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BREAST CANCER RISK FACTORS – AWARENESS AND ATTITUDES OF WOMEN IN PERIMENOPAUSAL AND POSTMENOPAUSAL AGE (45+) IN POLAND

CZYNNIKI RYZYKA W RAKU PIERSI – ŚWIADOMOŚĆ I POSTAWY KOBIET W WIEKU OKOŁO I POMENOPAUZALNYM (45+) W POLSCE

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zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. Breast cancer (BC) is the most common malignant cancer among women in Poland. As we do not have sufficient knowledge about origin of this disease, women's awareness and attitudes concerning the few well-known BC risk factors play a key role in the prevention and early detection of BC.
Material and methods. The questionnaire was answered by 380 women, 45 years and older, in Poland between May and August 2017. This randomly selected research group included subjects with a prior history of BC, a current diagnosis of BC, and healthy women without any history of BC in the past. Women were asked about their knowledge and attitudes concerning BC risk factors. Collected data were analyzed using Microsoft Excel, taking into account place of residence and education level.
Results. Among probable BC risk factors, the most commonly indicated by the women were gene mutations (60%), long-term use of hormonal contraception (49%) and overweight and obesity (38%). The most rarely indicated factors were late full-term pregnancy (12%), childlessness (21%) and alcohol consumption (26%). About 72% of the respondents assessed their knowledge about BC as good or very good, but only 41% of this group indicated overweight and obesity - one of the strongest risk factors – as contributing to BC. Moreover, only 26% of women who assessed themselves as having a high level of knowledge perceived alcohol consumption as a risk factor.
Conclusions. Results suggest that education in this age group should be more efficient and more focused on raising awareness about well-known BC risk factors.

Keywords: breast cancer, primary cancer prevention, risk factors, menopause

Streszczenie

Wprowadzenie. Rak piersi jest najczęściej występującym nowotworem złośliwym wśród kobiet w Polsce. Ponieważ nadal nie mamy pełnej wiedzy dotyczącej etiologii tej choroby, świadomość kobiet oraz ich postawy odnoszące się do kilku dobrze poznanych czynników zwiększających ryzyko raka piersi pełnią kluczową rolę w jego prewencji i wczesnym wykrywaniu.
Materiał i metody. W okresie od maja do sierpnia 2017 r. przeprowadzono ustrukturyzowany wywiad pośród 380 kobiet w Polsce (w wieku 45 lat i starszych). Losowo dobrana grupa badawcza składała się z kobiet, które miały lub mają raka piersi, oraz zdrowych kobiet, bez historii choroby. Badane kobiety zostały zapytane o ich wiedzę oraz postawy dotyczące czynników ryzyka w raku piersi. Zebrane dane zostały poddane analizie przy użyciu oprogramowania Microsoft Excel, biorąc pod uwagę również takie informacje, jak miejsce zamieszkania i poziom wykształcenia kobiet.
Wyniki. Najczęściej wskazywanymi przez kobiety czynnikami ryzyka, jako prawdopodobnie przyczyniającymi się do wystąpienia choroby, były: mutacje genowe – 60% (228), przedłużone stosowanie hormonalnej terapii zastępczej (HTZ) – 49% (186) oraz nadwaga i otyłość 38% (137). Najrzadziej: późna ciąża – 12% (46), bezdzietność - 21% (80), spożywanie alkoholu – 26% (99). Swoją wiedzę dotyczącą raka piersi, jako dobrą lub bardzo dobrą oceniło 72% (274) badanych kobiet. W tej grupie tylko 41% (112) wskazało nadwagę i otyłość – jeden z najważniejszych czynników ryzyka. Tylko 26% wśród kobiet z wysoką samooceną wiedzy nt. choroby postrzegało spożywanie alkoholu jako czynnik ryzyka.
Wnioski. Wyniki badania sugerują, że edukacja w tej szczególnej grupie wiekowej kobiet powinna być bardziej efektywna i kładąca więcej nacisku na wiedzę dotyczącą czynników ryzyka w raku piersi.

Słowa kluczowe: rak piersi, prewencja pierwotna nowotworów, czynniki ryzyka, menopauza

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Introduction

Breast cancer (BC) is the most common type of malignant cancer in women around the world and one of the main cause of cancer death among women [1]. World Health Organization (WHO) estimates that about 2.1 million women have breast cancer yearly, with 627,000 deaths in 2018 (approximately 15% of all cancer deaths among women globally) [2].

According to the latest epidemiological data from the National Cancer Registry in Poland, 18,615 new BC cases were diagnosed (ASW/100,000 = 54.1) in 2016. During the same time period, 6,493 deaths were caused by BC (ASW/100,000 = 14.9). BC was the second leading cause of cancer deaths among women in Poland. Since 2007, lung cancer has caused more deaths, however since 2010 there has been an increase in BC mortality. Moreover, in 2016 in Poland 14.5% of all cancer deaths among women were caused by BC [3].

BC risk increases with age. This disease is most common for women at about the age of 50. Approximately 80% of all BC cases occur in the perimenopausal phase of life. However, during the last three decades, the incidence among younger women (20-49 years of age) has increased as well [4]. The relationship of age and BC incidence is also reflected in epidemiological data from the years 1999-2016 (Figure 1). BC incidence grows dramatically among women starting at age 40, and reaches a peak at about the sixth decade of life. Moreover, the risk of death due to BC increases with women's age as well (Figure 2).

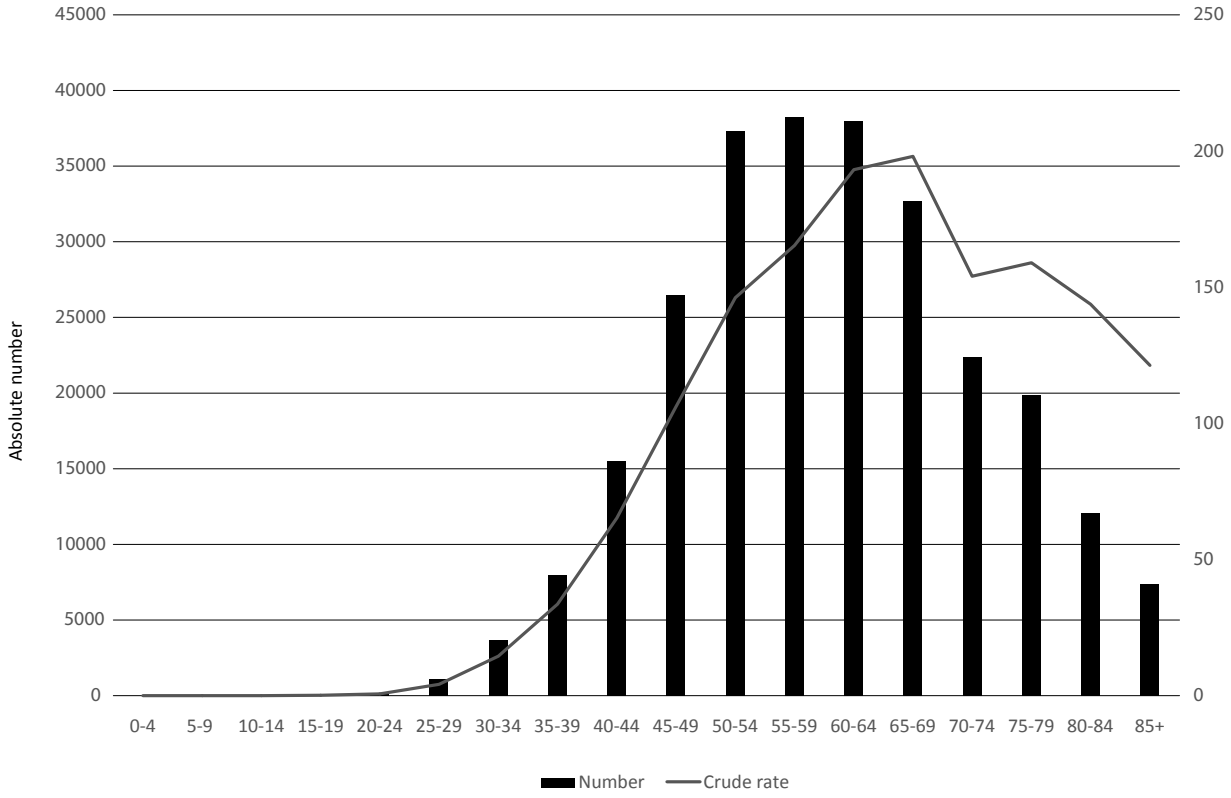

Figure 1. Breast cancer incidence by age groups in Poland in the years 1999-2016 (based on data from the National Cancer Registry in Poland, www.onkologia.org.pl)

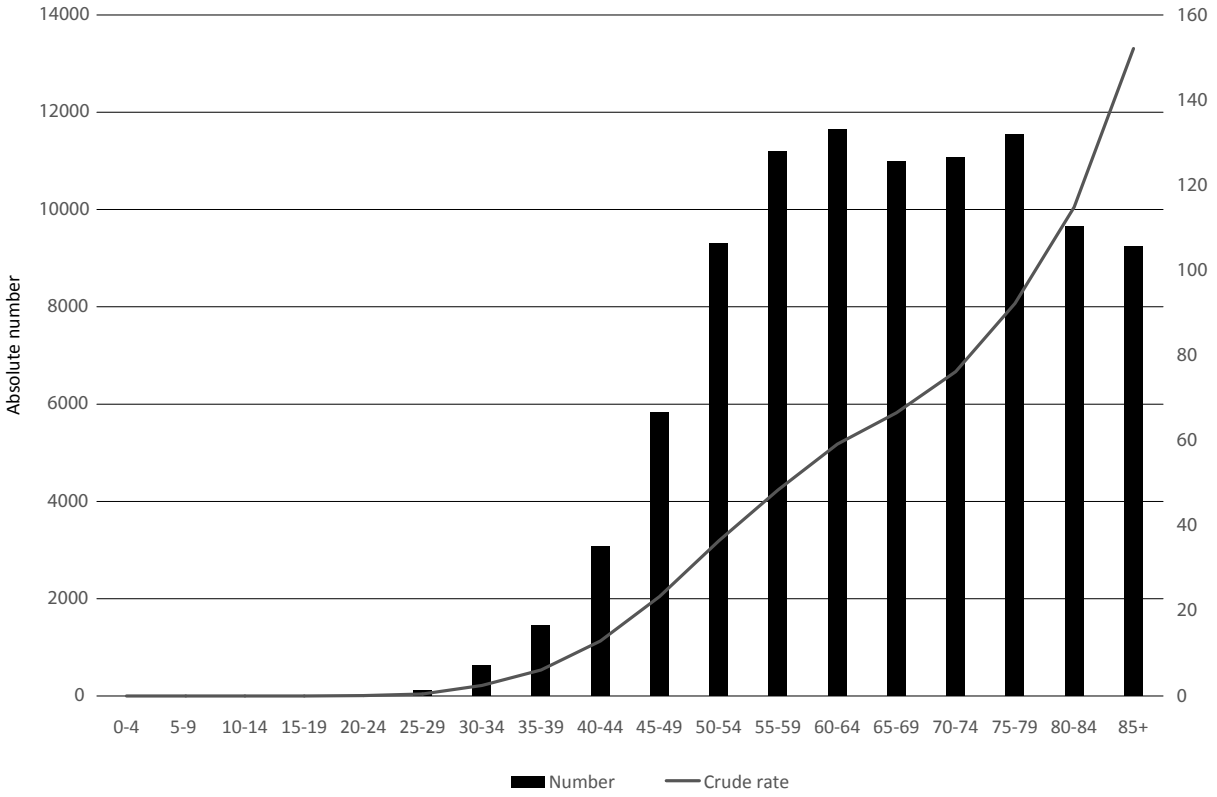

Figure 2. Breast cancer mortality by age groups in Poland in the years 1999-2016 (based on data from the National Cancer Registry in Poland, www.onkologia.org.pl)

Aging is one of the most important risk factors for all cancers, and this is also true for BC, as indicated in Figure 1. Nevertheless, apart from age, there are also well-known risk factors which have been identified as significant for BC development and which can be modified or eliminated. It has been estimated that 90-95% of all malignant cancers are caused by external factors connected with lifestyle while only 5-10% are primarily caused by genetics [5].

Overweight and obesity increase BC risk significantly, especially among postmenopausal women. The National Cancer Institute in the United States indicates that increased Body Mass Index (BMI) is undoubtedly one of the most powerful BC risk factors: a 5-unit increase in BMI results in about a 12% higher BC risk. Moreover, postmenopausal women with obesity present a 20-40% higher BC risk as compared to women at the same age but with regular weight [6]. About 50% of women who develop BC at an older age are also diagnosed with obesity. It has been estimated that the prevention of overweight could decrease the annual BC incidence rate in Europe by as much as 50% [7].

Another modifiable BC risk factor which is closely related to overweight and obesity is insufficient physical activity. In one study, women who were physically active had a BC risk 25% lower than those who were physically inactive [8]. The American Cancer Society stressed that this effect is especially visible among women after menopause [9].

Epidemiological data has proved that alcohol consumption is clearly linked with a higher BC risk. Drinking 1-2 drinks a day (15-30 grams of alcohol/day) increases BC risk about 30-50% in comparison with women who are abstainers [10]. This relation is observed among women both before and after menopause [11].

Among the other modifiable BC risk factors are also: prolonged use of hormonal replacement therapy (HRT), late full-time pregnancy (after the age of 30-35), and not having children. These all increase the overall risk of BC [8].

BC is a notably heterogeneous disease. Often it is caused by combination of variable risk factors – modifiable and not modifiable. As we still don't have sufficient knowledge about the origin of this disease, it is crucial to reduce exposure to well-known risk factors in order to decrease BC incidence and mortality as much as possible.

Material and methods

Data was collected with a questionnaire constructed specifically for the purpose of this study, addressed to women in the perimenopausal and postmenopausal ages. The inclusion criterion was the age - equal to or higher than 45 years old. Participants were selected randomly. The respondents included healthy women who never had been diagnosed with BC, women who had a history of BC or other cancer type, and women with BC at the moment of the study. The survey was sent to over 75 regional centers of the Amazons Associations, to the Polish Oncology Patient Coalition, 25 Universities of the Third Age, 4 women's associations and employees of the Central Statistical Office in Warsaw. Due to the specificity of the target group, the study applied both CAWI (Computer-Assisted Web Interview) methodology and the traditional PAPI (Paper and Pen Personal Interview) methodology. The questionnaire consisted of 26 single- and multiple-choice questions divided into following sections: breast cancer - previous treatment, breast cancer education, and prevention (regarding risk factors). Questions concerned the participants' perception of specific factors, as protecting from or predisposing to development of BC, health behaviors of women, their hormonal status, as well as socio-demographic profile (education, place of residence, etc.). Interviews were collected from May to August 2017. The final cohort of participants included 380 women. Subsequently, a database has been created: all the data were coded and preliminarily analyzed using Microsoft Excel ver. 15.22 (160506), taking into account the socio-demographic profile of the respondents.

Limitations of the study

Not all of the questions in the questionnaires were answered (obligatory fields). Especially in the case of the PAPI version of the questionnaire, some of the data was missing (e.g. place of residence, date of birth, education level, etc.). Some of the questionnaires (paper version) also contained so-called "transition errors" where participants answered questions they should not have, for example when healthy women answered questions meant for cancer survivors. These surveys were not taken on to further analysis.

Results

The final research cohort consisted of 380 women aged 45 years and older. In this investigated group, 58% of women (219) were former or current BC patients (BC group). 42% (158) were healthy, without history of BC (non-BC group). The average age in the BC group was 63 and in the non-BC group 58. The oldest participant was 82 at the time of the study. The great majority of women who took part in the study were living in cities – 86% (188) and 88% (139) respectively in the BC and non-BC group. Lower education levels were more characteristic for the BC group – 31% (68) declared higher educational status. Women from the non-BC group more often were recipients of education about BC risk factors, as well as early detection of this disease. Moreover, these women were more satisfied with the level of education which they had (40% (63) vs. 34% (74) in BC group). Almost the same percentage of women from the BC and non-BC groups declared participation in screenings – 84% (184) and 85% (134) (Table 1).

Table 1. Characteristics of participants

Characteristics	BC survivors/patients 58% (N=219)	Healthy women 42% (N=158)
Average age (years)	63	58
Place of residence – city	86% (188)	88% (139)
Place of residence – village	14% (31)	11% (17)
Higher education	31% (68)	63% (99)
Completion of education about BC risk factors	42% (92)	57% (90)
Completion of education about early detection of BC	46% (101)	59% (93)
Women satisfied with the level of education about BC risk factors and early detection	34% (74)	40% (63)
Declared participation in screenings	84% (184)	85% (134)

96% (367) of women answered the question about their self-assessment of BC risk factors. 72% (274) assessed their own knowledge in this matter as very good or good, 20% (75) as average and 5% (18) - as low or none. It was then calculated whether women from the above three subgroups perceived selected BC risk factors as increasing risk of the disease (Figure 3). Moreover, we analyzed the attitudes of women on well-known BC risk factors in their daily life in the same three subgroups (Figure 4).

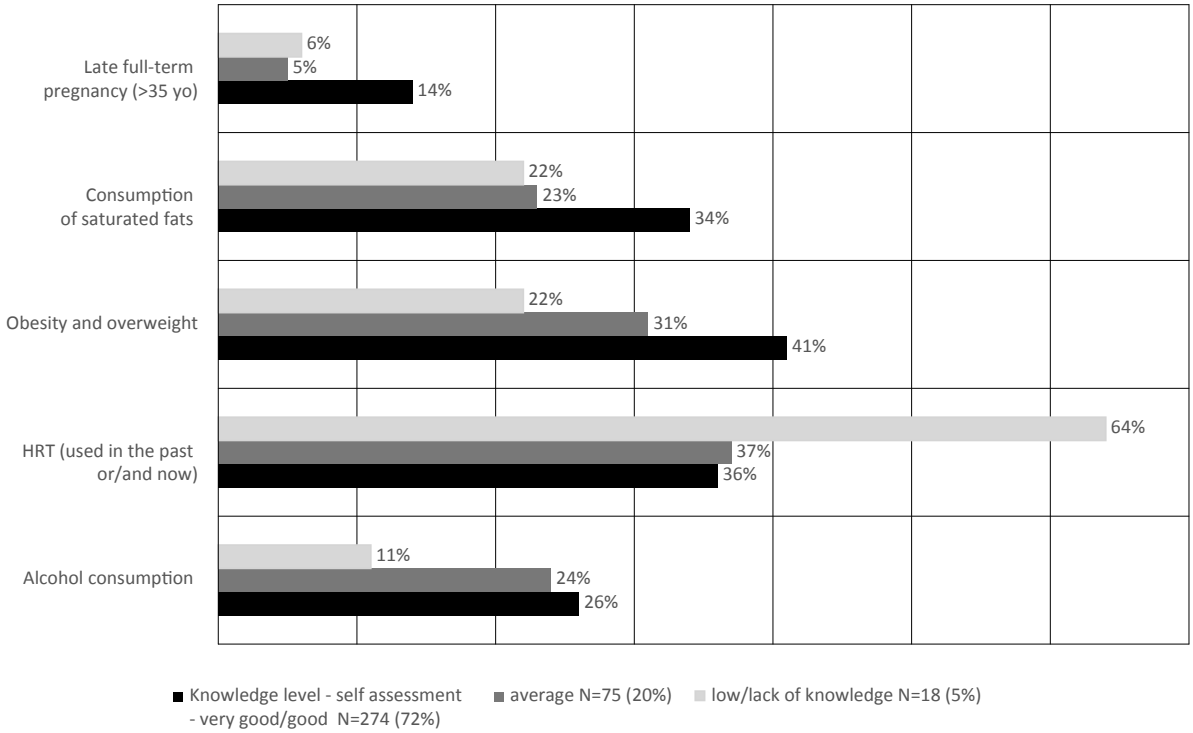

Figure 3. Risk factors for BC accurately perceived as BC risk factors by women who assessed their knowledge about BC as very good/good, average, or low/lack of knowledge

The data indicates significant differences in women's perception of specific factors as increasing BC risk (Figure 3). Among women who assessed their knowledge about BC as very good/good only 41% (112) of them indicated overweight and obesity – one of the strongest risk factors – as contributing to BC. In the same group only 26% (71) of women perceived alcohol consumption as a factor increasing this risk. In the group of women who assessed their knowledge as average, 31% (23) claimed that obesity and overweight contribute to BC, and 24% (18) thought that alcohol has an influence on BC occurrence. Women who assigned themselves to the group with a low level of knowledge or lack of knowledge about BC, in 22% of cases (4) assessed overweight and obesity as an important factor for BC risk, while 11% (2) indicated alcohol consumption.

For these two risk factors (overweight and obesity, and alcohol consumption) the tendency is similar – the higher women assessed their knowledge of BC, the more frequently they accurately indicated the specific BC risk factor. The same situation was observed for the consumption of saturated fats.

On the other hand, there were two risk factors for which the tendency was different. A completely reverse relationship is seen in the ability to accurately indicate HRT use as a breast cancer risk factor. 64% (12) of women from the group with lowest self-assessment of knowledge about BC perceived HRT use as an important factor for BC development, which is the highest percentage for all groups of respondents and all BC risk factors. In the group of women who assessed their knowledge as average and good/very good it was respectively 37% (28) and 36% (27) of women.

14% (38) of women who assessed their knowledge of BC as good/very good perceived late full-term pregnancy as a significant risk factor. Only 5% (4) and 6% (1) of women from groups with an average and low knowledge recognized this factor as increasing the risk.

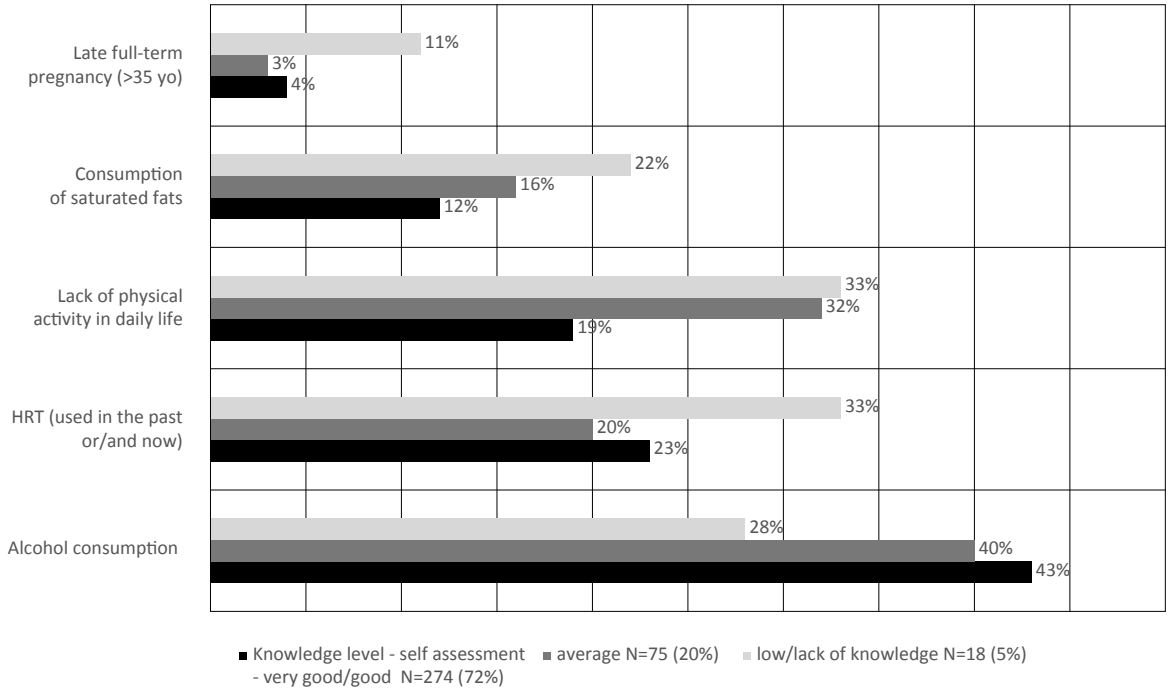

Figure 4. Personal exposure to modifiable BC risk factors presented by women who assessed their knowledge about BC as very good/good; average; low/lack of knowledge

The results showed also a lack of visible reflection between declared level of knowledge about BC and presented attitudes of women regarding the analyzed risk factors (Figure 4). As many as 43% (118) of women who assessed their knowledge as good/very good declared regular alcohol consumption as well. Moreover, in the same group almost 1/5 of women were physically inactive (52). Similarly, in the group of women who assessed their knowledge as average, as many as 40% (30) of them admitted that regularly drink alcohol. Also, in this group nearly 1/3 of women (24) were physically inactive. Almost the same percentage – 33% (6) has been observed among women with declared low/lack of knowledge about BC. What is significant, women who declared the lowest knowledge level of BC at the same time demonstrated the lowest alcohol consumption - 28% (5) - in comparison with women with self-assessed average and good/very good levels of knowledge.

Additionally, our results described the women's knowledge regarding BC screenings. In the group of women who assessed their knowledge of BC as good/very good, only 25% (69) indicated the correct frequency of mammography (every two years). In the same group, about 52% (142) of women declared performing breast self-examination once a month. In the group with declared average knowledge level it was respectively 31% (23) for mammography and 35% (26) for breast self-examination. In the group with the admitted lowest level of knowledge on BC or lack of knowledge at all, 44% (8) of women indicated the correct answer about mammography frequency and 17% (3) about breast self-examination.

With reference to education level, the largest percentage of women who performed breast self-examination once a month were those with the lowest level of education (primary education) – 65% (11). In the groups with secondary and higher education it was respectively 54% (102) and 38% (60) of women.

Discussion

Current activities to prevent BC at the national level in Poland are focused on secondary BC prevention, which is concentrated on mammography for women in the 50-69 year-old age group [12]. However, in order to decrease BC incidence, especially among women in the highest risk age group (perimenopausal and postmenopausal) it is crucial to focus also on primary cancer prevention, that is decreasing exposure to well-known BC risk factors.

In our study we showed that the perception of specific risk factors as increasing BC risk varies significantly. Surprisingly, only 26% (71) of women who assessed their knowledge as good or very good (N=274, 72%) perceived alcohol consumption as an important BC risk factor. In the same group, 43% (118) of women drank alcohol. Jokiel and Bielska-Lasota indicate in their study that daily alcohol intake, even in small doses, can increase the risk of BC, up to about 11% [13]. Similarly, Thazibi and Feizi showed that alcohol consumption is one

of the few well-established BC risk factors [14]. A study by Shield et al. showed that globally, the incidence and mortality of alcohol-attributable BC is significant [15]. Moreover, referring to the data from the State Agency for the Prevention of Alcohol-Related Problems in Poland (PARPA) about 80% of women in Poland drink alcohol. The highest consumption has been observed in the young age group (18-29 years old) [16]. However, the overall high alcohol consumption level in the population of Polish women is reflected also in our own study, albeit in a different age group.

Another important factor which significantly increases BC risk is overweight and obesity. 41% (112) of women who assessed their knowledge of BC as good/very good indicated that overweight and obesity is an important BC risk factor. At the same time, 19% (52) of women from this group admitted that they are physically inactive in daily life. Similarly, as in the case of alcohol consumption, the presented percentages (41% and 19%) seem to not support the self-assessed knowledge level of this group. Neuhouser et al. showed in the study performed among women in the postmenopausal age group (N=142) that there is a clear relationship between increased invasive BC risk and presence of overweight and obesity [17]. La Vecchia et al. in their study also indicated that BC among postmenopausal women is linked with overweight and obesity. Additionally, researchers highlighted a reverse relationship between overweight and BC occurrence among premenopausal women [18].

Today, overweight and obesity are becoming a more and more severe health problem in Poland. In 2014, 53.3% of the Polish population aged 15 or older was overweight or obese. Of women in this study, 30.1% of women were overweight and 15.6% were obese [19]. Moreover, results of the study conducted by the Polish Central Statistical Office showed that in Poland, people with a higher BMI mostly are aged approximately 50 years old [20], which has significance with reference to the BC incidence. The World Health Organization estimates that approximately 21-25% of BC cases worldwide are linked to physical inactivity [21]. In our research group, this factor was highly visible – especially among women who assessed their level of knowledge about BC as average or low/lack of knowledge – in these two groups it was respectively 32% (24) and 33% (6) of women who were physically inactive in their daily life. Similar to the WHO, Lynch et al. indicated in their study that physical activity results in a 25% reduction in BC risk. The activity brought the best health effects for women who were active regularly through the lifetime or started activity after menopause [22]. With reference to WHO data, physical activity at an adequate level in Poland is very low. In 2014, only 15.5% of women (15 years and older) were physically active (the number rises to 18% if we include physical activity connected with transport) [23]. These data are also reflected in own results – we observed a high percentage of physically inactive women in our investigated age group.

In order to decrease BC mortality rates, apart from primary cancer prevention, secondary prevention also has significant meaning. Basic methods – mammography and ultrasound examination – are without a doubt first and crucial actions which should be taken by women at certain age and risk groups [2, 24, 25, 26]. Nevertheless, "cancer vigilance" expressed through carrying out breast self-examination has also a great value. In our study, the majority of women who performed breast self-examination once a month had only a basic level of education (primary education) – 65% (11). In the groups with secondary and higher education it was respectively 54% (102) and 38% (60) of women. The reverse of this phenomenon was observed in the study by Garwacka-Czachor et al. In this study conducted among 32 626 women aged from 50-69 years old, it was observed that 14% (4 512) of women performed breast self-examination once a month. Moreover, there was a correlation between level of education and frequency of breast self-examination – the higher education a woman had, the more often she performed self-examination [27].

There is also some evidence that the most efficient tool in health education is to educate physicians.

Conclusions

1. The level of knowledge as well as attitudes concerning breast cancer risk factors in the most prone group (women 45+) should be constantly improved. Results suggest that education in this specific age group should be more efficient, dedicated only for these women and putting more effort on raising awareness of well-known breast cancer risk factors.
2. Results of the study indicate that existing women's education about BC could be ineffective – there was no BC risk factor chosen by 100% of women in any subgroup. Moreover, a great majority of women claimed that their knowledge about BC is good/very good, but it did not translate into health attitudes presented by them.
3. Strengthening the educational potential of medical personnel regarding BC risk factors could be beneficial for their patients and contribute to decreasing the incidence of BC.

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AWARENESS AMONG NURSING STUDENTS ABOUT CARE FOR CHILDREN WITH TYPE 1 DIABETES

DZIECKO Z CUKRZYCĄ TYPU 1 W ŚWIADOMOŚCI STUDENTÓW PIELĘGNIARSTWA

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. Diabetes, due to its prevalence and the rapid increase in the number of new incidences, has been recognized as an epidemic of the 21st century. It is estimated that over 3 million people in Poland currently suffer from this disease. According to the Ministry of Health, the knowledge of the society about diabetes is too little and insufficient. The aim of the study was to investigate and present general and expert knowledge of nursing students about type 1 diabetes, taking into account the needs of a child and the specialist skills required to care for diabetic children.

Material and methods. The study was conducted among the students of nursing at Pope John Paul II State School of Higher Education in Biała Podlaska. A questionnaire designed by the author was used in this study.

Results. The respondents reported that they possess basic knowledge about type 1 diabetes and at the same time are willing to learn more. They recognize that a child with type 1 diabetes requires special support, therefore medical personnel, educators and physical education teachers should have relevant knowledge and skills about care for type 1 diabetic children.

Conclusions. The majority of the students surveyed had a basic knowledge and skills enabling them to provide assistance to children with type 1 diabetes and are familiar with their needs. The significance of physical activity in the life of a child with type 1 diabetes was known to a lesser extent. The students surveyed are willing to broaden their knowledge about type 1 diabetes.

Keywords: diabetes, child, care

Streszczenie

Wprowadzenie. Cukrzyca z racji częstości występowania i szybkiego wzrostu liczby nowych zachorowań została uznana za epidemię XXI wieku. Szacuje się, że aktualnie w Polsce choruje ponad 3 mln ludzi. Zdaniem Ministerstwa Zdrowia wiedza społeczeństwa na temat cukrzycy jest zbyt mała i niewystarczająca. Celem pracy było zbadanie i przedstawienie wiedzy ogólnej i specjalnej studentów pielęgniarstwa na temat cukrzycy typu 1 z uwzględnieniem potrzeb dziecka oraz umiejętności umożliwiających pomoc choremu dziecku.

Materiał i metody. Badania przeprowadzono wśród studentów kierunku pielęgniarstwo Państwowej Szkoły Wyższej im. Papieża Jana Pawła II w Białej Podlaskiej. W badaniach zastosowano autorski kwestionariusz ankiety.

Wyniki. Badani ocenili, iż posiadają podstawową wiedzę na temat cukrzycy typu 1, a jednocześnie są chętni ją pogłębić. Przyznają, że dziecko z cukrzycą typu 1 wymaga szczególnego wsparcia, dlatego personel medyczny, pedagodzy oraz nauczyciele wychowania fizycznego powinni posiadać wiedzę i umiejętności z zakresu cukrzycy typu 1.

Wnioski. Badani studenci w zdecydowanej większości posiadają podstawową wiedzę i umiejętności umożliwiające pomoc dziecku z cukrzycą typu 1 oraz znają potrzeby chorego dziecka. Zdrowotne znaczenie aktywności fizycznej w życiu dziecka z cukrzycą typu 1 jest znane badanym w mniejszym zakresie. Badani studenci zgłaszają chęć poszerzenia swojej wiedzy na temat cukrzycy typu 1.

Słowa kluczowe: cukrzyca, dziecko, opieka

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Introduction

Diabetes is so called a 'life-style' disease, and due to the steadily increasing incidence has been considered an epidemic of the 21st century and one of the main threats to the health and life of the population [1].

New data published by the World Health Organization (WHO) indicate that, according to the estimates, in 2014 there were 422 million adults with diabetes in the world (compared to 108 million in 1980). The information contained in Poland's national profile, which is part of the WHO's first global report on the disease, shows that diabetes causes 2% of all deaths in the country [2].

There are no comprehensive nationwide registers of people with diabetes. However, in Poland, it is estimated that about 2-3 million people suffer from diabetes, about 25% of whom are unaware of it. In total, the incidence of diabetes is about 6.54% (including 5.81% men and 7.25% women) [3].

For people over 18 years of age, this ratio is 8% (including 7.15% men and 8.9% women), while for children under 15 years of age, the estimated number of diabetics is 17.7 cases per 100,000 inhabitants. According to estimates in the next 15 – 20 years the number of people with diabetes will double in Poland. Type 1 diabetes account for about 10% of the total number of people suffering from the disease. The onset of the disease usually falls between 10 and 14 years of age [3, 4].

The occurrence of type 1 diabetes is associated with the destruction of pancreatic B cells by the immune system of the owner. The result is a lack of insulin in the patient's body, which leads to hyperglycemia [5, 6, 7]. As indicated by the Polish Diabetes Association of 2018, chronic hyperglycemia may lead to damage, insufficiency and impairment of many different organs, in particular: eyes, kidneys, heart, blood vessels and nervous system [5]. According to the Ministry of Health, a significant increase in the incidence of this chronic disease has been observed for many years, and this phenomenon mainly affects children in the first years of their lives [8].

A person suffering from diabetes should be able to lead a normal, healthy and long life. However, in order to achieve this goal, it is necessary to constantly deepen the knowledge about the disease, systematically monitor glycemic levels, calculate the calorific intake of meals and conduct appropriate insulin therapy [2, 8, 9, 10]. As Joslin, the creator of modern diabetology, stated, "the sick who know the most live the longest" [11]. Moreover, rationally planned and implemented physical activity plays an important role in the treatment of type 1 diabetes. Regular physical activity has a positive effect on the body's need for insulin, normalizes cholesterol levels and decreases the incidence of cardiovascular diseases. Movement also stimulates muscle development, has a positive effect on the peripheral and central nervous system, improves the patient's condition and general well-being [11, 12].

In order to ensure full motor development of a diabetic child, it is necessary to enable the child to participate in physical education classes, also at school. However, it should be remembered that too intensive physical exercise can lead to a decrease in blood glucose levels and, consequently, even cause dangerous hypoglycemia. The safety of a child with type 1 diabetes, at an educational facility, should be ensured by the principal, educators, form teachers, including a physical education teacher. According to the information of the Ministry of Health, the knowledge of the whole society about diabetes, including educators, is too little and insufficient [8]. Lack of knowledge among educators results in difficulties in caring for sick children and raises concerns, both among parents and educators themselves. Therefore, the situation may have a negative impact on the implementation of compulsory education by children with type 1 diabetes [8].

The aim of the study was to investigate and present the general and special knowledge of nursing students about type 1 diabetes, taking into account the needs and the specialist pediatric care required.

Material and methods

This study was carried out among the nursing students at Pope John Paul II State School of Higher Education in Biała Podlaska. 89 students (4th year of undergraduate studies and 2nd year of supplementary master's studies) aged 22-54 years (mean 26.8; SD=7.5) were surveyed.

The majority of the respondents were women (87.6% of the total number of the respondents). The percentage of inhabitants of cities and rural areas was, respectively: 52.8% and 47.2%. Among the surveyed students, 21.3% have a person with type 1 diabetes among their friends and relatives, 74.2% do not have a diabetic person in their environment, and 4.5% declared lack of knowledge about it.

In this study, the author's questionnaire was used. It contained 21 closed questions related to general and special knowledge and skills in the field of type 1 diabetes, one open question concerned subjects (classes), during which the respondents gained knowledge and skills required to handle the problem. The questionnaire also included personal information (age, gender, place of residence, year of studies) and a question aimed to establish whether the respondents have a person with type 1 diabetes among their friends and relatives.

Results

The students have assessed that they had basic knowledge about type 1 diabetes (98.9%). At the same time, most of them show interest in deepening their knowledge about diabetes (84.3%), 12.4% are not interested in doing so. 85.4% of the respondents declared their willingness to acquire professional skills enabling them to support and help people suffering from type 1 diabetes, with particular emphasis on children. The majority of respondents believe that children with type 1 diabetes are at risk of additional school stress (86.5%) and require targeted support from the school environment (94.4%) (principal's office, teachers and service staff). Detailed results concerning particular aspects of the students' knowledge about the disease and functioning of a child with type 1 diabetes at school can be found in Table 1.

Table 1. General awareness of type 1 diabetes pediatric care in the students surveyed (%)

General knowledge about type 1 diabetes and the needs of a child	Yes	No	I don't know
I have basic knowledge of type 1 diabetes.	98.9	-	1.1
I am interested in learning more about type 1 diabetes.	84.3	12.4	3.4
I am interested in gaining professional skills to support and help people with type 1 diabetes, especially children.	85.4	6.7	7.9
Children with type 1 diabetes require additional support from the school environment.	94.4	3.4	2.2
Pupils with type 1 diabetes are exposed to additional school stress (health, anxiety, peer relationships).	86.5	11.2	2.3
Medical students should have professional knowledge and skills in the field of type 1 diabetes.	96.6	1.1	2.3
Students of pedagogical faculties should have professional knowledge and skills in the field of type 1 diabetes.	89.9	7.9	2.2
Care and assistance provided to a child with type 1 diabetes should be a required professional competence of teachers (form teachers, educators).	80.9	11.2	7.9
A physical education teacher should be able to diagnose conditions threatening the health of a child with diabetes and help.	95.5	3.4	1.1
A physical education teacher should encourage a child to systematically participate in physical education classes.	92.0	2.3	5.7
The Polish society has basic knowledge about type 1 diabetes.	20.2	70.8	9.0

The vast majority of the surveyed students declared that they knew the symptoms of hypo- and hyperglycemia (89.8%, 83.9%), proper glucose parameters (86.5%), as well as the differences between type 1 and 2 diabetes (73.0%). They are also able to perform the necessary diagnostic activities (blood glucose measurement 97.7%). More than half of the respondents are convinced of the need of an affected child to participate in physical education classes (63.2%) and sports trainings (51.1%), some of them stated that partial physical activity of the child in both forms of activities would be a better solution (34.5%, 43.2%). The vast majority of respondents (73%) stated that a child with diabetes should have special rights on the tests (eating, drinking, using the toilet, prolonging the credit period, controlling the glycemic levels). The results are presented in Table 2.

Table 2. Specialist knowledge and skills of respondents about type 1 diabetes pediatric care, including assisting sick children (%)

Special knowledge on type 1 diabetes and care for sick children	Yes		No	
	definitely	partially	but I would like to know / perform	I am not interested in it
I know the differences between type 1 and 2 diabetes.	73.0	25.8	1.1	-
I know the symptoms of hypoglycemia.	89.8	10.2	-	-
I know the symptoms of hyperglycemia.	83.9	14.9	1.2	-
I can measure blood glucose using the necessary equipment.	97.7	-	2.3	-

I know the correct parameters of the glucose level in a patient with type 1 diabetes.	86.5	11.2	2.3	-
A child with type 1 diabetes can participate in physical education classes.	63.2	34.5	2.3	-
A child with type 1 diabetes can take part in sports trainings.	51.1	43.2	3.4	2.3
A child with type 1 diabetes should have special rights on the test (eating, drinking, using the toilet, prolonging the credit period, controlling the glycemic levels).	73.0	25.8	-	1.1

The majority of the surveyed students (75.3%) declared that they had an opportunity to acquire sufficient knowledge about type 1 diabetes, and 22.5% assessed the acquired knowledge as partial. Only 2.2% of the respondents stated that they did not acquire sufficient knowledge, but they would like to do so. Among the subjects, in which it was possible to acquire knowledge and skills about type 1 diabetes, the students most often mentioned internal medicine and internal medicine nursing, nursing a patient with diabetes. Occasionally, responses included pediatrics and pediatric nursing, basics of nursing or dietetics. As part of the work experience program, 52.8% of the respondents declared direct contact with a pupil suffering from type 1 diabetes, and 10.1% had such a possibility to a limited extent. As many as 34.8% of respondents did not have such an opportunity but they would like to have such experience. On the other hand, 2.3% of the total number of students are not interested in having a direct contact with a pupil suffering from type 1 diabetes.

Discussion

In the published literature, to date, the assessment of the level of knowledge about type 1 diabetes has been rarely reported. In the available resources, the majority of the reports concern the disease itself, the assessment of the knowledge of respondents concerning diabetes, without making a division into type 1 and type 2 diabetes [13, 14, 15, 16], patients with diabetes [17], or people who have a sick family member [18]. There are no publications describing the knowledge about type 1 diabetes among future nurses, physiotherapists or teachers, i.e. people who, in the future, will come into contact with those suffering from this disease in the professional environment.

As shown by the results of author's own research, 84.3% of the respondents clearly indicated that they would be willing to broaden their knowledge of type 1 diabetes, although 98.9% of the respondents believe that they already have basic understanding of this subject. Similar conclusions were put forward by Janeczek with the team and Kłys and Gerstenkorn, who assessed the knowledge of nursing students about type 2 diabetes. The results of these studies indicate a clear need to increase the scope of education about diabetes in the studied group of students. The respondents even suggested creating a separate specialization in diabetes, which would help to broaden the knowledge of medical personnel [14, 16]. The results of Dębska, who studied the general knowledge about diabetes of university students in Lublin, are in line with the above-mentioned research results. These findings led the author to state that the implementation of general education on diabetes is necessary [13].

The results of author's research also highlighted, optimistically, that 85.4% of the respondents are interested in gaining professional skills enabling them to support and help those suffering from type 1 diabetes, especially children. The respondents admitted that not only medical students should have professional knowledge and skills in the field of type 1 diabetes (96.6%), but also students of pedagogical (89.9%) and physical education (95.5%) faculties.

The research conducted by Trojanowska and her team showed that only one in five children with diabetes had little knowledge about their disease, the possible treatment and self-monitoring [9], which may indicate that their education was insufficient or improperly conducted. It only highlights the fact that the vast majority of children with diabetes require additional information and help from others. The respondents (94.4%) agreed that children with type 1 diabetes require additional support from the school environment.

It may be of concern that only 63.2% of the respondents stated that a child with type 1 diabetes can participate in physical education classes, and even less, because only 51.1% believe that a child with diabetes can take part in sports trainings. As already mentioned, physical exercise is necessary, since it has a positive effect not only on the treatment process of diabetics, but also on the improvement of the quality of life, well-being, positive self-esteem and self-confidence. Therefore, it cannot be limited or avoided, but prepared for in a rational and responsible manner [12]. Moreover, it might be thought-provoking that the same group of respondents (92%) considered that a physical education teacher should encourage a child to systematically participate in physical education classes.

The surveyed students (70.8%) confirmed the opinion of the Ministry of Health that the Polish society does not have basic knowledge about type 1 diabetes [8]. Therefore, it is worth paying attention to the need to organize trainings in the field of knowledge, care and support for type 1 diabetic patients, especially in the communities of people, who in the future will have a direct, professional contact with diabetic patients. According to Zamarli M. – President of the National Federation of Diabetic Children and Youth Aid Organisations – teachers are afraid of taking over the care of a pupil with diabetes. They are reluctant to administer insulin to sick children, since not every teacher feels at the strength to make an injection and a vast number of people do not realize how different the genesis and treatment of type 1 and type 2 diabetes is. Some even think that you can get infected with diabetes. In one of the interviews, the president showed how difficult the situation of a child suffering from diabetes and its mother in the Polish school is; the mother who must resign from work when her child goes to school in order to provide an appropriate care [19].

According to Stefanowicz and his team, a contemporary nurse plays an essential role in the therapeutic education of a patient with type 1 diabetes – a professional who, apart from offering a sense of security and care, is also considered as a direct source of theoretical and practical knowledge and support in moments of doubt [11].

Conclusions

1. The majority of the students surveyed have basic knowledge and skills enabling them to help a child with type 1 diabetes and know the needs of a sick child.
2. The significance of physical activity in the life of a child with type 1 diabetes is known to a lesser extent.
3. The students surveyed are willing to broaden their knowledge about type 1 diabetes.

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PROBLEMS OF MOTHERS RAISING A CHILD WITH INTELLECTUAL DISABILITY

PROBLEMY MATEK WYCHOWUJĄCYCH DZIECKO Z NIEPEŁNOSPRAWNOŚCIĄ INTELEKTUALNĄ

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. Children with intellectual disability need special help from their parents, proportional to the type and degree of their disability. They require individual treatment, and their development depends not only on their health status but also on environmental conditions, measures and actions taken by supporting institutions, and social attitudes. Most often, mothers engage in a child care by giving up their own professional career, interests and social interactions. While raising a child, they face many adversities, and they are often helpless to overcome them. The aim of this work is to analyze the most important problems of mothers raising a child with intellectual disability.
Material and methods. The research was of a qualitative nature. Case studies were used based on the method of unstructured interview and structured interview. Each interview lasted about 2 hours. The participants of interviews were four mothers bringing up children with intellectual disabilities.
Results. The mothers who participated in the research pointed out negative social attitudes in the environment. They reported ambiguous situations in institutions supporting the family and the problems in the health care of their disabled children. Women's dreams focused around a child, his or her health and future.
Conclusions. There is a need to formulate procedures for dealing with an intellectually disabled patient in hospital wards, to attempt to regulate the institutional support for daily activities of adult, dependent people with intellectual disabilities.

Keywords: mother of a child with disability, intellectual disability, qualitative research

Streszczenie

Wprowadzenie. Dziecko z niepełnosprawnością intelektualną potrzebuje od rodziców specjalnej pomocy, proporcjonalnej do rodzaju i stopnia niepełnosprawności. Wymaga ono indywidualnego traktowania, a jego rozwój zależy od stanu zdrowia, ale także od warunków środowiskowych, działania instytucji wspierających, postaw społecznych. Najczęściej w opiekę nad dzieckiem angażują się matki rezygnując z własnej, zawodowej kariery, zainteresowań, kontaktów społecznych. W wychowaniu dziecka napotykają na wiele przeciwności, wobec których często są bezradne. Celem pracy będzie analiza najważniejszych problemów matek wychowujących dziecko z niepełnosprawnością intelektualną.
Materiał i metody. Badania miały charakter jakościowy. Wykorzystano analizę indywidualnych przypadków na podstawie metody wywiadu swobodnego oraz wywiadu skategoryzowanego. Każdy wywiad trwał około 2 godzin. W wywiadach uczestniczyły 4 matki wychowujące dzieci z niepełnosprawnością intelektualną.
Wyniki. Badane matki wskazywały na negatywne postawy społeczne otoczenia. Opowiadały o niejednoznacznych sytuacjach w instytucjach wspierających rodzinę i problemach w opiece zdrowotnej ich niepełnosprawnych dzieci. Marzenia kobiet koncentrowały się wokół dziecka, jego zdrowia i jego przyszłości.
Wnioski. Istnieje potrzeba wypracowania procedur postępowania w przypadku niepełnosprawnego intelektualnie pacjenta w oddziałach szpitalnych, podjęcia próby uregulowania instytucjonalnego wsparcia aktywności codziennej dorosłych, niesamodzielnych osób z niepełnosprawnością intelektualną.

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Introduction

As a result of the development of women's cultural capital in the last decade in Poland, there have been significant changes in the role of women. It can be said that the differences between men and women are beginning to blur when it comes to expectations related to work, or to the roles played in the public sphere. However, the differences in performing cultural roles are still big, which is the result of the traditional perception of women and men [1]. Budrowska points out the stereotypical perception of mothers in the Polish society, where a child is seen as most important, a woman as called to motherhood, and where the ideal mother must be always patient, understanding, and give her child continuous and unconditional love [2]. From these social expectations the conclusion can be drawn that it is the mother who is most burdened with responsibility for the child, and the discourse on family problems should focus mainly on the experience of mothers [3]. In this context, the article is based on the statements of mothers raising a child with intellectual disability.

Qualitative research on mothers raising a child with intellectual disability has been carried out by Lindyberg. Describing motherhood with a disabled child, the author negates the claim about handicapped motherhood, but emphasizes the fact of loneliness of women and the emotional side of this kind of motherhood, often marked by suffering. In the presented biographies, based on the experience of mothers, the topic of giving a birth to a disabled child also appears. According to the author, a child may be expected, but it may also appear in the life of a mother-to-be as a surprise. In both cases her current life changes. In the first case, it is the woman who decides to enlarge the family at the time most convenient to her. Gradually, she anticipates changes that are going to take place and she prepares for them. In the second case, a woman is often unprepared for changes in her life [4].

According to Dąbrowska, the mere fact of being told that a child will be born with a deficit poses a crisis and causes shock. Later, another stressor appears – discrepancy between the development of other children and the development of one's own child, as well as discrepancy between one's own expectations and the existing situation [5].

Maciarz states that "difficult motherhood is expressed by negative experiences and emotional states of the mother, her moral dilemmas and disorders of performing a maternal role" [6]. Dąbrowska points to the phenomenon of burnout of mothers raising a child with a disability. This syndrome is characterized by a state of mental and physical exhaustion, which is accompanied by various symptoms. It is a slow process, that takes an individual course for each mother, and it is the result of adding up and accumulating of problems, failures, and emotional tensions. "Burn-out" affects all aspects of a burned-out person's life, and also affects all people who enter into various relationships with her, especially her family [5].

Goldenberg and Goldenberg indicate that, despite these difficulties, family members raising a child with developmental disorders, when faced with the adversities of everyday functioning, often are able to activate their strength, immunity and internal potential, as well as various mechanisms, to deal with this situation [7].

Intellectual disability is associated with permanent changes in the central nervous system and with various types of disorders in its functioning. Obuchowska pointed out that children with intellectual disabilities and other disabled children belong to the category of children with lesser opportunities. She defines these children as "those who, compared to most of their peers, are from the beginning of their development, or from its early period, threatened by limited possibilities of meeting their basic needs and social expectations..." [8].

Providing an intellectually disabled child with optimal conditions for his or her development in the family requires a lot of knowledge, skills and competences of mothers who most often give up their professional work to take care of the child. Families bringing up children with intellectual deficits should be supported in the social and economic sphere, because when caring for a disabled child, apart from the needs typical for all children, there are additionally very specific needs that should also be met.

The aim of this article will be to diagnose the most important problems in a retrospective view of mothers raising a child with intellectual disability.

Material and methods

The social and institutional problems of families with children with disabilities, amply described as part of the quantitative research, have become the inspiration for the author of this article to undertake qualitative research among mothers caring for a disabled child.

Individual case analyses were used, based on the method of unstructured interviews, which were recorded on a voice recorder, and structured interviews aimed to obtain data on the social, material and demographic situation of the women surveyed. The mothers were asked about the difficulties in their daily existence, about

their dreams, and how they envision the future of their children with disabilities. When talking with mothers, the author of the article tried to maintain the attitude of a passive listener, sometimes asking about the details of the described situations.

The research was conducted at the turn of the years 2017 and 2018. Each conversation lasted from one to two hours. Four mothers participated in the interviews, two of them were raising children alone, and two in full families. The women did not work, they took care of children with disabilities. One of the women had twins with disabilities, the other women had one child with a disability. The children had moderate or severe intellectual disability.

Detailed social characteristics and material situation of the interviewed mothers

The first of the mothers, Wioleta, is a young, 33 years old woman, with secondary education. She does not work, she takes care of her son. She raises two sons alone. She is divorced, conflicted with the father of the boys; her husband blamed her for giving birth to a disabled child, he does not maintain any contact with his sons. After divorce, Wioleta returned to her parents. For 3 years now, she has been living with her sons, parents and two siblings in a family home. After being left by the father, the woman was deprived of financial resources, and although she asked for institutional help, she received help from a social assistance center after 3 months. She claims that if it was not for her immediate family, especially her parents, she does not know where she would have lived and how she would have feed her children. Currently, she estimates her financial situation as relatively good.

Her son, Michał, is currently 11 years old, and he is diagnosed with moderate intellectual disability and autism. He is a pretty, nice boy, independent of his everyday activities, he has no difficulty with verbal communication. He has artistic and musical talent, he has participated in art competitions many times and has won awards at the voivodship level. His another passion is dancing. However, he has no friends among non-disabled children. His mother is engaged in the care of her child. She tries to help Michał to develop his interests. She takes care that he spends his free time actively. She is convinced that sport, riding bicycle, and other physical activities are helpful in the boy's state of agitation. It is pleasant for her to talk about Michał, she is proud of him; she says that the boy has a good heart, and is extraordinarily sensitive: (quote) "when I bought him a new sweatshirt, he cried and did not want to wear it to school because other children did not have such a sweatshirt".

Another woman, Krystyna, is 60 years old and she has basic education. She does not work professionally, but takes care of his son with a disability. She is an extremely open person, very peaceful and self-confident. Her attitude results from the fact that her family – mostly her husband and children – are a great support for her. I quote: "When I gave birth to my boy, the hospital ward was closed (due to some bacteria). I was alone. On the other day I was told about Down syndrome, and that these children were short lived. It was a hard experience for me. It was not until two days later that I called my daughter and told her that she had a brother with Down syndrome and that he needed to be loved. She replied that we already loved him. She took care of him, helped me with bathing, rehabilitation, even though she was only 14 years old. Maybe that was the reason why later she graduated from the nursing school and wrote a dissertation paper about disability. My husband was so proud to carry his son from the hospital to the car that it made me feel happy. The older son was in France at that time – but it was him who chose the name for his younger brother".

Krystyna has five children, four of them are already adult and independent – they started their own families and live outside the family home. The fourth, youngest son, Konrad, was born when his mother was 40 years old. He is 21 years old now, he is diagnosed with severe intellectual disability and Down syndrome. He is a relatively independent boy. Konrad and his parents live in a block of flats, the mother estimates their financial situation as relatively good.

Parents, especially Konrad's mother, support their son's musical interests. Konrad learns to play various musical instruments. His passion is also being developed in the special school by a music teacher. In addition, a teacher comes to the boy's home to teach him how to play the guitar. The boy has no friends among non-disabled peers.

The boy's mother is a socially active person. She often supported other young mothers who had children with Down syndrome. They were women living in her town. She invited them to her home or offered help in the form of correspondence. These mothers came to her after the publication of her experiences in the magazine "Bardziej Kochani", a quarterly published since 1997 by the Association of Families and Caregivers of People with Down Syndrome (Stowarzyszenie Rodzin i Opiekunów Osób z Zespołem Downa). The woman is the Chairwoman of the Parents' Council at the Complex of Special Education Schools (Zespół Szkół Specjalnych) in Biała Podlaska.

The third mother, Beata, is 44 years old; she has a secondary education, she does not work professionally, and raises her daughter Iza, whom she drives by car to a special school 5 kilometers away from home every day. She is supported by her husband Rafał. They and their daughter live in the house. She describes their financial situation as relatively good. Their older son has already became independent, he studies, works and lives in Warsaw. Iza is not independent. She is already 22 years old, has significant intellectual disability, and she uses a wheelchair. The girl has no friends among non-disabled peers. Beata is the head of the Association operating at the Complex of Special Education Schools (Zespół Szkół Specjalnych) in Biała Podlaska. In the conversation, the mother's anxiety about the future of her child could be sensed. A woman worries about what will happen in two years when her daughter graduates from school. She would not like her daughter to stay at home, but she may lose "the fight" (quote) for a place for her at WTZ (Warsztaty Terapii Zajęciowej = Occupational Therapy Workshops) due to limited independence of the child.

The fourth woman, Anna, is 40 years old, she raises twin girls with significant disabilities (Kinga and Katarzyna). The girls are 19 years old. The woman also has a younger daughter, Magda, who often gives her mother support and assistance. The mother does not maintain contact with the father of the girls, and the relationship with her in-laws is cold and distant. Although Anna has a university degree, she does not work professionally. All her activity has been directed to the performance of the role of mother. The woman is raising three children and lives in a block of flats. She estimates her financial situation as relatively good. The girls are quite independent. The mother points to the difficulties in providing healthcare, obtaining information about disability and the rights of people with disabilities.

Results

Social perception of people with disabilities – "On the bus"

The role of social attitudes towards children with disabilities perceived by their mothers is of particular importance. It is one of the factors having impact on their self-assessment as a mother. Particularly severe negative attitudes of the environment are felt by children with disabilities, who perceive curious glances, or insistent looking at them as an assessment of their person as someone worthless, strange, or different.

The statements of the surveyed women, describing some situations in public transport may serve as examples. Most often, mothers described situations that took place during their way to school and back home.

Anna says: "(disabled children) are perceived differently on the bus when traveling. It is easier with a child (with a visible disability). People say: please, sit down. But in the case of my girls, for example, a typical disability cannot be instantly noticed, and moreover, they are over 20 years old. They have problems with body balance, with differences in levels, with steps. For me, it is very difficult to keep them by the hand on the bus when I am aware that one of them may suddenly "wobble" to the right and the other "to the left". You know, the bus is crowded, so it is easier for me to seat them. But then, it is seen as: "wow! young, nicely dressed girls etc. ... and they are sitting". And then it becomes awkward. My friend from the special school has a child with cerebral palsy with all four limbs affected, in a wheelchair – this disability can be instantly noticed. Then people find it easier to "show pity" and to help. For her, it is easier on the bus. But I have to always explain why my child is sitting".

Therefore, there is a principle that the lack of visible disability causes more restrictive social reactions. According to Larkowa, a positive or negative attitude towards a person with disabilities is affected not so much by the type of impairment as by its visibility and by the severity of the body's function disorder, as well as by the personality traits of the disabled individual and the level of being acquainted with him or her (negative attitudes are more common towards disabled people who are strangers to us) [9].

The next statement emphasizes the attitude of insistent looking, and also describes the reaction of a disabled boy's mother who has got irritated by this.

Krystyna: "I help mothers in a special school, especially mothers of children in early intervention. You need to be open, many mothers withdraw after giving birth to their baby. They do not go out with the child, they are ashamed of their behavior, for example in the church, they constantly admonish their children – to satisfy others. My son likes singing, I used to silence him on the bus, for example because he tried to sing the Polish national anthem loudly "Poland Is Not Yet Lost" (Jeszcze Polska nie zginęła) ..." – I insisted that he cannot do it on the bus. Then he stopped singing but got up and began to say loudly: "Our Father in heaven...". Now I do not admonish him any more if his behavior does not harm anyone. Young people treat children with disabilities better, older people – worse. Once, one lady on the bus was staring at my son insistently, she would not stop, so I asked her: Have you already seen enough? Then she turned her head to the window. Maybe she understood...".

There is always a dilemma: whether to stand on the side of the child or to avoid social confrontation. This mother was able to point out the behavior of social ignorance and tactlessness, and to stand in opposition to thoughtless social attitudes. Another mother experienced a similar attitude of a public transport passenger: "My son has some balance disturbance. When I seated him on the bus, an elderly person criticized me quite blatantly. But I do not have to explain myself to everyone".

Mothers experience unpleasant emotions when their children are being stared at persistently. It is difficult for them to accept the curiosity of the surroundings, and constant comparing their child with others. They either try to intervene or they withdraw. Avoiding interaction can cause frustration and humiliation due to the child being different.

Cooperation with institutions in the environment

Other problematic situations reported by mothers raising children with disabilities are related to the functioning of institutions aimed for people with disabilities and health care institutions. From the statements of women emerges the image of often incompetent clerks of these institutions, sometimes characterized by a sense of "superiority" towards the claimants. The helplessness of women against unfavorable regulations or a bureaucratic healthcare system can also be noticed.

Wioleta: "I had constricted contact with PFRON (Państwowy Fundusz Rehabilitacji Osób Niepełnosprawnych = State Fund for the Rehabilitation of the Disabled), and with MOPS (Miejski Ośrodek Pomocy Społecznej = City Social Welfare Centre). These institutions are to help us, but they do not help much. When we enter the institution, they look down on us because we take money for nothing. If we want something to be subsidized, it is difficult because we have a large income. Is PLN 1,406 a large income indeed? For this money we have to support our children, pay for rehabilitation, clothing, special food. The officials are not friendly in contact, they reject us in advance, they hide behind regulations that do not even exist. To obtain help we have to trample the path, and then walk it for two or three years. It was like that in my case. They hide behind the regulations, they think that we do not know them, that we get lost. But we do know them. It is similar at PFRON, they condescend to grant rehabilitation camps, diapers, etc., you need to fill in lots of documents. We, mothers of disabled children, are with our children 24/7, and the government pays us PLN 1,406. For this money, we have to support the children, (buy) food, pampers, rehabilitation camps. If the parent needs to go to the camp with a child, they must paid for it. The grand-aid depends on income, but you always need to pay part of the costs, only the child has a camp for free. But the child will not go alone, children are often not independent enough to go on a camp without a parent. The child cannot do it alone. It hurts me badly how the state treats mothers of disabled children. I have a son with some autism traits, with moderate disability. At first contact it looks like everything is fine, but when you sit and talk to him, all the defects become apparent".

Beata: "There was such a case: the child stood before a medical committee to be granted a disability pension, the certifying doctor told her to put a signature. I said to the mother: Anna, do not allow this under any circumstances, because your daughter is legally incapacitated and cannot sign documents. I finally got into the car, took that mother, went to the certifying doctor with her and explained that he has no right to force the child to sign".

A family fulfills its tasks towards a disabled child in a proper way if it receives appropriate assistance, especially in situations resulting from everyday problems [10]. In these cases, the system did not always work properly. A bureaucratic system, unfriendly attitude of officials, and in some cases lack of knowledge – these are the situations that the women had to face. However, attention should be paid to the self-help provided to one another by mothers raising children with disabilities.

Mothers proved themselves to be resourceful and active in dealing with their issues and problems. This conclusion is confirmed by subsequent mothers' statements regarding medical problems.

Krystyna: "Konrad had his teeth removed and dental plates inserted, but they were faulty and he was choking. I went to the NFZ (Narodowy Fundusz Zdrowia = National Health Fund) and asked for new plates, but the clerk said that the child is entitled to them only every 5 years. I was insisting, explaining that I was afraid he might suffocate. I live in the same city district where the school is located. When I see an ambulance passing, I am waiting for a call with anxiety – call from the school, that my child has suffocated. I cannot wait for 5 years.

The clerk still insisted that I should wait 5 years. I asked: will I get help only when the tragedy already happened? I was insistent and the clerk said that perhaps I could try my luck at the clinic in Lublin – but she did not know if that would work. Anyway, she gave me their address. I wrote an e-mail and described my situation. After two days I received the answer. They told me that I should go to Lublin, to the clinic. I went there with Konrad. The symposium gathered, they examined Konrad and immediately set a date for the procedure. We

received help within one week. The chief consultant said that the plates may be replaced as often as the situation requires it, even several times a year, because my son is still growing. In Biała Podlaska they claimed something quite opposite. If I had not insisted, I would not get help for my son. You need to inquire into everything, never give up; do not tell me today that this is typical. You have to ask around. I always tell other mothers: ask around".

Wioleta: "Doctors... we do not have proper specialists, we have to demand them ourselves, we need to look for doctors, the health fund does not have the doctors we need".

Beata: "This hospital is supposedly so nice, so big, but I do not know... These doctors, the whole institution... Don't they get any training how to approach a person with disabilities, a disabled child? Recently there was such a case: one of the mothers at school told that her daughter had some gynecological problems. Mother takes her to the hospital ward, asks what she should do and they... they don't know. They say that this is the first case of this kind, they don't know whether to place the girl in the hospital ward, they simply do not know. They advise to go to the disabled people coordinator, but the coordinator-doctor "blinks at them", and says; the head of the ward is not present today, and this is the first case of this kind. Such a trailing, up-and-down, up-and-down; if the mother is resourceful, she will manage. But there are a lot of parents who are backward, they do not cope. This is even more afflictive when a child is closed at home, for example if he or she has individual homeschooling. A child's mother cannot leave the home, she looks after the child, cannot go out to people. Even if she was previously a normal woman, now she can be so confused, so limited. And this is so that the day passes, and another day, it does not "go forward", just another day, and one more day... An institution is needed, a place where she could turn for help, where things would be arranged for a mother, where she would get some advice. Today, parents share information among themselves. This is the main source of information for them: from mother to mother. But mothers of children with individual homeschooling do not have such a chance".

Krystyna: "When we have to wait long in the medical center, my son gets impatient, but nobody wants to let us be served first. If I ask for this, I am forced to listen to such things that I do not even want to repeat".

Of course, it should be noted that these are the statements made only by one of the parties, i.e. by the mothers. A picture of the entire situation should be complemented by the opinion of doctors working with the disabled. Health problems of children with disabilities occur in certain specific situations in their lives. These are special stages of life, which result in individual needs for help. Adolescence and gynecological problems of disabled and dependent women are examples of such periods of life. Specific needs are associated with the dental care of patients with intellectual disabilities, where a cooperation of a dentist with a patient is sometimes impossible. For children with disabilities, dental care sometimes requires non-standard, and very rarely employed measures. As a consequence, it sometimes becomes a source of conflict situations. Despite the fact that mothers often felt resentful about the difficulties, they showed determination and coped with specific situations related to the health of their children.

The future of a child with disability

The anxiety expressed by the mothers often concerned the situation of their child after graduating from special school. Mothers worried that their children would lose the skills they have acquired, that they would have to spend idle time at home, that there would be no place for their child at WTZ or in other forms of activities. There was also a statement indicating that thanks to the fact that a child goes to school, mother has the opportunity to do some errands, take some break from taking care of her child, or participate in social life.

Wioleta: "Until 14 years old the child can attend school, but what comes next? There are no institutions that would take care of these children. There is one WTZ – but the places are already taken for a few years, a second WTZ would need to be created. I'm worried about what will happen after my child graduates from school".

Beata*:* "WTZ – each of them would like to (accept) a child who is more fit and independent, but the children with limitations, in a wheelchair – they need assistance even when going to the toilet, for instance. Because I have taught my child that we need to go to the bathroom – but you have to take her by the hand and lead her there, you need to remind her about it. But if you ask her: Iza, do you want to pee? She will say she does not want to, you have to take her to the bathroom. I did not teach her all this so that now they tell me to diaper her, and my child regresses. Her hands are functional, but she needs help because she has some limitations, for example when making a sandwich. I am worried that there will be more candidates to WTZ and they will be more fit than my child. We have this year and the next one, and then it will be harder. If there is no new WTZ, my child will be "closed" at home, and being "closed" at home equals regression. There is Caritas, but they are looking for quite independent children there who are able to take care of themselves. There is also the second department, but the children are all mixed up: some with autism, some with mental disorders. My friend placed her child with autism there, and it was implied to her to take a child – as if they were shoving this child away. At Prosta Street,

there is another WTZ, but they want independent children. Something is being built at Brzeska Street, but I don't know what is it supposed to be, and on what terms it will be functioning... (...) After graduating from school, some children stay at home. When children are at school, family life looks different, parents have time to run errands, to work, because their child is looked after at school. When the child turns 24, and he or she is again at home and is still dependent, parents have to take care of the child and be all the time present at home again".

Quite often a mother expresses her anxiety about the child's future after her death. Below is an exemplary statement, although each of the women surveyed perceives it as a serious problem. Not all mothers wanted to comment on this topic.

Beata said*:* "And the future of the child. What will happen when we are no longer here? I hope my child would go to some good care facility. I would not like to burden my son with this responsibility, because you know... he will have his own family. Even if my son wants it, but who knows how his life will go on – maybe he will have a wife and children in the future. How it all will go... He is still studying but is already working too. He is arranging his life in Warsaw. Do I have the right to disturb his life, to put the burden of taking care of his sister on his shoulders? I do not want it".

Krystyna: "I and my husband often talk about the future of my son, but we haven't talked about it with the children yet. We will leave the apartment for Konrad. I count on the children, I hope that they will get along, that they will be able to decide who should look after Konrad, they love him very much. He will definitely stay in the family".

Mothers point to the importance of WTZ in the rehabilitation of adult children with disabilities, and at the same time they emphasize the fact that there are not enough of the WTZs. The future of their children is becoming a serious problem. Mothers often do not want to burden their other children with taking care of their disabled siblings. However, they often cannot see any other option.

Mothers' dreams...

By getting to know what the mothers dream about, we have the opportunity to discover specific problems that are difficult to identify, and that the researcher would not ask herself.

Wioleta: "More peace... I like my life, I have learned a lot by having a child, my child is quite independent, he can dress himself, walk, wash himself, eat the prepared meal. However, you have to watch him so that he does not get into mischief, he needs to be occupied all the time (10 minutes of inattention and he was at the oven, began to burn some papers, burned the rug in front of the central heating oven). The state should support mothers whose children with disabilities have died because they were deprived of benefits. Greater help for mothers having children in wheelchairs".

Beata*:* "Dreams always revolve around the child and his future, we wish we could stop worrying about it, that there is some form of help for the children who are less independent. What will happen if the parents are not around anymore – we wish we could stop worrying about it. I'm worried about what will happen two years after graduating from school, I don't want my daughter to be home, but she may lose her fight for a place at WTZ".

Anna: "To live as long as possible to be able to look after the girls, I don't want to burden my daughter with this responsibility, to have financial resources, enough money for everyday needs and for emergency situations – if they occur. Now I am getting a benefit in the amount of PLN 720, care allowance of PLN 153, and the disability pension of PLN 1,406".

Krystyna: "I wish the health problems end. I would like to live to see the dolphinarium – in Russia – but this is an unrealistic dream. To go to the mountains – this will probably happen".

As it can be expected, the dreams of women often revolved around their children, their health, their future. Quite apparent in them were the need for peace, for sense of security in everyday existence, the need for some rest, trips to dream places.

Discussion

From the moment a disabled child appears in the family, the roles, functions and family structure change immediately. According to opinion of Popielecki and Zeman, what happens in the family is the disturbance of life plans of the parents and the entire family, and the disturbance of expectations for the newborn child. The emotions are often so strong that relationships between family members and the natural course of everyday life become disorganized [11]. Shock, anxiety, uncertainty are typical feelings of parents, and this fact is confirmed by the author's own research [12]. Many authors pointed to the difficulties in the functioning of a family raising a child with a disability, they were among others: Zalewska (1995) [13], Chodkowska (1995) [14], Otrębski (2011)

[15], Liberska (2011) [16], Stelter (2013) [17]. The authors distinguished various difficulties that can be classified as emotional, financial, economic, rehabilitation and health related problems, institutional, psychological and social problems.

Limitations in the functioning of the family resulting from the fact of a child's disability pose a real threat of exclusion from social life, and of arising specific social situations that are unusual in families raising a non-disabled child. We know, from "Diagnoza Społeczna" of 2009 and 2011, that social marginalization of disabled people had four basic dimensions, the most important of which concerned the availability of rehabilitation and medical services. The third dimension was the socially established negative perception of people with disabilities [18, 19]. According to Bartkowski, in three subsequent editions of "Diagnoza Społeczna" it was noticed that the disabled people felt more powerless and humiliated when dealing with official issues [20].

The detrimental consequence of inappropriate social attitudes towards children with disabilities is often pointed out. Dykcik claimed that the possibilities of self-realization of disabled people depend, among other things, on social attitudes, approach and consent, that to a lesser or greater degree provide a sense of security [21]. A similar position was presented by Chodkowska [14]. Adverse consequences of negative social attitudes were pointed out by Pisula. She suggested that this kind of experiences may result in isolation, withdrawal or avoiding social contacts [22].

Konieczna addressed the question of how parents of children with intellectual disabilities approach the issue of ensuring their child a dignified existence in the event of their own illness and/or death. She examined 50 parents of children with intellectual disabilities. Parents were aged 51-60. The respondents were most worried about the future of the child due to the fact that they could not be sure if the child will receive adequate care (65%). Parents were worried that their children would be lonely and inept (approx. 60%) and that their child will be in a difficult financial situation (25%). Over half of the parents thought about their child's future often and very often [23].

Conclusions

1. In specific phases of the lives of people with disabilities there are special needs of patients with disabilities that require non-standard ways of providing medical assistance.
2. There are mothers who feel called to raise awareness in the society about the issues of proper social attitudes, they show themselves in public, actively work to create more pro-social behavior towards people with disabilities, criticize immature and unethical behavior – these are mothers such as Krystyna. This kind of parents was also described by Kościelska [24].
3. The attitudes of the mothers who participated in the research indicate that women can help each other, are resourceful and active in dealing with issues related to their children.
4. However, the mothers feel helpless about planning the future for their children with disabilities, especially in the situations where schooling ends or what happens to their child when the parents are no longer around.
5. There is a need for macrostructural measures in the form of institutional mechanisms that would allow to include families raising a child with a disability into the general current of social life in the aspect of medical assistance, in relation to the future of children with disabilities. Gąciarz proposes similar theses [25]. An example of such help seems to be the Life Farm (Farma Życia), where are the adults diagnosed with autism. However, there are still not enough of such projects.
6. The point of reference for all activities supporting families with disabled children should be the right to subjective treatment of each person, as Górniewicz writes "the right to be yourself and to be treated as a person" [26]. This is the prism through which the treatment of children with disabilities and their parents should be assessed in institutions, hospitals, laws and regulations regarding the system of supporting them.

At the end, I would like to quote the mother's statement, which indicates the importance of support groups, especially those composed of parents in a similar situation:

Krystyna: "If it so happens that the mother is inept, has a relatively low level of education, and additionally low standards of living, it is reasonable to stimulate her to search for solutions related to expenses, arrangement of housework, and childcare by external support groups and institutions. The support group has a potential to mobilize individual's strength to fight illness or disability, makes it easier to cope with emotions, often negative and incomprehensible to parents. I subscribed to the quarterly magazine "Bardziej Kochani", I wrote a letter to them about my experiences, and later, it was published. The editors sent me letters written by two mothers who have recently given birth to children with Down syndrome, one of the women was only 19 years old. I maintained

correspondence with these mothers for a long time, I think I helped them to accept their situation. I wrote in a letter:

You have given birth to a healthy child – you are happy.

You have given birth to a disabled child – you are happier".

The research isolated examples of difficulties in the area of social attitudes, contacts with institutions aimed at supporting people with disabilities, difficulties of a medial nature. The interviews do not have the character of representative studies – however, they are extremely valuable due to specific examples of situations and events that these mothers experienced.

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BACK PAIN AS A FACTOR OF DISABILITY IN WOMEN OVER 50 FROM BIAŁA PODLASKA AND THE SURROUNDING AREAS

DOLEGLIWOŚCI BÓLOWE KRĘGOSŁUPA JAKO CZYNNIK NIEPEŁNOSPRAWNOŚCI KOBIET PO 50 ROKU ŻYCIA Z BIAŁEJ PODLASKIEJ I OKOLIC

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. Chronic back pain is one of the most common causes of disability. It is a civilisation disease and up to 75% of women over the age of 55 suffer from it. The aim of this study was to assess the degree of disability and limitations in the daily functioning of women with lumbar spine pain depending on socio-demographic factors. **Material and methods.** The study included a group of 274 professionally active women aged between 50 and 64 who come from Biała Podlaska, Poland, and the surrounding areas and who completed the Oswestry Disability Index. The responses showed functional limitations of the respondents during performing specific activities due to back pain. The respondents were characterised with regard to their age, place of residence, education and material status. The results were analysed statistically. **Results.** The most numerous group included women with moderate disability – 41.6%. Lower back pain intensifies when sitting, standing, walking, lifting objects and applies mainly to women from the oldest age group, women having secondary and lower education, women from the city and those whose financial situation is below the average. **Conclusions.** A socio-demographic factor that differentiates the degree of the women's disability in a significant way is their material status – the better the financial situation, the less severe the disability. Socio-demographic factors – such as age, education and material status – are strong determinants of functional limitations caused by back pain: women from the oldest age group (60-64 years old) had the biggest problem with walking; women with secondary or lower education experienced difficulty sitting and walking; women whose financial situation is below the average suffered much more difficulties while lifting objects, sitting and socialising.

Keywords: women, back pain, socio-demographic factors, the Oswestry Disability Index

Streszczenie

Wprowadzenie. Zespoły bólowe kręgosłupa są jedną z najczęstszych przyczyn niepełnosprawności. Należą do chorób cywilizacyjnych i skarży się na nie 75% kobiet powyżej 55 roku życia. Celem badań była ocena stopnia niepełnosprawności i ograniczeń w codziennym funkcjonowaniu kobiet z dolegliwościami bólowymi kręgosłupa lędźwiowego w zależności od czynników społeczno-demograficznych. **Materiał i metody.** Badaniami objęto grupę 274 kobiet aktywnych zawodowo w wieku 50-64 lat z Białej Podlaskiej i okolic, które wypełniły Kwestionariusz Niepełnosprawności Oswestry. Odpowiedzi ukazały ograniczenia funkcjonalne badanych podczas wykonywania poszczególnych czynności na skutek odczuwanego bólu kręgosłupa. Dokonano charakterystyki badanych ze względu na wiek, miejsce zamieszkania, wykształcenie i status materialny. Wyniki poddano analizie statystycznej. **Wyniki.** Najliczniejszą grupę stanowiły kobiety z niepełnosprawnością w stopniu umiarkowanym – 41,6%. Dolegliwości bólowe dolnego odcinka kręgosłupa nasilają się podczas: siedzenia, stania, chodzenia, podnoszenia przedmiotów i dotyczą głównie kobiet należących do najstarszej grupy wiekowej, posiadających wykształcenie średnie i niższe, pochodzących z miasta, i których sytuacja finansowa jest na poziomie poniżej przeciętnej. **Wnioski.** Czynnikiem społeczno-demograficznym, który w istotny sposób różnicuje stopień niepełnosprawności kobiet jest status materialny – im lepsza sytuacja finansowa tym mniejsza niepełnosprawność. Czynniki społeczno-demograficzne – takie jak wiek, wykształcenie i status materialny – są silnymi determinantami ograniczeń funkcjonalnych spowodowanych dolegliwościami bólowymi kręgosłupa: kobiety z najstarszej grupy wieku (60-64 lata), miały największy problem z chodzeniem; kobiety z wykształceniem średnim lub niższym odczuwały trudności podczas siedzenia i chodzenia; kobiety, których sytuacja materialna jest na poziomie poniżej przeciętnej, odczuwały znacznie większe utrudnienia w podnoszeniu przedmiotów, siedzeniu i prowadzeniu życia towarzyskiego.

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Introduction

Low back pain (LBP) syndrome is a serious social problem, which due to its high incidence, is classified as a civilisation disease [1, 2, 3]. Young people complain of low back pain in the lumbosacral spine [4, 5, 6], and this ailment becomes even more common with age [7, 8]. Research carried out in Poland shows that 72% of Poles under the age of 40 have experienced spinal pain in the lumbosacral spine at least once in their life [7]. It occurs in approx. 90% of the population over the age of 40 [9]. The peak incidence falls between the ages of 50 and 60 [10].

Spine pain occurs as a consequence of an incorrect lifestyle associated with stress, low levels of physical activity and a sedentary lifestyle, and often intensifies during activities that increase the load on the spine, e.g. during a prolonged forced flexion position with a rotation component, as a result of axial load on body posture or remaining in a sitting position for a long time. Other predisposing factors resulting in the occurrence of pain are also obesity, micro-injuries of the locomotor system and body posture defects [11, 12, 13, 14].

Lisiński et al. state that there is a lack of unequivocal data proving what type of work (physical, mental) particularly predisposes to pain in the lumbar spine. They stress that overloading of spine structures can be caused by both forms of professional activity requiring high physical exertion, as well as forms often referred to as "sedentary" or "mental" [15]. Lumbosacral back pain syndrome is one of the most common reasons for temporary or long-term inability to work [16, 17]. It also poses restrictions in private and social life [18]. Research indicates that as much as 75.0% of women over the age of 55 experience chronic back pain in the lumbar spine [7], which limits their daily functioning more than it does in the case of men [19]. In available literature, there are reports on the assessment of the degree of disability according to the Oswestry Disability Index and the associated quality of life of people of different populations, mainly in terms of gender and age. Apart from age, here, the authors focus on understanding the impact of other socio-demographic factors, namely place of residence, level of education, material status, to determine the difficulties in the daily functioning of women with back pain. The aim of the study was to assess the degree of disability resulting from pain in the lumbar spine in women and to answer the following research questions:

1. Do socio-demographic factors differentiate the degree of disability?
2. Do socio-demographic factors condition difficulties in carrying out everyday activities?

Material and methods

The study was conducted among 274 professionally active women aged between 50 and 64 (the average age was 56.4±4.3) who come from Biała Podlaska, Poland, and the surrounding areas. All the subjects experienced pain in the lumbar spine. In addition, the criteria for inclusion in the study group were: having good health and no chronic diseases, no spinal injuries or surgical treatment within the spine.

Based on interviews and obtained information on personal data, a division into three age groups was adopted: a) 50 – 54 years old, b) 55 – 59 years old, c) 60 – 64 years old; place of residence (the city, the country), education (secondary and lower, higher) and material status (financial standing below the average, average financial standing, financial standing above the average). The study was anonymous, participation was voluntary with the option of refusing participation at any stage.

Each subject completed the Oswestry Disability Index (ODI) [20], which is a reliable, widely used and recommended criterion for assessing the degree of disability of people with lumbar spine pain syndrome. It contains 10 questions about the intensity of pain and the change in its intensity, and determines the daily functioning of the respondents with respect to lifting objects, walking, sitting, standing, sleeping, self-care, social life, sexual activity, and travelling. For each question, the respondents gave one of six answers defining their condition according to the following scoring: A = 0; B = 1; C = 2; D = 3; E = 4; F = 5. The answers were classified on a scale from 0 to 5. The aggregate result in the form of point values from 0 to 50 was converted into percentages from 0 to 100%, thus calculating ODI (the Oswestry Disability Index) and determining the degree of disability of the respondents and their functional limitations when performing specific activities. When classifying the severity of disability of each of the women in accordance with ODI [21], the statistical analysis uses Fairbank's interpretation of ODI: (0 – 20%) – minimal disability, (20 – 40%) – moderate disability, (40 – 60%) – severe disability, (60 – 80%) – disablement, (80 – 100%) – total disablement – a bedridden person. Statistical calculations were made in STATISTICA v 10. For qualitative variables, a percentage structure (%) was presented. Pearson's Chi-squared test (χ^2) was used to detect statistically significant differences. For quantitative variables, arithmetic means were calculated and Mann-Whitney U and Kruskal-Wallis tests were used. The significance value in all the analysed cases was p= 0.05.

Results

Women aged 50-54 – 43.9%, women living in the city – 61.3%, women having higher education – 58.0% and women with an average financial situation – 77.7% were the majority in the study group. The smallest number of respondents was respondents aged 60-64 – 17.3%, respondents living in the countryside – 38.7%, respondents having secondary or lower education – 42.0% and those whose material status is below the average – 6.2% (Figure 1).

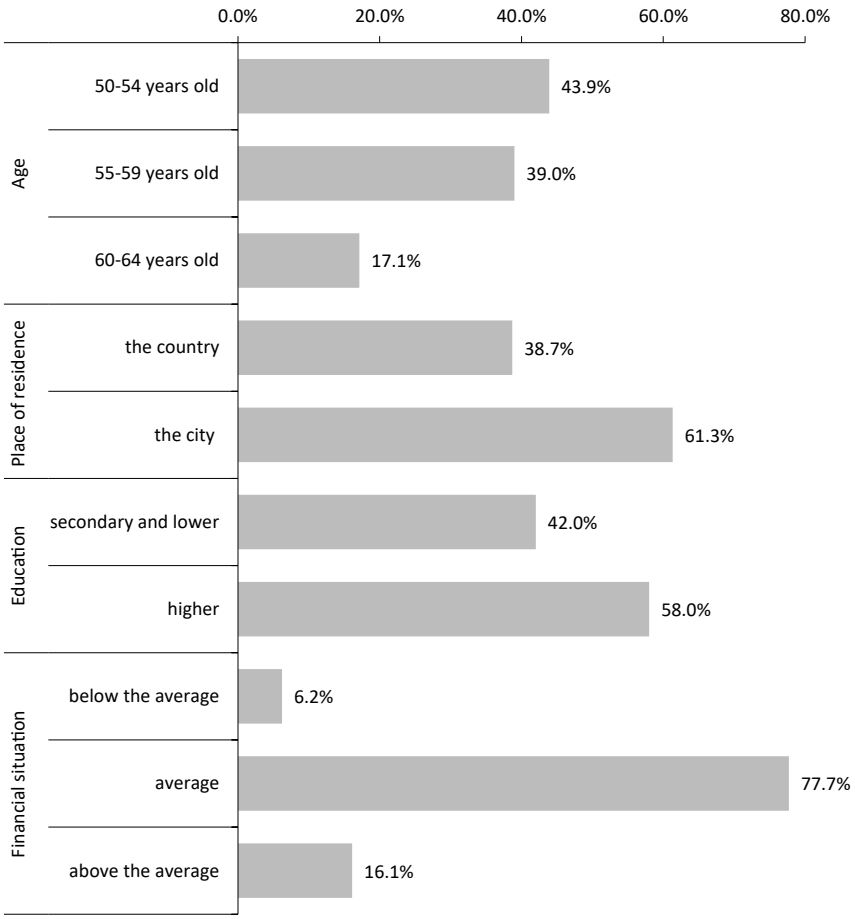
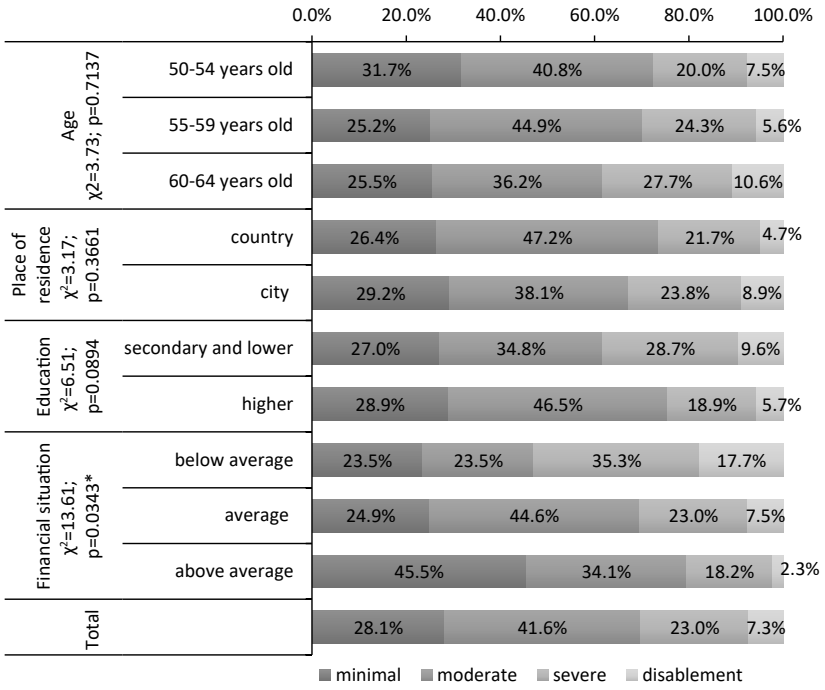


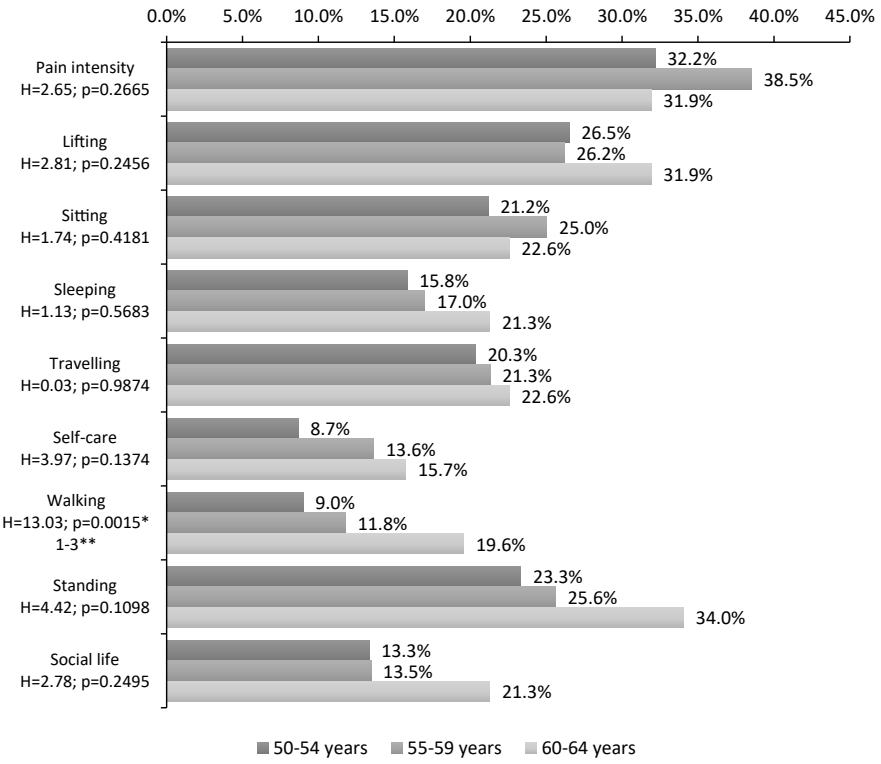
Figure 1. The characteristics of the respondents

The most numerous group of women were respondents with moderate disability – 41.6%. Minimal disability was found in 28.1% of the respondents, severe disability in 23.0%, and the highest disability rate, defined as disablement, was presented by 7.3% of all the respondents. Statistically significant differences were found in the subjective assessment of the degree of disability of the respondents depending on their material status. Among the women with a financial situation above the average, the largest group were those with minimal disabilities – 45.5%. In the group of women with an average financial situation, the most had moderate disability – 44.6%. In contrast, the highest percentage of women with severe (23%) and a high disability rate (disablement) was in the group of respondents with a financial situation below the average ($p = 0.0343$). In addition, women aged 50-54 were characterised by minimal disability – 31.7%, respondents living in the city – 29.2% and university graduates – 28.9%. A moderate degree of disability was evident mainly in older women, respondents aged 55-59 – 44.9%, women from rural areas – 47.2% and women with higher education – 46.5%. Severe disability was found among the respondents from the oldest age group (60-64 years old) – 27.7%, respondents from the city – 23.8%, respondents with secondary or lower education – 28.7%. A high level of disability (disablement) was declared by the least respondents and they were mostly the oldest women (60-64 years old) – 10.6%, respondents from the city – 8.9%, respondents having secondary or lower education – 9.6% (Figure 2).



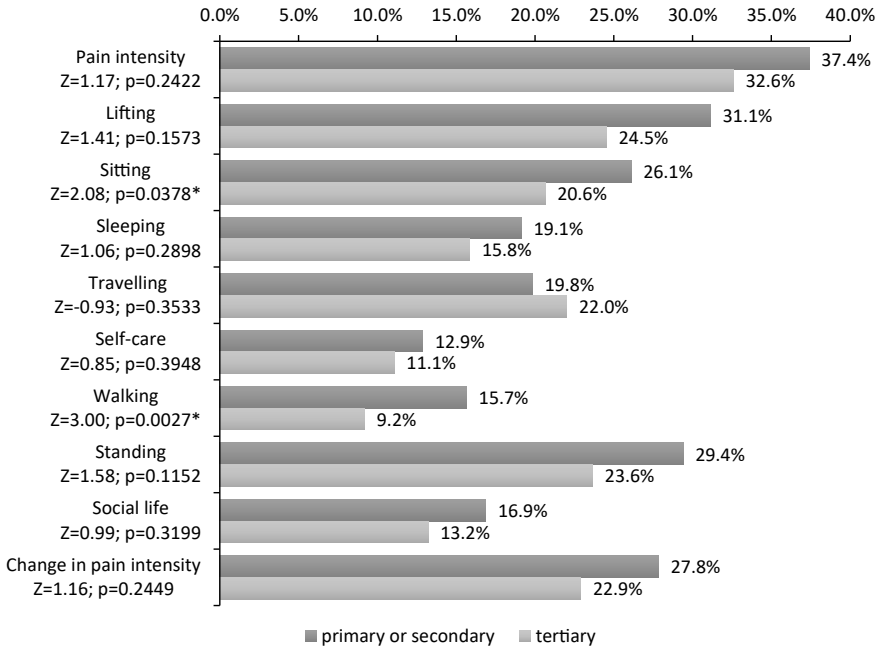
χ2– Result of the Pearson's Chi-squared test
*significant difference at p <0.05
Figure 2. The degree of disability among the women according to ODI in terms of socio-demographic factors

Age differentiated the respondents significantly in terms of pain sensation and walking difficulties related to it. A significant difference was found between women from the youngest and the oldest age groups. Women aged 60-64 rated their difficulty walking higher – 19.6% than women aged 50-54 – 9.0% (p = 0.0015) (Figure 3).



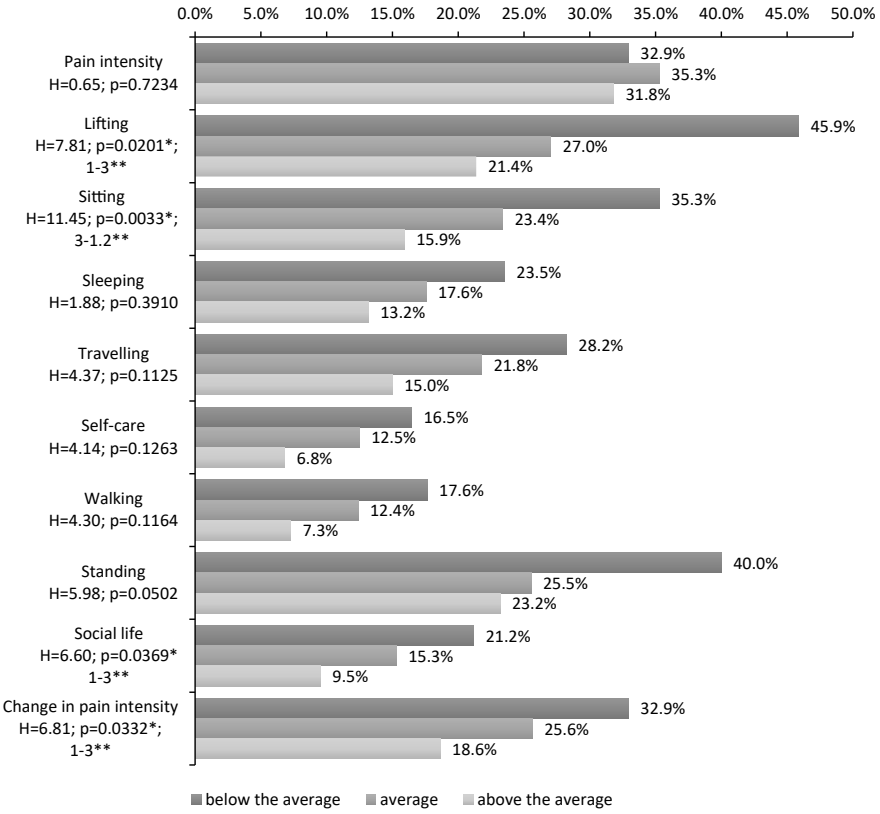
H – result of the Kruskal-Wallis test;
*significant difference at p <0.05; **age groups between which there is statistically significant difference
Figure 3. Functional restrictions caused by pain in the lumbar spine in terms of age

It turns out that education differentiates the respondents significantly as far as the occurrence of pain during sitting and walking is concerned. Women with secondary or lower education had more difficulty sitting for long periods of time – 26.1% than women with higher education – 20.6% (p = 0.0378). Similarly, women with secondary and lower education admitted that pain in the spine limits their unrestricted movement – 15.7%, which was indicated by fewer respondents with higher education – 9.2% (p = 0.0027) (Figure 4).



Z – result of the Mann-Whitney U test
*significant difference at p <0.05
Figure 4. Functional limitations caused by pain in the lumbar spine in terms of education

Material status differentiated the respondents significantly in terms of assessing the degree of disability hindering the performance of the following activities: lifting objects, sitting, socialising and experiencing a change in the intensity of pain. In the case of all of the above-mentioned activities, women declaring their financial standing as being below the average rated the difficulties associated with their functioning the highest. As far as lifting objects is concerned, a statistically significant difference was apparent between women with the lowest material status and women with the highest material status. The former assigned a much higher value – 45.9% to restrictions connected to this activity than women with the highest material status, who rated this barrier at 21.4% (p = 0.0201). Spine pain prevented women from sitting to a greater extent in the case of women with an average financial position – 35.3% than the respondents with financial standing above the average who classified this restriction at 15.9%. Furthermore, the pain sensation while sitting were definitely lower in women with the best material status than in women with an average material status – 23.4% (p = 0.0033). Respondents with a below-average financial situation rated the difficulties associated with social life higher – 21.2%, in comparison with respondents with an above-average financial situation – 9.5% (p = 0.0369). Similarly, women with a below-average financial situation experienced greater changes in pain intensity – 32.9% than those with an above-average financial situation – 18.6% (p = 0.0332) (Figure 5).



H – result of the Kruskal-Wallis test
*significant difference at $p < 0.05$; **financial situations between which there is statistically significant difference
Figure 5. Functional limitations caused by pain in the lumbar spine in terms of material status

Discussion

Pain, referred to as an unpleasant, subjective sensation associated with tissue damage, has a significant impact on the daily functioning of humans [22]. Movement restrictions resulting from the sensation of pain lead to a deterioration in the quality of motor functions and body function. Back pain is a problem of a social nature, the number of people suffering from low back pain syndrome is increasing rapidly [23, 4]. Analyses by Dep et al. confirmed that the indicator that determines the level of disability in people with back pain is age [24]. Their study shows that back pain is very intense during performing particular activities in women aged 60-64. Age predisposes to many diseases, the symptom of which is pain, especially in the musculoskeletal system. Apart from discomfort, pain reduces physical activity and affects basic activities of everyday life in a considerable way. Currently, back pain is an epidemic in societies with a high degree of civilisation development. Lorencowicz and colleagues demonstrated that chronic pain in the lumbar spine disrupts functioning in almost all spheres of life in a significant manner. 60.4% of nurses were shown to suffer from back pain while sitting for prolonged periods of time [25]. People with low back pain syndrome have problems with daily activities involving bending the torso forwards [26, 27]. In this study we determined the limitations of daily functioning in the participants. Among the assessed activities, the biggest problem for the respondents was lifting heavy objects, standing, sitting, travelling, sleeping, walking and self-care. Cichońska et al. obtained a similar result confirming that most people have a problem with standing whereas sitting in any position for more than 10 minutes is almost impossible. The pattern is similar in the case of walking and, to a lesser degree, sleeping. Lack of healthy lifestyle habits and knowledge on how to move and lift objects in a correct way causes weakening of the spine, which in turn leads to pain [3]. Our analysis showed that women residing in the city experienced pain more frequently. This is probably related to the type of work that they performed and their lifestyle. Some researchers indicate that study participants usually spend their free time watching TV, listening to the radio, talking to their neighbours and visiting their relatives. Their social life, participation in senior clubs or interest/support groups is also low [25, 28]. However, Repka and Wordliczek's study shows that the place of residence does not have much influence on the degree of pain and that respondents living in the urban environment felt less pain than people from rural areas [29]. Similarly, studies by Michalika et al. showed a higher number of hospitalisations of adults due to low

back pain among the inhabitants of rural areas than cities [30]. The authors of other studies have shown that the inhabitants of rural areas assess their health condition more negatively than urban residents. This is associated with additional negative determinants related to more difficult living conditions in the rural environment [31, 32]. The physical nature of work is an important factor contributing to the occurrence of overload changes in the lower spine and the occurrence of pain [33]. Solecki's study showed that farmers experience pain in the lower spine more often than white-collar workers [34].

According to Pędich, the condition of general health also depends on other variables such as education, lifestyle, and environmental factors [32]. Education is another demographic factor that affected the degree of pain sensation. Repka points out that respondents with primary and vocational education experienced the strongest pain [29]. The findings presented here confirm that the intensity of pain, especially when sitting and walking, in the case of women with secondary and lower education is higher than in the case of women with higher education. By contrast, studies by Lee et al. suggest that education plays a limited role in the modification of pain intensity [35]. Gajewski et al. emphasise that people with lower education more often express dissatisfaction with their health, and the level of satisfaction increases with the level of education [36]. Not only does the physiology of the body affect the intensity of pain, but also family and financial situation. That is why the support of loved ones, both emotional and financial, is so important. Treatment of back diseases requires ever-increasing financial outlays. Refunds by the National Health Fund are not sufficient compared with the demand. Patients wait for treatment for several years. Yet, patients who can afford commercial treatment, choose to pay for it [31]. The findings we describe indicate that women whose financial situation was below the average had more difficulty lifting objects and sitting because of back pain than women with high material status. In addition, back pain was a barrier for them to lead a regular social life. The reduction of spinal dysfunction enabling leading a normal family, social and professional life is one of the basic therapeutic and nursing tasks [37, 32]. People are usually happy with their lives, but the factor that reduces life quality is pain, which, according to research studies, occurs very often. Numerous reports emphasise that pain affects the well-being of respondents negatively, hence leading to disorganisation of life [32]. Therefore, it is crucial to educate society about the awareness of the causes of back pain syndrome, methods of treatment and, above all, preventive actions aimed at minimising pain and thus improving the quality of life.

Conclusions

1. A socio-demographic factor that differentiates the degree of women's disability in a significant manner is their material status – the better the financial situation, the lesser the disability.
2. Socio-demographic factors – such as age, education and material status – are strong determinants of functional restrictions caused by back pain:
   - women from the oldest age group (60-64 years old) had a significantly larger problem with walking than the youngest women (50-54 years old);
   - women with secondary or lower education had more difficulty sitting and walking than women with higher education;
   - women whose material status is above the average were more sensitive to changes in the intensity of pain compared with women whose material status is below the average. They also found socialising and moving objects to be less problematic. Sitting was less onerous than in the case of women with an average or below-average financial situation.

Disclosures and acknowledgements

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ORIGINAL PAPER
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EFFECTS OF ANIMAL-ASSISTED THERAPY ON PARENT-REPORTED BEHAVIOUR AND MOTOR ACTIVITY OF CHILDREN WITH AUTISM SPECTRUM DISORDER

WPŁYW ANIMALOTERAPII NA ZACHOWANIA I AKTYWNOŚĆ RUCHOWĄ DZIECI Z AUTYZMEM W OCENIE RODZICÓW

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. Autism spectrum disorder (ASD) is a neurobiological disorder characterised by abnormal development noted before three years of age. One of the forms of therapy suggested to children with ASD is animal-assisted therapy (AAT). AAT is a planned and organised therapeutic intervention that aims to improve physical, cognitive, behavioural, and socioemotional performance. The present study examined the effects of AAT on parent reports of their child's behaviour and motor activity.
Material and methods. The study group consisted of 50 parents (38 females and 12 males) of children diagnosed with ASD and who participated in AAT. All participants resided in the Lubelskie Voivodeship, Poland. A questionnaire was developed for parents for this study that included demographic information, and ten questions regarding the effects of AAT on their child with ASD.
Results. The most commonly reported forms of AAT among parents of children with ASD included canine-assisted therapy and equine-assisted therapy. Parents reported that AAT was associated with more animated gestures ($p = 0.01$), an increased frequency of verbal reactions ($p = 0.02$), and an increased frequency of expression of emotions and feelings ($p = 0.05$) among their children.
Conclusions. According to parents of children with ASD, AAT has positive effects on their child's emotion-related functioning, motor endurance, balance, and motor skills. However, access to AAT in the Lubelskie Voivodeship is limited.

Keywords: animal assisted therapy, autism, children, knowledge

Streszczenie

Wprowadzenie. Autyzm należy do zaburzeń neurobiologicznych, które charakteryzują się nieprawidłowym rozwojem, objawiających się przed 3 rokiem życia. Jedną z form terapii proponowanych dzieciom z ASD jest animaloterapia. Terapia z udziałem zwierząt jest planowaną i zorganizowaną interwencją terapeutyczną, której podstawowym zadaniem jest poprawa fizycznego, poznawczego, behawioralnego oraz społeczno-emocjonalnego funkcjonowania. Celem pracy była ocena efektów działania animaloterapii w opinii rodziców dzieci z autyzmem.
Materiał i metody. Grupę badaną stanowiło 50 osób – 38 kobiet i 12 mężczyzn zamieszkujących województwo lubelskie, u których dzieci zdiagnozowano ASD. Na potrzeby pracy skonstruowano autorski kwestionariusz ankiety składający się z metryczki oraz dziesięciu pytań dotyczących opinii rodziców dzieci z autyzmem na temat efektów działania animaloterapii.
Wyniki. Najczęściej wybieranymi formami animaloterapii były dogoterapia oraz hipoterapia. Rodzice, których dzieci uczestniczyły w zajęciach z udziałem zwierząt wskazywali wśród efektów terapii ożywioną gestykulację ($p = 0,01$), zwiększone występowanie reakcji głosowych ($p = 0,02$) oraz częstsze okazywanie uczuć i emocji ($p = 0,05$).
Wnioski. Terapia z udziałem zwierząt w opinii rodziców dzieci z autyzmem ma pozytywny wpływ na sferę emocjonalną, kondycję ruchową, równowagę oraz motorykę pacjentów. Dostęp do terapii z udziałem zwierząt na terenie województwa lubelskiego jest jednak ograniczony.

Słowa kluczowe: animaloterapia, autyzm, dzieci, wiedza

Tables: 1
Figures: 1
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Introduction

Autism spectrum disorder (ASD) is neurobiological disorder characterised by abnormal development noted before three years of age. Typical symptoms of ASD include pathological social functioning (e.g., social interactions, communication, and interests), as well as, limited and stereotypical motor activities. ASD is overall and presents under various conditions that are independent of the surroundings. At present, diagnostic reports and the scientific literature use the term 'ASD', which covers various pathologies, including autism, Asperger's syndrome, pervasive developmental disorder not otherwise specified, and childhood disintegrative disorders [1-6].

To date, the causes of ASD are yet to be identified; however, the causes are thought to be multifactorial in nature. Likely causes for ASD include genetic and hereditary factors, environmental and neurotoxic factors, allergies, food intolerances, immune system function impairment, and gestational and perinatal factors [2, 5, 6, 7].

Epidemiological studies are inconsistent regarding the frequency and incidence of ASD. Indeed, the reported rates of ASD differ based on the utilised diagnostic criteria. For example, a meta-analysis of 2012 epidemiological reports from across the globe showed that the incidence of ASD is approximately 62/10000 (or 1/160) [2]. The frequency of ASD is also thought to be increasing over time, which underscores that this is an ever-growing economic and medical problem. Taken together, the increasing frequency of ASD highlights the need for new evidence-based forms of therapy [1, 2, 8, 9, 10].

Therapy of a child with an ASD should be a comprehensive process that is carefully planned and considers the complexity of the disorder, the needs of the patient, and his/her surroundings. The apparent need for treatment and therapy for ASD prompts the development of new approaches, and/or the refinement of already existing methods. One of the forms of therapy suggested for children with ASD is animal-assisted therapy (AAT). The positive effects of AAT are increasingly noted by specialists in medical rehabilitation [2, 3, 11-15].

AAT is an organised and planned therapeutic intervention led by a specialist with appropriate theoretical and practical preparation in the field. AAT activities focus primarily on the improvement of cognitive, physical, socioemotional, and behavioural performance of the patient. A related form of animal-assisted classes is animal-assisted education, wherein a qualified specialist performs interventions within the scope of education and pedagogics. Animal-assisted classes are strictly planned and organised, and they focus primarily on educational and didactic methods. The third prominent form of animal-assisted intervention is animal-assisted activity, which consists primarily of recreational classes and classes that encourage activity of patients and fosters the provision of mental comfort to people undergoing crisis situations [3, 11, 16, 17].

The animals most commonly used in rehabilitation activities are horses (i.e., equine-assisted therapy), dogs (canine-assisted therapy), cats (feline-assisted therapy) and dolphins (dolphin-assisted therapy) [13, 19-21]. The present study aimed to evaluate the effects of AAT on children with ASD, as measured by parent reports.

Material and methods

The study group consisted of 50 parents (38 females, 12 males, age: M age = 38.1 years, Me = 39, SD = 9.35 years) of children (30 boys, 20 girls, M age = 9.3 years, Me = 7.2, SD = 4.5) diagnosed with ASD. All participants resided in the Lubelskie Voivodeship, Poland. A questionnaire was developed for parents for this study that included demographic information, and ten questions regarding the effects of AAT on their child with ASD. Statistical analysis was conducted with SPSS 17.0 suite (Softonic, USA). For the purposes of this paper, the following tests were applied: Phi assay and V Cramer test. In all tests, the significance level of $p < 0.05$ was assumed.

Results

All respondents (n = 50) reported that their children participated in AAT. Participation in AAT did not differ by gender and age of children.

Most frequently (68%), the parents reported learning about AAT on the Internet; 21% of parents reported learning about AAT from television, and 11% from healthcare professionals (e.g., physician, physical therapist, nurse). At the same time, over a half (64%) of the respondents reported that access to animal-assisted classes in the Lubelskie Voivodeship is limited. 30 (60%) respondents indicated that their child was eager to participate in AAT; 4 (8%) reported that their child participated reluctantly, and 16 (32%) respondents had no opinion. Parents of 22 (44%) children participated in AAT for more than 12 months; 17 (34%) participated between 6 and 12 months, and 11 (22%) participated in AAT for less than 6 months. All children participated in therapy once a week.

The most frequently reported forms of AAT used among study participants were canine-assisted therapy (40%) and equine-assisted therapy (38%) (Figure 1).

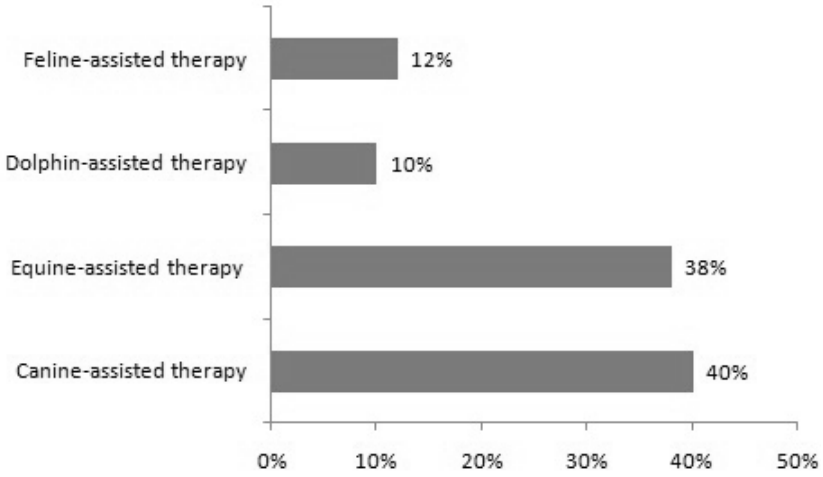

Figure 1. Forms of animal-assisted therapy (AAT) used by the children with autism (n = 50)

Table 1 presents a parent-reported assessment of the effects of AAT on the emotional behaviours of autistic children. All of the positive changes indicated by the parents reached statistical significance ($p < 0.05$).

Table 1. Effects of contact with animals according to the respondents (n = 50 parents)

What effects did you see in your child during his/her contact with animals?		Parent's assessment		p
		Yes	No	
More frequent expression of feelings and emotions	N	44	6	$p = 0.05$
	%	**88%**	**12%**	
Lively gestures	N	49	1	$p = 0.01$
	%	**98%**	**2%**	
More frequent vocal and verbal reactions	N	43	7	$p = 0.02$
	%	**86%**	**14%**	
Increased responsibility and independence	N	26	24	$p = 0.22$
	%	**52%**	**48%**	

27 (75%) parents reported that participating in AAT improved their child's motor coordination; 24 (66.7%) respondents reported an improvement in their child's concentration, 21 (58.3%) reported an improvement in balance, and 20 (55.6%) reported an improvement in motor skills.

Parents of children who participated in AAT reported that contact with animals had a positive impact on the child's activity ($p = 0.001$, V Cramer = 0.58). However, respondents reported that they are less aware of contraindications for animal-assisted interventions (e.g., allergies to certain animals or fear of animals) [22]. In addition, there was a significant negative correlation between disability level and awareness of contraindications such that parents of children with moderate degree of disability were less aware of contraindications for contact with animals ($p = 0.002$, V Cramer = 0.50, Chi-square = 12.66 ($df = 2$)). Participation in animal-assisted classes was not associated with possession of a pet.

We found that the degree of disability is not related to participation in AAT ($p = 0.06$). Indeed, children with a higher degree of disability are also more likely to have various concomitant diseases; however, the difference was statistically significant only in the case of speech impediments ($p = 0.05$, V Cramer = 0.35, Chi-square = 6.06 ($df = 2$)).

Discussion

AAT may have positive effects on ASD patient outcomes in several domains. Most frequently, AAT has been shown to have multifaceted effects on the human body in terms of physical, mental, educational, and motivational functioning. At present, the health merits of an interaction between humans and animals have become a point of interest of many scientific disciplines, including medical, social, and psychological.

In the present study, parents reported that children showed feelings and emotions more often, had animated gestures and vocal reactions, as well as, improved motor coordination, concentration, and balance following AAT. Grigore et al. found a positive effect of AAT in children in the form of improved verbal communication skills, improved eye contact, reduced motor hyperactivity, and increased expression of feelings [9].

Lanning et al. examined the effects of equine-assisted therapy on behaviour and quality of life of children with ASD [23]. In that study, the authors reported that a nine-week therapeutic regime was associated with positive changes in the study group in terms of physical activity, and in emotional and social functioning [23]. These improvements were not observed in the control group [23]. A similar study by Bass et al. assessed the impact of equine-assisted therapy on social, mental, and physical functioning of children with ASD [24]. In that study, the authors reported that, compared to the control group, the study group showed an increase in social relations, a decrease in distraction, and an increase in physical activity following equine-assisted therapy [24].

The present study showed a statistically significant higher frequency of speech impediments in children with a considerable degree of disability. Importantly, 71.1% of parents reported an improvement in vocal and verbal reactions following their child's participation in AAT.

The reported improvement in vocal and verbal reactions is consistent with a study by Gabriels et al. [25], who reported an improvement in social behaviours, particularly an increase in communication and lower irritability, among young patients following a ten-week equine-assisted therapy regimen. In that study, the positive effects of therapy continued for at least six months [25]. Similarly, a study by Kern et al. reported that equine-assisted therapy was associated with a reduction in autistic symptoms, and an increase in quality of life among children [14]. These beneficial effects were evident for at least half a year following the end of therapy [14].

The literature review performed by Trzmiel et al. showed a positive effect of horseback riding on children with ASD, including a reduction in aggression, an improvement in motor functioning, and an improvement in social behaviours [26]. The present study did not find a statistically significant correlation between possessing a pet at home and participating in AAT. In contrast, Hall et al. showed that having a dog at home may have a positive effect on social problems among children with ASD [27].

Burgoyne et al. evaluated the impact of canine-assisted therapy on the behaviour and social relations of children with ASD [28]. In that study, the authors reported that patients using canine-assisted therapy were less exposed to environmental threats, and were more positively perceived by the society [28]. However, in a follow-up study performed by Fung and Leung in children with ASD, the authors reported that canine-assisted therapy was not superior to therapy sessions with an "artificial" dog [29]. Notwithstanding the results, the authors suggest that a dog may be a motivating factor for stimulating the development of speech in autistic children [29].

Families with a child with ASD have encountered barriers to therapy access, which could hinder the child's emotional, educational, and social growth. For example, Habik et al. examined therapeutic and rehabilitation activities and found that parents reported, for example, difficulty in accessing specialists, a high cost of therapy, and a lack of systematic physiotherapeutic procedures [30]. In line with these findings, we found that 64% of parents in the present study reported that access to AAT in the Lubelskie Voivodeship is limited.

According to the available forms of AAT, equine-assisted and canine-assisted therapy are the most commonly used and provide the best results [14, 23-28]. Indeed, the present study together with previous reports suggest that AAT can be used in the rehabilitation of children with ASD, and may be particularly useful for stimulating mental, social, and motivational functioning. It is important to note that the mechanism of AAT has not yet been fully explained. Therefore, it is imperative to perform further studies to examine the underlying mechanisms. Given that ASD is a growing medical problem, the search for new and more effective forms of treatment are needed to facilitate the growth of children with ASD.

Conclusions

1. Parents of children with ASD report that AAT has a positive effect on their child's emotional functioning.
2. Parents of children with ASD report that AAT has a positive effect on their child's motor fitness, balance, and motor activity.
3. Access to AAT in the Lubelskie Voivodeship is limited.

Disclosures and acknowledgements

The study was performed according to the International Code of Medical Ethics (Declaration of Helsinki).

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ORIGINAL PAPER
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PART II. PHYSICAL ACTIVITY OF SOCIAL AND PROFESSIONAL GROUPS
DZIAŁ II. AKTYWNOŚĆ FIZYCZNA GRUP SPOŁECZNYCH I ZAWODOWYCH

FUNCTIONAL STATUS OF THE CENTRAL NERVOUS SYSTEM IN GIRLS AGED 16-18 YEARS OLD

STAN FUNKCJONOWANIA OŚRODKOWEGO UKŁADU NERWOWEGO DZIEWCZĄT W WIEKU 16-18 LAT

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. The objective of the study was to explore the dynamics of the functional state of the central nervous system (CNS) and neurophysiological processes of girls 16-18 years old in the context of their transition to a new level of social organization.
Material and methods. The functional state of the CNS was studied in girls 16-18 years old in a state of relative muscular rest through observation of visible motive reactions, Loskutova's method, and in the fifth minute of renewal after the physical loading with variable power.
Results. We found that 17 year-old girls had the best functional CNS capabilities. The reduced adaptive capacity of the CNS in 16 year-old girls is due to their necessity for adaptive reorganization of regulatory mechanisms to new social conditions: examinations and university entry. After physical activity, 16 and 18 year-old girls registered stress reactions, indicating decreased CNS adaptation.
Conclusions. 17 year-old girls were observed at rest to have better CNS functionality compared to the other age groups. Analysis of the dynamics of the functional CNS states of 16–18 year-old girls after exercise resulted in the identification of two main reaction types: 1) reduction of the basic criteria at high initial values; 2) increase of criteria of a general functional state of a brain at low raw data.

Keywords: central nervous system, general functional state, load, youth period, simple visual-motor reaction

Streszczenie

Wprowadzenie. Celem pracy było zbadanie zmian funkcjonowania ośrodkowego układu nerwowego oraz specyfiki procesów neurofizjologicznych u dziewcząt w wieku 16-18 lat w wyniku przejścia na nowy poziom organizacji społecznej.
Materiał i metody. Stan funkcjonowania ośrodkowego układu nerwowego był badany u dziewcząt w wieku 16-18 lat na podstawie przestojów widocznych reakcji motywacyjnych metodą T. Loskutova w stanie relatywnego odpoczynku mięśniowego i w piątej minucie odnowy po obciążeniu fizycznym o zmiennej mocy.
Wyniki. Wyniki badań wykazały, że dziewczęta w wieku 17 lat miały najlepsze możliwości funkcjonalne ośrodkowego układu nerwowego. Zmniejszenie zdolności adaptacyjnych ośrodkowego układu nerwowego u dziewcząt w wieku 16 lat wynika z konieczności reorganizacji i przystosowania mechanizmów regulacyjnych do nowych warunków społecznych: egzaminów i przyjęcia na uniwersytet. Po aktywności fizycznej u dziewcząt w wieku 16 i 18 lat zaobserwowano reakcję stresową, która wskazuje na obniżenie mechanizmów adaptacyjnych ośrodkowego układu nerwowego.
Wnioski. U dziewcząt w wieku 17 lat w stanie odpoczynku zaobserwowano lepsze funkcjonowanie ośrodkowego układu nerwowego w porównaniu z innymi grupami wiekowymi. Analiza zmian w stanie funkcjonowania ośrodkowego układu nerwowego u dziewcząt w wieku 16-18 lat po wysiłku pozwoliła zidentyfikować dwa główne typy reakcji: 1) obniżenie podstawowych kryteriów przy wysokich wartościach początkowych; 2) wzrost kryteriów ogólnego stanu funkcjonowania mózgu przy niskich danych surowych.

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Figures: 2
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Słowa kluczowe: ośrodkowy układ nerwowy, ogólny stan funkcjonowania, obciążenie, okres młodzieńczy, prosta reakcja wzrokowo-ruchowa

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Introduction

The period of youth is characterized by a variety of changes in all functional systems of the body: the end of growth, development and transition to an adult level. At this time, all systems establish cooperation. Girls synchronize their reproductive system by strengthening neurohormonal connections between the central nervous system (CNS) and hypophysis and peripheral links with the ovaries. The role of the cerebral cortex in adjusting the body's functions increases, the strength of nervous system processes changes, the ratio of excitation to inhibition in the CNS aligns and autonomic nervous system ripening completes [1, 2]. All transformations are closely related to the changes in the relationship between the endocrine and nervous systems. So if in adolescence the influence of hormonal mechanisms of regulation over the nervous system prevails, as a result of ontogenetic alterations, new relationships with a prevalence of influence of the nervous mechanisms of regulation of all systems are established [3, 4, 5, 6]. Knowledge of these phenomena becomes more relevant in the context of studying the transition processes from one educational system, high school, to another, that of higher education institutions. Consequently, the mechanisms of central and humoral control over human abilities during this period come to the fore [7, 8, 9, 10].

The main activity in adolescence is education, and ultimately appropriate and successful professional orientation towards a future specialty [11]. The manifestation of activity in the social sphere results in nervous system activation, which is the basis for the implementation of intellectually mnestic activities. The CNS provides information transformation, carries out its processing and produces target answers, i.e., commands for sustained actions aimed at the achievement of positive results for the organism [12, 13, 14, 15, 16, 17]. Therefore, an important role is played by the evaluation of various characteristics of the adaptive and compensatory mechanisms of the youthful organism while changing school systems. This alteration in the main nervous processes can be detected by diagnosing sensorimotor reactions illustrating the interaction between mental and neurophysiological mechanisms and are the basis of successful intellectual activity [18, 19]. The study of indicators of sensorimotor reactions is used in neurophysiological studies of different population segments [20, 21, 22, 23, 24, 25, 26].

In a field this diverse, we study the dynamics of basic criteria characterizing the CNS functions of girls of different ages. The importance and necessity of this kind of research is well recognized [24, 27, 28, 29, 30, 31]. Our work is devoted to the study of the problem of the general functional state (GFS) of the CNS and peculiarities in the neurophysiological processes taking place in 16-18 year-old girls in the context of their transition to a new level of social organization.

To achieve the main goal, we have identified the following tasks:

1. to study the main criteria for estimation of the general functional state of the CNS of girls 16–18 years old in a state of relative muscle rest;
2. to investigate the dynamics of the general functional state of the brain of girls 16–18 years old in the implementation of burden with variable power;
3. to conduct comparative analysis between the studied criteria of girls 16–18 years old.

Material and methods

The research was carried out in the Tsoneva Laboratory of Age Physiology of Sports, Department of Biology and Health of the State Institution "Ushynsky South Ukrainian National Pedagogical University". 51 16-18 year-old girls were examined, and divided into three groups: group I – 16 year-olds (n=23); group II – 17 year-olds (n=12); and group III – 18 year-olds (n=16).

The study was conducted in accordance with the basic provisions of the Council of Europe Convention on Human Rights and Biomedicine (dated 4th April 1997), and Helsinki Declaration of the World Medical Association on ethical principles of conducting scientific medical research with the participation of a person (1994–2008).

The dynamics of the functional state of CNS was studied by means of Reflexometry by the method of T. Loskutova [9, 32, 33]. To measure the time of a simple visual-motor reaction, the Lightning device developed and patented by Bosenko was used [34].

Research was conducted as follows: the surveyed, in response to light stimuli, have to quickly press a button with the thumb of their "working" hand. The reaction time is displayed on the experimenter's indicator, recorded and memorized. In total, there are 60 signals in the series, an interval between each varies between 3 and 6 seconds, in order to avoid reflex actions based on set times. The test duration is up to 6 minutes. Research terms are limited by afferent effects, that is instrumental in the decline of tone of CNS. Thus, instruction requires pressing the button as quick as possible, so that motivation is utilized to promote tone of the nervous system. In this way, conditions were created to identify the abilities to formulate and appropriately maintain a functional brain state [7, 9].

According to the time of the latent period of the visual-motor reactions, a graph of the distribution of values is constructed, characterizing the individual level of the general functional brain state and also the protocol of inspection with the sizes of three indexes unsealed – functional level of the system (FLS), reaction stability (RS) and level of functionality (LF) and significance of 60 latent periods.

Upon receiving instruction in the moment of organization of ready condition, the functional system forms to realize a simple motive reaction. Its formation is related to the necessity of association of the different functional specialized nerve centers for the unique system which, in turn causes coherence of time parameters for these centers in synchronizing their activities [32, 33, 35]. It is necessary to note that based on the influence by modality and intensity of the irritant and the level of complexity and automation of the irritant and the functional readiness of the nervous system, the latent period can vary considerably. However, the time of the reaction-answer for a stimulus cannot be below a certain physical limit or "uncontinuous minimum" of about 100 milliseconds [36].

Reflexometry was carried out in a state of relative muscle relaxation and at the fifth minute of recovery after physical bicycle ergometric load, as carried out according to the methodology of D. Davydenko and coauthors [37]. According to this method, the load power increased continuously at constant speed (33 W per minute) from zero to a certain level determined by the heart rate of 150 beats per minute, whereupon it dropped to zero with the same speed. The frequency of pedaling for all surveyed was identical at 60 revolutions per minute. The rotation (reverse) of load was performed at the same time for all tested heart rates (150 to 155 beats/min) that is, at the same physiological price, the surveyed reached a different load capacity.

Statistical analysis of data was performed using the statistical package SPSS 16. The critical level of significance in checking statistical hypotheses was assumed to be $p \leq 0.05$. To describe selective distribution, M indicated the arithmetic mean and m indicated the error of the arithmetic mean. In order to study the effect of loads on the functional state of the studied system for comparison of two dependent selections, the Wilcoxon criterion was applied [38].

Results

The comparative characteristics of the studied parameters of the general functional state (GFS) of brain in norm for girls (youth period of ontogenesis) and in adults are presented in Table 1.

Table 1. Indices of the general functional state of the CNS in the state of relative muscular rest of girls of youth age and adults

Criteria of functional state CNS, c. u.	Contingent			
	16 years old (n=23)	17 years old (n=12)	18 years old (n=16)	Adults (Loskutova's method)
Functional level of the system (FLS)	4.75±0.07	4.61±0.09	4.74±0.06	4.2–5.5
Reaction stability (RS)	1.93±0.10	1.67±0.12	2.03±0.12*	1.0–2.8
Level of functionality (Lf)	3.61±0.11	3.23±0.10	3.66±0.12*	2.7–4.0

Note: * $p<0.05$ in relation to 17 year-old girls; c. u. – conventional units

According to the reference values, the magnitude of the functional level of the system, reaction stability and level of functionality using Loskutova's method, all surveyed can be divided into three main groups: the lowest, highest and middle functional center of the CNS. The optimum, according to many scientists, is the average level of activation (tone) of the brain [9, 30].

According to the indicators of stability of the reaction (Figure 1), the average level of the general functional state of the brain was observed in 34.78% of 16 year-old girls, 58.33% of 17 year old girls and 31.25% of 18 year-old girls. A higher percent with a high functional CNS level is registered in 18 year-old girls (62.5%), with the lowest in 16 year-old girls (26.09%).

Based on the values of the functional level of the system, which is characterized by mechanisms representing tension of tonic non-specific influences, the middle level of GFS in the brain was determined in 43.48–58.33% of girls aged 16-18 years old. Moreover, a higher percent fell on the first course of studies, and the lower percent in the 16 year-old girls.

Only by the integrative index of the functional state of the CNS – a level of functional capabilities allowing us to judge the ability of the nervous system to formulate and maintain a functional system for a long time – there was an increase in the average level of the surveyed 17 and 18 year-old girls compared to 16 year-old girls: 43.48% – girls of I group; 66.67% – girls of group II and 62.5% – girls of group III.

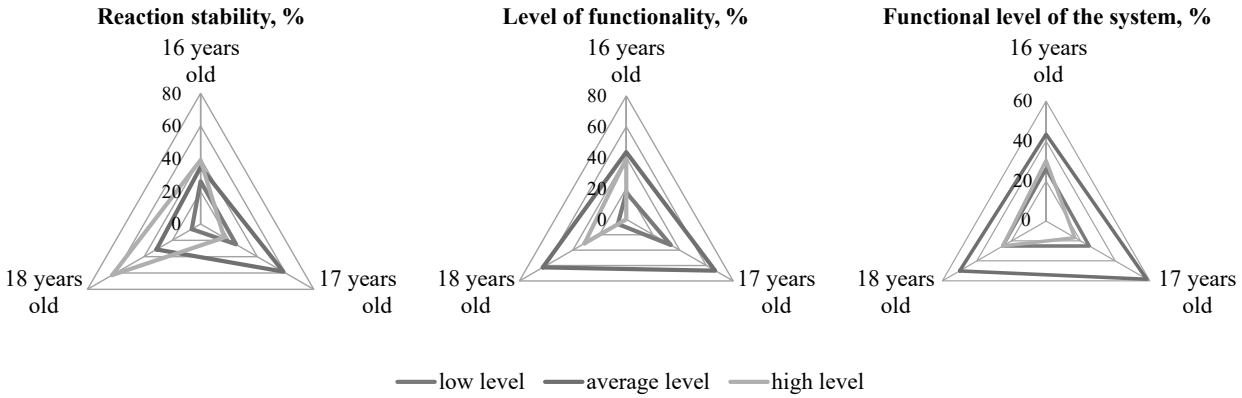
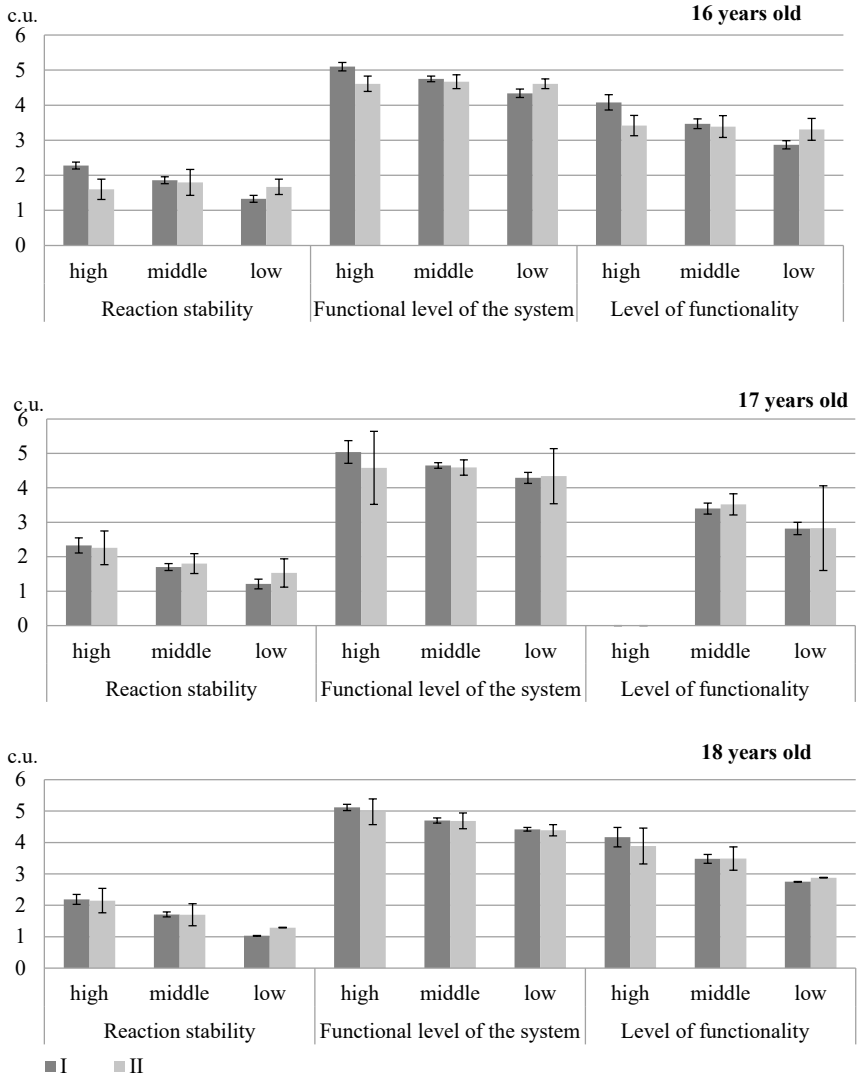


Figure 1. Levels of the general functional state of the brain of girls aged 16-18 in a state of rest (based on Loskutova)

Under the effect of dosed physical activity in a closed cycle, the probed indices of surveyed girls changed differently: there was an increase and decrease of indicators in different age groups. For the type of pattern established, we identified two main types of dynamics of the GFS parameters of the surveyed brain at metered load with reverse. They differ in orientation, depth of developments and quantitative ratio: with a high level of brain functional state, as a rule, decreasing in indicators, and at low output values, an increase in criteria (Figure 2).



I – state of the relative muscular rest, II – fifth minute of restoration after a physical load

Figure 2. Changes in indicators of general functional state of the brain in girls aged 16-18 years old after physical activity

The identified features are consistent and confirm previously noted regularities in the reaction of the functional CNS state to a wide range of surveyed both on mental, and on metered-dose and maximum muscular load [3, 9, 32]. There is also a third type of reaction to the GFS of the brain – an absence of similar or multidirectional changes of the studied parameters. This type is considered rigidity in the system and response inadequacy.

Discussion

In this study of a comparative analysis of reflexometry in the relative rest state of the three age groups, we found that 17 year-old girls had the best CNS functionality. Leaving school is the beginning of a new social phase in the lives of adolescents. So a slight percent reduction in CNS criteria in girls of group I, in our opinion, due to the need for adaptive restructuring of regulatory mechanisms to the new social conditions of man: examinations and university entry. A similar distribution can also be explained by the fact that girls at this age have not yet fully and functionally formed brain structures, and the maturation and development processes of the body as a whole are not complete. It is also possible to relate the results to the features of the adjustment and compensation processes occurring in the youth's body and endocrine remodeling accompanying this age period of ontogeny [12, 39, 40].

Reduction of regulatory mechanisms of the CNS in the surveyed 18 year-olds is confirmed by longitudinal studies of youth functionality carried out in the Tsoneva Laboratory of Age Physiology of Sports from 2014-2018. Studies have established the strain of adaptive capacity regulatory systems of the youth body at age 18 [33]. To assess the dynamics of the functional state of the CNS on the load of different orientation, the use of the methodical proposals of Baevskiy and Berseneva has been suggested previously [41]: shift in the ± 25% range is considered an activation reaction, ± 50% – stress response of regulatory mechanisms, and changes within ± 50% – overexertion response with possible failure of adaptive mechanisms. In our view, this approach gives a more objective individual description of the adaptive reactions of the CNS to physical and mental load and possibly other factors. Consequently, our research into simple visual motor reactions after physical activity have established that the stability of the reaction of tension of the regulatory systems of the CNS was observed in almost half the 16 year-old girls (43.47% of cases) and less in the 17 and 18 year-olds (33.33% and 31.25%, respectively) (Table 2). The resilience of response reflects the stability of the functional CNS state. Therefore, the less dispersion of response time, the tighter its distribution.

Table 2. The range of deviations of the reference level of indicators of the functional state of the CNS of girls aged 16-18 years old after physical activity in a closed cycle (%)

Improvement, %	Groups of girls	FLS	SR	LF
± 25 %	16 years old	100	47.83	82.61
	17 years old	100	66.67	100
	18 years old	100	68.75	87.50
± 50 %	16 years old	0	43.47	17.39
	17 years old	0	33.33	0
	18 years old	0	31.25	12.50
More ± 50 %	16 years old	0	8.70	0
	17 years old	0	0	0
	18 years old	0	0	0

Note: FLS – functional level of the system, RS – reaction stability, LF – level of functionality

By the functional level of the system, girls of all age groups showed reaction activation. However, by level of functionality, as an integral criterion for the CNS, some differences were also recorded. Indeed, all surveyed 17 year-old girls, who studied at the first year at the university, the positive dynamics of this criterion is revealed. However, girls of other age groups were registered with the reaction of tension of the regulatory systems of the CNS: 17.39% in 16 year-olds and 12.50% in 18 year olds, indicating CNS fatigue after physical activity and a need to increase the recovery period after completing physical activity. Voltage response that registered on the physical activity of surveyed 16 and 18 year-old girls also testifies to declining CNS adaptation in the surveyed girls of these age groups. It can be concluded that these age periods are transitional in the youth period.

In summary, we found that identifying the functional CNS status using the time of a simple visual motor reaction represents physiological processes, occurring in the brain at rest and with certain load types. With a great deal of reliability, this method measures the adaptive and compensatory reserves during ontogenesis.

The method expands and complements knowledge about the adaptation of adolescents as measured using other methods.

Conclusions

17 year-old girls in a state of rest had the best functional possibilities of the CNS compared to other age groups.

Analysis of the dynamics of the functional CNS state in 16-18 year-old girls after implementation of physical load allowed the identification of two main types of reaction: 1) a decline in basic criteria at high initial values; 2) an increase of GFS values of the brain at low initial data.

The physical load with the change of power revealed 16 and 18 year-old girls have tension response of regulatory mechanisms that illustrates decreased adaptation mechanisms of the CNSs of these girls.

The reflexometry method adequately reflects the physiological processes of the brain and can be used to get additional information in the application areas of physiology, sports medicine, and psychology.

Disclosures and acknowledgements

We thank all members of the research team. The authors declare no conflict of interest regarding this article. The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as national laws. The study was approved by the ethics committee. Informed consent was obtained from all the subjects included in the study. There was no funding for this study.

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PHYSIOPROPHYLAXIS OF TYPE 1 DIABETES IN CHILDREN USING PHYSICAL EXERCISE

FIZJOPROFILAKTYKA CUKRZYCY TYPU 1 U DZIECI Z WYKORZYSTANIEM AKTYWNOŚCI FIZYCZNEJ

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

According to the Physiotherapist Act, physioprophylaxis is an important component of physiotherapy and of the physiotherapist's professional activities. Physioprophylaxis can be oriented towards practicing healthy lifestyle behaviours, minimizing disease risk factors, or attenuating the consequences of the disease, surgery, and/or disability. Type 1 diabetes is a chronic metabolic disease characterized by hyperglycaemia, i.e. high blood glucose levels. It is caused by the dysfunction or destruction of β cells of pancreatic islets of Langerhans, which are responsible for the production and secretion of insulin. Type 1 diabetes is most common in children and adolescents. According to the 2018 report, 6,400 children aged 0-14 years and about 180,000 people over 14 years old suffer from type 1 diabetes in Poland alone. Physical activity is an important stimulus for optimal physiological development of children and adolescents, and is an important factor in reducing the risk of cardiovascular diseases, cancer, and mortality. Physical exercise reduces the need for insulin and increases the sensitivity of cells to insulin, so that the daily dose of insulin can be reduced. The Polish Diabetes Association recommends that children with type 1 diabetes should exercise for more than one hour a day in order to reduce the risk of vascular complications associated with the disease. The aim of this paper is to examine the effects of type 1 diabetes physioprophylaxis in children in the form of physical exercise, based on previous literature. The majority of research indicates physical activity has a positive effect on physiological function in children with type 1 diabetes, specifically reducing the risk of hypoglycaemia, high blood glucose level, insulin demand, and premature death.

Keywords: physioprophylaxis, type 1 diabetes, physical exercise, children

Streszczenie

Fizjoprofilaktyka, zgodnie z Ustawą o zawodzie fizjoterapeuty, jest składową fizjoterapii i czynnością zawodową fizjoterapeuty. Może być ukierunkowana na praktykowanie zachowań zdrowotnych, zapobieganie czynnikom ryzyka choroby lub zapobieganie konsekwencjom choroby (operacji) i niepełnosprawności. Cukrzyca typu 1 to przewlekła choroba metaboliczna cechująca się występowaniem hiperglikemii, czyli podwyższonego poziomu glukozy w osoczu krwi. Jej przyczyną jest zaburzenie funkcji lub zniszczenie komórek β wysp Langerhansa trzustki. Cukrzyca typu 1 występuje najczęściej u dzieci i młodzieży. Według raportu z 2018 roku w Polsce na cukrzycę typu 1 choruje 6 400 dzieci w wieku 0-14 lat oraz ok. 180 000 osób powyżej 14 roku życia. Aktywność fizyczna jest ważnym stymulatorem prawidłowego rozwoju dzieci i młodzieży w ujęciu holistycznym, a także istotnym czynnikiem zmniejszania ryzyka chorób układu sercowo-naczyniowego, nowotworów oraz śmiertelności. Wysiłek fizyczny powoduje zmniejszone zapotrzebowanie na insulinę oraz zwiększanie wrażliwości komórek na insulinę, dzięki czemu dawka dobowa insuliny może być zmniejszona. Polskie Towarzystwo Diabetologiczne zaleca podejmowanie wysiłku fizycznego przez dzieci chorujące na cukrzycę typu 1 w wymiarze powyżej jednej godziny dziennie celem redukcji ryzyka powikłań naczyniowych. Celem artykułu jest przedstawienie wyników fizjoprofilaktyki cukrzycy typu 1 u dzieci w formie aktywności fizycznej na podstawie literatury. Większość badań wskazuje pozytywne działanie aktywności fizycznej na stan funkcjonowania dziecka z cukrzycą typu 1 zmniejszając: ryzyko hipoglikemii, stężenie glukozy we krwi, zapotrzebowanie na insulinę i ryzyko śmierci.

Słowa kluczowe: fizjoprofilaktyka, cukrzyca typu 1, aktywność fizyczna, dzieci

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Introduction

Physioprophylaxis is one of the health services provided within the framework of physiotherapeutic activity [1]. The goal of physioprophylaxis is to advocate pro-health behaviours and to improve fitness of people of different ages in order to prevent disability. In the literature we distinguish three levels of physioprophylaxis – primary, secondary, and tertiary. Primary physioprophylaxis is targeted at the general population and vulnerable groups. Its purpose is to provide knowledge and skills for maintaining health through appropriately-oriented physical activity. Secondary physioprophylaxis includes actions taken when the first symptoms of the disease appear. Its aim is to prevent the consequences of the disease or to slow down the development of symptoms that are not yet visible but predictable. Tertiary physioprophylaxis is action taken with developed diseases or dysfunctions, which cannot be cured; its task is to prevent the possible accumulation of symptoms and to create optimal compensation mechanisms [2].

Type 1 diabetes is a chronic metabolic disease characterized by hyperglycaemia, i.e. high blood glucose levels. It is caused by the dysfunction or destruction of β cells of pancreatic islets of Langerhans, which are responsible for the production and secretion of insulin [3, 4].

According to data from 2014, 387 million people worldwide suffer from diabetes, of which 46.3% are undiagnosed; in other words, approximately 1 in 12 people suffer from the disease. This number is expected to increase by 205 million people by the year 2035 [5].

Type 1 diabetes develops rapidly, and its first symptoms, such as increased thirst, weight loss, and general fatigue, appear suddenly. No effective method of preventing type 1 diabetes exists, and the aetiology of type 1 diabetes is still not fully understood [3-5]. Vitamin D1 deficiency and excess body fat have been suggested as modulating factors. Further, excessive inflammatory responses to various external factors can be induced by polygenic hereditary factors. Such factors may increase the risk of autoimmune dysfunction [6].

Prophylaxis in the prevention and treatment of diabetes is inadequate, but attention should be also drawn to the lack of diabetes education of various social groups, especially parents and teachers of children. As a result, individuals with diabetes have little social and familial support in coping with the disease. This is particularly disturbing given that type 1 diabetes is most common in children and adolescents [3, 4]. In Poland, 6,400 children aged 0-14 years and 180,000 people over 14 years old suffer from type 1 diabetes [7, 8].

Type 1 diabetes generates high treatment costs for diabetic patients. According to data from the World Bank, diabetes is the second largest economic burden on society after ischemic heart disease, and it constitutes between 5-10% of the total health care budget [7]. Further, according to the data obtained from the Social Insurance Institution, the National Health Fund, and Statistics Poland, it was estimated that the total costs due to diabetes and related complications were at least PLN 7 billion in 2013 [9]. Evidence suggests an active lifestyle, including moderate and frequent physical activity, has a positive impact on glycaemia, better disease control, and improvement of patient quality of life [3-5].

This paper aims to outline the impacts of preventive physical therapy in treatment of childhood type 1 diabetes through physical exercise, taking into account the location, role, and form of the physioprophylaxis within the available literature. PubMed, EBSCO, and Google Scholar databases were used to find qualifying papers; specifically, to identify the proper publications, a search was performed with combinations of the following keywords: Diabetes Mellitus, Type 1, children, adolescent, and exercise (according to Medical Subject Headings, MeSH), with publication dates from 2009-2019.

Physical activity (PA) in physioprophylaxis of type 1 diabetes in children

For many years, physical exercise was considered dangerous for people with type 1 diabetes. It was not until 1986 that results of a scientific study indicated physical activity does not have a negative impact on patient health, and may, in fact, also have a pro-health effect [10].

Physical activity is one of the most important factors holistically influencing the proper physical and mental development of children and adolescents. The musculoskeletal, circulatory, respiratory, and neurohormonal systems are particularly important for development – all of which are impacted by PA [11-13]. PA also prevents many metabolic diseases such as obesity, cardiovascular diseases, and cancer [14-16].

The rapid development of civilization causes systematic reduction of physical activity in every age group [16-18]. As more nation-states become developed, this inactivity epidemic is likely to increase. Currently, only 30% of adolescents and 10% of adults participate in regular physical activity satisfying their health needs [19, 20]. Studies by Chabros et al., conducted on a group of 1054 primary and secondary school students, showed that physical activity of children and adolescents is insufficient and far from recommended – 18.4% of boys and 11.9% of girls were overweight [12]. Ridell et al. indicated that children with type 1 diabetes, in particular, often

have problems with maintaining proper body weight and do not reach the minimum dose of daily PA [17].

There is no evidence to suggest that physical exercise can prevent the development of type 1 diabetes. Therefore, PA may not be effective as a primary preventive physical therapy; however, it is possible to use exercise as an effective means of secondary and tertiary preventive physical therapy.

Physical exercise influence on the organism of patients with type 1 diabetes

During physical activity, the demand for oxygen increases, which results in increased muscle consumption of glycogen, triglycerides, free fatty acids, and glucose from the liver. In healthy individuals, the hormonal system is largely responsible for maintaining normoglycaemia. In the initial phases of exercise, dropping insulin levels and the presence of glucagon cause an increase in liver glucose production. However, during long-term exercise, the increases in glucagon and catecholamine levels play a more substantial role in the response. In patients with type 1 diabetes with insulin deficiency, this control mechanism is disturbed – there is not enough insulin in the blood, and the resultant hormones cause an increase in hyperglycaemia and ketone concentration. In contrast, high insulin levels as a result of insulin treatment may result in weakening or even inhibition of glucose release during physical activity, thus causing hypoglycaemia [13, 14].

A common symptom of type 1 diabetes is myopathy, characterized by decreases in muscle mass and function [21]. The mechanisms responsible for muscle atrophy in this population are complex. It is believed that hyperglycaemia contributes to muscle tissue atrophy through the formation and accumulation of glycolysis end-products in skeletal muscles and increased oxidative stress, which results in increased expression of genes responsible for atrophy and normal protein metabolism [3].

Physical activity also influences the growth of muscle mass by stimulating morphological tissue changes, i.e. improving blood supply to the tissue, improving elasticity and, consequently, maintaining correct joint range of motion. Physical exercise also speeds up the conversion of cartilage into bone, thus supporting the growth process [11, 13, 22, 23, 24]. Importantly for type 1 diabetics, regular training reduces the need for insulin after physical exercise and increases the sensitivity of cells to insulin, so that the daily dose of insulin may be reduced. This is an important factor in reducing the risk of cardiovascular diseases, cancer, and mortality [25-31].

Wu et al. conducted a meta-analysis of 24 articles on the impact of aerobic physical activity on patients with type 1 diabetes. The results show that physical exercise improves physical fitness, muscle strength and lipid profile and reduces the risk of cardiovascular diseases [27]. Similar conclusions were reached by Chimen et al., who analysed 48 studies on the influence of aerobic physical activity on patients with type 1 diabetes. A reduced need for insulin was noted; however, the influence of physical activity on the control of glucose levels, function of β cells of pancreatic islets, and the risk of cancer was not established. The authors recognise the need for further research on the intensity, duration, and types of physical activity that may bring the greatest health benefits to patients with type 1 diabetes [30].

Ostman et al. prepared a meta-analysis of 15 publications on the influence of physical exercise on major health parameters of patients with type 1 diabetes. In adults, body mass index (BMI) and low-density lipoproteins (LDL) decreased, and maximal oxygen capacity (VO_2max) increased, while in children, the body weight, insulin dose, and lipid profile improved [29].

Meta-analyses by Absil et al., Aljawarneh et al., and Tonoli et al. confirmed the positive effects of aerobic training, while emphasizing the ambiguous influence of strength training on glycaemia of patients with type 1 diabetes [32-34]. Yardley et al. indicated a smaller initial decrease in blood glucose levels during strength training compared to aerobic training [35]. The same authors in their previous studies point to a more effective influence of physical activity on glycaemic control in the case of using first strength and then aerobic exercises in one training session. Additionally, this sequence of exercise attenuates hypoglycaemia and its duration after the training [36].

Wójcik et al. examined the level of physical activity of 95 children with type 1 diabetes. Most (75%) of the respondents subjectively stated that physical activity had a positive effect on glycaemia control. They noted, however, that physical activity had no significant effect on metabolic control as assessed by glycated haemoglobin (HbA1c) [37].

Similar conclusions were reached by Kennedy et al., who performed a meta-analysis examining 14 publications. The authors did not report any statistically significant influence of physical activity on glycaemic control, however, they point to other positive effects accompanying the training, such as improved quality of life [38].

The impact of physical exercise on mental health is worth emphasizing. Regular physical activity reduces symptoms of depression and anxiety and improves mental fitness and mental well-being through an increase

in blood endorphins levels [39-41]. Aman et al. surveyed 2269 adolescents (average age 14.5 years old) from 21 paediatric diabetes departments in 19 countries. The results confirmed a significant correlation between physical activity and mental well-being in patients, but an influence on metabolic control was not observed [42].

In their research, Ridell et al. stressed the impact of emotional barriers limiting physical activity in patients with type 1 diabetes, including fear of hypoglycaemia, loss of control over glycaemia, and a lack of knowledge about physical activity [17].

Treatment of type 1 diabetes includes insulin therapy, a properly chosen diet, and physical exercise. Regular training is especially important because it leads to a reduced need for exogenous insulin by raising insulin sensitivity of cells, improves the lipid profile, and reinforces the muscle strength and physical efficiency of patients. In addition, physical exercise reduces the risk of cardiovascular complications and decreases rates of mortality, though the effect of exercise on glycaemic control remains unclear. The most significant conclusions drawn from the discussed systematic reviews are presented in Table 1.

Table 1. Search results

Study (Author, year, title)	Number of studies included in the meta-analysis	Conclusions
Absil et al., 2019 Benefits of physical activity in children and adolescents with type 1 diabetes: a systematic review.	n=7	– Physical effort has a positive effect on metabolism (i.e. total cholesterol reduction, physical fitness improvement etc.) and mental health in children with type 1 diabetes. – The effect of exercise on glycaemic control is unclear.
Aljawarneh et al., 2019 A systematic review of physical activity and exercise on physiological and biochemical outcomes in children and adolescents with type 1 diabetes.	n=27	– Supervised regular moderate to vigorous physical activity is more effective on adiposity and cardiorespiratory fitness than habitual physical activity. – Physical activity of different intensities improves insulin sensitivity and decreases daily insulin dosage requirements. – The effect of exercise on glycaemic control is unclear.
Wu et al., 2019 Cardiovascular health benefits of exercise training in persons living with type 1 diabetes: a systematic review and meta-analysis.	n=24	– Exercise training increases maximal aerobic capacity and reduces glycated haemoglobin and total cholesterol. – Exercise training does not lead to consistent changes in body mass index, blood pressure, triglycerides, high-density lipoprotein cholesterol, or low-density lipoprotein cholesterol. – Exercise training is associated with a beneficial cardiovascular profile, including improvements in lipid profile, glycaemic control (decreased daily insulin dosage and HbA1c), and aerobic fitness.
Ostman et al., 2018 Clinical outcomes to exercise training in type 1 diabetes: a systematic review and meta-analysis.	n=15	– Exercise training improves some markers of type 1 diabetes severity, particularly insulin dose, waist circumference, LDL-C, and triglycerides in children.
Quirk et al., 2014 Physical activity interventions in children and young people with type 1 diabetes mellitus: a systematic review with meta-analysis.	n=26	– Physical activity is important for diabetes management and has the potential to delay cardiovascular disease. – There is a lack of studies underpinned by psychological behaviour change theory that promote sustained physical activity and explore psychological outcomes. – There remains a lack of knowledge of how to successfully promote physical activity in people with type 1 diabetes.
Kennedy et al., 2013 Does exercise improve glycaemic control in type 1 diabetes? A systematic review and meta-analysis.	n=13	– This meta-analysis does not reveal evidence for a glycaemic benefit of exercise as measured by HbA1c.

Tonoli et al., 2012 Effects of different types of acute and chronic (training) exercise on glycaemic control in type 1 diabetes mellitus: a meta-analysis.	n=33	– The addition of brief bouts of high-intensity, sprint-type exercise to aerobic exercise can minimize the risk of sustaining a hypoglycaemic episode. – Only regular aerobic training improves HbA1c levels of patients with type 1 diabetes.
Chimen et al., 2012 What are the health benefits of physical activity in type 1 diabetes mellitus? A literature review.	n=48	– There is little evidence for a beneficial effect of physical activity on glycaemic control or microvascular complications. – Further, there is little evidence indicating significant risk of harm from physical activity via hypoglycaemia. – While there is sufficient evidence to recommend physical activity in the management of type 1 diabetes, it is still unclear as to what form, duration, and intensity should be recommended and what specific beneficial outcomes are supported.
Sluik et al., 2012 Physical activity and mortality in individuals with diabetes mellitus: a prospective study and meta-analysis.	n= 12	– Higher levels of physical activity are associated with lower mortality risk in individuals with diabetes. – Even those undertaking moderate amounts of activity were at appreciably lower risk for early death compared with inactive persons.

Recommended dose and types of physical training for individuals with type 1 diabetes

According to the recommendations of the American Diabetes Association and the Polish Diabetes Association (2019), young patients with stabilized type 1 diabetes can undertake most types of physical exercises. Before training, the patients should be examined by a physician for risk of complications [43].

In order to best support children with diabetes, experts recommend that parents, teachers, physiotherapists, and trainers should receive appropriate training on the basics of physical activity in diabetic patients [7, 39, 44]. Chmiel-Perzyńska et al. indicated that the main source of information about diabetes among teachers is mass media. Only 4.5% of the responding teachers received knowledge from physicians, and 24.8% were not interested in this subject [45]. An important problem concerning the use of physical activity in physioprophylaxis of type 1 diabetes is access to physiotherapy specialists, as evidence suggests nearly half (48%) of diabetic patients report no access to physiotherapist services [47].

Due to the interindividual variability in glycaemic responses to physical activity, it is difficult to create uniform carbohydrate consumption recommendations, for both before and after training. In order to prevent hypoglycaemia during prolonged exercise (over 30 minutes) of moderate intensity, additional carbohydrate doses of 10-15 grams are recommended. Those with type 1 diabetes should measure blood glucose level before, during, and a few hours after training. As an alternative to additional carbohydrate portions or as a supplement to prevent hypoglycaemia, the dose of insulin may be reduced. In order to avoid hypoglycaemia during and after a physical activity, patients should have knowledge of the typical metabolic and hormonal responses to the physical activity, as well as the skills necessary for self-control and prevention of adverse events. Patients should also take care of proper hydration both before and after physical exercise [14, 17, 18, 29, 43, 46, 47].

Type 1 diabetes should not be a contraindication to participation in physical education classes or in school sports. Diabetics should simply be aware of blood sugar levels at the beginning and during sports activities, and monitor levels and symptoms accordingly. Recommended blood sugar levels are as follows: for aerobic exercise 126-180 mg/dl (7-10 mmol/l); for anaerobic exercise 90-180 mg/dl (5-10 mmol/l) [43].

Current recommendations are that children should exercise for more than one hour a day to reduce the risk of vascular complications. The reduced risk is achieved as physical exercise induces an increase in adiponectin secretion, increases HDL levels and glucose uptake by muscle cells, and reduces the level of proinflammatory cytokines, including C-reactive protein and IL-6 [47]. To maximize the therapeutic effect, physical activity should be performed regularly, at least 2-3 times a week. The standard training session for a type 1 diabetic patient should consist of a warm-up (10 minutes) with low intensity aerobic exercises, a main part (10-15 minutes), and a cool-down (10 minutes) [14]. Moderate exercise in the range of 40-56% VO_2max or 55-69% of maximum heart rate is recommended. The development of individual insulin therapy schemes is also important [47].

According to the guidelines (2019) of the American Diabetes Association and the Polish Diabetes Association, patients with type 1 diabetes can practice any sport following clinical examination, specifically after receiving a positive medical opinion from a diabetologist. However, particular caution should be exercised when choosing

disciplines such as paragliding, gliding, motor and car racing, scuba diving, horse racing, extreme mountain climbing, and parachute jumping due to the overall greater risks involved [48].

Undesirable consequences of exercise and contraindications to training

Contraindications to physical training in children with type 1 diabetes include hyperglycaemia (>250 mg/dl), hypoglycaemia (<70 mg/dl), acute complications such as ketoacidosis, lack of glycaemic control, and lack of medical consent [14].

The highest risk of hypoglycaemia occurs during prolonged moderate-intensity training or during high-intensity exercises [47, 49]. Fear of hypoglycaemia is a significant obstacle to physical activity in both children and adults with diabetes, and reduced blood glucose levels may occur during or after exercise. Late post-workout hypoglycaemia usually develops after 6-15 hours, but may appear the following day. The delayed hypoglycaemia is caused by a prolonged increase in insulin sensitivity of tissues and resynthesis of glycogen in the liver and muscles. In individuals who exercise, meal composition and inadequate insulin dosing are also important factors contributing to the development of hypoglycaemia. Major symptoms include fatigue, tachycardia, and increased sweating [47-49]. In contrast, high glucose levels, i.e. hyperglycaemia, can arise from anaerobic exercises and/or very intensive endurance training. The causes of hyperglycaemia include insufficient insulin dose, excessive carbohydrate intake, high stress level, and less physical activity than planned. Symptoms of hyperglycaemia include drowsiness, weakness, frequent urination, headaches and increased thirst [47-49]. People with uncontrolled diabetes, who tend to experience a greater influence of sympathetic nervous system activity, adrenaline and glucagon secretion with increased blood glucose levels, are particularly at risk of hyperglycaemia [47].

Conclusions

Diabetics face numerous daily challenges, including learning about the disease, developing self-control skills, and addressing emotional issues related to the disease and necessary lifestyle changes. The main task of healthcare professionals is to prepare patients for life with the disease and to prevent its secondary consequences [50]. Physioprophylaxis in the form of physical activity not only has a positive impact on the physical health of patients, but also on their mental well-being and self-esteem, and thus, improves the quality of life. Exercise increases the chance of entering a period of partial remission of the disease, while also reducing the duration of episodes. Finally, regular physical activity reduces the risk of cardiovascular complications and related mortality.

The presented studies illustrate a positive influence of physical activity in diabetic patients. Specifically, regular physical activity increases measures of strength and efficiency in diabetic patients, reduces the need for insulin, and reduces the risk of cardiovascular diseases, which significantly improves the quality and lifespan of patients. Given the absence of consistent evidence regarding physical activity's effects on glycaemic control, there is a need to individually adjust the intensity and type of physical activity to the patient's abilities. Further research on the impact of physical activity on the overall health of patients with type 1 diabetes, especially children, is also necessary.

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PART III. OTHER
DZIAŁ III. RÓŻNE

SUPERIOR MESENTERIC ARTERY SYNDROME – DIAGNOSTIC DIFFICULTIES

ZESPÓŁ TĘTNICY KREZKOWEJ GÓRNEJ – TRUDNOŚCI DIAGNOSTYCZNE

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. Superior mesenteric artery syndrome (SMAS) is a rare disease caused by the acute angle of branching of the superior mesenteric artery from the aorta.
Material and methods. There were 63 patients (56 women and 7 men) with low body weight, who reported recurrent persistent abdominal pain, nausea, post-prandial vomiting, significant weight loss. All of them had abdominal ultrasonography performed with measurement of the angle of branching of SMA from the aorta. CBC, total bilirubin, AST, ALT, GT, ALP, amylase, lipase, albumins, iron, sodium, potassium, GFR, lipid profile, TSH, urinalysis were ordered. Additionally, esophagogastroduodenoscopy with Hp. test and esophageal impedance measurement in correlation with the reported ailments was performed.
Results. Acid reflux impedance was diagnosed in 10 patients. There were >55 acid reflux episodes per day and a positive reflux sign (SI) for heartburn and nausea. Abnormal impedance recording of acid reflux was diagnosed in 17 patients. They had >21 episodes of non-acid reflux per day. Positive reflux sign (SI) was not confirmed for any non-acid reflux-related symptoms.
Conclusions. It is justified to perform impedance pH monitoring in this group of patients as it allows to modify the therapy. The most important dietary recommendations are weight gain and understanding the cause of the disease.

Keywords: SMAS, laboratory tests, esophageal impedance pH monitoring, gut-brain axis

Streszczenie

Wprowadzenie. Zespół tętnicy krezkowej górnej (ZTKG) (SMAS – ang. superior mesenteric artery syndrome) jest rzadko rozpoznawaną chorobą, a jej przyczyną jest ostry kąt odejścia tętnicy krezkowej górnej od aorty.
Materiał i metody. Wyłoniono 63 pacjentów (56 kobiet i 7 mężczyzn) z niską masą ciała, którzy zgłaszali nawracające uporczywe dolegliwości bólowe w nadbrzuszu, nudności, poposiłkowe wymioty, istotną utratę masy ciała. Wszystkim wykonano ultrasonografię jamy brzusznej z pomiarem kąta odejścia TKG od aorty. Następnie oznaczono morfologię krwi, stężenie bilirubiny całkowitej, AST, ALT, GT, ALP, amylazy, lipazy, albuminy, żelazo, sód, potas, GFR, lipidogram oraz TSH, badanie ogólne moczu oraz wykonano gastrofiberoskopię z testem Hp. i pomiar impedancji przełykowej w korelacji ze zgłaszanymi dolegliwościami.
Wyniki. Nieprawidłowy zapis impedancji w zakresie refluksu kwaśnego rozpoznano u 10 pacjentów. Zarejestrowano >55 epizodów refluksu kwaśnego na dobę oraz dodatni objaw refluksowy (SI) dla zgagi oraz uczucia nudności/mdłości. Nieprawidłowy zapis impedancji w zakresie refluksu niekwaśnego rozpoznano u 17 pacjentów. Obserwowano u nich >21 epizodów refluksu niekwaśnego na dobę. Dla żadnego objawu związanego z refluksem niekwaśnym nie potwierdzono dodatniego objawu refluksowego (SI).
Wnioski. Uzasadnione jest wykonanie impendancji w tej grupie chorych gdyż pozwala na zmodyfikowanie terapii. Najważniejsze zalecenia dietetyczne to przyrost masy ciała i zrozumienie przyczyny choroby.

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Introduction

Superior mesenteric artery syndrome (SMAS), also known as Wilkie's Syndrome, is a rare disease caused by the acute angle of branching of the superior mesenteric artery from the aorta. In these narrow forks of both vessels the transverse part of the duodenum passes, and its pressure causes disturbed passage of digestive content. It was first described in 1861 by Carl Von Rokitansky as an anatomical anomaly. A detailed description of 75 clinical cases was presented in 1927 by Dr. P. Wilkie [1-3]. The correct angle of branching of the superior mesenteric artery (TKG) is 35-55 °, the distance between the wall of the superior mesenteric artery and the aortic wall is 10-20 mm. In patients with diagnosed SMAS, the angle of branching of the superior mesenteric artery is below 26 °, the distance between the SMA wall and aortic aorta is 2-8 mm [4-6]. A familial susceptibility to the occurrence of SMAS has been demonstrated [7, 8]. It mainly affects young children and women aged 18-35 years [9]. SMAS should be suspected in individuals who have consciously (dieting) or as a result of a disease rapidly lost weight, including visceral fat which pushes the SMA away from the aorta [10-15]. This applies particularly to people with BMI <18 kg/m2 [16, 17]. The acute angle of branching of the SMA (<25^{o}) does not always disturb the passage of digestive content in the transverse part of the duodenum. Studies have shown that SMA has some mobility and only 14% of these patients experience clinical manifestation [18, 19], caused by disturbed intestinal contents passage in the transverse part of duodenum [20]. The ailments usually appear after meals and have a recurring character. Patients complain about abdominal pain, nausea, belching, vomiting, feeling of heartburn. For fear of ailments, they avoid eating meals and the weight loss increases [21-23]. Depending on the severity of symptoms and general condition of the patient, conservative or surgical treatment is considered. Conservative treatment consists of supplementing water-electrolyte deficiencies, recommendation of a rich calorie diet, eating frequent meals in small amounts. After meals the position should be lying on the left side or knee - elbow. This results in gravitational displacement of the SMA from the aorta and reduction of pressure on the duodenum [24]. The aim is to increase body weight. Visceral fat widens the angle between the SMA and the aorta and facilitates the duodenal passage [25]. Surgical treatment is more commonly used in small children or in case of significant cachexia. It consists in the formation of bypassing gastro-intestinal or duodenal intestinal anastomoses [26-28].

Early diagnosis based on subjective examination supported mainly by ultrasound examination of the abdominal cavity, excluding other diseases, is extremely important. Analyses have shown that the majority of patients with SMAS were previously consulted or treated by a psychiatrist with a diagnosis of depression, bulimia, mental anorexia or bipolar disorder [29]. Especially since this syndrome affects young women, who may suffer from menstrual disorders due to weight loss and a decrease in sex hormones. The ailments reported by patients with SMAS are not pathognomonic and can be attributed to functional or organic disorders of the upper gastrointestinal tract. Moreover, literature data show that there is an increased risk of acute pancreatitis or gallbladder stones [30, 31]. It is also worth mentioning that SMAS sometimes co-exists with the nutcracker syndrome, where the left renal vein is pressed through the aorta and the superior mesenteric artery. In this syndrome hematuria, unknown cause proteinuria, atypical abdominal pain located in the left lumbar region and/or the left iliac fossa may be present. They are accompanied by reduced effort tolerance, menstrual disorders in women or varicocele in men [32-34].

Aim of the study

The aim of the study was to identify a group of patients with rarely diagnosed SMAS and then to conduct a detailed analysis of the clinical picture of the disease in terms of differential diagnostics, especially esophageal reflux.

Material and methods

After obtaining permission from the bioethics committee, 63 patients (56 women and 7 men) with low body weight were selected, who reported recurrent abdominal pain, nausea, postprandial vomiting and significant weight loss.

Patients were diagnosed in the Department of Gastroenterology of the Medical University of Lodz, mean hospitalization period 3.69 ± 1.26 days. All of them had abdominal ultrasonography performed with the measurement of the angle of branching of SMA from the aorta. Eventually, 37 patients met the criteria of ZTKG, where the tight angle of TKG's departure from the aorta was determined below 26°. CBC, total bilirubin, AST, ALT, PGD, ALP, amylase, lipase, albumin, iron, sodium, potassium, GFR, lipid profile, TSH, urinalysis were evaluated. Esophagogastroduodenoscopy with urease test for Helicobacter pylori and esophageal impedance

were measured in correlation with the reported ailments. The small size of the study group is related to the rare occurrence of SMAS in the population.

Patients before the impedance measurement and gastroscopy for 14 days did not take drugs blocking gastric acid secretion or drugs affecting upper gastrointestinal motility.

The 24-hour esophageal impedance was measured using Sandhill Scientifi's ZepHrT™ multi-channel recorder and ComforTEC Z/pH disposable probes from the same manufacturer. This equipment makes it possible to recognize the range and composition of esophageal reflux episodes occurring. The parallel measurement of the reflux pH qualifies the reflux as acidic or non-acidic and the symptoms reported by the patient are qualified as related or unrelated to the reflux episodes. Patients were fasting for 8 hours before the examination. Then, after calibrating the probe in the attached buffers, it was placed through the nasal tube in the stomach and then its position was corrected so that the pH-meter sensor was 5 cm above the lower esophageal sphincter (LES).

The first impedance channel was 3 cm above the LES and the last 17 cm above the LES. Patients were trained in using the recorder to mark meal periods, position of the body and report clinical symptoms. After 24 hours of recording, the probe was removed, and the collected data was analyzed on a computer using BioVIEW Analysis software supplied by the recorder manufacturer. The gastroesophageal reflux incident was considered to be a decrease in impedance of at least 50% in relation to the initial value, in at least two neighboring segments of the probe, and the incident was ascending. Analyzing the pH distribution, acid reflux was considered to be a decrease of the pH of the acid refluxate below 4 for at least 5 seconds, whereas any reflux not accompanied by a pH decrease below 4 was classified as non-acid [35]. The clinical symptom reported by the patient was classified as associated with reflux, i.e. a positive reflux index (index symptom - SI), if in half of the cases it was associated with the occurrence of reflux episode.

The results obtained were compared with standardized standards developed by Shay and his team for a healthy population [36]. According to these standards, the maximum number of episodes allowed should not exceed 73 per day.

Due to the small number of people in the study group, no statistical analysis was carried out with parametric tests.

Results

Characteristics of the studied group of patients

The mean age of women qualified for the study was 31.2 ± 8.2 years and men 28.6 ± 3.4 years. The study group was dominated by young women (92%) in the hormonally active period (two women had irregular menstruations), more than a half of which were under 32 years of age (Table 1). Height, body weight and BMI were analyzed separately for women and men due to the specificity of these variables. The average height of women was 168.3 ± 5.38 cm and that of men was 189.7 ± 2.52 cm. The average body weight of women was 53.2 ± 5.91 kg, of men 64.0 ± 3.61 kg. Despite the natural difference in height and body weight related to the gender difference, the BMI was on average not significantly higher in the group of women 18.6 ± 1.48 kg/m^2 vs. 17.7 ± 1.68 kg/m^2 of men. Further analysis of the study was undertaken regardless of the sex of the examined patients. It is worth noting that none of the subjects was characterized by a low height when compared to the Polish population (Table 1).

Table 1. Characteristics of the studied group of patients according to their age, gender, BMI

Gender	Number of subjects	Current age (years)	Height (cm)	Weight (kg)	BMI kg/m^2
Women	34/91.9%	31.2 ± 8.2	168.3 ± 5.38	53.2 ± 5.91	18.6 ± 1.68
Men	3/8.1 %	28.6 ± 3.4	189.7 ± 2.52	64.0 ± 3.61	17.7 ± 1.68

Duration of the disease

Patients reported different duration symptoms; most often up to several years (70%), up to 0.5 years (16%) and 13.5% of patients were not able to specify the duration of the symptoms.

Medical consultations

Due to the ailments, patients were most often consulted by a gastroenterologist (89.2%), followed by an endocrinologist (27%), a gynecologist (21.6%) and a psychiatrist (18.9%).

Weight loss

Nearly half of the subjects reported weight loss up to 5 kg, further 37.8% by 6-10 kg, and 10.8% above 10 kg. Two people (5.4%) did not report weight loss. The time in which weight loss occurred was quite short in the vast majority of patients, up to a maximum of 6 months. Weight loss was most often related to dietary changes (40.5%).

Socio-economic conditions of patients, smoking addiction

From the clinical point of view, an interesting analysis of socioeconomic conditions of the study group was carried out. Characteristics of patients concerning their place of residence, education, economic status (freely determined by the subjects) are presented in Tables 2 and 3. People living in cities accounted for almost 80%. Secondary and higher education was declared by 91.9% of the respondents (Table 2). Based on the questionnaire filled in by patients, 94.5% of the subjects determined their economic situation at a medium and high level (Table 3). Cigarette smoking can have a significant impact on gastric emptying and reflects the level of public awareness of a healthy lifestyle. The vast majority of respondents (81%) denied smoking (Table 4).

Table 2. Characteristics of the studied group of patients by place of residence and education

	Place of residence		**Education**			
	city	**village**	**primary**	**vocational**	**secondary**	**higher**
Number of subjects	29	8	1	2	15	19
Percentage share	79%	21%	2.7 %	5.4%	40.5%	51.4%

Table 3. Economic status freely determined by patients

	Economic status		
	Low	**Middle**	**High**
Number of subjects	2	30	5
Percentage share	5.40%	81.00%	13.50%

Table 4. Frequency of smoking in the studied group of patients

	Smoking of cigarettes pieces/day			
Number of subjects	**0-10**	**10-20**	**Above 20**	**Smokers in total**
	4	2	1	
Percentage share %	10.80%	5.40%	2.70%	19.00%
		Addiction free		**Non-smokers in total**
Number of patients	30 individuals			81.00%

Analysis of laboratory tests

Complete Blood Count

No significant changes in CBC were noted among the patients studied. Platelet levels in all patients were within normal limits. The analysis of the protein-cell system showed only a slight increase in the percentage of monocytes - 8.42 ± 1.84% on average (Normal level: 3.0-8.0%) (Table 5).

Table 5. Results of CBC in the tested group

Variables	**Calculated statistical parameters**					
	min	**max**	**x**	**Me**	**SD**	**v (%)**
WBC (thous./µl)	4.0	10.7	**5.76**	5.6	1.31	22.7
RBC (mln/ µl)	3.58	5.46	**4.42**	4.54	0.47	10.7
HGB (g/dl)	11.5	17.8	**13.5**	13.3	1.30	9.6
HCT (%)	33.9	50.2	**39.4**	39.1	3.57	9.1
MCV (fl) µg/dl	63.0	98.1	**88.5**	89.3	6.42	7.2
MCH (pg)	25.7	33.6	**30.5**	30.9	1.82	6.0
MCHC (g/dl)	32.8	35.5	**34.1**	34.2	0.67	1.97

PLT (thous./µl)	130.0	329.0	**232.5**	327.0	42.0	18.1
NEUT (thous./µl)	1.82	6.0	**3.22**	2.94	1.09	33.7
NEUT (%)	34.6	71.9	**55.1**	56.8	10.5	19.1
LYMPH (thous. µl)	1.07	4.03	**1.96**	1.80	0.64	32.4
LYMPH (%)	20.3	53.5	**34.2**	33.6	9.23	27.0
MONO (thous./µl)	0.30	0.83	**0.48**	0.46	0.13	28.0
MONO (%)	4.9	12.4	**8.42**	8.45	1.84	21.9
EO (thous./µl)	0.01	0.35	**0.105**	0.080	0.08	73.4
EO (%)	0.10	7.5	**1.90**	1.60	1.39	72.8
BASO (thous./µl)	0.01	0.05	**0.020**	0.020	0.01	50.7
BASO (%)	0.10	0.90	**0.356**	0.300	0.18	51.4
MPV (fl)	8.7	12.4	**10.4**	10.3	0.96	9.2

Urinalysis

The specific gravity of urine ranged from 1005 to 1030 mg/dL, averaging 1018.4 ± 7.09. It was probably due to an insufficient supply of fluids as the reported complaints occurred after both solid and liquid foods. The pH of urine ranged from 5.0 to 8.0, mean 5.91 ± 0.71 (Table 6). Abnormalities: Nitrogen compounds in urine were observed in 8.1% of patients, four patients had leukocyturia >10 in the field of view, abundant mucus, erythrocyturia. Urine cultures were performed and an effective targeted therapy was applied (Table 7).

Table 6. Results of urine tests in the study group

Variables	Calculated statistical parameters					
	min	**max**	**x**	**Me**	**SD**	**v (%)**
Specific gravity	1005	1030	**1018.4**	1020	7.09	0.7
Urine pH	5.0	8.0	**5.91**	6.0	0.71	12.1

Table 7. Results of urine tests (presence of glucose, bilirubin, etc.)

Variables	Presence in urine			
	Yes		No	
	n	**%**	**n**	**%**
Glucose	-	-	37	100.0
Bilirubin	-	-	37	100.0
Ketone bodies	-	-	37	100.0
Protein	-	-	37	100.0
Nitro compounds	3	8.1	34	91.9
Blood	3	8.1	34	91.9
Leukocytes	6	16.2	31	83.8
Polygonal epithelial cells	33	89.2	4	10.8
White blood cells	32	86.5	5	13.5
Red blood cells	13	35.1	24	64.9
Bacteria	12	32.4	25	67.6
Mucous	26	70.3	11	29.7

Biochemical blood tests

Serum glucose concentrations were in the range 62-104 mg/dl, mean 90.1 ± 8.22 mg/dl, urea concentration 1-34 mg/dl, mean 23.7 ± 4.79 mg/dl. Creatinine concentration ranged from 0.53 to 0.98 mg/d (mean 0.75 ± 0.12 mg/dl. Albumin concentrations from 4.3 to 5.3 g/dl, mean 4.75 ± 0.26 g/dl. CRP from 0.10 to 24.6 mg/l, averaging 1.85 ± 4.28 mg/l. No decreased serum total protein concentration, mean 7.10 ± 0.43 g/l, total bilirubin concentration 0.68 ± 0.46 µmol/l was observed. Activity of liver enzymes: AST average values 20.1 ± 7.29 U/l, ALT 16.8 ± 7.53 U/l. Alkaline Phosphatase (ALP) 31 -106 U/l, mean 58.3 ± 19.1 U/l and PGD 4- 306 U/l, mean 26.8 ± 53.3 U/l. Activities of pancreatic enzymes: Serum lipase mean 34.3 ± 9.52 U/l, Serum Amylase 14 to 109 U/l (N to 100U/L), mean 58.5 ± 20.1 U/l. Exceeding the standards of GGTP and amylase was observed in one patient. Serum iron levels in blood between 2 - 181 µg/dl, mean 98.9 ± 39.1 µg/dl (N 33-193 µg/dl). Only one patient

had iron levels decreased to 27 μg/dl (Table 8). Serum potassium ion concentrations ranged from 3.38 to 4.76 mmol/l, mean 4.18 ± 0.32 mmol/l, chlorine 95-108 mmol/l, mean 103.1 ± 2.21 mmol/l, sodium 136-145 mmol/l, mean 141.5 ± 1.95 mmol/l. Average concentrations of the determined ions were within the limits of the norm, except for reduced concentration of potassium ion in one patient to 3.38 mmol/l and chlorine to 95 mmol/l in another patient. GFR was within the norms; 81.8-128.9 ml/min/1.73 m, mean 101.1 ± 16.4 ml/min/1.73 m. TSH was in the range of 1.26 -5.44 μUl/ml and the mean was 2.63 ± 1.78 μUl/ml. In one of the examined patients the result exceeded the norm - 5.44 μUl/ml (N: 0.4-4.0 μUl/ml) (Table 9).

Table 8. Results of biochemical tests

Variables	Calculated statistical parameters					
	min	max	x	Me	SD	v (%)
Glucose (mg/dl)	62	104	**90.1**	90.5	8.22	9.1
Urea (mg/dl)	15	34	**23.7**	23.0	4.79	20.2
Creatinine (mg/dl)	0.53	0.98	**0.75**	0.74	0.12	15.6
CRP mg/l)	0.1	24.6	**1.85**	0.50	4.28	231.8
Total protein (g/dl)	5.99	7.80	**7.10**	7.11	0.43	6.1
Total bilirubin (mg/dl)	0.26	2.64	**0.68**	0.55	0.46	67.1
AST (U/l)	11	51	**20.1**	19.0	7.29	36.2
ALT (U/l)	6	36	**16.8**	15.0	7.53	44.9
ALP (U/l)	31	106	**58.3**	56.0	19.1	32.8
GGTP(U/l)	4	306	**26.8**	12.5	53.3	198.9
Albumins (g/dl)	4.3	5.3	**4.75**	4.74	0.26	5.5
Lipase U/l)	17	64	**34.3**	34.0	9.52	27.8
Amylase (U/l)	14	109	**58.5**	61.0	20.1	34.5
Cholesterol (mg/dl)	113	259	**181.6**	183.0	35.9	19.8
LDL (mg/dl)	55	150	**93.7**	91.0	29.5	31.5
HDL (mg/dl)	38	94	**69.2**	72.0	15.3	22.1
TG (mg/dl)	28	168	**81.2**	74.0	33.7	41.5
Iron (μg/dl)	27	181	**98.9**	104.0	39.1	39.5

Table 9. Electrolyte, GFR and TSH results

Variables	Calculated statistical parameters					
	min	max	x	Me	SD	v (%)
Potassium (mmol/l)	3.38	4.76	**4.18**	4.18	0.32	7.6
Chlorides (mmol/l)	95	108	**103.1**	103.0	2.21	2.1
Sodium (mmol/l)	136	145	**141.5**	141.0	1.95	1.4
GFR(ml/min/1.73 m)	81.8	128.9	**101.1**	105.4	16.4	16.2
TSH (μUl/ml)	1.26	5.44	**2.63**	1.74	1.78	67.7

Analysis of the distribution of the measurement of SMA branching angle from the aorta

In more than 75% of the subjects the angle was below 20° and in the remaining ones within the range 21°-26°. The selected group of patients met the criteria for the diagnosis of SMAS (Table 10).

Table 10. Measurements of the angle of branching of the superior mesenteric artery (SMA) from the aorta in the studied group of patients

	Angle of branching of SMA from the aorta expressed in degrees		
	7-17	16-20	21-26
Number of patients/ Percentage share	14/37.8 %	14/37.8%	9/24/3%

Analysis of the impedance results

Acid gastroesophageal reflux

Any decrease of pH<4 in the esophagus lasting over 5 s. was considered to be an episode of acid gastroesophageal reflux. These episodes were registered in 89.1% of patients, but only in 29.7% of patients their number exceeded the cut-off point for the healthy population, which is defined as 50 episodes per day (Table 11).

Table 11. Frequency of acid reflux episodes recorded in 24-hour impedance in patients with SMAS

Number of acid reflux episodes	Acid reflux episodes in different types of body positioning					
	upright		lying		overall	
	n	%	n	%	n	%
0	5	13.5	9	24.3	4	10.8
1-20	17	46.0	19	51.4	8	21.6
21-50	8	21.6	6	16.2	14	37.8
Above 50	7	18.9	3	8.1	10	29.7
In total	37	100.0	37	100.0	37	100.0

Subsequently, a detailed analysis of the reported ailments during the recording of esophageal impedance in connection with the acid reflux episodes was performed. The highest correlation was observed in the case of heartburn - on average 61.0 ± 30.7%; abdominal pain correlated with acid reflux in 43.8 ± 24.9%, nausea in 55.4 ± 35.2%, belching in 46.2 ± 24.6% on average. Bloating occurred the least – 34.8 ± 23.0%, gurgling, in 23.5 ± 13.4% (Table 12). Abnormal acid reflux impedance was diagnosed in 10 patients. There were >55 acid reflux episodes per day and a positive reflux symptom (SI) for heartburn and nausea.

Table 12. Analysis of reported acid reflux-related ailments in patients with SMAS in 24-hour impedance recording

Confirmed complaints	Calculated statistical parameters (%)					
	min	max	x	Me	SD	v (%)
Abdominal pain (n=13)	13	100	**43.8**	33.0	24.9	56.8
Nausea (n=9)	8	100	**55.4**	40.0	35.2	63.5
Belching (n=11)	14	80	**46.2**	37.0	24.6	53.2
Flatulency (n=4)	13	67	**34.8**	29.5	23.0	66.1
Heartburn (n=4)	27	100	**61.0**	58.5	30.7	50.4
Gurgling (n=2)	14	33	**23.5**	23.5	13.4	57.2
Hoarseness (n=1)	33	33	**33.0**	33.0	-	-
Cough (n=1)	12	12	**12.0**	12.0	-	-

Non-acid gastroesophageal reflux

Any episode of regurgitation registered during impedance recording with pH≥4 lasting more than 5s was considered to be an acid reflux episode. Non-acid reflux was observed in the vast majority of patients (91.9%). In the upright position, acid reflux occurred in 89.2% of patients and in the lying position in 86.5% (Table 13).

Table 13. Frequency of non-acid reflux episodes recorded in 24-hour impedance in patients with SMAS

Variable	Non-acid reflux episodes			
	Present		Absent	
Non-acid reflux overall	34	91.9	3	8.1
Non-acid reflux in upright position	33	89.2	4	10.8
Non-acid reflux in lying position	32	86.5	5	13.5

A detailed analysis of the number of non-acid reflux episodes showed their occurrence from 1 to 109 episodes, with an average of 26.0 ± 23 episodes (Table 14). In the upright position, 1 to 80 episodes of non-acid reflux were recorded in patients with an average number of such episodes 16.2 ± 16.5.

Table 14. Characteristics of recorded non-acid reflux episodes in 24-hour impedance in patients with SMAS

Number of non-acid reflux episodes	Calculated statistical parameters					
	min	max	x	Me	SD	v (%)
Upright position (n=33)	1	80	**16.2**	15.0	16.5	102.0
Lying position (n=32)	1	44	**10.9**	8.0	9.8	89.9
Regardless of the position (n=34)	1	109	**26.0**	21.0	23.0	88.2

In the lying position, 1 to 44 episodes of non-acid reflux were recorded, with an average of 10.9 ± 9.8 episodes. The number of registered non-acid reflux episodes varied greatly from patient to patient. The coefficient of variation (calculated as the quotient of standard deviation and mean value) exceeded 100% in the upright position and 90% in the lying position.

The correlation between recorded non-acid reflux and epigastric pain was 17.4 ± 13.3% on average; with nausea 33.9 ± 31.7% on average; with belching 20.5 ± 9.47% on average; and with flatulence 18.7 ± 14.6 on average. The correlation between the symptom reported as heartburn was 29.2 ± 19.8% on average and cough 17.0 ± 9.90% on average (Table 15).

Abnormal impedance recording of acid reflux was diagnosed in 17 patients. They had >21 episodes of non-acid reflux per day. No positive reflux signs (SI) were confirmed for any non-acid reflux-related signs.

Table 15. Analysis of complaints reported by patients with SMAS related to non-acid reflux in 24-hour impedance records

Confirmed complaints	Calculated statistical parameters (%)					
	min	max	x	Me	SD	v (%)
Pain (n=12)	5	50	**17.4**	13.0	13.3	76.5
Nausea (n=7)	5	100	**33.9**	29.0	31.7	93.6
Belching (n=10)	8	33	**20.5**	21.0	9.47	46.2
Flatulency (n=3)	5	34	**18.7**	17.0	14.6	78.1
Heartburn (n=6)	8	60	**29.2**	29.0	19.8	67.8
Gurgling (n=1)	29	29	**29.0**	29.0	-	-
Hoarseness (n=1)	22	22	**22.0**	22.0	-	-
Cough (n=2)	10	24	**17.0**	17.0	9.90	58.2

Medical Imaging

All patients qualified for the study program had ultrasound and gastroscopy performed. Colonoscopy was previously performed in 29.7% of patients.

In gastroscopy, only one patient had signs of gastritis with Helicobacter pylori infection (positive urease test). In the case of other patients, the endoscopic examination was normal. Therefore, it can be assumed that 97.3% of patients did not show any abnormalities in the endoscopic examination. It is worth noting that in CT descriptions in only one out of four individuals, the radiologist pointed out, the narrow angle of the SMA's branching from the aorta.

Treatment used

Depending on the results of laboratory tests, endoscopic tests and impedance measurements, the current treatment was included or modified (Table 16). It was recommended to eat 5-6 small meals which are easily digestible and in some of cases enriched with oral supplements. After a meal, if possible, lying on the left-side should be applied and in case of severe ailments knee-elbow position should be used. In more than half of the patients (51.3%) PPI drugs were used, mainly in patients with acid symptomatic reflux. Prokinetic drugs were recommended in 40.5% of patients, especially in those with dominant non-acid reflux.

Treatment with selective serotonin reuptake inhibitors (SSRI) was applied in 51.3% of patients, most frequently in patients reporting ailments that were not confirmed by the impedance record. In case of H. pylori infection, an effective eradication therapy confirmed by a negative urea breath test was applied. All patients were informed in detail about the cause of the ailments, the need to increase their body weight and change their diet. The mere fact of explaining to them the cause of the disease was an important breakthrough in the treatment. In the 6-month observation period, a significant reduction of the ailments in the studied group of patients and an increase in body weight were achieved.

Table 16. Treatment used

Treatment used	Number of subjects	%
PPI's	19	51.3
Prokinetic agents	15	40.5
Choleretic agents	9	24.3
SSRI's	19	51.3

Discussion

Young patients, especially women with unintended weight loss, who report nausea, vomiting, heartburn, belching should have an abdominal ultrasound examination performed indicating the angle of branching of the superior mesenteric artery. In the studied group of patients, despite significant weight loss, no significant changes in CBC, electrolytes concentration, total protein, albumin and creatinine were found.

Only in one patient an increase in cholestatic enzymes (GGTP, ALP) activity was observed. According to the literature data, this syndrome may lead to impaired bile and pancreatic juice outflow to duodenum [30, 31]. In one of the examined patients elevated TSH concentration of 5.44 μUl/ml was observed (N: 0.4-4.0 μUl/ml). This is explained by disturbances in the secretion of hormones on the TRH - TSH axis in patients with low BMI [37].

Analyzing the distribution of the number of registered acid reflux episodes in the group of patients, it was observed that, regardless of the position of the body, only 30% had more than 50 episodes, and every tenth had no acid reflux at all. Out of 37 patients, 32 reported pain, but only 41% of them were confirmed in the study. Nausea was reported by 19 individuals and were justified in less than half of the cases (47.4%). Belching was confirmed in 61.1% of individuals. Flatulence occurred in 11 patients and was confirmed only in 36.4%. Heartburn was confirmed only in every third patient (33.3%). The research also confirmed that cough and hoarseness are not significant ailments in SMAS. Non-acid reflux was observed in the vast majority of patients (91.9%), regardless of body position. It was often related to the feeling of pain in the upper abdomen and the occurrence of belching.

Comparing the distribution of reflux episodes in the study of esophageal impedance with the norms adopted for healthy population [38], it was noted that in patients with diagnosed SMAS, asymptomatic non-acid reflux occurs significantly more frequently (46%).

Conclusions

Superior mesenteric artery syndrome most often occurs in young, educated women with BMI below 20 kg/m^2, coming from urban agglomerations, without economic problems, most often non-smoking, who observed a significant weight loss in a relatively short period of time.

Laboratory tests are not important in the diagnosis of SMAS, the angle of branching of the SMA from the aorta is the most important factor which helps to estimate the diagnosis of SMAS. Gastroscopy in SMAS is important in differential diagnostics.

24-hour impedance showed an increased number of episodes of asymptomatic non-acid reflux, although no positive reflux signs were confirmed for any of the reported ailments (SI).

Patients who reported ailments not related to reflux episodes were treated with SSRI group drugs with improvement. Since these drugs affect the gut-brain axis, it is possible that in SMAS patients, serotonin secretion may be disturbed on this axis.

It is justified to perform impedance in this group of patients as it allows to modify the therapy.

The most important are dietary recommendations, weight gain and understanding of the essence of the disease.

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DETECTION OF WEAK D ANTIGEN IN THE POPULATION OF POTENTIAL BLOOD RECIPIENTS

WYKRYWALNOŚĆ ANTYGENU D SŁABY W POPULACJI POTENCJALNYCH BIORCÓW

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. The strongest immunogen of the Rh system is the D antigen. It is found in several variants and categories, which makes it difficult to determine the correct RhD (Rh+) or RhD negative (Rh-) phenotype. Although only some of the varieties and types of this antigen are of clinical significance, it is important to determine the normal Rh phenotype in recipients and donors. The aim of this study was to determine the frequency of weak D antigen in a population of potential recipients.
Material and methods. The study group consisted of selected blood recipients in whom weak expression of the D antigen or its antibody was detected. In order to estimate the expression of antigen D, the blood was analyzed in the laboratory of the Regional Center of Blood Donation and Blood Treatment in Lublin. Blood from 220 potential recipients (149 women and 71 men) were used in the conducted research. The clinical material from the Laboratory of Transfusion Serology at the Provincial Specialist Hospital in Biała Podlaska was also used.
Results. The presence of a weak D was confirmed in 21 recipients. 4 cases of weak D were confirmed among recipients of blood transplant, while 17 cases among those who did not have blood transfusions. There were significant differences in the occurrence of the weak D in relation to the transfusion in both women ($\chi^2 = 18.34$ df = 2, p = 0.0001) and men ($\chi^2 = 17.25$).
Conclusions. The correct determination of the RhD+ or RhD- phenotype is important for pregnant women who should be subjected to immunoprophylaxis of maternal-fetal conflict when a weak D is detected. In order to avoid post-transfusion complications among recipients, it is necessary to choose serologically and phenotypically crossed-matched blood components.

Keywords: blood, blood donor, RhD antigen, weak D, antibody

Streszczenie

Wprowadzenie. Najsilniejszym immunogenem układu Rh jest antygen D. Może on występować w kilku wariantach i odmianach, co stanowi trudność w ustaleniu prawidłowego fenotypu RhD dodatni (Rh+) lub RhD ujemny (Rh-). Chociaż tylko niektóre z odmian i warianty tego antygenu mają znaczenie kliniczne, to jednak istotne jest oznaczenie prawidłowego fenotypu Rh u biorców i dawców. Celem pracy było określenie częstości występowania antygenu D słaby w populacji potencjalnych biorców.
Materiał i metody. Grupę badaną stanowili wyselekcjonowani biorcy krwi, u których wykryto słabą ekspresję antygenu D lub jego przeciwciała. W celu oceny wielkości ekspresji antygenu D, krew analizowano w pracowni Regionalnego Centrum Krwiodawstwa i Krwiolecznictwa w Lublinie. W przeprowadzonych badaniach przeanalizowano 220 potencjalnych biorców (149 kobiet i 71 mężczyzn). Wykorzystano też materiał kliniczny pochodzący z laboratorium Serologii Transfuzjologicznej przy Wojewódzkim Szpitalu Specjalistycznym w Białej Podlaskiej.
Wyniki. Obecność słabego antygenu D potwierdzono u 21 biorców. Biorcom, którym przetaczano krew, w 4 przypadkach potwierdzono antygen D słaby, natomiast tym, którym nie przetaczano krwi, 17 przypadków. Wykazano istotne różnice w występowaniu antygenu D słaby w zależności od transfuzji zarówno w grupie kobiet ($\chi^2 = 18,34$ df = 2, p = 0,0001), jak i mężczyzn ($\chi^2 = 17,25$).
Wnioski. Prawidłowe określenie fenotypu RhD+, RhD- jest istotne dla kobiet w ciąży, które w przypadku wykrycia antygenu D słaby powinny być poddawane immunoprofilaktyce konfliktu matczyno-płodowego. Chcąc uniknąć powikłań poprzetoczeniowych, biorcom należy dobierać zgodne serologicznie i fenotypowo składniki krwi.

Słowa kluczowe: krew, krwiodawca, antygen RhD, D słaby, przeciwciało

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Introduction

With exception to A and B antigens of the AB0 system, the D-antigen of the Rh system shows the highest immunogenicity of all blood group antigens and is clinically relevant. In the white population, antigen D occurs in about 85% of people. Individuals referred to as RhD-positive (Rh+) have D-antigen on red blood cells, while those referred to as RhD-negative (Rh-) do not. Both phenotypes (Rh+ and Rh-) are determined by the RHD gene with variable expression. Therefore, different variants and categories of D antigen may be formed. The phenotypic classification may be difficult due to the existence of variants or types of the D antigen, as phenotyping only uses serological methods [3, 17]. People with the Rh-phenotype are characterized by the complete deletion of the RHD gene. However, there are also people who have this gene or its fragments, but the expression of RHD proteins does not occur or is weakened. Then they have a "residual" presence of D antigen and describe it as "people with a weak D or D partial antigen" [5]. The reason for the weak D antigen is, among others, point mutations in the RHD gene, which cause changes in the amino acid composition of the RhD protein. The result of this mutation is the weak expression of the D antigen. Weakly expressed D antigen was also observed when the haplotype coding for the D antigen is in the trans position relative to the haplotype encoding the C antigen. Serological and genetic characteristics allowed to classify variants and weak antigen categories as partial D, weak D and DEL antigens. Weak variants of D antigen occur in about 0.2-1% of people and may stimulate the production of anti-D alloantibodies after blood transfusion in RhD negative recipients or during pregnancy in RhD negative women [1, 17]. The clinical relevance of poor varieties is considered when a person with a D weak or a variant of D antigen after contact with RhD positive blood cells (transfusion or pregnancy) may produce anti-D antibodies, or when a negative RhD (blood recipient or pregnant woman) is exposed at the risk of alloimmunization when the blood donor or fetus has a weak version of D antigen. Only some of the variants or types of D antigen are of clinical significance. Weak D and partial RhD can be the cause of immunization, therefore the determination of this antigen is very important in pregnant women and women in the premenopausal period. The generation of anti-D antibodies by them may have consequences in the course of their future pregnancies and may even cause hemolytic disease of newborns when the fetus is RhD positive. The poor D antigen determination is also important for blood recipients because they may be also prone to immunization [17].

The aim of the study was to determine the frequency of occurrence of weak D antigen in a population of potential recipients and to demonstrate its significant immunohematological significance.

Material and methods

Characteristics of the study group

The clinical material from the Laboratory of Transfusion Serology in Biała Podlaska was used for the research. Blood samples from 220 patients (149 women including 2 girls and 71 men including 1 boy) were tested. Blood group in AB0 and Rh systems, review of antibodies to red blood cells and a possible test of compliance were determined. Patients were hospitalized in various departments (surgery, internal, geriatrics, urology, neonatology, cardiology, pediatrics, OIT, orthopedics, oncology, dialysis, palliative care, gynecology, pulmonology, ENT, neurology). The average age of men was 69.5 (the youngest was a year, the oldest was 96, SD = 19.93) and women 58.6 (the youngest was 2 years, the oldest was 100 years old, SD = 23.86). The age distribution of men is consistent with the normal distribution (K-S d = 0.13 p <0.20), whereas in the case of women, it differed significantly from the normal distribution (K-S d = 0.14 p <0.01). For research and statistical analysis, children were classified in the "men" and "women" groups respectively.

In order to verify the obtained results, the Kolmogorov-Smirnov test (K-S) and the χ^2 test were used using the Statistica 12.0 software (StatSoft).

The authors have the consent of the Director of the Provincial Specialist Hospital in Biała Podlaska for the use of anonymized data.

Collection and preparation of material for serological tests

Serological tests were performed using two methods: test tube and microcolumn. From adults, 8-10 ml of venous blood were collected in a dry tube, and 3 ml from newborns in EDTA sputum tubes (in order to take the lowest possible volume of blood to prevent anemia). The material collected in a dry tube, after previous clotting (incubation for about 1 hour at 37 °C), was centrifuged for 5-10 minutes at 3000 rpm to separate serum from blood cells. In contrast, blood collected on EDTA for coagulation did not require incubation and was

centrifuged immediately after collection. Both in the serum of adults and newborns, the presence of antibodies was tested and red blood cell antigens were determined in the blood cells. The hemolyzed and lipemic samples were disqualified and the tests were performed again with newly collected blood samples, as hemolysis and significant blood lipemia could hinder agglutination and alter the results in an uncontrolled manner. The blood tubes were stored for 5 days in a cold room with temperature monitoring as recommended [11]. The collected material was used to diagnose D antigen from the Rh system along with its weak variants and categories. The qualification of the patient to the group of persons RhD (+) or RhD (-) was determined based on the presence or absence of D antigen on the blood cells. Specimens with dubious results for antigen D were subjected to additional testing for variants weak D and partial D. In these cases, the persons (blood recipient of the woman before the menopause) were treated as RhD negative with an unambiguous description: RhD negative "weak expression of antigen D". In order to determine in detail the weak expression of antigen D, a blood sample was transferred to the consultative office of the Regional Center for Blood Donation and Blood Treatment in Lublin. Recipients where the DVI category of the D-antigen was found or the weak D-antigen was included in the RhD negative group and negative blood was selected for transfusion. Women were included in the prevention of the Rh conflict.

The D-antigen from the Rh system was determined based on the presence or absence of agglutination of the blood cells tested with the anti-D reagent. Depending on the degree of agglutination, the RhD antigen or its variants were determined. Two monoclonal reagents were used: anti-D IgM (RUM-1) - to detect a weak type of D antigen (D weak) and most categories of D antigen except D VI and anti-D IgM + IgG (BLEND) - to detect a weak antigen variant D (weak D) and most categories of D antigen, including DVI. Positive control (K+) was an anti-D monoclonal reagent with RhD+ reference cells, the negative (K-) was anti-D monoclonal reagent with RhD- reference cells.

Results

Distribution of blood groups of recipients in the AB0 and Rh system

Considering the presence or absence of D antigen on blood cells, recipients were divided into two groups Rh- and Rh+. We examined 125 RhD+ (57%) - 81 women and 44 men and 95 RhD- (43%) - 68 women and 27 men (Table 1). Analysis of the distribution of blood groups in AB0 and Rh systems revealed that the most frequent group of blood in men was ARh+ (16 people, 23%), while the least frequent group was BRh-, which was only determined in two men (3%). In the case of women, the most frequent group was 0Rh+ (28 people, 19%), and the rarest was ABRh+ and ABRh- (6 people, 4%) (Figure 1).

Table 1. Percentage distribution of RhD+ and RhD- phenotypes

Blood recipients	Phenotypes	
	Rh+	Rh-
men	44 (62%)	27 (38%)
women	81 (54%)	68 (46%)
Σ	125 (57%)	95 (43%)

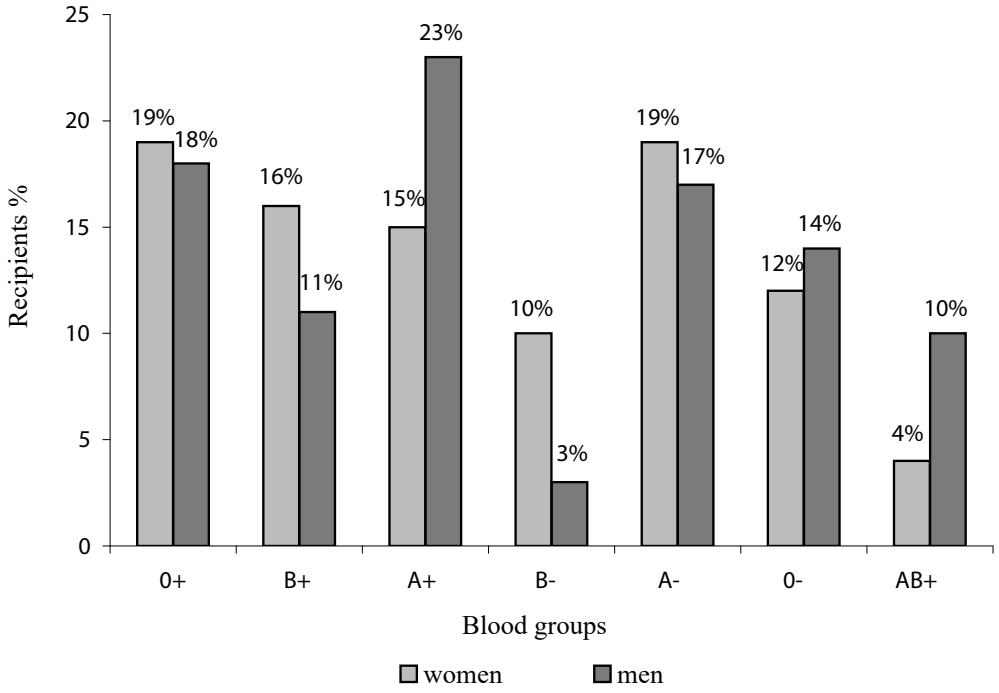

Figure 1. Percentage distribution of blood groups depending on gender

The group of blood recipients was also analyzed in the context of the phenotypes from the Rh group system occurrence. The most frequently detected phenotype in women was the dccee phenotype (41 recipients - 27.5%) and DCcee (38 recipients - 25.5%), and the most rarely: DCcEe and DccEE, which were found only in individual cases. Similarly, in males, the most common phenotype was dccee (14 recipients - 20%) and DCcee (14 recipients - 20%) (Figure 2). When comparing the phenotypes of the Rh system, there were no statistically significant differences between men and women (χ^2 = 2.57, df = 2, p = 0.28). Twenty-one recipients with weak D were identified. A variant with a weak D was detected in 13 women (8.7%) and in 8 men (11.3%) detected phenotypes of the Rh system (Figure 3).

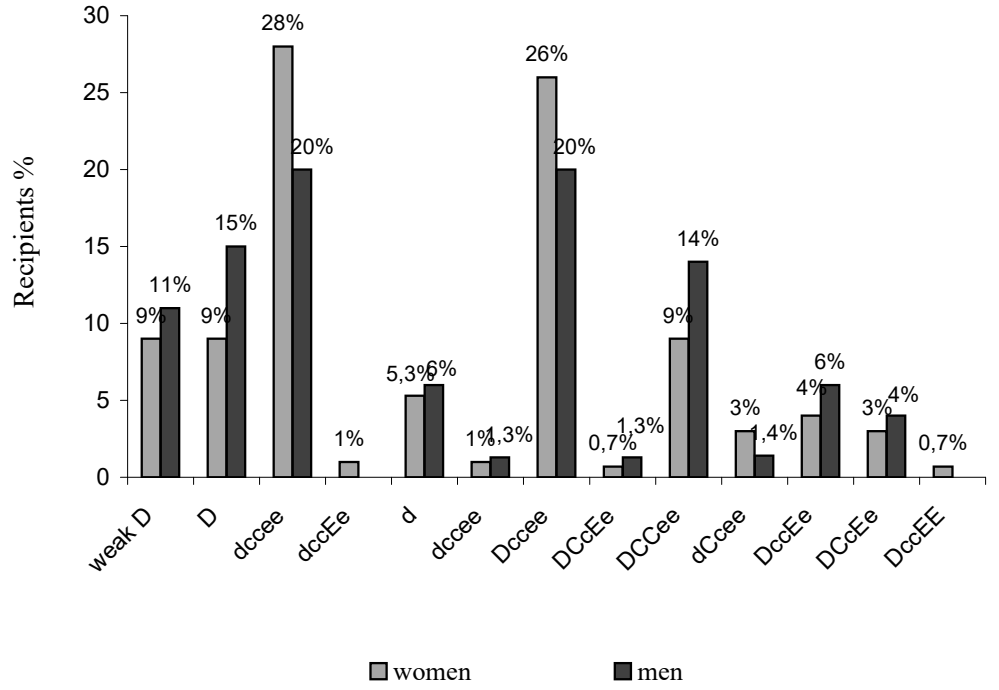

Figure 2. The role of the Rh system phenotypes depending on gender

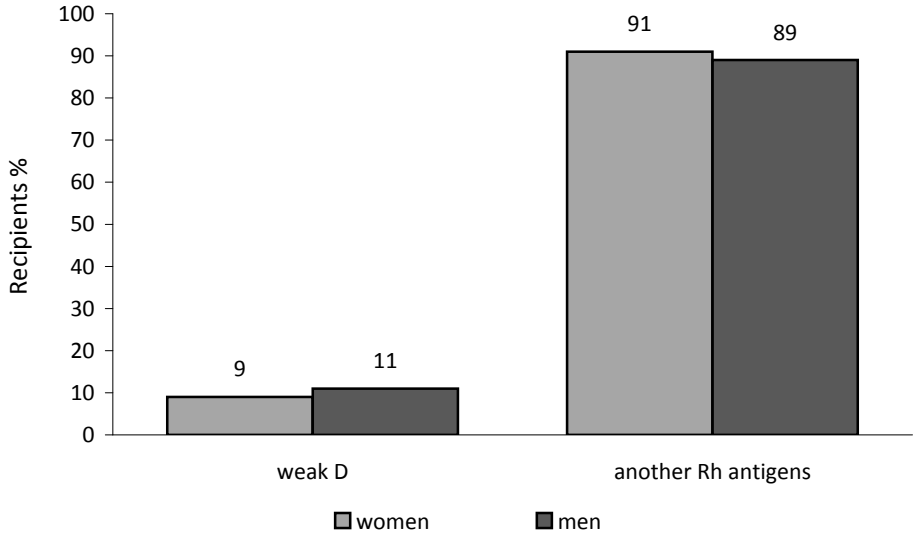

Figure 3. Percentage distribution of weak D depending on gender

Weak D distribution among blood recipients

The study group included patients hospitalized in various departments, patients from specialist clinics and individuals. Women were the most common patients in the internal ward (23%) and gynecology and obstetrics (21%), the least in pediatric wards, hemodialysis and palliative care (1%). Similarly, men were most often hospitalized in the internal ward (30%), and the least frequently in the hemodialysis wards, palliative care, pulmonology, ENT and neurology (1%). Weak D was most often determined in cardiology patients (5 cases): 3 for women (19%) and 2 cases for men (28%), and the least frequently for the internal ward (two cases - 6%).

Detection of weak D in recipients treated and not treated with blood

156 recipients had transfused blood in the study group, while 64 were not transfused. Women were the majority of recipients, 101 women were given blood (68%) and 55 men (77%). Among subjects who received blood transfusions, there were 4 patients with weak D (2 men - 4% and 2 women - 2%). In recipients who did not have blood transfusions, weak D was found in 11 women and 6 men (Table 2). The χ^2 test compared the occurrence of the weak D depending on the transfusion. There were significant differences in both women (χ^2 = 18.34 df = 2, p = 0.0001) and in men (χ^2 = 17.25 df = 2, p = 0.001).

Table 2. The occurrence of a weak D in recipients depending on the transfusion

Recipients	Transfusion	
	Yes	No
Women	101 (68%)	48 (32%)
Men	55 (77%)	16 (23%)
Weak D Women	2 (1%)	11 (7%)
Weak D Men	2 (3%)	6 (8%)

The contribution of phenotype weak D in women depending on pregnancy

149 women were examined, of whom 138 were pregnant. In the group of pregnant women, 11 patients (8%) had a weak D. Women who were not pregnant constituted a minority (11 people), two of whom (18%) were marked with a weak D antigen (Figure 4). Comparing the occurrence of weak D in women, depending on pregnancy, the χ^2 test was performed, which did not show any significant differences (χ^2 = 3.47, df = 2, p = 0.18).

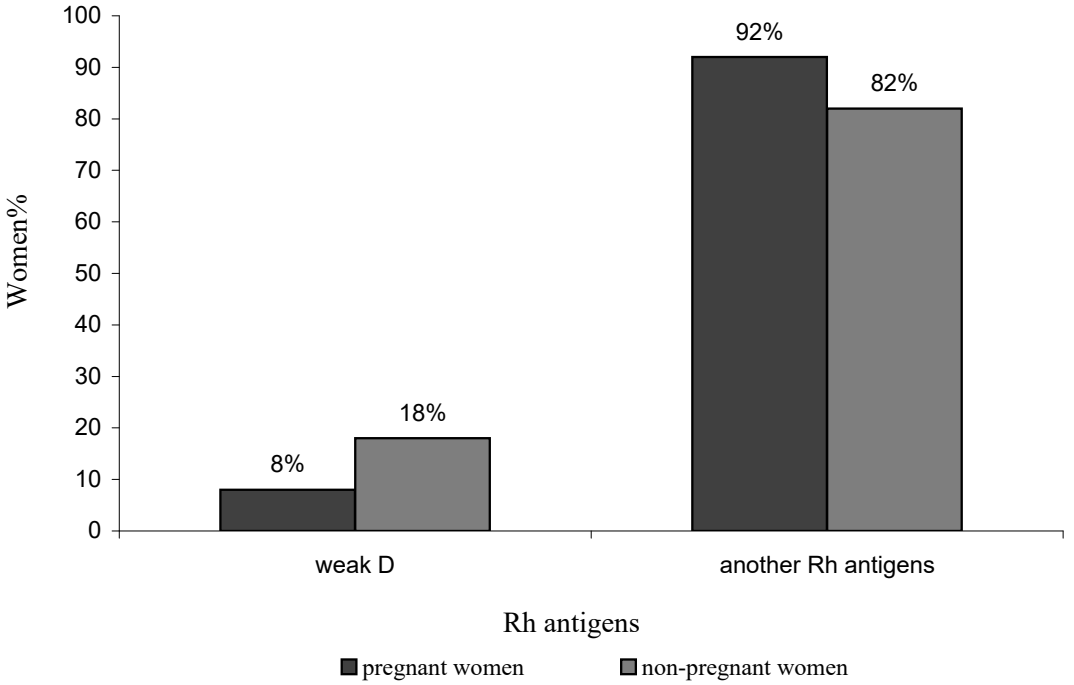

Figure 4. The presence of a weak D antigen in pregnant and non-pregnant women

Discussion

The D-antigen from the Rh system is the strongest immunogen that in over 80% of recipients stimulates the immune system to produce alloantibodies. In the human population, its presence is diverse and depends on latitude. The results of the Fabijańska-Mitek study [4] show that in the Caucasian population it ranges from 83 to 87%, in Asians even over 99%, in the black population from 82 to 95%. In Poland, as many as 82.7% of people have this antigen [1, 6]. The results of own research deviate from the literature. It was shown that 57% of the recipients tested had an Rh antigen, while 43% of the phenotypes did not have this factor. The differences may be due to the fact that in the study group there were also pregnant women RhD-, which were covered by the prevention of maternal-fetal conflict. Pregnant RhD negative increased the number of non-Rh positive recipients.

Similarly, the incidence of antigens from the AB0 system varies depending on the distribution of the geographical population. In East Asia, group B occurs two to three times more often than in Europe. The indigenous South American Indians have group 0, Australians do not have group B and AB [4]. In this study, the most frequent groups of the blood of the analyzed recipients were groups 0 and A, and the least frequently the group AB. This is in line with the Brojer study [3], according to which the A and 0 groups are the most common in the Polish population, and the AB group the most rarely.

In addition to the D antigen of the highest clinical significance, there are also other antigens in the Rh group system, such as C, E, c, e. Using specific reagents, 18 genotypic systems characteristic of this system can be detected [4]. The study analyzed the incidence of various phenotypes from the Rh system. The dccee (25%) and DCcee (23.6%) phenotypes were most often found in the recipient group, and DCcEe (0.7%) and DccEE (0.5%) were the most rarely found. According to Pelc-Kłopotowska et al. [16], in the Polish population, the dccee phenotype occurs at a frequency of 15%. Fabijańska-Mitek [4], in her research, indicates the DCcee phenotype as the most frequent one, followed by DCcEE, dCCee and dCeEe with the lowest frequency. Own results partly agree with the literature, because a higher prevalence of the dccee phenotype has been demonstrated. This can be explained by the presence of pregnant women RhD- in the study group, which are subject to the prevention of serological conflict.

The difficulty of the correct RhD phenotype determination is the presence of its weak forms. Although only some of them are clinically relevant, this is important for recipients and donors [16]. We also analyzed the detectability of the weak D from the Rh system. 125 recipients as RhD positive and 95 RhD negative were qualified for the study. In 21 recipients very weak reactions with anti-D reagents were found, which may indicate the presence of poor expression of the D antigen. Specific serological and molecular tests confirmed

the presence of a weak form of D antigen in all these cases (9.5%). Generally, in the world, weak forms of D antigen (weak D, partial D and DEL) rarely occur with prevalence around 0.2-1% [4, 15, 18]. According to Pelc-Kłopotowska et al. [17], the percentage of people with weak D expression in Poland is 0.45%. Other authors also confirm its small share in various populations, e.g. in Delhi 0.25%, in Germany 0.21%, in Austria 0.4% [5, 8, 20]. However, own results differ from the literature. This is probably due to the fact that the study group consisted of selected recipients who were found to have a poor expression of the D antigen or its antibody. The unequivocal determination of the phenotype of these people was difficult. The recipients were subjected to further detailed serological consultations, after which their appearance was confirmed by a weak D.

Incorrect determination of a weak D or its types in blood donors, as well as its erroneous determination in RhD negative women, may lead to serious clinical consequences. As indicated by Kuśnierz-Alejska [10], in some disease, for example, myeloid leukemia or autoimmune hemolytic anemia, D antigen may be depressed. Such a case was noted in the serological laboratory of the Institute of Hematology and Transfusion in Warsaw, where in one of the patients in the acute phase of immunohemolytic anemia, the D antigen was periodically undetectable. The above fact shows how clinically relevant are the studies of RhD antigen expression and its correct phenotyping. Daniels [3] reports that the determination of weak D often depends on the reagents and the technique used, which is why it is very difficult to present the frequency of this phenotype. In his research, he showed that the presence of the weak D varies depending on the geographical location. Among donors of the white and black breed in North London, it occurs at a frequency of 0.3% to 1.7%. According to Brojer et al. [2], weak D occurs in about 0.2-1% of people. Studies conducted at the Central European Blood Banks showed that 50 of the 8422 donors identified as RhD negative were found to have weak D. In Austria, 804 people were marked as RhD negative, in 18 cases fragments of the RHD gene were found. In 14 people with fragments of the RHD gene, antigen D was detected on the blood cells with reduced expression, which was not detectable in routine studies [7, 20].

Due to the clinical significance of D antigen, it is very important to determine the RhD phenotypes correctly. According to Kuśnierz-Alejska [10], transfusion of negative blood to recipients with a very poor expression of D antigen, classified as RhD negative, proceeds without adverse effects. On the other hand, donor blood with a low expression of D antigen (weak D) should not cause immunization of negative RhD recipients. Opponents of this view, however, pay attention to the possibility of clinical consequences as a result of transfusion of red blood cells with very weak D to people who produce anti-D antibodies, as well as pregnant women. Therefore, to avoid complications of potential blood donors in which weak D is present, they belong to the group RhD positive with an appropriate annotation that recipients must get RhD negative blood [11]. After analyzing our research, it was shown that in transfusion patients (156 recipients), 4 cases of weak D expression were found, while among those without blood transfusion (64 recipients) 17 cases were detected. Transfusion patients had serum-matched and phenotypically selected blood in AB0, Rh and Kell systems. According to numerous publications, RhD transfusion of the negative blood recipient to the weak D may lead to alloimmunity or other clinical complications. Therefore, the diagnostic importance of donors towards the weak D should be emphasized here. Brojer et al. [2] after Castilho et al (2013) describe a case of a Portuguese patient with acute myelogenous leukemia who was qualified for the RhD positive group without immune alloantibodies. The patient received 33 RhD positive blood units within six months. Patients' anti-D antibodies were detected using specific tests in the patient's serum. It turned out that the patient was diagnosed with category DIIIc of D antigen, the detection of which is possible only through genetic tests. Pelc-Kłopotowska et al. [17], using Real-time PCR technologies (molecular studies), examined 3000 donors towards the presence of the RHD gene. Although all donors were classified as RhD negative, fragments of the RHD gene were detected in 0.45% of cases.

The diagnosis of weak D is also very important for pregnant women. They are exposed to alloimmunization when the fetus has a weak version of D antigen. During pregnancy, women are required to perform tests both for the determination of blood group and for all erythema alloantibodies. The analysis of our results showed that among the 138 pregnant women, the weak D was detected in 11. These women were qualified for immunoprophylaxis of maternal-fetal conflict. The results obtained are slightly different from those available in the literature. Until 2010 428 RhD negative pregnant women were examined in the IHiT laboratory in Warsaw, 4 of them were diagnosed with weak D, and in one of them RhDel. In the years 2000-2012, studies on the weak expression of the D. antigen were carried out in Prague. In the pool of examined people, in 827 RhD variants were detected, 722 cases of weak D and 105 partial D [9, 18]. Dutch scientists have analyzed the occurrence of the RHD gene in 24057 pregnant women. In 275 cases its presence was detected. In order to better diagnose the Rh serological conflict, RhD genotyping is increasingly performed in the fetus. This is a non-invasive method based on the analysis of free-running fetal DNA (cffDNA) in the mother's plasma. The priority of conducting such tests is primarily targeted at prevention of anti-D immunoglobulin only in RhD mothers, whose child has RhD+ [12, 18].

The frequency of the weak D was also analyzed depending on the hospitalization of patients in individual wards. It was most frequent in cardiac patients. This is probably related to the high rotation of patients in this ward, and hence a large number of ordered immunohematological tests. In the internal ward, the number of patients hospitalized was the highest, however, the detectability of the weak D was the lowest. This may be due to the fact that it is a ward with chronically ill patients, the patient's turnover is very low, and therefore also the small phenotypic diversity. The discussion of these results is difficult because in the literature there are mainly data about donors, recipients, pregnant women, RhD negative, with our division based on hospitalization in different wards. It seems that the study analyzed the dependence of the occurrence of D weak in hospital wards for the first time. In the literature, generally hospitalized patients, regardless of the ward, are treated as potential recipients.

Conclusions

1. The correct determination of RhD+, RhD- phenotypes is important for pregnant women who should be subjected to immunoprophylaxis of maternal-fetal conflict if a weak D detected.
2. Patients who were not subjected to blood transfusion were more often characterized as a weak D than in patients after transfusion.
3. In order to avoid post-transfusion complications, the recipients should be serologically and phenotypically crossed-matched blood components.

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PRE-NOSOLOGICAL MONITORING OF THE HEALTH STATUSES OF FEMALE OBSTETRICIAN-GYNECOLOGISTS

WSTĘPNE MONITOROWANIE NOZOLOGICZNE STANU ZDROWIA KOBIET BĘDĄCYCH LEKARZAMI POŁOŻNIKAMI-GINEKOLOGAMI

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Authors' contribution
Wkład autorów:
A. Study design/planning
zaplanowanie badań
B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
przygotowanie artykułu
F. Literature analysis/search
wyszukiwanie i analiza literatury
G. Funds collection
zebranie funduszy

Summary

Background. Female obstetrician-gynecologists of reproductive age provide medical care in harmful working conditions creating health risks for themselves.

Material and methods. Female obstetrician-gynecologists working in hospitals (n=32) and antenatal clinics (n=32), therapists of outpatient clinics (n=31) and women working in the positions of accountants, economists, lawyers and secretaries (n=31) in the healthcare organizations of the Grodno region participated in this research. Working conditions were assessed by studying the results of the workplaces' certification. Pre-nosological monitoring was conducted using the following methods: cytomorphological testing of buccal epithelium, microbiological testing of the oral biocenosis and psychological testing.

Results. We established that the studied female obstetrician-gynecologists work in harmful conditions (hazard classes 3.2-3.3). It was associated with functional changes in their bodies: 23.3% of them had deviations in cytomorphological parameters of buccal epithelium; 59.3% had excessive amounts of *E. coli* group bacteria in their oral cavity and already formed phases of the occupational burnout syndrome.

Conclusions. The selected set of methods for pre-nosological monitoring permit analysis of the impact of different occupational factors and the formation of target risk groups for the implementation of measures improving adaptive reserves.

Keywords: occupational conditions, health risks, female doctors, pre-nosological monitoring

Streszczenie

Wprowadzenie. Lekarki położne-ginekolodzy w wieku rozrodczym świadczą opiekę medyczną w szkodliwych warunkach pracy, które stanowią ryzyko dla ich zdrowia.

Materiał i metody. W badaniu brały udział lekarki położne-ginekolodzy, pracujące w szpitalach (n=32) i placówkach opieki przedporodowej (n=32), terapeutki pracujące w przychodniach (n=31) oraz kobiety, które pracowały na stanowiskach księgowych, ekonomistów, prawników i sekretarek (n=31) w placówkach opieki zdrowotnej obwodu grodzieńskiego. Warunki pracy były oceniane poprzez badanie wyników certyfikacji miejsc pracy. Wstępne monitorowanie nozologiczne przeprowadzono następującymi metodami: badanie cytomorfologiczne nabłonka policzka, badanie mikrobiologiczne biocenozy jamy ustnej oraz badania psychologiczne.

Wyniki. Ustalono, że lekarki położne-ginekolodzy pracowały w szkodliwych warunkach (klasy zagrożenia 3.2-3.3). Wiązało się to ze zmianami w funkcjonowaniu organizmu kobiet: u 23,3% z nich stwierdzono nieprawidłowości w parametrach cytomorfologicznych nabłonka policzka, u 59,3% stwierdzono zbyt wysokie wartości bakterii z grupy *E. coli* w jamie ustnej i już ukształtowane fazy syndromu wypalenia zawodowego.

Wnioski. Wybrany zestaw metod wstępnego monitorowania nozologicznego pozwala zidentyfikować wpływ różnych czynników zawodowych i stworzyć docelowe grupy ryzyka w celu wdrożenia środków zapobiegawczych, które zwiększą rezerwy adaptacyjne organizmu.

Słowa kluczowe: warunki pracy, ryzyko dla zdrowia, kobiety lekarze, wstępne monitorowanie nozologiczne

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Introduction

Female obstetrician-gynecologists of reproductive age belong to the risk group for health deterioration due to a complex interaction of harmful occupational factors [1]. However, these women are often at the pre-nosological stage of the disease with reversible functional disorders that are prospective in terms of correction [2]. Nevertheless, evaluation and identification of the pre-nosological conditions characterized by a predominance of nonspecific changes in the body is quite a difficult task in the case of classical clinical approach usage [3].

It is for this reason that the introduction of pre-nosological monitoring system for assessment of worker health status is very topical, especially because of the lengthening trend for the asymptomatic period of occupational-related diseases in recent years [4]. The most promising methods of this kind are those based on the study of various parameters of the oral mucosa, found to be the earliest target for exposure of aggressive factors and psychological testing. These allow assessment of the body's functional state in a constantly changing environment [5, 6].

The purpose of this study was to assess the health status of female obstetrician-gynecologists of reproductive age by applying pre-nosological diagnostic methods.

Material and methods

This research was carried out by the Department of General Hygiene and Ecology at the Grodno State Medical University from 2015–2018 (Governmental registration number 20150651 of 18th May 2015). The research protocol was approved by the Bioethical Commissions of the Grodno State Medical University and healthcare organizations of the Grodno region where the research was conducted. Groups of surveyed women were formed after prior consultation and written informed consent.

We chose healthy women to participate in the research on the basis of their medical examination results. Participation was disallowed in the context of health complaints, periods of convalescence, or use of antibacterial, anti-inflammatory and hormonal drugs on the eve of the examination. The main group consisted of female obstetrician-gynecologists providing medical care in obstetric-gynecological departments of hospitals (the first subgroup, n=32) and antenatal clinics (the second subgroup, n=32). The control group consisted of female doctor therapists who worked in outpatient clinics (n=31). Women with higher education who worked in healthcare organizations in the positions of accountants, economists, lawyers and secretaries (n=31) were included in the comparison group. All examined women lived in the Grodno region of the Republic of Belarus.

Hygienic analysis of the working conditions was carried out using the latest workplace certifications, as well as on the basis of measurements made by the laboratory service of the Grodno Regional Center of Hygiene, Epidemiology and Public Health.

Pre-nosological monitoring of the health status was conducted using the following methods: cytomorphological testing of the buccal epithelium for assessment of the influence of occupational factors of biological nature, microbiological testing of the oral biocenosis for assessment of the influence of occupational factors of chemical nature and psychological testing for assessment of mental tension.

Cytomorphological testing of the buccal epithelium was aimed at identifying anomalously changed cells in the form of degenerated neutrophilic leukocytes, mastocytes, non-nuclear cells, epitheliocytes with micronuclei, protrusions, doubled nuclei, double nuclei, phagocytized apoptotic bodies, cells in the state of karyorexis and vacuolar dystrophy [7]. Microbiological testing of the oral biocenosis was aimed at identifying *E. coli* group bacteria normally absent from the mucous membrane due to cellular secreted immune factors [8]. Psychological testing was conducted to identify the main symptoms of occupational burnout syndrome using the method described by Boyko in "Diagnostics of person's emotional burnout" [9].

Statistical processing of the data was performed using Statistica 10.0. The normal distribution of quantitative traits was estimated using Kolmogorov-Smirnov agreement criterion (the data are presented as M±δ in the case of the normal distribution and the statistical significance of the differences was determined using the t-criterion). Conjugation tables were created to assess qualitative characteristics: the hypothesis of independence of columns and rows was tested using the Fisher exact test, the Pearson χ^2 test, the Kruskal-Wallis test, the trend criterion for Alvo and Berthelot shares; τ Goodman and Kruskal criterion were used as the association coefficients. In all analyzed cases, the null hypothesis was rejected at a value of $p < 0.05$.

Results

It was found that female doctors of the first subgroup of the main group were the most exposed to occupational factors. The greatest contributions to the formation of the final evaluation of their working conditions (hazard

class 3.3) were made by high mental tension (hazard class 3.2), factors of biological (hazard class 3.2) and chemical (hazard class 3.1) nature. Harmful working conditions at the workplaces of female doctors of the second subgroup of the main group (class 3.2) consisted of biological factors' influence (class 3.2) and high mental tension while diagnosis and treatment process were one degree lower (class 3.1).

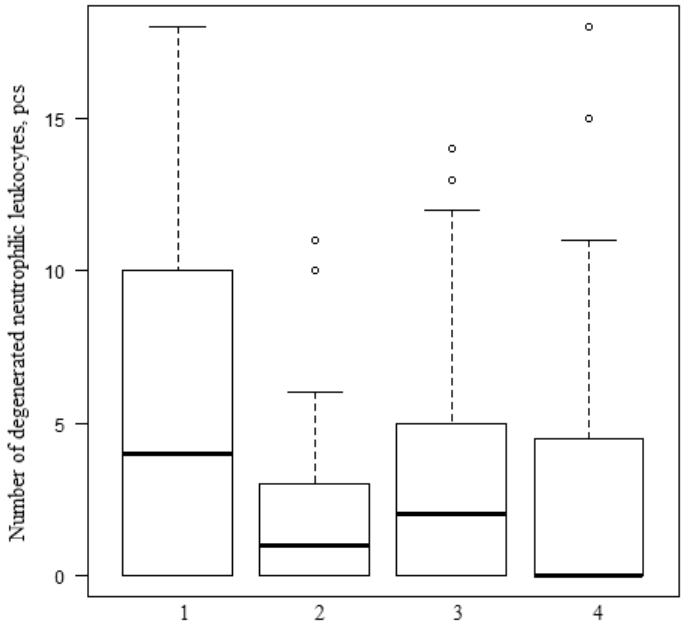
The high mental tension of work was due to significant intellectual (solving complex production problems in limited time, processing large amounts of complexity with subsequent distribution of other functions), emotional (increased responsibility for the results of medical care and patient safety) and sensory loads (long focused observation) coupled with double shift irregular work regimes, as well as a high working day density (up to 90.3% of the work shift).

Occupational factors of a biological nature posed a threat due to prolonged contact (more than 80% of working time) with microorganisms of different pathogenicity groups (viruses such as hepatitis B and D, human immunodeficiency, influenza, herpes; bacteria including pathogens of gonorrhea, syphilis, local inflammatory processes; fungi including pathogens of candidiasis; protozoa including pathogens of urogenital trichomoniasis), including their hospital strains, despite the relatively low rates of total air bacterial contamination in the working area (up to 485.1±99.1 cfu/m^3).

The impact of chemical occupational factors was due to constant long-term contact with vapors and aerosols of chemical toxicants of different hazard classes (drugs, disinfectants, ethyl and isopropyl alcohols, hydrogen peroxide and narcotic anesthetics, ozone) in total concentrations exceeding maximal permissible values (4 points on the Wright's scale).

Professional activity of female therapists (control group) was linked mainly to the unfavorable effects of biological occupational factors (hazard class 3.2). Women of the comparison group worked in permissible working conditions (class 2) without the influence of any harmful occupational factors. Study of the subjects' smears revealed only four variants of cytomorphological changes in buccal epithelium cells from all possible changes: degenerated neutrophilic leukocytes, epitheliocytes with doubled nucleus, epitheliocytes with double nucleus, and epitheliocytes with protrusion in the shape of the tongue.

We found that the combination of harmful occupational factors was associated with more expressed changes in the functional states of female obstetrician-gynecologists of reproductive age performing professional duties in the hospitals. Thus, the number of identified degenerated neutrophilic leukocytes (median=4, interquartile range=0–10) was significantly higher than in those of the second subgroup ($p<0.01$) and control ($p<0.001$) group (Figure 1).



1 – obstetrician-gynecologists of hospitals; 2 – obstetrician-gynecologists of antenatal clinics; 3 – therapists of outpatient clinics; 4 – women with higher education who worked in the positions of accountants, economists, lawyers and secretaries in the healthcare organizations

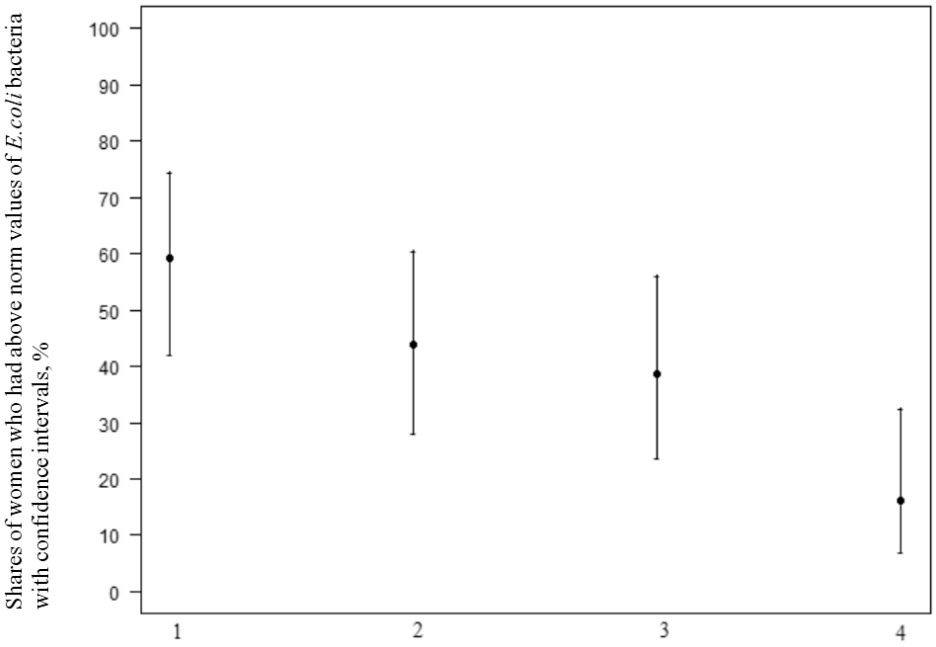
Figure 1. Number of degenerated neutrophilic leukocytes in the buccal epithelium smears taken from women who worked in the healthcare organizations

The buccal epithelial cells of female obstetrician-gynecologists who provided medical care in antenatal clinics were mainly represented by unchanged forms (median=98, interquartile range=96–99), evidence of more stable adaptive functioning. Nevertheless, we found that 80.6% of them had all the above-described variants of cytomorphological changes of the buccal epithelium in the smears. In addition, the frequency of epithelial cells with protrusions in the shape of the tongue taken from women of this subgroup was significantly higher than those of obstetrician-gynecologists of the first subgroup ($p<0.00001$), therapists ($p<0.01$), as well as women from the comparison group ($p<0.00001$).

The absence of a marked effect of harmful chemical factors, as well as the performance of professional duties in the permissible parameters of physical and mental tension of the labor process resulted in the stability of the adaptation's processes among female therapists: unchanged cytomorphological cells prevailed in the smears of buccal epithelium (median=97, interquartile range=94–98). However, we found degenerated neutrophilic leukocytes, epitheliocytes with doubled and double nuclei, as well as with protrusions in the shape of the tongue prevailed quantitatively in the smears taken from female therapists compared to obstetrician-gynecologists of inpatient hospitals ($p<0.001$) and women in the control group ($p<0.00001$).

Adaptation reserves of the women from the comparison group were the highest: smears of 64.5% women were represented by unchanged forms of buccal epitheliocytes. We have found only degenerated neutrophilic leukocytes from all possible cytomorphological changes in the smears of women from the control group. Although these morphological elements were identified in 35.4% of women, their frequency in the smears was significantly lower compared to those of the first subgroups of the main group (70.0%, $p<0.01$) and the control group (70.9%, $p<0.005$). Only 6.4% of women had deviations from the reference values in the content of degenerated neutrophilic leukocytes.

The microbiological study also confirmed that the professional activity in the conditions of the highest hazard classes was accompanied with the greatest changes in the functional state of the women's bodies of the first and the second subgroups of the main group: the percentage shares of examined subjects, who had excessive values of *E. coli* group bacteria, were, respectively, 59.3% and 43.7% (Figure 2).



1 – obstetrician-gynecologists of hospitals; 2 – obstetrician-gynecologists of antenatal clinics; 3 – therapists of outpatient clinics; 4 – women with higher education who worked as accountants, economists, lawyers and secretaries in the healthcare organizations

Figure 2. Shares of women with confidence intervals who had above-norm values of *E. coli* group bacteria

The adaptation potential of female therapists was slightly higher: excessive values of the *E. coli* group bacteria were identified only among 38.7% of women. In turn, the percentage share of women in the control group who worked in permissible working conditions and had excessive values of *E. coli* group bacteria was the smallest (only 16.1%), that is an objective evidence of the stable functioning of adaptation mechanisms in a large majority of the examined women (Figure 3). Therefore, in spite of the fact that the greatest differences in

the quantitative values of the parameters were registered between the examined women of the first subgroup of the main group and the women of the comparıson group (p<0.001), they were also significant between the obstetrician-gynecologists of inpatient hospitals and therapists of outpatient clinics (p<0.05). In addition, we identified significant differences in the values of the quantitative parameters of the *E. coli* group bacteria during the examination of women from the second subgroup of the main group and women of the control group (p<0.01). A significant majority of female doctors of the first (59.3±0.86%) and second (46.8±0.88%) subgroups of the main group had already formed phases of the occupational burnout syndrome in comparison to examined women of the comparison group (25.8±0.76%; p<0.05) (Figure 3).

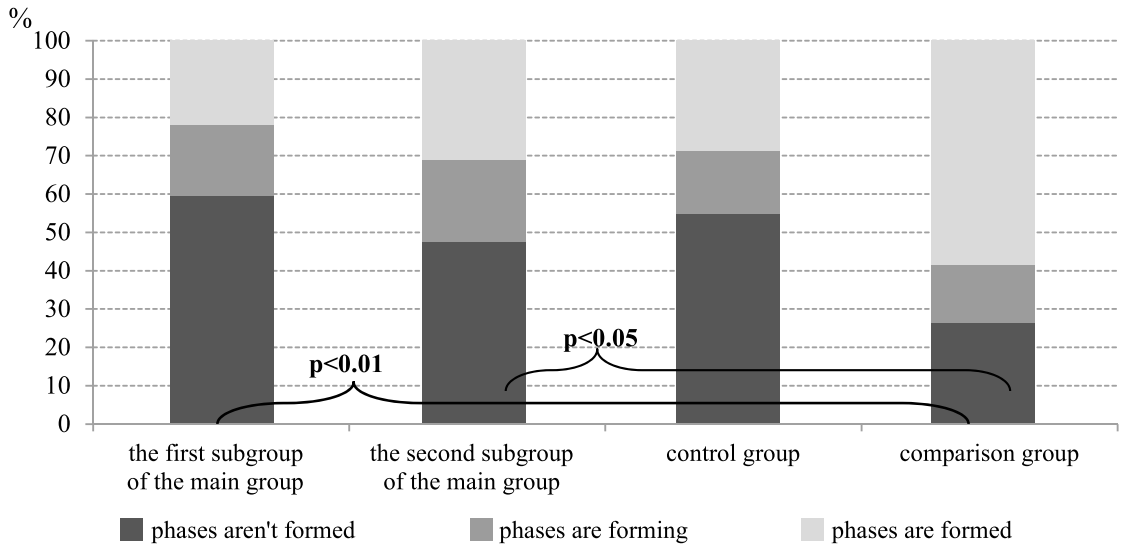


Figure 3. Results of the psychological testing for identification of the occupatıonal burnout syndrome among examined women (%)

A significant majority of the examined women who had only one formed phase of the occupational burnout syndrome, whereas all phases of this syndrome were completely formed only in 10.4±0.68% of obstetrician-gynecologists who provided medical care in the hospitals and in 5.8±0.52% of women from the control group.

Analysis of the structure of the occupational burnout syndrome's phases with a completed single-phase formation cycle made it possible to establish that the vast majority of women from the first and second subgroups of the main group were in the phase of "resistance" (62.0±1.34% and 60.0±1.54%, respectively), 22.8±1.14% and 30.0±2.64% in the phase of "depletion", and 15.2±0.99% and 10.0±0.94% in the phase of "tension" (Figure 4).

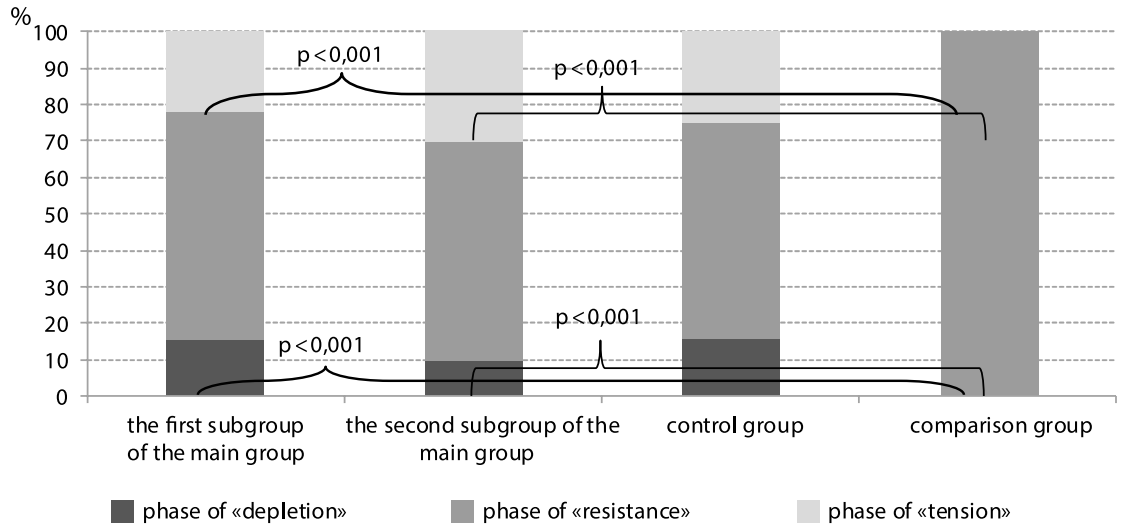


Figure 4. Structure of the occupational burnout syndrome's phases with the completed cycle of the formation of one phase among women (%)

A similar picture was seen in women from the control group: the percentage of those who had phase of "resistance" was 58.5±1.42%, phase of "depletion" – 24.9±1.23%, and phase of "tension" – 16.6±1.05%. The formation of the occupational burnout syndrome's phases among women of the comparison group was absolutely different: all subjects had completely formed phase of "resistance" that can be explained by features of their labor activity, which didn't require significant emotional loads typical for female doctors of the main and control groups.

Discussion

As it is well known, the body's capabilities can compensate for those negative reactions which are a result of response to the influence of harmful occupational factors only up to a certain threshold [10]. Moreover, the nature and degree of preclinical and clinical manifestations depend on the class of working conditions and the risk category: the higher the class and degree of working conditions, the more significant the medical-social risk to the health [11]. It was also shown by analysis of the obtained results that confirmed that the share of women who had changes in pre-nosological health status increases with the unfavorable effect of the occupational factors objectively documented while assessing the working conditions of the relevant hazard class.

The mucous membrane of the oral cavity has a significant effector potential in reactions of both local and general organismic inflammatory response that arise under the influence of harmful occupational factors [5]. Buccal epitheliocytes are able to enter into active cascade and network interaction with such inducers as neutrophilic leukocytes, macrophages, T- and B-lymphocytes, eosinophils, mastocytes and dendritic cells [12]. Moreover, it is well known that there is a robust correlation dependence between the states of inflammatory and cytological status, which, in turn, causes subsequent development of various pathological processes in the body [13]. Therefore, recorded changes of the oral mucosa in the form of abnormal epithelial cell appearances is the result of the negative influence of the biological occupational factors [14]. The oral microbiocenosis is a stable ecosystem, the functioning of which can be disturbed due to the influence of anthropogenic factors of chemical nature, including occupational ones [2]. The appearance in the oral cavity of the *E. coli* bacteria group is evidence of the inhibition of nonspecific element of the immune system [8].

The results we obtained during the study are comparable to the results of other researchers, which indicate that the development of occupational burnout syndrome among doctors is typical even in the first years of work and is accompanied by decreased adaptation reserves, followed by an increase in overall morbidity [15]. The selected set of methods for pre-nosological monitoring allows the identification of the impact of different occupational factors and the formation of target risk groups for the implementation of preventive measures increasing the adaptive reserves of these critical people.

Conclusions

The professional activity of female obstetrician-gynecologists in the harmful working conditions was accompanied by decreasing adaptive reserves of their organism and significantly increased risk of occupational-related disease occurrence. The use of pre-nosological monitoring allows the identification of women with reduced adaptive reserves in time as well as the development and implementation of a set of purposeful preventive measures aimed at maintaining and improving health status.

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"Health Problems of Civilization" to czasopismo naukowe, które jest kontynuacją czasopisma "Human and Health" (ISSN 2082-7288). Czasopismo to wydawane jest wyłącznie w języku angielskim i dotyczy różnych grup tematycznych, takich jak: biomedyczne aspekty zdrowia, współczesne choroby, aktywność fizyczna, otyłość, zachowania prozdrowotne. Wśród autorów poszczególnych artykułów znajdują się uznani specjaliści w zakresu nauk medycznych oraz nauk o kulturze fizycznej.

Misją czasopisma jest promowanie wiedzy w zakresie różnych problemów zdrowotnych człowieka w świetle szybko postępujących zmian życia współczesnego, spowodowanego rozwojem cywilizacyjnym, industrializacją, urbanizacją oraz zmianami środowiska naturalnego. Artykuły należy przesyłać do Redakcji czasopisma za pomocą http://www.editorialsystem.com/hpc/login/.

Przed rozpoczęciem procesu przygotowania pracy do publikacji autor/ autorzy przesłanych artykułów zobowiązani są do wniesienia bezzwrotnej opłaty w wysokości 150 zł brutto. W przypadku przesłania do Redakcji artykułu w j. polskim, Redakcja nie ponosi kosztów tłumaczenia artykułu na język angielski. Opłata za tłumaczenie wynosi 45 zł brutto za stronę obliczeniową, tj. 1800 znaków ze spacjami. W przypadku gdy Redakcja otrzyma artykuł w j. angielskim i będzie wymagał on korekty językowej (po weryfikacji Redaktora Językowego), Redakcja prześle artykuł do korekty; koszt korekty pokrywany jest przez autorów. Opłata za korektę językową wynosi 30 zł brutto za stronę obliczeniową, tj. 1800 znaków ze spacjami. Tłumaczenie/weryfikacja będzie wykonywane przez aktualnie współpracującego z Redakcją tłumacza, artykuł zostanie przekazany do tłumaczenia/korekty za pośrednictwem Redakcji po pozytywnej recenzji i ostatecznym zaakceptowaniu artykułu do publikacji. Po otrzymaniu od Redakcji informacji o zaakceptowaniu artykułu i ostatecznej kwocie tłumaczenia/korekty, Autor zobowiązany jest do przelania podanej kwoty na konto Państwowej Szkoły Wyższej im. Papieża Jana Pawła II w Białej Podlaskiej: Santander Bank Polska S.A., 45 1500 1331 1213 3001 7949 0000. Obowiązkiem Autora jest również dostarczenie do Redakcji potwierdzenia dokonania wpłaty (np. w formie elektronicznej na adres mailowy).

Wymagania etyczne

W przypadku opisywania eksperymentów przeprowadzanych na ludziach autorzy wskazują, czy zastosowane procedury były zgodne z Deklaracją Helsińską z roku 1975, uaktualnioną w 2000 roku (dotyczącą zasad etyki dla społeczności medycznej oraz zakazu ujawniania nazwiska pacjenta, inicjałów lub numeru ewidencyjnego szpitala) oraz ze standardami etycznymi komisji ds. eksperymentów na ludziach (instytucjonalnej i państwowej). Autorzy prezentujący studia przypadków są zobowiązani do nieujawniania danych osobowych pacjentów. Odnośnie do zdjęć, w przypadku wątpliwości, czy dane zdjęcie odpowiednio zabezpiecza anonimowość pacjenta, wymagana jest zgoda pacjenta na publikację danego zdjęcia.

Konflikt interesów

Oczekujemy od autorów opisania źródeł finansowania badań, roli potencjalnego sponsora w planowaniu, wykonywaniu i analizie badań oraz wpływu, jaki organizacja finansująca mogła mieć na zawartość artykułu. Pozostałe relacje (takie jak zatrudnienie, konsultacje, posiadanie akcji, honorarium, płatne zaświadczenia eksperckie), które mogą być potencjalnie źródłami konfliktu interesów w związku z dostarczonym artykułem, należy ujawnić.

Ghostwriting, guest authorship i zasady dotyczące plagiatu

„Health Problems of Civilization" stosuje procedury, które zapobiegają wystąpieniu zjawisk „ghostwriting", „guest authorship" oraz plagiatu. Każda praca zgłoszona do czasopisma jest sprawdzana za pomocą programu antyplagiatowego.

Przygotowanie manuskryptów

Artykuł należy przygotować w j. angielskim; manuskrypt powinien być komunikatywny, przejrzysty i spójny, a także utrzymywać klasyczny wygląd edycyjny.

Wygląd pracy

Teksty przesłanych artykułów nie powinny przekraczać:

- w oryginalnych artykułach naukowych i artykułach przeglądowych, 4400 słów, łącznie z tabelami i bibliografią – ok. 20 stron, napisanych komputerowo, z podwójnym odstępem, z czcionką 11 pkt i 30 pozycjami literatury,
- w studiach przypadków, 1000 słów, łącznie z tabelami i bibliografią – ok. 7 stron, napisanych komputerowo, z podwójnym odstępem, z czcionką 11 pkt i z 10 pozycjami literatury;
- w artykułach od redakcji, 1500 słów wyłączając spis literatury – ok. 10 stron, z podwójnym odstępem, z czcionką 11 punktów, 15 pozycjami literatury, bez streszczenia i słów kluczowych; tabele i ryciny mogą być dołączone, artykuł może zawierać podział na sekcje;
- w recenzjach książek – 750 słów, bez podziału na sekcje, bez słów kluczowych i streszczenia.

Artykuły przekraczające wymaganą długość lub liczbę pozycji literatury będą przedstawiane do indywidualnej decyzji Redaktora Naczelnego.

Oryginalne artykuły naukowe powinny zawierać następujące elementy:

- tytuł (w j. polskim i j. angielskim),
- słowa kluczowe (z Medical Subject Headings [MeSH], katalog Index Medicus; w j. polskim i j. angielskim),
- streszczenie (150-250 słów, w j. polskim i j. angielskim, podzielone na części: Wstęp, Materiał i metody, Wyniki, Wnioski),
- wprowadzenie,
- materiał i metody,
- wyniki,
- dyskusja,
- wnioski,
- ujawnienia i uznania,
- bibliografia.

Studia przypadków powinny zawierać następujące elementy:

- tytuł (w j. polskim i j. angielskim),
- słowa kluczowe (z Medical Subject Headings [MeSH], katalog Index Medicus; w j. polskim i j. angielskim),
- streszczenie (150-200 słów, w j. polskim i w j. angielskim, podzielone na części: Wstęp, Materiał i metody, Wyniki, Wnioski),
- wstęp,
- opis przypadku,
- wnioski,
- bibliografia.

Artykuły przeglądowe powinny zawierać następujące elementy:

- tytuł (w j. polskim i j. angielskim)
- słowa kluczowe (z Medical Subject Headings [MeSH], katalog Index Medicus; w j. polskim i j. angielskim)
- streszczenie (150-250 słów, w j. polskim i j. angielskim)
- wstęp
- cel pracy
- krótki opis stanu wiedzy
- wnioski
- bibliografia

Tabele

Tabele powinny być ponumerowane zgodnie z ich kolejnością w tekście. Tekst powinien zawierać odniesienia do tabel.

Każda tabela powinna być przesłana w osobnym pliku.

Ilustracje

Każda rycina powinna być wysłana w osobnym pliku. Ryciny najlepiej przesłać w formacie TIF lub EPS. Format JPG jest także dozwolony.

Wszystkie ryciny, zarówno fotografie, wykresy, jak i diagramy, powinny być ponumerowane kolejno, zgodnie z pojawieniem się w tekście. Autor/autorzy powinni wskazać w tekście głównym, w którym miejscu należy umieścić daną tabelę czy rycinę.

Cytaty i bibliografia

Pozycje literatury powinny być cytowane w nawiasach kwadratowych w kolejności cytowania.

Bibliografia powinna być ułożona w kolejności cytowania w tekście. Jeżeli liczba autorów przekracza 6, po 6 nazwisku należy dopisać „et al.". Jeżeli praca posiada numer DOI, należy podać go w formie pełnego linku na końcu opisu bibliograficznego, np.:

Adamowicz K. Association between Body Mass Index and gastric cancer in Pomeranian men and women. Health Prob Civil. 2018; 12(4): 231-237. https://doi.org/10.5114/hpc.2018.76517

Cytowanie czasopisma:
Tomao P, Ciceroni L, D'Ovidio MC, De Rosa M, Vonesch N, Iavicoli S, et al. Prevalence and incidence of antibodies to Borrelia burgdorferi and to tick-borne encephalitis virus in agricultural and forestry workers from Tuscany, Italy. Eur J Clin Microbiol Infect Dis. 2005; 24(7): 457–463. https://doi.org/10.1007/s10096-005-1348-0

Czasopismo – suplement:
Kalman M, Inchley J, Sigmundova D, Iannotti RJ, Tynjälä JA, Hamrik Z, et al. Secular trends in moderate-to-vigorous physical activity in 32 countries from 2002 to 2010: a cross-national perspective. The European Journal of Public Health. 2015; 25(Suppl. 2): 37-40.

Tom czasopisma z numerem części:
Abend SM, Kulish N. The psychoanalytic method from an epistemological viewpoint. Int J Psychoanal. 2002; 83(Pt 2): 491-5.

Cytat z czasopisma online:
Zhang M, Holman CD, Price SD, Sanfilippo FM, Preen DB, Bulsara MK. Comorbidity and repeat admission to hospital for adverse drug reactions in older adults: retrospective cohort study. BMJ. 2009 Jan 7; 338: a2752. https://doi.org/10.1136/bmj.a2752

Publikacja elektroniczna przed drukowaną:
Yu WM, Hawley TS, Hawley RG, Qu CK. Immortalization of yolk sac-derived precursor cells. Blood. 2002 Nov 15; 100(10): 3828-31. Epub 2002 Jul 5.

Książka:
Biddle SJ, Mutrie N. Psychology of physical activity: determinants, well-being, and interventions. 2th edition. London: Routledge; 2008.

Rozdział z książki:
Hung Chih Yu A. Exploring motivation for leisure-based physical activity: a case study of college students. In: Burns R, Robinson K., editors. Proceedings of the 2006 Northeastern Recreation Research Symposium. Newtown Square: Department of Agriculture, Forest Service, Northern Research Station; 2006. p. 342-349.

Zapowiedzi/w druku:
Tian D, Araki H, Stahl E, Bergelson J, Kreitman M. Signature of balancing selection in Arabidopsis. Proc Natl Acad Sci U S A. Forthcoming 2002.

Materiały opublikowane online nieposiadające numeru DOI:
Abood S. Quality improvement initiative in nursing homes: the ANA acts in an advisory role. Am J Nurs [Internet]. 2002 Jun [cited 2002 Aug 12]; 102(6): [about 1 p.]. Available from: http://www.nursingworld.org/AJN/2002/june/Wawatch.htmArticle

Materiały opublikowane w języku innym niż angielski:
Wielkoszyński T. [Modified, spectrophotometric method of silicon determination in biological material]. Diagn Lab. 2000; 36(3): 377–385 (in Polish).

Proces recenzji

Zarejestrowane manuskrypty są przesyłane do 2-3 niezależnych ekspertów do oceny naukowej. Przesłane artykuły są akceptowane do publikacji po otrzymaniu pozytywnej opinii niezależnych recenzentów. „Health Problems of Civilization" prowadzi proces recenzji „double-blind", w którym autorzy nie znają tożsamości recenzentów, a recenzenci – tożsamości autorów. Proces oceny zajmuje zazwyczaj 2-4 miesiące.

Obowiązki i odpowiedzialność autorów

Autor jest zobowiązany do przygotowania i przesłania artykułu zgodnie z wymogami ustanowionymi przez redakcję czasopisma. Ponadto, autor powinien dołączyć oświadczenie, które zawiera: oświadczenie o oryginalności artykułu (artykuł niepublikowany dotąd nigdzie indziej), integralność praw autorskich innych osób, brak konfliktu interesów, jak również zgodę na publikację artykułu w czasopiśmie. Autorzy są obowiązani do ujawnienia wszelkich finansowych lub osobowych powiązań, które mogą spowodować stronniczość w odniesieniu do ich pracy.

Obowiązki i odpowiedzialność recenzentów

Artykuły są wybierane do publikacji w drodze systemu podwójnej ślepej selekcji i publikowane w trybie open access. Recenzenci obowiązani są do oceny artykułu poprzez panel redakcyjny, bazując na przygotowanych pytaniach. Recenzent ma również możliwość przesyłania oddzielnych komentarzy umieszczonych w tekście artykułu.

Obowiązki i odpowiedzialność redaktorów

Redaktorzy decydują, które artykuły powinny być zaakceptowane do publikacji. Redaktorzy wypełniają swoje obowiązki w sposób wyważony, obiektywny i sprawiedliwy, unikając dyskryminacji ze względu na płeć, orientację, religijne bądź polityczne poglądy, pochodzenie etniczne lub geograficzne autorów.

Adres do korespondencji

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