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Ladies and Gentlemen, Faculty, Graduates and Students of Universities, Readers and Enthusiasts of *Medical Science Pulse*!

We are delighted to announce this year's third issue of Medical Science Pulse, and simultaneously the first one issued entirely by the University of Opole.

In line with the change of the publisher of the Medical Science Pulse quarterly, in relation to the regulation issued by the Ministry of Science and Higher Education on merging the Opole Medical School with the University of Opole on 15 July 2020 (Journal of Laws of 25 May 2020, item 938), the Editorial Board has been merged into the University's structure from 15 July. Its members quickly found their feet in the new publication process and have worked without interruption at the Faculty of Health Sciences.

We would like to thank you for your ongoing interest, support, cooperation and kind opinions throughout all these years! We are grateful to the members of the Scientific Committee, Section Editors, Reviewers and members of the Editorial Board for their hard work and continuous assistance! Our thanks also go to the Authors for their frequently submitted manuscripts and their desire to publish in our quarterly. Hopefully, we will continue these successes at the University of Opole.

All of our colleagues from other institutes, faculties and universities are invited to cooperate with Medical Science Pulse!

The Medical Science Pulse quarterly (e-ISSN 2544-1620) is a peer-reviewed scientific journal with primary readership being academics operating within the medical and health sciences, but also at practitioners engaged in the completion of medical goals, health policies and promotion. The mission of the quarterly is to form a platform of cooperation as well as exchange of knowledge and experience among medical sciences and related areas. One of the priorities of the Editors is to expand the current of academic communication with valuable works of young scientists, including students and graduates of medical schools.

All published articles are available free-of-charge on the journal's website under the Creative Commons license, which falls in line with the contemporarily promoted Open Access approach to publications including research results. Submissions are handled via the unified website of the Editorial Board. All manuscripts sent to the journal are screened by means of a licenced anti-plagiarism software prior to the review process. Since 2018, the quarterly only accepts texts written in English.

From the very beginning, the Editorial Board has followed the COPE ethical standards for scientific communications and expects all members of the Board to abide by the Code of Conduct for Journal Editors, expressing its disapproval of those that refuse to do so.

Medical Science Pulse has been positively evaluated by experts in a competition announced by the Minister of Science and Higher Education under the „Support for scientific journals" de minimis programme and has thereby been awarded 20 points.

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Archives of Medical Science Pulse issues, guidelines for authors, contact information and other data are available at: https://medicalsciencepulse.com/resources/html/cms/MAINPAGE

We invite you to read the scientific part of the quarterly, including original papers on "Kappa" conformance test between three acute appendicitis scoring systems, elements of eating pattern and intensity of dysmenorrhea, knowledge and attitudes of parents towards responsible antibiotic therapy in respiratory system infections, the role of simulation-based training in neonatal cardiopulmonary resuscitation, sexual behaviour of women in early and middle adulthood, the biopsychosocial status of women during the antepartum period, selected risk factors for ischemic heart disease and the success of treatment in patients with STEMI myocardial infarction treated with percutaneous coronary intervention, comparative analysis of socioeconomic, behavioral and biological factors between healthy patients and patients with newly diagnosed diabetes and variables modulating the sense of safety in nurses and midwives facing epidemiological endangerment of COVID-19. The case studies section includes the paper about subclavian steal syndrome in a patient with dizziness, left upper arm paresthesia, and exercise-related syncope, the reviews sections opens with an American opinion on tele-healthcare and the use of virtual communication technologies in medical research and application, next uromodulin – biomarker of renal function with promising clinical application and the last topic: physical effort in treating depression in the elderly.

In this new academic year 2020/2021, our editors wish the entire academic community all the health and high spirits, successful didactic and scientific endeavours, favourable execution of planned targets. We also wish all students a lot of resilience and joy in gaining the knowledge, qualifications and skills that will allow them to follow their professional dreams.

Let us all contribute to making this difficult time of the pandemic not only about fearing for our health, but also about being caring and kind, perhaps taking a new look at the contemporary academic and research models.

We encourage you to publish your research and deepen your academic interests. Join the authors or the Editorial Board of Medical Science Pulse!

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Medical Science Pulse 2020 (14) 3

Original papers

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"KAPPA" CONFORMANCE TEST BETWEEN THREE ACUTE APPENDICITIS SCORING SYSTEMS (PEDIATRIC APPENDICITIS SCORE/PEDIATRIC APPENDICITIS RISK CALCULATOR/ALVARADO) IN PREDICTING APPENDICITIS IN CHILDREN

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Appendicitis is the most common abdominal emergency in the pediatric population. The clinical features of appendicitis in children are usually atypical, leading to misdiagnosis in 19–57% of preschool age children, which can result in complications. Thus, scoring systems are used to estimate the risk of appendicitis based on symptomatology and laboratory results.

Aim of the study: The aims of this study were to analyze the conformance of the Pediatric Appendicitis Score (PAS), the Pediatric Appendicitis Risk Calculator (pARC), and the Alvarado score as screening tools for appendicitis in children attending a public hospital emergency department.

Material and methods: The inclusion criteria were all children aged < 14 years who presented with symptoms of appendicitis and were confirmed to have appendicitis either by imaging or surgery. The exclusion criteria were incomplete medical records. Data was collected retrospectively from medical records. Data analysis included examination of the proportion and distribution of data, and statistical analysis in the form of the Kappa conformance test.

Results: The result of the conformance test between the PAS and the Alvarado score was 75%, but the Kappa conformance value between them was only 46.8κ although statistically significant (p value = 0.013). The conformance test between the PAS and the pARC was 50%, but the Kappa conformance value was only 19.4κ and not statistically significant (p value = 0.143). The conformance test between the Alvarado score and the pARC was 55%, but the Kappa conformance value was 13.5κ and not statistically significant (p value = 0.492).

Conclusions: The PAS has advantages over other appendicitis screening questionnaires with greatest conformance between PAS and Alvarado.

KEYWORDS: Conformance test, acute appendicitis, PAS, pARC, Alvarado

Background

Acute abdominal pain in children is common and merits further research due to its unique diagnostic challenges (1). Causes of acute abdominal pain in the pediatric population is extensive, including infectious, inflammatory, musculoskeletal, traumatic, gynecological, and other etiologies, with acute appendicitis being an essential differential diagnosis due to the advantages of early surgical intervention (2).

Appendicitis is the most common abdominal emergency in the pediatric population (2–5) and accounts for 10–30% of pediatric abdominal pain presenting to emergency departments (6, 7). Early diagnosis of acute appendicitis is essential to avoid complications such as perforation and abscess formation (8, 9) which can lead to significant morbidity and occasional mortality (10). Yet, overdiagnosis of appendicitis can lead to unnecessary surgery (10).

The incidence of appendicitis in the general population United States is 1 per 1,000, and is higher in South Korea but lower in Africa (11). It is estimated that about 70,000 appendectomies are performed annually in the pediatric population in the United States (2, 4). The incidence of appendicitis is found to be higher in Hispanics, Asians, and Native Americans, and lower in Caucasians and African Americans (11). Appendicitis typically presents between 10–19 years of age, being less common in very young children (11). The incidence of acute appendicitis nowadays is reported as 1.1/10,000 in preschoolers, 6.8/10,000 in children aged 5–9 years, and 19.3/10,000 in children aged 10–14 (12).

The clinical features of appendicitis in children are usually atypical, leading to misdiagnosis in 19–57% of preschool age children, which can result in the development of complications. Appendicitis in the adult population typically presents as periumbilical pain that migrates to the right lower quadrant (RLQ), followed by nausea, vomiting, anorexia, fever, and diarrhea (5, 11). Due to the varied clinical presentations that appear in pediatric appendicitis, scoring systems are often used to estimate the risk of appendicitis based on history, clinical presentation and preliminary laboratory results (3, 6, 11).

The Alvarado score is the oldest scoring tool for acute appendicitis, and is frequently used in the general population (13). The most well-established clinical prediction scores for appendicitis are the pediatric appendicitis score (PAS) and the novel pediatric appendicitis risk calculator (pARC)(3). The Alvarado score and PAS are the most widely used in the pediatric population (14).

The Alvarado score includes nausea/vomiting, anorexia, RLQ tenderness, migration of pain to the RLQ, rebound tenderness, fever, leukocytosis, and polymorphonuclear leukocyte shift (15). PAS variables include migration of pain, anorexia, nausea/vomiting, tenderness in the RLQ, cough/percussion tenderness, fever, leukocytosis, and polymorphonuclear neutrophilia (11). Variables used in the pARC are sex, age, duration of pain, guarding, pain migration, maximal tenderness in the RLQ, and absolute neutrophil count (16). The PAS is the most widely used prediction tool, stratifying patients by risk group (6), whereas the pARC is a novel risk calculator which has not yet been validated thoroughly but appears to have a higher diagnostic accuracy. In a study by Kharbanda et al. (2018), the pARC score could accurately classify more than half of their population studied as at <15% or ≥ 85% risk of appendicitis, whereas only 23% would be identified as having a PAS score of < 3 or > 8 (17).

Aim of the study

Our study aims to analyze the conformance of the PAS, pARC and Alvarado scoring systems as screening tools for acute appendicitis in children in a public hospital emergency department.

Material and methods

Study design

This is a retrospective cross sectional study of cases of appendicitis in children obtained from medical records, and includes use of recorded variables for various scoring systems applicable to assessing risk of appendicitis.

Study setting

Data collection took place at Depati Hamzah Regional Public Hospital from 1st August 2020 to 14th August 2020. This study's accessible population were children with confirmed appendicitis attending Depati Hamzah Regional Public Hospital in the period January 2019 to July 2020.

Study participants

The cases studied were part of an accessible population meeting the inclusion criteria. Twenty cases were used according to the preliminary test sample size, and according to the number of samples required to find the proportion in an infinite population (p = 13/10,000, 5% type 1 error, and clinical judgment (the limit of the study considered significant for the sample size) of 0.015). The inclusion criteria in this study were children aged less than 14 years who presented with symptoms of appendicitis and were confirmed to have appendicitis either by imaging or surgery. The exclusion criteria in this study were incomplete medical records.

Sampling technique

The sampling technique used in this study was total sampling.

Data collection

The data used in this study was extracted from medical records. The research procedure involved making a proposal, submitting to the hospital for ethical review and research permits, and coordinating obtaining medical records, data collection, and data processing. This study consisted of 2 variables, namely the dependent variable; the incidence of acute appendicitis evidenced by surgery and imaging and the independent variable; appendicitis screening. The three scoring systems examined in this study each consist of 8 questions, namely the PAS, the pARC, and the Alvarado score each with their interpretation according to the requirements or preferences of each questionnaire.

Data analysis

Data analysis includes descriptive terms comprising the proportion (%) and distribution of data (mean, standard deviation, median, minimum, and maximum), as well as statistical tests in the form of the Kappa conformance test (Kappa conformance/Kappa's value). Cohen's kappa coefficient (κ) is a statistic that is used to measure inter-rater reliability (and

also Intra-rater reliability) for qualitative (categorical) items. The p-value < 0.050 is considered significant for confidence interval of 95%.

Results

Twenty respondents met the inclusion criteria in this study (Figure 1). The participants were predominantly male (n = 13, 65%) and the average age was 11.7 (+/- 3.2) years. Clinical symptoms and laboratory results of participants are presented in Table 1. Using the PAS, 16 patients (80%) scored > 5, indicating 'appendicitis likely', and 3 patients (15%) scored 5 and 1 patient (5%) scored < 5. Using the pARC, 6 patients (30%) scored 76–90% (moderate–high risk), 8 patients (40%) scored 51–75% (moderate risk), 1 patient (5%) scored 26–50% (moderate risk), 4 patients (20%) scored 16–25% (moderate risk) and 1 patient (5%) scored 6–15% (low risk). Using the Alvarado score, 11 patients (55%) scored 7–8, (appendicitis probable), 6 patients (30%) scored 5–6 (appendicitis possible) and 3 patients (15%) scored 1–4 (appendicitis unlikely) (Table 1).

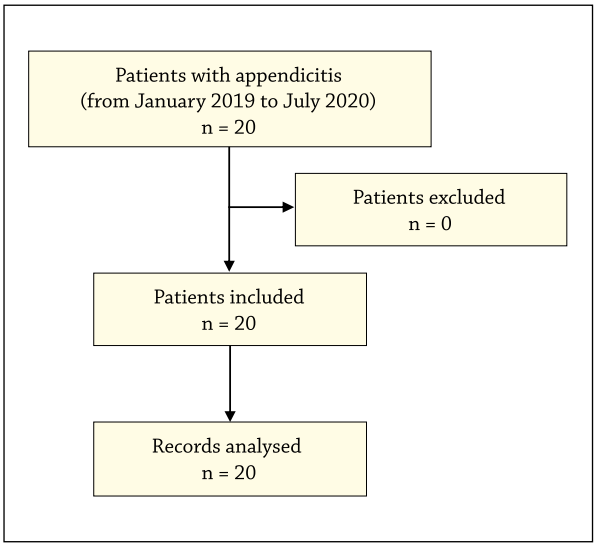

Figure 1. Flow diagram

The data extracted from each medical record was used to provide an estimation of risk of acute appendicitis in the three diagnostic scoring systems. The PAS was found to have the highest true positive rate, with a positive predictive value of 80% when compared to the gold standard of diagnostic imaging and/or surgery. The Alvarado score had a positive predictive value of 55%, and the pARC had a positive predictive value of only 30% (Table 2).

Conformance testing was performed to compare the Alvarado Score and the pARC to the PAS scoring system which had the highest positive predictive value. The result of the conformance test between the PAS and the Alvarado score was 75%, but according to the Kappa conformance statistical test, the Kappa conformance value between the two scores was only 46.8κ and statistically significant (p value = 0.013). The result of

Table 1. Basic Characteristics of 20 Children with Acute Appendicitis in Depati Hamzah Public Hospital, January 2019 to July 2020.

Parameter		N (%)	Mean (SD)	Median (Min–Max)
Gender	– Male – Female	13 (65%) 7 (35%)		
Age			11.7 (3.2)	11.5 (6–18)
Diagnosis	– Appendicitis – Peritonitis	15 (75%) 5 (25%)		
Migration of pain	– Yes – No	6 (30%) 14 (70%)		
Anorexia	– Yes – No	17 (85%) 3 (15%)		
Nausea/vomiting	– Yes – No	13 (65%) 7 (35%)		
RLQ Tenderness	– Yes – No	19 (95%) 1 (5%)		
Cough/Hopping/ Percussion Tenderness in the RLQ	– Yes – No	12 (60%) 8 (40%)		
Elevated Temperature (>38°C)	– Yes – No	12 (60%) 8 (40%)		
Leukocytes > 10,000 cells/μL	– Yes – No	11 (55%) 9 (45%)		
Polymorphonuclear neutrophilia > 75%	– Yes – No	16 (80%) 4 (20%)		
Rebound Tenderness	– Yes – No	11 (55%) 9 (45%)		
Duration of Pain	– < 24 hours – 24–48 hours – 48–96 hours – > 96 hours	5 (25%) 5 (25%) 5 (25%) 5 (25%)		
Pain When Walking	– Yes – No	1 (5%) 19 (95%)		
Abdominal Guarding	– Yes – No	13 (65%) 7 (35%)		
Rovsing's Sign	– Yes – No	8 (40%) 12 (60%)		
PAS Interpretation	– > 5 appendicitis likely – 5 appendicitis possible – < 5 appendicitis unlikely	16 (80%) 3 (15%) 1 (5%)		
pARC Interpretation	– 76–90% (Moderate–High) – 51–75% (Moderate) – 26–50% (Moderate) – 16–25% (Moderate) – 6–15% (Low)	6 (30%) 8 (40%) 1 (5%) 4 (20%) 1 (5%)		
Alvarado Interpretation	– 7–8 appendicitis probable – 5–6 appendicitis possible – 1–4 appendicitis unlikely	11 (55%) 6 (30%) 3 (15%)		

Table 2. Value of Conformity/True Positive of 3 Diagnostic Scoring Systems for Acute Appendicitis in Children.

Scoring System	Interpretation	Score compared with gold standard	
		Number	Value of conformity (%)
PAS	> 5 appendicitis likely	16	80%
	5 appendicitis possible	3	15%
	< 5 appendicitis unlikely	1	5%
pARC	76–90% (moderate–high)	6	30%
	51–75% (moderate)	8	40%
	26–50% (moderate)	1	5%
	16–25% (low–moderate)	4	20%
	6–15% (low)	1	5%
Alvarado	7–8 appendicitis probable	11	55%
	5–6 appendicitis possible	6	30%
	1–4 appendicitis unlikely	3	15%

the conformance test between the PAS and the pARC was 50%. However, according to the Kappa conformance statistical test, the Kappa conformance value between the two scores was only 19.4κ and again not statistically significant (p value = 0.143). The result of the conformance test between the Alvarado score and the pARC was 55% and again according to the Kappa conformance statistical test, the Kappa conformance value between the two scores was only 13.5κ and not statistically significant (p value = 0.492). We categorized appendicitis likely in PAS, moderate-high risk in pARC and appendicitis probable in Alvarado score as positive (Table 3).

Table 3. The Kappa Conformity Test between 3 Types of Diagnostic Scoring Systems for Acute Appendicitis in Children.

Parameter		PAS		Kappa value	p value
		Positive	Negative		
Alvarado	Positive	11 (55%)	0	46.8%	0.013
	Negative	5 (25%)	4 (20%)		
pARC	Positive	6 (30%)	0	19.4%	0.143
	Negative	10 (50%)	4 (20%)		
Parameter		**Alvarado**		**Kappa value**	**p value**
		Positive	**Negative**		
pARC	Positive	4 (20%)	2 (10%)	13.5%	0.492
	Negative	7 (35%)	7 (35%)		

Discussion

Key results

The result of the conformance test between the PAS and the Alvarado score was 75%, but the Kappa conformance value between them was only 46.8κ and statistically significant (p value = 0.013). The conformance test between the PAS and the pARC was 50%, but the conformance value was 19.4κ and not statistically significant (p value = 0.143). The conformance test between the Alvarado Score and the pARC was 55%, but the Kappa value was 13.5κ and also not statistically significant (p value = 0.492).

Interpretation

This study found that acute appendicitis occurred in more male (65%) than female (35%) children. This findings is in agreement with a study by Badebarin et al. (2020) in Iran which found that the incidence of appendicitis in male vs. female children is 1.32:1 (18). There is no anatomical difference in the appendix between males and females, and reasoning behind this difference is yet unknown (19).

The most significant clinical variable used in prediction scoring for acute appendicitis in our study was RLQ tenderness (95%), followed by anorexia (85%). These findings are similar to a study by Badebarin et al. (2020) that showed that 90% of cases with appendicitis presented with RLQ tenderness, and 81.5% experienced anorexia (18). The percentage of nausea/vomiting (65%) and migration of pain (30%) in our sample was also similar to Al-Rudaini et al. (2018), which found that 63.3% and 25.5% respectively experienced these symptoms (20). The finding of cough/hopping/percussion RLQ tenderness in our study was 60%, which is similar to a study by Arias et al. (2018)(6). The presence of fever in 60% and rebound tenderness in 56% in our study is similar to findings by El-Shamy et al. (2017), who reported these findings in 60.5% and 56% of study participants (15). Temperature elevation in early appendicitis is rarely > 1°C, and temperatures of 38.2°C or higher usually appear after localized tenderness is apparent (21).

Samples displaying a polymorphonuclear neutrophilia were found in 80% of cases in our study, with leukocytosis in 55%, which contradicts other studies such as a study by Dhruv et al. (2016) which found neutrophilia in 44% of cases and leukocytosis in 76% (22). Elevated white blood cell count > 11,000 cells/μL with polymorphonuclear cell predominance is common in children and young adults (21) therefore leukocyte count alone cannot be used as a marker of appendicitis (23). In late presentations, a leukocytosis of over 20,000 cells/μL , with predominantly neutrophils suggests perforation of the appendix or another diagnosis such as an abscess (21, 24). Most cases of acute appendicitis do show a raised leukocyte count (26); however acute appendicitis with a normal leukocyte count has been documented (25, 27). The duration of acute appendicitis correlates with the diagnostic accuracy of several diagnostic markers (28). Kharbanda et al. (2011) showed that leukocyte count was more powerful in predicting appendicitis in children with pain for < 24 hours, while c-reactive protein (CRP) was more useful in those with pain for 24–48 hours (28, 29).

Scoring systems allow clinicians to approach a patient rationally by using common signs, symptoms,

and laboratory results to stratify risk of appendiceal pathology, thereby reducing the rate of imaging studies, unnecessary hospital admissions, and negative appendectomies (14, 22). However, the accuracy of the different scoring systems in identifying children at low or high risk for appendicitis also depends on the primary clinicians and their use remains unclear as most of the scoring systems do not consider variation in duration from symptom onset. The signs and symptoms of patients with acute appendicitis may vary and all symptoms might not be present at the time of admission. Thus, it is important to note the duration of signs and symptoms, and this should be considered when utilizing clinical scoring systems in the diagnostic workup for appendicitis (30).

Our study found that PAS has a positive predictive value of 80% when compared with the gold standard diagnostics, which is in agreement with research by El-Shamy et al. (2017), who found a conformity value of 84% (15). The Alvarado score had a positive predictive value of 55%, similar to the study by Chung et al. (2019) who reported a positive predictive value of 65.7% (9). The pARC showed a positive predictive value of only 30%. This contradicts findings in a study by Gudjonsdottir et al. (2020) that found that 88% of cases with appendicitis and complicated appendicitis scored as high risk on pARC scoring (3).

The conformance between the Alvarado score and the pARC was 55%, but according to the Kappa conformance statistical test, the Kappa conformance value between the two scoring systems was only 13.5κ and not statistically significant (p value = 0.492). These results are similar to those by Gudjonsdottir et al. (2020) which found that the sensitivity of the Alvarado scoring system was 84.1%, compared with 39.8% for the pARC (3).

The conformance between the PAS and the Alvarado score was 75%. However, according to the Kappa conformance statistical test, the Kappa conformance value between the two scoring systems was only 46.8κ and statistically significant (p value = 0.013). These results are similar to findings of a study by Pogorelić et al. (2015) who found that there was no significant difference between Alvarado score (sensitivity, 89%; specificity, 59%; positive predictive value, 93.1%) and PAS (sensitivity, 86%; specificity, 50%; positive predictive value, 90.1%)(31).

Limitation

This research has never been done before, hence there is no comparable data. Our data are limited by small sample size despite we have taken the entire sample from our hospital.

Conclusion

In conclusion, considering the three scoring systems analyzed for use in the diagnosis of appendicitis in children, we have found that the PAS has an advantage over the others with 46.8κ conformance with the Alvarado scoring system and 19.4κ conformance with the pARC scoring system. From the analysis conducted here, the author recommends the use of the PAS and Alvarado scoring systems in screening for appendicitis in children due to the evidence based medicine behind the questionnaires and ease of use.

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ELEMENTS OF EATING PATTERN AND INTENSITY OF DYSMENORRHEA – A CROSS-SECTIONAL STUDY IN A SAMPLE OF POLISH WOMEN

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ABSTRACT

Background: The importance of dietary pattern for pain relief in women with dysmenorrhea is increasingly discussed in the literature. It is believed that a proper eating pattern may have pain-relieving properties. The development of a perfect diet composition for patients with dysmenorrhea constitutes a major challenge.

Aim of the study: The present study aimed to characterize the eating pattern of Polish women with severe and moderate dysmenorrhea.

Material and methods: The observational cohort study was conducted among 718 women, divided into two subgroups: Group 1 (G1) comprised women suffering from severe pain (N = 355), while Group 2 (G2) involved women with moderate pain (N = 363). Two measurement tools were used in the study: The Visual Analogue Scale (VAS) and an original questionnaire for assessing the frequency of consumption of selected food groups.

Results: The average consumption of vegetables, fruits, dairy products and coffee was significantly lower in G1 than in G2. On the other hand, average consumption of meat, fish and fast food products was significantly higher in G1 than G2. The greatest effect size was observed for the consumption of coffee, as well as fruits and vegetables. Women from G2 had a diet like the lacto-ovo-vegetarian diet, whereas those from G1 followed a Western model diet containing fast food products and foods rich in sugar, salt, and saturated fatty acids.

Conclusions: A proper diet should be promoted among women suffering from dysmenorrhea. The use of a proper diet may be particularly important for the treatments offered to this group of patients.

KEYWORDS: menstrual pain, dietary habit, dysmenorrhea, vegetarian diet, woman health

Background

"Dysmenorrhea," or "menstrual pain," constitutes one of the most common complaints reported by women [1]. It is referred to as dysmenorrhea, unspecified in the ICD-10 (N94.6), and there are no uncertain diagnostic criteria [2]. The literature defines the disorder as a severe and oppressive pain in the lower abdomen that may spread to the back and legs [1]. Such pain may occur during menstruation without any pelvic pathology or comorbidities. In this case, the disorder is referred to as primary dysmenorrhea [3]. Some general symptoms may accompany menstrual pain including chills, sweating, headache, nausea, and vomiting. These symptoms may occur before or during menstruation.

Menstrual pain appears for the first time during puberty, shortly after the menarche. Pain persists between 8–72 hours and is most severe during the first or second day of menstruation. Intense recurring pain limits physical activity, deteriorates mental health, as well as affect work productivity and learning processes [1,5,6]. In addition, menstrual pain may also influence public and occupational health [1].

Epidemiological data on dysmenorrhea strata are not coherent [1] and there are numerous factors that try to explain the differences including a subjective assessment of pain intensity [4]; ethnic, sociocultural, or biological factors; as well as different definitions of dysmenorrhea [1]. A multi-variable analysis provided by Grandi et al. [1] stressed that the issue may concern as many as 45 to 93% of women in their reproductive age [7]. According to another study, approximately 40-60% of women may struggle with dysmenorrhea [4].

Common recommendations for relieving severe menstrual pain include nonsteroidal anti-inflammatory drugs (NSAIDs) [8], acupuncture or acupressure, and oral contraception [9]. However, Marjoribanks et al. [10] demonstrated there is insufficient evidence determining which (if any) individual NSAID is safest and most effective for treating dysmenorrhea. Smith et al. also [11] pointed to the fact that there is insufficient evidence demonstrating whether acupuncture or acupressure are effective in treating primary dysmenorrhea. Zahradni et al. [12] reported that combined oral contraceptives are preferential for dysmenorrhea pain relief. At the present time there is no consensus on the most effective and safe treatment of dysmenorrhea [13].

In addition to the above-mentioned therapeutic strategies, scientists are increasingly raising the important and underestimated issue of diet and eating patterns regarding dysmenorrhea [14]. Najafi et al. [15] emphasized that nutrition plays a key role in the prevalence and severity of dysmenorrhea. Additional evidence suggests that diet therapy is effective in reducing pain in female students with primary dysmenorrhea complaints [14]. It is believed that dietary habits might also be of importance [15]. A Western model diet full of processed food rich in simple carbohydrates and saturated fatty acids may lead to increased pain [14,15]. The following factors also appear to influence pain intensity: a high consumption of caffeine [16], salt or high-sodium products, livestock products like meat and offal, and skipping meals [17]. On the other hand, fruits and vegetables and food products rich in fiber may relieve pain [15,18].

Even though the links between dietary factors and menstrual pain are inconclusive, there is a correlation between dietary habits and the prevalence of primary dysmenorrhea. It is also crucial to assess the importance of diet with child-bearing aged women in the follicular phase of the menstrual cycle to determine the role of proper nutrition in menstrual pain relief. Taking the above into consideration, increasing attention is given to the role of diet and eating pattern as a complementary or alternative treatment method for severe menstrual pain [16].

Aim of the study

The present study aimed to characterize the eating pattern of Polish women with severe and moderate dysmenorrhea. Eating pattern analysis focused particularly on food products that may have a direct impact on the intensity of self-perceived menstrual pain. Such food groups included fruits, vegetables, dairy, meat, fish, fast food products/salty products, sweets, and stimulants (coffee and alcohol).

Material and methods

Study design, setting and duration

The cross-sectional study was performed using computer-assisted web interviewing (CAWI). CAWI is an Internet surveying technique in which the interviewee follows a script provided by the website [19]. The study was carried out from January 2020 to March 2020.

Study population

A total of 949 women with dysmenorrhea took part in the study. The inclusion criteria were not met for 231 women. The analysis included data from a total of 718 surveys. The respondents were divided into two subgroups by pain intensity measured by the VAS [20]. Group 1 (G1) comprised women suffering from severe pain (N = 355), while Group 2 (G2) involved women with moderate pain (N = 363). An average pain level measured by the VAS was significantly higher in G1 compared to G2 (M: 8.04 vs. 5.66, t = 21.443, P<0.001, d = 1.60: 95%CI [1,43; 1,77]).

Inclusion criteria

Inclusion criteria included: 1) dysmenorrhea; 2) age between 18 and 55 years; 3) informed consent.

Exclusion criteria

Women with co-morbidities that may worsen menstrual pain including endometriosis, pelvic inflammatory disease, uterine fibroids, endometrial polyps, adenomyosis, fibromas, polycystic ovary syndrome, cysts, thyroid disease, and anatomic or functional abnormalities (congenital or acquired) were excluded from the study.

Sample size

With a sample size of N = 718 and the number of women between 18 and 50 years of age in Poland (as of 31 December 2018: N = 11 million [21]), the prevalence of menstrual pain was in approximately 45% cases [1] and the error margin was 3.7% (95% confidence level and proportion 0.50).

Ethical Considerations

The non-interventional study design was presented to the Bioethics Committee of the Medical University of Warsaw and was accepted without reservations. Every potential study participant was informed of the aim and course of the study, as well as how data was collected and stored. Study participants provided their consent by electronic questionnaire. Study participants

were also informed that all data and results obtained were anonymous. Approval from the Local Inspector for Personal Data Protection was not necessary due to no personal data were collected.

Measures

Two measurement tools were used in the study: The Visual Analogue Scale (VAS) and an original questionnaire to assess the consumption frequency of selected food groups. The VAS consisted of a straight line with the endpoints defining extreme limits such as "no pain at all" and "pain as bad as it could be". This tool was first used in psychology by Freyd in 1923. The Numerical Rating Scales (NRS) version was used for this study. Patients were asked to circle the number between 0 and 10. Zero represented "no pain at all" whereas 10 represented "the worst pain ever possible". Numerical Rating Scales have been successful as pain-assessment tools in several studies [20].

The original questionnaire for assessing the consumption frequency of selected food groups was developed using literature data [15,18]. This questionnaire consisted of 9 questions. Each of the questions concerned a different food product (vegetables, fruits, dairy, meat, fish, fast food products /salty products, sweets) or stimulant (coffee, alcohol). Each question had the same structure. The respondents were asked a question: "How often do you eat...? Choose the answer that best describes your eating patterns during the past year." (For instance, How often do you eat vegetables?, How often do you eat fruits?, etc.). The following answer options were available and scored accordingly: Never or almost never (0 pt); once a month or less (1 pt); several times a month (2 pt); several times a week (3 pt); every day (4 pt); several times a day (5 pt).

The research tool was supplemented by a list of demographic questions which allowed for a more complete description of the study population. Demographic questions included the following data: place of residence (village/city); education (primary/secondary/higher); menstrual regularity (yes/no); use of hormonal contraception (yes/no); family history of dysmenorrhea – mother, sister, grandmother (yes/no); number of meals (four or less meals per day/more than four meals per day); and smoking (yes/no).

Data collection

The research tool was formatted Google tools and made available to members of a closed user groups on social media focused on dysmenorrhea. The part preceding the questions specified the aim of the study and informed that participation in the study was fully anonymous and voluntary. The project manager was responsible for the distribution and protection of data collected using Computer-Assisted Web Interviews (CAWI method) [19]. The questionnaire was addressed to women struggling with painful menstruation and placed on special forums, blogs, and sites devoted to dysmenorrhea. Women participating in the study were not financially rewarded for taking part in the study.

Data sharing statement

The data for this study are available on "Zenodo" at https://doi.org/10.5281/zenodo.3757661.

Statistical analysis

Select descriptive statistics were calculated to characterize the data set. The amount and frequency were determined for the categorical variables. The mean (M) and standard deviation (SD) were determined for continuous variables. The variation for categorical variables in both groups was compared using the Chi-square test of independence.

The k-means clustering algorithm was used in the first stage of the analysis to identify groups of women that differ in intensity of pain and frequency when eating certain food products. Distinguishing groups of similar objects within the two clusters was performed. A non-hierarchical clustering algorithm was implemented based on the values calculated for three indices: VAS scores, consumption frequency of selected food groups (vegetables, fruits, dairy, meat, fish, fast food products/salty products, sweets), and stimulants (coffee and alcohol). Two subgroups of women were distinguished: G1 (women suffering from severe pain) and G2 (women suffering from moderate pain).

The second stage of the analysis compared the mean consumption frequency of food products in both groups (G1 vs. G2) with Student's t-test because the sample size was large ($N \geq 30$), and the sample mean was normally distributed. This is a result of the Central limit theorem. Therefore, the normal variable distribution test was not performed before using the Student's t-test. The effect size was estimated by calculating Cohen's *d* coefficient. Values below 0.30 were considered as a "small" effect size, 0.50 corresponded to a "medium" effect size, and >0.50 was a "large" effect size. All calculations were carried out using the STATISTICA package, version 13.3 (Tibco Software Inc., Palo Alto, CA, United States). The threshold of statistical significance was set at 0.05.

Results

Participant characteristics

The mean age of the study group was 22.8 ± 3.32 (min. 18.0, max. 53.0) with a mean BMI value of 22.2 ± 3.33 (min. 16.4, max. 36.6). Both groups of women did not differ in mean BMI value ($t = 1.113$, $P = 0.266$) and slightly differed in mean age (M: 22.5 vs. 23.0, $t = 2.026$, $P = 0.043$). In addition, women in G1 used oral contraceptives significantly less often compared to women in G2 (13.8 vs. 19.8%, $\chi^2 = 4.660$, $P = 0.031$). See Tab. 1 for a list of selected variables of the study population about groups G1 or G2.

Table 1. Comparative analysis of selected women features of the study.

Variable		Total (N = 718)		G1 "severe pain" (N = 355)		G2 "moderate pain" (N = 363)		χ^2	P-value*
		N	%	N	%	N	%		
Place of residence	village	90	12.5	47	13.2	43	11.8	0.318	0.573
	city	628	87.5	308	86.8	320	88.2		
Education	primary	9	1.3	5	1.4	4	1.1	0.137	0.934
	secondary	352	49.0	174	49.0	178	49.0		
	higher	357	49.7	176	49.6	181	49.9		
Regular menses	no	73	10.2	38	10.7	35	9.6	4.413	0.110
	usually	279	38.9	150	42.3	129	35.5		
	yes	366	51.0	167	47.0	199	54.8		
Oral contraception	no	597	83.1	306	86.2	291	80.2	4.660	0.031
	yes	121	16.9	49	13.8	72	19.8		
Family history	no	294	40.9	136	38.3	158	43.5	2.020	0.155
	yes	424	59.1	219	61.7	205	56.5		
Number of meals	≤4	579	80.6	284	80.0	295	81.3	0.185	0.667
	>4	139	19.4	71	20.0	68	18.7		
Smoking	no	477	66.4	233	65.6	244	67.2	0.202	0.653
	yes	241	33.6	122	34.4	119	32.8		

* Chi-square independence test

Consumption frequency of food groups and stimulants

The consumption frequency of selected food groups, coffee, and alcohol demonstrated that vegetables, dairy products, fruits and coffee (in descending order) are chosen most often. Alcohol and fish (in descending order) are chosen least often. Meat, sweets, and fast food products were consumed with mean frequency. See Tab. 2 for details on consumption frequency of particular food groups.

Differences in the mean consumption frequency for all food groups, except for sweets and alcohol, were sta-

Table 2. Consumption frequency of food groups.

Group of food products	Never or almost never		Once a month or less often		Several times a month		Several times a week		Every day		Several times a day	
	N	%	N	%	N	%	N	%	N	%	N	%
Vegetables	6	0.8	6	0.8	56	7.8	212	29.5	261	36.4	177	24.7
Fruits	3	0.4	17	2.4	96	13.4	303	42.2	204	28.4	95	13.2
Dairy products	26	3.6	17	2.4	54	7.5	265	36.9	266	37.0	90	12.5
Meat	84	11.7	14	1.9	106	14.8	314	43.7	165	23.0	35	4.9
Fish	95	13.2	184	25.6	363	50.6	74	10.3	2	0.3	0	0.0
Fast food	40	5.6	213	29.7	371	51.7	84	11.7	9	1.3	1	0.1
Sweets	20	2.8	95	13.2	259	36.1	262	36.5	64	8.9	18	2.5
Coffee	113	15.7	46	6.4	86	12.0	104	14.5	209	29.1	160	22.3
Alcohol	70	9.7	208	29.0	349	48.6	85	11.8	5	0.7	1	0.1

tistically significant for both groups (Tab. 3). The average consumption of vegetables, fruits, dairy products and coffee was significantly lower in G1 than in G2. On the other hand, average consumption of meat, fish and fast food products was significantly higher in G1 than G2. The greatest effect size was observed for the consumption of coffee, as well as fruits and vegetables. See Fig. 1 for a detailed breakdown of the average consumption of particular food products and stimulants.

Discussion

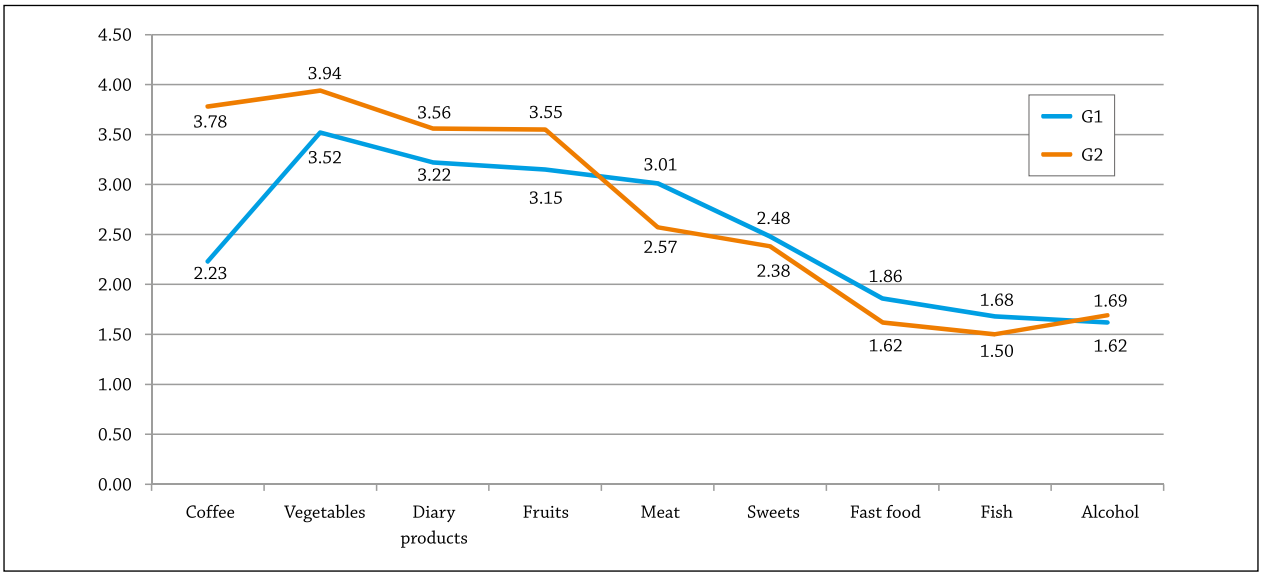
The present study demonstrated a difference in dietary pattern between women with severe (G1) and moderate pain (G2). It is also one of the few studies that emphasizes the importance of nutrition in menstrual pain relief. The issue discussed here is largely unexplored and the number of reliable studies available is limited [15,17,18]. The present findings may also point to a new field of therapies for menstrual pain relief.

The present findings distinguished patterns of consumption frequency of selected food groups such as vegetables, fruits, dairy, meat, fish, fast food products/salty products, sweets, as well as stimulants including coffee and alcohol. Differences in the mean consumption frequency between groups was found with all food groups except for sweets and alcohol. There was no correlation between alcohol consumption and menstrual pain, which has previously been shown in the literature [3,16].

Table 3. Average consumption of selected food groups.

Product group	G 1 "Severe pain" (N = 355)		G 2 "Moderate pain" (N = 363)		t	P-value*	*d* (95%CI)
	M	SD	M	SD			
Vegetables	3.52	1.04	3.94	0.90	5.781	<0.001	0.43 (0.28; 0.58)
Fruits	3.15	0.97	3.55	0.94	5.623	<0.001	0.42 (0.27; 0.57)
Dairy products	3.22	1.07	3.56	1.11	4.135	<0.001	0.31 (0.17; 0.46)
Meat	3.01	1.12	2.57	1.40	4.680	<0.001	0.35 (0.20; 0.50)
Fish	1.68	0.83	1.50	0.87	2.927	0.004	0.21 (0.07; 0.36)
Fast food	1.86	0.81	1.62	0.76	4.176	<0.001	0.31 (0.16; 045)
Sweets	2.48	1.00	2.38	1.01	1.431	0.153	-
Coffee	2.23	1.81	3.78	1.23	13.442	<0.001	1.00 (0.85; 1.16)
Alcohol	1.62	0.87	1.69	0.82	1.092	0.275	-

* Student t test.



G1 – women suffering from severe menstrual pain; G2 – women suffering from moderate menstrual pain.

Figure 1. Average consumption of selected food groups in two clusters.

G2 (women with moderate menstrual pain) demonstrated significantly higher consumption of vegetables, fruits, dairy and coffee compared to G1. The mean consumption of meat, fish and fast food products was significantly lower compared to G1 (women suffering from severe menstrual pain). These findings suggest these particular food groups play a potential key role in menstrual pain relief among these women. Despite some discrepancies among the published studies, an inverse relationship between menstrual pain and eating vegetables, fruits and dairy products was observed in the literature and in this study [3,14,15]. Bajlan et al. [16] summarized several studies confirming the soothing properties of certain food groups including dairy, vegetables, and fruits with respect to painful menstrual cramps. Additionally, studies showed a positive correlation between menstrual pain and eating sweets, and processed food containing saturated fatty acids. The differences in dairy consumption we found are consistent with Abdul-Razzak et al. [22], where introducing three servings of dairy per day significantly decreased the incidence of dysmenorrhea compared to the group excluding dairy. In addition, there was no report of severe pain in women who consumed four servings of dairy per day. Calcium is the main nutrient in diary productions. Kim et al. showed a small correlation between calcium affecting female sex hormones and regulation of the menstrual cycle [23].

Higher coffee consumption revealed in G2 (moderate pain) compared to women from G1 (severe pain) remains controversial and matches the incoherent findings. Some scientific reports emphasize caffeine either amplifies pain or has no such effect [14-16]. Perhaps a further study should include both a quantitative and qualitative (e.g. FOCUS study or individual interviews) analysis of the caffeine source (not only coffee) in women diets suffering from menstrual pain. It might be crucial to study what drives women to drink coffee and other caffeine-containing products. Tracking eating habits related to coffee consumption would also be of interest.

Meat consumption was another differentiating factor between both groups. Our study suggests that high meat consumption (animal protein in particular) may have a negative impact on the menstrual cycle [24,25]. Differences in daily protein consumption were observed in women regardless of age. Women with menstrual cycle disorders consume a higher amount of total fat, saturated fatty acids, and animal protein compared to plant protein. However, the correlation between protein consumption and menstrual pain was not analyzed; only menstrual regularity was observed [26]. Thus, the study should continue. According to Kartal and Akyuz [14], the quality of meat might be crucial. High quality, low fat meat products may have pain-relieving properties.

Fish proved to be a controversial food group as they were consumed significantly more often by women of G1 (severe menstrual pain). These findings are in contrary to the literature showing that a high source of alpha-linolenic acid in fish produce anti-inflammatory and pain-suppressing effects by dampening the production of inflammatory cytokines and eicosanoids [14,15,18]. Perhaps our results are explained by little fish consumption in Poland. Fish consumption is very low among Polish women, and only take in half the recommended amount [27].

Limitations of the study

The present study is not without limitations. One of the main constraints is the method used for data collection (CAWI), which does not allow for a full control of the study participants. Since, we have introduced verifying questions so persons that do not meet the inclusion criteria were automatically excluded from the ongoing study. Additionally, the original questionnaire assessing the consumption frequency of selected food groups lacks in the qualitative domain. Finally, the lack of plan to conduct a causal longitudinal study is another limitation of this study.

Clinical implications

The present findings suggest that it is crucial to perform a thorough nutritional review for women with menstrual pain instead of just an analysis of consumption of particular food products. Hence, our results may be useful in developing a nutritional procedure for women with dysmenorrhea. The data also supports research to further investigate the eating pattern represented by G2 (similar to the lacto-ovo-vegetarian diet) and its impact on protective and dysmenorrhea-related pain-relieving processes. This is contrary to a Western model diet (food rich in sugar, salt, saturated fatty acids, and fast food products), which may involve an increased risk of menstrual pain [16,17]. The possible health benefits by reducing or completely excluding meat and offal from the diet has been shown [28]. However, there is a need to further investigate and optimize dietary patterns for persons suffering from pain.

It needs to be emphasized that the literature has paid little attention to women eating patterns with respect to their gynecological ailments. As an integral part of the daily routine, diet has a profound impact on body functions and may be crucial in pain occurrence without a clear organic cause, such as with severe menstrual pain. Nutrients from food participate in numerous metabolic pathways related to the regulation of excessive uterine contractions and improved blood flow to the reproductive organs. An adequate supply of these nutrients is critical for maintain health and proper function of the reproductive system. It may also help to relieve pain associated with dysmenorrhea. It is very important to continue research on dietary patterns. Cooperation between members of an interdisciplinary therapeutic team (doctors, physical therapists, and dieticians) is essential for providing top patient care for women with severe menstrual pain. Every effort should be made to thoroughly investigate individual eating patterns not

only to relieve pain and accompanying symptoms, but to also prevent pain occurrence.

Conclusions

The nutrient profile is likely to influence the relief of menstrual pain. A diet compliant with the guidelines of the lacto-ovo-vegetarian diet (high consumption of fruits, vegetables, and dairy products) has protective effects and may relieve pain related to dysmenorrhea. Therefore, this eating pattern should be promoted among women suffering from dysmenorrhea and the use of this diet should be considered as an important measure in treating this group of patients.

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KNOWLEDGE AND ATTITUDES OF PARENTS TOWARDS RESPONSIBLE ANTIBIOTIC THERAPY IN RESPIRATORY SYSTEM INFECTIONS

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ABSTRACT

Background: Testing general knowledge on antibiotics, and the rational application of them in practice, is very important in order to understand the need to educate society and the irreversible problem of antibiotic resistance.

Aim of the study: The aim of the study was to analyze the knowledge and practice of parents regarding responsible antibiotic therapy in respiratory infections.

Material and methods: This study was carried out among 317 parents aged 22-61 (M = 34.74; SD = 6.31). The diagnostic survey method was applied, and the research tool was a survey questionnaire. Statistical analysis was performed using the IBM SPSS Statistics 25.0 statistical package. Statistical significance was set at $p < 0.05$.

Results: Viruses were identified as the most frequent cause of respiratory tract infection by respondents (n = 245, 77.3%). According to 91.2% of participants, antibiotics are used against a bacterial infection. Almost all (n = 315, 99.4%) respondents are of the opinion that antibiotics ought to be applied after a medical examination if they are definitely recommended, 97.5% (n = 309) believed that taking antibiotics could not be stopped at any time, whereas 10.4% (n = 33) used antibiotics without contacting a physician. 15.1% (n = 48) of the respondents used the antibiotics left over from previous treatment.

Conclusions: The respondents possess knowledge concerning indications for antibiotic treatment and on their rational use, but unfortunately, not everyone uses this knowledge in practice.

KEYWORDS: antibiotics, antibiotic resistance, knowledge, practice, parents

Background

The discovery of antibiotics, and their implementation in the treatment of human infections, was a very important event in the history of medicine, which made it possible to cure millions of patients. However, over time, the over-prescription of antibiotics has given rise to the problem of antibiotic resistance. Antibiotics are used not only in medicine but also, on a massive scale, in other fields, e.g., in agriculture. The phenomenon of drug-resistance has become a global concern for public health. Both globally and in Poland, much is said and written about responsible antibiotic treatment – the European Centre for Disease Prevention and Control warns that every single year, in the countries of the European Union (EU), there are 33,000 deaths from infections caused by bacteria resistant to multiple antibiotics [1,2]. The Antibiotic Resistance Threat Report (2013) in the United States estimated at least 2 million people each year acquire antibiotic-resistant infections, with about 23,000 dying as a result [3]. It is estimated that 700,000 people all over the world die every year due to antibiotic resistance (ABR), and this number is expected to rise to 10 million by 2050 if no action is taken [1,4]. The challenge constituted by antimicrobial resistance (AMR) requires a coordinated approach on the part of all countries, as well as sectors such as the environment and human and animal health [5]. In 2015, the World Health Organization (WHO) published the Global AMR Action Plan (GAP), describing relevant strategic goals, one of which is to raise the awareness and understanding of AMR [6].

Many countries, including Poland, have taken steps to make society aware of resistance to antimicrobial

medications by means of broad-scope educational campaigns, whilst many magazines raise the issue of responsible antibiotic treatment. It is quite noticeable how easy it is to gain access to antibiotics; frequently, parents demand that a physician prescribe an antibiotic, or even force them to do it, when a child starts to show the symptoms of a respiratory tract infection. In the case of children, the problem is particularly important because they start their lives without fully developed immunity, and the unjustified application of antibiotic treatment results in antibiotic resistance, which may have an impact later in their life. That is why the knowledge of parents and the guardians of children is so important and, if they do not possess such knowledge, it is necessary to provide relevant education. One of the strategic goals in fighting antibiotic resistance is to cause a change in consumer behaviors by means of promoting the responsible use of antibiotics. We hypothesize that the knowledge of parents on antibiotic treatment is insufficient, and that antibiotics are administered to children irresponsibly, and in excess, by adults.

Aim of the study

The aim of this study was to analyze the knowledge and practice of parents regarding responsible antibiotic therapy in respiratory infections.

Material and methods

Study population and data collection

The study group comprised of 317 parents living in Warsaw. The criterion to be included in the study was having children. The study was conducted in November and December 2018.

Questionnaire

The research tool used was an original questionnaire. The survey was sent by electronic means using the Google form; participation in the study was voluntary and anonymous. The survey was divided into two parts: the first included a personal questionnaire, consisting of 4 questions, whilst the second consisted of 16 questions concerning antibiotic treatment. For the statistical analysis of this dissertation, the questions in the second part were divided into two groups: the first one concerned general knowledge, and the second one, practice.

Statistical analyses

The statistical analyses were performed using IBM SPSS Statistics 25.0 suite. As the statistical significance threshold, the conventional level of $p < 0.05$ was adopted. The results of the study were presented in comparison with the qualitative data, with the application of size and percentage of quantitative data: the average, standard deviation, and minimum and maximum values. The relationships between the number of children of the respondents were analyzed using likelihood ratios with a normal distribution.

Results

The study group

The study sample comprised of 317 people aged 22–61 ($M = 34.74$; $SD = 6.31$), 311 of whom were women, 6 of whom were men. The majority of subjects had higher education ($n = 272$, 85.8%), 12.9% ($n = 41$) had secondary education, and 1.3% ($n = 4$) had basic/vocational education. Individuals with two children were the majority ($n = 154$, 48.6%). Those with a single child constituted the second-largest group ($n = 130$, 41%), and the remaining 12.6% ($n = 33$) had 3–5 children. The analyses concerning the correlations between the number of children and the answers to the remaining questions were conducted dividing the respondents into a group of 130 (41.0%) with a single child, and a group of 187 (59%) with at least two children. Considering the possible experience of parents with the use of antibiotics when having children, it was decided to separate these two groups.

General knowledge

As the cause of the infection of the respiratory tracts, the respondents most frequently mentioned viruses ($n = 245$, 77.3%), whereas bacteria were mentioned by only 20.2% ($n = 64$) (of the studied). A significant number of respondents ($n = 289$, 91.2%) said that antibiotics ought to be applied in the treatment of a bacterial infection, whereas 5.7% ($n = 18$) thought them useful against a viral infection.

Most frequently, the respondents answered that antibiotics ought to be applied in the case of infections of the upper respiratory tract, such as tonsillitis ($n = 299$, 94.3%) and bronchitis ($n = 254$, 80.1%), pharyngitis ($n = 114$, 36.0%), influenza was indicated by 13.9% ($n = 44$), and a cold by 0.9% ($n = 3$).

Almost all respondents ($n = 315$, 99.4%) expressed the opinion that antibiotics ought to be applied after a medical examination when the need to use them is evident; 309 (97.5%) expressed the opinion that antibiotic treatment may not be discontinued without consulting a physician.

The majority of respondents expressed the opinion that antibiotics can cause adverse reactions, or may have an adverse impact on health; 1.3% ($n = 4$) of the group were not aware of that. 96.8% ($n = 307$) of respondents mentioned microbial antibiotic resistance as the result of the excessive prescribing of these medications.

Practice in the application of antibiotics

The majority ($n = 258$, 81.4%) of respondents did not discontinue receiving antibiotics without first consulting a physician. Only 3.2% ($n = 10$) had never received

antibiotics. The remaining group of 15.4% (*n* = 49) had done so once or more. Most frequently, the respondents purchased antibiotics prescribed by a general practitioner (*n* = 270, 85.2%); 11.4% (*n* = 36) received such prescriptions from a physician at a private surgery. The majority of respondents (*n* = 253, 79.8%) had never taken antibiotics remaining after a previous treatment, whilst 15.1% (*n* = 48) had done so sometimes. Those who had a single child more frequently chose the answer "not applicable", whereas those with at least two children more frequently chosen the answer "sometimes" ($p < 0.05$).

The majority of respondents (*n* = 306, 96.5%) did not suggest to the physician that antibiotics ought to be prescribed when exhibiting symptoms of a common cold. The majority (*n* = 278, 88%) did not use antibiotics without first consulting a physician, whereas 10.4% (*n* = 33) admitted that they had used this kind of medication without consulting a physician. The majority (*n* = 299, 94.3%) always followed medical recommendations concerning the regimen of antibiotic treatment, and 3.2% (*n* = 10) did so only sometimes.

Regular probiotic application was undertaken by 75.4% (*n* = 239) of respondents during the course of antibiotic treatment, and followed the information in leaflets, whereas 10.4% (*n* = 33) did it irregularly, and 4.1% (*n* = 13) did not do it at all.

The sources and self-assessment of possessed knowledge

The following sources of knowledge on antibiotics were mentioned by the respondents: firstly, a general practitioner and the internet, and the smallest group mentioned a nurse (Fig. 1).

Respondents scored their personal knowledge on antibiotics from 1 to 10 points (*M* = 6.36; *SD* = 2.14) (Fig. 2).

Discussion

The discovery of antibiotics was a very important event in the history of medicine, making it possible to treat infections, thus saving countless lives. In this study, it was observed that 91.2% of parents are aware of the fact that antibiotics are antibacterial medications, but 5.7% are convinced that they are effective against viruses. The respondents are aware that antibiotics are not used against common colds, however, 13.9% think that they are used against flu. In comparison with the results of the study conducted by J. Senderowska *et al.*, who surveyed public health students on rational antibiotic treatment in primary medical care (PMC), in this study, there were many more people who answered the question correctly. The above study was conducted in 2013, and demonstrated that only 15% of the students answered correctly [7]. Much different results than those already presented were those of Eurobarometer 445 (2016), with respondents from 28 countries in Europe, including Poland; 57% of Europeans did not know that antibiotics are ineffective against viruses [8]. In the studies conducted under Eurobarometer 478 in 2018, only 46% of Poles answered the ques-

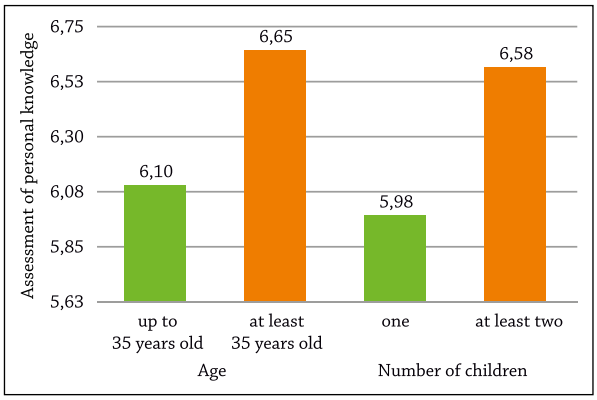

Figure 1. Sources of knowledge on antibiotics mentioned by respondents

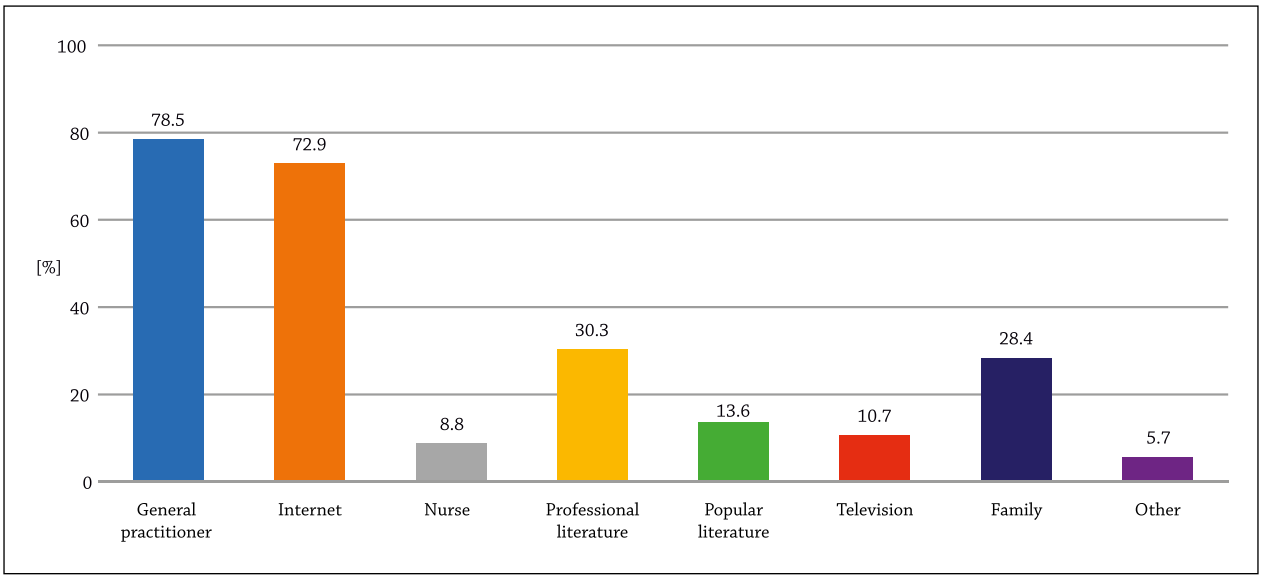

Figure 2. Average values of results on the scale of the assessment of personal knowledge in correlation with age and number of children of respondents.

tion on antimicrobial medication resistance correctly: namely, that antibiotics do not kill viruses [9]. Eurobarometer 478 and 445 [8,9] suggest lesser knowledge among respondents than in this study. In studies conducted in 2019, better results were received by the customers of Norwegian pharmacists: only 1/3 of them claimed that antibiotics could be effective against viral infections [10]. Italians were also aware that antibiotics cannot cure a viral infection, cold, or flu; however, only 1/5 said when they ought to be applied [11]. Unfortunately, reports from other countries such as the United Arab Emirates [12,13], Pakistan [14], Hong Kong [15], Saudi Arabia [16,17], Malaysia [18], and Turkey [19] are not satisfying; as many as half of the respondents mentioned the use of antibiotics as recommendable against a cold, flu, sore throat, and cough, i.e. viral infections. The results of other studies are also alarming, as it is revealed that even those who plan on working in the health service sector in the future do not possess complete knowledge concerning the use of antibiotics. Half of selected medicine students in Nigeria [5] erroneously defined when antibiotics ought to be utilized, claiming that it is possible to use them against a cold, flu, and sore throat. A tenth of Polish dentistry students would apply antibiotics in the treatment of flu [20], and 70.3% of selected nursing students in Saudi Arabia find it justified to use antibiotics against cold, sore throat, flu, and fever [21]. Almost half (43.44%) of Chinese medicine students were convinced it was recommendable to prescribe antibiotic treatment against viral infections [22]. Nearly half (41.34%) of selected pharmacists from Riyadh, Saudi Arabia find it justified to apply antibiotics mainly against fever and infections of the upper respiratory tracts [23]. Quite different results were those of students from Nepal, where almost all respondents agreed that antibiotics could be used only in bacterial infections (98.2%) [24]. Looking at such data, one may conclude that many, even future workers in medical services, do not know the difference between bacterial and viral infections.

Virtually everyone participating in this study agreed that antibiotics ought to be prescribed after a medical examination when it is certain they are needed, and that therapy may not be discontinued without first consulting a physician. This knowledge was reflected in practice, and the majority of respondents purchased prescribed medications after a visit to the physician, and when it was clearly recommended, with 81.4% indicating that they would never have discontinued a therapy. However, is it really so? Such an attitude would be a positive step toward preventing antibiotic resistance, of which 96.8% of respondents were aware. In the study conducted by J. Senderowska *et al.*, the majority of participants (98%) knew that it is not allowed to discontinue treatment without consulting a physician when symptoms are no longer observed, and that it is a physician who decides when therapy can be discontinued [7], whereas in Eurobarometer 478, 17% of the surveyed Poles believed it was possible to discontinue a treatment when a patient felt better. The correct answer was given by the majority of respondents (79%) [9], as in this study. According to the respondents in Eurobarometer 445, a whole dose of an antibiotic ought to be taken in accordance with medical recommendations (82%), and this answer is similar to that from Eurobarometer 478 [8].

The respondents in this study claimed that they follow medical recommendations concerning the regimen of antibiotic treatment (94.3%), i.e. that they take antibiotics at the appropriate time, and take them for as long as indicated. However, it should be noted that answers to other questions prove that a larger number of individuals fail to follow these recommendations. The study demonstrated that some of the respondents discontinue antibiotic treatment before the time recommended by a physician (8.5% – once, 6.3% – twice or several times), and many more (34%) finished antibiotic treatment before the recommended time at least once, as was shown by B. Zając *et al.* [25]. An even greater number of individuals discontinuing antibiotic treatment was observed by K. Król-Turmińska *et al.* (46% did so at least once in their lifetime) [26]. It has been shown that discontinuing antibiotic treatment after a patient starts to feel better is a common practice in other countries as well [5,14,16–18,27,28]. Better results were seen in medical students, 78.9% of whom stated that they took antibiotics for the recommended period of time [24].

The most frequent source of antibiotics is a general practitioner, which is demonstrated by this study's results; this finding is confirmed in the studies conducted by K. Król-Turmińska *et al*. In that study, the largest number of respondents received prescriptions from a general practitioner [26]. Unfortunately, in other studies, respondents admitted that they attempted to use antibiotics without consulting a physician, even in the case of their own children, which may be a common practice [5,11–14,16,21,23,29]. Regardless of the fact that parents are aware of the detrimental consequences of the improper use of antibiotics, the risk of antibiotic resistance, and the risk of adverse effects, their approach to the non-consulted application of antibiotics in the case of children is intolerable.

In this study, 15.1% of respondents admitted that they sometimes used the antibiotics remaining after a previous treatment, which means that they also did not complete this treatment, and applied antibiotics without consulting a physician. In such a situation, in the study group of parents, we can notice self-treatment, and, according to statistical data, it was more frequently observed among parents with more than one child. In the study conducted by K. Król-Turmińska *et al.* on the application of antibiotics prescribed during a previous treatment, there was a question on self-treatment, and a large group of respondents (43.1%) admitted to attempting self-treatment with the application of antibiotics from a home medicine chest (55.3%) [26]; this suggests as well that these antibiotics were stored after a previous treatment. When asked a straight-

forward question about self-treatment in this study, approximately only 10% of respondents admitted to using antibiotics before consulting a physician. In the study conducted by J. Strumiło *et al*., in Białystok, 7.6% of participants admitted to attempting antibiotic self-treatment and to storing them [6]. The majority of respondents in this study (96.5%) did not admit to suggesting to a physician that an antibiotic ought to be prescribed against the infection of the upper respiratory tracts. The study conducted by A. Senderowska et al. confirms the result of this study, where a substantial majority of those surveyed (92%) did not force a physician to prescribe antibiotics when it was not recommended [7], whereas in comparison to the results of J. Stumiło, a large group of participants exerted pressure on a general practitioner. The most frequent factor of this pressure in this study (21.15%) was a diagnosis formulated by the surveyed, e.g. "It must be bronchitis." Another factor in this study was emphasizing the severe course of the disease and the presence of a medical problem (18.68%) [6]. According to a report by the National Institute of Public Health – National Institute of Hygiene (NIPH-NIH) in 2017, 88% of Polish society is of the opinion that a physician prescribes antibiotics when it is unnecessary, and 9% go as far as to ask that they not be prescribed [30]. In turn, PMC physicians themselves think that antibiotics are applied excessively, and that they are prescribed even when it is not necessary, but a large group of them feel pressured by patients to prescribe such medications [4,31].

In studies performed by J. Kraśnicka *et al*. among 200 PMC patients, the source of information in the case of the application of antibiotics was a physician (90.5%), followed by a pharmacist (11.5%) [32]. In this study, the majority of respondents mentioned a general practitioner and the Internet. Unfortunately, a nurse is hardly ever mentioned as a source of knowledge in both studies. According to our data, a nurse was mentioned by 8.8%; in the studies from Białystok, only 2.5% mentioned a nurse [6]. In Eurobarometer 478, nurses were mentioned by more respondents (13% of Poles and 14% of Europeans), whereas a physician was mentioned by a similar number of people in Europe (86%) and in Poland (81%). In turn, the second most frequent source of credible information on antibiotics was that of a pharmacist, similar to the study of PMC patients [8,9].

The problem of gaps in knowledge on the causes of the flu and acute bronchitis among the respondents in this study, and also in the aforementioned Polish and foreign literature, is noteworthy. Becoming aware of the appropriate treatment of these diseases would significantly limit the excessive use of antibiotic treatment.

After the analysis of this study and studies by other authors mentioned, it is possible to emphasize the continuous need to educate society on antibiotics and their use, including also, and perhaps above all, the medical sector.

Limitations of the study

The study comprised a relatively small group of parents, mostly women – mothers. Therefore, it was not possible to analyze knowledge and attitudes broken down by gender. As a next step, the study should be extended to include male – fathers. The research did not take into account the financial status and the level of education, which could theoretically affect the state of knowledge and attitudes of the respondents.

Conclusions

1. Respondents possess knowledge concerning recommendations to apply antibiotic treatment and the rational use of antibiotics, but, unfortunately, not all of them apply this knowledge in practice.
2. Regardless of the fact that parents know they should have a medical recommendation to use antibiotics, some of them apply such medications without it, and use antibiotics remaining after a previous treatment.
3. As the main source of information on antibiotic treatment, respondents mentioned a general practitioner and the Internet. As can be concluded from the study, knowledge acquired from these sources is insufficient.
4. In practice, parents with two or more children reached for the antibiotics remaining after a previous treatment significantly more frequently.
5. The continuous education of society in the scope of antibiotics and their applications, including, and perhaps above all, the medical service sector, is required.

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THE ROLE OF SIMULATION-BASED TRAINING IN NEONATAL CARDIOPULMONARY RESUSCITATION COMPLICATED BY MECONIUM ASPIRATION SYNDROME

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: The use of simulation-based training is strategic in training medical staff.

Aim of the study: The aim of the study was to assess the knowledge and skills of performing neonatal CPR (cardiopulmonary resuscitation) complicated by the presence of meconium in the respiratory tract in two groups of midwives (trained in the traditional tutorial-based model vs simulation-based training) with an interactive neonatal manikin.

Material and methods: The knowledge and practical skills assessment was conducted in two groups of midwives. The knowledge of the participants was assessed using both a written test consisting of 25 control questions (5 questions on meconium aspiration syndrome, 20 on neonatal CPR) and practical skills including 12 activities (1-initial, 9-proper, 2-final). The complex "success" indicator was determined based on the effects of patient resuscitation (15 minutes of the scenario), and the reference point for knowledge and skills was to obtain a minimum of 70% correct answers/activities performed, evaluated by three independent experts.

Results: In the knowledge test, the respondents scored 17.93 ± 3.11 points out of 25 (71.7%). Practical skills for all respondents were 17.57 ± 2.49 points out of 21 (83.66%), with a tendency to obtain higher points in cleaning of the airways and stimulation of the newborn, and lower for ventilation and the use of an alternative method of intubation. Despite the similar level of practical skills in both groups, only a higher statistical tendency was observed in three out of nine instrumented "proper activities" in the simulation trained midwives.

Conclusions: The scenario used by us assessing the knowledge and skills of midwives taught in traditional tutorial-based and simulation-based training, indicates the advantage of acquiring individual competences in a short time using simulation-based training. This increasingly popular scientific model allows the acquisition of "invasive" competencies, but it requires further research.

KEYWORDS: newborns, simulation, meconium aspiration syndrome, cardiopulmonary resuscitation, midwives, education

Background

The use of simulation-based training in developing, improving and maintaining comprehensive clinical competences in healthcare professionals is strategic in the training of medical staff. The simulation-based method is based on training and improving management of rare or incidental clinical events, which are crucial in preventing morbidity and mortality of the patient. In clinical practice they become difficult to assess, due to their occasional incidence [1,2]. Undertaking simulation-based training in this case is aimed at analyzing the performance of the healthcare professional during the patient clinical event (scenario). It aids in the detection of areas of scarcity or excess in practical activities, and direct debriefing initiates improvement in efficiency, translating into better clinical conduct [3,4].

In this case, the relatively rare and unpredictable situation of CPR complicated by the presence of meconium in the amniotic fluid occurs in about 10-20% of viable neonates, and less than 5% will develop meconium aspiration syndrome (MAS) [5,6]. This study aims to assess whether midwife's conduct toward a newborn during a delivery with meconium-stained amniotic fluid and/or meconium in the airways may influence the baby's health condition in future [1]. In addition, use of medical simulation to analyse a particular case becomes a standard tool used by professionals to learn independently, but also an active tool in the pre- and postgraduate training of nurses and midwives [7–9]. Its main goal is to prepare staff to acquire knowledge and skills, which will ultimately lead to higher quality patient care [4,10–12].

Aim of the study

The aim of our study was to improve the quality of cardiopulmonary resuscitation in newborns with meconium aspiration syndrome based on the improvement of acquired knowledge and skills through medical modeling.

Material and methods

Study design

The study was conducted in two groups of licensed midwives (group I: midwives trained in traditional tutorial-based model, n = 37; group II: midwives trained in medical simulation model, n = 32) in the Center for Medical and Natural Sciences Research and Innovation, University of Rzeszów; all participants provided written consent. The study was carried out on the SimNewB simulator by Laerdal using a neonatal CPR scenario with meconium in the respiratory tract. The study was approved by the Bioethics Committee of the University of Rzeszów.

Data sources/measurement

Knowledge was assessed by means of a test consisting of 25 control questions (5 questions in MAS, 20 questions in newborn CPR): symptoms, risk factors and management of MAS, vital parameters determining the resumption of CPR and anatomical conditions of the neonatal circulatory and respiratory system, guidelines for resuscitation regarding care and therapeutic measures to protect the newborn from the adverse effects of the actions undertaken (thermoregulation, gas perfusion, pharmacological management). Participants scored 1 point for each correct answer, giving a total maximum score of 25 points.

Skills of the participants were assessed with the neonatal CPR scenario complicated by the presence of meconium in the amniotic fluid and the airways, focusing on the knowledge and skills required to take action during the occurrence of this event.

For the purpose of the study, a database of scenarios was created covering numerous variants of newborn CPR, depending on the actions undertaken by the participants during the scenario. The assessments have been designed by ourselves to involve teams of three working together. Therefore, three months prior to the study, an introduction to the specifics of medical simulation was organized for the participants. They were familiarized with the environment and equipment, and weekly two-hour training sessions in three-person teams were organized. All participants were introduced in simulation debriefing based on similar scenarios. Each scenario was developed with specialist knowledge in the areas of: preparatory, proper, and final activities. The scenario prepared for the purpose of the study consisted of three parts:

1. Preparatory actions: diagnosis of the clinical situation; checking the equipment; gathering the team for resuscitation; preparation of equipment for intubation and aspiration of meconium from respiratory tracts; applying aseptic rules.
2. Proper actions: clamping the umbilical cord, cleaning the airways; maintaining thermoregulation; stimulation of breaths; assessment of vital signs; ventilation; alternative intubation; heart massage; pharmacotherapy.
3. Final actions: monitoring of the newborn's condition.

For each properly performed specific action, the participants could score 2 points, 1 point for each preparatory and final action, up to a maximum total score of 21 points.

Statistical methods

Statistical analysis was carried out using Statistica 10.0 software by StatSoft, while the database and charts were created in Microsoft Excel. Parametric and nonparametric tests were used for the analysis of variables: the Shapiro-Wilk W test for compliance of distributions of the tested variables with normal distribution; Student's t-test to assess differences in the mean level of a numerical feature in two populations for independent variables or, alternatively, the Mann-Whitney U test. The assessment of qualitative data

was based on the Pearson chi-square test, and the correlation of numerical variables that did not meet the normality criterion based on the Spearman rank correlation coefficient. The statistical significance was assumed at p <0.05.

Results

In the test of knowledge, the respondents scored on average 17.93 ± 3.11 points out of 25 (71.7%). The least was 8 points, the most 24 points. From group I, the subjects scored an average 17.7 ± 3.04 points out of 25 (70.8%), while in group II the average score was 18.19 ± 3.11 points out of 25 (72.8%), differentiating the respondents groups among themselves (Table 1).

Table 1. Assessment of the participants' knowledge (minimum 70% of positive answers)

The results of the test on knowledge				
Descriptive statistics	**Total**	**Group I**	**Group II**	***p***
n mean±SD	69 (17.93±3.11)	37 (17.70±3.04)	32 (18.19±3.22)	0.018*
min. – max.	8.00-24.00	8.00-22.00	10.00-24.00	
Total: n (%)	69 (100)	37 (100)	32 (100)	

n – number of observations; S – -standard deviation; p – level of probability for the Mann-Whitney U test.

For assessment of participants' skills during newborn CPR with MAS, each correct proper action was awarded 2 points, with preparatory and final actions scoring 1 point each. Activities with the highest score (2 points) included efficient upper airway cleaning and stimulation of the newborn, with the lowest being ventilation and alternative airway intubation. The different scoring between the two groups was not found to be statistically significant (p > 0.05) (Table 2).

The number of points from the practical task obtained by the participants was transformed into a grade with a total of 21 points possible to obtain. Participants of the experiment acquiring knowledge in traditional tutorial-based training (Group I) obtained an average of 17.81 ± 1.63 points, with the group learning using the simulation-based method (Group II) scoring 17.28 ± 3.22 points, ranking the participants of the experiment at a good level (Group I: 35.1%, Group II: 43.8%). Pooling all participants of the experiment, the average score was 17.57 ± 2.49 points, with a range of 10-21 points (Group I: 15-20 points, Group II: 10-21 points). Despite similar levels of practical skills in both groups, there was a trend in favor of medical simulation-based training in three instrumented actions (Group I>Group II: umbilical cord clamping Group I 1.41±0.86 vs. Group II 1.66±0.65, thermoregulation Group I 1.54±0.56 vs. Group II 1.56±0.56, alternative intubation Group I 1.35±0.79 vs. Group II 1.47±0.76). This preliminary study did not reveal the existence of a clear relationship between the traditional tutorial-based training and the medical simulation-based training of the participants in our experiment (Group I vs. Group II). The general assessment of skills also did not differentiate between the groups (p > 0.05) (Table 3).

Table 2. Checklist of skills of participants: newborn CPR complicated by the presence of meconium in the respiratory tract

Checklist of skills		**Descriptive statistics ($\bar{x}$ ± SD)**			
		Total	**Group I**	**Group II**	***p***
Preparatory actions	preparation of equipment for intubation and aspiration of meconium from respiratory tracts, gathering the team for CPR	0.99±0.12	1.00±0.00	0.97±0.18	0.295
	applying aseptic rules	1.00±0.00	1.00±0.00	1.00±0.00	1.000
Proper actions	clamping the umbilical cord	1.52±0.87	1.41±0.86	1.66±0.65	0.259
	cleaning the airways	1.91±0.28	1.95±0.23	1.88±0.34	0.306
	thermoregulation	1.55±0.56	1.54±0.56	1.56±0.56	0.851
	Stimulation	1.78±0.57	1.86±0.42	1.69±0.69	0.311
	assessment of vital signs	1.71±0.52	1.81±0.46	1.59±0.56	0.054
	Ventilation	1.45±0.58	1.54±0.56	1.34±0.60	0.167
	intubation = laryngeal mask	1.41±0.77	1.35±0.79	1.47±0.76	0.506
	heart massage	1.71±0.46	1.73±0.45	1.69±0.47	0.708
	Pharmacotherapy	1.58±0.72	1.65±0.68	1.50±0.76	0.369
Final actions	monitoring of the newborn's general condition	0.96±0.21	0.97±0.16	0.94±0.25	0.485

$\bar{x}$ – arithmetic mean; SD – standard deviation; p – level of probability for the Mann-Whitney U test

Table 3. Skill checklist transformed into assessment: the neonate CPR complicated by the presence of meconium in the respiratory tract (minimum 70% of positive responses).

Assessement of skills	Total n=69	Group I n=37	Group II n=32	*p*
A, n (%)	1 (1.5)	0 (0)	1 (3.1)	0.574
B, n (%)	13 (18.8)	7 (18.9)	6 (18.8)	0.996
C, n (%)	27 (39.1)	13 (35.1)	14 (43.8)	0.644
D, n (%)	11 (15.9)	9 (24.3)	2 (6.3)	0.572
E, n (%)	11 (15.9)	8 (21.6)	3 (9.4)	0.641
F, n (%)	6 (8.7)	0 (0)	6 (18.8)	0.201

n – number of observations; %-percent; *p* – level of probability; * statistically significant result at the level of $p < 0.05$.

Assessment of skills: A – very good (5.0); B – good plus (4.5); C – good (4.0); D – sufficient plus (3.5); E – sufficient (3.0); F – insufficient (2.0).

Discussion

Key results

Meconium-stained amniotic fluid (MSAF) is a complication in approximately 10-20% of viable neonate deliveries, of whom 5% will develop meconium aspiration syndrome, and half of them will require replacement ventilation [5]. The scenario created by us shows a great need for practical training of such clinical situations, because for decades, the presence of meconium in the amniotic fluid and occurring airway obstruction was considered a serious consequence of MAS, resulting in suction of the newborn's airway [13]. The scenario also indicates the strengths and weaknesses of preparation of the participants to react in the event of identifying possible symptoms of MSAF (dyspnea, pulmonary hypertension) in the newborn [1]. It compares the undertaken activities, strategies for prevention, diagnosis, treatment and monitoring of the patient's condition, on the basis of the benefit/harm balance in midwives trained in the traditional tutorial-based model and simulation-based model [10,13].

In the case constructed by us, the opening and clearing of the oral cavity was of fundamental importance for the course of the scenario. Any delay in starting activities and making decisions could lead to loss of health or even the life of a newborn, an example of which is the analysis of the actions of the participants in our experiment. The highest assessment was for activities of airway clearing and newborn stimulation, the lowest was for using the laryngeal mask and ventilation with bag valve mask.

In our case, difficulties in carrying out a replacement respiration with the bag valve mask may result from differences in the initial length of inspiration (5-20 seconds), maximum inspiratory pressure (20-30cm H_2O) and the interface devices used (endotracheal tube, face mask, nasopharyngeal cannulas) that provide optimal volume and the necessary strength to expand the lungs of the newborn, with minimal risk of iatrogenic complications [14]. Visual determination of the volume and strength necessary to start replacement ventilation, in addition to the participants' knowledge of the CPR algorithm, requires consideration of the emotional and physical state of the resuscitator [15]; then, this type of training will contribute to the high performance of participants [1,16]. Our scenario included endotracheal intubation of the newborn, since we required specialist skills [17] on the use of the laryngeal mask from the participants. It was associated with the success and rapidity of the use of resuscitation equipment, guaranteeing the achievement of effective positive pressure ventilation (PPV) and better tightness hemodynamically. In addition, it could be effectively implemented in clinical practice after a short training of all participants, being an alternative to endotracheal intubation among people who do not have sufficient skills to perform this procedure, or due to the smaller number of such interventions [17]. Our actions in the description of the scenario and associated endotracheal intubation of the newborn were preceded by studies of other authors indicating the legitimacy of the use of neonatal ventilation with the laryngeal mask [18–21].

Interpretation

Classes conducted by simulation are one of the more promising methods of education of medical staff [16,22], as manikins for simulation activities offer high fidelity anatomical features and clinical functionality, including realistic airways and breathing patterns, tactile impulses, and realistic response to actions [4,23]. Despite causing stress in the trainees, they promote the acquisition of proficiency in performing medical procedures and making decisions, constituting an indicator of effective action [4,7,8,24]. Worldwide, medical simulation has become an instrumental, experimental science, using well-established principles of andragogy in adult learning. In Poland, it has only recently become a part of nurse training programs, setting trends in practical education [2,23].

As this study shows, in this population of midwives, simulation-based training appears to confer greater effectiveness in instrumented tasks, compared to traditional tutorial-based training. The results of our research present the superiority of pragmatism of simulation training over the traditional clinical education model, due to the safety of the environment, repeatability, standardization of content, and ease of simulation of critical events [10]. Attention needs to be drawn to continuous evaluation of simulation-based training - to implement, refine and adapt the scenarios to realistic conditions, so that they accurately resemble the real picture of the medical event, [4,10,23,25], increase the participants' ability to respond to strategic moments of practice [11,12], giving them a sense of greater competence and self-confidence [24,26].

Although our clinical case is not specifically practiced, alternative ventilation and cardiac massage may

be used in clinical practice in other patients [27]. Scenarios based on real cases emphasize the value of simulation exercises and automatic memorizing of the „nuances" of rare cases perpetuated during debriefing. They are based on improving practical skills, gaining knowledge, and working in a team [1,2,12,28,29], to increase the learning and memory of each participant in the simulation session [8,9,30].

Limitations of the study

Our study involved three-person teams of midwives, instead of an interdisciplinary team, as would be the case in a real clinical situation; in this particular case, our assessment model can teach making strategic decisions until the doctor arrives. This program combines reality with active involvement of all team members [4,11], and creates a sense of security without the mental burden and embarrassment of other team members with the possibility of repeating the task, reflection and evaluation of its performance [30]. However, in order for such an educational program to bring tangible benefits, it must be focused on maintaining acquired competences through the 5 step strategy "Learn-See-Exercise-Proof-Perform-Improve", enhanced by participation in training and courses of medical simulation, due to the progress of effectiveness observed three months after the end of the training [2,3,27,31,32]. Undoubtedly, the prepared and maintained vocational education program for midwives will be conducive to effective cooperation in the team, building trust, and acquiring competence in the care of the newborn [12,33,34].

Conclusions

Medical simulation on high fidelity manikins is an opportunity to improve acquired knowledge and skills in midwives trained in the traditional tutorial-based model of education, and those trained with the newer method of medical simulation. This increasingly popular science model allows acquisition of "instrumental" competences over a short period of time, and in conditions not threatening to the health of the baby. Despite the benefit/risk balance indicated by us on the example of participants of our experiment, it will require further analysis to develop proven methods of effectiveness, evaluation, and demonstration of improvement in clinical results.

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SEXUAL BEHAVIOUR OF WOMEN IN EARLY AND MIDDLE ADULTHOOD

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ABSTRACT

Background: Sexual activity is extremely important and is also of strategic importance for a woman's health.

Aim of the study: The assessment of women's sexual preferences in early and middle adulthood.

Material and methods: The study sample consisted of 100 women in early adulthood (aged 20–30 years) who were students of the University of Rzeszow in the field of Midwifery. A second group of 200 middle-aged women (aged 45–55 years) who were working and undergoing treatment at Clinical Provincial Hospital No. 2 of St. Jadwiga Queen in Rzeszow, students of the University of the Third Age in Rzeszow, as well as women from the Postgraduate Education Centre of Nurses and Midwives in Rzeszow. The research was carried out in 2016 by means of a diagnostic survey using our own questionnaire.

Results: As compared to the middle adulthood group, the women in the early adulthood group more frequently used items that diversify sex life, i.e. lubricants, massage oils, condoms, erotic lingerie, and handcuffs ($p < 0.001$). In addition, women in the early adulthood group felt more sexually attractive than the middle adulthood group ($p < 0.001$) and also preferred sexual modes of behaviour (e.g., clitoral stimulation, breasts stimulation, vaginal stimulation and oral stimulation) more frequently than middle adult women.

Conclusions: Women in middle adulthood feel less sexually attractive than women in early adulthood. Women in middle adulthood could introduce factors that improve the quality of sexual intercourse during perimenopausal age, such as: lubricants, massage oils, stimulating condoms, and erotic lingerie.

KEYWORDS: sex life, breasts stimulation, erotic gadgets

Background

According to Harwas-Napierała, early adulthood is a period from around 20 years of age up to about 40 years of age. This period is distinguished by developing sexual activity, and during this period, partners are ready not only to get erotic satisfaction, but also to mutually adapt and learn from each other [1,2]. Early adulthood is a period of diversity in forms of sexual activity including a change in partners and contact with more than one partner [3]. During this time, the highest frequency of sexual intercourse is observed. The ability to achieve orgasm is a skill that can be acquired. The maximum intensity of sexuality and thus sexual activity and a higher level of sexual satisfaction is observed in women at about 30 years of age, after which this gradually decreases. It is worth mentioning, however, that the frequency of sexual intercourse significantly decreases with the duration of the relationship [2]. Machaj's research indicates that the power of sexual need in women aged 25–40 is greater than in men, and that the sexual needs of women are accompanied by an increase in expectations regarding marriage [1]. The women who are most satisfied with their sex life are respondents in the 25–29 and 30–39 age groups [4]. Early adulthood is a period associated with the regulation of sex life, forming lasting relationships that are of a formal nature, obtaining the role of a husband, wife, parent, as well as the period of giving birth and raising children [1].

According to Grabowska, middle adulthood is from around 35–40 years of age up to 55–60 years old, and for most women, middle adulthood represents a breakthrough period. Middle adulthood is also a period of time of many serious changes and development tasks – such as: adaptation to the aging of one's own parents

and fulfilling the duties of the role of a wife and mother. Middle adulthood is also a period of care for the relationship and proper treatment of a partner, as well as supporting adult children [2]. Changes in appearance, a decrease in the sense of attractiveness (e.g., wrinkles, loss of skin firmness, greying hair) and an associated negative image of one's own body, can determine self-esteem and subsequently affect sexual modes of behaviour [5,6]. The largest and most intense sexual need for a woman falls around the ages of 40–50. At this time, libido reaches the highest level, and subsequently declines after 50 years of age [7]. Sexual activity is extremely important for women during middle adulthood and is also of strategic importance for a women's health [8]. In particular, sexual activity (but not age) is important for psychological well-being, life history, and motivation. According to Depko, 70% of 50-year-old women still have sex [9]. Similarly, studies in northern European countries show that most women over the age of 50 are still sexually active [10]. There is an increase of sexual need among some women during the menopause period, which can be associated with a sense of freedom in terms of reproductive consequences (i.e., fear of unwanted pregnancy is reduced). The increased interest in sex during middle adulthood is also due to the lack of restrictions connected with children. This "empty nest" situation is conducive to renewing relationships and getting to know each other again by partners [2]. Sexual activity among women during the menopause period can arise from the fact that they have had regular sexual contact throughout their lives, which results in prolonged activity during middle adulthood [7].

Self-esteem in terms of sexual attractiveness can influence sexual activity and the satisfaction derived from it. Sexual attractiveness is defined as a set of features that can arouse interest in a potential partner [2]. Scientific research is consistent with the notion that self-image changes during phases of the monthly cycle, which corresponds with changes in the concentration of hormones. Self-image also changes after the onset of menopause [11].

Aim of the study

The assessment of women's sexual preferences during early and middle adulthood.

Material and methods

Study design

The present study was carried out from March 11 to December 2, 2016. The study protocol was approved by the Bioethics Committee of the University of Rzeszow no. 11/12/2015 from December 2, 2015.

Participants

A survey was carried out among a group of 100 women, aged 20–30, who were students at the University of Rzeszow. Women in the early adulthood group consisted of students who were in both the first- and the second-cycle studies the field of Midwifery. The middle adulthood group comprised of 200 women, aged 45–55. The middle adulthood group consisted of women who were working at the Clinical Provincial Hospital No. 2 of St. Jadwiga Queen in Rzeszow (Gynaecology and Obstetrics Clinic), patients from General Surgery Clinic and Internal Medicine, Nephrology and Endocrinology Clinic with the Nuclear Medicine Laboratory of the same hospital, students of the University of the Third Age in Rzeszow at the University of Rzeszow, or women in the Postgraduate Training Centre of Nurses and Midwives in Rzeszow.

Inclusion/exclusion criteria

The study included women who met the following inclusion criteria: ages 20–30 years or 45–55 years, female persons, sexually active women, and ability to sign informed consent form. Exclusion criteria consisted of: lack of consent to participate in the study, above 30 or 55 years of age, below 20 or 45 years of age, providing inconsistent data (e.g., the age of sexual initiation is higher than the current age), the presence of diseases that may have a negative influence on the results of the assessed parameters (e.g., partial or full removal of the uterus, ovaries, or breasts, perineal plastic surgery, disorders that affect reproductive organs).

Data sources and measurement

The study was carried out using a survey, which was a self-constructed questionnaire that was created to obtain basic information concerning women's sex lives during early and middle adulthood. All respondents were informed about the study's subject area, the aim of the study, the possibility of discontinuing from the study, and participants were also assured of complete anonymity.

Thereafter, the manner of answering in respective questionnaires was discussed and the manner of protecting anonymity. In particular, survey questionnaires were returned to the researchers in a sealed white envelope, and envelopes were to be left in a designated place.

Each set of questionnaires was marked with a number, which was also included in the database. Initially, the data was encoded in the Excel spreadsheet in the form of numerical values in accordance with the accepted key.

Statistical analysis

For the purposes of the study, the following statistical tests were applied for questions concerning nominal scales: V Cramer (2x3, 4x5 tables, etc.) and Phi (2x2 tables). Survey responses are symmetrical measures that are based on the chi-square test, which assesses the strength of the relationship between variables in cross tables. All measures of compound strength are normal-

ized to achieve values in the 0–1 range. Thus, associations in the 0–0.29 range indicate a weak dependence; associations in the 0.30–0.49 range indicate a moderate dependence; values from 0.5–1 indicate a strong dependence [12]. For numerical variables, descriptive statistics were calculated, including the median and first and third quartiles. Mann-Whitney U test was used to test for differences in the average level of a numerical characteristic between two groups. The level of statistical significance was set at $p < 0.05$. Statistical analyses were performed in the Statistica 13.1 package.

Results

Characteristics of the study group

The median age of the women in the early adulthood and middle adulthood groups were 23 and 50 years, respectively. Fifty-four percent of survey respondents (i.e., 162 women) reported living in the countryside, 20.3% (i.e., 61 women) reported living in a city with population of up to 100,000 residents, and 25.7% (i.e., 77 women) reported living in a city with population of over 100,000 residents. Ninety-five percent (i.e., 95 women) in the early adulthood group and 93.5% (i.e., 187 women) in the middle adulthood group perceived themselves as religious Catholics. In the early adulthood group, the majority (70%) were unmarried women (i.e., 70 women), whereas the majority (94%) of women in the middle adulthood group were married women (i.e., 188 women). Women in the middle adulthood group reported a much longer duration of a partnered relationship (an average of 25 years) as compared to women in the early adulthood group (average of 4 years). Among the respondents, the largest proportion of women (95%) have been married once (i.e., 190 women) in the middle adulthood group, whereas 31% of women in the early adulthood group have been married once (i.e., 31 women).

Outcome data

Ninety-seven percent (i.e., 97 women) from the early adult group and 68% (i.e., 136 women) from the middle adulthood group considered themselves to be sexually attractive. This difference was statistically significant ($p < 0.001$) and it was of moderate strength. In particular, women in the early adulthood felt sexually attractive than women in the middle adulthood group (Tab. 1).

The women in the early adulthood group preferred the following sexual modes of behaviour more often than women in the middle adulthood group: clitoral stimulation, breasts stimulation, vaginal stimulation and oral stimulation (Tab. 2). These group differences reached statistical significance.

Among women in the early adulthood group, there was no significant difference in sexual modes of behaviour between married and unmarried women (Tab. 3).

In contrast, among women in the middle adulthood group, there was a significant difference in sexual modes of behaviour between married and unmarried women. In particular, unmarried women reported engaging in clitoral stimulation ($p = 0.031$) and oral stimulation

Table 1. The assessment of women's sexual attractiveness in the early and middle adulthood group

Seeing yourself as a sexually attractive person	Early adulthood group		Middle adulthood group		Total	
	n	%	n	%	n	%
No	3	3%	64	32%	67	22%
Yes	97	97%	136	68%	233	77%
Total	100	100.0%	200	100.0%	300	100.0%
Significance (p)	$\chi^2(1) = 32{,}32$ $p < 0.001$ Phi = 0.33					

n – number of observations; % – percent; χ^2 – Pearson chi-square test result; p – level of significance of differences.

Source: present study.

Table 2. Preferred modes of sexual behaviour among women in the early and middle adulthood group

Preferred modes of sexual behaviour among women	Early adulthood group		Middle adulthood group		Total		Significance (p)
	n	%	n	%	n	%	
Clitoral stimulation	83	83%	125	62.5%	208	69.3%	$\chi^2(1) = 13.17$ $p < 0.001$ Phi = 0.20
Breast stimulation	77	77%	130	65%	207	69%	$\chi^2(1) = 4.48$ $p = 0.034$ Phi = 0.12
Vaginal stimulation	63	63%	80	40%	143	47.7%	$\chi^2(1) = 14.13$ $p < 0.001$ Phi = 0.21
Oral stimulation	40	40%	25	12.5%	65	21.7%	$\chi^2(1) = 29.70$ $p < 0.001$ Phi = 0.31
Anal stimulation	5	5%	2	1%	7	2.3%	$\chi^2(1) = 4.68$ $p = 0.03$ Phi = 0.12
Masturbation	12	12%	4	2%	16	5.3%	$\chi^2(1) = 13.20$ $p < 0.001$ Phi = 0.21
Other	1	1%	6	3%	7	2.3%	$\chi^2(1) = 1.17$ $p = 0.279$

n – number of observations; % – percent; χ^2 – Pearson chi-square test result; p – level of significance of differences.

Source: present study.

(p = 0.024) more often than their married counterparts. Nonetheless, these correlations were relatively weak (Tab. 4).

Among women in the early adulthood group, there was a statistically significant relationship between the duration of a relationship and preference of sexual mode of behaviour as a vaginal stimulation (p = 0.029). In particular, respondents who reported a longer relationship duration were more likely to prefer this mode of behaviour (Tab. 5).

Among women in the middle adulthood group, duration of the relationship was significantly associated with

Table 3. Correlation between married life and sexual modes of behaviour among women in the early adulthood group

Modes of sexual behaviour	Unmarried		Married		Total		Significance (p)
	n	%	n	%	n	%	
Clitoral stimulation	57	80.3%	26	89.7%	83	83%	$\chi^2(1) = 1.28$ p = 0.257
Breast stimulation	53	74.7%	24	82.8%	77	77%	$\chi^2(1) = 0.76$ p = 0.381
Vaginal stimulation	42	59.2%	21	72.4%	63	63%	$\chi^2(1) = 1.55$ p = 0.212
Oral stimulation	30	42.3%	10	34.5%	40	40%	$\chi^2(1) = 0.51$ p = 0.471
Anal stimulation	3	4.2%	2	6.9%	5	5%	$\chi^2(1) = 0.30$ p = 0.578
Masturbation	9	12.7%	3	10.3%	12	12.0%	$\chi^2(1) = 0.10$ p = 0.744

n – number of observations; % – percent; χ^2 – Pearson chi-square test result; p – level of significance of differences.

Source: present study

Table 4. Correlation between married life and sexual modes of behaviour among women in the middle adulthood group

Modes of sexual behaviour	Unmarried		Married		Total		Significance (p)
	n	%	n	%	n	%	
Clitoral stimulation	11	91.7%	114	60.6%	75	37.5%	$\chi^2(1) = 4.63$ p = 0.031 Phi = -0.15
Breast stimulation	8	66.7%	122	64.9%	130	65%	$\chi^2(1) = 0.01$ p = 0.9
Vaginal stimulation	3	25%	77	41.0%	80	40%	$\chi^2(1) = 1.19$ p = 0.273
Oral stimulation	4	33.3%	21	11.2%	25	12.5%	$\chi^2(1) = 5.06$ p = 0.024 Phi = -0.16
Anal stimulation	0	0%	2	1.1%	2	1%	$\chi^2(1) = 0.12$ p = 0.719
Masturbation	1	8.3%	3	1.6%	4	2%	$\chi^2(1) = 2.61$ p = 0.106

n – number of observations; % – percent; χ^2 – Pearson chi-square test result; p – level of significance of differences.

Source: present study.

Table 5. Correlation between time and modes of sexual behaviour among women from the early adulthood group

Modes of sexual behaviour and the use of gadgets diversifying sex life	Yes			No			Z	p
	Me	Q1	Q3	Me	Q1	Q3		
Clitoral stimulation	4.00	2.00	6.00	4.00	2.00	5.00	0.01	0.988
Breast stimulation	4.00	2.00	6.00	2.00	1.00	5.00	1.42	0.154
Vaginal stimulation	4.00	2.00	6.00	3.00	1.00	5.00	-2.17	0.029
Oral stimulation	4.25	1.15	6.00	3.75	2.00	5.00	0.25	0.801
Anal stimulation	1.00	1.00	6.00	4.00	2.00	6.00	0.82	0.407
Masturbation	5.00	2.75	7.50	3.50	2.00	5.00	1.46	0.143
Vibrators	5.00	3.00	6.00	3.75	2.00	5.00	-1.30	0.193
Lubricants	5.00	2.00	6.00	3.00	2.00	5.00	1.54	0.122
Erotic literature	3.50	1.50	6.50	4.00	2.00	6.00	-0.01	0.985
Erotic films	5.00	3.50	5.50	3.25	2.00	6.00	-1.07	0.280
Massage oils	4.50	2.00	6.00	3.00	2.00	5.00	1.31	0.186
Condoms	4.75	2.00	6.00	3.00	1.65	5.00	-1.77	0.075
Erotic lingerie	3.75	2.00	6.00	4.00	2.00	5.00	-0.23	0.810
Handcuffs	4.00	1.00	5.00	4.00	2.00	6.00	0.73	0.462

Me – median; Q1 – lower quartile; Q3 – upper quartile; Z – Mann-Whitney U-test result; p – level of significance of differences.

Source: present study.

the use of condoms (p = 0.003) as well as erotic lingerie (p = 0.024). In particular, both condoms and erotic lingerie were more frequently used by survey respondents in shorter duration relationships (Tab. 6).

Among women in the early adulthood group, self-assessment of sexual attractiveness was not significantly associated with sexual modes of behaviour (Tab. 7).

Among women in the middle adulthood group, self-assessment of sexual attractiveness was associated with a preference of clitoral stimulation as a sexual mode of behaviour (p = 0.011). In particular, women who preferred clitoral stimulation reported feeling more sexually attractive than women who did not prefer this mode of behaviour (Tab. 8).

Table 6. Correlation between time and modes of sexual behaviour among women from the middle adulthood group

Modes of sexual behaviour and the use of gadgets diversifying sex life	Yes			No			Z	p
	Me	Q1	Q3	Me	Q1	Q3		
Clitoral stimulation	25.00	21.00	30.00	26.00	20.00	30.00	-0.78	0.432
Breast stimulation	25.00	20.00	30.00	26.00	22.00	30.00	-0.79	0.430
Vaginal stimulation	25.00	20.00	29.00	26.00	20.50	30.00	0.69	0.489
Oral stimulation	24.00	19.00	30.00	26.00	21.00	30.00	-1.06	0.287
Anal stimulation	23.00	15.00	31.00	25.00	20.00	30.00	0.09	0.926
Masturbation	25.00	18.50	27.50	25.00	20.00	30.00	-0.40	0.687
Vibrators	25.00	15.00	30.00	25.00	21.00	30.00	0.71	0.474
Lubricants	30.00	15.00	30.00	25.00	20.00	30.00	0.66	0.505
Erotic literature	30.00	27.00	30.00	25.00	20.00	30.00	-1.38	0.166
Erotic films	25.00	20.00	27.00	25.50	20.00	30.00	1.00	0.316
Massage oils	24.00	18.00	30.00	25.00	22.00	30.00	-1.40	0.159
Condoms	23.00	19.00	25.00	26.50	22.00	30.00	2.94	0.003
Erotic lingerie	23.00	19.00	29.00	26.00	22.00	30.00	2.24	0.024
Handcuffs	28.00	28.00	28.00	25.00	20.00	30.00	0.00	1.00

Me – median; Q1 – lower quartile; Q3 – upper quartile; Z – Mann-Whitney U-test result; p – level of significance of differences.
Source: present study.

Table 7. The assessment of sexual attractiveness and modes of sexual behaviour among women from the early adulthood group

Modes of sexual behaviour	I feel sexually attractive			I do not feel sexually attractive			Z	p
	Me	Q1	Q3	Me	Q1	Q3		
Clitoral stimulation	1.00	1.00	1.00	1.00	1.00	1.00	-0.67	0.497
Breast stimulation	1.00	1.00	1.00	1.00	1.00	1.00	1.22	0.902
Vaginal stimulation	1.00	1.00	1.00	1.00	1.00	1.00	-0.31	0.753
Oral stimulation	1.00	1.00	1.00	1.00	0.00	1.00	0.41	0.675
Anal stimulation	1.00	1.00	1.00	1.00	0.00	1.00	-0.11	0.911
Masturbation	1.00	1.00	1.00	1.00	0.00	1.00	0.18	0.852

Me – median; Q1 – lower quartile; Q3 – upper quartile; Z – Mann-Whitney U-test result; p – level of significance of differences.
Source: present study.

Table 8. The assessment of sexual attractiveness and modes of sexual behaviour among women in the middle adulthood group

Modes of sexual behaviour	I feel sexually attractive			I do not feel sexually attractive			Z	p
	Me	Q1	Q3	Me	Q1	Q3		
Clitoral stimulation	1.00	1.00	1.00	1.00	0.00	1.00	-2.52	0.011
Breast stimulation	1.00	0.00	1.00	1.00	0.00	1.00	1.43	0.151
Vaginal stimulation	1.00	0.00	1.00	1.00	0.00	1.00	1.59	0.110
Oral stimulation	1.00	1.00	1.00	1.00	0.00	1.00	0.73	0.461
Anal stimulation	0.50	0.00	1.00	1.00	0.00	1.00	0.43	0.662
Masturbation	1.00	0.50	1.00	1.00	0.00	1.00	0.23	0.810

Me – median; Q1 – lower quartile; Q3 – upper quartile; Z – Mann-Whitney U-test result; p – level of significance of differences.
Source: present study.

As compared to women in the middle adulthood group, women in the early adulthood group reported more frequent use of tools that can diversify sex life, such as lubricants, massage oils, condoms, erotic lingerie, and handcuffs. In contrast, women in the middle adulthood group reported more frequent use of tools in the category of "other" as compared to younger women ($p < 0.001$). This answer was likely most often understood as lack of use of any objects (Tab. 9).

Sixty-one percent of women in the early adulthood group (i.e., 61 women) and 23% of women in the middle adulthood group (i.e., 46 women) reported using contraception. This group difference reached statistical significance ($p < 0.001$) and was of moderate strength (Tab. 10).

Forty-eight percent of women in the early adulthood group reported using condoms (i.e., 48 women), 10% reported using hormonal contraception (i.e., 10 women), and 3% reported using natural methods (i.e., 3 women).

In contrast, 15% of women in the middle adulthood group reported using condoms (i.e., 31 women), 4% reported using hormonal contraception (i.e., 8 women), 2% used the withdrawal method (i.e., coitus interruptus, 4 women), 1.5% reported using intrauterine devices (i.e., 3 women), and 0.5% reported using natural methods (i.e., 1 woman).

Among religious women in the early adulthood group, 37–39% of women reported most frequently not using any contraceptive method. Among religious women in the early adulthood group, those who did report using contraception reported using condoms most frequently (49%, i.e., 46 women), followed by hormonal contraception (9%, i.e., 9 women), and natural methods (3%, i.e., 3 women). Among non-religious women in the middle adulthood group, 25% reported using condoms (i.e., 2 women) and 75% (i.e., 7 women) did not use any contraceptive method. Among religious women in the middle adulthood group, 78% (i.e., 144 women) did not use any contraceptive method. Among religious women in the middle adulthood group who did report using contraception, the most common methods were condoms (15%, i.e., 30 women), followed by hormonal contraception (4%, i.e., 7 women), intrauterine device (1.5%, i.e., 3 women), the withdrawal method (i.e., coitus interruptus, 1%, i.e., women), and natural methods (0.5%, i.e., 1 woman).

Discussion

Results from the present study demonstrate that most women in the early adulthood group assess themselves as sexually attractive, and this frequency was lower among women in the middle adulthood group. Prior research suggests that a negative perception of the body can contribute to avoidance of sexual encounters. In contrast, a positive perception of the body can lead to an increase in sexual activity. Similar conclu-

Table 9. The use of items that can diversify sex life by women and their partners in the early and middle adulthood groups

The use of items that diversify sex life	Early adulthood group		Middle adulthood group		Total		Significance (p)
	n	%	n	%	n	%	
Vibrators	10	10.0%	11	5.5%	21	7.0%	$\chi^2(1) = 2.07$ $p = 0.149$
Lubricants	26	26.0%	17	8.5%	43	14.3%	$\chi^2(1) = 16.62$ $p < 0.001$ Phi = 0.24
Erotic literature	4	4.0%	6	3.0%	10	3.3%	$\chi^2(1) = 0.20$ $p = 0.649$
Erotic films	12	12.0%	14	7.0%	26	8.7%	$\chi^2(1) = 2.10$ $p = 0.146$
Massage oils	39	39.0%	27	13.5%	66	22.0%	$\chi^2(1) = 25.26$ $p < 0.001$ Phi = 0.29
Condoms	52	52.0%	38	19.0%	90	30.0%	$\chi^2(1) = 34.57$ $p < 0.001$ Phi = 0.34
Erotic lingerie	50	50.0%	38	19.0%	88	29.3%	$\chi^2(1) = 30.9$ $p < 0.001$ Phi = 0.32
Handcuffs	7	7.0%	1	1.0%	8	2.7%	$\chi^2(1) = 10.85$ $p < 0.001$ Phi = 0.19
Other	15	15.0%	98	49.0%	113	37.7%	$\chi^2(1) = 32.82$ $p < 0.001$ Phi = -0.33

n – number of observations; % – percent; χ^2 – Pearson chi-square test result; p – level of significance of differences.

Source: present study.

Table 10. The use of contraception at present

The use of contraception at present	Early adulthood group		Middle adulthood group		Total	
	n	%	n	%	n	%
No	39	39.0%	154	77.0%	193	64.3%
Yes	61	61.0%	46	23.0%	107	35.7%
Total	100	100.0%	200	100.0%	300	100.0%
Significance (p)	$\chi^2(1) = 41.95$ $p < 0.001$ Phi = 0.37					

n – number of observations; % – percent; χ^2 – Pearson chi-square test result; p – level of significance of differences.

Source: present study.

sions were drawn by Holt et al. after examining 187 women with average age 20.71. In the study by Holt et al., the authors concluded that women who were dissatisfied with their sex life were also dissatisfied with their bodies, which is in contrast to women who were satisfied with their sex lives [13].

In the present study, two-thirds of survey respondents in the middle adulthood group considered themselves to be sexually attractive. This finding is consistent with research by Czajkowska, wherein almost two-thirds of women over the age of 50 perceived themselves as sexually attractive, 60.9% as rather attractive, and 15% reported that they were unlikely to be sexually attractive. In that study, only 5.9% believed that they were definitely not attractive [14]. However, opposite results were reported by Gardziejewska et al. In particular, Gardziejewska et. reported that 46% of perimenopausal women evaluated themselves as unattractive or not completely attractive [15]. Also, Bielawska-Batorowicz et al. reported that the sense of sexual attractiveness of menopausal women is different and women in their surveyed group perceived themselves as very, average, or not very attractive from a sexual point of view [16]. Further, cultural stereotypes can affect women who feel less attractive after the onset of menopause [17]. The existing studies indicate that older women consider themselves to be less attractive than when they were younger [18].

Data collected in the present study suggest than women in the early adulthood group more often prefer the following sexual modes of behaviour as compared to women in the early adulthood group: clitoral stimulation, breast stimulation, vaginal stimulation, oral stimulation, and masturbation. Further, 88% of women in the early adulthood group have never chosen masturbation as their preferred sexual mode of behaviour. Similar results have been reported in research by Zdrojewicz et al., wherein a large group of female students (i.e., 63%) from the Medical University reported that they have never experienced masturbation. Similar results were obtained at the Wroclaw University of Economics, such that 73% of students reported that they have never experienced masturbation. Only 29% of students at the Medical University and 21% of students at the University of Economics practised occasional masturbation. Regular masturbation was practised by 1% of students from the Medical University, and 0.5% of the respondents from the University of Economics [19]. According to a study by Müldner-Nieckowski et al., one-third of women reported that they satisfy their sexual needs by means of masturbation without restriction. Still, 18% of women in general have never engaged in this sexual activity in their life [20]. Importantly, the authors noted that they would have wished to compare other sexual preferences in the early adulthood group but regrettably, the data were limited. Traditional sex was preferred by 60% of students from both universities, fellatio was favoured by 29% of students from the Medical University and 23.0% from the University of Economics, and 7% and 2% preferred other techniques (e.g., petting), respectively [19]. According to surveys carried out in the years 2012–2013 – 10 years after the previous survey, 7.9% of students reported that they masturbated regularly and 40.3% sporadically. 48.5% of the respondents reported that they have never experienced masturbation [21]. Young women maintained that fellatio (50%) is an alternative to vaginal intercourse. Further, 10.9% of students reported anal sex and 3.3% of students experienced group sex [22]. On the other hand, a study by Chmielewska et al. reported that 87% of nurses aged 25–29 and 65% aged 20–24 practised fellatio. Further, 47% of nurses aged 25–29 and 25% aged 20–24 experienced anal intercourse. 19% of nurses aged 25–29 have engaged in sadomasochistic practices [23]. In the field of applied sexual intercourse techniques, the highest scores were reported by respondents in early adulthood, followed by middle adulthood, and then late adulthood [2].

Perimenopausal women were frequently engaged in the following modes of sexual behaviour: clitoral stimulation, breasts stimulation, vaginal stimulation. The present study has shown that oral stimulation is practised by a very small percentage of respondents. Therefore, women who rarely engage in oral and anal activities may be less experienced and open-minded with regards to sexual activity. In our sample, anal intercourse and masturbation were not the preferred sexual activity among middle-adult subjects. Presents of the present study are similar to those reported by Woloski-Wruble et al in a sample of women aged 45 and older. In particular, Woloski-Wruble et al. found that 47% of women preferred breast caressing, followed by clitoral stimulation (46%), kissing breasts by a partner (45.0%), stroking a partner's sex organs (44 %), then kissing lips (43%) [24]. Similar results have also been reported in a study by Czajkowska et al., wherein the respondents most often undertook the following sexual behaviours: intercourse (51%), clitoral stimulation (51%), combining several techniques (28%), oral sex (19%), breast caresses (20%), kisses (18%), nipple stimulation (15%), stimulation with a tool (e.g. with a water jet, 8%), and anal sex (5%) [14]. A Wróbel examined a slightly older age group of women (M ± SD age: 57.2 ± 3.5 years) as compared to the present study. In that study, only 26.1% of the surveyed women reported touching each other during foreplay, and/or caressed and stroked the whole body, and 30.4% of women only touched the husband's genitalia [25]. On the other hand, results of Chmielewska et al. in a sample of women aged 40 and above are inconsistent with those of the present study. In that study, 44% of women aged 40 and above practised fellatio, 15% experienced anal intercourse, and 8% were engaged in sadomasochistic practices [23]. A study by Lew-Starowicz found that sexual modes of behaviour did not change significantly from the year 1992 to 2002. In that study, the only difference found in menopausal women was an increase in masturbation activity from 1992 to 2002 (by 15%) [26]. Czajkowska

et al. did not observe any statistically significant differences in achieving orgasm among the surveyed women aged 35–49 and 50 or more. Similarly, there was no significant difference in the frequency of masturbation over time, across groups [14].

The results of the present survey study indicate that clitoral simulation and oral stimulation were more common among unmarried than married women. In the middle adulthood group, only one-third of unmarried women experimented more frequently as compared to married women. These results are not consistent with those of Grabowska, who did not find differences in sexual modes of behaviour between single and married women in middle adulthood, or between married women and those in cohabitation [2].

Women in the early adulthood group more frequently used items that cam diversify sex life as compared to women in the middle adulthood group (e.g., lubricants, massage oils, condoms, erotic lingerie, and handcuffs). In contrast, women in the middle adulthood group more often indicated the "other" answer, which may reflect a lack of any objects. In a similar group of women, Czajkowska et al. reported no significant differences among all studied age groups (i.e., aged 35–49, 50–59, ≥60) regarding the use of sexual tools or toys and watching pornographic films [14]. Another study by Chmielewska et al. reported different results wherein 38% of the women aged 25–29 and 20% of women aged 20–24 reported using various gadgets to diversify their sex life. In particular, vibrators, handcuffs, whips, and erotic lingerie were most frequently reported by the respondents aged 25–29 (ranging from 8–20%), whereas women in other age groups reported more infrequent use (ranging from 3–13% of respondents) [23].

According to our research, women in the middle adulthood group rarely introduced erotic gadgets. This is surprising that nearly half of the survey respondents reported not using any objects that could diversify their sex lives. The opposite pattern of results have been obtained by Czajkowska et al., stating that 30% of women aged 50–59 reported using sexual gadgets and 35% watch pornographic movies [14]. Various gadgets are reportedly implemented by 18% of the respondents aged 40 and more, which may enhance and enrich sex life [23].

In the present study, 61% of women in the early adulthood group reported using contraception. According to available research, condoms [22] are some the most universal and best known of the contraceptive methods among young people. The review of the results confirmed that women in the early adulthood group most often used condoms and hormonal contraception. However, a study by Jarząbek-Bielecka et al. reported slightly different results, wherein the prevailing contraceptive methods were contraceptive pills (55%), pills and condoms combined (28%), followed by condoms (16%) [27]. In addition, according to a study by Nowosielski et al., the most frequently adopted contraceptive methods in a group of women aged 18–26 were condoms (95.4%), followed by contraceptive pills (75.9%), coitus interruptus (34.9%), spermicides (12.7%), intrauterine devices (3.7%), postcoital pills (5.9%), and none (5.5%). The availability, universality, and low price of condoms makes this method particularly attractive for young people. It is worth noting that only 25.6% of the surveyed women in another study implemented natural methods of family planning [28]. On the other hand, research by Izdebski et al. found that condoms were a prevalent form of contraceptive method among people aged 18–24 (77%), unmarried (78%), not currently in a stable relationship (84%), people who have never been in a stable relationship (89%), people planning to have children (73%), and people without children (78%). Contraceptive pills as a method of preventing pregnancy was reported by 35% of people aged 25–29, 37% of people in cohabitation, 47% of non-religious people, and 32% of people planning to have children [29].

Our data suggest that contraception was preferred by 23% of women in the perimenopausal age. The obtained results are similar to the research of Gardziejewska et al., who reported very similar patterns in contraception use wherein only 18% of women in perimenopausal age used contraceptive methods to prevent unplanned pregnancy (e.g., condoms, intrauterine devices, oral contraceptives or natural methods of fertility regulation) [15]. In a study by Izdebski et al., natural methods of family planning were reported among 17% of people aged 40–49, 16% of married people, 14% of people in a current stable relationship, 15% of those with children under 189 years of age, and 28% of the deeply religious and regular practitioners [29].

In the present study, young adult religious women often used condoms and hormonal contraception, and rarely tried to live according to the principles set by their faith (e.g., natural methods of family planning to prevent unwanted pregnancy). Different results were obtained by Hejmej et al., wherein female students aged 18–28 who were atheists most often chose two-component contraceptive pills whereas this method was used least often by religious women [30].

Research limitations

This study was carried out among a relatively small group of women. Subsequent research should include a larger number of participants. Another limitation of the present study was that we used only one tool to measure women's sexual preferences during early and middle adulthood.

Conclusions

1. Women in middle adulthood feel less sexually attractive than women in early adulthood.
2. Women may consider tools that can improve the quality of sexual intercourse during the perimenopausal period, such as lubricants, massage oils, stimulating condoms, and erotic lingerie.

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THE BIOPSYCHOSOCIAL STATUS OF WOMEN DURING THE ANTEPARTUM PERIOD

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ABSTRACT

Background: The time leading up to delivery significantly affects the state of a pregnant woman in each of the spheres of human functioning.

Aim of the study: The aim of the study was to assess the biopsychosocial status of women in the antepartum period.

Material and methods: The study was carried out in St. Queen Jadwiga's Clinical Regional Hospital No. 2 in Rzeszow. The study group consisted of 200 women awaiting delivery: 100 preparing for physiological delivery, and 100 qualified for elective Caesarean section. The following tools were used: Labor Anxiety Questionnaire, Social Support Scale, Sources of Social Support Questionnaire, Short-form McGill Pain Questionnaire, and the questionnaire developed by the author.

Results: Statistical analyses showed a relationship between the biopsychosocial status of pregnant women and the planned mode of delivery. In turn, the sense of availability of social support was influenced by the place of residence and living conditions, the number of people cohabiting with the respondent, and the number of people with whom they maintained contact with during pregnancy. However, the occurrence of somatic complaints was found to be associated with the level of labor anxiety.

Conclusion: The biopsychosocial status of women in the antepartum period is influenced by many factors. Proper social relations positively influence psychological well-being, which in turn is closely related to the lack of pain sensations in the biophysical sphere.

KEYWORDS: pregnancy, status biopsychosocial, antepartum period, support, anxiety

Background

For many years, the traditional biomedical model, which focused mainly on somatic disorders when it comes to the functioning of the human body, dominated the field of treating diseases and understanding health,. This line of thought was based on the Cartesian assumption of duality, and the separation of the body from the psyche. The recognition of health in such categories lasted until nearly the mid-twentieth century. At that time, the challenge for this model was that research, conducted by representatives of behavioral and social sciences, proved that the model had many limitations and did explain many issues, including why different people, whose physical condition was similar, coped with the disease in completely different ways. It was stated that in order to understand pathogens, and develop both treatment methods and health care systems in a rational manner, the following should also be taken into consideration: the patient's social context, the environment in which the patient lives, as well as the complementary systems created by society to cope with the results of diseases. The presence itself of biological disorders does not explain the symptoms experienced. The human organism is an indivisible whole of symbiotic biopsychosocial aspects that are in constant interaction with the natural, social, and cultural environment [1,2].

The scientific concept of treating health in a multidimensional manner has become the basis for the World Health Organization's formulation of the commonly used definition of health, which is treated as a state of complete physical, mental, social, and spirit-

ual well-being, not just the lack of disease or disability. The definition relates to any human being at different stages of life. One of them is pregnancy, during which a woman's health is of great importance for the development of the fetus, the course of labor, and the mother's well-being in the postpartum period [3].

Pregnancy is a complex phenomenon that involves morphological and physiological processes, as well as psychological changes. During this period, life goals and the hierarchy of values change [4,5]. The dynamics of the emotional processes experienced by a woman is very intense, from the very beginning of pregnancy to its end, and depends on many factors. The pregnancy itself is a highly emotional situation, and when additional stressors comes along, it may be accompanied by ambivalence of sensations and other mental disorders [4,6]. One of the factors that can cause stress is the time of the upcoming delivery. Among many women, this situation may be expressed as antenatal anxiety, which many researchers consider to be the most important psychological variable modifying the course and quality of pregnancy, delivery, and the postpartum period [7].This anxiety can express itself both in vegetative and somatic disturbances, as well as behavioral disturbances [4,8]. During labor, in women who have given birth previously, anxiety increases, sometimes causing unreasonable efforts to end pregnancy earlier by Caesarean section, even in the absence of indications for this procedure. In order to maintain balance in functioning of the biological and psychological spheres, support and acceptance from society seems to be important; it creates a sense of security and minimizes the risk of complications [4,9,10]. The growing problem of the increasing percentage of Caesarean sections is the primary driver of research on the biopsychosocial state of pregnant women in the antenatal period, so that we may gain a greater understanding of the issue, identify the factors leading to disorders, and determine the risk groups.

Aim of the study

The aim of the study was to investigate the biopsychosocial status of women in the antepartum period.

Material and methods

Study design

A prospective cohort study was conducted in St. Queen Jadwiga's Clinical Regional Hospital No. 2 in Rzeszow (Poland) during 2016 and 2017. Consent was obtained for conducting the study from the Bioethics Committee of the University of Rzeszow (No. 12/2015).

Participants

Study group B consisted of 200 women waiting for delivery. B-I cohort comprised 100 women preparing for delivery through natural passages and natural labor. Cohort B-II comprised 100 women qualified for an elective Caesarean section.

Inclusion criteria:

a. a pregnant woman awaiting delivery through natural passages and natural labor or qualified for an elective Caesarean section,
b. a patient in the antepartum period, up to 7 days before the estimated date of delivery, determined on the basis of the last menstrual period in accordance with the Naegele's rule and confirmed by ultrasound in the first trimester of pregnancy,
c. a patient verbally responsive, informed consent to participate in the study granted,
d. a correctly completed questionnaire.

The study excluded women who were diagnosed with a history of mental disorders and concomitant pain caused by a chronic somatic disease requiring analgesics.

Table 1. Indication for an elective Caesarean section in cohort B-II.

Reason for an elective Caesarean section	N	Percent
Abnormal fetal lie/position	15	15.0%
Bigeminal/multiple pregnancy	7	7.0%
Previous Caesarean section and the risk of a natural labor	60	60.0%
Diseases during pregnancy and complicating its course	6	6.0%
Diseases diagnosed before pregnancy	12	12.0%
Other	10	10.0%

Data sources/measurement

The following standardized tools were used in the diagnostic poll:

a. Labor Anxiety Questionnaire (KLP II),
b. Short-form McGill Pain Questionnaire (SF-MPQ),
c. Social Support Sources Questionnaire prepared by Michael Nieland (Polish translation by Eleonora Bielawska-Batorowicz),
d. Danuta Zarzycka's Social Support Scale.

An additional element of the study was the authors' own questionnaire, which enabled the collection of socio-demographic data and information on obstetrics and gynecological history of the respondents.

Statistical analyses

Statistical analysis of the collected data was conducted in Statistica 13.1 (Statsoft). Both parametric and non-parametric tests were used to analyze the variables. The choice of the parametric test was determined by the fulfillka' Student' women. Nowakowska ment of its basic assumptions, i.e., the distribution of the examined variable was normal, which was verified with the use of the Shapiro-Wilk test. In order to evaluate the differences at the average level of the quotient in two populations, the Student's t-test (t) for independent

variables was used or alternatively, the non-parametric Mann-Whitney (Z) test was used. The correlation of two variables that were not normally distributed was determined with the use of the Spearman's rank correlation coefficient (R). To assess the relationship between the selected variables for questions on nominal scales, V Cramer and Phi tests (2x2 tables) were used. These are symmetrical measures that are based on the chi test – Pearson square (χ^2), illustrating the strength of the relationship between the variables in the cross tables. Descriptive statistics were calculated for numerical variables, i.e., arithmetic mean (), median (Me), minimum (Min), maximum (Max), lower quartile (Q1), upper quartile (Q3) and standard deviation (SD). The level of statistical significance was $p<0.05$.

Results

Characteristics of the study group

The characteristics of the most prevalent socio-demographic data in the studied cohorts are presented in Table 2. The differences in the data were not statistically significant in the studied groups.

Table 2. Characteristics of the studied group

Socio-demographic data		Cohort B-I		Cohort B-II	
		N	Percent	N	Percent
Age	26-35	68	68.0%	67	67.0%
Marital status	Married	92	92.0%	89	89.0%
Place of residence	Countryside	60	60.0%	55	55.0%
Education	Secondary	41	41.0%	34	34.0%
	University degree	39	39.0%	47	47.0%
Professional activity	Working	73	73.0%	68	68.0%
Living conditions	Good	64	64.0%	68	68.0%

Main results

Analyzing the obstetrics history of these women, primiparas were more frequently recorded in cohort B-I, while multiparas were found more often in cohort B-II. These results were statistically varied. Women preparing for spontaneous delivery statistically more often had natural labor with perineotomy, whereas those from cohort B-II were statistically more likely to have Caesarean sections performed.

Statistically, more social support in the antepartum period was sought-after by the respondents from cohort B-II (Table 4). Support received was maintained at the same level in both groups, and the level of satisfaction with the received social support was higher in cohort B-II (p=0.011). The results concerning the evaluation of available support were statistically slightly higher for women from cohort B-II (p<0.001).

The analysis of social support sources revealed that women from cohort B-II received support from doctors and midwives working in the hospital more often than women from cohort B-I (p=0.048), as well as from their own older children (p=0.001).

Among the selected factors, the living and housing conditions of the respondents had a significant impact on the level of available social support in both cohorts. The better the living conditions of the respondents, the higher the assessment of available social support (B-I: p=0.008, B-II: p=0.009). The same applied to the number of people with whom respondents maintained contact (B-I and B-II: p<0.001). Moreover, cohort B-II showed a statistically significant influence of the place of residence on the level of available social support. Respondents who lived in the city (p=0.008) and those living with a larger number of people (p=0.046) had a greater sense of availability of social support. The number of previous deliveries had no significant impact on the sense of availability of social support experienced by the respondents from both groups (B-I: p=0.571, B-II: p=0.348).

Table 3. Obstetrics history in the studied cohorts

Obstetrics history		Cohort B-I		Cohort B-II		P
		N	Percent	N	Percent	
Number of deliveries	First	52	52.0%	28	28.0%	$\chi^2(1)=12.00$ p<0.001 Phi=0.24
	Subsequent	48	48.0%	72	72.0%	
Miscarriages	Yes	18	18.0%	16	16.0%	$\chi^2(1)=0.14$ p=0.706
	No	82	82.0%	84	84.0%	
The course of previous deliveries	Delivery without perineotomy	10	10.0%	4	4.0%	$\chi^2(1)=2.76$ p=0.096
	Delivery with perineotomy	39	39.0%	8	8.0%	$\chi^2(1)=26.72$ p<0.001 Phi=-0.36
	Delivery with perineal rupture	3	3.0%	0	0.0%	$\chi^2(1)=3.04$ p=0.080
	Instrumental delivery (forceps, VE)	0	0.0%	1	1.0%	$\chi^2(1)=1,00$ p=0.316
	Caesarean section	6	6.0%	68	68.0%	$\chi^2(1)=82,45$ p<0.001 Phi=0.64

χ^2 – Pearson's chi-squared test.

Table 4. Social support in the antepartum period, desired by the respondents

Desired support	Descriptive statistics [points]							
	N	$\bar{x}$	Me	Min.	Max.	Q1	Q3	SD
Cohort B-I	100	36.65	36.00	20.00	56.00	33.00	41.00	6.87
Cohort B-II	100	38.89	39.00	26.00	56.00	35.00	42.00	6.03
p	t=-2.45 p=0.015							

t – Student's t-test.

A statistically higher level of anxiety was observed among women in group B-I (Table 5). No significant statistical relationship between basic socio-demographic data and the level of labor anxiety was observed. The qualitative assessment of the level of labor anxiety in the studied cohorts did not reveal any statistically significant differences. The majority of study participants were characterized by low or average level of labor anxiety (in B-I and B-II: 62% and 69% respectively). Furthermore, the women studied from cohort B-I, more than respondents from cohort B-II, feared that their labor would be long and painful, but they indicated that afterwards they would quickly return to their pre-pregnancy condition (Table 6).

Table 5. Level of labor anxiety in the studied groups

Level of labor anxiety [0-27 point scale]	Descriptive statistics [points]							
	N	$\bar{x}$	Me	Min.	Max.	Q1	Q3	SD
Cohort B-I	100	12.85	13.00	7.00	20.00	11.00	15.00	2.69
Cohort B-II	100	11.90	12.00	4.00	20.00	10.00	14.00	3.08
p	t=2.32 p=0.021							

t – Student's t-test

Table 6. The attitude of respondents to the statements contained in the labor anxiety questionnaire

KLP II point: 3 – definitely not 2 – probably not 1 – probably yes 0 – definitely yes	Cohort B-I			Cohort B-I			Z	p
	$\bar{x}$	Me	SD	$\bar{x}$	Me	SD		
I am afraid my labor will be long	0.98	1.00	0.74	1.81	2.00	0.85	-6.62	<0.001
I know that during the birth, I will be in complete control of the situation	1.41	1.00	0.64	1.49	2.00	0.72	-1.01	0.310
I am worried that my baby may be born with some kind of defect	1.80	2.00	0.70	1.69	2.00	0.72	1.05	0.292
I feel that there will be some unforeseen complications in the delivery	1.83	2.00	0.59	1.74	2.00	0.69	1.00	0.316
I am convinced that during childbirth I will be calm and composed	1.64	2.00	0.72	1.45	1.00	0.74	1.83	0.067
I am afraid my labor will be painful	0.66	1.00	0.64	1.09	1.00	0.87	-3.63	<0.001
I am convinced that I will recover quickly after giving birth	1.94	2.00	0.58	1.69	2.00	0.72	2.48	0.013
I am concerned that my baby may be damaged in childbirth	1.90	2.00	0.64	2.04	2.00	0.62	-1.60	0.109
Waiting for the birth is a very happy time for me	1.99	2.00	0.82	2.10	2.00	0.92	-1.12	0.263

Z – Mann-Whitney U test

Considering the number of previous deliveries, the level of anxiety was higher in women preparing for their first labor, regardless of the planned method of delivery. However, these differences were not statistically significant (B-I: p=0.330, B-II: p=0.130). The previous method of delivery and current indications for Caesarean section did not affect the level of labor anxiety.

Table 7. Level of labor anxiety in respondents based on their sense of availability of social support

Variables	R	p
Cohort B-I	0.03	0.747
Cohort B-II	-0.28	0.005

R – value of Spearman's rank correlations.

In the assessment of the relationship between the level of labor anxiety and available social support, a statistically significant dependence was described for respondents from cohort B-II. Greater social support among women from this group was associated with a lower level of labor anxiety (R=-0.28), (Table 7).

Table 8. Current pain intensity in respondents based on Current Pain Intensity Scale

Pain [0-100 point scale]	Descriptive statistics [points]							
	n	$\bar{x}$	Me	Min.	Max.	Q1	Q3	SD
Cohort B-I	100	22.72	19.00	0.00	100.00	4.00	31.50	22.62
Cohort B-II	100	20.16	16.50	0.00	73.00	2.00	33.50	19.80
p	Z=0.75 p=0.451							

Z – Mann-Whitney U test

In Current Pain Intensity Scale, women from cohort B-I showed higher levels of pain intensity, but the difference was not statistically significant (Table 8). In assessing the nature of pain felt, women from cohort B-I reported piercing pain statistically more often than women from cohort B-II (p=0.032).

Comparative analysis of the intensity of pain felt in all participants, depending on the somatic symptoms accompanying them, showed statistically significant relationships for the following symptoms: breathlessness/dyspnea (p=0.037), heat/sweating (p=0.048), sleeping disorders (p=0.005), coldness (p=0.008), and between those experiencing any symptoms and those not experiencing them at all (p=0.009). Higher levels of pain intensity was observed among respondents reporting the presence of the above-mentioned somatic symptoms.

The level of intensity of childbirth anxiety among women reporting various somatic symptoms during pregnancy was considered. In cohort B–I, women complaining of breathlessness or shortness of breath, as well as trembling hands and muscles, experienced statistically significantly higher levels of labor anxiety than those who were not concerned by this problem. In cohort

B–II, women reporting a feeling of heat, sweating, sleep disturbances and other ailments (diarrhea and heartburn) experienced statistically significantly higher levels of labor anxiety than those who did not experience this problem. It was also noticed that a significantly lower level of anxiety was found among women who did not experience any somatic symptoms (Table 9).

Table 9. Level of labor anxiety and accompanying other somatic ailments – comparison in cohorts

	Physical symptoms associated with the upcoming delivery	p
Cohort B-I	Palpitations/chest pain	Z=-0.54 p=0.584
	Breathless/short of breath	Z=-2.08 p=0.037
	Feeling hot/sweating	Z=0.47 p=0.633
	Stomach pains. lack of appetite	Z=-0.04 p=0.966
	Nausea, vomiting	Z=-0.70 p=0.482
	Headaches	Z=-0.99 p=0.320
	Sleep disturbance	Z=-1.16 p=0.243
	Turning red	Z=-0.89 p=0.372
	Tremors in hands and muscles	Z=-2.07 p=0.038
	Dry mouth	Z=0.50 p=0.613
	Feeling cold	Z=1.76 p=0.077
	Other	Z=0.15 p=0.876
	No symptoms	Z=-0.57 p=0.563
Cohort B-II	Palpitations/chest pain	Z=1.55 p=0.120
	Breathless/short of breath	Z=-1.82 p=0.068
	Feeling hot/sweating	Z=2.63 p=0.008
	Stomach pains, lack of appetite	Z=0.29 p=0.769
	Nausea, vomiting	Z=1.55 p=0.119
	Headaches	Z=-0.76 p=0.445
	Sleep disturbance	Z=-2.22 p=0.025
	Turning red	Z=0.00 p=1.000
	Tremors in hands and muscles	Z=0.95 p=0.340
	Dry mouth	Z=1.48 p=0.137
	Feeling cold	Z=-0.80 p=0.420
	Other	Z=-2.60 p=0.009
	No symptoms	Z=3.82 p<0.001

Z – Mann-Whitney U test

Discussion

This study confirms the presence of anxiety in women in the antepartum period. For all respondents, the intensity of labor anxiety was average, comparable to the results of Dembińska et al. [8]. The effects of the authors' own work were also confirmed by the findings of Marylowska-Topolska et al., and Szymański et al., who observed that the highest percentage of women reporting anxiety before delivery concerns those who are in the final stage of pregnancy [11,12]. It may be observed that anxiety during pregnancy is a natural phenomenon, but the perspective of an approaching delivery significantly increases its intensity.

In the authors' own research, the verification of the occurrence of labor anxiety in terms of the planned method of delivery proved interesting; significantly higher levels of labor anxiety were observed in women preparing for spontaneous delivery. The authors' own findings are confirmed by the study of Kang et al., conducted in China, which revealed that anxiety at the end of pregnancy was clearly related to vaginal delivery [13]. This is a view shared by other researchers as well; although Dembińska does not mention any significant differences in the analysis of labor anxiety and the expected method of delivery, she indicates that a high level of anxiety before delivery is significantly associated with the desire to have a Caesarean section performed [8]. Størksen et al., based on studies conducted in Norway, are of a similar opinion [14]. Comparable conclusions were also formulated by Saisto and Halmesmäki [15]. These results may be explained by a common misconception among women regarding the safety and painlessness of Caesarean sections.

The characteristics of anxiety among pregnant women in the antepartum period specified in the authors' own studies are consistent with the results obtained by other authors [8,16]. Bączyk et al., also emphasized that a significant factor affecting the presence of labor anxiety was the fear that a child would be born in poor condition [16].

Considering the parity and the level of labor anxiety, a slightly higher degree of anxiety was observed in the group of women preparing for their first delivery, regardless of the planned method of delivery. The same results were obtained by researchers from India, who observed a higher level of labor anxiety in nulliparas [17,18]. It can be assumed that previous obstetrics experiences do not have an impact on the labor anxiety, and every subsequent delivery is a new challenge for a woman. Similar conclusions were also reached by Szymański et al., Błaszczak et al., and Kazimierczak et al. [4,12,19]. However, these data contradict the results of research conducted by psychologists from Katowice (Poland). They reported that memories of previous deliveries statistically significantly affect the level of anxiety during current pregnancy. These conclusions were also confirmed by Rouhe et al., in studies conducted in Finland; the authors observed much higher levels of anxiety in multiparas who experienced instrumental deliveries in the past [20]. Dissimilarity of presented results may be attributed to cultural differences.

A surprising effect of the authors' own studies was the level of pain and discomfort reported by the respondents in the antepartum period, and the link between these ailments, the planned delivery, and mental functioning of these women. Well-being decline in terms of physical signs was statistically more frequently reported by patients preparing for vaginal delivery. These data represent innovative knowledge, as no similar publications have been found in the available literature. The results obtained in this respect suggest the hypothesis

that pregnancy, although it is a physiological state, may be the cause of deterioration in the functioning of the female biological sphere, regardless of its duration.

In the above-mentioned problem of pain sensations, the synthesis of the authors' own material revealed that the relationship between the obstetrics history and the planned method of delivery is not without significance. The ailments reported by both cohorts of pregnant women were statistically different, but a common feature was the more frequent occurrence of problems in parturients with a lower number of previous deliveries. Existing somatic symptoms may be an expression of the mother's fear of an approaching delivery and concern about the health of the baby to be born. Current scientific reports do not confirm the above implications since there is no research in this regard.

In terms of social support, higher expectations towards the society and better evaluation of the support obtained were observed among patients qualified for Caesarean sections. Gebuza et al. also acknowledged that women after Caesarean sections received significantly more social support during pregnancy [21]. As far as the sources of support are concerned, both groups of respondents paid special attention to the key role of the closest family, while women planning a Caesarean section additionally emphasized the assistance of doctors and midwives from the hospital, as well as support received from their children. Offspring, indicated as a source of support, most probably results from the fact that there were more multiparas in this group of women. Nowakowska-Gołąb et al., investigating the impact of social support on the quality of life of pregnant women in Łódź (Poland), also stressed the supportive role of the family. The authors also confirmed their own results concerning the impact of the place of residence and other people on the reported greater availability of social support [22]. The number of available studies on the subject is limited. The risk of complications, including postnatal depression, in women who do not receive social support during pregnancy is very high. The results obtained in the authors' own study are therefore worthy of special attention. Statistically higher level of support indicated by women qualified for Caesarean sections living in urban areas can be explained by the better accessibility and ease of use of support from selected groups and institutions in urban conurbations.

The study also analyzed the significance of social support in the context of labor anxiety. It is commonly accepted that adequate social support contributes to reducing the level of negative emotions, and thus improving the mental state of pregnant women. In the authors' own study, a significant correlation in this respect was observed in the group of women qualified for an elective Caesarean section. A considerable number of researchers support the effects of the presented results indicating that the lack of social support contributes to labor anxiety [8,13,23–27]. A review of studies confirms that disturbed interpersonal relations reduce self-esteem in pregnant women, increase stress, and cause pain and depression symptoms during pregnancy [6,28,29].

The analysis of the impact of the number of previous deliveries on the level of social support in the current pregnancy also deserves attention; the authors' studies do not confirm this correlation. These results are inconsistent with the reports of other researchers. The work of Gebuza et al. showed that significantly more emotional and instrumental support in the peripartum period was received by primiparas than multiparas [10]. Nowakowska-Gołąb et.al. demonstrated that the number of supportive persons was lower for women already having children [22]; this difference is difficult to explain.

The results of these studies are significant not only because of the absence of such data in Poland and worldwide, but above all because they indicate that the planned method of delivery may be a significant cause of the altered functioning of women in the antepartum period. Understanding the needs and mechanisms of certain behaviors of women waiting for a baby to be born in the near future is the first step to improving the quality of life of these patients. Additionally, these results may contribute to changing women's preferences regarding the method of delivery.

Limitations of the study

The problem of assessing the biopsychosocial state of patients in the antenatal period has been resolved, to a large extent. One may be unsatisfied when considering the fact that the results in some of the issues raised for both groups were insignificant, although the obtained values of the probability index were approaching statistical significance. It is also unsatisfactory that in selected cases, despite the fact that correlations between the selected variables turned out to be statistically significant, the strength of their relationship was relatively weak. An increased number of respondents would possibly enable us to distinguish the tendency from the randomness of behavior of women expecting childbirth, as well as point out more clearly the factors that determine their biopsychosocial state.

Conclusions

1. Compared to women awaiting an elective Caesarean section, patients who are qualified for delivery through natural passages and natural labor experience higher levels of anxiety.
2. Pregnant women need social support. Patients who feel that social support is available to them have a lower level of labor anxiety.
3. The intensity of pain and somatic symptoms in women in the antepartum period is determined by their mental well-being.
4. It is essential to prepare medical personnel to recognize the needs of women awaiting delivery in terms of their biopsychosocial functioning.

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SELECTED RISK FACTORS FOR ISCHEMIC HEART DISEASE AND THE SUCCESS OF TREATMENT IN PATIENTS WITH STEMI MYOCARDIAL INFARCTION TREATED WITH PERCUTANEOUS CORONARY INTERVENTION

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ABSTRACT

Background: Coronary heart disease is one of the most common causes of hospitalization and premature deaths in Europe. ST-segment elevation myocardial infarction (STEMI) has been a clinical problem for many years, particularly in the aspect of choosing the optimal treatment method. The success of treatment is determined by many factors, including risk factors for ischemic heart disease, time between onset of symptoms and initiation of treatment, number and degree of coronary stenosis, and many more.

Aim of the study: The aim of the study was to identify risk factors for ischemic heart disease affecting the success of STEMI patients treated with percutaneous coronary intervention (PCI).

Material and methods: A retrospective analysis was carried out on data from medical records of patients treated in the Department of Acute Coronary Syndromes of St. Hedvig Provincial Hospital No. 2 in Rzeszow between 2009 and 2014. The research tool used in this paper was the author's questionnaire. A total of 508 patients with STEMI myocardial infarction treated in the Department of Acute Coronary Syndromes (ACS) between 2009 and 2013 were included in the analysis. The inclusion criteria were the complete and clear files of patient treatment in the ACS department between 2009 and 2013 due to acute coronary syndrome treated invasively by the PCI method.

Results: Majority of the study group, 334 subjects, (65.7%) had hypertension. The most common risk factors for ischemic heart disease were found to be dyslipidemia in 176 subjects (34.6%) and smoking in 163 subjects (32.1%). This paper presents the results of the analysis of the success of treatment in relation to risk factors for ischemic heart disease. There was a statistically significant relationship between hypertension and successful treatment (p=0.0425). More cases in which treatment was unsuccessful were observed in the group of patients who had no previous treatment for lipid disorders (20.2% vs. 4.0%) (p = 0.0000). Significantly more cases of treatment failure were found among people who denied smoking (17.4% vs. 8.6%; p = 0.0087).

Conclusions: Among the analyzed behavioral and somatic risk factors for failure in patients subjected to treatment were untreated hypertension, hyperlipidemia and a negative history of cigarette smoking.

KEYWORDS: myocardial infarction, risk factors, ischemic heart disease

Background

ST-segment elevation myocardial infarction (STEMI) is the most acute manifestation of coronary artery disease and is associated with great morbidity and mortality [1]. STEMI has been a clinical problem for many years, particularly in the aspect of choosing the optimal treatment method. The technique of percutaneous coronary intervention (PCI), introduced in 1977 by Gruentzig, replaced in most cases, the thrombolytic therapy used since the 1970s. Further development of

techniques for the invasive treatment of myocardial infarction has changed the way patients with myocardial infarction are treated. However, despite the great advancements in modern medicine, the treatment of myocardial infarction is still a therapeutic challenge. The success of myocardial infarction treatment is determined by many factors like the risk factors for ischemic heart disease, the time that elapsed since the onset of symptoms, the number and degree of coronary stenosis, and many more.

Risk factors for cardiovascular disease

In Poland, the biggest country in this region, with a population of over 38 million, mortality due to the three leading causes of premature death, namely, cardiovascular disease, cancer, and injuries, are gradually declining, while life expectancy at birth is increasing [2]. In the Polish population, the strongest risk factors for cardiovascular disease include hypercholesterolemia, overweight and obesity, smoking, hypertension, metabolic syndrome and diabetes [3].

Smoking is a potentially reversible risk factor for cardiovascular disease and the components of tobacco smoke, nicotine and carbon monoxide, are known to cause vasoconstriction, lower high-density lipoprotein (HDL) cholesterol levels and increase the levels of low-density lipoprotein (LDL) cholesterol [4]. Smoking can significantly increase morbidity and mortality due to cardiovascular diseases, especially in smokers [5, 6]. According to Maniecka-Bryła and colleagues, smoking among the participants of the "Program for the early detection of cardiovascular disease" study was high, affecting one-third of the general population in Poland. Furthermore, the prevalence of smoking was found to be higher among men (42%) when compared to women (25%) between the ages of 18 and 94 years [7].

Lipid disorders are also risk factors for cardiovascular diseases and therefore, earlier diagnosis and treatment are necessary to prevent lipid abnormalities and to predict emerging risks of various cardiovascular diseases and disorders [8]. Lipid metabolism disorders occur in more than half of adult Poles, and the incidence of hypercholesterolemia increases with age. The most frequent laboratory component of lipid disorders is elevated total cholesterol, found in about 60% of the general population. LDL cholesterol above 115 mg/dl occurs in 55–60% of cases, and decreased HDL cholesterol in 15–17%, while hypertriglyceridemia is found in 30% of the population [9].

According to NATPOL PLUS (Arterial Hypertension in Poland Plus Lipid Disorders and Diabetes), about 1.65 million adults suffer from diabetes. A high prevalence of diabetes occurs people over 50 years old which make up 12.4% of the studied population. Diabetes incidence increases with age and adversely affects other risk factors such as hypertension and dyslipidemia [10].

Overweight and obesity. The NATPOL PLUS study showed that overweight occurs in Poland in about 40% of men and 28% of women, and obesity in 18% of men and 19% of women. Visceral obesity, the most important risk factor for cardiovascular disease, was found in 35% of women and 19% of men [3]. The same study also showed that body mass index (BMI) above 25 kg/m^2 was associated with increased cardiovascular-related mortality. Obesity, especially central, adversely affects other risk factors such as glucose tolerance and insulin resistance, hyperlipidemia and hypertension [10, 11].

Hypertension. Hypertension is another risk factor for cardiovascular disease. It affects more than 8 million adult Poles, and a further 8–9 million have blood pressure values considered to be normal but elevated. Hypertension is undiagnosed in about 30% of patients, and only about 1 million patients with hypertension are treated effectively. Up to 45% of patients, do not obtain satisfactory control of blood pressure (<140/90 mmHg), despite treatment [12]. In many epidemiological studies, elevated blood pressure was shown to be an important risk factor for coronary heart disease [3, 10].

Psychosocial factors. Low socioeconomic status, social isolation, lack of social support, stress at work and in family life, negative emotions and depression affect the risk of developing coronary heart disease, and in patients with diagnosed coronary heart disease, further aggravate its course. These factors are often cumulative and have a demotivating effect on lifestyle change [12].

Low physical activity. In a meta-analysis of several clinical trials, physical training has been shown to improve the reduction of atherosclerotic lesions in vessels and reduces the total mortality by 20–25% [13]. Therefore, one the most important cardio-protective factors is physical activity. In the Polish population, 56% of women and 49% of men aged 20–74 declare having low physical activity [12, 13]. In summary, cardiopulmonary prophylaxis is particularly important in people after cardiac events and changing lifestyle is a process that affects many areas. Therefore, a proper diet, systematic physical activity, cessation of cigarette smoking, stress management, the ability to adapt to the existing situation and managing depression, can bring the desired effects only with consistent and long-term use [14].

Aim of the study

The aim of the study was to identify risk factors for ischemic heart disease affecting the success of with myocardial infarction with STEMI treated with percutaneous coronary intervention (PCI).

Material and method

A retrospective analysis of medical records from patients treated in the Department of Acute Coronary Syndromes of St. Hedvig Provincial Hospital No. 2 in Rzeszow from 2009 to 2014 was carried out. The research tool used in this study was the author's questionnaire, which consisted of socio-demographic data regarding

the time from the onset of symptoms to the first contact with medical staff, data on the patients' parameters on admission, data on coronary heart disease risk factors, previous interventions and cardiological procedures. The medical data entered in the documentation were obtained from the medical history on admission and hospitalization of the patient at the Department of Acute Coronary Syndromes. The medical documentation in use at the department of Acute Coronary Syndromes was standardized, completed by medical staff and subjected to periodic inspection by the quality control team. The study was approved by the Bioethics Committee at the University of Rzeszow No. 13/06/2013.

Data from a total of 508 patients with a history of STEMI myocardial infarction treated in the Department of Acute Coronary Syndromes (ACS) between 2009 and 2013. The inclusion criterion was the complete and clear files of patient treatment in the ACS department between 2009 and 2013 due to ACS treated invasively by the PCI method. Data from patients whose documentation was incomplete and / or illegible were excluded from the analysis.

Statistics

Data analysis consisted of their presentation using selected methods of descriptive statistics and testing of selected hypotheses using statistical inference tools. The description of the data consisted in presenting their percentage distribution for nominal features. The research was focused in the assessment of treatment effectiveness in groups distinguished by the occurrence of ischemic heart disease risk factors. The significance of differences between the groups concerning the participation of successfully treated patients was assessed by means of Chi-square test. A p-value less than 0.05 was considered statistically significant relationship between the analyzed variables.

Results

Sociodemographic characteristics of the studied group

Patients' age ranged from 26 to 99 years, with a mean age of 65 years (SD 12.9) and majority of the surveyed population were men (71.5%). The distribution of the place of residence was almost even, although slightly more patients resided in cities than villages (51.2% vs. 48.6%) (tab. 1).

Risk factors for coronary heart disease

As shown in Tab. 2, majority of patients in the study group had arterial hypertension (334 subjects; 65.7%) and the second most common risk factor for ischemic heart disease was dyslipidemia, seen in 176 subjects (34.6%), followed by smoking (163 subjects; 32.1%). Among the individuals with hypertension, one-third of them were not treated pharmacologically (23.2%).

Table 1. Descriptive statistics sex and place of residence of the respondents.

Variable		N	Percentage
Sex	Male	363	71.5%
	Female	145	28.5%
Place of residence	City	260	51.2%
	Village	247	48.6%
	No information	1	0.2%

Table 2. Prevalence of risk factors for coronary heart disease in the studied group.

Variable		N	Percentage*
Risk factors	Hypertension	334	65.7%
	Dyslipidemia	176	34.6%
	Cigarette smoking	163	32.1%
	Diabetes	125	24.6%
	Obesity	98	19.3%
	No information	64	12.6%
Treatment of hypertension	Hypertension treated with pharmacotherapy	216	42.5%
	Hypertension not treated with pharmacotherapy	118	23.2%
	Without hypertension	174	34.3%
Type of diabetes	Type 2 diabetes	92	18.1%
	De novo diabetes	36	7.1%
	Type 1 diabetes	2	0.4%

* The sum does not have to amount to 100%, as there may be several factors in one person.

Table 3. Success of the treatment in patients with myocardial infarction treated with PCI.

Variable		N	Percentage
Success of the treatment	No	74	14.6%
	Yes	434	85.4%

Correlations of variables influencing the success of the treatment

In the study group, the success of the treatment was defined and was determined by the occurrence of two factors; namely patient survival and thrombolysis in myocardial infarction (TIMI) risk score in the infarction vessel at level 3. In this way, the patients were divided into two groups based on the success of their PCI treatment, as shown in Tab. 3. Treatment success with PCI was achieved in 434 patients (85.4%) but was unsuccessful in 74 patients (14.6%).

Risk factors for ischemic heart disease and the success of the treatment

Tab. 4 presents the results of the analysis of the success of the treatment in relation to risk factors for ischemic heart disease.

The first risk factor analyzed was hypertension. The study group was divided into two groups: subjects with hypertension and subjects without hypertension. In this respect, one can speak of a statistically significant rela-

tionship of hypertension with successful treatment outcome. The success of the treatment in the hypertensive group was statistically significant (p=0.0425). Following the analysis of the success of the treatment in relation to diabetes and obesity, there was no statistically significant relationship between the prevalence of diabetes and obesity and the success of the treatment in patients with a heart attack. A statistically significant effect on treatment success in patients with lipid disorders. More cases in which treatment was unsuccessful were observed in the group of patients who had no previous treatment for lipid disorders (20.2% vs. 4.0%; p=0.0000). Significantly more cases of treatment failure were found among people who were non-smokers (17.4% vs. 8.6%; p=0.0087).

Table 4. Treatment success and hypertension, diabetes, obesity, hyperlipidemia, smoking.

Success of the treatment	Hypertension (p = 0.0425)		
	Yes	No	Total
No	41 (12.3%)	33 (19.9%)	74
Yes	293 (87.7%)	141 (81.0%)	434
Total	334	174	508
	Diabetes (p = 0.8173)		
	No	Yes	Total
No	55 (14.4%)	19 (15.2%)	74
Yes	328 (85.6%)	106 (84.8%)	434
Total	383	125	508
	Obesity (p = 0.4683)		
	No	Yes	Total
No	62 (15.1%)	12 (12.2%)	74
Yes	348 (84.9%)	86 (87.8%)	434
Total	410	98	508
	Hyperlipidemia (p = 0.0000)		
	No	Yes	Total
No	67 (20.2%)	7 (4.0%)	74
Yes	256 (79.8%)	169 (96.0%)	434
Total	332	176	508
	Smoking (p = 0.0087)		
	No	Yes	Total
No	60 (17.4%)	14 (8.6%)	74
Yes	285 (82.6%)	149 (91.4%)	434
Total	345	163	508

p-test probability value calculated using the Chi-square independence test.

Discussion

Among the risk factors studied for ischemic heart disease, hypertension was the most common among the studied patient group (65.7%). A higher mortality rate was observed in patients who had not been diagnosed with hypertension by the time of heart attack and had never been treated for this reason. In this group of patients, death occurred in every sixth case, which translates to approximately 16%. Our data also shows that patients with hypertension had a larger number of significantly narrowed coronary vessels. According to some authors, the importance of hypertension as a risk of cardiovascular events decreases with age, and its impact on the course of acute coronary syndromes is not assessed unambiguously [15]. Similar conclusions arose from the EUROASPIRE II study conducted in 15 European countries, where hypertension was found in 50% of patients after myocardial infarction [16]. The study by Auresus et al., reached a different conclusion however, and showed that in-hospital mortality was significantly higher in patients with normal blood pressure values compared to patients with hypertension [17]. Interesting conclusions regarding the association of hypertension with successful treatment of myocardial infarction are also provided by Jonas et al., who did not observe a difference in in-hospital mortality in three groups of patients (normal blood pressure, elevated blood pressure and hypertension) admitted to hospital due to myocardial infarction. Furthermore, there was also no significant difference during the annual mortality observation in the studied groups [18]. The GUSTO I study also did not confirm the influence of elevated blood pressure on survival [19].

Another analyzed risk factor for ischemic heart disease was obesity. The observations in our study suggest rather surprisingly, that mortality risk as a result of STEMI infarction, was lower in patients with diagnosed obesity. Tomaszuk et al. arrived at a similar conclusion in their study, following the evaluation of the impact of BMI on long-term survival in PCI-treated patients with STEMI infarction [20]. In their study, there were no differences in 30-day and annual mortality between patients with BMI below 25 kg/m^2 and patients with BMI above 25 kg/m^2, but surprisingly patients with BMI above 25 kg/m^2 had better 5 years survival and this was independent of the presence of other risk factors for myocardial infarction [20].

In our study population, diabetes as a risk factor for myocardial infarction constituted 24.6%. Type 2 diabetes predominated (18.1%), *de novo* diabetes was diagnosed in 7.1% of hospitalized patients. The results obtained from the study did not show a statistically significant relationship between the incidence of diabetes and the successful treatment of STEMI myocardial infarction. Based on data from the HCA report, which included 3,139 PCI-treated patients with myocardial infarction, 23.5% of patients were found to have diabetes. There were no significant differences in treatment outcomes during hospitalization and PCI. After a year, patients with diabetes underwent more re-revascularization of the same lesion and more revascularization of coronary vessels [21].

Our findings regarding cigarette smoking as a risk factor for myocardial infarction and the impact on the success of PCI treatment were unexpected. Overall, cigarette smokers accounted for 32.1% of the population surveyed and there were significantly more treatment failures observed among non-smokers (17.4% vs. 8.6%). In addition, there were more cases of significant stenosis of at least one vessel among those who did not smoke, as well as a larger number of vessels with significant nar-

rowing of the lumen. These results are partially by Zębik et al., who showed that patients with STEMI infarction with multivessel disease reported less smoking than in patients with single-vessel disease [22]. In addition, these conclusions were like those of studies carried out by Zielińska et al., the aim of which was to assess the risk factors for death in recent myocardial infarction after reaching the department of interventional cardiology. Among patients who died in the first day of hospitalization, nicotinism was reported less frequently [23].

Another of the risk factors for ischemic heart disease is hyperlipidemia. Based on the analysis of the collected material, it was observed that patients who did not have a history of diagnosed and treated hyperlipidemia were characterized by a higher rate of treatment failure. In addition, significantly fewer deaths were found among people with diagnosed hyperlipidemia. This is probably because people with diagnosed hyperlipidemia are under constant medical supervision and take cholesterol-regulating drugs.

The results of the Multicenter Health Survey (WOBASZ) conducted in Poland in the period from 2000 to 2005 showed lipid disorders in 70% of Poles above 18 years of age [24]. In turn, in studies conducted by Bachórzewska-Gajewska et al., among 200 patients who underwent coronary angiography at the Invasive Cardiology Clinic of the Medical Academy in Bialystok in 2007, 60.8% of the respondents admitted having hypercholesterolemia and 9% of the examined patients were untreated. [25]

The results of the NATPOL 2011 study proved that lipid metabolism disorders are the most frequent risk factor for ischemic heart disease in the general population of adult Poles, and the incidence is nearly twice as high as the prevalence of hypertension and almost three times higher than the incidence of obesity. In addition, the results of the cited study indicate that in as many as 65% of patients' hypercholesterolemia remains undiagnosed and therefore not treated [25].

In conclusion, the treatment of patients with myocardial infarction has been one of the most serious challenges of medicine for many years. The success of treatment is determined by many factors, including the risk factors for ischemic heart disease, the time elapsed from the onset of symptoms to the beginning treatment, number and degree of coronary stenosis. The success of the treatment is also influenced by the activities of the whole group of people, ranging from the patient himself, through the primary care physician, the emergency medical team, to the cardiologist working in the hemodynamic laboratory. For these reasons, it is important to promote all activities within the framework of broadly understood health education aimed at the knowledge of risk factors for myocardial infarction, as well as diagnosing the symptoms of myocardial infarction and the operation of the emergency medical system itself.

Conclusions

Among the analyzed behavioral and somatic factors, the risk factors for treatment failure in PCI patients were untreated hypertension, hyperlipidemia and negative history of cigarette smoking. The analysis of health behaviors and factors considered to be the risk of coronary heart disease requires further research.

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COMPARATIVE ANALYSIS OF SOCIOECONOMIC, BEHAVIOURAL AND BIOLOGICAL FACTORS BETWEEN HEALTHY INDIVIDUALS AND PATIENTS WITH NEWLY DIAGNOSED DIABETES IN THE LUBUSKIE VOIVODESHIP

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: The most effective way to prevent an increasing diabetic population lies in early detection of risk factors and diagnosis of carbohydrate metabolism disorders.

Aim of the study: The study aimed at determining socio-economic variables, lifestyle behaviours and biological factors differentiating patients with newly diagnosed diabetes from diabetes-free individuals.

Material and methods: Assessment of diabetic vs. non-diabetic individuals was performed according to the American criteria issued by the Commission on Social Determinants of Health as well as the FINDRISC form, which helps identify patients who are at risk of developing type 2 diabetes on the basis of multi-factorial determinants of its development. The research was conducted in 2018 among 1167 primary health care patients from Lubuskie Voivodeship using a diagnostic survey method which interviewed the respondents according to the FINDRISC standard questionnaire.

Results: The group of healthy patients was similar to the group of patients with newly diagnosed diabetes with respect to variables such as age (p=0.713), sex (p=1), place of residence (p=1), level of education (p=0.076), professional activity (p=0.758), BMI (p=0.133), waist measurement (p=0.665), frequency of fruit and vegetables intake (p=0.572), frequency of taking hypotensive medications (p=0.176), frequency of diabetes occurrence in the family history (p=0.227) and physical activity (p=0.321).

Conclusions: Early detection of carbohydrate metabolism disorders, with the use of standardised tools that assess diabetes development, appears to be essential in the prevention of this disorder. Therefore, there is a strong need to create a tool adjusted to socio-demographic factors such as geographical location, economic conditions and lifestyle. Additionally, active and massive screening for carbohydrate metabolism disorders in patients with a low risk of diabetes seems to be crucial in its prevention.

KEYWORDS: patients, type 2 diabetes mellitus, prediabetic state

Background

Biopsychosocial determinants of diet-dependent disorders, including diabetes, generate a number of individual differences in predispositions, burdens and the course of the disease. Being aware of the variables, especially in the area of economic status, life and work conditions, socio-cultural context, individual lifestyles or biological determinants, has huge preventive value. Recent decades have resulted in significant scientific progress in primary prophylaxis for type 2 diabetes, its treatment as well as presentation with coexisting diseases and associated complications. Although measures to circumvent the growing diabetes pandemic are being introduced and implemented worldwide, scientific

progress in the area of diabetes does not align with real world public health improvements to address the disease. Over the past 30 years, the number of adults with diabetes has quadrupled globally, increasing from 108 million in 1980 to 463 million in 2020, while the age-standardised global prevalence has doubled from 4.7% to 8.5%. In the USA alone, one in 11 people was diagnosed as a diabetic [1], and expenditure on diabetes is among the highest of all spending for public health and in the health care sector. In Europe, 59 million people are affected by the disorder and it is estimated that by 2045, the number will have increased to approximately 70 million. In Poland, the overall adult population of the country is 28,891,100, of which 8.1% suffer from diabetes, making up 2,344,600 individual cases of the disorder [2].

World economic analysis points out the high costs associated with the treatment of diabetes. Research from the US shows that it remains the most expensive chronic condition. A diabetic patient spends 2.3 times higher in treatment costs than their age and sex-related non-diabetic counterparts. It was reported that in 2017, one in four American dollars spent on medical care was spent on diabetes treatment [3]. Therefore, we can observe a real precipice between the development of effective measures to prevent and treat diabetes, and existing health care systems that have high treatment costs for the disease.

Raising awareness about diabetes, particularly its prevention, has become a social challenge in the European region. Diverse initiatives including the mobilisation of patients, health care workers, partners and decision-makers have not brought radical changes thus far. Therefore, supporting physical and social lifestyle changes has becoming increasingly important. Assessing the plethora of factors that influence the development of diabetes requires a holistic approach. On the other hand, the impact of environmental and personal factors, which need to be addressed through coordinated and multi-sector approaches, is only possible when they are well-known and well-defined. The recognition of these factors will allow for the support of patients who are at high risk of diabetes at the national, regional and most importantly, local level. Urbanisation and socioeconomic status are primary factors that influence disease indicators in research on diabetes prevalence, introducing interesting differences between population groups. After a diabetes diagnosis, there is an urgent need for the effective implementation of interventions.

A complex approach to the development, management and assessment of interventions promoting equity in the prevention and treatment of diabetes is necessary. In the US, social determinants of health (SDOH) have a huge impact on health inequities in health care [4]. The basic components of SDOH based on the conceptual framework of the CSDH (Commission on Social Determinants of Health) include: (a) the socioeconomic and political context (e.g. the labour market, the educational system and political institutions including the welfare state), (b) structural determinants and socioeconomic position (e.g. income, education, occupation, social class, gender, race) and (c) intermediary determinants (e.g. material circumstances, social-environmental or psychosocial circumstances, behavioural and biological factors, the health system as a social determinant of health). Behavioural and biological factors include nutrition, physical activity, tobacco consumption, alcohol consumption and genetic factors [5]. (Fig. 1)

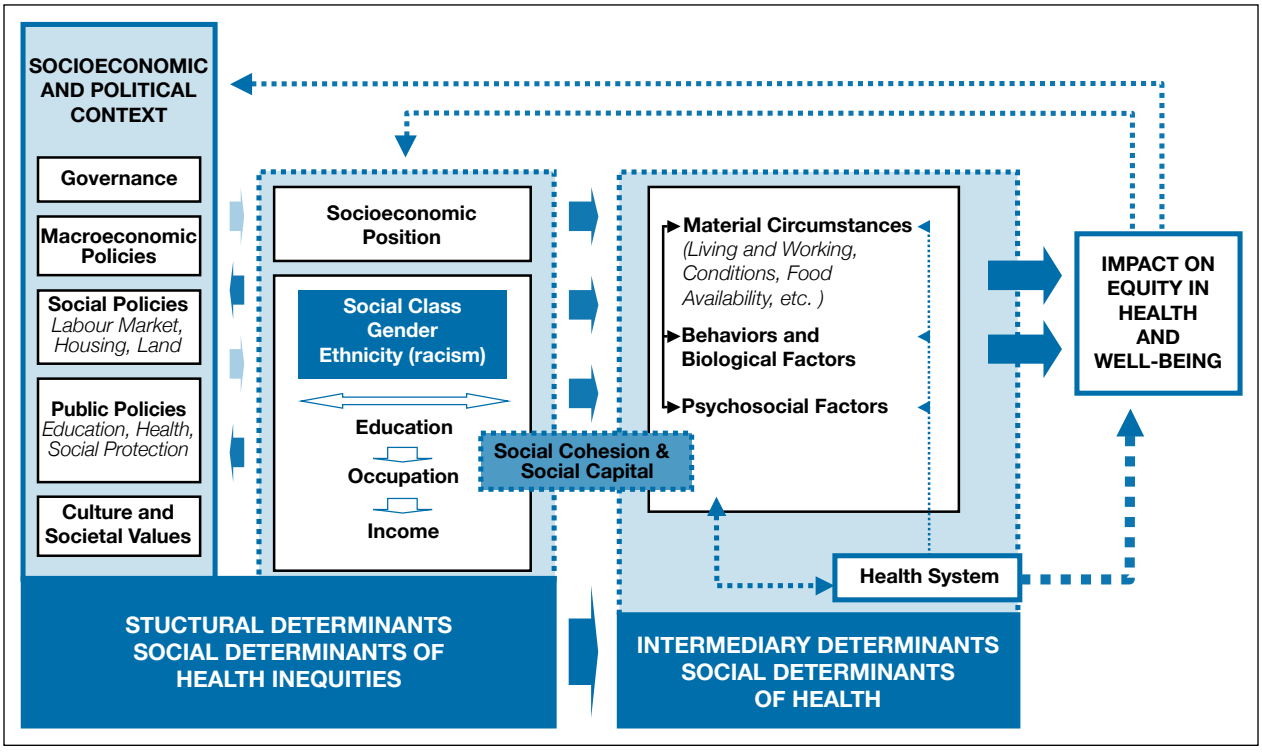

Figure 1. The CSDH conceptual framework [5].

The areas of influence are co-dependent rather than independent, which appears to be a significant differentiating factor when considering interventions. SDOH has a significant influence on health and diabetes development. Consideration of the influence of these factors on medical interventions for diabetes appears to be a priority as they might result in the improvement of prophylactic actions [6]. Diabetes is the fourth most prevalent health issue in Lubuskie Voivodeship, right after diseases of the circulatory, musculoskeletal, connective tissue and digestive systems [7]. Diabetes incidence in Lubuskie Voivodeship is shown in Tab. 1.

Despite advances in treatment and care for the disease, diabetes is still diagnosed too late. Early identification of risk factors and carbohydrate metabolism disorders can be key in preventing the alarming increases in diabetic patients in Poland and worldwide.

Aim of the study

The study aimed at determining socio-economic variables, lifestyle behaviours and biological factors differentiating patients with newly diagnosed diabetes from diabetes-free individuals according to the American criteria issued by the Commission on Social Determinants of Health as well as the FINDRISC form, which helps identify patients who are at risk of developing type 2 diabetes on the basis of multi-factorial determinants of its development.

Material and methods

Study design

A fundamental aspect of the program was conducting screening tests for diabetes in a population of working individuals with the highest risk of developing diabetes. The program received a positive review from the Agency for Health Technology Assessment and Tariff Systems (no. 8/2017 from January 16th, 2017).

Setting

The study was carried out from January to December 2018 in Polish primary health care patients in Zielona Góra (Lubuskie Voivodeship) as part of the "Health policy program of early detection and prevention of diabetes and its complications in professionally active people in Lubuskie Voivodeship". The program consisted of 5 stages, with results analysed from the first stage which included familiarisation with the program inclusion criteria, identification of people with carbohydrate metabolism disorders and preliminary qualification for the program. The research was conducted in the Primary Health Care Clinic 'Medkol' in Zielona Góra. The opportunity to participate in the program was announced and advertised in local media and across health care institutions. All adults were permitted to take part in the research study by coming to the clinic and filling out the FINDRISC, RODO and the research consent forms in the diabetes educational office in the presence of a nurse. If patients achieved ≥ 15 points, they were qualified for a OGTT (Oral Glucose Tolerance Test) in a certified analytical laboratory with the use of fluorine plasma.

Participants

The inclusive criteria consisted of professional activity age ≥15, not being diagnosed with diabetes (at time of study), not having been subjected to diabetes screening tests in the last 12 months, consent for the research study, achieving ≥15 points in the FINDRISC test (high and very high risk of developing diabetes) and performing the OGTT.

The research was carried out in compliance with the Declaration of Helsinki. Before the examination, each participant was informed about the aim, the method and the possibility of withdrawal at any stage of the study. The patients were assured full anonymity and freedom of participation. The research was conducted after receiving participants' consents in writing.

Table 1. The number of patients by age group diagnosed with ICD-10 related to diabetes treated in the province Lubuskie in 2017 [7].

Diagnosis of a disease entity ICD-10	Total number of people	Patient age ranges							
		0-18	19-29	30-39	40-49	50-59	60-69	70-79	≥80
E10-E10.9 Diabetes mellitus type 1	10,880	378	422	595	714	1 475	3,432	2,321	1,543
E11-E11.9 Diabetes mellitus type 2	51,698	109	300	1,055	2,665	7,556	19,653	12,739	7,621
E12-E12.9 Diabetes associated with malnutrition	28	0	0	1	2	3	11	6	5
E13-E13.9 Other specific forms of diabetes	812	9	74	173	111	141	191	85	28
E14-E14.9 Diabetes mellitus not specified	1,250	24	46	84	89	190	432	262	123
TOTAL	56,821	451	713	1,626	3,089	8,205	20,982	13,553	8,202

Variables

Variables were divided into two groups according to the CSDH criteria:

a. Structural determinants and socioeconomic position – age, sex, level of education, professional activity and the place of residence
b. Intermediary determinants (behavioural and biological factors) – physical activity, frequency of fruit and vegetables intake, regularity of taking hypotensive medications, diagnosis of diabetes in the family history, BMI, waist measurement, OGTT results, increased glycaemia in the past.

Study size

A total of 1167 non-diabetics were included in the study. 124 of them achieved below 15 points in the FINDRISC questionnaire (healthy patients) and 1043 scored 15 or more points, which meant they were at risk or high risk of diabetes development. In the latter group, 621 of the respondents were tested with the OGTT and 309 of them had a proper result while 254 were found to have pre-diabetes syndrome and 58 achieved results that were above normal, which indicated diabetes (unhealthy patients).

The study compared a group of 58 diabetics to a group of 58 healthy patients who were randomly chosen for the study (out of 124 individuals who achieved a result below 15 points in the FINDRISC questionnaire). The schematic for the group selection is shown in the Fig. 2.

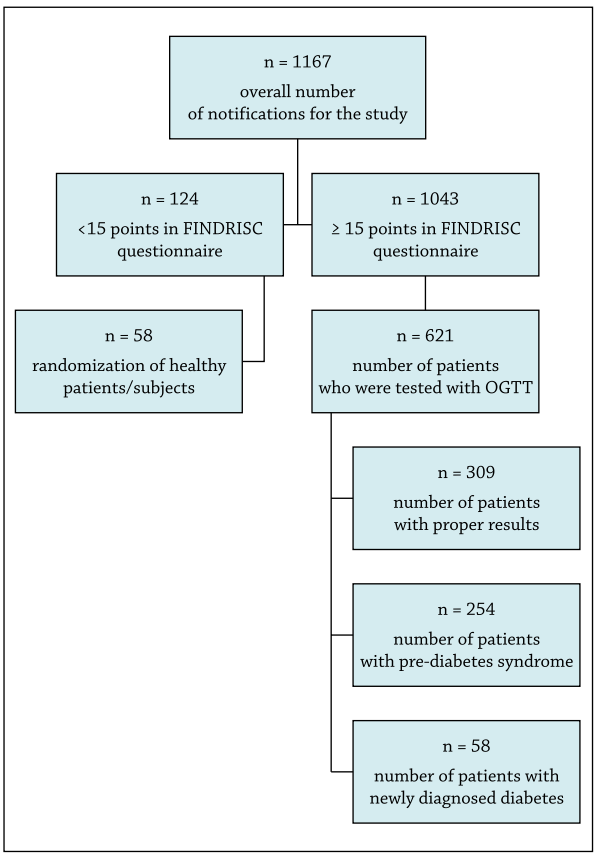

Figure 2 Schematic of the sample selection of the study.

The study was carried out using a diagnostic survey method and an interviewing technique with the use of a standardised FINDRISC questionnaire and a proprietary questionnaire for collecting socio-demographic data. To calculate BMI, a medical scale and a centimetre tape were used. The FINDRISC questionnaire was created by Finnish scientists, who were the authors of a first in Europe and the world National Program of Diabetes Prevention designed on the basis of the Data sources/measurement results of a randomised research study called the Finnish Diabetes Prevention Study. It was a tool to estimate the risk of diabetes occurrence in the next 10 years. The FINDRISC questionnaire consists of 8 questions concerning age, BMI, waist measurement, physical activity, fruit and vegetables intake, taking hypotensive medications and improper level of glucose detected on an empty stomach (i.e. fasting). If the result is below 7 points, it is estimated that the risk of diabetes is low (1 in 100 patients may develop diabetes). If the score is 7-11 points, the risk is slightly elevated and 1 in 25 patients will develop diabetes. If the score is in the range of 12-14 points, the risk is moderate which means that 1 in 5 patients will develop the disorder. If the score is between 15-20 points, the risk is high and 1 in 3 patients will suffer from diabetes while a score above 20 means very high risk and every second patient is likely to develop the disorder [8].

The questionnaire is very specific and responsive, and is recommended by the International Diabetic Federation to be used in population programs. It is available as an electronic form on the IDF website in various language options. What is more, patients who had a score of 15 points or higher on the FINDRISC questionnaire were tested with OGTT in a certified analytical laboratory with the use of fluoride plasma. Currently, the Polish Diabetes Association (PTD) does not recommend testing glycated haemoglobin (HbA1c) as a diagnostic measure for diabetes because it is not standardised in Polish laboratories. The OGTT was carried out, without the earlier limitation of carbohydrate intake, in the morning, on an empty stomach, in rested patients and after a night's sleep. The two-hour interval between intake of 75 g of glucose liquid and blood sample collection was spent with patients resting. Glucose concentration marking was done on venous blood plasma [9]. Results of the OGTT were assessed by the nursing coordinator of a program who specialises in diabetology. Patients at risk of diabetes were referred to a diabetes clinic in primary health care institutions. Patients with a pre-diabetes syndrome were qualified to a second stage of the program while healthy individuals were advised on healthy lifestyle approaches and modification of diabetes risk factors.

Statistical analysis

Correlation of qualitative variables in groups was calculated with the use of the Chi-squared test (with Yates' correction for tables 2x2) or Fisher's test if the

expected multiplicity values were low. The correlation of quantitative variables in both groups was obtained by Student's t-test (if the variable displayed a normal standard distribution) or Mann-Whitney's test (if not normally distributed). The correlation of qualitative variables in three or more groups was assessed by ANOVA variance analysis (if the variable displayed standard distribution in these groups) and Kruskal-Wallis test (if not a standard distribution). The normality of the variables' distribution was calculated with the Shapiro-Wilk test. The analysis assumed statistical significance at the level of 0.05. Therefore, values below 0.05 were interpreted as significant correlations. Analysis was performed in the R program, version 3.5.3. [10].

Results

Participants

The group of healthy respondents consisted mostly of people over 64 (37; 63.79%) and those between 55-64 (12; 20.69%) and who were residents of cities (49; 84.48%). The group of patients with newly diagnosed diabetes showed similar statistics – these can be viewed in Tab. 2.

Analysis of structural determinants and socioeconomic position

It was found that age, sex, place of residence, education and professional activity did not differentiate patients who had or did not have diabetes (Tab. 2).

Intermediary determinants – analysis of behavioural and biological factors

The group of healthy individuals was similar to the group of those with newly diagnosed diabetes with respect to variables including BMI (p=0.133), waist measurement (p=0.665), frequency of fruit and vegetables intake (p=0.572), regularity of taking hypotensive medications (p=0.176) and cases of diabetes in the family (p=0.227). For BMI, obese individuals constituted the largest group among both healthy respondents (79.31%; 46) and diabetics (91.38%; 53). For waist measurement in both groups, measurements of over 102 cm for men and over 88 cm for women were the most common (84.48%; 49 of the healthy group and 89.66%; 52 of diabetics). Respondents in both groups did not perform any physical activity for at least 30 minutes a day (94.83%; 55 of the healthy group and 87.93%; 51 of diabetics). Most respondents consumed fruit and vegetables daily (62.07%; 36 in the healthy group, 55.17%; 32 in diabetics) and took hypotensive medications (56.90%; 33 of the healthy group and 70.69%; 41 of diabetics) (Tab. 3).

Non-diabetic individuals (healthy) differed significantly from diabetics only with regard to OGTT results (p<0.001) and level of glycaemia (p=0.001). Diabetic patients displayed higher OGTT results at the '0' and '120' minute periods, and also more frequently showed higher results of glycaemia in the past compared to the healthy group (Tab. 3). The median OGTT level at the '0' minute time in diabetics was 127 mg/dL (min-max; 83-229) compared to 93 mg/dL (min-max; 33-99) in non-diabetics. The median OGTT at 120 minutes was 225 mg/dL (min-max; 83-351) in diabetics and 94 mg/

Table 2. Analysis of determinants between healthy and diabetic respondents in reference to socioeconomic variables.

Variables		Healthy patients n=58	Patients with newly diagnosed diabetes n=58	Total	p*
Age	< 45 years	5.17% (3)	8.62% (5)	6.9% (8)	0.713 F
	45-54 years	10.34% (6)	4 (6.90%)	8.62% (10)	
	55-64 years	20.69% (12)	15 (25.86%)	23.28% (27)	
	> 64 years	63.79% (37)	34 (58.62%)	61.21% (71)	
Sex	Women	43.10% (25)	25 (43.10%)	43.10% (50)	1 chi^2
	Men	56.90% (33)	33 (56.90%)	56.90% (66)	
Place of residence	City	84.48% (49)	50 (86.21%)	85.34% (99)	1 chi^2
	Village	15.52% (9)	8 (13.79%)	14.66% (17)	
Education	Basic	3.45% (2)	17.24% (10)	10.34% (12)	0.076 chi^2
	Vocational	24.14% (14)	18.97% (11)	21.55% (25)	
	Secondary	50% (29)	50% (29)	50.00% (58)	
	Higher	22.41% (13)	13.79% (8)	18.10% (21)	
Professional activity	Working	27.59% (16)	29.31% (17)	28.45% (33)	0.758 F
	Pensioner	67.24% (39)	62.07% (36)	64.66% (75)	
	Disability Pensioner	5.17% (3)	8.62% (5)	6.9% (8)	

Legend: chi^2 – Chi-squared test, F – Fisher's test (low expected values in the table).

Table 3. Analysis of determinants between healthy and diabetic respondents in reference to selected variables of the FINDRISC questionnaire.

Variables		Healthy patients n=58	Patients with newly diagnosed diabetes n=58	Total	p*
BMI	Normal weight	3.45% (2)	0% (0)	1.72% (2)	0.133 F
	Overweight	17.24% (10)	8.62% (5)	12.93% (15)	
	Obesity	79.31% (46)	91.38% (53)	85.34% (99)	
Waist circumference	M < 94 cm W < 80 cm	3.45% (2)	1.72% (1)	2.59% (3)	0.665 F
	M 94-102 cm W 80-88 cm	12.07% (7)	8.62% (5)	10.34% (12)	
	M > 102 cm W > 88 cm	84.48% (49)	89.66% (52)	87.07% (101)	
Physical activity at least 30 minutes a day	Yes	5.17% (3)	12.07% (7)	8.62% (10)	0.321 chi^2
	No	94.83% (55)	87.93% (51)	91.38% (106)	
Eating fruit and vegetables	Daily	62.07% (36)	55.17% (32)	58.62% (68)	0.572 chi^2
	Irregularly	37.93% (22)	44.83% (26)	41.38% (48)	
Antihypertensive drugs	No	43.10% (25)	29.31% (17)	36.21% (42)	0.176 chi^2
	Yes	56.90% (33)	70.69% (41)	63.79% (74)	
Diabetes in the family	No	25.86% (15)	36.21% (21)	31.03% (36)	0.227 chi^2
	Yes: at grandfather's or cousin's	36.21% (21)	22.41% (13)	29.31% (34)	
	Yes: at the parent, siblings or child	37.93% (22)	41.38% (24)	39.66% (46)	

Legend: BMI – body mass index, chi^2 – Chi-squared test, F – Fisher's test, M – man, W – woman.

Table 4 Analysis of determinants between healthy patients and diabetic patients with respect to OGTT results and glycaemia level

Variables		Healthy patients n=58	Patients with newly diagnosed diabetes n=58	Total	p*
OGTT 0 min [mg/dl]	M±SD	91.09±9.43	126.22±23.55	108.66±25.1	<0.001 NP
	Median	93	127	98.5	
	Quartiles (Q1-Q3)	89-96	109.75-137.5	92.75-127	
OGTT 120 min [mg/dl]	M±SD	96.78±23.75	228.58±44.08	159.08±74.66	<0.001 P
	Median	94	225	135.5	
	Quartiles (Q1-Q3)	78.25-114.75	204.75-259.25	93-221.75	
Elevated glycaemia in previous examinations	No	63.79% (37)	31.03% (18)	47.41% (55)	0.001 chi^2
	Yes	36.21% (21)	68.97% (40)	52.59% (61)	

Legend: p = normality of variance, parametric analysis, Student t-test, NP – no normality of variance, non-parametric analysis, Mann-Whitney's test, M – mean, SD – standard deviation.

dL (max-min; 53-139) in the healthy examinees. The latter had glucose levels on an empty stomach at levels below 70 mg/dL, which does not meet the criterion for pre-diabetes or diabetes conditions, but requires further observation for carbohydrate metabolism disorders (Tab. 4).

Discussion

Many aspects of medical care lack regular and systematic assessments of social and economic situations of patients including education levels, professional status or household income. This is a concern as social and economic factors may have a significant impact on determining an individual's health condition and their health care experience in terms of accessibility and overall results [11]. With respect to this, based on the CSDH model, it was found that it is essential to examine the socioeconomic, behavioural and biological variables that differentiate diabetes from non-diabetes patients.

Key results

The comparative analysis of socioeconomic, behavioural and biological variables showed no significant differences between the two participant groups (diabetic

and non-diabetic). The only difference was detected in OGGT and glycaemia results. The levels of both of these indicators was higher in diabetes patients compared to healthy participants.

Interpretation

Structural determinants and socioeconomic position

A Healthy People 2020 goal for the diabetes health indicator is to "reduce the disease and economic burden of diabetes mellitus, and improve the quality of life for all persons who have, or are at risk for diabetes" [12]. In the US, social determinants of health are being increasingly recognised for their relationship to the soaring incidence of type 2 diabetes [13]. Clark et al. suggested that social determinants of health and diabetes need to be considered when focusing on improving diabetes outcomes [12].

There is a plethora of research showing a relationship between social determinants of health and health condition among diabetes patients. Kollannoor-Samuel et al. found that those with lower socioeconomic status were more likely to have higher HbA1c [14]. Osborn et al. showed that higher HbA1c is associated with low health literacy [15]. In a study by Pirdehghan et al., problematic health literacy could increase the chance of uncontrolled diabetes by more than three times [16]. Socioeconomic status was a statistically significant independent predictor of mortality and morbidity for adults with type 1 diabetes in a study by Scott et al. [17]. Other researchers have reported that lower levels of education and income were found to be associated with higher mortality among diabetic individuals [18,19]. Moreover, there are studies which indicate particular socio-demographic factors as predisposing for diabetes occurrence. For example, Suwannaphant et al. showed that individuals who were of the female gender, of old age and low educational attainment were vulnerable to diabetes mellitus [20].

This self-reported study differs, however, from the research cited above, as it focused on comparing socioeconomic variables between healthy and diabetic patients *de novo*. The results displayed no significant correlations between age, sex, place of residence, level of education and professional activity. It might be slightly surprising, but suggests that the risk of diabetes might be the same regardless of socio-demographic determinants or professional activity. However, proving this hypothesis requires further studies. The presence of no socioeconomic differences may also be explained by the screening method used in the research (only non-diagnosed patients volunteered). It is highly probable that if we had compared a group of diagnosed diabetics affected by the disorder for many years with healthy individuals, the socio-demographic differences would have been detectable. However, the aim of the research was different. The results suggest that a deeper consideration is needed for the relevance and necessity of regular mass screening examinations to detect carbohydrate tolerance disorders in adult patients at a primary health care level irrespective of age, sex, place of residence or professional activity. We suggest the FINDRISC questionnaire and the OGTT, which are also recommended by the Polish Diabetes Association as successful diagnostic tools in detecting carbohydrate intolerance disorders [9] and may be prescribed by nurses and doctors as a self-examination. It is also advised to educate patients how to use the tools and how to evaluate their own risk of diabetes development.

Behavioural and biological factors

The data collected showed that both study groups were dominated by obese respondents whose waist measurement exceeded 102 cm in men and 88 cm in women, who do not participate in any physical activities at least 30 min a day, take hypotensive medicines and who are genetically predisposed to diabetes due to a family history of the disease. Inadequate physical activity accompanied with poor dietary habits are associated with the development of obesity and type 2 diabetes mellitus [21]. Many current type 2 diabetes interventions focus on biologic and behavioural factors, such as symptoms, diet and physical activity [13] because lifestyle and health behaviours determine human health to the highest degree [22]. A lot of studies have shown that patients with chronic diseases including diabetes mellitus are characterised by a higher level of pro-health behaviours when compared to healthy individuals. The fact of being chronically ill motivates patients to adjust their behaviours. For example, Juczyński showed that the average rate of pro-health behaviours was higher in a group of diabetics than in healthy adults [23]. Another example is a study by Kurpas et al. which demonstrated that diabetes patients had the highest rates of pro-health behaviours when compared to patients suffering from circulatory and nervous system diseases. Moreover, the results achieved were related to the external health locus of control (i.e. a patient's belief that their health is dependent on other peoples' actions, particularly those of medical staff) [24]. By analysing BMI, waist measurement and physical activity, it might be concluded that the level of pro-health activities was not high in both groups examined in the self-study, although most patients were already on hypotensive medicines (suffering from one chronic disease) and were aware of genetic predispositions towards diabetes. It is quite likely that newly diagnosed diabetes patients, while being supported by proper education from health care professionals, will be motivated to change their lifestyle behaviours in the future and change their biological parameters. However, validating the hypothesis would require further analysis.

Limitations of the study

The study was limited by the fact that the number of study groups was low and that it was only carried out in one voivodeship.

Conclusions

1. Early detection of carbohydrate metabolism disorders with the use of standardised tools, which assess the development of diabetes in patients, seems to be an essential factor in diabetes prevention.
2. There is a strong need for the development of a tool tailored to modifiable socio-demographic factors such as geographical location, economic status and lifestyle.
3. Screening for carbohydrate metabolism disorders in people with a low risk of diabetes development might constitute a key preventive measure.

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VARIABLES MODULATING THE SENSE OF SAFETY IN NURSES AND MIDWIVES FACING EPIDEMIOLOGICAL ENDANGERMENT OF COVID-19

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ABSTRACT

Background: Nurses and midwives are currently facing new challenges at work related to the epidemiological situation caused by the occurrence of a new SARS-CoV-2 pathogen. An immediate concern during the pandemic is a complete shortage of publications or research concerning safety procedures for the medical staff.

Aim of the study: The aim of the study was to examine the factors affecting work safety for nursing and midwifery teams, to raise awareness about those risks, and gain the knowledge to minimize occupational risk in the pandemic era.

Material and methods: The research group consisted of 550 professionally active nurses and midwives who were interviewed with the use of surveys. The author's survey questionnaire contained 33 questions, including 13 open and 20 closed ones.

Results: The medical staff usually felt safe at work 73.8% of the time (406); however, 7.5% (41) of the respondents always declared that positive feeling. The sense of safety at work in relation to the COVID-19 pandemic decreased to 82.5% (454). Occupational and epidemiological training was attended by 73.45% (404) of the staff. However, only 57.6% (317) of them were instructed on how to proceed with a patient suspected of having a COVID-19 infection, while 42.40% (233) were not. The respondents who did not take part in the training felt less secure more frequently ($p < 0.05$) than the trained ones. The respondents who were provided with increased accessibility to the personal protective equipment (PPE), rarely experienced a decrease in their sense of safety at work.

Conclusions: The sense of safety at work among medical staff undoubtedly depends on regular training on health and safety measures during epidemiological crises. Participation in training sessions about the procedures connected with COVID-19 endangerment significantly increases the sense of safety at work. Guaranteeing the accessibility of PPE daily also substantially influences the feeling of security among the active medical staff who face increased danger from COVID-19 transmission.

KEYWORDS: viruses, nurses, midwifery, work, epidemiology, methods

Background

Direct exposure to patients and their bacterial flora is an inevitable and constant threat for nursing and midwifery teams. Both professions are regularly subjected to physical, biological, and chemical dangers. Biological pathogens include prions, viruses, protozoans, bacteria, fungi, and parasites [1]. These harmful biological agents might enter the human body through direct skin contact, inhalation, exposure to blood, and bodily excretions. The viability of pathogens on various objects is mostly unknown, and will likely increase in duration [2].

Taking into consideration a long and hidden course of some occupational diseases caused by viruses infecting the nursing staff, the bibliography on the subject contains a lot of articles. The most common viral exposures include the actions of hepatotropic viruses (HBV, HCV), human immunodeficiency virus (HIV), tuberculosis, and flu-like viruses [3,4].

Since 2020, the number of dangerous agents at work for the medical staff has been expanded to include the SARS-CoV-2 virus, which causes COVID-19 disease. The first case was noted in Wuhan in China on 31st December 2019 [5,6]. SARS-CoV-2 is an alarming, almost unknown, and highly infectious pathogen, which might constitute the reason for the development of an occupational disease [7].

Building awareness of the exposure risk at work and the knowledge of proper procedures to minimize these risks are two crucial elements for workplace safety for staff in health centers. The functional organization of the workspace also directly influences the sense of accomplishment and safety [8], which correlates directly with the quality of work.

Safety, according to Maslow, is a basic human need manifested by the lack of fear of one's health and life. It is influenced by the work environment and its organization [8]. Among many studies on the subject, Z. Prażak identifies the most important factors which affect work safety in medical institutions, which include educational enterprises, update training about current standards and post-exposure proceedings, procedure verifications, workplace organization, providing the staff with the PPE, and work ergonomics [8]. The research by A. Garus et al. in 2009, who examined the nursing staff practices, revealed that the knowledge about the routes that infections spread and work safety rules are not sufficient [9].

What is more, K. Kosonóg et al. in 2010 found that the knowledge of asepsis and antisepsis is also not adequate, proving that only 60% of the respondents were aware of the Ayliffes' hand washing technique [10]. Finally, Z. Prażak et al. showed in 2017 that the knowledge of work safety measures among nurses is also low [11,12].

In the face of the danger due to the SARS-CoV-2 exposure, it is extremely vital to increase the sense of safety at work by introducing the epidemiological procedures and guidelines published on the website of the Ministry of Health [13]. Such universal procedures include the post-exposure proceedings and health care of a patient suspected of being infected or with confirmed infection with SARS-CoV-2; disinfection of air in the rooms where the risk of infection by SARS-CoV-2 virus is possible; proper application of the PPE by the staff taking care of the infected or suspected infection by SARS-CoV-2 virus patients, and protective masks [14].

European Centre for Disease Prevention and Control first published an official document related to the prevention and control of the infections while caring for COVID-19 patients in medical institutions on 2nd February 2020 [15]. The document contains regulations connected with staff training and points out the necessary PPE as well as makes employers responsible for controlling the effectiveness of the training and proper usage of the PPE [16].

The organization of staff training for nurses and midwives in the field of occupational safety belongs to the responsibilities of an employer. This responsibility was stated in the Regulation of the Ministry of Economy and Labour issued on 27th July 2004 [17]. According to the regulation, first staff training ought to be given to an employee before starting a job, and then periodically, at least every five years [18,19].

The responsibility for the application and adherence to the procedures in a health institution lies in the people holding coordinating and overseeing positions and an epidemiological nursing specialist. The same rules ought to be applied in the situation of a new epidemiological danger [20], such as the appearance of SARS-CoV-2, which causes COVID-19. Those responsible are the Department of Health Inspection, the Ministry of Health, and the World Health Organization (WHO), that are tasked with formulating new epidemiological procedures and guidelines for nursing and midwifery staff. The knowledge of the regulations and proper access to the PPE has a significant impact on decreasing the in-company infection occurrence and increasing the safety of patients and therapeutic teams that provide health services.

Aim of the study

The primary purpose of the work was to demonstrate the need to improve the quality of work for teams of nurses and midwives by raising their awareness about the risks at work, knowledge of the principles of minimizing occupational risk in the pandemic era.

To achieve this aim, we studied the sense of safety among the nursing and midwifery staff related to the actions undertaken by the employers in the areas such as accessibility to the Personal Protective Equipment (PPE), epidemiological and health and safety training as well as rules of proceeding with a patient suspected of being infected by COVID-19.

Material and methods

Study design

The research was carried out from March to April 2020 among the medical staff endangered by patients who might be carrying or be infected by SARS-CoV-2.

Settings

Epidemiological restrictions and lack of opportunities to cooperate with local health centers made access to medical staff difficult and limited. Therefore, the questionnaire was sent via online platforms, which are commonly used by nurses and midwives.

The procedure for accessing the survey questionnaire was regulated by the rules and was only possible after being accepted by the administrator of each group. The publication of the questionnaire on the

forum for each group had prior administrative consent to the research.

The consent to participate in the survey was voluntary and anonymous. The study was carried out in the spirit of the Declaration of Helsinki, dated in 1975 and amended in 2000 as well as *Good Clinical Practice*.

Data sources/measurement

The method used in the study was a diagnostic survey with the use of an author's survey questionnaire. It contained 33 questions; 13 open and 20 closed ones; 27 – single choice and six multiple-choice ones.

The questionnaire was divided into three parts. The first part was aimed at obtaining socio-demographic data, the level of education, working hours, workplace, and work duties (questions 1–10). The second part was designed to assess the level of work safety before the COVID-19 pandemic. Questions 11–21 aimed to examine the awareness of professional risks and fears connected with starting the job, the frequency of hand disinfection and washing as well as changing protective gloves and personal clothes into workwear. Question 14 was to check the sense of safety at work. Question 15 aimed to get access to the information connected with regular health, safety, and epidemiological training provided by the employers. The third part of the questionnaire contained questions related to work conditions at the time of COVID-19 endangerment (questions 22–33).

Questions 22–24 were directly connected with work during COVID-19 pandemic and the training on the procedures of how to take care of a patient suspected of being infected by the virus (question 22). The questions were designed to collect the information about whether employers increased the access to the PPE and whether the situation connected with COVID-19 had any impact on the level of the sense of safety among nurses and midwives. Questions 29–31 investigated the fear of going to work and performing regular work duties during the pandemic.

Participants

The entering criteria of the participation in the research included age over 18, the license to practice nursing or midwifery, professional activity, being employed in the place where there is a risk of COVID-19 epidemiological danger, and the consent to the research.

The exclusion criteria consisted of the lack of work activity, staying professionally inactive at the time of the COVID-19 pandemic, and the lack of consent for participation in the study.

There were 550 participants qualified for the study, of whom 35.5% were aged 41–50. Most of the respondents were nurses, 95.6% (526), among whom 2.2% (12) were male. The group of midwives constituted 4.36% (24) of the examinees. 54.9% (302) of the nurses and 2.36% (13) of the midwives declared work experience longer than 20 years. Senior nurses and midwives amounted for 57.27% (315) of all the respondents, while 20.50% (113) worked fewer than five years in the profession. For 19.09% (105) of the nurses and 1.45% (8) of the midwives, it was their first year of work experience. Most of the respondents, 83.09% (457), worked in one place. 14.9% (82) of the nurses and 0.72% (4) worked in two places. 0.72% (4) nurses and 0.36% (2) midwives worked in three workplaces. 0.81% (1) nurse worked in four workplaces. 46.4% (249) of the respondents had a university degree: 96.4% (240) nurses and 3.6% (9) midwives. The level of vocational education was not specified by 2.36% (13) respondents. The title of specialist was indicated by 42.2% (232) respondents: 96.55% (224) nurses and 3.44% (8) midwives. The biggest group of the respondents worked in hospital wards – 58.5% (320), and among them, the largest group completed specialization – 46.56% (149) (Tab. 1).

Table 1. Socio-demographic data of the respondents (n=550).

Variables		n	%
Age, years	20–30 years old	113	20.50
	31–40 years old	97	17.60
	41–50 years old	195	35.50
	over 50 years old	145	26.40
Gender	women	538	97.80
	men	12	2.20
Education	medical secondary school	68	12.70
	associate degree	220	41.00
	master degree	249	46.40
Specialization	yes	232	42.20
	no	318	57.80
Profession	nurse	526	95.60
	midwife	24	4.40
Work experience	1–5 years	113	20.50
	6–10 years	51	9.30
	11–20 years	71	12.90
	over 20 years	315	57.30
Workplace	primary Health Clinic/Centre	178	32.54
	specialist's clinic	43	7.86
	hospital ward	320	58.50
	the ER	9	1.65
	long-term nursing home care	35	6.40
	residential home	15	2.74
	nursing facility	3	0.55
	hospice	11	2.01
	others	37	6.76

n – number of respondents, % – percentage in reference to all respondents.

Statistical methods

The research calculations were made with the use of the R software environment for statistical computing – version 3.6.0, PSPP software for analysis, and MS Office 2019. The probability value was presupposed at the level of $p = 0.05$. The variables stated at the nominal scale were analyzed with a chi-squared test. If the conditions did not allow for a chi-squared test, then the

Fisher's test was applied for tables bigger than 2x2. The choice of the test was determined by the distribution of the variables verified by Shapiro–Wilk normality test.

Results

Descriptive data

The results of the survey revealed that 73.8% (406) of the respondents felt safe at their workplace (nurses 96.06%, 390; midwives 3.94%, 16). Only 6.5% (36) declared that they never felt safe (nurses 94.44%, 34; midwives 5.56%, 2) (Fig. 1).

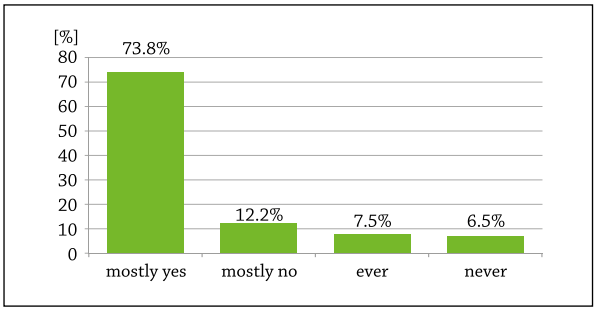

Figure 1. Sense of security of respondents at work (%).

73.45% (404) of the respondents confirmed their participation in the trainings on health, safety, and epidemiological procedures (nurses: 98.26%, 387; midwives: 0.42%, 17) while 36.7% (202) took part in such trainings every 2 years (nurses: 95.54%, 193; midwives: 4.45%, 9). However, 20.4% (112) of the staff were not provided with such training by their employers at all (nurses: 95.54%, 107; midwives: 4.46%, 5). Other forms of training included on admission training, paper version training, cursory training or the training only when the risk arose and was attended by 6.2% (34) of all the surveyed (nurses 94.1%, 32; midwives: 5.9%, 2) (Tab. 2).

Table 2. Regularity of training at work among the research group.

Health and Safety and epidemiological training	n	%
at least once a year	197	35.8
every two years	202	36.7
never	112	20.4
every five years	5	0.9
others	34	6.2
total	550	100

n – number of respondents, % – percentage in reference to all respondents.

Once a year, 35.81% (197) persons took part in the training (nurses 95.94%, 189; midwives 4.06%, 8). In this group, 74.11% (146) nurses and 2.54% (5) midwives almost always felt safe. Despite training once a year, 5.08% (10) of the nurses never felt safe. In a group of medical staff that were trained every two years, they mostly felt safe 71.78% (145) for nurses and 5 (2.47%) for midwives. Among 95.54% (107) nurses and 4.46% (5) midwives who never had training, those that felt mostly felt safe were 33.49% (71) nurses and 3.57% (4) midwives (Tab. 3).

Table 3. Detailed distribution of the sense of safety, depending on the training.

Sense of safety at work		Frequency of Health and Safety and epidemiological training				
		at least once a year	every two years	every five years	never	others
		n (%)	n (%)	n (%)	n (%)	n (%)
ever	nurses	21 (10.66)	10 (4.95)	0 (0)	5 (4.46)	0 (0)
	midwives	3 (1.52)	2 (0.99)	0 (0)	0 (0)	0 (0)
mostly yes	nurses	146 (74.11)	145 (71.78)	0 (0)	71 (63.39)	23 (67.65)
	midwives	5 (2.54)	5 (4.47)	2 (40)	4 (3.57)	2 (5.88)
mostly no	nurses	12 (6.09)	26 (12.87)	3 (60)	23 (20.54)	5 (14.71)
	midwives	0 (0)	1 (0.5)	0 (0)	0 (0)	0 (0)
never	nurses	10 (5.08)	12 (5.94)	0 (0)	8 (7.14)	4 (11.76)
	midwives	0 (0)	1(0.5)	0 (0)	1 (0.9)	0 (0)
respondents in this group	nurses	189 (95.9)	193 (95.54)	3 (60)	107 (95.54)	32 (94.12)
	midwives	8 (4.1)	9 (4.46)	2 (40)	5 (4.46)	2 (5.9)

n – number of respondents, % – percentage in reference to all respondents in this group.

The analysis dependence between the training and their regularity and the sense of safety in the research group showed that the influence of regular training in the field of safety was statistically vital $p<0.05$ (Tab. 4). The average level of sense of security increased with the frequency of training. Persons trained in health, safety, and epidemiological procedures once a year had a significantly higher level of security compared to respondents undergoing training every two years (M=2.96, SD=0.62 vs. M=2.80, SD=0.64, $p<0.001$). In contrast, people undergoing training every two years had a higher level of sense of security compared to those undergoing

Table 4. Dependence between the sense of safety and the frequency of Health and Safety and epidemiological training.

Health and Safety and epidemiological training		χ^2	df	p	M	SD	Me	95% CI	
								low	top
The sense of safety at work	once a year	20.83	2	<0.001	2.96	0.62	3.00	2.87	3.05
	every two years				2.80	0.64	3.00	2.71	2.89
	less than every two years				2.68	0.68	3.00	2.57	2.78

χ^2– test statistics, df – degree of freedom, p – probability value, M – average, SD – standard deviation, Me – median, CI – confidence interval.

training less than every two years (M=2.80, SD=0.64 vs. M=2.68, SD=0.68, p<0.001) (Tab. 4).

The analysis of the results concerning the change in the sense of safety connected with the COVID-19 pandemic showed that in most of the respondents, the sense of safety decreased to a level of 82.5% (454). Only 16.5% (91) of them claimed that the sense of safety at work was not changed during the pandemic.

57.6% (317) of all the respondents were trained at work in matters of new procedures connected with COVID-19 occurrence; nurses 94.95%, (301); midwives 5.05%, (16), whereas 42.4% (233) were not (nurses: 96.57%, 225; midwives: 3.43%, 8) (Tab. 5).

Table 5. Detailed data from training and changes in the safety of nurses and midwives.

Changes in the sense of safety		COVID-19 procedure training			
		yes		no	
		n	%	n	%
decrease	nurses	233	77.4	200	85.84
	midwives	14	87.5	7	3
no change	nurses	66	21.9	22	9.44
	midwives	2	12.5	1	0.43
others	nurses	2	0.66	3	1.29
	midwives	0	0	0	0
respondents in this group	nurses	301	94.95	225	96.57
	midwives	16	5.05	8	3.43

n – number of respondents, % – percentage in reference to all respondents in this group.

Respondents who had no opinion (0.9%, 5) regarding the sense of safety at work during the pandemic were excluded from further analysis (Tab. 6–8).

Respondents undergoing training in COVID-19 procedures significantly less often felt a decrease in the sense of security compared to people who did not undergo such training and significantly more often felt the lack of change in the level of perceived safety (p=0.001) (Tab. 6).

Table 6. Statistically significant differences between the sense of safety and the COVID-19 procedure training in the research group.

Variables			The COVID-19 procedure training		Test results
			yes	no	
The change in the sense of safety	decrease	n	247	207	χ^2=13.462 df=2 p=0.001
		%	77.9%	88.8%	
	no change	n	68	23	
		%	21.5%	9.9%	
The sum of all the answers		n	315	230	–
		%	100%	100%	

χ^2 – test statistics; df – degree of freedom; n – number of respondents; p – probability value.

The accessibility to the PPE provided by an employer before the pandemic outbreak was estimated at the following levels: protective gloves – 99.09% (545); uniforms – 52.91% (291); protective glasses – 25.64% (141); protective head caps – 23.82% (131); shoe protectors – 14.36% (79); face masks – 7.82% (43). Interestingly, 1.09% (5) of the respondents claimed they were not supplied with the PPE at all.

After the occurrence of biological endangerment of COVID-19, according to the examinees, the accessibility to the PPE increased in 35.5% (195) of the cases (nurses 95.38%, 186; midwives 4.62%, 9), was the same in 28.9% (159) (nurses: 96.23%, 153; midwives 3.77%, 6), and in the opinion of 35.6% (196) of them, it decreased (nurses: 95.41%, 187; midwives: 4.59%, 9).

The analysis of the results collected in the study indicated the impact (p<0.05) between the accessibility to the PPE at the time of the COVID-19 pandemic and the change in the sense of safety. Along with the increase in the availability of PPE, respondents significantly less often felt a decrease in the sense of security due to the COVID-19 epidemic (Tab. 7).

Table 7. Dependence between the change in the sense of safety caused by COVID-19 and the increase of accessibility to the PPE.

Variables			The accessibility to the PPE at the time of COVID-19 pandemic			Test results
			increased	no change	decreased	
The change in the sense of safety caused by COVID-19	decreased	n	150	122	182	χ^2=22.594 df=4 p=0.001
		%	76.9%	76.7%	92.9%	
	no change	n	43	35	13	
		%	22.1%	22%	6.6%	
The sum of all the answers		n	193	157	195	
		%	100%	100%	100%	

χ^2 – test statistics; df – degree of freedom; n – number of respondents; p – probability value.

Among the respondents who noticed a decrease in the sense of safety at the time of the COVID-19 pandemic, 86.1% (391) were afraid of going to work. However, in those whose sense of safety did not change, 47.3% (43) did not experience the fear. The analysis of the results collected in the study indicated the impact (p<0.05) between the change in the sense of safety and the fear of going to work in the research group (Tab. 8).

Table 8. The results of the respondents' assessment in the change of the sense of safety vs. fear of going to work and performing professional duties during the COVID-19 pandemic.

Variables			The change in the sense of safety caused by COVID-19		Test results
			decreased	no change	
Fear of going to work caused by COVID-19	yes	n	391	48	χ^2=54.838 df=2 p=0.001
		%	86.1%	52.7%	
	no	n	63	43	
		%	13.9%	47.3%	
Avoiding professional duties because of COVID-19	yes	n	96	22	χ^2=0.419 df=2 p=0.811
		%	21.1%	24.2%	
	no	n	358	69	
		%	78.9%	75.8%	

χ^2 – test statistics; df – degree of freedom; n – number of respondents; p – probability value.

Among the respondents 21.60% (119) avoided going to work (nurses: 94.96%, 113; midwives: 5.04%, 6), while 78.40% (431) did not (nurses: 95.82%, 413; midwives 4.18%, 18).

The analysis of the results collected in the study indicated no influence between the change in the sense of safety at the time of COVID-19 and avoiding professional duties ($p > 0.05$) (Tab. 8).

Discussion

The current epidemiological situation connected with the occurrence of the new pathogen SARS-CoV-2 creates new challenges for medical staff as nurses and midwives. The rapid outbreak of the pandemic reveals a lack of proper publications and research concerning safety procedures for these professions. Due to the epidemiological and pandemic situation in Poland, scientific research in this area is in the initial phase of implementation.

Key results

The study shows the sense of safety among the nursing and midwifery staff is related to the actions undertaken by the employers in the areas such as accessibility to the Personal Protective Equipment (PPE), epidemiological and health and safety training as well as rules of proceeding with a patient suspected of being infected by COVID-19.

A decrease in the sense of security was felt by trained and untrained people, but the decline in the sense of security was less pronounced in those who had received such training. People who felt a decrease in their sense of security during the COVID-19 pandemic were afraid to go to work. In contrast, a change in the sense of security did not affect avoiding professional duties.

The accessibility to the PPE at the time of the COVID-19 pandemic has an influence on the change in the sense of safety.

Interpretation

Safety at work is closely related to the notion of professional risk. It is defined as the appearance of endangerment of unexpected events and factors at work. Employers, regardless of the workplace, ought to guarantee the performance of professional duties in the conditions which ensure safety and protect workers from a negative impact of biological agents [21,22]. To effectively protect employees from a disease, it is compulsory to provide them with proper work conditions, the PPE, and regular training on new procedures [23]. The self-reported results of the research on training among medical staff were similar to those collected by A. Dyk-Duszyńska in 2013. Those results revealed that only 68.81% of the nurses were trained on the procedures related to the prevention of professional endangerment to potentially infectious materials [24]. Both studies show the lack of sufficient training among medical staff. The nurses surveyed in 2010 by Jarosik also identified the need for improving their knowledge and the benefits of participating in regular training [25].

The self-reported study showed that 73.45% of the respondents felt safe at work. The report of the poll carried out in 2014 confirmed that 87% of Poles felt safe at their workplace [26]. Since the outbreak of COVID-19, 82.5% of the nurses claim that their sense of safety decreased and that it was dependent on training. Participation in the training had a positive impact on the feeling of professional security. It suggests that the number of professional health, safety, and epidemiological training should be increased. Well-trained employees will use the PPE properly if supplied. According to the guidelines issued by the European Centre for Disease Prevention and Control, 2000/54/EC directive, to prevent COVID-19, the primary PPE should include face surgical masks, protective gloves, uniforms, and glasses [27]. The highest risk of COVID-19 infection occurs when there are basic PPE and prophylaxis shortages [28,29]. In light of the research, the quantity of the PPE correlates positively with the sense of safety among medical staff. It might be, then, concluded that art. 2376 § 1 of The Labour Code, which makes an employer responsible for providing an employee with proper PPE was not met [30]. Shortages of PPE and proper training might potentially influence the number of COVID-19 infections and deaths among nursing staff. The situation actually took place in Italy, where 97 doctors and 26 nurses died of COVID-19 [31].

Nurses and midwives, according to the employment laws, might withdraw from their work duties in case of not being provided with proper work conditions or when their mental and physical state does not allow for safe duty fulfillment [32]. Avoiding work and work duties is one of the elements of professional burnout. By taking into consideration the median age of the respondents (41±50) and work experience (57.3%, >20 years), it may be concluded that the respondents in this study have already experienced burnout. The research by A. Sadomska et al. carried out in 2014 showed that the syndrome is mostly found in nurses between their 10th to 19th years of working in the profession [33]. The sense of safety in daily work was normally at a high level and accompanied 73.8% of the respondents in our study. Only 6.50% claimed to have never felt safe. After the COVID-19 outbreak, the sense of safety decreased in 82.50% of the surveyed. Lack of a sense of safety is a stress factor, which affected 96% of the respondents in the study by B. Trętkiewicz in 2008 [34]. According to the self-reported study, a low sense of safety was found in 82.5% of the nurses and midwives. But, although 80.4% of them were afraid of going to work because of COVID-19, only 21.60% admitted to having avoided professional duties. Performing the job and its duties in such a situation may only be the result of a high sense of obligation in the staff and applying effective techniques of stress management, which otherwise could affect work absence [35]. Therefore, it might be assumed that, together with a prolonged

epidemiological situation, the ability of stress management may decrease, and the aversion to daily work duties and work absence will increase.

Limitations of the study

The main limitations of the study were the epidemiological restrictions, which enabled direct interviews. However, online polling allowed surveying a larger group of respondents than it was initially assumed.

By taking into account multiple aspects in the study (employer's duties, organization, and participation in training on health, safety, and epidemiological COVID-19 procedures, accessibility to the PPE, the sense of safety at the time of pandemic), this may constitute a sound basis for further studies in the subject.

Recommendations

The study aimed at answering the question, to what degree the measures undertaken by the employers in the area of occupational and procedural training at the time of the pandemic, as well as the application of the PPE, influence the sense of safety in nurses and midwives. The results collected might be preliminary to further studies at the time of the COVID-19 pandemic. They might also indicate the main issues experienced in these two medical professions, which may help develop a consistent system and supporting procedures as well as training programs to improve the quality of work in such dangerous situations.

The results of the research might strengthen the structure of the comprehensiveness of nursing services, which might also have a positive impact on the quality of patient care at the time of the pandemic. It may also improve the quality of medical services as well as the level of patients' satisfaction.

1. In order to achieve a higher, satisfactory level of security among medical personnel, the recommendations of the Ministry of Health regarding the implementation of epidemiological procedures and training should be met. The number of training sessions in epidemiological and health and safety training should be increased in nurses and midwives.
2. To monitor the sense of safety in the work of nurses and midwives, standard tools should be implemented. The systematic use of standardized tools will enable a thorough examination of factors that reduce the sense of security and improve these areas.
3. In order to minimize the negative effect of a decrease in the sense of security, nursing teams and midwives should be given constant access to psychological support in the workplace.
4. Employers and the Ministry of Health should provide both professional teams with unrestricted access to PPE regardless of the place of work. Nursing teams and midwives should not agree to work without sufficient PPE protection.

Conclusions

1. The regularity of training connected with COVID-19 and epidemiological procedures as well as health and safety at work influence the sense of safety among nurses and midwives. Due to the COVID-19, a significant decrease in the sense of security has been observed, especially among untrained persons.
2. Along with the occurrence of the epidemiological endangerment due to COVID-19, nursing and midwifery teams declare a substantial decrease in the sense of safety at work.
3. Decreased accessibility to the PPE negatively influences the sense of safety at work. The reduced sense of security indicates that nursing teams and midwives do not have sufficient access to PPE.
4. The decrease in the sense of safety at work caused by COVID-19 significantly influences the anxiety of going to work. However, it has no clear statistical impact on work performance. This means that Polish nursing teams and midwives have a strong sense of duty and are professional.

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SUBCLAVIAN STEAL SYNDROME IN A PATIENT WITH DIZZINESS, LEFT UPPER ARM PARESTHESIA, AND EXERCISE-RELATED SYNCOPE – A CASE REPORT

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ABSTRACT

Background: Dizziness, numbness, and paresthesia of upper limbs are common symptoms in patients who undergo physiotherapy. Most of the symptoms are caused by neurological and skeletomuscular diseases. Subclavian steal syndrome is a rare case of such symptoms.

Aim of the study: This study aimed to analyze how to proceed with symptomatic patients suspected of subclavian steal syndrome.

Material and methods: Medical documentation was used.

Case report: A 69-year-old patient, long term cigarette smoker, with the anamnesis of spine surgery due to discopathy, atherosclerosis of the lower extremities, and hypertension was referred to our hospital due to exacerbation of coronary artery disease. During his stay in the cardiac department, after smoking a cigarette, he felt pain and numbness in his left arm. He began intense movement of this hand, and then lost consciousness. A difference in pulse filling and blood pressure between the upper extremities was noted. In a duplex Doppler study, reversal flow in the left vertebral artery due to stenosis of the left subclavian artery was found. Angio-CT of the head vessels confirmed a significant stenosis of the proximal left subclavian artery. The patient was referred for further treatment to a Vascular Surgery Clinic.

Conclusions: The subclavian steal syndrome is a rare cause of dizziness and paresthesia of the upper extremities. Physiotherapy procedures on the affected limb can exacerbate neurological symptoms. It is easy to identify the disease based on differences in pulse amplitude and blood pressure between upper limbs. Diagnosis should be established before proceeding with physiotherapy, due to the fact that some procedures can worsen the patient's condition.

KEYWORDS: subclavian steal syndrome, dizziness, paresthesia

Background

Subclavian steal syndrome (SSS) is a phenomenon causing retrograde flow in an ipsilateral vertebral artery due to stenosis or occlusion of the subclavian artery, proximal to the origin of the vertebral artery. The term was introduced by Fisher in 1961 in his commentary to Reivich`s article, who first connected symptoms of transient ischemic attack with retrograde blood flow through vertebral artery [1,2].

If the subclavian stenosis exists proximal to the vertebral artery branch, there is a chance of reverse blood flow from the brain circulation (Circle of Willis) and a stealing phenomenon can occur [3]. Due to retrograde flow from the contralateral vertebral and basilar arteries into the low-pressure ipsilateral upper extremity artery, vertebro-basilar insufficiency symptoms appear. Exercises of the upper limbs increase the blood flow to the muscles and steal it from the brain. Therefore, during upper extremity exertions, symptoms of arm fatigue, cerebral ischemia, and reduced blood flow in the occipital cortex can occur. A left subclavian stenosis may also provoke angina symptoms in patients after a successful coronary artery bypass grafting (CABG) with the left internal mammary artery (LIMA) [4].

Despite the subclavian stenosis, most patients are asymptomatic, and the SSS is an incidental finding or a differential diagnosis in patients with a pulse deficit or a systolic blood pressure difference of greater than 20 mmHg between the arms [5]. If there is isolated stenosis, the likelihood of symptoms is less than in other vascular beds. Most common symptoms are arm claudication, consisting of exercise induced arm pain, paresthesia or fatigue [6]. Only 5.3 % of patients experience neurological symptoms [7]. Vertebrobasilar hypoperfusion can result in visual disturbances, dizziness, ataxia, vertigo, dysarthria, or syncope.

The most common etiology of SSS is an atherosclerotic plaque, mostly in patients with multiple comorbidities. SSS symptoms may indicate a very high cardiovascular risk for atherosclerotic complications, such as myocardial infarction and brain stroke [8]. In other cases, the subclavian stenosis or occlusion may be caused by arteritis, inflammation due to radiation exposure, compression syndrome, fibromuscular dysplasia, or less often, aortic dissection, Takayasu's disease, giant cell arteritis, or thoracic outlet syndrome [9]. An anomalous connection of the left subclavian artery to the pulmonary artery in d-transposition of the great arteries was also described as a rare case of SSS [10]. The prevalence of SSS is approximately 0.6 to 6,0%, mostly in older patients. Males are more affected compared to females by a ratio of about 2 to 1 [11]. The left subclavian artery is more likely to be affected than the right [3].

Due to advances in medical science, people live longer, resulting in increased medical and rehabilitation needs. The risk associated with pharmacotherapy is high, hence attention is being given to a wider application of physical therapy methods [12]. For many patients, rehabilitation is a chance to return to normal activity and an optimum quality of life. The largest group referred for rehabilitation are patients with root pain, and spine disorders [13]. Patients with cervical radiculopathy often present with complaints that include pain, numbness, and paresthesia of upper limbs. SSS should merit consideration as one of the differentials in the evaluation of a patients with such symptoms.

Medical diagnostic classifications focus on identification of disease are determined by physicians. Recognition of risk factors for certain medical conditions impacts the physical therapy interventions. The physical therapist, before embarking upon a therapy plan, must determine whether the patient's condition is appropriate to start exercises. Therefore, in some cases of SSS, the patient should be immediately referred for other medical investigation and treatment, prior to any physical therapy.

Aim of the study

This study aimed to analyze how to proceed with symptomatic patients suspected of subclavian steal syndrome.

Material and methods

The medical documentation of a patient hospitalized in December 2019 in the Department of Cardiology at Saint Elisabeth Hospital in Biala was used. The patient's consent to publication was obtained.

Case report

A 69-year-old patient, with familial anamnesis of atherosclerosis, a long-term cigarette smoker, osteoarthritis of the spine, atherosclerosis of the lower extremities for twenty years (Fontaine IIB), hypertension for fifteen years, and a five-year history of coronary artery disease, was admitted to the Cardiac Department due to episodes of exercise induced angina (Canadian Cardiovascular Society class II) to undergo diagnostic tests**.** There was no history of stroke or myocardial infarction. On admission, the patient reported episodes of fainting and dizziness (lasting for few minutes), as well as numbness in the left arm, worsening after exercise, especially during arm rising. These symptoms began four months prior to admission, worsening over that period.

In the physical examination he was hemodynamically stable, with an increased arterial blood pressure of 153/96 mmHg; a 20 mmHg difference in blood pressure between both upper extremities, and weak pulse in the left radial artery, was noted. The results of the laboratory tests (morphology, fasting blood sugar level, creatinine, electrolytes, TSH) where within normal values; the elevated cholesterol and LDL level indicated a high cardiac risk. The resting ECG did not show any abnormalities. The Bruce exercise treadmill test (XScribe 6.25, Trackmaster) was aborted in the third minute due to angina, there were no ST-T wave abnormalities noted.

During his stay in hospital, after smoking a cigarette, the patient began to feel numbness and pain in the left hand. He started shaking this hand intensely and making rotational movements in the ipsilateral shoulder joint, losing consciousness as a result.

Duplex Doppler examination of the major arteries of the neck was performed (Arietta V70, Aloka, Hitach, Japan). It revealed 80% narrowing of the lumen in the right internal carotid artery, retrograde flow in the left

vertebral artery, and a difference in the flow spectrum between radial arteries (Fig. 1). The angio-CT of the cranial vessels (Brightspeed S, General Electrics, USA) confirmed a high-grade atherosclerotic stenosis (up to 75% of the surface area) of the proximal left subclavian artery before the vertebral artery departed (Fig. 2). The right internal carotid artery was also obstructed to 65% of the surface area.

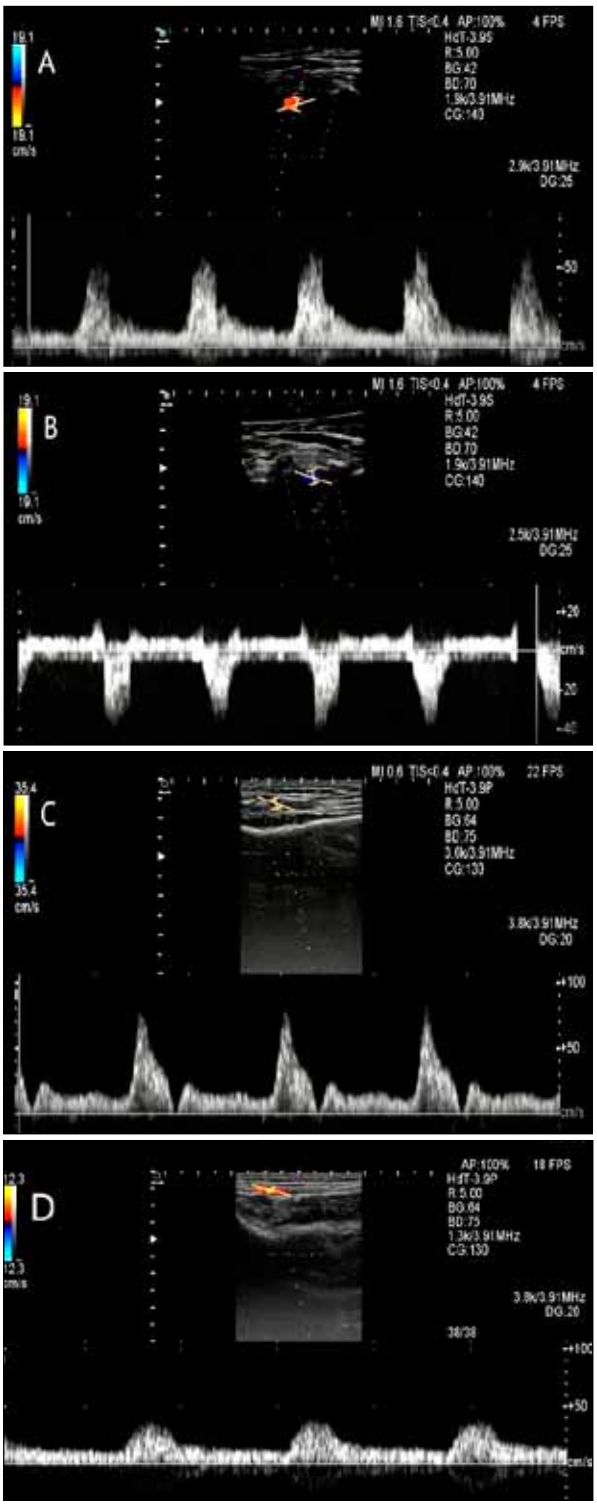

Figure 1. Doppler flow spectrum in radial and vertebral arteries. A – Right vertebral artery. B – Retrograde flow in the left vertebral artery. C – Right radial artery. D – Reduced flow in the left radial artery.

Source: the author.

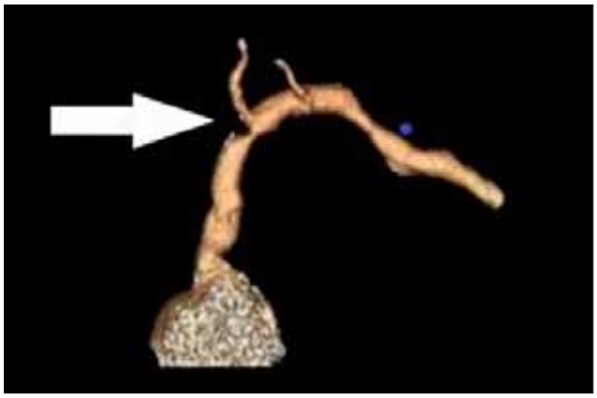

Figure 2. A high-grade proximal stenosis in the left subclavian artery (arrow).

Source: the author.

Discussion

Patients suffering with SSS are found among those referred for rehabilitation with spine and limb symptoms. The disease may occur when a significant stenosis in the subclavian artery compromises distal perfusion to the vertebral, axillar, or internal mammary artery. The result is a pressure gradient favoring reversal blood flow (retrograde flow) in the vertebral artery distal and ipsilateral to the subclavian stenosis [1]. Arm claudication is the most common complaint, coexisting with exercise induced arm pain and fatigue [14]. The real prevalence of the disease is still unknown, but it has been estimated between 0.6-6% [7]. Physiotherapy procedures on the upper limb, by reducing arterial resistance and increasing blood flow to the arm muscles, can exacerbate neurological symptoms. In rare circumstances reverse flow of vertebral artery may cause vertebrobasal ischemic attack [9]. The diagnosis in such cases is of utmost importance, since the character of the pathological process determines the treatment policy.

One-sided pain in the upper limb accompanied by numbness and weakness, intensifying especially after exercise, should raise the suspicion of SSS. A difference in amplitude of pulses and in systolic blood pressure of more than 20 mmHg between arms is a simple and cost-efficient diagnostic screening test. Doppler ultrasound of the extracranial arteries is the test of choice for SSS confirmation. Visualization of stenosis, or more often, reversal flow in the vertebral artery at rest or arm exercise, facilitates accurate diagnosis [15]. Angio-CT or angio-MR finally confirm the narrowing of the subclavian artery, and often show the coexisting narrowing of the carotid arteries [7]. Subclavian artery angiography remains the gold standard to confirm the diagnosis. These tests are necessary before planning surgical treatment.

Dizziness, numbness, and paresthesia of upper limbs are common in patients who undergo physiotherapy. Physical therapy of a patient with missed diagnosis or misdiagnosis of SSS may provoke symptoms, and can cause deterioration of their condition. Therefore,

amplitude of pulse on both radial arteries, and blood pressure on both upper extremities, should be carefully observed before qualifying patients with neurological symptoms for physiotherapy.

The implementation of appropriate treatment is important because, in many cases, atherosclerotic lesions in patients with symptomatic SSS also affect other vascular areas, such as coronary and cerebral circulation. Therefore, SSS can be a marker of cardiovascular risk in a population that will benefit from aggressive secondary prevention. According to the recommendations of the European Society of Cardiology, every patient requires pharmacotherapy, antiplatelet therapy, aggressive lipid management, and lifestyle modifications [8]. Incidental subclavian stenosis, in the absence of symptoms, even if reversal flow in the vertebral artery is demonstrated, rarely requires revascularization. In patients with symptomatic SSS, subclavian artery endovascular angioplasty with stenting gives the best clinical results, with low surgical risk [16]. In other cases, the traditional surgical approach can be used. Technical success of the percutaneous approach can be achieved in 90% of cases, with five-year patency rates of 85% [17,18]. Longer or more complex occlusions in the subclavian artery are usually qualified for surgical treatment to by-pass the stenosis or occlusion of the subclavian artery.

In our case, subclavian steal syndrome of the left subclavian artery, accompanied by stenosis of the right internal carotid artery, was diagnosed. The patient has been scheduled for optimal medical treatment. Acetylsalicylic acid, a statin, and antihypertensive drugs were prescribed. He was advised to stop smoking immediately. He was also qualified for further treatment and follow-up in the Department of Vascular Surgery.

Conclusions

Dizziness, numbness, and paresthesia of upper extremities occur in subclavian steal syndrome. Physical exercise of the upper limbs may provoke symptoms, or even induce a stroke. The difference in pulse amplitude and blood pressure between upper limbs is a simple test which should be performed on patients who are being qualified for physiotherapy. Diagnosis must be established before proceeding with physiotherapy, due to the fact that some procedures may worsen the patient's condition.

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TELE-HEALTHCARE AND THE USE OF VIRTUAL COMMUNICATION TECHNOLOGIES IN MEDICAL RESEARCH AND APPLICATION: THE FUTURE OF TELEMEDICINE IS NOW!

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ABSTRACT

Contemporary world events are demonstrating the need to embrace and further develop tele-health options for assessment and delivery of biopsychosocial healthcare services. This is now possible, given advances in communication technologies allowing virtual connections of medical personnel with constituents, as well as necessary, in light of recent challenges posed by infectious conditions and growing needs for travel restrictions, social distancing, and isolation of large portions of populations. Moreover, the opportunity to virtually connect with persons through ubiquitous computer-based and handheld communication devices allows comprehensive care provision to include underserved areas, where restricted, walk-in access to brick-and-mortar establishments has long been recognized as a limiting factor in healthcare. This review examines evolving approaches of tele-healthcare, with a specific focus on telemedicine as a bridge between traditional, in-person approaches to diagnose and treat medical conditions and new healthcare opportunities developing to meet changing societal needs. The three purposes of the review are: discuss background information, with a brief look at policy and procedure guiding applications of tele-techniques in healthcare practices; identify relevant scientific studies to show the breadth of new evidence-based research for telemedicine practices; and, discuss challenges for the further development of telemedicine as healthcare systems in the United States evolve to meet current and projected healthcare needs.

KEYWORDS: telemedicine, tele-healthcare, tele-techniques, virtual communication technologies, integrated primary care-behavioral healthcare, mental health

Background

The need for healthcare to be responsive to environmental concerns has never been greater. As this article is being written, challenges for healthcare providers are growing exponentially, with calls for wide-ranging solutions to meet unprecedented needs posed by the novel coronavirus – COVID-19 [1]. Among these concerns are: more efficient testing procedures to pinpoint virus spread, community containment and contact tracing strategies to isolate hot spots of contagion [1,2], and nuanced implementation of strategies to minimize iatrogenic effects of widespread economic disruption. In addition, the need to better protect first-responders and front-line medical personnel has been pushing the use of virtual communication for remote diagnoses, advice, and triage systems [3]. In the United States, persons experiencing symptoms are told to avoid, if possible, going to the hospital emergency room and to first call the doctor or clinic before showing up in person; following a consultation and diagnosis, persons with less than severe symptoms are advised to isolate at home. Telemedical services are increasingly being utilized and developed to handle these initial communications with patients as well as a wide variety of needed follow-ups. While many of the adjustments made to healthcare are being forced by the logistics of COVID-19 treatment and care, the further development of tele-procedures is expected to continue to reshape the biopsychosocial delivery of services beyond the current crisis and into the future [4–6].

Telemedicine and Growth of Tele-healthcare

Telemedicine includes the use of information and communication technology devices to deliver professional services across geographical distance and time [7,8]. While the concept of telemedicine has been discussed as potentially useful in practice for decades [9,10], the continuing lack of empirical validation for tele- techniques, overall, has led many physicians to move cautiously toward modification of traditional practice guidelines. In short, not all physicians have been convinced that patients would be well served (not to mention better served) by significant alterations of traditional face-to-face interactions occurring inside brick-and-mortar establishments [11]. The circumstances prompting the use of tele-techniques, however, has now changed with the exigencies of the COVID-19 crisis. Against the backdrop of ever-rising healthcare costs [12], projected shortages of professionals to meet growing healthcare challenges [13], and increasing needs to manage chronic health-related conditions [13], physicians are being encouraged to consider whether more rapid incorporation of telemedicine into medical practices is warranted [1].

Consumer-demand issues are also driving the market toward the adoption of tele- techniques in healthcare [14]. Use of virtual technologies outside the realm of healthcare has become common and familiar; phones are now computers, and comparison shopping has become an everyday activity for many people. Research shows that consumers now expect choices and often look beyond price to range of services offered [15]. The healthcare industry has shown sensitivity to this trend, with hospitals and physicians developing and using websites to advertise and gauge demand. In turn, just as retail consumers have shown a preference for comprehensive business systems – consider Walmart and Amazon, the ultimate one stop shops – consumers in the healthcare marketplace are now similarly beginning to look for comprehensive care provision. As an example, the development of integrated primary care-behavioral healthcare (PCBH) models over the last decade in the United States has broadened many medical service delivery practices to include psychological and social forms of care previously ignored or accessed only through off-site referrals by medical practitioners [16,17]. The more comprehensive PCBH systems have provided choice for persons with mental health issues, who still rely on physicians as a first line of defense [18]. Rather than not knowing where else to go or having no choices, though, data now show that persons in need of mental health interventions can and do search online for inclusive service delivery, where medical, psychological and social care are accessible in a single practice [19,17]. The PCBH systems have been early in the move to adopt virtual care delivery, sometimes using telehealth techniques to facilitate service delivery onsite but, more typically, using tele-techniques such as videoconferencing when too few professionals are available onsite and services must be accessed and shared across virtual space [16]. The sharing of resources has been particularly relevant for rural areas, where medical and mental health professionals are in great demand, although there are shortages of psychiatrists and psychologists in many urban areas, as well [20]. As mental illness is now recognized as a leading cause of disability [21], and the conjoint presence of mental and physical health problems affects one in four persons in the United States [22], a persuasive argument can be made that use of tele-techniques offers potential to alleviate suffering and aid in provision of treatments for a significant number of people.

These shifts in societal needs and consumer expectations toward a virtual consumer market for medical services have recently been supported by reformulations of policy by professional organizations [23,12], resulting in a broader range of practitioner credentials approved for tele-practice modalities [17]. In March 2020, the United States Federal Government, under the direction of the president, declared that COVID-19 represented a national emergency and invoked the National Emergencies Act (NEA) to temporarily loosen restrictions on use of telemedicine and telehealth interventions, broadly defined [1]. Among those professionals moving quickly to incorporate and/or further expand use of tele-techniques were physicians, psychiatrists, psychologists, nurses, counselors, and social workers, with additional professionals (e.g., occupational therapists) operating under the aegis of integrated practices [10]. This rush to market for virtual service delivery has not, however, been ignored or quietly accepted by all healthcare professionals. Editorials and commentary in medical circles have been issued and note the continuing need to hold the empirical line for science to guide the direction and future development of telemedicine [24,25]. This response is consistent with the NEA, which holds as a first principle that national emergency responses must strike a balance between public health and individual rights and insure that interventions are evidence-based through scientific studies and not representative of political concerns [1].

Telemedicine Practice Areas

As tele-service provision is relatively new, overall, literature reviews to gauge its use and effectiveness typically cover studies across various uses of the term tele-. For example, a search for the term "telemedicine" in medical databases results in research-based articles for telemedicine [26], but also articles for tele-health [27,10,28], tele-rehabilitation [29,30], e-consults [31], eHealth [8], mHealth [32], and tele-practice [33]. Similarly, a search for "telemedicine" across science and health literature databases, in general, results in studies that employ such comprehensive terms as technology-driven interventions [34], information and commu-

nication technology devices [35], innovative assistive technologies [36], and digital health interventions [37]. This abbreviated list does not include research for mental health issues, typically covered under such terms as tele-psychology [38] and tele-mental health [39,40], nor does it address studies increasingly identifying roles in virtual delivery of mental health services by practitioners (e.g., social workers) operating as behavioral health providers [16,17]. For purposes of clarity, this overview will use the term telemedicine and primarily focus on studies clearly indicative of use of tele-techniques for medically-directed interventions.

Research literature made available since the declaration of the pandemic by the World Health Organization on March 11, 2020 [41] highlights evidence for when telemedicine service delivery might be useful as stand-alone or adjunctive therapies and, further, defines areas of medical practice for which telemedicine may not be appropriate [23,42]. An overview of these recent, evidence-based studies shows that tele-interventions are useful in: allergy/immunology practices [8]; cancer and radiotherapy treatments [43]; chronic respiratory disease treatment [44]; palliative care for Parkinson's and neurocognitive disorders [45]; and, treatment, monitoring, and/or rehabilitation of persons with cardiovascular conditions [46], type 2 diabetes [47,43]), stroke conditions [48], asthma [42], and chronic obstructive pulmonary disease [49]. Further, recent studies have supported the use of telemedicine techniques in ophthalmology [25], treatments of opioid use disorder [50], chronic pain care [51], anxiety and depression [52], and in post-trauma treatments within a primary care-behavioral health framework of integrated care [17]. In addition, tele-techniques have been shown to be efficacious: for children [53], adolescents [54,55], and adults of all ages [43]; in urban [43] as well as rural areas [56]; for medical [47], psychological [52], and social problems [57]; with acceptance by clinicians [58], nurses [59], and clients and their caregivers [58,44]; when used in primary care [23] and home settings [60]; and, for acute [17], postacute [61], and long term care [56].

In addition to treatment outcome studies, the telemedicine literature also covers a wide variety of practice issues as providers share knowledge for what needs attention. Assistive-technology needs of caregivers are discussed to support aging-in-place and independent living in light of the burgeoning and coming need for long-term care based on population aging [36,13]. Studies are available that call for "reimagining" medical education [5, p. 1127] and how best to prepare nurses for the "uncharted waters" of the COVID-produced "transformed workplace" [59, p. 288]. Issues such as licensing [8], ethics of practice [44], and reimbursement for specialty consultations outside of the "traditional inpatient consult structure" are discussed [31, p. 399] and provide insight for providers on how to best move forward. An examination of rural-urban disparities in care gives insight into the potential of tele-techniques to address perceived inequities in mental health care practice [62]. Some authors have provided in-depth examinations for what tele-techniques work in their practices – yes: smartphone monitoring in cardiology emergencies [46]; no: "breaking bad news" in an oncology setting [23, p. e879]. In an insightful commentary entitled, "Telemedicine: The unsung corona warrior", issues in the legal, technological, financial, ethical, and scientific domains were discussed as barriers that must be addressed before telehealth can reach its full potential [25]. It seems apparent that this burgeoning literature, albeit perhaps as a result of societal restrictions somewhat limiting access to traditional care, attests to a growing interest in tele-healthcare options. This cannot be determined at the present, however, and will most likely not be determined until the pandemic ends and full empirical assessments of the new treatment modalities are conducted.

Challenges for Telemedicine

There are numerous issues to address before use of tele-techniques can become the "new normal". There is an expressed need for training and education, necessary to manage complex aspects of technology of telehealthcare, although data exist showing that technology issues diminish for healthcare personnel with a higher frequency of usage [58]. Nonetheless, depending on the type of technology involved, virtual service delivery may require the assistance of an IT (information technology) person to set up and manage equipment used [16]. This is an issue with synchronous (i.e., real time) connections in a supervised setting, such as when videoconferencing allows face-to-face connections within a provider system; even with commercially-available programs designed for virtual connections, training for personnel responsible for scheduling and executing sessions [58], as well as a knowledgeable person to upload program updates and troubleshoot disconnections (e.g., during power surges and outages), may be useful. Similar technology concerns surround asynchronous communications, defined as automated and preprogrammed content of computer-based applications, when store-and-forward health provider information and remote-patient monitoring [8] are administered within practices by persons without backgrounds in information technology areas. Both synchronous and asynchronous issues are compounded when service delivery involves direct-to-consumer care and clients located offsite use their own equipment [8]. Although most people today have access to and know how to use smart phones, the types of technology involved in healthcare delivery, with stringent standards for such practice issues as informed consent and confidentiality, are often complex and beyond the capabilities of many consumers. This is particularly true for older adults, who are making gains in the virtual world but still lag behind younger persons in utilization of internet-based technologies [63,64].

A similar issue involves the non-uniform access in the United States to broadband, a problem highlighted through the pandemic by unmet needs of adults working remotely and children attending internet-based classes. An often cited advantage of tele-communications for healthcare is provision of services in rural areas, where access to brick-and-mortar institutions is restricted. Although phone service and internet-based computer connections have improved greatly in recent years and communication devices meeting healthcare standards (i.e., computers, laptops, tablets) are increasingly affordable, access is still limited or completely unavailable in many remote areas [62].

There are also practice issues associated with telehealth that may require further resolution, such as when boundaries overlap and professionals working in interdisciplinary settings adhere to different sets of practice guidelines [16]. While physicians are most often the acknowledged leaders of telemedicine teams, there are other providers working in close association with physicians, sometimes as employees but also through consultations, who may have their own guidelines for practice and ability to seek reimbursement for services rendered. One would think that the practice guidelines for different disciplines should be consistent in instances of team treatments of clients – for example, in primary care-behavioral health integrated practices – but preemptive conversations for clarification of possible differences can be useful. Licensure issues appear to be reaching consensus for telehealth providers in the United States, with professional licensure most typically required in the state of the client, regardless of practice and/or provider location [8]. Similarly, reimbursement for tele-services, at least during the temporary conditions granted by the NEA, are consistent with previous rates.

Conclusion

It is clear that the use of tele-techniques in practice settings predate the pandemic [10], but it is equally true that there has been an acceleration of telehealth service delivery driven by need and the rapid production and expansion of policies necessary to guide and protect providers. There is some concern, perhaps well-founded, that technological advances may outpace ethical guideline development [65]. It is true that the accelerated pace of change for technologies has become the expectation, particularly among young consumers, and it may be difficult to return from this forced immersion in the tele-health world to care approaches that are perceived as less convenient. In any evaluation, the pandemic has lasted a sufficient length of time for researches to begin establishing scientific validation for what aspects of telemedicine do and do not work in practice settings. It is doubtful that the insights gained through this process will be lost as COVID-19 is finally brought to heel. What is more certain is that the key to the continuation of telehealth lessons learned during the pandemic is acceptance by physicians [58], and acceptance by physicians depends upon establishing the empirical bases for tele-healthcare techniques [1].

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UROMODULIN – BIOMARKER OF RENAL FUNCTION WITH PROMISING CLINICAL APPLICATION

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ABSTRACT

Uromodulin (also known as Tamm-Horsfall protein) is a glycoprotein produced exclusively in the kidneys, mainly in the epithelial cells of the thick ascending limb of the loop of Henle. Under physiological conditions, it is the most abundant urinary protein. A small proportion is released into the renal interstitium and then into the blood, where it can be detected and used as a potential parameter of renal function. Uromodulin has numerous physiological roles and potential pathogenetic significance, including providing protection against urinary tract infections and the formation of urinary deposits, as well as being involved in the immunomodulatory functions and regulation of water and electrolyte balance by the kidneys. Unlike classic renal markers (such as creatinine), uromodulin levels decrease with progressive renal dysfunction. A significant advantage of this parameter is therefore the detectable changes in concentration at the early stages of development of chronic kidney disease. In addition, assessment in clinical materials, such as urine and blood, is relatively simple by immunoenzymatic methods. It is evident that the quantitative determination of uromodulin in blood serum is associated with a lower risk of laboratory error and has a better correlation with renal function. Based on previous studies, Tamm-Horsfall protein / uromodulin can be considered a valuable parameter for standard diagnostics of kidney function and renal diseases. It appears that no other marker is currently able to reflect the integrity and functional state of the renal tubules as sensitively as uromodulin. Due to the potential of this parameter, the article presents and overview of the current information available about uromodulin, as well as the available diagnostic tests and the frequency of their use in clinical practice.

Keywords: Tamm-Horsfall protein, chronic kidney disease, acute kidney failure, Umod

Background

In 1950, scientific researchers I. Tamm and F.L. Horsfall described the discovery of a mucoprotein in urine, which they proceeded to designate Tamm-Horsfall protein (THP) [1]. Three decades later, A.V. Muchmore and J.M. Decker isolated an 85 kDa glycoprotein from the urine of a pregnant woman and demonstrated its immunosuppressive properties on the activity of T lymphocytes and monocytes *in vitro*. They named this molecule uromodulin (Umod) [2]. It eventually became clear that THP and Umod referred to the same protein, and both designations are still used in the literature. However, during the 21st century there has been a dramatic increase in knowledge concerning the pathogenic and prognostic significance of Umod in various forms of kidney disease, and its function, genetics, synthetic and secretory pathways have been studied in detail. Nephrologists are interested in a parameter that would sensitively reflect changes in kidney function, shifting focus onto Umod, which is secreted both into the urine via the renal tubules and, in small amounts, into the blood via the renal interstitium.

Currently, Umod appears to be superior to other markers in terms of reflecting the functional state of the renal tubules. The aim of this review is to examine literature, predominantly Pubmed-sourced and originating over the last 5 years, to provide an analysis of Umod's clinical significance, including aspects of the protein's biology, physiology, characterization as a marker of renal function, and an overview of available diagnostic tests and their use in clinical practice.

Biology, physiology, functions and pathogenetic significance of uromodulin

Uromodulin (Umod) is synthesized exclusively in the kidneys by epithelial cells of the thick ascending limb (TAL) of the loop of Henle, as well as to a lesser extent (about 1/10 the amount produced in TAL) in the early part of distal convoluted tubule (DCT) [3–5]. Umod production occurs in the rough endoplasmic reticulum (RER), and after appropriate modifications in the Golgi apparatus it is exported via transport vesicles through the apical membrane to the extracellular space [6]. The protein molecules are anchored in the cell membrane by glycosylphosphatidylinositol (GPI) and are released into the lumen of the renal tubules upon proteolysis of intermolecular bonds by the serine protease hepsin [7,8]. Remaining in close proximity to epithelial cells after proteolytic cleavage, Umod forms part of a protective hydrophobic gel covering the above-mentioned cells [3,6], which may, in some cases, form hyaline castings [3]. Umod glycoprotein molecules released into the urine behave as monomers and polymerize [7,9]. Most of the glycoprotein produced in the cells goes to the renal tubules and into the urine, where it makes the largest fraction of urinary proteins [3,9,10]. Daily excretion of Umod via the urine of healthy people has been estimated to be about 50 mg (ranging 20–75 mg) [9–11]. A small amount of Umod enters the interstitial tissue through the basolateral membrane of epithelial cells and, from there, enters the bloodstream [9,10]. The mechanism by which a small fraction of secreted Umod, normally released into the urine, proceeds to the interstitium is likely via retrograde leakage through intercellular spaces, which may occur as a result of kidney damage [10]. It has been estimated that protein levels are approximately 1000 times higher in urine (urinary uromodulin or uUmod) than in blood serum (serum uromodulin or sUmod) [3,9]. In the bloodstream, the glycoprotein molecules remain in the form of monomers and do not polymerize [9]. One of the regulating factors of Umod secretion from renal tubular epithelial cells is the activation status of the calcium-sensing receptor (CaSR). Activation of this receptor reduces the secretion of Umod by TAL cells and, in converse, its inactivation increases this secretion [4,12,13].

Investigating the molecular mechanisms underlying protein production, it was determined that the gene encoding uromodulin (*UMOD*) is located at the 16p12.3-p13.11 loci [14]. Hereditary mutations in this gene underlie the development of a group of diseases known as "autosomal dominant tubulointerstitial kidney disease; UMOD-related" (ADTKD-UMOD). The most common mutations found in genetic tests are missense mutations and small deletions in exons 3 and 4 [15,16]. The spectrum of symptoms of this rare monogenic pathology includes hyperuricemia, gout, interstitial renal fibrosis and progressive Ren Fail. They stem from disruptions in the maturation processes of the protein and its accumulation in the RER, resulting in excessive signaling of intracellular stress and disorders of Umod release and function [15,17].

Genome-wide association study (GWAS) showed that some types of single nucleotide polymorphisms (SNP) within the *UMOD* gene promoter deregulate the genetically determined production and release of Umod and thus impact all functions of this protein in the body, potentially predisposing an individual to the development of hypertension, nephrolithiasis or chronic kidney disease (CKD) [4,18,19]. Both protein synthesis and activity may be disturbed in either direction. Hypoactivity and/or deficiency in Umod, as well as hyperactivity and/or excess of Umod, can be potentially pathological and contribute to the development of diseases.

Umod is associated with many physiological functions, both local (within the kidneys) and systemic [13,20]. The hydrophobic gel covering the epithelial cells of TAL and DCT has protective functions attributed to Umod proteolytically cleaved from GPI. It protects against the development of urinary tract infections such as acute pyelonephritis by preventing the adhesion and colonization of bacteria on the cell surface [3,21]. Umod probably contributes to maintenance of water and electrolyte homeostasis by reducing water permeability [6,10]. A detailed summary of the physiological roles of Umod, along with the potential pathological effects of disorders in the synthesis and/or activity of this protein in the body, is presented in Tab. 1.

Uromodulin as a marker of renal function

The usefulness of Umod as an indicator for monitoring renal function, by determining the protein's concentration in people with impaired kidney function and Ren Fail as well as in healthy people, has been extensively scientifically characterized. Currently, diagnostic tests based on serological methods to monitor sUmod and uUmod are available on the medical market which can deliver results in a relatively short time. These include enzyme-linked immunoassay (ELISA) tests, in which the reaction plate is coated with monoclonal antibodies against Umod and specific reactivity is determined by measuring absorbance and converting this into a parameter concentration [22].

The appropriate conditions for the pre-analytical processing and storage of urine samples is essential in order to obtain reliable and reproducible results [22,23]. As previously mentioned, in the urine uUmod occurs in the form of polymers, while in the blood sUmod remains a monomeric form [7,9]. This is important for the determination of protein levels by ELISA. In addition, Umod polymerization in urine probably alters the availability and modality of protein antigens detected by antibodies in ELISA assay [9]. Steubl et al. have demonstrated in a study involving 933 participants that the concentra-

Table 1. Physiological functions and pathological significance of uromodulin [summary based on 2–6, 9, 13, 15, 19, 21,24–38].

Functions	Detailed description	Pathological significance of abnormalities in synthesis/activity	
		↓ down	↑ up
Prevention of urinary tract infections (UTI)	– Inhibition of the adhesion of uropathogenic bacteria to the epithelium of the urinary tract. Higher levels of uUmod have been associated with a lower risk of developing UTI in the elderly [3,21, 24,25].	– More frequent and recurrent UTI [3,15]	-
Prevention of nephrolithiasis	– Inhibition of the formation of calcium-containing kidney stones. – Prevention of hypercalciuria by regulating calcium homeostasis [4,26,27].	– Nephrolithiasis – Hypercalciuria	-
Maintenance of water and electrolyte homeostasis	– Promoting NKCC2 activity (Na^+-K^+-$2Cl^-$ reabsorption), including transport to the apical cell membrane and phosphorylation [4,5,19,28]. – Promoting NCC activity (NaCl reabsorption) [4,5]. – Promoting ROMK ion channel) activity (excretion of K^+), including transport to the apical cell membrane [4,28]. – Homeostasis of magnesium metabolism, including promoting the activity of the TRPM6 ion channel (reabsorption of Mg^{2+}) by inhibiting endocytosis [29]. – Homeostasis of calcium metabolism, including promoting the activity of the TRPV5 ion channel (reabsorption of Ca^{2+}) by inhibiting endocytosis [4,27].	– Initially NKCC2 dysfunction, followed by excessive compensatory responses, such as prolonged RAA system activation and hypertension – Water-electrolyte imbalance [28,30]	– Salt sensitive hypertension – Water-electrolyte imbalance [19]
Immunomodulatory properties (pro- and anti-inflammatory)	Umod remains immunologically neutral in the lumen of renal tubules and has immunogenic properties in the renal interstitium and in the blood [31]: – Activation of the NLRP3 inflammasome and of the process of pyroptosis (a pro-inflammatory form of programmed cell death) to modulate the number of pro-inflammatory macrophages and to regulate the antibacterial response [31,32]. – Stimulation of monocytes/macrophages for the secretion of pro-inflammatory cytokines (IL-1β) and for phagocytic activity, promoting the development of interstitial nephritis [31,33]. – Stimulation of dendritic cells activity via Toll-like receptor 4 (TLR4), influencing mechanisms of innate immunity [34]. – Stimulation of neutrophils activity and migration through renal tubular epithelium [9,35,36]. – Inhibition of T lymphocytes activity [2,9].	An imbalance in the quantity and/or activity of Umod may promote dysregulation of immune responses in the kidneys, resulting in increased risk of extensive damage, prolonged healing time in acute inflammation and interstitial kidney fibrosis [13,33]	
Excretion of uric acid and prevention of hyperuricemia	– Support of renal excretion of uric acid. Lower uUmod levels have been associated with higher serum uric acid levels [6,37]	– Hyperuricaemia – Gout [6,30]	-
Oxidative stress	– Inhibition of the activity of TRPM2 non-selective calcium channel. – Inhibition of the formation of reactive oxygen species (ROS) locally and systemically. A decrease in sUmod level has been observed after the acute kidney injury (AKI) incident [38]	– Increased ROS production and increased risk of damage caused by oxidative stress [13]	-

NKCC2: sodium potassium chloride (Na-K-Cl) cotransporter 2; NCC: sodium chloride (NaCl) co-transporter; ROMK: renal outer medullary potassium channel; TRPM6: transient receptor potential melastatin 6; TRPV5: transient receptor potential cation channel subfamily V member 5; RAA: renin-angiotensin-aldosterone; NLRP3: NOD-, LRR- and pyrin domain containing protein 3; TRPM2: transient receptor potential cation channel, subfamily M, member 2; IL-1β: interluekin 1β.

tion of sUmod correlated more strongly with the estimated glomerular filtration rate (eGFR) than the level of uUmod [39]. Therefore, the determination in serum appears to be a more reliable test reflecting the clinical condition of patients. However, study results should be interpreted based on patients' personal data, including gender and age. It has been observed that adult women exhibit a slightly higher concentration of sUmod than either adult men or children. Among a group of 190 healthy blood donors aged 18–60 years, the average sUmod levels in women were found to be 230 ng/ml and in men were 188 ng/ml [9]. In a group of 443 children, the average concentration was 193 ng/ml [9]. It was initially assumed that values below 100 ng/ml in women and below 80 ng/ml in men and children should raise suspicion of renal dysfunction [9], however, these cutoffs may also be age dependent. Statistically significant differences in the concentration of sUmod between sexes were also observed in an older age group by the "KORA F4 Study", involving 1079 participants aged 62–81, which reported average sUmod values of 170 ng/ml in women and 138 ng/ml in men [40]. As this and other studies demonstrated, a significant decrease in the level of sUmod is evident in people over 60–65 years of age with respect to younger people [9,41]. This is likely a result of the physiological aging process of the kidneys and the body in general. Aging-related changes in the kidney typically affect the volume of the renal cortical layer and are associated with a decline in eGFR [42]. It is possible, however, that the production and release of Umod may remain undisturbed for a long time despite a decrease in eGFR.

Uromodulin and traditional parameters of renal function

Numerous studies have shown a positive correlation between both sUmod and uUmod concentrations and the eGFR value [11,39,43–48], although this correlation appears stronger with respect to sUmod than for uUmod [39]. In addition, an inverse relationship has been demonstrated between Umod levels and conventional renal markers, such as serum creatinine, urea or cystatin C [44–48]. Concentrations of these commonly referenced parameters increase due to their retention in the body as kidney function decreases. This suggests that higher levels of sUmod and uUmod are indicators of high renal functionality and are associated with a lower risk of developing end-stage renal disease (ESRD) in patients with chronic kidney disease (CKD), as well as with a lower risk of rapid loss of kidney function and eGFR decline [49–51].

Prajczer et al. reported findings which appear to contradict the above-mentioned conclusions [52]. They showed that the eGFR value positively correlates with uUmod and negatively with sUmod. The explanation for this apparent inconsistency may be the fact that the kidneys of patients with CKD may be predisposed to increased retrograde leakage of Umod into the renal interstitium and then the blood, thereby inducing increased inflammatory responses [10,32]. This damages the failing kidneys even more and, by virtue of the this repeated cycle, impairs kidney function, reduces eGFR and, thereby, urinary excretion of Umod. The pathomechanism described above can also be an explanation for the findings of Köttgen et al., who proposed that high concentrations of Umod in urine may forebode the development of CKD for many years [53]. It is possible that in kidneys exhibiting some sort of dysfunction, the inflammatory component and the etiology of primary disorders may influence the serum Umod level and its correlation with eGFR. Nevertheless, there are not many scientific reports on large study groups that would lead to conclusions similar to those presented by Prajczer et al.

Changes in the concentration of Umod can be observed already in the early stages of loss of kidney function, which is a significant advantage over traditional markers that do not show clear deviations from the norm until a much more advanced disease stage. It has been observed that blood creatinine concentrations may remain at the same level until 50% of renal function is lost [54]. Using statistical analyses such as the receiver operating characteristics (ROC) and area under the curve (AUC), sUmod level most effectively differentiated healthy people without kidney disease (non-CKD) from patients with stage 1 CKD (CKD-1) when compared with eGFR, cystatin C and creatinine. As the CKD stages progressed, the concentration of sUmod decreased. The differences between sUmod levels for all adjacent pairs of CKD stages were statistically significant, except for stages 1 and 2 [9,44]. Furthermore, sUmod has been shown to be a valuable parameter for monitoring kidney transplant function in that lower and slower recovering levels may be associated with a higher risk of failure or delayed activity, while rapid post-surgical increase in sUmod levels suggests immediate start of function and proper organ acceptance [45,55,56].

One of the greatest advantages of Umod over conventional renal markers is related to the fact that its concentration is independent of the glomerular filtration process [57], with production and release occurring only within the kidneys via TAL and DCT1 cells. The serum concentration of Umod, more than any other renal parameter, reflects the structural and functional status of renal tubules and renal interstitium [9,44,46]. Therefore, Umod can be considered as an important complementary marker for use in routine diagnostics, although at present it is not commonly used in clinical diagnostic practice.

Uromodulin in other disease entities

The clinical value of Umod may probably extend further than just as a marker of kidney function. In recent years, evidence of a potential diagnostic and prognostic role of this protein in disease entities such as cardiovascular diseases, diabetes and metabolic syndrome has been brought to the fore, as well as to determine the risk of developing acute kidney injury (AKI) in patients undergoing cardiac surgery.

Higher sUmod levels are associated with a lower incidence of diabetes and hypertension and a lower risk of overall mortality, based on findings from a group of patients subjected to coronarography, which suggests Umod may have potential for predicting the risk of cardiovascular events [38,41]. A study involving 933 older patients by Steubl et al. leads to similar conclusions [43], however, Then et al. reported that the potential of sUmod as a biomarker of cardiovascular mortality in people aged 62 and older applied only the men [40].

In addition to its advantages as a biomarker of kidney and cardiac dysfunction, Umod is probably associated with glucose metabolism disorder. Leiherer et al. found a statistically significant inverse correlation between sUmod level and fasting glucose, based on 75 g oral glucose load and glycated hemoglobin tests. Patients with type 2 diabetes or prediabetes have been shown to exhibit lower sUmod concentrations compared with those without these disorders, which may indicate subclinical and early renal impairment [58]. Levels of glycated Umod (as the final glycation product) in urine were significantly higher in patients with diabetic kidney disease (DKD) compared with patients suffering from CKD without diabetes, which may be associated with impaired Umod function in diabetic patients, although the relationship underlying this association remains unclear [59]. In a study monitoring 527 patients with type 1 dia-

betes, a 12-year follow-up found that higher baseline sUmod concentrations were associated with a lower risk of developing coronary artery calcification (CAC) and diabetic kidney disease (DKD) [60]. In adolescents with type 1 diabetes, lower sUmod levels correlated with a higher degree of albuminuria, which may indicate the beginning of the development of kidney dysfunction [61].

Furthermore, Umod may serve as a marker for metabolic syndrome. The concentration of Umod in blood serum is inversely correlated with parameters which are indicative of persistent metabolic syndrome (including elevated triglycerides and elevated blood pressure), but does not necessarily allow the prediction of newly developing disorders [62].

Preliminary data also suggest that the risk of acute kidney injury (AKI) in patients undergoing cardiac surgery can be assessed based on Umod concentrations. A lower preoperative Umod-to-creatinine ratio in the urine has been associated with a higher risk of developing AKI as a complication after undergoing cardiac surgery in adults [63]. Reduced concentrations of uUmod in the preoperative period may also indicate a higher probability of AKI occurring in children after undergoing cardiopulmonary bypass (CPB) surgery [64]. However, no correlation between the sUmod concentration and the risk of developing AKI after acute pancreatitis could be demonstrated [65].

Conclusions

Seventy years after the discovery of Tamm-Horsfall protein, the factor now known as uromodulin is undergoing a revival as the subject of clinical research into its potential as a diagnostic parameter. Although its physiological role is still not fully defined, advanced research techniques such as meta-analyses of laboratory and clinical data are shedding further light on the potential of Tamm-Horsfall protein / uromodulin as a biomarker of renal function, alongside conventional parameters. Uromodulin is a more sensitive indicator than creatinine for the detection of early CKD. In addition, uromodulin concentration reflects the function of the renal tubules, which is currently not possible using other parameters. Higher concentrations of sUmod and uUmod have become associated with a lower risk of CKD progression, with a lower risk of CKD incidents, lower mortality in elderly patients and lower risk of AKI in the postoperative period. All these correlations demonstrate the close relationship between uromodulin and renal function, making it a specific and sensitive indicator of kidney health. Clinical application as a renal marker and the association of Umod with various disease entities requires further research in order to be able to introduce uromodulin monitoring into routine clinical practice as a diagnostic and prognostic tool with respect to kidney and other organ diseases.

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PHYSICAL EFFORT IN TREATING DEPRESSION IN THE ELDERLY – A SYSTEMATIC REVIEW

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ABSTRACT

Depression is the most common mental disorder among people over 65 years old, making it one of the most significant health problems for this population. Due to the fact that medications and psychological therapy are not effective in all cases, many studies in recent decades have highlighted alternative treatments for depression. In particular, physical exercise has been highlighted as a potentially beneficial form of treatment. The purpose of this paper was to conduct a review into the relationship between exercise and its effects on the treatment of depression in the elderly. Specifically, PubMed and Google Scholar were searched for articles on the effectiveness of physical activity interventions for the treatment of senile depression and the reduction of its symptoms.

The results show that physical activity is effective for reducing the symptoms of depression amongst the elderly. The positive effects of physical activity in the treatment of depression in the elderly were found for both endurance and resistance exercises, and for low-, moderate- and high-intensity exercise. Positive effects were observed for both traditional and water-based forms of exercise. Aligning the type and intensity of exercise to the patient's personal preferences also helps to enhance the effectiveness of training. Overall, it was concluded that physical exercise can serve as a valuable strategy for the protection of mental health amongst the elderly. However, more research is needed to clarify the most effective type, intensity, and frequency of exercises to treat depression.

KEYWORDS: depression, elderly people, physical activity, physical exercise

Background

Depression is a recurrent psychiatric disorder with a chronic course [1], the main symptoms of which include: low mood, decreased interest or pleasure in most or all activities of everyday life, reduced motivation, increase or decrease in appetite and weight, insomnia or hypersomnia, psychomotor agitation or delay, fatigue, cognitive impairment (e.g. memory deficit), and thoughts of suicide or suicide attempt [2]. It is generally understood to be caused by impaired impulse transmission between neurons in the central nervous system, which causes abnormal sensitivity of receptors in synapses between nerve cells [3].

Depression is the most common mental disorder among the elderly [4]. The World Health Organization (WHO) estimate that one in ten older people are depressed, and it has been elsewhere reported that approximately 15% of adults over the age of 65 are depressed [5]. In older people, depression tends to occur along with cognitive impairment, which increases the risk that the disease will persist. In addition, patients in this age group have a number of physical and mental comorbidities, which means that the effects of depression are more severe [6].

Several questionnaires can be used to measure depression. For example, different scales developed for the identification and diagnosis of depression include the Patient Health Questionnaire (PHQ) [7], the Hospital Anxiety and Depression Scale (HADS) [8], the Quick Inventory of Depressive Symptomatology (QIDS) [9], and the Raskin Depression Rating Scale [10]. The criterion of the 10th edition of the International Classification of Diseases (ICD-10) can also be applied by determining the occurrence and severity of depressive symptoms [11]. For elderly populations in particular, a common tool that is used is the Geriatric Depression Scale (GDS), which can be used together with a diagnostic interview performed by mental health specialists to provide an accurate diagnosis of depression [12].

Depression is commonly treated with antidepressants and psychological therapy. Medicinal pharmacological agents, such as selective serotonin reuptake inhibitors (SSRIs), serotonin / noradrenaline reuptake inhibitors (SNRIs), noradrenaline and specific serotonin antidepressants (NsSSA), are selected individually on the basis of pharmacological history and data confirmed in medical documentation [13]. The main goal of psychological therapy is to make contact with a sick person, create interest and sense of security, as well as focus on a positive perception of reality [14].

Research evidence suggests that only about half of people taking antidepressants tend to see a clinically significant response [2]. In addition, taking antidepressants is associated with side effects that may include weight gain, drowsiness, increased risk of diabetes, and sexual dysfunction [2]. Another problem associated with the treatment of depression is that antidepressants are often combined with each other, particularly when the patient struggles with other diseases, which involves numerous consultations with the doctor. Such solutions may prove to be too expensive for patients, which means that sometimes they give up treatment. Due to the limitations of existing treatments, some alternative and complementary methods have been given more attention. In particular, it has been suggested that combining existing treatments with physical exercise can lead to considerably better results [2].

Exercise has many health benefits. Physical activity leads to the secretion of endorphins (hormones associated with feelings of happiness and positive mood), and so helps to fight against stress and negative emotions. Furthermore, physical exercise reduces the level of cortisol, a stress hormone, thereby improving patients' mood and supporting the treatment of many conditions, including depression. Finally, exercise also stimulates the growth of new nerve cells and releases proteins that help the nerve cells survive, meaning that regular exercise can partially reverse the effects of aging in physiological functions [15].

An increasing amount of research is being conducted into the effectiveness of exercise in the healing process. This article focuses on geriatric mental health in particular, exploring the impact of exercise on depression symptoms in people over 60 years of age. Attention was paid to various types of exercise, their intensity, and other ailments (e.g. cancer, cognitive impairment, or reduced muscle strength). The effects of physical exercise in treating depression in the elderly were compared with cognitive-behavioral therapy (CBT), which is the most common form of psychological treatment for depression.

Material and Methods

A systematic literature review was carried out into the impact of physical activity on the effectiveness of depression treatment and the reduction of depressive symptoms. The PubMed and Google Scholar databases were searched for articles on senile depression, treatment standards, the impact of physical exertion on the human body, and the depression treatment process. From the search results, all papers were examined for relevance and timeliness of information. In total, 39 relevant studies were identified. Eight studies were rejected because they were published prior to 2007 and/or because they used a sample which did not consist of elderly people. The above data is summarized in fig. 1. The studies which were included were mostly intervention studies, in which a physical activity intervention was described in detail.

Results

Difficulties of the elderly

Reduced muscle strength is a phenomenon often found in older people [16], and is associated with the development of depression. For example, a review of 17 articles found a much greater likelihood of depression symptoms in people with reduced muscle strength. This suggests that the use of resistance exercises to increase muscle strength or prevent its decline could be an effective method for the treatment of depression in the elderly [17].

There are many scientific reports that oxidative stress, which can be defined as the build-up of excessive free radicals in the body (causing damage to tissues and cells), is associated with worsening symptoms of depression [18–20]. Oxidative stress is the build-up of too much free radicals in the body, which can damage tissues and cells [21]. In the Acordi da Silva study, the effects of water-based exercise on mental health and oxidative stress parameters in older people were examined. A 12-week study covered a study group of 20 depression patients aged 50–80 years and a control group of 20 people without depression aged 50–80 years. The training program completed by both groups included two 45-minute sessions per week of interval exercises in water. Exercises were performed in the low intensity range (50%-60% of maximum heart rate [HR max]). All participants were examined before and after the intervention. The study group showed a 53% decrease in depression symptoms, a 48% decrease in anxiety symptoms and a 46% decrease in oxidative stress, suggesting that low-intensity water exercises can be an effective means of treatment for depression in the elderly [22].

Older people often struggle with many different diseases at once. These comorbidities can be independent of the depression, or can serve to cause or worsen the disorder [6,23]. In both cases, physical exercise can help improve the patient's overall health and quality of life, as long as the disease is not a contraindication to physical activity. For example, the 12-week randomized study by Abdelbasset involved 69 patients with both heart failure and depression. They were randomly assigned to three groups: group 1 completed low-intensity exer-

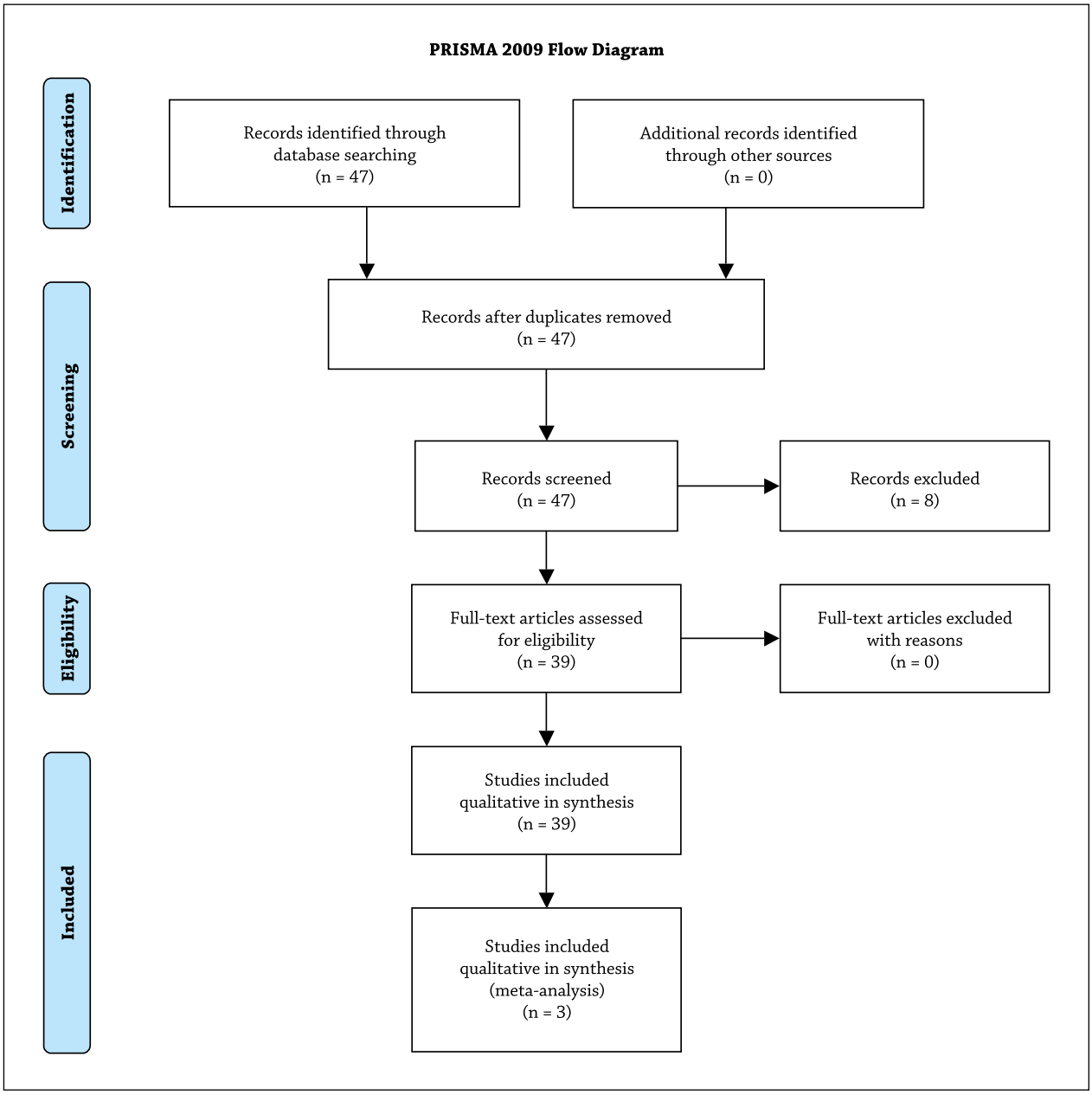

Figure 1. Summary of research used in the article

cises, group 2 completed low- to moderate-intensity exercises, while group 3 did not complete any exercise. The results of the study show that both exercise programs had a positive effect on reducing the severity of depression in patients with heart failure [24].

Depression also often accompanies cancer. Exercise helps cancer patients return to physical fitness and reduce depression symptoms. For example, a prospective study provided evidence that a 10-week intervention in the form of a twice-weekly exercise group program (consisting of gymnastics, movement games, relaxation, walking, and jogging) was effective in significantly improving the psychosocial well-being of patients and their ability to cope with the disease [25]. Similarly, the Coutiño-Escamilla study showed that a yoga exercise program resulted in a decrease in depressive symptoms in patients with breast cancer [23].

Exercise and depressive symptoms

Cognitive impairment is one of the symptoms of depression, and is also implicated in other diseases such as schizophrenia. Various studies have investigated the effects of physical activity on alleviating cognitive impairment. For example, one study showed a positive effect on mental health, cognitive function, and brain activity as a result of an exercise program in patients suffering from schizophrenia [26]. Moreover, a meta-analysis showed that a combination of cognitive and physical training strategies in patients with dementia was associated with significant improvements on patients' cognitive functions, although the study did not identify the features of the most effective types of training (e.g. exercise type, duration, and frequency) [27]. However, with respect to depression in particular, a review of randomized controlled stud-

ies including various aerobic (e.g. running, walking, and cycling) and anaerobic (e.g. weightlifting, isometric exercises) exercise interventions showed that there were no significant improvements in cognitive impairment [28]. These results were contrary to the literature data a positive effect of physical exercise on cognitive functions in other mental disorders [26,27,29]. These conflicting reports suggest there is a need for more research.

Another symptom associated with depression and a decreased quality of life is anxiety, which can be described as a fear of everyday life events. The cross-sectional study by de Oliveira and colleagues focused on the relationship between the level of quality of life, anxiety, and depression. They conducted a cross-sectional study which involved 100 older people who led an activity lifestyle and 100 people who lived in the same community but were not involved in physical activity. It was discovered that those with an active lifestyle had significantly better quality of life, and lower scores for anxiety and depression [5]. Similarly, De Mello compared the relationships between physical activity, depression, and anxiety, and found that depression and anxiety symptoms tended to be higher amongst elderly adults who did not exercise. Female participants tended to exercise less frequently than male participants, suggesting that they might be particularly at risk of developing depression [30].

Suicidal thoughts are another symptom of depression. Abbas Abdollahi investigated the effects of exercise as a complementary treatment to CBT for people with suicidal thoughts and mild to moderate depression. Seventy study participants were randomly assigned to two groups. The first group combined CBT with exercises that consisted of a 5-minute warm-up, light cardiovascular exercises, a 20-minute walk, and a 5-minute stretch combined with breathing exercises. Exercises were performed three times a week at 12 weeks at moderate intensity, with a rating of between 12 and 14 at the Borg Scale (a commonly-used scale for training intensity, based on the relationship between heart contractions and maximal oxygen uptake, where 6 indicates no effort at all and 20 indicates maximum effort). In the second group, the subjects underwent only cognitive behavioral therapy. The results showed that both groups experienced a decrease in depression and suicidal thoughts, but the improvements were greater in the group which combined CBT with exercise [31].

Exercise in the treatment of depression

Huang compared the effectiveness of CBT and physical activity in the treatment of depression amongst patients aged 65 and older. In the physical activity group, patients completed an exercise program lasting approximately 50 minutes three times per week for 12 weeks in total. Exercises began with warm-up, followed by moderate-intensity cardiovascular exercises, muscle strength exercises and finally stretching exercises combined with breathing exercises. The exercises were accompanied by music. In contrast, those in the CBT group received 12 weekly group CBT sessions, lasting 60–80 minutes each. The results showed that the physical activity group experienced significant post-intervention improvements in depressive symptoms, physical fitness, and quality of life, whereas there were no statistically significant changes in the CBT group on these measures [32].

Physical exercises can be used both in the treatment of depression and its prevention [34]. Older people often tend to live sedentary lifestyles, and many studies show that people with lower levels of physical activity have a higher risk of depressive symptoms [34–36]. Mammen and Faulkner conducted a review into the relationship between physical activity and depression, and found that 25 out of 30 studies identified a protective effect of physical activity on the occurrence of depression [36]. In a different study, Meyer and colleagues found that a 20-minute bicycle ride led to a reduction of depressed mood 10 and 30 minutes after exercise, regardless of the intensity [37]. These studies suggest that physical exercise can therefore serve as a valuable strategy for reducing the risk of developing depression among older people and promoting mental health.

The Ströma study explored whether the effects of physical activity interventions differed with respect to depression severity, recruiting 48 patients with major depression as participants. The control group consisted of people with mild and moderate depression, and the study group consisted of people with severe depression. Both groups underwent an Internet-vased physical activity promotion program, consisting of 9 modules, which people completed every Monday for 9 weeks. Participants also received pedometers, but no results were reported because they were used in different ways. The results did not show an increase in the level of physical fitness and muscle strength, but there were significant improvements in symptoms of depression, quality of life, and physical activity levels in both the study group and control group [38].

Finally, Nyström conducted a systematic review which aimed to determine which type of physical activity is most effective in the treatment of major depressive disorders. The most common intervention was aerobic, followed by anaerobic and mixed training. In aerobic training, activities such as jogging, cycling or walking were chosen, and in resistance training weightlifting was the most common activity. Exercises were more often performed individually than in groups. The average frequency was three times a week, with an intensity of 65–85% HR max and a session duration of 30–90 minutes. The results showed that both aerobic and resistance training were associated with reductions in the symptoms of depression, and these effects were consistent whether the training was performed by individuals or in groups. Longer interventions also tended to give more positive results [39].

Discussion

Physical exercise can take various different forms. In the treatment of depression in the elderly, it is justified to use endurance exercises [22, 24, 25, 37] as well as resistance exercises [17]. For example, studies showing the positive impact of endurance exercises highlighted various forms of physical activity (e.g. aquabatics, jogging, cycling, walking) and classic gym exercises (e.g. warm-up, cardiovascular exercises, stretching exercises with breathing exercises) that can be effective in treating depression [22,28,39]. Furthermore, the combination of aerobic and resistance exercises also shows positive results in fighting depression [39]. However, too few studies have compared the effectiveness of different types of activities, and so it is still not clear which type of activity will be most effective in reducing depression symptoms [39].

Additionally, questions remain regarding the optimal intensity of the exercise for reducing depression symptoms. Many studies [22,24,39] show that benefits can be attained by imposing a pre-determined intensity (e.g. low, moderate, or high) on the exercise for patients. However, more positive results are attained when the patient can choose the intensity of their exercises, suggesting that patients in future research and practice should have a choice as to how intense the training set they will perform should be [38].

The optimal frequency and duration of the exercise is also an issue which will need to be explored in future research, as this has varied in existing studies with unconclusive results. In some studies it was found that exercise which took place once per week was sufficient for improving the depressive state, whereas other studies found improvements when the exercise took place three times a week [22,32,38,39]. Similarly, with respect to the duration of the exercise, the studies reviewed did not adjust exercise durations to the preferences of the subjects and instead selected a duration most often in the range of 30–60 minutes.

Finally, the impact of exercise on cognitive impairment, which is one of the most common symptoms of depression in the elderly, is also unclear. Studies of other mental illnesses have shown a positive effect of exercise on cognitive impairment [26,27,29], but unfortunately this is not confirmed in studies on depression [28]. Therefore, more research is needed to determine the effectiveness of exercises in this area.

Conclusion

In this article, 39 studies into the effectiveness of physical exercise for elderly individuals struggling with depression were reviewed. First, attention was paid to people who also struggle with other ailments (e.g. reduced muscle strength, oxidative stress, heart failure, or cancer). Then, reference was made to the effect of exercise on depression symptoms, such as cognitive impairment, anxiety, and suicidal thoughts. Finally, the positive effect of exercise in treating depression is presented. It was demonstrated that physical activity is associated with reductions in the intensity of depression, improvements in the quality of life, and the prevention of the rapid development of the disease.

Therefore, it can be concluded that physical exercises have a positive effect in combating depressive symptoms. Regular activity under qualified supervision, whether completed individually or in groups, can be tailored to the individual needs and skills of a person in terms of the type of exercise, intensity, frequency, and duration. By exercising regularly, older people will improve biological and physical functioning, increase mobility and muscle strength, and improve mood. Specifically, it can be expected that physical activity will help to increase motivation and self-esteem amongst elderly populations, and also improve depressive symptoms, quality of life, and general daily functioning. This will help to eliminate or alleviate the experience of depression and its comorbidities. In future research, it will be most beneficial to explore the type, intensity and frequency of exercise that is associated with the most effective results in terms of preventing depression.

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