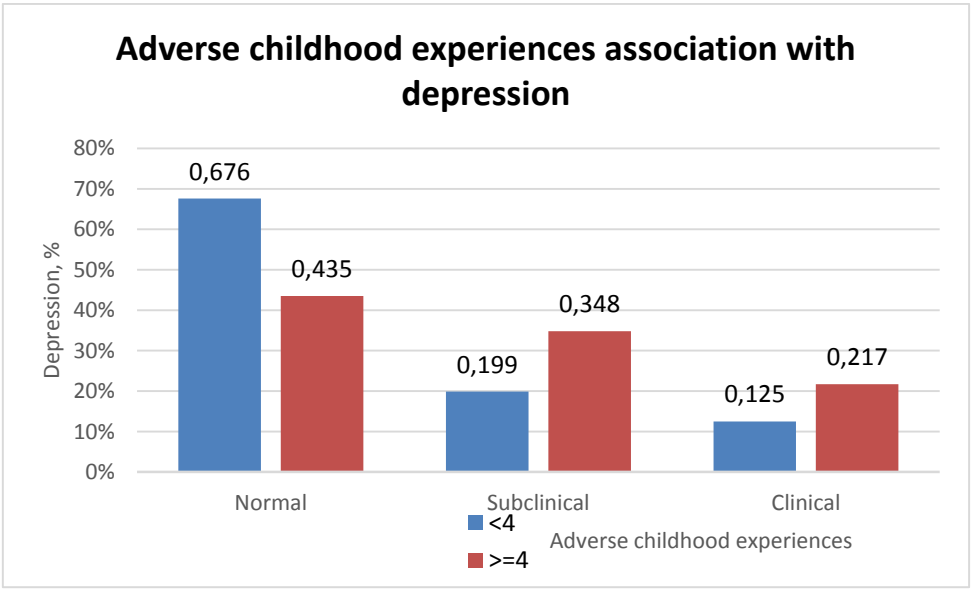

Figure 6. **Adverse childhood experiences association with depression**

Discussion

The prevalence of anxiety disorder among RSU medical students is about 44%. That is significantly higher than it is for general population, which is 12%. In contrast, studies in several other countries conclude, that medical students anxiety levels are significantly higher than they are in the general population. Among medical students, these rates range from an average of 33% to

37%. It follows that the anxiety level of RSU medical students is slightly higher than the average in other parts of the world (Moutinho I. L. et al., 2017).

This could be explained by the fact, that the questionnaire was sent out at a time when students are expecting colloquiums and exams, as well as defending their scientific and diploma papers. These rates likely would be lower if there were more male respondents, as anxiety disorders are more common among women.

The prevalence of depression or its symptoms among RSU medical students was about 35%, which is slightly higher than the prevalence of depression among medical students described in the studies, with rates ranging around 28% (Puthran R. et al., 2016). This could be related to a higher number of women among respondents, given that women had more common symptoms of depression than men.

In 2019, a California study showed that 12% noted 4 and more adverse childhood experiences. The same study found that the risk of mental illness increases significantly for students with 4 and more points in the test (Sciolla A. F. et al., 2019). In a RSU study, 14.5% of respondents noted 4 and more adverse childhood experiences, which is slightly more than the California study.

This suggests, that there is a higher risk of child abuse among RSU students compared to students at the University of California.

So the correlation between anxiety and depression with adverse childhood experience for RSU students should confirm. Study found a statistically significant correlation for anxiety with adverse childhood experience, but the correlation between depression did not reach a statistically reliable result.

Conclusions

Riga Stradins University medical students have a high prevalence of anxiety and depression disorders. A statistically significant correlation and association between anxiety and negative childhood experience was obtained. No statistically significant correlation was found between depression and the student's negative childhood experience.

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THE PREVALENCE OF INSOMNIA AND USED MEDICATION FOR TREATING ENDOCRINOLOGY AND RHEUMATOLOGY PATIENTS IN LATVIA

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Abstract

The prevalence of insomnia and used medication for treating endocrinology and rheumatology patients in Latvia

Key words: *insomnia, prevalence of insomnia, benzodiazepines, benzodiazepine analogues, pharmacotherapy, treatment of insomnia*

Introduction. The prevalence of insomnia in industrialized society is approximately 20%. Chronic insomnia has been reported by 10% of population. Long-lasting sleep deprivation is associated with development of other mental and physical problems, as well as lowering health-related quality of life.

Aim. To determine the prevalence of insomnia and the most commonly used medication for the treatment of insomnia in endocrinology and rheumatology patients in Latvia.

Materials and methods. In overall 92 endocrinology and rheumatology patients were interviewed at the Pauls Stradins Clinical University Hospital. All patients who agreed to participate in the study by completing a questionnaire were included in the cross-sectional study that took place between 25.10.2017 and 30.12.2017. All data from 92 questionnaires were analyzed in the study. The presence, duration of insomnia and medication used in the treatment of insomnia were analyzed in each patient.

Results. Of all patients enrolled in the study, insomnia was reported by 63% (n = 58) of whom 69% (n = 40) were women and 31% (n = 18) were men. Acute insomnia has been reported by 30.4% (n = 28) of patients, of whom 55.6% (n = 10) were men and 45% (n = 18) were women. Chronic insomnia has been reported by 32.6% (n = 30), of whom 44.4% (n = 8) were men and 55% (n = 22) were women. Pharmacological treatment of insomnia was used by 51.7% (n = 30) of patients of whom 80% (n = 24) were women, and 20% (n = 6) men. Most of the medication were prescription drugs (83.3%). The most commonly used group of drugs was benzodiazepines – 58% (n = 24), followed by benzodiazepine analogues – 15% (n = 6). The most commonly used medicine was alprazolam 10.90% (n = 10).

Conclusion. More than half of the patients (63%) had insomnia. Chronic insomnia was reported by 33% of patients. Most commonly, prescription drugs were used to treat insomnia. The most often used drugs are benzodiazepines and benzodiazepine analogues. The most commonly prescribed medication for insomnia was alprazolam.

Kopsavilkums

Bezmiega prevalence un lietotie medikamenti bezmiega terapijā endokrinoloģijas un reimatoloģijas pacientiem Latvijā

Atslēgvārdi: *bezmiegs, bezmiega prevalence, benzodiazepīni, benzodiazepīnu analogi, farmakoterapija, bezmiega ārstēšana*

Ievads. Bezmiega prevalence industrializētā sabiedrībā ir aptuveni 20%. Hronisks bezmiegs sastopams 10% populācijas. Ilgstošs miega trūkums ir saistīts ar citu psihisku un fizisku veselības problēmu attīstību, kā arī pazemina ar veselību saistīto dzīves kvalitātes līmeni.

Mērķis. Noskaidrot bezmiega prevalenci un biežāk lietotos medikamentus bezmiega ārstēšanā endokrinoloģijas un reimatoloģijas pacientiem Latvijā.

Materiāli un metodes. Kopumā tika aptaujāti 92 endokrinoloģijas un reimatoloģijas nodaļas pacienti Paula Stradiņa Klīniskās universitātes slimnīcā. Šķērsgriezuma pētījumā tika iekļauti visi nodaļas pacienti laika posmā no 25.10.2017. līdz 30.12.2017., kuri piekrita piedalīties, aizpildot pētījuma anketu. Darbā tika analizēti iegūtie dati no visām 92 anketām. Katram pacientam tika analizēta bezmiega esamība, ilgums un pielietotā medikamentozā terapija.

Rezultāti. No visiem pētījumā iekļautajiem pacientiem bezmiegu atzīmēja 63% (n=58), no kuriem 69% (n=40) bija sievietes un 31% (n=18) vīrieši. Akūts bezmiegs bija 30.4% (n=28) pacientiem, no kuriem 55,6% (n=10) bija vīrieši un 45% (n=18) sievietes. Hronisks bezmiegs bija 32.6% (n=30) pacientu, no kuriem 44.4% (n=8) bija vīrieši un 55% (n=22) sievietes. Medikamentus bezmiega ārstēšanai lietoja 51.7% (n=30) pacienti, no kuriem sievietes bija 80% (n=24), vīrieši 20% (n=6). No lietotajiem medikamentiem 83.3% bija recepšu medikamenti. Visbiežāk lietotā medikamentu grupa bija benzodiazepīni – 58% (n=24), pēc tam sekoja benzodiazepīnu analogy – 15% (n=6). Visbiežāk lietotais medikaments bija alprazolāms 10.90% (n=10).

Secinājumi. Bezmiega traucējumi bija vairāk nekā pusei pacientu (63%). Hronisks bezmiegs bija 33% pacientu. Visbiežāk bezmiega ārstēšanā tika lietoti recepšu medikamenti. Visbiežāk lietotās medikamentu grupas – benzodiazepīni un benzodiazepīnu analogi. Visbiežāk nozīmētais medikaments bezmiega ārstēšanā bija alprazolāms.

Introduction

Sleep is a physiologically rejuvenating process that maintains homeostasis of multiple body functions, including mental, neural, immunological, cardiometabolic, neurocognitive systems (Buysse 2013) (Kok et al. 2006).

Insomnia is defined as the deterioration of daily performance at emotional, social and professional levels. This is due to difficulty of falling asleep and maintaining depth of sleep, premature waking in the morning, and impaired ability to fall asleep again despite adequate sleep conditions. In industrialized society its prevalence is about 20%. Chronic insomnia occurs in 10% of the population (Buysse 2013) (Kok et al. 2006).

Immediate effects of insomnia include fatigue, drowsiness and irritability as well as worsening of memory and reaction. In contrast, chronic lack of sleep is associated with the development of other mental and physical health problems. It is also associated with lowering the level of health-related quality of life (HRQoL) (Katz et al., 2002) (Sivertsen et al., 2014).

In addition, chronic insomnia that requires the use of sleep medication is linked to a 70% higher risk of future autoimmune disease development (Kok et al. 2006). This is a significant risk factor for the development of rheumatologic diseases (including fibromyalgia, rheumatoid arthritis), headache, asthma, myocardial infarction and trauma (Sivertsen et al., 2014).

Chronic sleep disorders are also associated with an increased risk of developing diabetes (RR = 1.30, 95% CI = 1.01-1.68) and prediabetes (RR = 1.31, 95% CI = 1.00-1.72) (Kowall et al. 2016).

Moreover, the psychological conditions associated with diabetes, such as hyperglycaemia, diabetic neuropathy, sleep apnoea and depression, can cause sleep disturbance in diabetic patients (Shoji et al. 2009).

Cognitive behavioural therapy (CBT) is proposed by European guideline for the diagnosis and treatment of insomnia as the first line treatment of chronic sleeplessness. Pharmacotherapy is used in cases where CBT is not effective or available (Riemann et al. 2017).

Benzodiazepines, benzodiazepine receptor agonists and antidepressants are effective in short-term therapy (less than four weeks). Antihistamines, antipsychotics, melatonin and phytotherapy are not recommended for the treatment of insomnia (Riemann et al., 2017).

If the pharmacotherapy (specifically with benzodiazepines or benzodiazepine analogues) is suddenly stopped after prolonged use, the patient may experience a ‘withdrawal’ syndrome characterized by general weakness, altered perception, increased anxiety and insomnia. In addition, sleeping pills may exacerbate or cause de novo depression (Lader et al. 1994).

The treatment of insomnia should be individualized for each patient, assessing the potential benefit-loss ratio.

Our scope of interest is to determine the prevalence of insomnia and the most commonly used medication for the treatment of insomnia in endocrinology and rheumatology patients in Latvia.

Materials and Methods

It was a cross-sectional study held in Pauls Stradins Clinical University Hospital between October 25th, 2017 and December 30th, 2017. All of the Endocrinology and Rheumatology department patients who agreed to participate by completing a questionnaire made by authors of this article were included in the study. The presence, duration of insomnia and medication used in the treatment of insomnia were analyzed in each patient.

Data were processed using SPSS IBM v. 19.0 and Microsoft Excel 2019. P-value of 0.05 was considered statistically significant. For the analysis of the results, the Mann-Whitney and Pearson Chi square tests were used.

Results

Demographic

A total of 92 patient questionnaires were obtained of which 37% (n = 34) were man and 63% (n = 58) women. The average age of respondents was 59 ± 17.5 years.

Measurements

Of all patients enrolled in the study, insomnia was reported by 63% (n = 58) of whom 69% (n = 40) were women and 31% (n = 18) were men. There was no statistically significant difference between men and women in prevalence of insomnia, although there was a tendency for women to suffer from insomnia more often (p=0.124).

Acute insomnia has been reported by 30.4% (n = 28) of patients, of whom 55.6% (n = 10) were men and 45% (n = 18) were women. Chronic insomnia has been reported by 32.6% (n = 30), of whom 44.4% (n = 8) were men and 55% (n = 22) were women (Figure 1). However, there was no statistically significant difference in the duration of insomnia depending on gender (p = 0.457) (Figure 2).

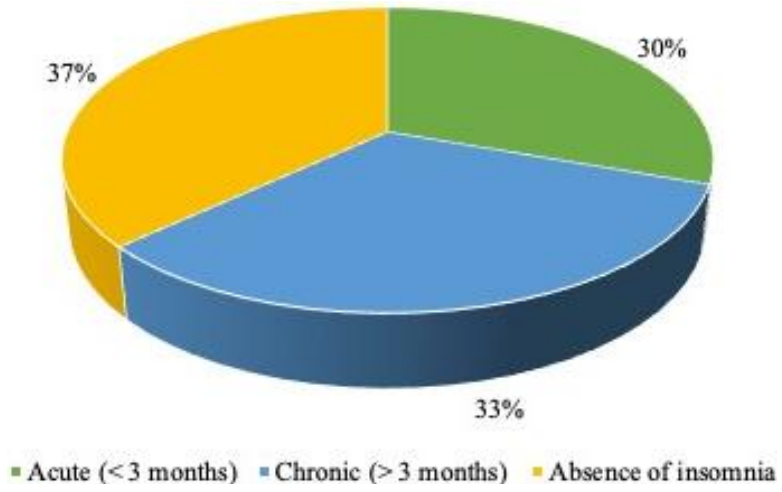

Figure 1. **Prevalence of insomnia**

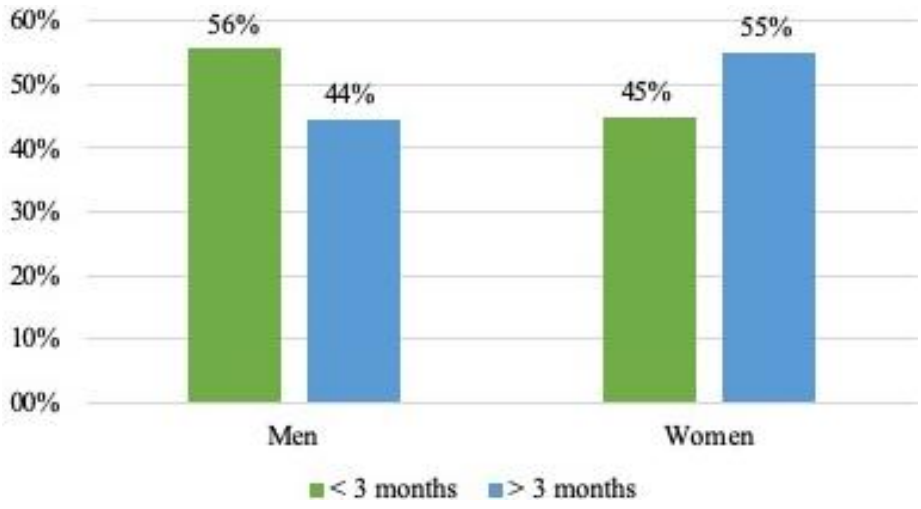

Figure 2. **Duration of insomnia between genders**

Pharmacological treatment of insomnia was used by 51.7% (n = 30) of patients of whom 80% (n = 24) were women, and 20% (n = 6) were men. Most of the medication were prescription drugs (83.3%). Only 14% of used medication was non-prescription drugs (Figure 3).

There was no statistically significant difference between men and women, although there was a tendency for women to use medication more often (p=0.06).

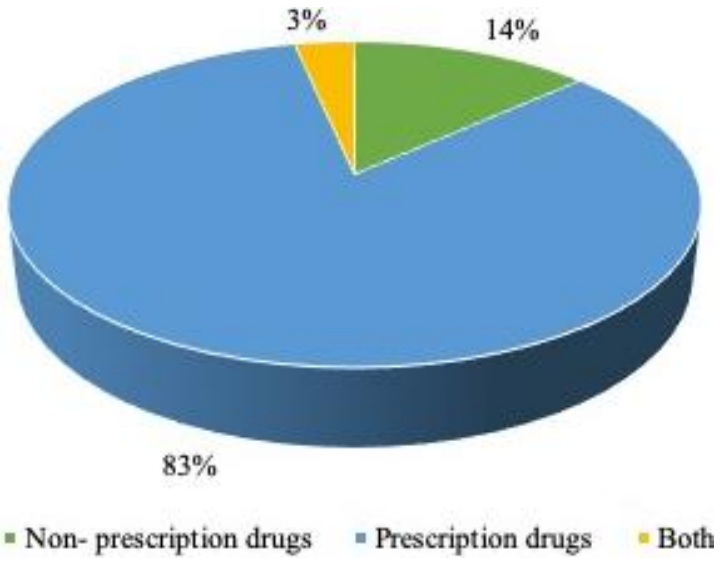

Figure 3. **Medication type used in the treatment of insomnia**

The most commonly used group of drugs was benzodiazepines – 58% (n = 24), followed by benzodiazepine analogues – 15% (n = 6). Only 12% of used medication was non-prescription drugs (Melatonin, *Valeriana Briz)* and antipsychotics (Quetiapine) (Figure 4).

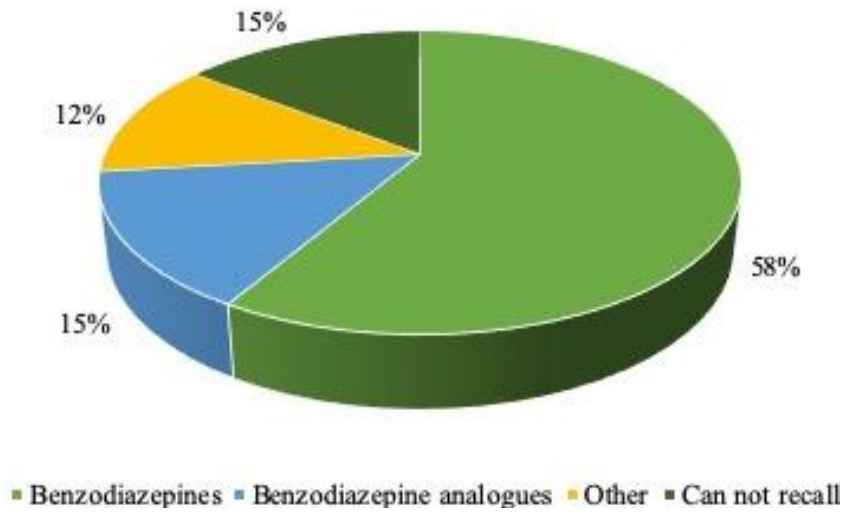

Figure 4. **Medication groups used in the treatment of insomnia**

The most commonly used medicine was alprazolam 10.90% (n = 10), followed by Zopiclone 3.30% (n=3), Zolpidem 3.30% (n=3) and Diazepam 3.30% (n=3) (Figure 5).

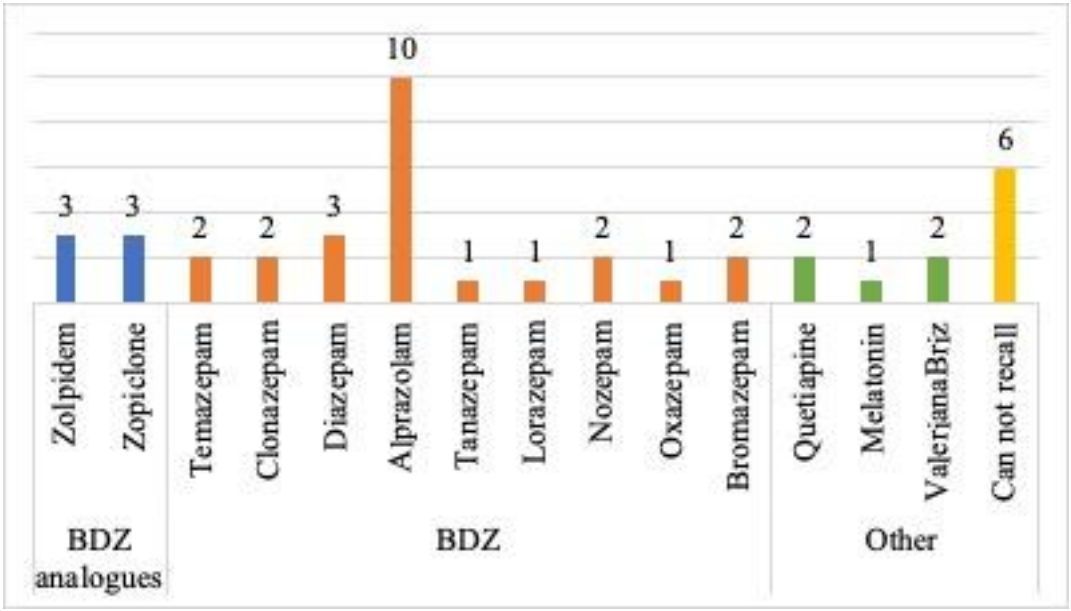

Figure 5. **Medication used in the treatment of insomnia**

Discussion

According to literature data, the prevalence of insomnia in the industrialized society is about 20%, chronic insomnia – 10% of the population (Buysse2013) (Kok et al. 2006). Based on the data from the study, the prevalence of insomnia in endocrinology and rheumatology patients is much higher – 63%. Furthermore, 33% of patients have chronic insomnia which is three times more often than in general population. From all the patients who reported insomnia, only 51.7% received treatment.

According to the State Agency of Medicines 2013–2017 annual data, there is an increase in consumption of benzodiazepine derivatives and benzodiazepine-like drugs (State Agency of Medicines, 2018). According to the findings of the study, most often used treatment for insomnia is prescription drugs, most commonly benzodiazepines. Alprazolam was the most prescribed drug.

The study demonstrated that benzodiazepine analogues with a selective spectrum of activity (thus also – less side effects) are much less popular in Latvia. This may be due to the availability of the drug to the patient, the cost, and the underlying diseases in which case the patient could benefit from the broader spectrum of benzodiazepine activity.

Further studies with a larger study population are required, as well as stricter criteria for patient selection. Patients should be grouped according to the type, duration and severity of their co-morbidities. Secondary causes of insomnia should be excluded, and a control group with healthy patients should be required.

It would be important to obtain data about the doses of benzodiazepines and benzodiazepine analogues that are prescribed to a patient, as these drugs are known to be able to cause a "withdrawal" syndrome characterized by general weakness, altered perception, increased anxiety and insomnia, as well as the principles by which doctors choose individualized pharmacotherapy for each patient.

Conclusion

More than a half of the endocrinology and rheumatology ward patients had insomnia. Chronic insomnia was reported by 33% of patients. There was no statistically significant difference between men and women in the prevalence of insomnia, although there was a tendency for women to suffer more often from insomnia.

Pharmacotherapy was used by 52% of patients with insomnia. There was no statistically significant difference between men and women, although there was a tendency for women to use medication more often. The most common type of medication used in the treatment of insomnia was prescription drugs. The most often used drugs were benzodiazepines. The most commonly prescribed medication for insomnia was alprazolam.

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COLORECTAL CANCER PATIENTS' VIEWS ON HOW TO IMPROVE THE COLORECTAL SCREENING TEST RESPONSIVENESS, QUALITATIVE RESEARCH

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Abstract

Colorectal cancer patients' views on how to improve the colorectal screening test responsiveness, qualitative research

Colorectal cancer is the third most common oncology in Latvia and the second most common in EU. *Faecal occult blood (FOB) test* as a screening program takes place in Latvia since 2009. However, during the last 10 years patients' compliance is dramatically low – it was only 16.0% in 2018. The main reason for that was an absence of information about the development features of colorectal oncology, lack of information about the FOB test availability, family doctors involvement and personal complex. The interviewees offered options on how to improve this situation – screening program should become a compulsory test for everyone, informational booklets should be available at family doctors practise, information about the colorectal oncology and invitation to the FOB screening test should be sent by post. Study results of this *qualitative research* imply that awareness on colorectal cancer screening programme is low among colorectal cancer patients before diagnosis and rises after.

Introduction

Colorectal cancer takes the second place in occurrence and mortality in Europe and the third place in Latvia (Ferlay et al., 2018; The Centre for Disease Prevention and Control of Latvia, 2019). There were 500,000 colorectal cancer cases registered and 243,000 cases caused death in 2018 in Europe (Ferlay et al., 2018). The five – year survival rate for colorectal cancer diagnosed at an early stage is 90% compared with 5% for the late stage disease (Adler et al., 2014). An important feature of development of colorectal oncology is a possible asymptomatic period up to the late stages (Tolmanis et al., 2012; Bresalier, 2016). As the result, colorectal cancer is often detected at the late stage that affects the type and duration of treatment, treatment cost and patient survival rates in the future (Šantare, 2016; Laws of Republic of Latvia, 2017). However, colorectal cancer can cause bleeding in the intestinal wall being at an early stage of development, resulting in blood that gets into the faeces (Smirnova et al., 2017). Therefore, colorectal cancer screening programme using faecal occult blood (FOB) test is used to detect this type of oncology at an early stage (Vermeer et al., 2017; Altobelli et al., 2014). Percentage of people who participated in a screening test is dramatically low in Latvia. There were only 16% of participants in 2018 that is the highest result since the time of initiation of screening program (The National Health Service of the Republic of Latvia, 2019). However, 45% is a minimal response rate that is recommended by European guidelines (Leja et al., 2012). Therefore, the objective of this research work is to identify the main

problems and possible solutions of low FOB screening test compliance offered by colorectal cancer patients.

Methods and materials

A qualitative study was conducted in the Department of Surgical Coloproctolgy at Riga East University Hospital. Ten colorectal cancer patients 50 to 74 years old of various education levels were included in research. All patients have a diagnosis of colorectal cancer and recent experience of colorectal oncology excision surgery. The study was approved by Riga Stradins University Ethics Committee and Riga East University Hospital Scientific Department. Informed written consent was obtained from participants. All data were anonymous and participants' identity kept confidential. Patients were interviewed regarding their participation in FOB screening test and a possible solution of low screening test compliance by their opinion. Semi – structured interviews were audio recorded and transcribed for further thematic analysis.

Results

All invited individuals agreed to complete interviews. Only one out of ten interviewees participated in the screening program, but it happened three years ago and the person did three screening tests in total, being 67 years old.

There are four problems that cause people not to participate in the screening program: lack of information about colorectal cancer, lack of information about the screening test, family doctors' involvement and personal complex (Table 1).

Table 1. **Quotes of respondents that define the reasons for not participation in the colorectal cancer screening programme**

Theme	Subtheme	Supporting quotes
Reasons for not participation	Lack of information about colorectal cancer	**Int. 1:** *"I had a sharp pain in my stomach. I thought it will pass, but it didn't. I even stopped eating, so the situation went till the moment I've fainted. Only then I went to the family doctor.";* **Int. 4:** *"I thought that my stomach hurts, I never thought of a rectum, the symptoms were also like in case of a stomach pain."; "I was eating packs of fleaworts* (Plantain-medicinal plant), *because someone said that if you have a stomach pain, you have to drink the fleaworts… but there was another thing there, and if I get to know about it in time, I wouldn't have such a problem.";* **Int. 8:** *"No, I didn't know about such an oncology before. My brother had but a prostate cancer. But I didn't hear anything about the large intestine.";*
	Lack of information about FOB screening test	**Int. 7:** *"No, there were jars* (with faecal sample) *that had to be brought to the laboratory.";* **Int. 8:** *"No, I didn't do that. Yes,* (family doctor) *gave like an ampoules in the lab.* (faecal analysis in ampoules was done) *But I did not do the screening test.";* **Int. 9:** *"No, I've never made such a screening. Is such a test required? But I didn't know before, nobody told me."*
	Family doctors' involvement	**Int. 5:** *"I didn't perform colorectal screening. The family doctor also gave nothing. Not once in my life did I do such a screening.";* **Int. 9:** *"And the doctor will start to worry if the patient comes and asks to give the test – then he* (family doctor) *will give. The information should be comprehensive and also come from the doctor.";*

Theme	Subtheme	Supporting quotes
		Int. 10: *"Turns out that a screening is very important. Yes, I would definitely participate if a family doctor could give it to me."*
	Personal complex	**Int. 6:** *"The last time I was there, he* (family doctor) *told me to give faecal analysis to the lab, but I thought – the faeces, what's that, don't want to handle. I had a complex – to go with that jar and faeces, so I didn't do that. I just didn't go. As it turned out – it's a pity."*

Lack of information about colorectal cancer. Lack of information about the colorectal cancer is a fundamental problem that initiates people not to participate in the colorectal cancer screening test. Interviewees thought about absolutely different disease. For example, non-acquaintance of the symptoms, such as pain, did not result in patients quicker turning to a family doctor for further investigation.

Lack of information about FOB screening test. Nine respondents never participated in a colorectal cancer screening program. Two patients participated in the ampoule test to detect FOB in the faeces, but this was a laboratory analysis following a referral from a family doctor.

Family doctors involvement. Another fact that was mentioned as a problem is that the colorectal cancer screening program is directly dependent on the family doctor. Majority of respondents said that never received an information or the screening test from a family doctor.

Personal complex. Only one patient said that he had a personal complex that caused him not to participate in the screening program. In this case, the person had to take a faecal sample in ampules to laboratory but didn't use a screening test.

Each respondent suggested improvements that should be made to increase responsiveness of an aim group to the colorectal cancer program (*Table 2*).

Table 2. **Quotes of respondents that offer solution of low compliance problem**

Theme	Subtheme	Supporting quotes
Solution of the problem	Strict regulation	**Int. 2:** *"If this* (screening test) *could happen in a forced situation* (regulated by law – didn't do the test, could not return to work) *then people would think and would do the screening";* **Int. 6:** *"I will definitely say that there is a need to go and to do such a test, but there are younger people who think that it will never happen to me, or I will get through. That is why I also think that this should be regulated by law";*
	Information availability for society	**Int. 7:** *"No, perhaps information on these stops* (transport stops) *won't be useful. Maybe there could be some booklet* (with information) *at the families' doctor while sitting and waiting* (patients could read while waiting for appointment)*";*
	Information mailing by post	**Int. 7:** *"Or even if it could be sent by post like breast checklist, I would have read and thought about it, more people could go and investigate.";* **Int. 9:** *"It could be excellent if it* (information, invitation) *could be sent by post. It should be a national program, it won't be that expensive.";*

Strict regulation. Two participants (both male) said that if the rules for screening program will not be changed in the law, nothing will change in the attitude of society and nothing will improve the compliance. Information that, for example, is available on the transport stops is not

important as person usually thinks that a colorectal cancers' problem will never affect him. In their view the best method is that you will not be allowed to return to work if the screening test is not completed.

Information availability for society. Another respondents' idea is to introduce information booklets in family doctor practice so that patients can read while they are waiting in line.

Information mailing by post. Another patients point of view is to send information about colorectal cancer and an invitation to get the screening test at families doctor practice by post.

Discussion

All of the respondents have different but exclusively positive thoughts about FOB screening test. Nowadays the main problem in Latvian medical field is that people are not informed about the risk factors, development and symptoms of colorectal cancer, as well as about the screening test availability at family doctors' practice. Lack of information and low awareness are the factors that inhibit colorectal cancer screening program responsiveness. The same factor is mentioned as a colorectal cancer screening barrier in large systematic review study. It was proved that there is strong relationship between knowledge and number of FOB screening test participants. That means that responsiveness to the colorectal screening test increases when people have more information about colorectal cancer (Honein-AbouHaidar et al., 2016). At the moment, colorectal cancer is more often diagnosed being at a late stage of development that in turn affects the type of treatment needed and survival rate after the start of the therapy, as well as increases duration and cost of the treatment. Therefore prophylactic check up, for example FOB screening test, is very important, taking into consideration significant decrease in mortality rates after diagnosis of colorectal cancer at an early stage of development (Navarro, 2017).

Family doctor has a key role in colorectal cancer screening program. Doctor has an exclusive position in the screening test realisation because patients do not have other trustful information sources about the colorectal cancer and screening test availability. Therefore at the moment family doctor is the only doctor who could initiate and motivate the patient to fulfil the colorectal screening test. Respectfully, trustful information and motivation to participate in the colorectal screening program should come from the family doctor. This way makes it possible also to solve persons' personal complex problem, for example by explaining new information and giving answers to questions that a patient could have. However, lack of family doctors' involvement is described as a screening test barrier in over half out of thirty-one European countries. It was investigated that primary care physicians are not sharing information or promoting colorectal screening test (Priaulx et al., 2018). Unfortunately, patients have noted that their family doctor is very busy and there is lack of the time for a doctor to think about every patient. This fact suggests that communication between the family doctor and the patient cannot be effective enough due to the lack of time for a

doctor to deepen into the patients' health problems. Despite the fact that family doctors are financially motivated to complete the screening test coverage in their practice in Latvia. As the result, invitation to participate in colorectal screening still does not have sufficient coverage in Latvia that corresponds with information published in colorectal cancer screening systematic review (Helsingen at al., 2019). Therefore respondents suggested sending such important information to every person from an aim group by post, as it is done for example with invitations to breast and cervical cancer screening tests. On one hand, it is a good opportunity to inform people about colorectal cancer and screening test availability in cases when family doctor due to different factors is unable to perform colorectal cancer early diagnosis and prevention functions. However, on the other hand, increase in colorectal screening test responsiveness, as the result of FOB screening test sending to individuals by post, cannot be 100% guaranteed. Even if patients agreed to participate in colorectal screening test by phone and received FOB screening test by post, more than a half of the patients did not complete the test[1] (Ivanova, 2016). Therefore, informational booklets, or posters present at family doctors' practice could give important information that could result in the higher compliance in the future. This fact is also proved in scientific publications, as it is said, that educational booklets and invitation letters improve screening participation (Honein-AbouHaidar et al., 2016).

The strong feature of this study is that only patients who already have diagnosis of colorectal cancer and recently experienced an excision surgery were included in this research. This type of research was never performed in Latvia before, as in majority of cases are targeted people of family doctors practice, who in theory are healthy individuals. In this specific study were analysed opinions of people who have treatment experience, thoughts about the illness and importance of the screening program as a preventive method. Therefore, it would be valuable to make short commercial movies to be shown on TV during commercial break where patients with colorectal cancer could inform other people about colorectal cancer and possible prevention of this oncologic disease. Subsequently, responsiveness and participation in the colorectal screening program might increase, as information from this type of patients is more trustful and motivating for other people.

Conclusions

Results of this study imply that lack of information and low awareness about colorectal cancer and screening test availability are the main problems that cause people not to participate in the screening program. The interviewed colorectal patients believe that the best way on how to improve present problematic situation of low colorectal screening test responsiveness is to inform

[1] Information based on the results from one family doctors' practice. 69% (n=11) out of the 16 patients did not participated in FOB test after being informed about colorectal cancer by phone, receiving screening test by post or collecting it from the family doctors' practice.

people by sending informative letters personally to an aim group person, as well as to use information posters and booklets at family doctors' practice.

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MOST COMMON CARDIOVASCULAR DISEASES AS MIGRAINE COMORBIDITIES

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Abstract

Most common cardiovascular diseases as migraine comorbidities

Key words: *migraine, aura, cardiovascular, comorbidities, prevalence*

Background. Last studies have found that a migraine is common with other diseases. These cases are called "comorbidities", which means that they occur in parallel and are likely to affect a migraine. Suspected that cardiovascular diseases (CVD) vascular component is part of the pathophysiology of a migraine. There are studies showing a link between a migraine and stroke, subclinical cerebrovascular disease, coronary artery disease, arterial hypertension and patent foramen ovale.
Aim. The general aim of the study is to identify cardiovascular comorbidities of a migraine and it's clinical pattern.
Materials and methods. A retrospective study was performed at the Headaches Center in outpatient clinic *"Veselības centrs 4"*. The study contains data from medical histories including Headache Questionnaire of patients with migraine with/without aura. Data was analyzed with *IBM SPSS 22* software.
Results. The study involved 100 patients, of which 88 were female and 12 male. Patients ages ranging from 17 to 66 years (M=37,34; SD=11.01). Only 31% of all patients had migraine with aura and 69% presented with a migraine without aura. The total amount of patients with cardiovascular disease was 19 (19%). 37% of patients with CVD (n=7) had migraine with aura and 63% (n=12) – migraine without aura. Anamnesis of stroke had 3% of all patients, 4% of patients had transient ischemic attack, 5% of all patients had stage 1 arterial hypertension, 10% of patients had stage 2 arterial hypertension and only 1% had dyslipidemia. All patients with stroke had a migraine with aura.
Conclusions. The total prevalence of CVD in patients with diagnosis of a migraine is 19%. Also our data suggest that the most common CVD was stage 2 arterial hypertension. There is a statistically significant relationship between stroke and a migraine with aura (p=0.028).

Kopsavilkums

Visbiežākās kardiovaskulāras saslimšanas kā migrēnas blakusslimības

Atslēgvārdi: *migrēna, aura, kardiovaskulāras, blakusslimības, prevalence*

Ievads. Pēdējie pētījumi liecina, ka migrēna ir saistīta ar citām slimībām. Šos gadījumus sauc par "blakusslimībām", kas nozīmē, ka tās notiek paralēli un var ietekmēt uz migrēnas gaitu. Ir aizdomas, ka kardiovaskulāro slimību asinsvadu komponents ir daļa no migrēnas patofizioloģijas. Eksistē pētījumi, kas liecina par saikni starp migrēnu un insultu, subklīnisko cerebrovaskulāro slimību, koronāro sirds slimību, arteriālo hipertensiju un persistējošo ovālo atveri.
Mērķis. Pētījuma galvenais mērķis ir identificēt migrēnas kardiovaskulāras blakusslimības un to migrēnas klīnisko variantu.
Materiāli un metodes. Retrospektīvais pētījums tika veikts Galvassāpju kabinetā ambulatorajā klīnikā "Veselības centrs 4". Pētījumā ir iekļauti dati no pacientu ambulatorām vēsturēm, ieskaitot galvassāpju anketas pacientiem ar migrēnu ar / bez auras. Dati tika analizēti ar *IBM SPSS 22* programmatūru.
Rezultāti. Pētījumā piedalījās 100 pacienti, no kuriem 88 bija sievietes un 12 vīrieši. Pacientu vecums bija intervālā no 17 līdz 66 gadiem (M = 37,34; SD = 11,01). No kopējā pacientu skaita 31% bija migrēna ar auru un 69% migrēna bez auras. Kopējais pacientu skaits ar kardiovaskulārām blakusslimībām bija 19 (19%). 37% no pacientiem ar kardiovaskulārām blakusslimībām (n=7) bija migrēna ar auru un 63% – migrēna bez auras (n=12). Insults anamnēzē bija 3% no visiem pacientiem, 4% – tranzitora išēmiskā lēkme, 5% – 1. pakāpes primārā arteriāla hipertensija, 10% – 2. pakāpes primārā arteriāla hipertensija un tikai 1% bija dislipidēmija. Visiem pacientiem ar insultu bija migrēna ar auru.
Secinājumi. Kopējā kardiovaskulāro blakusslimību prevalence pacientiem ar migrēnas diagnozi ir 19%. Arī mūsu dati liecina, ka visbiežākā kardiovaskulārā blakusslimība bija 2. pakāpes primārā arteriāla hipertensija. Ir statistiski ticama sakarība starp insultu un migrēnu ar auru (p = 0,028).

Introduction

A migraine is a neurological disorder which main pathophysiological mechanism is neurogenic sterile inflammation. It's common in young people and women.

Prior studies have found that a migraine occurs together with other illnesses at a greater coincidental rate than is seen in the general population. These occurrences are called "comorbidities" which means that these disorders are interrelated with a migraine (Wang et al., 2010). Identifying and defining a migraine comorbidities are important because it can help to discover new pathophysiological processes in a migraine and to improve the treatment strategy in future.

Wang et al. defined a migraine comorbidity groups as: cardiovascular, neurological, autoimmune and psychiatric (Wang et al., 2010).

The vascular component of cardiovascular disease is suspected to be part of the pathophysiology of a migraine and the therapeutic effect of triptans associated with it. Many studies delineate the association between a migraine and vascular problems (Wang et al., 2010). There is a relationship between migraine and stroke, sub-clinical vascular brain lesions, coronary artery disease, hypertension and patent foramen ovale (Biçakci et al., 2013).

Possible shared mechanisms between a migraine and cardiovascular diseases exist (Wang et al., 2010):

- Patients with a migraine with aura may have other traditional cardiovascular risk factors, which increase the risk of vascular diseases, such as higher total cholesterol, lower high-density lipoprotein cholesterol (HDL), higher total cholesterol-to-HDL ratios and higher blood pressure (Wang et al., 2010);
- The proinflammatory or vasoactive peptide released during a migraine attacks may damage the vascular endothelium and result in stroke or other vascular events (Tietjen, 2007);
- Lower levels of endothelial progenitor cells in migraineurs indicated a reduced endothelial repair capacity, particularly in a migraine with aura, which may contribute to the association between a migraine and vascular diseases (Wang et al., 2010);
- The genetic risk factors are possible shared mechanisms between a migraine and cardiovascular diseases (Wang et al., 2010);

Aim

The general aim of the study is to identify cardiovascular comorbidities of a migraine and its clinical pattern.

Materials and Methods

This study was made retrospectively using data from medical histories including Headache Questionnaire of patients with a migraine with/without aura. A study was performed at the Headaches Center in outpatient clinic "*Veselības centrs 4*" in Latvia in 2018. Medical information from patients' histories was analyzed with IBM SPSS 22 software.

Results

A total of 100 patients with migraine were enrolled in our research. Out of 100 patients, 88 were female (88%) and 12 were male (12%).

The age of the patients ranged from 17 to 66 years (M=37.34; SD=11.01). The mean age of male was 34.25 years (SD = 5.97). The mean age of female was 37.76 years (SD = 11.48).

Of the total number of patients 31% had migraine with aura (n=31) and 69% – migraine without aura (n=69). Of the 31 patients with a migraine with aura 5 were found to be male and 26 were female.

Overall cardiovascular comorbidities were observed in 19% of patients (n = 19). Of these 19 patients: 12 had migraine without aura (63%) and 7 had migraine with aura (37%). The most common cardiovascular comorbidity was stage 2 arterial hypertension. It was observed in 10% of patients with migraine (n=10), of which 8 were female and 2 were male. The mean age of patients is 44.1 years (Me=42.5 years; SD=10.17). In 20% of patients (n=2) diagnosis was – migraine with aura and 80% (n=8) – migraine without aura.

Stage 1 arterial hypertension was identified in 5% of total count of patients (n=5), of which 4 were female and 1 was male. The mean age of patients is 42 years (Me=42 years; SD=14.50). In 40% of patients (n=2) the diagnosis was migraine with aura and 60% – migraine without aura (n=3).

Transient ischemic attack was diagnosed in 3% of patients with migraine (n=3). The mean age of patients was 47.25 years (Me=49.5 years; SD=11.44). 3 patients had migraine with aura (75%) and 1 – migraine without aura (25%).

The history of stroke between patients with diagnosis of migraine was identified in 3 persons (3%). The mean age of patients was 42 years (Me=42 years; SD=14.50). All 3 patients had the diagnosis – migraine with aura (visual and sensory). Using Fisher exact test, it was concluded that there is a statistically significant relationship between a stroke and a migraine with aura (p=0.028).

Dyslipidemia was reported in only one patient (woman). The age of the woman was 56 years and the diagnosis was migraine without aura. The total prevalence of all migraine cardiovascular comorbidities is shown in Chart 1.

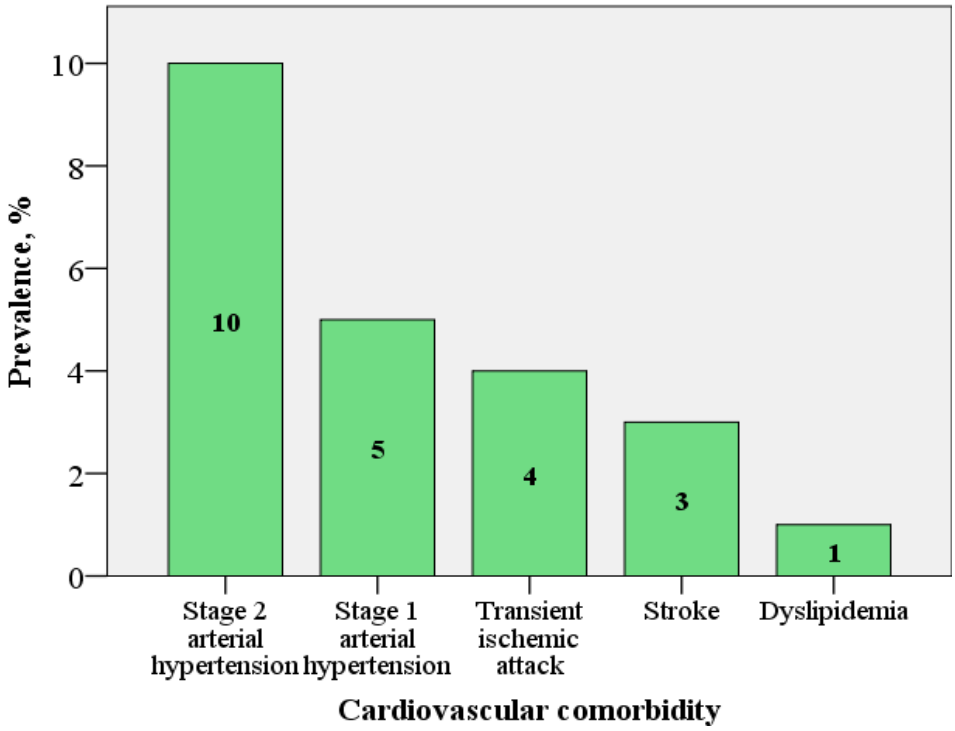

Chart 1. **Cardiovascular comorbidity total prevalence**

Discussion

According to our data, a migraine is more common in women. The female-to-male ratio is 7.3:1. However, this ratio varies from one literature to another. Chawla et al. (2019) note in their study the ratio in the range of 2.5 to 3.5: 1. However, another study reported a sex ratio of 6.3: 1 (females to males, respectively) closer to that obtained in our study (Kelman, 2006).

The most common migraine clinical pattern is a migraine without aura (69% from total patient count).

The total prevalence of cardiovascular comorbidities in a migraine cohort is 19% and the most common clinical migraine pattern – a migraine without aura (63%).

The most common cardiovascular comorbidity is stage 2 arterial hypertension with prevalence in a migraine cohort – 10%. The dominant clinical pattern of a migraine with this comorbidity is a migraine without aura (80%). The less common is stage 1 arterial hypertension with prevalence in a migraine cohort – 5% and dominant migraine clinical type – a migraine without aura (60%). The total prevalence of arterial hypertension in cohort is – 15% with the dominant migraine clinical pattern – a migraine without aura. Despite all of the above, PAH as a migraine comorbidity can be debated as this prevalence in the general population is also quite high at 31% (Bloch, 2016), so there should be a control group to improve the study.

Transient ischemic attack and stroke has respectively prevalence in cohort: 4% and 3%. This stroke's prevalence in cohort is similar to 4.5% in the scientific literature (Adelborg et al., 2018).

But the most interesting thing is that the dominant migraine clinical pattern in both diseases is a migraine with aura (respectively 75% and 100%).

Conclusions

1. The total prevalence of cardiovascular comorbidities in a migraine cohort is 19%.
2. The dominant clinical type of a migraine in patients with cardiovascular comorbidities is a migraine without aura (63%).
3. The prevalence of each migraine cardiovascular comorbidity:
    - Stage 2 arterial hypertension – 10%,
    - Stage 1 arterial hypertension – 5%,
    - Transient ischemic attack – 4%,
    - Stroke – 3%,
    - Dyslipidemia – 1%.
4. There is a statistically significant relationship between stroke and a migraine with aura (p=0.028).

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THE PREVALENCE OF INFLUENZA SEASONAL VACCINATION IN PRE-EPIDEMIC PERIOD AMONG CHILDREN YOUNGER THAN TWO YEARS IN LATVIA

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Abstract

The prevalence of influenza seasonal vaccination in pre-epidemic period among children younger than two years in Latvia

Key words: *influenza vaccination, public health, children, parental opinion, reasons for refusing*

Background. Influenza is a contagious infectious disease caused by influenza virus. Children are in risk group to get this disease and to suffer from influenza complications. There is available influenza vaccination in Latvia, but it is not included in Latvia Childhood Vaccination schedule mandatory.

Materials and methods. To investigate this matter, a questionnaire was made and used. It included questions about vaccination status, chronic diseases, reasons for refusing from vaccination, parental sources of information about influenza vaccine efficiency and necessity for their children and others. Respondents were parents whose children are in the age group from 6 months till 2 years. Data were processed using MS Excel 2010 and SPSS 20.

Results. Totally 110 children were included to the study. Vaccinated against seasonal influenza were 15.7% (n = 22). Analyzing reasons of refusal from influenza vaccination results were: 9% (n = 10) were not informed about opportunity to vaccinate the child; 27.3% (n = 30) parents thought that vaccination will not safe their child from the influenza infection. 10% (n = 11) answered that vaccination is too expensive and were not informed that it is totally covered by government for children of age till two years old in Latvia. Main source of information about influenza vaccination necessity for children were general practitioners, pediatricians and personal opinion.

Conclusion. Prevalence of vaccination against influenza in research included children was 15.7%. Main cause of refusal from vaccination was opinion that vaccination is not save for their children and will not prevent the influenza infection. There is strong correlation between parents and children vaccination status ($p < 0.01$).

Kopsavilkums

Pretgripas vakcinācijas prevalence bērniem vecumā līdz diviem gadiem pirmsepidēmijas periodā

Atslēgvārdi: *vakcinācija pret gripu, sabiedrības veselība, bērni, vecāku viedoklis par pretgripas vakcīnu*

Ievads. Gripa ir infekcioza augšējo un/vai apakšējo elpceļu saslimšana, kuru izsauc gripas vīrus. Bērni ir augsta riska grupā inficēties ar šo saslimšanu, kā arī bērniem ir augsts smago komplikāciju risks. No sešu mēnešu vecuma Latvijā ir pieejama primāra pretgripas profilakse – vakcinācija, bet tā nav iekļauta bērnu obligātajā vakcinācijas kalendārā.

Metodes un materiāli. Tika izveidota aptaujas anketa, kura ietver jautājumus par bērnu un vecāku vakcinācijas statusu, hronisko slimību esamību, vacāku informācijas avotus par pretgripas vakcinācijas nepieciešamību viu bēnien un citus. Respondenti bija vecāki, kuru bērni ir vecumā no 6 mēnešiem līdz 2 gadiem. Dati tika apkopoti MS Excel un apstrādāti SPSS 20.

Rezultāti. Kopā 110 bērni tika iekļauti pētījumā. Pretgripas vakcinācijas prevalince bija 15,7% (n = 22). 9% (n = 10) vecāki tika informēti par iespēju vakcinēt bērnu pret gripu šājā vecuma grupā; 27.3% (n = 30) uzskata, ka vakcīna pret saslimšanu bērnu nepasargās. 10 vecāki atbildēja nebija informēti par pretgripas vakcinācijas pilnīgu valsts kompensāciju bērniem līdz 2 gadu vecumam Latvijā. Galvēnais informācijas avots par vakinācijas nepieciešamību bērniem, vecākiem – ārsti vai arī persoīgs viedoklis.

Secinājumi. Pretgripas vakcinācijas prevalence pētījumā iesaistītiem bērniem ir 15.7%. Biežāk vecāki atteicās no pretgripas vakciācijas bērniem, jo uzskata, ka vakcīna pret gripu bērnu nepasargās. Pastāv cieša statistiski ticama korelācija starp bērnu un vecāku vakcinācijas statusu ($p < 0,01$).

Introduction

Influenza is acute respiratory infection that is cause by RNS virus lat. *Orthomyxoviridae* or influenza virus. Infection affects upper and/or lower respiratory tract and also manifests with systemic symptoms like fever, malaise, fatigue et al. Influenza infection has epidemic characteristics. For high risk group the disease might manifest with complications and even lead to the lethal outcome.

Each year there are nearly 4–50 million cases in Europe. And up to 70 thousand cases are lethal.

Last influenza season (2017–2018) influenza was diagnosed in 2 181 Latvia inhabitants. And 385 cases were in children younger than 4 years old. Furthermore, 91 (2 children younger than 9 years) cases were lethal related to the influenza associated complications.

But despite this, the prevalence of vaccination against influenza still low in Latvia. According to the DPCC (Disease Prevention and Control Centre) only 606 children under 2 years of age were vaccinated against influenza during the last season (2017–2018). It is almost two times more than year 2016–2016, when only 363 children aged till 2 years were vaccinated. According to the National Statistics data at the end or 2018 years there were officially registered 64 843 children in the age group till 2 years. So, data shows that the prevalence of vaccination against influenza was lower than one per cent last season.

There are vaccinations against influenza, which have to be done every influenza season, because of virus high opportunity to mutations. It includes antigenic shift and antigenic dreift. First one is more characterized for A type virus and causes pandemic outbreak. In order antigenic dreift can be met in all virus types (A, B and C) and causes epidemic outbreaks. This phenomenon influences the influenza vaccination effectivity during the outbreak.

According to the DPCC there are high risk groups that must be vaccinated against influenza each season. They include children aged from 6 months till 2 years old and children aged till 18 years with current comorbidities – chronical pulmonary diseases, chronical cardiovascular diseases, immunodeficiency, during immunosuppressive therapy and children, who have a long-term treatment with aspirin. For these children, influenza vaccination is totally covered by government.

The only contraindication for influenza vaccination is hard allergic reaction after influenza vaccination before to the current vaccine component.

Aim

The goal of the research was to figure out the prevalence of seasonal influenza vaccination among children under age of two years; to figure out main parental reasons for refusal the influenza vaccination for children.

Methods and materials

Totally 110 parents whose children are aged from six months till two years were interviewed in the study. The survey took place in Riga preschool institutions and among parents whose children were hospitalized in the Riga Children's Clinical University hospital due to various reasons.

Research time from 30.09.2018 till 30.12.18 The survey development and adaptation time from 27.09.2018 till 29.09.2018. The questionnaire included 25 specific questions related to the research theme. Each respondent was interviewed personally. Before interview parents were informed about anonymity and signed a consent form.

For primary data collection Microsoft Excel 2010 was used. For secondary data summary, *Chi-Square* coefficient and data processing IMB SPSS Statistics 20 was used.

Results

Totally 110 children and 110 parents were included to the study. 58.2% (n = 64) of children were boys and 41.8% (n = 46) girls. Parents aged from 19 till 46 years old. (SD=11.7). According to the research data 15.7% (n = 22) were vaccinated against influenza season 2018–2019 (Figure 1).

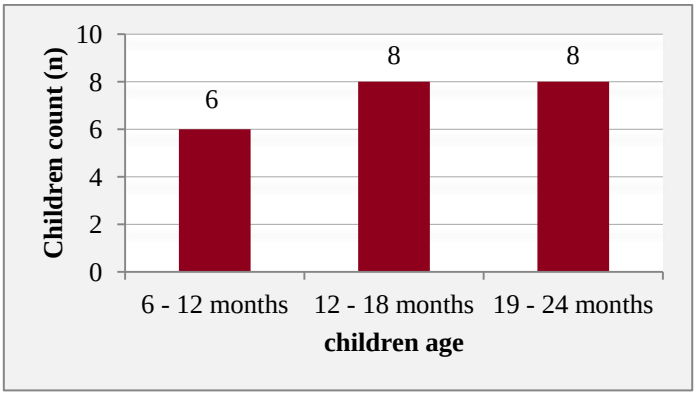

Figure 1. **The frequency of vaccination against influenza among children younger than two years old**

Study results showed that 12.2% of parents were vaccinated against influenza. Analyzing research data was found strong statistically significant correlation between parents and children vaccination status (Figure 2).

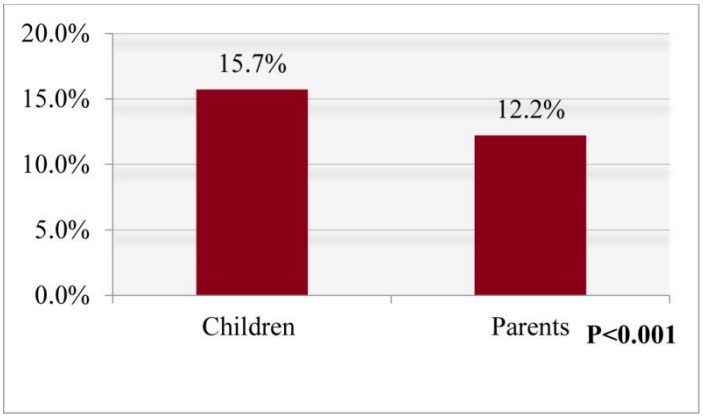

Figure 2. **The prevalence of influenza vaccination among children and parents**

Research data showed that more common parental reasons for refusal influenza vaccination for children were doubts about vaccination effect on the child immunity – 41.6%, complication risk after vaccination – 35.6% and that vaccine will not save a child from the disease – 27.3%. Furthermore, 3.6% (n = 4) of parents refused from all vaccinations for children included in Latvia vaccination schedule (Figure 3).

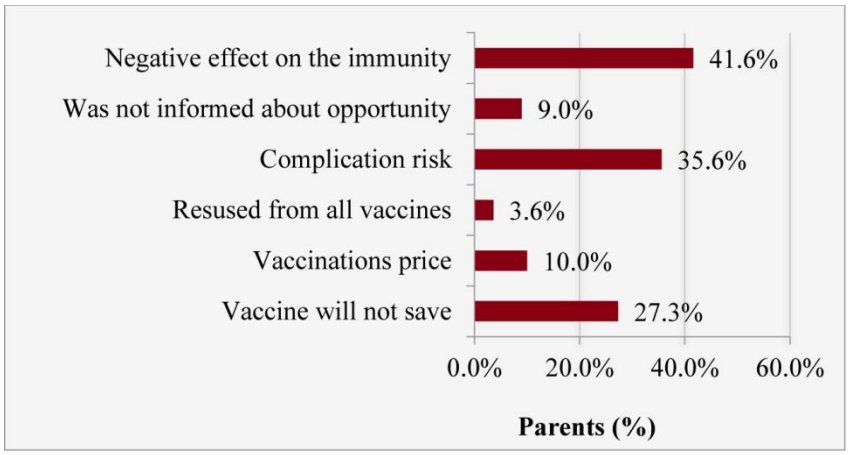

Figure 3. **Parental causes of refusal from influenza vaccination**

Study results showed that parents, whose children were not vaccinated mostly decision about childs vaccination status made themselves – in 47 cases. In 21 cases, consulted a pediatrician and in 28 cases, a general practitioner. Comparing to those whose children were vaccinated – in 16 cases parents consulted with a doctor and only in 4 cases with relatives or internet (Figure 5).

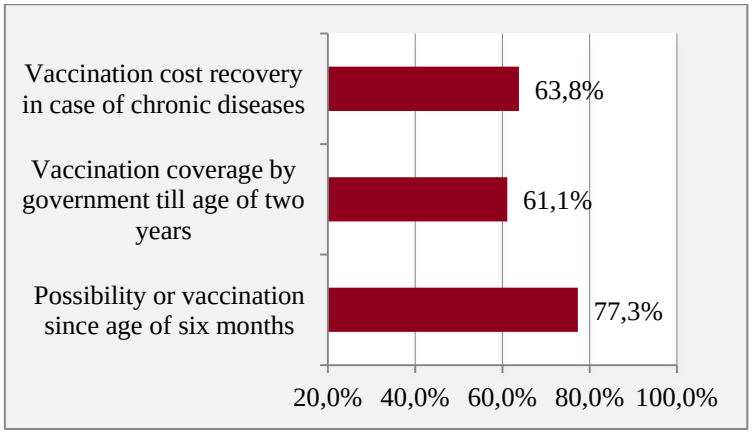

Figure 4. **The parental awareness of the possibilities of influenza vaccination**

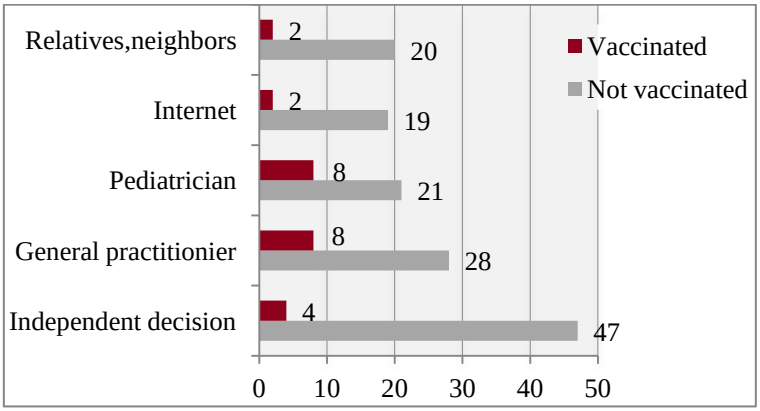

Figure 5. **The parental sources of information about influenza vaccination before decision about children vaccination status**

Discussion

The research data showed that the prevalence of ifluenza vaccination of children is still yery low in Latvia. And reasons why parents refuse from vaccination were different. During the interview with parents was seen that some of them do not even know about influenza vaccine availability and many of parents were not informed that vaccine is for free for children till age of two years. And many parents answered that they would vaccinate a child from influenza if vaccine were cheaper. And it is when a vaccine is totally covered by government. And parents often are confused about complications after vaccination and healthy immunity reaction to the such irritation. Also, the lack of information was seen about possible complications getting influenza.

To improve this situation there might be a hard work from both parents and medical stuff side. Because parents education might decrease number of morbidity and mortality from influenza in children.

Conclusions

The study showed strong correlation between children and parents vaccination status ($p < 0,001$). Parental awareness of influenza vaccine is insufficient in Latvia. Almost every fifth in the study included a parent who did not know about the possibility of vaccinating a child from influenza. Most often unvaccinated children parents decide about children vaccination status without a consultation with a general practitioner or pediatrician

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BIOLOĢIJA / BIOLOGY

IS SPERM DNA DAMAGE ASSOCIATED WITH IVF EMBRYO QUALITY? REVIEW

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Abstract

Is sperm DNA damage associated with IVF embryo quality?

Key words: *spermatozoa, sperm DNA, embryo, pregnancy, in vitro fertilization*

Sperm DNA damage is common amongst infertile men and may adversely impact natural reproduction, assisted reproduction and to a lesser degree IVF pregnancy. Sperm DNA integrity is vital for successful fertilization, embryo development, pregnancy, and transmission of genetic material to the offspring. DNA fragmentation is the most frequent DNA anomaly present in the male gamete that has been associated to poor semen quality, low fertilization rates, impaired embryo quality, and preimplantation development and reduced clinical outcomes in assisted reproduction procedures. High DNA fragmentation index (DFI) may be associated with poor outcome after ICSI.
The objective of this study was to examine the influence of sperm DNA damage on embryo quality and/or development at IVF and ICSI. We conducted a systematic review of studies that evaluated sperm DNA damage and embryo development and/or quality after IVF and/or ICSI.
This review indicates that the evaluable studies are heterogeneous and that overall, there is no consistent relationship between sperm DNA damage and embryo quality and/or development.

Kopsavilkums

Vai spermas DNS bojājumi ir saistīti ar IVF embriju kvalitāti?

Atslēgvārdi: *spermatozoīdi, spermas DNS, embrijs, grūtniecība, apaugļošana in vitro*

Spermas DNS bojājumi ir bieži sastopami neauglīgiem vīriešiem un tie var negatīvi ietekmēt dabīgo auglību, medicīnisko apaugļošanu un arī IVF grūtniecību. Spermas DNS integritātei ir būtiska nozīme veiksmīgai apaugļošanai, embriju attīstībai, grūtniecībai un ģenētiskā materiāla pārnešanai pēcnācējiem. DNS fragmentācija ir visbiežāk sastopamā DNS anomālija vīriešu gametās, kas saistīta ar sliktu spermas kvalitāti, zemiem apaugļošanas rādītājiem, sliktu embriju kvalitāti un pirmsimplantācijas attīstību, samazinātu grūtniecības iestāšanās biežumu medicīniskās apaugļošanas ārstēšanas ciklos. Augstu DNS fragmentācijas indeksu (DFI) var saistīt ar sliktu rezultātu pēc ICSI.
Šī pētījuma mērķis bija izpētīt spermas DNS bojājumu ietekmi uz embriju kvalitāti un/vai attīstību IVF un ICSI ciklos. Mēs veicām sistemātisku pārskatu par pētījumiem, kas novērtēja spermas DNS bojājumus un embrija attīstību un/vai kvalitāti pēc IVF un/vai ICSI cikliem.
Šis pārskats liecina, ka novērtētie pētījumi ir neviendabīgi un kopumā nav saskanīgas saiknes starp spermas DNS bojājumiem un embriju kvalitāti un / vai attīstību.

Introduction

Semen quality is frequently used as an indirect measure of male infertility. Ejaculate volume, sperm concentration, motility, and morphology determined according to the World Health Organisation (WHO) are the most important parameters evaluated in infertility centers as part of routine semen analysis. The genetic composition in a newborn is the results of oocyte and sperm DNA information, and it should be intact for further embryo and fetal development that will result in a healthy offspring. Any type of damage present in the DNA of male or female gametes can lead to an interruption of the reproductive process. Sperm DNA integrity has been used as a new marker of sperm quality in the prediction of pregnancy. Sperm DNA fragmentation can be caused by apoptosis, defects in chromatin remodeling during the process of spermiogenesis, and oxygen radical-induced DNA damage. Sperm DNA fragmentation might be the most frequent cause of paternal DNA anomaly transmission to progeny and is found in a high percentage of spermatozoa

from subfertile and infertile men. Several hypotheses have been proposed as to the molecular mechanism of sperm DNA fragmentation, the most important ones being: apoptosis, abnormal chromatin packaging, and reactive oxygen species (Sakkas D, et al. 1999). Several studies show that spermatozoa with DNA fragmentation are able to fertilize an oocyte (Aitken RJ, et al. 1998, Gandini L, et al. 2004), but are related to abnormal quality embryo, block in the blastocyst development, and lower pregnancy rates either natural or using IUI, IVF, or ICSI procedures (Sun JG, et al. 1997, Muriel L, et al. 2006). There is now good evidence to show that sperm DNA and chromatin damage is associated with male infertility and reduced natural conception rates (Evenson DP, et al. 1980, Evenson DP, et al. 1999, Giwercman A, et al. 2009, Spano M, et al. 2000). This is highly pertinent given that infertile men will be seeking treatment with ARTs and will be at risk of contributing to the development of embryos derived from spermatozoa with DNA damage. These observations have led several investigators to examine the relationship between sperm DNA damage and assisted reproductive technologies (ARTs) results in order to assess the impact of this sperm abnormality on reproductive outcomes. No association with sperm DNA damage has been found for the early paternal effect. The diagnosis of the late paternal effect is thus based on the examination of sperm DNA integrity, which should be performed in cases of repeated assisted reproduction failure even if morphologically normal embryos result from fertilization with the patients spermatozoa. The only element leading to the diagnosis of the early paternal effect is the poor zygote and embryo morphology and low cleavage speed. The absence of increased sperm DNA damage does not exclude the presence of this pathology. ICSI with testicular spermatozoa has recently been shown to be an efficient treatment for the late paternal effect. The use of oral antioxidant treatment in this indication has also given promising results. (Tesarik 2005) Various studies demonstrate that the oocytes and the embryo retain the ability to repair DNA damage that may be present in the paternal genome; however, it is not yet clear if all types of damage can be repaired. For instance, double-stranded DNA breaks appear to be less repairable than single-stranded breaks and, therefore, have a greater impact on embryo quality and/or embryo development. Additionally, the capacity of oocyte to repair DNA damage will depend on factors like maturity, maternal age, and external factors. This review summarizes the causes that produce sperm DNA fragmentation, its relation to seminal parameters, paternal age, and effect on assisted reproduction procedures.

Experimental studies have shown that mammalian embryo development and implantation depend in part on the integrity of the sperm DNA, with a threshold of sperm DNA damage beyond which these events are impaired (Ahmadi A,1999). Moreover, there is also evidence from animal studies that sperm DNA fragmentation increases the risk of adverse post-natal events (cancer development and reduced longevity) (Fernandez-Gonzalez R, et al. 2008). In contrast, human

studies indicate that DNA-damaged spermatozoa can fertilize successfully at IVF and ICSI and allow for normal embryo development and subsequent pregnancy (Collins JA, et al. 2008, Gandini L, et al. 2004, Zini A, Sigman M. 2009). These observations have raised questions regarding the risks of using DNA-damaged sperm for IVF and ICSI (Barratt CL, et al. 2003, Perreault SD, et al. 2003).

Sperm DNA contributes half of the offspring's genomic material and abnormal DNA can lead to derangements in the reproductive process. Several studies provide good evidence that sperm DNA and chromatin damage are associated with male infertility and reduced natural conception rates (Evenson DP, et al. 1999, Spano M, et al. 2000, Giwercman A, et al. 2010). In humans, high levels of sperm DNA damage have been related to low fertility potential, failure to obtain blastocysts, blockage in embryo development after embryo implantation, increased risk of recurrent miscarriages, reduced chances of successful implantation, and negative effects on the health of the offspring (Seli E, et al. 2004, Bungum M, et al. 2007).

If a major anomaly is detected in a blastomere at a cell cycle checkpoint, the cell in question does not divide, which leads to the observation of a lower number of cells in the embryo than expected for a given time point. If the existing problem cannot be resolved, the cell in question is ultimately removed by fragmentation, resulting in an impairment of embryo morphology grade according to current cleaving embryo scoring systems. In view of the recent hypothesis suggesting that trophectoderm arises from a single founder blastomere of the 4-cell embryo such partial blastomere losses may be compatible with embryo implantation in some cases and incompatible in others, depending on whether the trophectoderm founder cell is or is not concerned. Limited production of fragments detaching from blastomeres may also occur as part of the remodelling mechanisms involved in cellular reparatory processes, which means that fragments may appear in human preimplantation embryos even if none of its blastomeres is ultimately lost. Both the slow cleavage and the poor morphology grade of cleaving embryos are thus likely to be consequences of active auto defence mechanisms employed by the embryo in its fight against aneuploidy and DNA damage in general. (Hansis et al., 2004)

Studies of Virro et al. 2004, Huang et al. 2005, and Borini et al. 2005 showed a negative correlation between fertilization rates and high levels of sperm DNA fragmentation. However, if the type and extent of DNA damage can be balanced by the reparative ability of the oocyte, it is possible to achieve fertilization even in the presence of elevated sperm DNA fragmentation rates (Collins JA, et al. 2008, Lin MH, et al. 2008). Given that, excessive damage in sperm DNA may result in early reproductive failures and during the 4 to 8 cell stage, when the paternal genome is switched on, the development of the embryo will be affected by sperm DNA integrity causing

apoptosis, fragmentation, and difficulty to reach the blastocyst stage (Acharyya S, et al. 2005, Spano M, et al. 2005).

Other studies have suggested the activity of the classical PCD pathway in the human seminiferous tubules (Francavilla et al., 2002). However, these activities appear to prevent abnormal germ cells from reaching the ejaculate rather than promote DNA damage in ejaculated spermatozoa, and most of the germ cells concerned are dismantled by Sertoli cells Thus, ejaculated sperm DNA damage has been suggested to be a sequela of oxidative damage occurring to spermatozoa after their release from Sertoli cell support (Tesarik et al., 2004).

Experimental studies have shown that mammalian embryo development and implantation depend in part on the integrity of the sperm DNA, with a threshold of sperm DNA damage beyond which these events are impaired (Ahmadi A, Ng SC. 1999;284:696–704.)

In contrast, human studies indicate that DNA-damaged spermatozoa can fertilize successfully at IVF and ICSI and allow for normal embryo development and subsequent pregnancy. (Collins JA et al. 2008, Gandini L, et al. 2004, Zini A, et al. 2009)

These observations have raised questions regarding the risks of using DNA-damaged sperm for IVF and ICSI (Barratt CL et al., Perreault SD, et al. 2003)

Methods

Research strategy and selection criteria

I researched the Americam society of the reproductive medicine – Fertility and Sterility database and National Library of Medicine – Medline database from 1995 to 2015 using the following search terms: “human sperm DNA”, “human sperm DNA damage”, “human sperm chromatin”, in combination with “embryo”, “pregnancy”, “assisted reproduction”, “in vitro fertilization” and “ICSI”. Additional studies were identified from the study reference lists. Only full articles published in English were searched.

I selected studies that evaluated sperm DNA damage and embryo quality after ICSI. I recorded the patient selection, female inclusion/exclusion criteria, treatment type, sperm DNA assay type, sperm DNA damage cut-off point, number of cycles or patients, and relationship between embryo quality and/or development and sperm DNA test results. Embryo quality was reported differently in the various studies: (1) embryo development (e.g. cleavage rate), (2) embryo grade or score, (3) embryo fragmentation or (4) multi-nucleation.

Results

Studies selected

Of the initial 173 citations retrieved, review of the titles and abstracts indicated that 154 were not relevant. Full papers were obtained for the remaining 17 citations. After reviewing the 7 papers, 7 were excluded because embryo quality/development was not reported.

The remaining papers included a total of 10 studies on the association between sperm DNA damage and embryo quality/development after ICSI.

Table 1. **Selected characteristics of 10 studies on sperm DNA damage and embryo quality after ICSI**

STUDY	n	DNA test	Female factors Inclusions (controlled)	Day of embryo development	Embryo quality	DD&poor EQ (corellation)
Hammadeh ME, et al.	60	Aniline Blue	unspecified (no)	2	Development	none
Host E, et al.	61	TUNEL	unspecified (yes)	3	Grade	none
Henkel R, et al.	54	TUNEL	unspecified (no)	Not reported	Fragmentation	none
Gandini L, L et al.	22	SCSA	unspecified (yes)	2	Grade	none
Zini A et al.	60	SCSA	<40 (yes)	3	Multinucleation	positive
Muriel L et al.	85	SCD	unspecified (no)	3 and 5	Development	positive
Benchaib M et al.	218	TUNEL	unspecified (yes)	5	Development	positive
Lin MH, et al.	86	SCSA	<40, FSH < 15 (yes)	3	Grade	none
Micinski P et al.	50	SCSA	< 38 (no)	2	Development	none
Avendano C et al.	36	TUNEL	unspecified (no)	3	Grade	positive

10 ICSI studies were prospective, but sampling was consecutive in only 2 papers. Three studies excluded couples with poor ovarian reserve or advanced maternal age. In nearly half of the studies (4/10 ICSI studies accounting for 399 of the 732 cycles), sperm DNA damage was associated with poor embryo quality (2 studies) and/or impaired development (2 studies).

Discussion

Some studies have suggested that measuring sperm DNA damage could be a promising tool in determining a man's fertility status; however, the relationship between this measure and ART outcomes remains uncertain. Some studies have suggested that this arises because different types of sperm samples were used for research into sperm DNA damage, namely, freshly ejaculated semen samples or washed motile spermatozoa. Here, a reduction in DNA fragmentation was seen in all samples after DGC and swim-up, and this was probably because of the removal of immotile, nonviable, and degenerated sperm. However, when we compared semen parameters and sperm DNA damage levels between the pregnant and nonpregnant groups, including freshly ejaculated spermatozoa and washed motile spermatozoa, we found a significant difference in the levels of DNA damage between the two groups, both in fresh ejaculates and washed motile spermatozoa. One reasonable explanation for this is that DGC might assist in selecting motile spermatozoa, but cannot remove the effect of sperm DNA damage on embryo development; moreover, the forces produced during centrifugation might even cause new DNA damage.

Correlations between sperm DNA damage and abortion rates have not always been found to be statistically significant, but a tendency for this was confirmed in our study. Other studies have shown that an increased proportion of sperm DNA damage is a deleterious factor for sustaining

pregnancies and results in miscarriage. Moreover, men with abnormal sperm parameters had a higher proportion of sperm sex chromosome aneuploidy than men with normal sperm parameters. Thus, paternal genomic abnormalities might be a significant cause of miscarriage.

Our data showed that sperm DNA damage was negatively correlated with day 3 embryo quality, with the blastocyst formation rate and the CPR. Therefore, addition of sperm DNA damage tests to the conventional semen analysis might improve the clinical prediction of male infertility and ART outcomes. Targeted large-scale studies are necessary to standardize the test methods, sperm variables, and reference values before these could be integrated into routine ART.

During early embryogenesis, the paternal genome is activated just after the 4–8-cell stage, so further development of the embryo is potentially affected by the integrity of the sperm DNA.

In cases with elevated levels of sperm DNA damage, apoptosis and damage can also be present in the embryo, leading to slow or arrested embryo development and difficulty in reaching the blastocyst stage, along with low implantation and pregnancy rates.

Conclusions

In summary, this systematic review demonstrates that there is no consistent relationship between sperm DNA damage and embryo quality/development after IVF and IVF/ICSI. The data also suggest that the influence of sperm DNA damage on embryo quality may be less significant in IVF compared to ICSI cycles. Moreover, the influence of sperm DNA damage on the embryo appears to be related to embryo development more so than embryo quality. However, the conclusions of this study are very much weakened by the limitations of the current embryo scoring systems and the heterogeneity of the analyzed studies (e.g. data collection, day of embryo evaluation, definition of embryo quality, population characteristics, female inclusion/exclusion criteria, IVF protocol and sperm DNA test type). As such, additional, well-designed prospective studies are needed to further evaluate the relationship between sperm DNA damage with both embryo development and quality.

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DABAS AIZSARDZĪBA UN VIDES PĀRVALDĪBA / NATURE PROTECTION AND ENVIRONMENTAL MANAGEMENT

EVALUATION OF IMPACT OF FOREST FERTILIZATION ON PHYTOBENTHOS DIVERSITY IN SURFACE WATER

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Abstract

Evaluation of impact of forest fertilization on phytobenthos diversity in surface water

Key words: *diatoms, deformities of the valves, Shannon's diversity index, nitrogen fertilizer, wood ash*

To respond to increasing demand for wood resources, in addition to drainage and thinning, the forest fertilization may enhance increment of trees and future harvest rates. Nonetheless, excessive input of nutrients may increase eutrophication risk of freshwater ecosystems. Diatoms are sensitive to alterations in the aquatic environment, including pH level and inorganic nutrients. Therefore, they can be utilized as indicators for environmental changes like acidification and eutrophication. The purpose of the research was to estimate, how the spreading wood ash and nitrogen containing mineral fertilizer affects the ecological quality of rivers, in particular, the composition of phytobenthic species. The trial objects were established in two stands – in a pine stand on dry mineral soil (*Myrtillosa*) next to the Rusinupe Stream and in a pine stand on drained organic soil (*Myrtillosa turf. mel.*) near the Age Stream. The ammonium nitrate was applied in the *Myrtillosa* stand in June, 2017 and wood ash was applied in the experimental site of *Myrtillosa turf. mel.* in February, 2018. Phytobenthic samples were collected in May, July and November, 2017 and May, July and October, 2018. The samples of phytobenthos were collected in sections of the Rusinupe Stream upstream and downstream experimental site, and in sections of the Age Stream upstream and downstream the inflow of the drainage ditch flowing from the trial object. The values of Shannon's diversity index for phytobenthic species from the Rusinupe Stream indicate that the composition of species was less diverse and dominance of particular species was more definite in 2018. A similar tendency was observed in phytobenthic samples collected from the Age Stream. However, according to Shannon's diversity index values in general there was lower level of diversity in samples collected from the Age Stream downstream the inflow of drainage ditch. There was an increase in diatom deformities in samples collected from both streams in 2018, although only increase in the deformities of diatom samples collected from the Age Stream was significant. The teratologies of the valves might be caused by prolonged dry period resulting in atypically low water level in the stream and eliminated discharge in 2018, as well as the observed activities of beavers.

Kopsavilkums

Meža augsnes ielabošanas ar mēslojumu ietekmes uz virszemes ūdens fitobentosa daudzveidību novērtējums

Atslēgvārdi: *diatomejas, vāciņu deformācija, Šenona daudzveidības indekss, slāpekļa minerālmēslojums, koksnes pelni*

Reaģējot uz pieaugošo pieprasījumu pēc koksnes resursiem, meža augsnes ielabošana ar mēslojumu līdztekus meža nosusināšanai un kopšanas cirtei var veicināt koku pieaugumu un palielināt koksnes ciršanas apjomu nākotnē. Tomēr pārmērīga barības vielu ieplūde var veicināt saldūdens ekosistēmu eitrofikācijas risku. Diatomejas ir jutīgas pret ūdens kvalitātes pasliktināšanos, tai skaitā pH līmeņa un neorganisko elementu koncentrāciju izmaiņām. Šī iemesla dēļ diatomejas var pielietot bioindikācijā, lai noteiktu ūdens vidē tādas izmaiņas kā paskābināšanos un eitrofikāciju. Pētījuma mērķis bija novērtēt, kā koksnes pelnu un slāpekļa minerālmēslojuma izkliede ietekmē ūdensteču ekoloģisko kvalitāti, jo īpaši, fitobentosa sugu daudzveidību. Izmēģinājuma objekti ierīkoti divās mežaudzēs – priežu audzē uz sausas minerālaugsnes (lāns) blakus Rūsiņupei un priežu audzē uz organiskās augsnes (šaurlapju kūdrenis) Aģes upes apkaimē. Amonija nitrāta izkliede lānā veikta 2017. gada jūnijā, bet koksnes pelnu izkliede šaurlapju kūdrenī – 2018. gada februārī. Fitobentosa paraugi ievākti 2017. gada maijā, jūlijā un novembrī, kā arī 2018. gada maijā, jūlijā un oktobrī. Paraugi ievākti Rūsiņupes posmos augšpus un lejpus izmēģinājuma platībām, kā arī Aģes upes posmos pirms un pēc meliorācijas grāvja ieteces vietas, kas plūst no izmēģinājuma objekta platības. Rūsiņupītes fitobentosa paraugiem aprēķinātās Šenona daudzveidības indeksa vērtības norādīja uz mazāku fitobentosa daudzveidību un lielāku atsevišķu sugu dominanci 2018. gadā. Līdzīga tendence 2018. gadā novērota arī Aģes upes paraugos. Tomēr atbilstoši Šenona daudzveidības indeksa vērtībām zemāka sugu daudzveidība lielākoties konstatēta fitobentosa paraugos no Aģes upes posma lejpus meliorācijas grāvja ieteces vietai. 2018. gadā abās upēs ievāktajos paraugos konstatēts lielāks deformēto kramaļģu vāciņu īpatsvars, kaut gan tikai Aģes upes paraugos konstatētais deformāciju pieaugums ir būtisks.

Vāciņu teratogēnās izmaiņas radušās, iespējams, ilgstoša sausuma perioda, netipiski zema upes ūdens līmeņa un samazinātas caurteces 2018. gadā, kā arī novērotās bebru aktivitātes dēļ.

Introduction

Forest soil fertilization with a sanitary cut and drainage can be an effective measure of forest growth condition improvement. Enhanced forest growth removes extra carbon dioxide in the biomass and, as a result, may contribute to climate change mitigation targets (Houle, Moore 2019).

Rivers are an important part of freshwater resources. According to the Directive 2000/60/EC of the European Parliament and of the Council waters must achieve a good ecological and chemical status until 2027. The definition of ecological status provided by the Water Framework Directive includes the abundance of aquatic flora, macroinvertebrates and fish fauna, the availability of nutrients, parameters like salinity, temperature and pollution (The European Parliament and Council of the European Union 2000).

Bio-assessment helps to evaluate the condition of waterbodies using the resident biota of surface water. Aquatic biota, for instance, micro-algal species reflect stresses and the fluctuation of environmental factors. Moreover, populations of bioindicators provide identification of initial biotic and abiotic modifications (Rimet 2012). Diatoms are a type of phytoplankton, benthic microalgae, unicellular algae, in size from 2 μm to 500 μm. Diatom cells are enclosed in siliceous frustule that consists of two valves (Rimet 2012).

Diatoms are considered to be powerful bioindicators regarding nutrients and organic matter (Rimet 2012), therefore, freshwater diatom analyses can be applied to estimate the ecological quality of rivers. Deformities of diatom valves are indicative of altered water quality (Falasco et al. 2009; Lavoie et al. 2017). Since diatoms are sensitive to environmental changes, it would, thus, be of interest how forest fertilization affects the composition of phytobenthos.

Shannon's diversity index (Shannon-Wiener index) is widely used in pollution monitoring, likewise in the evaluation of the diversity of benthic organisms. (Magurran, 2013). Shannon's diversity index is equally sensitive to rare and abundant species in the sample (Morris et al. 2014); therefore, the index is useful for characterizing the composition of phytobenthos. Although even distribution of species is not characteristic under natural conditions (Magurran 2013), a calculated evenness value shows a more equable distribution of species or, on the contrary, the dominance of one or more species. Therefore, the evenness value may indicate changes in environmental factors. Certain ecological changes can be more unfavourable for particular species while beneficial for others in terms of changed environmental factors or reduced competition among species. Calculation of Shannon's diversity index initially takes into account evenness of species. Still it is possible to calculate a separate evenness index (Magurran, 2013).

The purpose of the research was to estimate how the application of wood ash and the mineral nitrogen fertilizer affects the ecological quality of streams, particularly, diatoms.

Material and Methods

Study site and treatment

Two trial objects were established in forests managed by Joint Stock Company "Latvia's State Forests" (

Table 1). The first object was located in a pine stand next to the Rusinupe Stream in Vecumnieku parish and second – in a pine stand near the Age Stream in Skulte parish.

Table 1. **Description of experimental sites**

Forest stand	Forest type	Age	Dominant tree type	Coordinates, X	Coordinates, Y
508-230-39	*Myrtillosa*	60	Pine	56.668012	24.519193
405-421-3	*Myrtillosa turf. mel*	90	Pine	57.399438	24.594358

Nitrogen containing fertilizer in form of ammonium nitrate was spread in the *Myrtillosa* stand in July, 2017. Wood ash was applied in the *Myrtillosa turf. mel* stand in February, 2018. Water ecology monitoring points were established in the Rusinupe Stream upstream (control zone) and downstream (impact zone) the treated forest stand (

Figure 1), but in the Age Stream – upstream and downstream the inflow of the drainage ditch that flows from the treated forest stand (

Figure **2**).

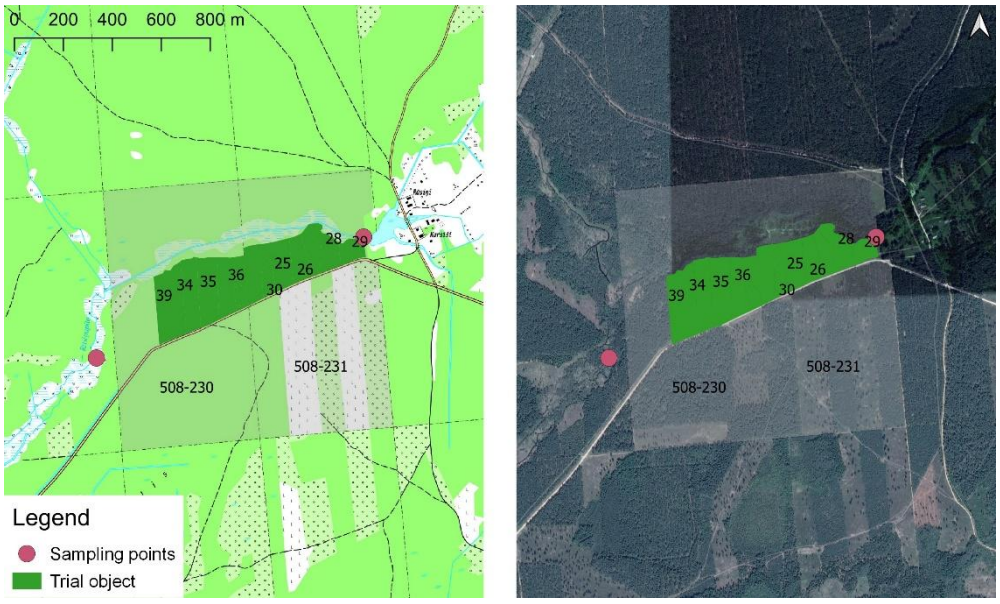

Figure 1. **Phytobenthos sampling points in the Rusinupe Stream**
(Latvijas Ģeotelpiskās informācijas aģentūra n. d.; Valsts meža dienests n. d.)

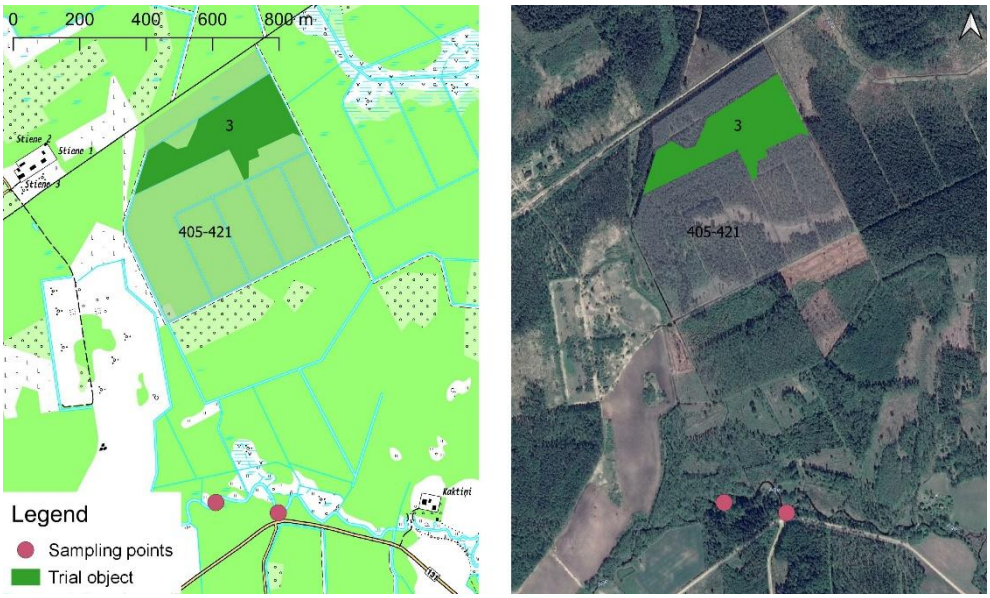

Figure 2. **Phytobenthos sampling points in the Age Stream**
(Latvijas Ģeotelpiskās informācijas aģentūra n. d.; Valsts meža dienests n. d.)

Sampling and analyses

Samples of phythobenthos were collected three times per year – in spring, in summer and in autumn during the period 2017 – 2018. The samples were collected according to the requirements of the standard LVS EN 14407:2014. OPTIKA – **B-383Phi** microscope with 40x to 100x magnification was used for species identification. The total number of individuals of all diatom species and deformed valves of diatoms was counted. Diatom species were determined according to the guidelines for identification of diatom samples ("Water quality. Guidance for the identification and enumeration of benthic diatom samples from rivers and lakes." 2014). The Rusinupe Stream and the Age Stream have different types of riverbed substrate. Therefore, phythobenthos samples were collected from small branchwood in the monitoring points of the Rusinupe Stream, while samples were collected from medium size pebbles (10 – 15 cm) upstream and from branchwood downstream the inflow of the ditch in the Age Stream.

The temperature and dissolved oxygen of surface water were determined in two points in the Rusinupe Stream – upstream and downstream the trial plot. Surface water samples reflecting the impact of the Age Stream's experimental site were collected from a stream 0.5 km downwards the trial object. The parameters were determined in surface water two times per month during the period 2017 – 2018. The measurements were conducted with HACH portable multi meter HQ40d according to the requirements of the standard LVS EN ISO 5814:2013.

Data analysis

In order to estimate the diversity of phytobentos composition, the Shannon's diversity index and evenness value were calculated. The Shannon's diversity index is calculated from the formula (Magurran 2013):

$$H' = \sum p_i \ln p_i,$$

where *p*i is the proportion of individuals found in the *i*-th species. A higher index value means higher diversity. Evenness is calculated using formula (Magurran, 2013):

$$E = H'/Hmax = H'/\ln S,$$

where Hmax is the maximum diversity which could occur in the situation where all species are equally abundant. Evenness is construed between 0 and 1,0. If evenness equals 1,0 than all species are equally abundant in the sample.

The indexes were calculated, and the graphics were drawn using Microsoft Excel. The cartographic material was prepared in *QGIS* using the base map from the Latvian Geospatial Information Agency (Latvijas Ģeotelpiskās informācijas aģentūra n. d.) and the forest stand geospatial data from the State Forest Service database (Valsts meža dienests n. d.).

Results and discussion

A total of 106 diatom species were identified in samples collected from the Age Stream and 138 – in the samples collected from the Rusinupe Stream. There were less observed species in 2018, except in the samples collected from the Age Stream, downstream the inflow of the ditch. On average, 37 species were detected in 2017 and 20 species – in 2018 in the samples collected from the Rusinupe Stream upstream the trial plot (the control zone). 33 species in 2017 and 25 in 2018 were detected in the samples collected from the Rusinupe Stream downstream the experimental site (the impact zone). On average, 34 species in 2017 and 28 in 2018 were detected in the samples collected from the Age Stream upstream the inflow of the ditch (the control zone). On the contrary, 22 species in 2017 and 24 in 2018 were detected in the samples from the Age Stream downstream the inflow of the ditch (the impact zone).

The following genus were more abundant in the samples from the Rusinupe Stream: *Amphora*, *Cocconeis*, *Achnanthidium*, *Navicula*, *Fragilaria* and *Nitzschia*, while *Amphora*, *Cocconeis, Navicula, Gomphonema, Rhoicosphenia* and *Nitzschia* were more abundant in the samples collected from the Age Stream. *Fragilaria* is usually observed in waters with high concentrations with nitrites and ammonium nitrogen (Dziengo-Czaja et al. 2008). In this study, *Fragilaria* was detected both upstream and downstream the trial plot in Rusinupe Stream. *Navicula* and *Nitzschia* are adapted for both turbulent water and high nutrient concentrations (Rimet 2012). However, their tolerance to environmental factors varies depending on particular species (Dam et al. 1994). According to the values of Shannon's diversity index the diversity of diatoms has reduced in the both streams in the second year of monitoring. On average, the Shannon's diversity index values were higher in the impact zone of the Rusinupe Stream (

Figure **3**). On the contrary, the values were higher in the control zone of the Age Stream (

Figure **4**).

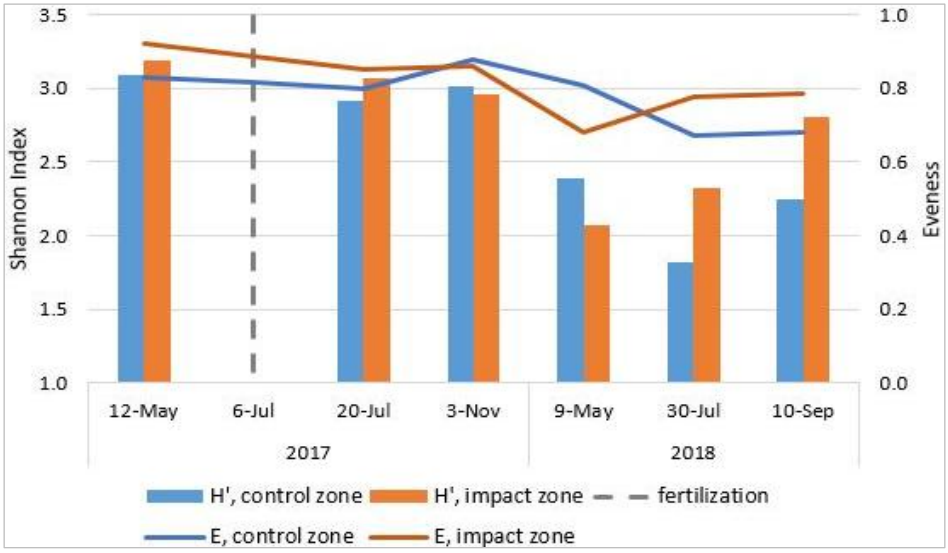

Figure 3. **Shannon's diversity index (H') and evenness (E) changes in the phytobenthos samples collected from the Rusinupe Stream**

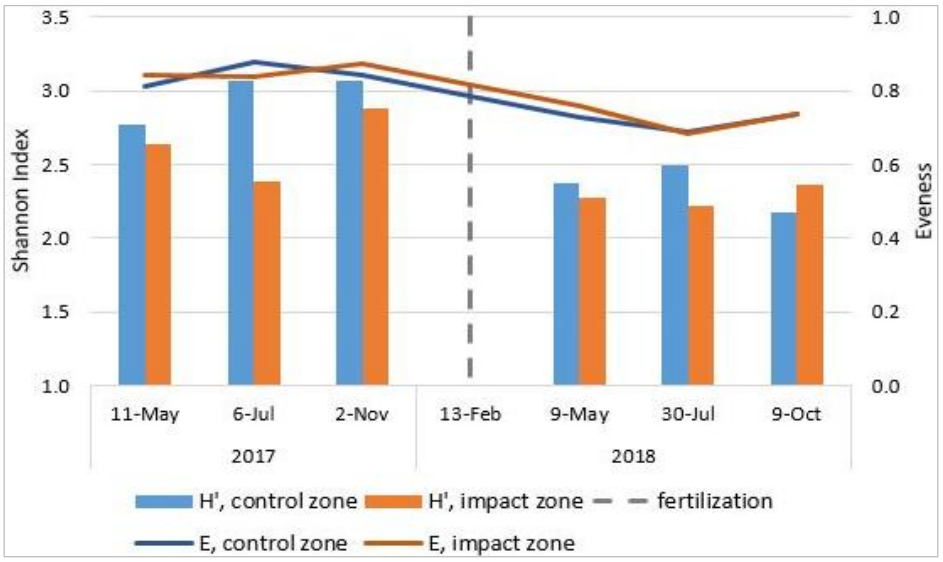

Figure 4. **Shannon's diversity index (H') and evenness (E) changes in the phytobenthos samples collected from the Age Stream**

The abundance of species also varied during the period 2017 – 2018. There was a similar tendency in the variability of Shannon's diversity indexes and evenness values in diatoms' samples from the Rusinupe Stream both upstream and downstream the trial plot. There was a decrease in these values in 2018. Namely, the average Shannon's diversity index values decreased from 3.01 to 2.15 in control zone while the average values changed from 3.07 to 2.40 in impact zone. Likewise, the average evenness values changed from 0.84 to 0.72 and from 0.88 to 0.75 – in the control and in the impact zone, respectively. The average Shannon's diversity index values changed from 2.97 to 2.35 upstream the inflow of the ditch and from 2.63 to 2.29 downstream the inflow of the ditch in the Age Stream, while average evenness values changed from 0.84 to 0.72 and from 0.85 to 0.73 –

upstream and downstream inflow of the ditch, respectively. The average values seem to indicate that there was higher diversity of diatoms in the impact zone of the Rusinupe Stream and, on the contrary, in the control zone of the Age Stream. Despite the decrease of diatoms' diversity downstream the inflow of the ditch in the Age Stream, these species were more equally abundant. A possible explanation is that less dominant or rare diatoms' species were detected in 2018. The cause might be changes in an environmental factor or several factors that are more beneficial for some species while unfavourable for others. However, these results should be interpreted with caution. In both streams, dams of beavers were observed. In the Rusinupe Stream, beaver dam was observed upstream the trial object in autumn 2018. It could explain the lower abundance and diversity of phytobenthos species in the particular sector of the river. In the Age Stream, the beaver dam was observed downstream the inflow of the ditch in both monitoring years. The dam altered stream's velocity. It could explain the generally lower phytobenthos diversity in the Age Stream.

The mean values of water temperature and dissolved oxygen show the differences between the study years rather than the differences between the control zone and the impact zone (

Table **2**). Namely, observed higher water temperature and lower concentration of dissolved oxygen could be the key factor of changes in the composition of phytobenthos, since diatoms are sensitive to changes in aquatic environment (Falasco et al. 2009)

Table 2. **Annual average water temperature and dissolved oxygen concentration in the monitoring points of the Rusinupe Stream and the Age Stream**

Year	Rusinupe Stream				Age Stream	
	Water temp. (°C)		O_2, mg/l		Water temp. (°C)	O_2, mg/l
	control	impact	control	impact	impact	impact
2017	7.4	7.1	8.84	8.24	8.0	5.98
2018	9.8	9.4	7.11	8.12	9.4	4.48

There was slight increase in the deformities of diatom valves in the samples collected from the Rusinupe Stream (**Error! Reference source not found.**) – in total, from 31 to 32 in the control zone and from 17 to 24 in the impact zone. More rapid increase was observed in the samples collected from the Age Stream (**Error! Reference source not found.**) – in total, from 10 to 23 in the control zone and from 8 to 28 in the impact zone.

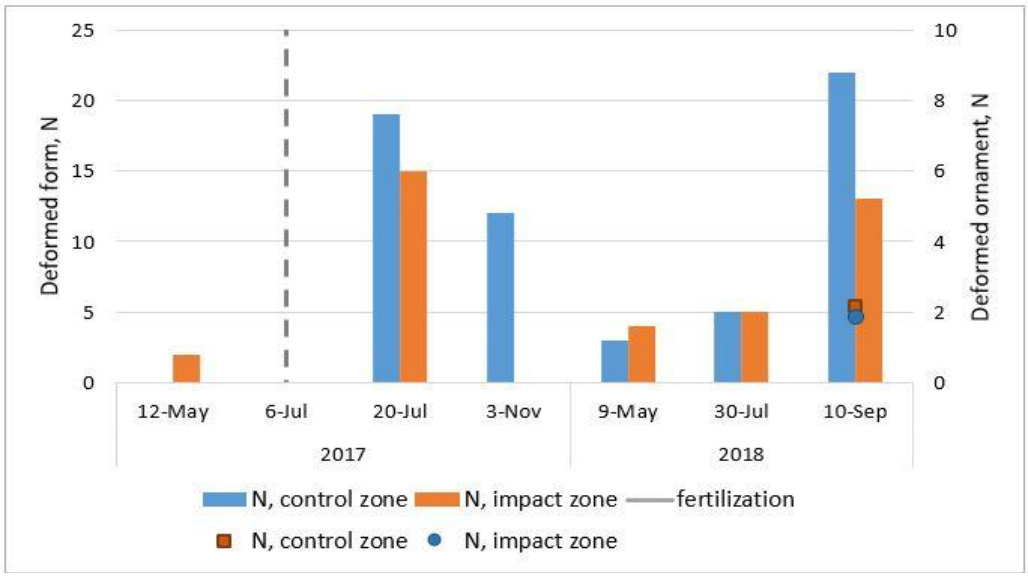

Figure 5. **Types of diatom deformities in the samples collected from the Rusinupe Stream**

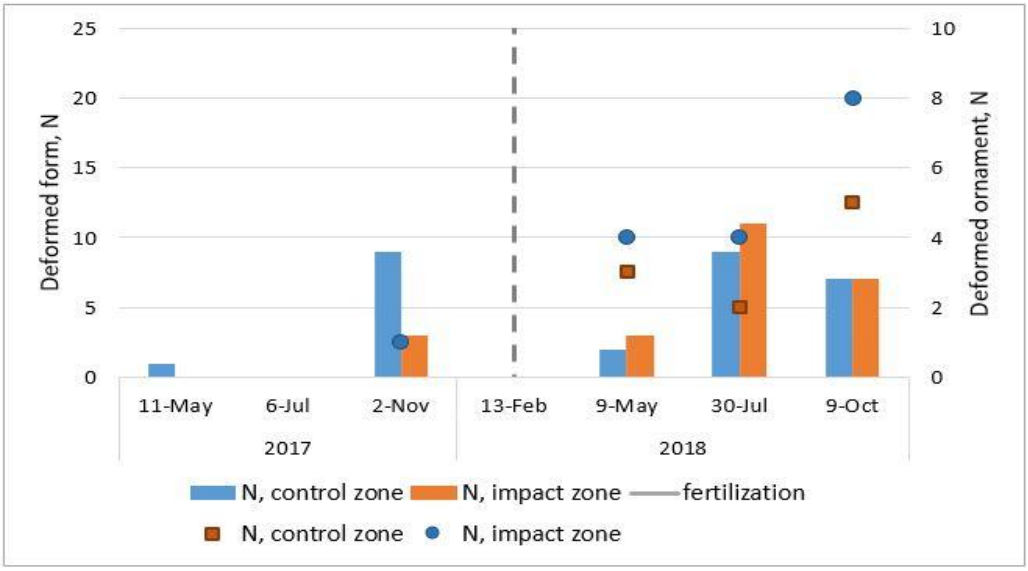

Figure 6. **Types of diatom deformities in the samples collected from the Age Stream**

It has been reported that environmental stresses, mechanical causes and nutrient level have an impact on diatoms' deformities (Falasco et al. 2009; Lavoie et al. 2017). This might show the impact of forest stand treatment with fertilizers. Still, the data should be interpreted with caution because of an atypically low water level in 2018. It has been reported on impact of the decreased discharge and dissolved oxygen on deformities of diatoms' valves (Falasco et al. 2009), while teratologies do not always correlate with contamination (Lavoie et al. 2017). However, there was relatively less strongly deformed forms in 2018 (**Error! Reference source not found.**; **Error! Reference source not found.**).

Conclusions

The initial results seem to indicate that neither soil enrichment with nitrogen containing fertilizer nor the application of wood ash have caused the changes in the phytobenthic diversity. The observed beaver dams have an impact on the monitoring sections of the Rusinupe Stream and the Age Stream that could be related to lower diversity of phythobenthic species in the control zone of the Rusinupe Stream and in the impact zone of the Age Stream. The results of the changes in the phytobenthos diversity indicate the impact of both lower concentration of dissolved oxygen and higher water temperatures in 2018 rather than the impact of the forest soil fertilization. The preliminary results of this study suggest conducting a correlation analysis to investigate whether there are statistically significant relationship between the diversity of phythobenthos and the chemical parameters of water.

Acknowledgements

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MONITORING AND CONTROL OF ODOUR EMISSIONS IN THE BALTIC STATES

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Abstract

Monitoring and control of odour emissions in the Baltic States

Key words: *odours, complaints, odour control, monitoring*

People are experiencing disturbing odors in many countries in the world, as evidenced by the growing number of publications. Disadvantageous emitters are most often encountered by residents living relatively close to industrial building sites, waste water treatment plants, landfills, farms and other objects. The control and monitoring of odor emissions require modern techniques and equipment such as field olfactometer, electrochemical, metal oxide and photoionisation detectors and others. In Latvia, the monitoring and control of odor emissions is carried out by the State Environmental Service, in Estonia by the Environmental Protection Department of the Environmental Inspectorate, and in Lithuania by the National Public Health Center, which is subordinate to the Ministry of Health. Of all three Baltic States, the highest number of complaints is in Latvia and Estonia, where more than 1000 complaints are received annually. While in Lithuania only a few hundred, for example, in 2018, 209 complaints were received in Lithuania. The number of complaints depends to a large extent on building characteristics and emission sources.

Kopsavilkums

Smaku emisiju kontrole un monitorings Baltijas valstīs

Atslēgvārdi: *smakas, sūdzības, smaku kontrole, monitorings*

Ar traucējošām smaku emisijām iedzīvotāji saskaras daudzās pasaules valstīs, uz ko norāda aizvien pieaugošo publikāciju skaits. Ar traucējošām smaku emisijām visbiežāk saskaras iedzīvotāji, kuri dzīvo salīdzinoši tuvu rūpnieciskās apbūves teritorijām, notekūdeņu attīrīšanas iekārtām, atkritumu poligoniem, fermu un citu objektu tuvumā. Smaku emisiju kontrolei un uzraudzībai ir nepieciešamas mūsdienīgas metodes un aparatūra, piemēram, lauka olfakometrs, elektroķīmisko, metāla oksīdu un fotojonizācijas detektori un cita. Latvijā smaku emisiju uzraudzību un kontroli veic Valsts vides dienests, Igaunijā – Vides inspekcijas vides aizsardzības departaments, savukārt, Lietuvā – Nacionālās Sabiedrības veselības centrs, kas ir Veselības ministrijas pakļautībā. No visām trijām Baltijas valstīm visvairāk iedzīvotāju sūdzību ir Latvijā un Igaunijā, kur gadā tiek saņemts vairāk kā 1000 sūdzības. Savukārt Lietuvā tikai daži simti, piemēram, 2018. gadā Lietuvā kopumā saņemtas 209 sūdzības. Sūdzību skaits lielā mērā ir atkarīgs no apbūves īpatnībām un emisijas avotiem.

Introduction

Air pollution is an agglomeration environmental problem, particularly in agglomerations cities and industrial zones. In addition to air pollution and the monitoring of pollutants, the attention of increasing population and controlling authorities is directly focused on odour emissions. Scientific publications are also increasing by devoted to identifying the most appropriate method, because, as a known odour emissions are subjective. The perception of odours also depends on the cause of the odour, the frequency, intensity, duration, the hedonic tone (disgust) and the nature of the site. Anton Ph. Van Harreveld (2014, 2015) has pointed out that over the past 30 years there is a tendency to opt out of a variety of judgments, but instead rely on quantitative measurements of odours.

Odour studies in recent years have increased the attention of scientists. Scientists have conducted odour emissions studies in both agricultural areas (Traube et al. 2006, Parker et al. 2010, Henry et al. 2011), other researchers have focused on emissions of waste water treatment plants (Gostelow et al. 2001, Munoz et al. 2010, Dlugosz and Gawdzik 2012), others, while industrial

emissions (Gage 2010). The appropriateness of the indirect (static) and direct (dynamic) method of olfaktometry (Bokowa 2012, Munoz et al. 2010, Traube et al. 2011, Brandt et al. 2010, Benzo et al. 2012, Capelli et al. 2013) and the persistence of odour samples during transport (Henry et al. 2011, Nicell 2009) have also been studied several times.

Similarly, mass media articles have increasingly included publications one missions of disturbing odours (Smirde Vecmīlgrāvī 2017), thus highlighting the topics.

Although more advanced technologies are increasingly being used to detect odour concentrations, such as electrochemical, metal oxide and photoionisation detectors (such as electrochemical, metal oxides, photo ionization detectors or "electronic noses"), which allows continuous indicative measurements of odours concentration, the human nose is still the best indicator for odours, so far, being able to detect odours also by their type.

Given that it is the population who is exposed to odour emissions and that the perception of odours can be individual for each citizen, the participation of the population and the provision of information on odour emissions is very important. In such a way, according to information provided by the population on the type, frequency, intensity and the like, the controlling authorities may identify the source of the emissions and take measures to reduce the odour.

The aim of the study was to involve all the competent authorities of the three Baltic States that deal with odour emissions control, there by gaining experience in exchanging information to promote more effective monitoring and monitoring of odour emissions in the Baltic States.

Material and methods

In view of the fact that the State Environmental Service carries out odour emissions control in Latvia, information regarding actual odours emissions, i.e. complaints from residents were collected using the register of complaints from the Service. The data was collected and visualized with MS Excel. Information was obtained from the complaint registration journal on the site, time, type of smell and potential sources of odours emissions. Information from Lithuania and Estonia was received in an already aggregated form, submitted accordingly by Milda Raičiene Head of Environmental Impact Assessment and Pollution Assessment Department, Ministry of Environment and Environmental Protection of Lithuania, Ingrida Skridailienė Head of Public Health Safety Control Department of Lithuania National Public Health Centre and General Directorate for Environmental Protection of Estonia Silva Prihodko.

Some companies in Latvia have installed electrochemical, metal oxide and photon ionization detectors or "electronic noses" in the public building area. These "electronic noses" perform continuous odor measurements. Measurement results provide information on odor concentration in odor units (ou_E). The data from the monitoring stations were processed with MS Excel.

Considering that the population is the main indicator, which evaluates the existence of a disturbing odour in a given area, as well as to assess whether disturbing smells in the administrative territory of Riga are considered to be a serious environmental problem, which may have an adverse effect on human health and well-being in order to obtain more detailed information from residents regarding odour caused in the administrative area of Riga, 05.09.2017. On-line polls were created for "Deducing odours in the Administrative Territory of Riga". The polls closed at 06.09.2018. i.e. the survey was active for a one-year period. 566 respondents have responded to the survey.

Results and discussion

For the visualization of data and the perception of information, the results of the study are further distributed to each country.

Estonia

In Estonia, smell control shall be performed by the Environmental Protection Department of the Environmental Inspectorate. Referring to letter No 14-1/17/4451 (Prihodko 2017) of General inspector Silva Prihodko of that institution, complaints of interfering odours received by telephone are recorded in the OKAS database in Estonia. According to data from the database, in Estonia, more than 1000 citizens receive phone complaints every year (Fig. 1). An analysis of the 5-year period (including 2012–2016; no full data for 2017) leads to the conclusion that in 2014 Estonia received the most complaints from citizens, i.e. 1512, while in 2013 there were almost 500 fewer complaints.

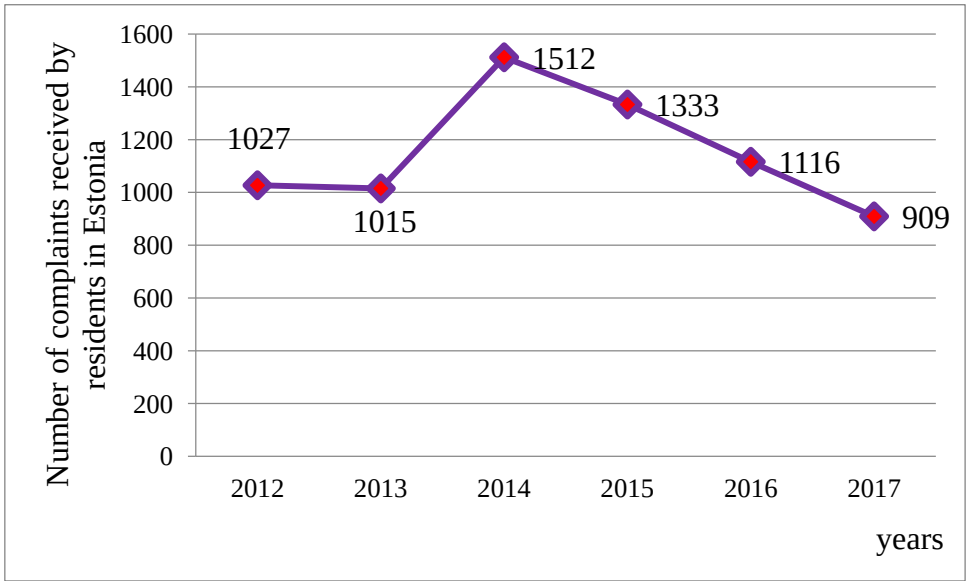
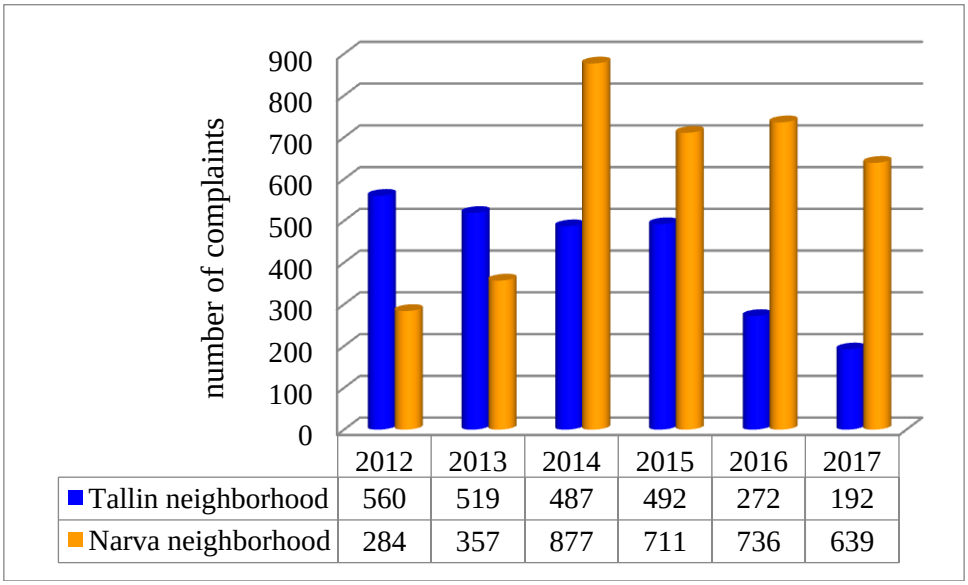


Figure 1. **Number of complaints received in Estonia concerning disturbing odors during the period from January 1, 2012 to August 29, 2017**
(Source: Created by the author after Prihodko 2017)

Following the information provided by Silva Prihodko (2017), the most complaints are received in the areas of Tallinn and Narva, where more than 200 complaints are received in each region during the year. In 2012 and 2013 the number of complaints in the Estonian capital (Tallinn) was more than in Narva's neighborhood, but as of 2014 the number of complaints in Narva's neighborhood has increased rapidly, i.e. by several hundred (Fig. 2).



	2012	2013	2014	2015	2016	2017
Tallin neighborhood	560	519	487	492	272	192
Narva neighborhood	284	357	877	711	736	639

Figure 2. **Number of complaints received in Tallinn and Narva neighborhoods about nuisance odours between January 1, 2012 to August 29, 2017**
(Source: Created by the author after Prihodko 2017)

The largest emissions of the nuisance odours in Narva's neighborhood come from chemical plants and port areas. In the neighborhood of Tallinn, complaints are about the smells of fuel, i.e. gas and petroleum products.

At present, in Estonia, the controlling body, when receiving complaints from residents regarding harmful odours, evaluates emissions from the smell on site, as well as emissions from the odour of polluting activity, i.e. the odours generated by the operation of oil terminals have been calculated in theory. A pilot project on the port of Harju Muuga (near Tallinn) is currently being developed in Estonia, which plans to perform additional odour measurements together with air pollutants measurements.

Latvia

According to November 25, 2014 Cabinet Regulation No. 724, Regulations regarding the methods for determining odours caused by polluting activity, as well as the procedures for limiting the spread of such odours, the State Environmental Service shall be the competent authority in the assessment of odour disturbances. Like Estonia, in Latvia all received phone complaints are listed in the register of complaints.

In Latvia, for the determination of odour units, accredited laboratories use the field olfactometer (**State limited Liability Company** 2018), by which a sample of odour is collected in special bags directly from the source of emissions, then a team of not less than four experts in the laboratory shall determine the true level of smell, which results in a computer program it is possible to perform a calculation of odour distribution in a specific area.

The State Environmental Service, which is not an accredited laboratory, shall also carry out a survey of the territory upon receipt of complaints from the population and use the field olfactometer during the examination, with which measurements are carried out under the conditions of the field. The measurements are carried out by one person, i.e. the inspector, so the measurements of one person cannot be considered accredited, so that the odour measurements carried out by the inspector are indicative. If the inspector finds disturbing odors during the examination and has determined the odour concentration, he or she shall carry out a survey of the undertaking and shall check whether the polluting activity is performed in accordance with the permit issued.

Telephone complaints received by the State Environmental Service have been listed since the third quarter of 2015. For an analysis of a period of three years (Fig. 3), the most complaints received in 2017. About a third of the complaints received have been registered in the administrative territory of Riga.

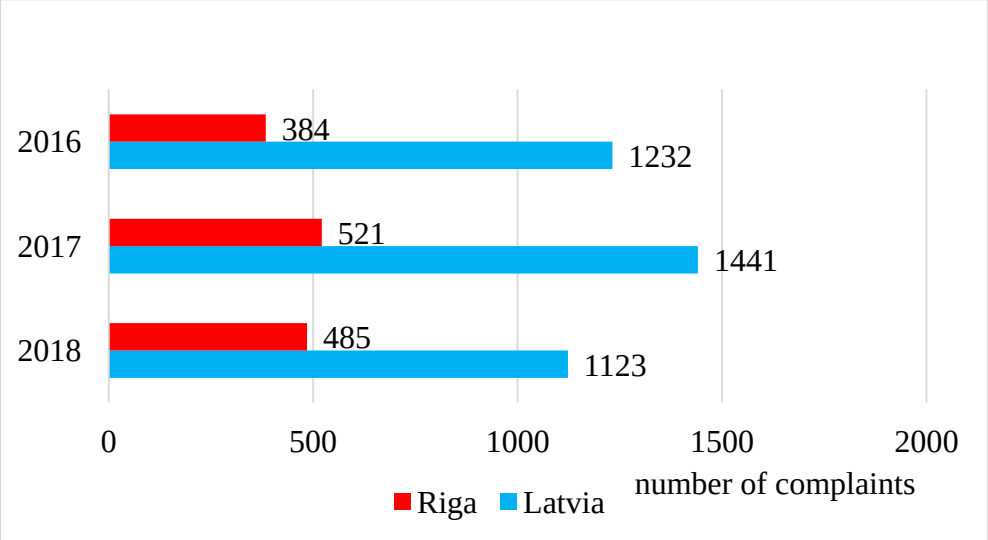


Figure 3. **The number of complaints received by residents in Latvia about disturbing smells over the period 2016–2018**

In Latvia, most complaints have been received about the smells of petroleum products. The most affected areas are the northern part of Riga (the territory of Riga Free Port), the territory of Ventspils Free Port and the western part of Incukalns county from 2015 to early 2018. Electrochemical, metal oxide and photoionisation detectors, known as “electronic noses”, are installed in all these areas. These “electronic noses” carry out continuous measurements of the

odour concentration. The results of the measurements shall ensure the possibility of obtaining information on the odour concentration, expressed in the odour units (ou_E).

In Latvia, regulatory enactments prescribe that the target value of the odour, which is determined for an hour period, is 5 ou_E/m^3. In the case of polluting activities which cause a disturbing odour, the target value of the odour must not exceed 168 hours per calendar year (Republic of Latvia Cabinet Regulation No. 724 2014).

The monitoring station in Riga has repeatedly recorded overshoots in 2017 (Fig. 4) and 2018 (Fig. 5). It is also essential that a high intensity of odour persists for several hours, which means that such odours may adversely affect people's well-being and health, knowing that a person already senses the smell at 1 unit of odours.

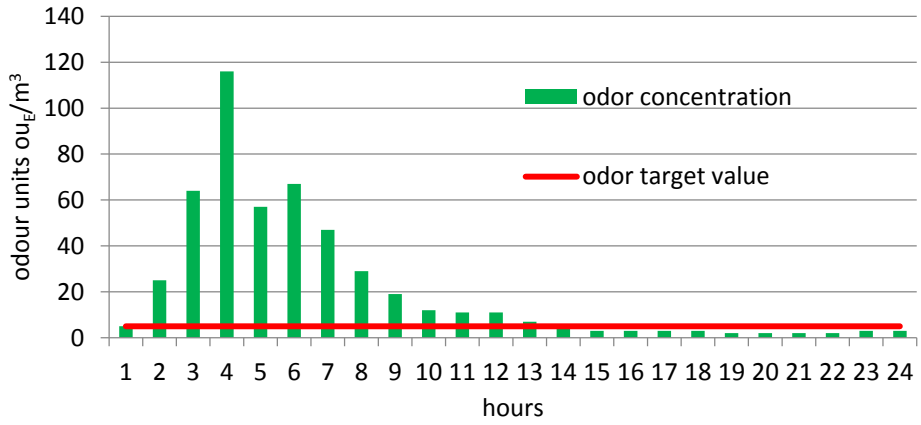


Figure 4. **Odour concentration an hour period from "electronic noses" on 29.07.2017.**

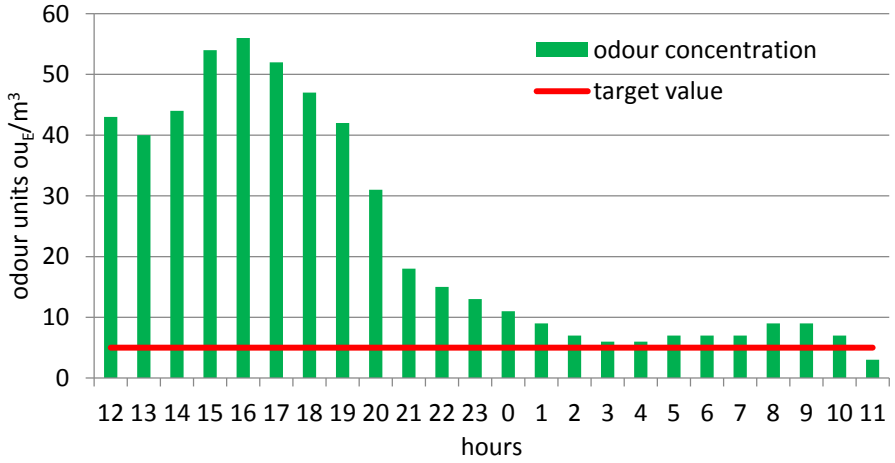


Figure 5. **Odour concentration an hour period from "electronic noses" on 20–21.04.2018.**

Regarding the spread of disturbing odours in Riga, the majority of the population, i.e. 416 respondents, or 73.5%, think that Riga is often the source of disturbing odours. A relatively large number of respondents, i.e. 118 or 20.8%, think that there are disturbing odours in Riga but

relatively rare. Only 2% of the respondents, respectively, 11 people say that disturbing odours have not felt in the administrative territory of Riga. 3.7% of respondents or 21 inhabitants have given a broader explanation on the spread of odour in Riga, for example, in Mangaļi, Mīlgrāvis, Vecmīlgrāvis, Sarkandaugava and Bolderāja, there are very often disturbing odour, in the outermost regions the odour intensity decreases.

Lithuania

Smell measurement and odour distribution control in Lithuania shall be carried out by the National Public Health Centre which is under the Ministry of Health. This area doesn't fall within the competence of the Ministry of the Lithuanian Environment and Environmental Protection Agency, which carries out air pollution control and monitoring (Raičiene 2017).

The Lithuanian controlling authorities receive significantly fewer complaints from the population regarding the odour of disturbance (Fig. 6). In 2018, the number of complaints has been half as high as in 2017. According to Head of Public Health Safety Control Departament Ingrid Skridailienė: "Complaint regarding odours nuisance from people are in the written form can be signed by one or more persons. For example, Klaipeda department of National Public Health Centre received 2 complaints regarding odours caused by the operators were signed by 878 people".

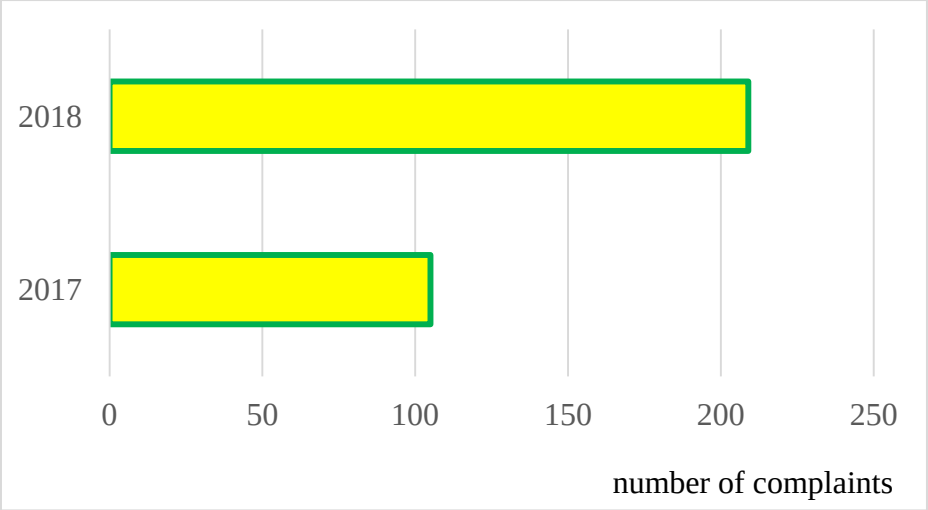


Figure 6. **The number of complaints received by residents in Lithuania about disturbing odour over the period 2016–2018**

There are received complaints regarding odours from food preparation units (restaurants, cafeteria, etc.), livestock farming, sewage and waste, etc. The Fig. 7. shows the complaints received in Lithuania in 2018.

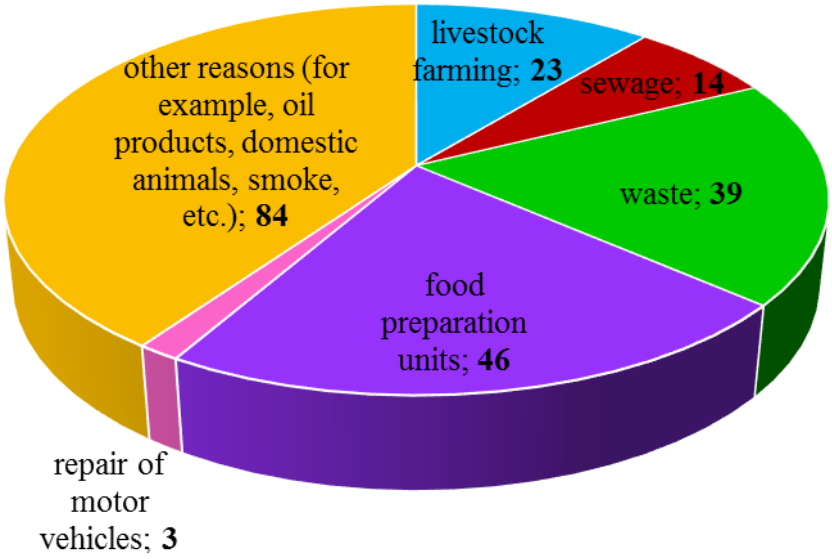


Figure 7. **Distribution of complaints received by type by National Public Health Centre of Lithuania in 2018**
(Source: Created by the author after Skridailienė 2019)

Conclusions

The results obtained allow some conclusions to be drawn. The competent authorities of Latvia and Estonia have received the most complaints from residents about disturbing odours. Latvia and Estonia receive over 1000 complaints every year, while in Lithuania only over 100 – 200. Of course, one written complaint can be signed by several hundred people. Like in Lithuania, written complaints with several signatures are received in Latvia, however, this study only summarizes telephone complaints, as written and telephone complaints are registered in other databases. Additional studies are needed to determine why the number of complaints is different in the Baltic States, whether this is related to building characteristics or to the development of technological processes or other factors. Currently, monitoring equipment for continuous odour measurements has been installed only in Latvia, which in turn points to well higher odours emissions as determined by modeling and calculations. The majority of respondents consider that disturbance is often felt in Riga. Also, “electronic noses” indicates high odor units. If the type of odor is known, such as oil products, these devices are a good control and monitoring mechanism. The competent authorities rely on the measurement of odours performed by an accredited laboratory directly in emission sources and on the calculation of emissions by computer programs, but actual emissions are well above theoretical estimates.

Acknowledgement

The authors express great gratitude to the competent authorities of all three Baltic States, which carry out odour emissions control, for their willingness and information.

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KVARTĀRVIDES PĒTĪJUMI / RESEARCHES OF THE QUATERNARY ENVIRONMENT

GRANULOMETRIC COMPOSITION OF AEOLIAN SEDIMENTS IN THE DVIETE FOREST

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Abstract

Granulometric composition of aeolian sediments in the Dviete forest

Key words: *aeolian sediments, inland dunes, European Sand Belt, granulometric composition, Folk and Ward granulometric indicators*

The complex of aeolian landforms in the Dviete forest, northward from Dviete village (SE Latvia), mainly represented by parabolic inland dunes, has been investigated using an accurate and detailed analysis of the granulometric properties of sand deposits. For this purpose, 26 samples of aeolian sediments were collected from the crests of inland dunes. Subsequently laser diffraction analysis of grain size distribution was carried out and data on Folk and Ward (1957) granulometric indicators, namely, mean grain size (M_z), sorting (σ), skewness (Sk) and kurtosis (K_G) were obtained. In order to study the grain-size characteristics of aeolian sediments, regression analysis was applied and bivariate scatter diagrams of granulometric parameters were plotted. The results indicate that aeolian landforms in the study area are composed of fairly homogenous fine-grained, well-sorted and moderately well-sorted material, thus revealing the conditions of wind transport and sedimentation processes in SE Latvia. However, further field work has to be carried out and more samples have to be analysed to obtain more reliable data in terms of geographic representativeness, as well as to elucidate the spatial variability of granulometric indicators.

Kopsavilkums

Dvietes meža eolo nogulumu granulometriskais sastāvs

Atslēgvārdi: *eolie nogulumi, iekšzemes kāpas, Eiropas smilšu josla, granulometriskais sastāvs, Folk un Ward granulometriskie raksturlielumi*

Eolas cilmes reljefa formu komplekss, ko galvenokārt veido paraboliskas iekšzemes kāpas Dvietes mežā uz ziemeļrietumiem no Dvietes ciemata (DA Latvija), tika pētīts precīzi un detalizēti veicot smilšu paraugu granulometrisko īpašību analīzi. Šim mērķim 26 eolo nogulumu paraugi tika ievākti iekšzemes kāpu virsotnes daļās. Tālākā darba gaitā tika veikta daļiņu izmēru sadalījuma lāzerdifrakcijas analīze un tikai iegūti dati par Folk un Ward (1957) granulometriskajiem raksturlielumiem, t.i., daļiņu vidējo izmēru (M_z), šķirotības pakāpi (σ), asimetrijas koeficientu (Sk) un ekscesa koeficientu (K_G). Lai noskaidrotu eolo nogulumu granulometrisko raksturlielumu savstarpējo saistību, tika pielietota regresijas analīze un tika izveidotas punktu izkliedes diagrammas. Iegūtie rezultāti parāda, ka pētījumu teritorijā esošās eolās reljefa formas ir veidotas no diezgan homogēna, smalkgraudaina, labi līdz vidēji labi šķirota materiāla, tādejādi liecinot par apstākļiem, kādos DA Latvijā norisinājās vēja transporta un akumulācijas procesi. Tomēr ir nepieciešams veikt turpmākus lauka pētījumus un izanalizēt lielāku skaitu paraugu, lai iegūtu ticamākus datus attiecībā uz ģeogrāfisko reprezentativitāti, kā arī lai noskaidrotu granulometrisko raksturlielumu telpisko variabilitāti.

Introduction

The Late Pleistocene and Holocene aeolian sand deposits and associated landforms of the "European Sand belt" (Zeeberg 1998) – aeolian sedimentation areal, which stretches over Europe from Belgium and The Netherlands in west to Baltic states and Lake Ladoga in east – recently have been the focus of many studies. These researches have been carried out to establish geochronology of sedimentation (e.g. Vandenberghe et al. 2013; Kalińska-Nartiša et al. 2015), as well as paleoclimate and paleoenvironmental conditions during the phases of aeolian activity and stabilization (e.g. Kasse 2002; Kalińska-Nartiša et al. 2016; Hirsch et al. 2017).

The area of late Pleistocene and Holocene aeolian sediments belong to the NE part of 'European Sand Belt' and is documented in maps of Quaternary geology (Juškevičs et al. 2003). It is located in the Dviete forest, northward from Dviete village, SE part of Latvia. The topmost Quaternary sediments in this part of the East Latvian lowland are considered to be deposited in the Nīcgale ice-dammed lake (Eberhards 1972), where glaciofluvial and glaciolacustrine sedimentation occurred in a front of the retreating Lubāns ice lobe after the Gulbene deglaciation phase (Zelčs and Markots 2004). During this deglaciation phase, which based on ^{10}Be exposure ages (Rinterknecht et al. 2006) has been estimated between 14.6 and 12.6 Ka, glacial meltwater and precipitation runoff from nearby uplands transported material to the ice-dammed lake. After drainage of the lake glaciolacustrine plains and deltas of the glaciofluvial streams developed. Subsequently, under subaerial conditions in a cold and dry climate the unconsolidated sandy sediments were re-mobilized by wind, forming inland dunes. Hence, landforms of aeolian origin can be observed in the area, where the dunes are rather sparse, with an easy-distinguishable morphology – an asymmetric cross profile and U-shaped or parabolic configuration in planar view (Soms 2018).

Inland dunes in the Dviete forest remains insufficiently studied in comparison with the territories of aeolian sediment distribution in Western and Central Europe. Hence, the objective of this study was to analyse granulometric composition of the aeolian sand deposits from the Dviete forest in order to obtain data on the mean grain size and other Folk and Ward (1957) indicators, i.e. sorting, skewness and kurtosis.

Material and methods

During field works a total of 26 representative bulk samples for granulometric composition analysis, each with a mass of about 200 g, were collected from the crests of inland dunes in the Dviete forest. To obtain samples shallow pits were prepared and samples were taken by stainless steel spatula directly from manually cleaned sections at a depth of 0.5 to 0.8 m, i.e. from the C horizon of soil. After that all samples were stored in labelled plastic bags. The precise location of all sampling sites was recorded by GPS device TRIMBLE *Juno SB Handheld*.

Considering the fact that laser diffraction method provides more information and is more efficient than the dry sieving and the sieve-hydrometer methods (Goossens 2008; Di Stefano et al. 2010), laser diffraction method was chosen to perform the granulometric analysis and to obtain data on grain size distribution in aeolian sand samples. For this purpose, first of all, sand samples were air-dried for two weeks in a laboratory and after that sieved with a 2 mm Endecotts geotechnical mesh to remove organic matter like fragments of roots. Subsequently, samples were soaked in a sodium hexametaphosphate $(NaPO_3)_6$ solution (5 g L^{-1}) to break cohesion. After that they were analysed with a laser diffraction analyser Malvern Mastersizer 2000 equipped with Hydro 200MU dispersion unit in the Laboratory of Quaternary Environment, Daugavpils University. Sand samples

were suspended in deionised water until optimal obscuration range between 10% and 20% was reached. Then, the suspension was subjected to 60 seconds long ultrasonic displacement at stirrer speed 2800 rpm to achieve homogenous dispersion.

For the calculation of particle size, a refractive index of 1.333 for deionised water and the index of 1.55 for the particles was used by applying the Mie theory (Jones 2003). For each sample six repetitions of measurement per aliquot were performed and the duration of each measurement cycle was 30 seconds. The estimated error of replicate measurements was within 0.3%.

Data processing on granulometric composition was carried out by GRADISTAT module (Blott and Pye 2001), which can be integrated with MS Excel environment. In this software, grain size was converted into *phi* units ($\Phi = -\log_2 d$, where d is grain size in millimetres). Data on Folk and Ward (1957) granulometric indicators, namely, mean grain size (M_z), standard deviation or sorting (σ), skewness (Sk), and kurtosis (K_G) were determined by formulas (1 to 4) as follows:

$$M_z = \frac{\Phi 16 + \Phi 50 + \Phi 84}{3}, \quad (1)$$

$$\sigma = \frac{\Phi 84 - \Phi 16}{4} + \frac{\Phi 95 - \Phi 5}{6.6}, \quad (2)$$

$$Sk = \frac{\Phi 16 + \Phi 84 - 2\Phi 50}{2(\Phi 84 - \Phi 16)} + \frac{\Phi 5 + \Phi 95 - 2\Phi 50}{2(\Phi 95 - \Phi 5)}, \quad (3)$$

$$K_G = \frac{\Phi 95 - \Phi 5}{2.44(\Phi 75 + \Phi 25)}, \quad (4)$$

where Φ5, Φ16, Φ25, Φ50, Φ75, Φ84 and Φ95, represent the grain diameters in *phi* units at 5, 16, 25, 50, 75, 84 and 95 cumulative percentiles of the sample, respectively.

Following the procedures described in scientific publications (Liu et al., 2014; Zhu & Yu, 2014), regression analysis was performed and bivariate scatter diagrams of grain-size parameters – mean grain size (M_z), standard deviation or sorting (σ), skewness (Sk), and kurtosis (K_G) – were plotted to study the grain-size characteristics of the aeolian sediments.

Results and discussion

The analysis of granulometric composition of Quaternary sediments, including aeolian ones, is usually applied to obtain useful information on particle components and their transport and sedimentation processes, namely, suspension, saltation, and surface traction or sliding. The obtained results demonstrate that the mean grain size M_z of the aeolian deposits across the inland dune field in the Dviete forest ranges between extremes of 143.1 μm and 232.4 μm, or between 2.805 and 2.105 *phi* units, respectively. Hence aeolian landforms in the study area are composed of fairly homogenous, fine-grained sands according to the Udden-Wentworth grain-size scale of sediment

(Wentworth 1922). Most frequent classes of mean size of particles in micrometres are the sizes between 150–160 μm, 170–180 μm, 200–210 μm and 210–220 μm (Fig. 1).

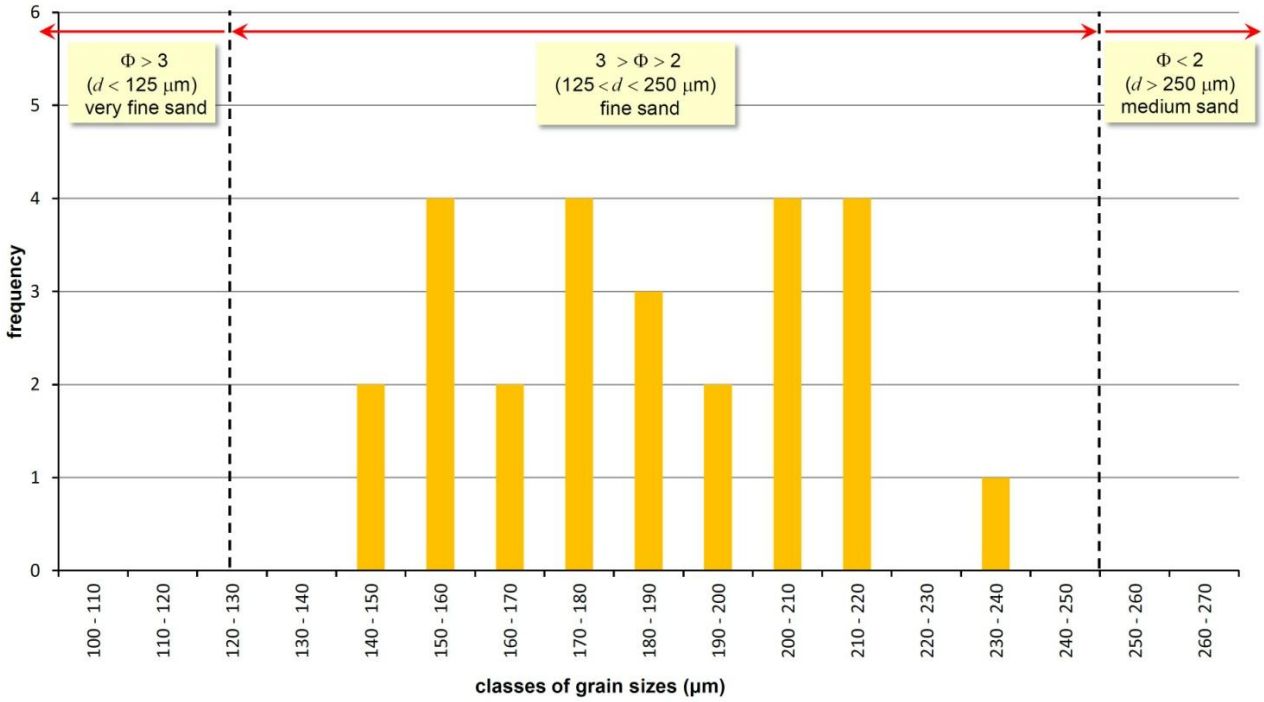

Fig. 1. **The frequency histogram of particle mean size classes composing the dune crest sands in the Dviete forest**

The distribution frequency histogram reveals the dominance of aeolian sediments of 2 – 3 *phi* values, whilst very fine sediments of 3 – 4 *phi* values, as well as coarser sediments of 1 – 2 *phi* values were not identified at all. It indicates the dominance of saltation and a balance between sand particles and comparatively low energy of local wind power during the sorting, transporting and deposition process.

A sand fraction is composed mainly of fine sand particles – more than 40% for each sample (Fig. 2). Each sample also consists of medium sand (20–30%) and very fine sand (mostly less than 20%). The results show that small parts of samples were identified as coarse sand and silt fractions (not more than 4% of each sample). An exception of these results is sample No. 4.9, which contains more silt than other samples (almost 10%). This is not the only difference for sample 4.9 – it showed atypical results in other granulometric parameters too (see further in a text).

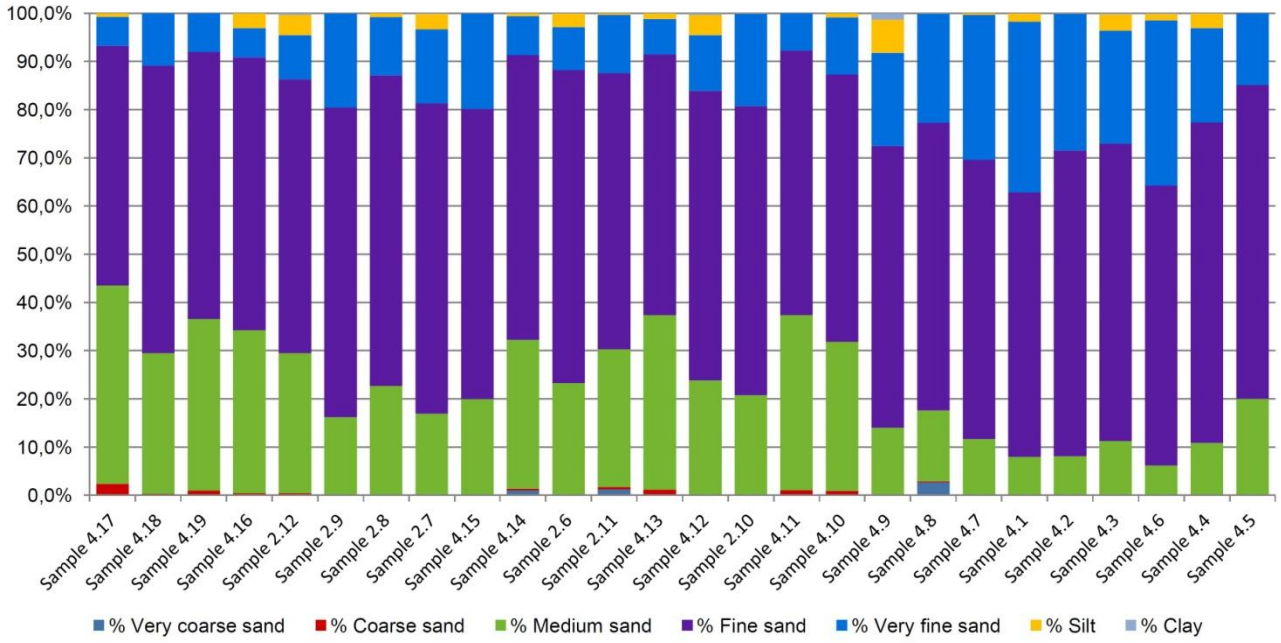

Fig. 2. **The granulometric composition of all analysed samples and percentage of different fractions of sand, silt and clay in aeolian sediments. The left-to-right sequence of samples in the graph corresponds to their geographic distribution across the dune field from the south to the north, where "Sample 4.17" is the furthest point in the south and "Sample 4.5" is the furthest point in the north**

The sediments of analysed aeolian sand samples demonstrate well and moderate sorting i.e. σ values ranges between 0.506 and 0.628 Φ with an exception 1,089 Φ for sample 4.9. The regression analysis of obtained data on mean grain size M_z values *versus* standard deviation or sorting σ and plotting of results in bivariate scatter diagram (Fig. 3) show that majority of the samples embed in the sector of σ values between 0.50 and 0.71, and accordingly can be described as moderately well sorted following the classification of sorting degree proposed by Folk and Ward (1957). With an increase of the mean size of particles, the sorting slightly decreases – higher σ values indicate less sorted material. However, this regularity is not confirmed by the statistical analysis, which indicate that there is not statistically significant negative linear correlation between mean grain size M_z and sorting σ (Pearson's correlation coefficient r = - 0,365 at p=0,06). The material that is sorted well, reveals that particles of sand have a similar size and that sediment accumulation by wind energy occurs evenly. Results of sample 4.9 are quite different and show that it is poorly sorted.

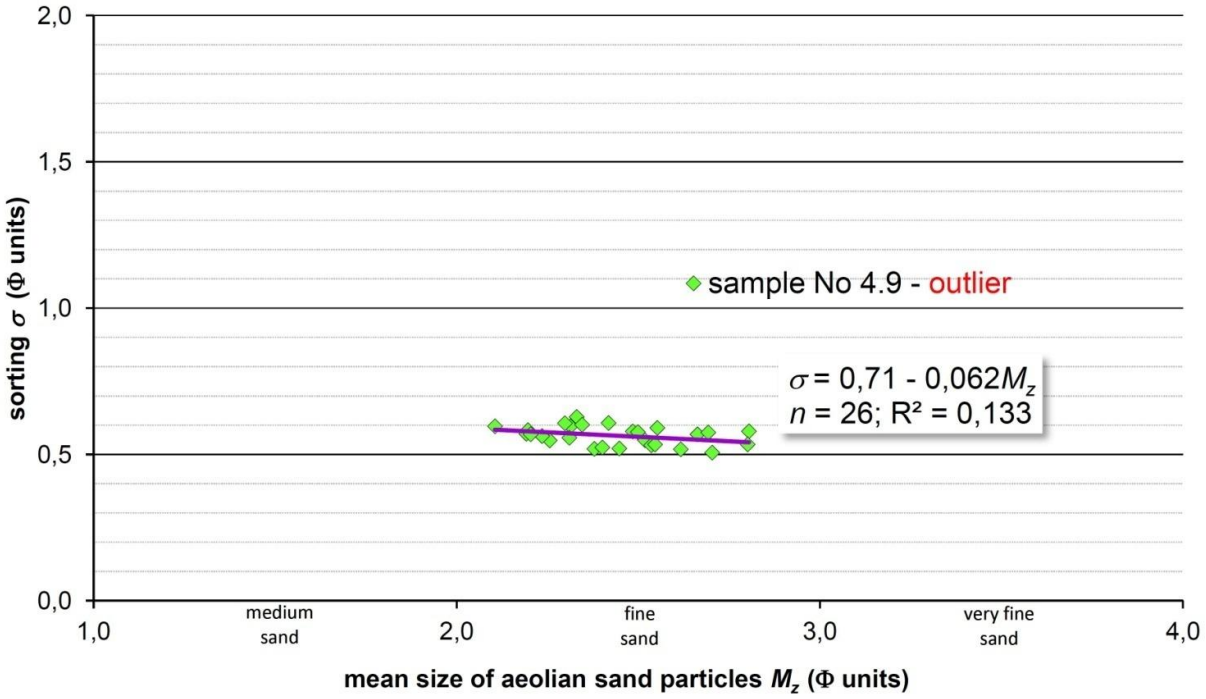

Fig. 3. **Relationship between mean grain size M_z and sorting σ for aeolian sediments in the Dviete forest; the sample 4.9 is an outlier and was not included in the calculations**

The obtained results elucidate symmetrical bell-shaped distribution of particles of different fraction with both negative and positive skewness *Sk* values ranging from -0.048 to 0.097 Φ, with an exception 0.358 Φ for sample 4.9. The regression analysis of obtained data on mean grain size M_z values *versus* skewness *Sk* and visualization of results in bivariate scatter diagram (Fig. 4) show that majority of the *Sk* values are between -0.10 and 0.10, and accordingly can be described as symmetrical or nearly symmetrical following the classification of skewness degree proposed by Folk and Ward (1957). It means that samples have a normal distribution of particles and there is no deviation to fine-grained or coarse-grained fraction, except sample 4.9, which is strongly coarse-skewed and hence has deviation to a fine-grained fraction.

There is no well-expressed trend of skewness *Sk* value changes with increase or decrease of mean size of particles (R^2 = 0,003). However, in several samples the middle classes of grain sizes corresponding to Φ values from 2.2 to 2.5 (210 μm to 175 μm, respectively) weakly tend to positive asymmetry, indicating deviation to fine-grained or coarse-grained fraction. In addition, the statistical analysis indicates that there is not statistically significant negative linear correlation between mean grain size M_z and skewness *Sk* (Pearson's correlation coefficient r = -0,0056 at p=0,977).

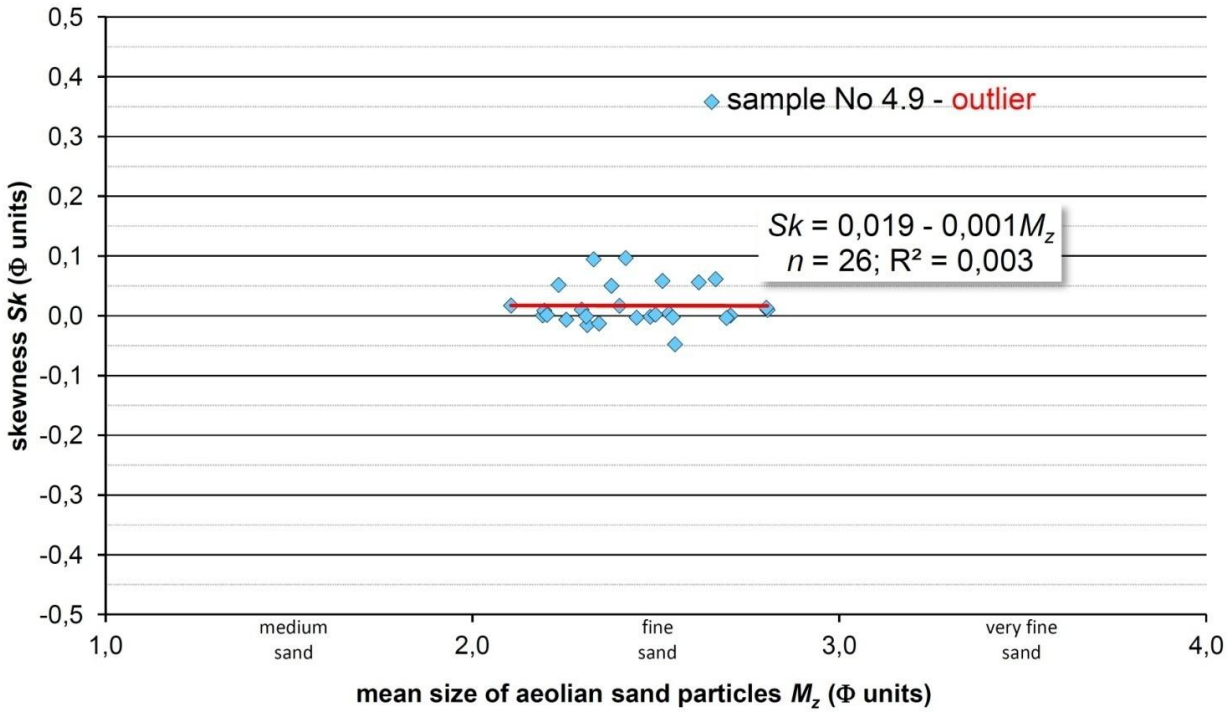

Fig. 4. **Relationship between mean grain size M_z and skewness *Sk* for aeolian sediments in the Dviete forest; the sample 4.9 is an outlier and was not included in the calculations**

For the values of graphic kurtosis K_G, results showed that sand from the Dviete forest is mesokurtic, with *phi*-transformed kurtosis values averaging 0.98, ranging from 0.94 to 1.09 with an exception 2.50 for sample 4.9. This means that sorting in fine-grained, medium-grained and coarse-grained fraction interval is similar. According to data given in literature, extremely high or low K_G coefficient values indicate that high energy wind affected sand during the transportation and sedimentation, and as a result the accumulation was not steady. In this case, results obtained by authors do not indicate that.

Similarly, to skewness, there is no well-expressed trend of K_G value changes with increase or decrease of mean size of particles (R^2 = 0,005). The statistical analysis also indicates that there is not statistically significant positive linear correlation between mean grain size M_z and kurtosis K_G (Pearson's correlation coefficient r = 0,0069 at p=0,972).

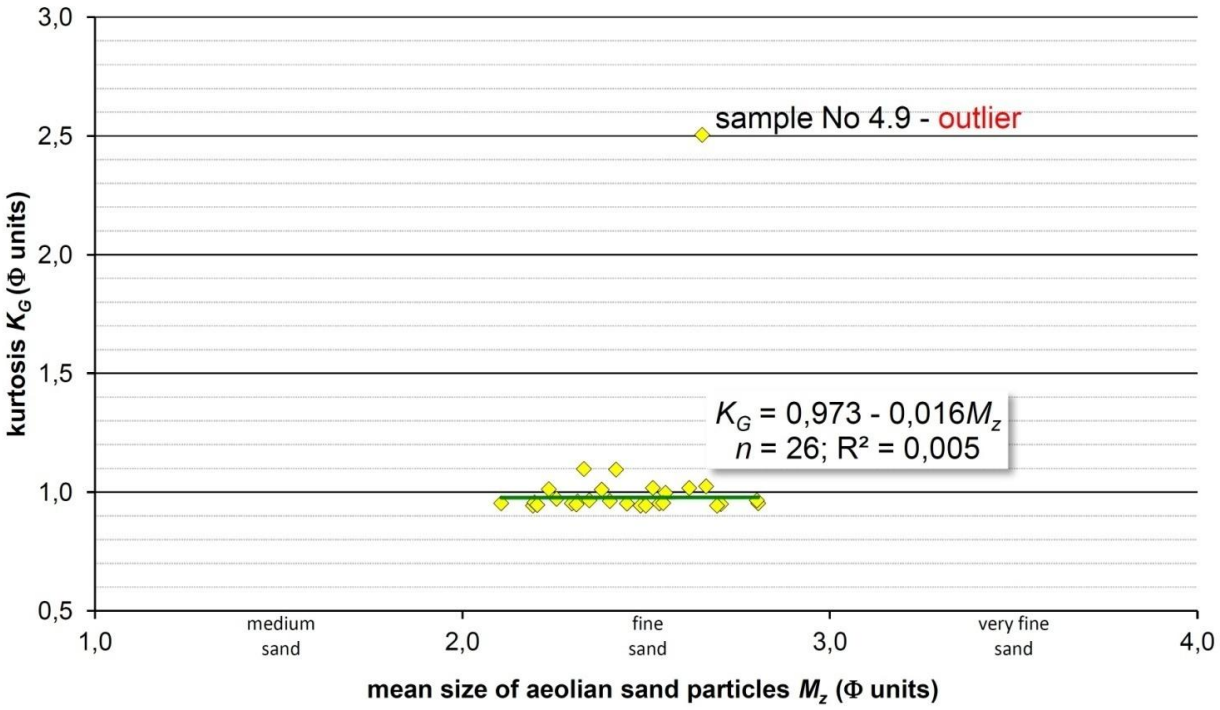

Fig. 5. **Relationship between mean grain size M_z and graphic kurtosis K_G for aeolian sediments in the Dviete forest; the sample 4.9 is an outlier and was not included in the calculations**

As mentioned before, sample 4.9 shows well-expressed differences in results in comparison with other samples. The review of geomorphological data and digital elevation model of the Dviete forest area shows that the sample 4.9 was collected on the crest of the largest inland dune located in the study territory. It is possible that these differences are related to a direction of paleo winds from west to east, which reflects in parabolic curvature of the dunes. That could mean that heavier material (coarse sand) was accumulated in the western part of the dune field, but lighter material (fine sand) was blown by wind further to the east. For now, only one sample is collected from this particular dune and research has to be continued to obtain more samples and results to verify this assumption.

Conclusions

The data obtained in the granulometric studies of aeolian sand samples from the Dviete forest indicate that plots of grain-size parameters can be used for the discrimination of wind transport and sedimentation processes. Considering that aeolian landforms in the study area are composed of fairly homogenous fine-grained material, it allows to conclude that grain size distribution at the local scale in inland dune is mainly governed by patterns associated with sediment sources and wind sorting.

The dominance of fine sand and very fine sand in samples is related to fine glaciolacustrine and glaciofluvial deposits, accumulated in this area during the Late Pleistocene deglaciation. In turn it is revealed, that aeolian sediments within the study area had been derived from pre-existing

glacioaquatic sediments, and during the past aeolian activity phases, these sediments had not been transported by wind far from nearby sources. Simultaneously, fine-grained sediments indicate the comparatively low kinetic energy of wind during the transportation and accumulation of aeolian sediments.

The values of sorting, skewness and kurtosis indicate unimodally distributed particles in deposited sediments with well-expressed dominance of single fraction, hence allowing to conclude that wind power during the sorting, transporting and deposition process was more or less even. This leads to assumption that subaerial environmental and climate conditions during the aeolian activity were steady. Thus, the study demonstrates the extent to which the granulometric properties of aeolian sediments can contribute to a better understanding of the regional depositional history and environmental changes during the transition from glacial to non-glacial conditions in SE Latvia.

This preliminary study remains limited to the number of sampling sites; hence, the problem of geographic representativeness may exist. Further field work and obtainment of more sand samples have to be carried out in the future to conduct a more reliable research. In addition, optically stimulated luminescence dating of aeolian sand is required to establish the luminescence-based chronology and to define the chronostratigraphic correlation between deposits in the inland dune field under study and the similar deposits in the north-eastern part of the "European Sand belt".

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