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"European Physical Activity And Sports Monitoring System"

EUPASMOS – DEVELOPING AN EUROPEAN UNION COMPARABLE PHYSICAL ACTIVITY AND SPORT MONITORING SYSTEM

Project name: "EUPASMOS – European Physical Activity and Sports Monitoring System"
Project total funding value from ERASMUS + Sport: € 399.980
Project duration: January 2018 – December 2019

The European Union Physical Activity and Sport Monitoring System (EUPASMOS) is a two-year project developed by EU Member States, leaded by the Portuguese Institute of Sport and Youth. The project will run between January 2018 and December 2019 and includes already several EU Member States namely Bulgaria, Cyprus, Denmark, England, Italy, France, Finland, Hungary, Latvia, Netherlands, Portugal, Poland, Slovenia, Spain and Sweden. As an inclusive European Union project, all other remaining Member States can also join EUPASMOS anytime. The project is being driven by a coordination team led by Mr. Paulo Rocha (Portuguese Institute of Sport and Youth) working in close collaboration with the WHO Regional Office for Europe.

The project is co-funded by the Erasmus+ Sport Programme of the European Union and the participating Member States, being estimated a total project budget of 1.5 million euros. Erasmus+ Sport Programme aims to support European partnerships on grassroots sport in order to pursue the following objectives: tackle cross-border threats to the integrity of sport, such as doping, match fixing and violence, as well as all kinds of intolerance and discrimination; to promote and support good governance in sport and dual careers of athletes; and to promote voluntary activities in sport, together with social inclusion, equal opportunities and awareness of the importance of health-enhancing physical activity, through increased participation in, and equal access to sport for all.

The aim of the EUPASMOS project is to implement an European Union Physical Activity and Sport Monitoring System through the development of an integrated and shared methodological process that will provide comparable, valid and reliable physical activity and sport participation data across EU Member States. The outcome of this project will support Member States, WHO, European Commission and other relevant stakeholders in the design, promotion, implementation and surveillance of more effective, evidence-based HEPA policies and strategies across the European Union.

Therefore the project focuses on the following objectives:

I. To Establish a monitoring framework to assess sedentary behavior patterns, PA and sport participation in EU MS.
II. To compare commonly used questionnaires for PA surveillance (e.g. GPAQ, IPAQ, European Health Interview Survey Physical Activity Questionnaire - EHIS-PAQ, Eurobarometer and national - specific PA questionnaires) with each other and with objective accelerometer data in a validation study that will use adjusted representative samples from EU partner countries.
III. To analyze and compare sedentary behavior patterns and PA and sport participation prevalence rates across European MS based on the results obtained in the validation study.
IV. To develop a toolkit to build and reinforce MS capacity to monitor, analyze, and compare sedentary behavior patterns, PA and sport participation prevalence data, as well as to support MS in implementing and developing the EU PA and sport monitoring framework in their own countries.
V. To support the development of the PA section of the WHO Health Gateway database, including data on sedentary behavior patterns, aligned with the EU HEPA monitoring framework.

The list of original project partners (as indicated in the EUPASMOS application) is as follow:

- Portuguese Institute of Sport and Youth (Lisbon, Portugal) – Leader of the Project; Paulo Rocha
- Cyprus Sports Medicine & Research Centre (Nicosia, Cyprus), Michalis Michaelides
- Université Clermont Auvergne (Clermont-Ferrand, France), Martine Duclos
- Public Health Agency of Sweden (Stockholm, Sweden), Marita Friberg
- Latvian Academy of Sport Education (Riga, Latvia), Andra Fernate
- Hungarian Leisure Sport Association (Budapest, Hungary), Réka Veress
- Faculty of Sport, University of Ljubljana (Ljubljana, Slovenia), Gregor Jurak
- National Institute for Public Health and the Environment (Bilthoven, Netherlands), Wanda Wendel-Vos
- Movimento Sportivo Popolare Italiano (Rome, Italy), Igor Lanzoni

Since the initial EUPASMOS application several other EU Member States have joined the project and are already working together:

- Pope John Paul II State School of Higher Education in Biala Podlaska (Biała Podlaska, Poland), Józef Bergier
- Bulgarian Ministry of Youth and Sport (Sofia, Bulgaria), Viktoria Slavkova
- UKK Institute for Health Promotion Research (Tempere, Finland), Tommi Vasankari
- University of Castilla-La Mancha (Toledo, Spain), Antonio Campos-Izquierdo
- Sport England (London, Great Britain), Andrew Lewis
- University of Southern Denmark, (Odense, Denmark), Anne Illemann Christensen

The project is also counting with the support of several relevant international sport and health sector organizations such as TAFISA, ISCA, EuropeActive, European Cycling Federation, European Platform for Sport Innovation, Robert Koch Institute, Institute of Sport Science and Sport, and of course WHO – Regional Office for Europe.

All the information developed by the EUPASMOS project regarding the framework definition, methodology used, results obtained and toolkits produced will be published in the official website at www.eupasmos.com.

Editorial Board
"Health Problems of Civilization"

Od Redakcji

Państwowa Szkoła Wyższa im. Papieża Jana Pawła II w Białej Podlaskiej w projekcie
"European Physical Activity And Sports Monitoring System"

EUPASMOS – OPRACOWANIE PORÓWNYWALNEGO SYSTEMU MONITOROWANIA AKTYWNOŚCI FIZYCZNEJ I SPORTU W KRAJACH CZŁONKOWSKICH UNII EUROPEJSKIEJ

Nazwa projektu: "EUPASMOS – System Monitorowania Aktywności fizycznej i sportu w krajach członkowskich UE"
Całkowita wartość projektu otrzymana z ERASMUS + Sport: € 399.980
Długość projektu: styczeń 2018 – grudzień 2019

System Monitorowania Aktywności Fizycznej i Sportu w krajach członkowskich Unii Europejskiej (EUPASMOS) to dwuletni projekt opracowany przez państwa członkowskie UE i kierowany przez Portugalski Instytut Sportu i Młodzieży. Projekt będzie realizowany od stycznia 2018 r. go grudnia 2019 r. i swoim zasięgiem obejmuje już kilka państw członkowskich UE, tj. Bułgarię, Cypr, Danię, Anglię, Włochy, Francję, Finlandię, Węgry, Łotwę, Holandię, Portugalię, Polskę, Słowenię, Hiszpanię i Szwecję. Jako integracyjny projekt Unii Europejskiej wszystkie inne pozostałe państwa członkowskie mogą również dołączyć do projektu EUPASMOS w dowolnym momencie. Projekt jest realizowany przez zespół koordynacyjny kierowany przez Paulo Rochę (Portugalski Instytut Sportu i Młodzieży), który ściśle współpracuje z Regionalnym Biurem ds. Europy Światowej Organizacji Zdrowia.

Projekt współfinansowany jest ze środków Unii Europejskiej tj. Projektu Centralnego Erasmus+ Sport, którego całkowity budżet szacuje się na 1,5 miliona euro. Celami szczegółowymi realizowanymi w ramach programu Erasmus+ w dziedzinie sportu są: eliminowanie transgranicznych zagrożeń dla uczciwości w sporcie, takich jak doping, ustawianie wyników zawodów sportowych i przemoc, a także wszelkiego rodzaju nietolerancji i dyskryminacji; promowanie i wspieranie dobrego zarządzania w sporcie i kariery dwutorowej sportowców; promowanie wolontariatu w sporcie oraz włączenia społecznego, równych szans i podnoszenia świadomości znaczenia aktywności fizycznej poprawiającej zdrowie dzięki większemu udziałowi i równemu dostępowi do sportu dla wszystkich.

Celem projektu EUPASMOS jest wdrożenie systemu monitorowania aktywności fizycznej i sportu poprzez opracowanie zintegrowanego i wspólnego procesu metodologicznego, który dostarczy porównywalnych, potwierdzonych i wiarygodnych danych o aktywności fizycznej oraz danych dotyczących udziału w sporcie w państwach członkowskich UE. Wyniki tego projektu będą wsparciem dla państw członkowskich UE, WHO (Światowej Organizacji Zdrowia), Komisji Europejskiej i innych zainteresowanych stron przy opracowywaniu, promowaniu, wdrażaniu i nadzorowaniu skuteczniejszych, opartych na dowodach polityk i strategii dotyczących HEPA (polityka UE dotycząca sportu pt. Propagowanie aktywności fizycznej służącej zdrowiu (Health Enhancing Physical Activity)) w całej Unii Europejskiej.

Dlatego też, projekt EUPASMOS będzie w głównej mierze skupiał się na:

I. Ustanowieniu ram monitorowania w celu oceny zachowań sedenteryjnych, aktywności fizycznej i udziału w sporcie obywateli w państwach członkowskich UE.
II. Porównaniu powszechnie stosowanych kwestionariuszy oceny aktywności fizycznej (np. GPAQ, IPAQ, EHIS-PAQ, Eurobarometr i krajowe kwestionariusze dot. aktywności fizycznej) ze sobą oraz z obiektywnymi danymi uzyskanymi za pomocą akcelerometrów typu Hookie Am20 Triaxial w badaniu walidacyjnym, które wykorzysta skorygowane reprezentatywne próbki z krajów partnerskich UE.
III. Analizie i porównaniu zachowań sedenteryjnych, aktywności fizycznej i udziału w sporcie obywateli w państwach członkowskich UE w oparciu o wyniki uzyskane w badaniu walidacyjnym.
IV. Opracowaniu zestawu narzędzi do budowania i wzmacniania potencjału państw członkowskich w zakresie monitorowania, analizowania i porównywania zachowań sedenteryjnych, aktywności fizycznej i udziału w sporcie obywateli UE, a także wspieraniu państw członkowskich we wdrażaniu i rozwijaniu ram systemu monitorowania aktywności fizycznej sportu w poszczególnych krajach.
V. Wspieraniu rozwoju sekcji odnoszącej się do aktywności fizycznej w bazie danych WHO iNCD (Zintegrowany nadzór nad chorobami niezakaźnymi), w tym danych na temat zachowań sedenteryjnych i dostosowane ich do ram monitorowania UE w polityce HEPA.

Lista organizacji pierwotnie uczestniczących w projekcie jest następująca:

- Portugalski Instytut Sportu i Młodzieży (Lizbona, Portugalia) – lider projektu; Paulo Rocha
- Cypryjska Organizacja Sportowa (Nikozja, Cypr), Michalis Michaelides
- Universytet Clermont Auvergne – Wydział Żywienia (Clermont-Ferrand, Francja), Martine Duclos
- Agencja Zdrowia Publicznego Szwecji (Sztokholm, Szwecja), Marita Friberg
- Łotewska Akademia Wychowania Fizycznego (Ryga, Łotwa), Andra Fernate
- Węgierskie Stowarzyszenie Sportu Rekreacyjnego (Budapeszt, Węgry), Réka Veress
- Uniwersytet w Lublanie - Wydział Sportu (Lublana, Słowenia), Gregor Jurak
- Narodowy Instytut Zdrowia Publicznego i Środowiska (Bilthoven, Holandia), Wanda Wendel-Vos
- Włoskie Stowarzyszenie Sportowe (Rzym, Włochy), Igor Lanzoni

Od rozpoczęcia EUPASMOS kilka innych państw członkowskich UE przystąpiło do projektu i rozpoczęło wspólną pracę:

- Państwowa Szkoła Wyższa im. Papieża Jana Pawła II w Białej Podlaskiej (Biała Podlaska, Polska), Józef Bergier
- Ministerstwo Sportu i Młodzieży (Sofia, Bułgaria), Viktoria Slavkova
- Instytut promocji Zdrowia UKK (Tempere, Finlandia), Tommi Vasankari
- Uniwersytet Castilla – La Mancha (Toledo, Hiszpania), Antonio Campos-Izquierdo
- Sport England (Londyn, Wielka Brytania), Andrew Lewis
- Uniwersytet Południowej Danii, (Odense, Dania), Anne Illemann Christensen

Projekt może liczyć również na wsparcie kilku znaczących międzynarodowych organizacji sektora sportu i zdrowia, takich jak TAFISA, ISCA, EuropeActive, Europejska Federacja Rowerowa, Europejska Platforma na rzecz Innowacji Sportowych, Instytut Roberta Kocha, Instytut Nauk o Sporcie i Sportu, i oczywiście WHO - Regionalne biuro ds. Europy.

Wszystkie informacje opracowane w ramach projektu EUPASMOS dotyczące definicji ram monitorowania, zastosowanej metodologii, uzyskanych wyników i opracowanych zestawów narzędzi zostaną opublikowane na oficjalnej stronie internetowej www.eupasmos.com.

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PART I. DISEASES AND PROBLEMS DISTINGUISHED BY WHO AND FAO
DZIAŁ I. CHOROBY I PROBLEMY WYRÓŻNIONE PRZEZ WHO I FAO

EFFECT OF SELENIUM ON BREAST CANCER IN WOMEN – PART I

WPŁYW SELENU NA ZAPOBIEGANIE NOWOTWOROM GRUCZOŁU PIERSIOWEGO U KOBIET – CZĘŚĆ I

Katarzyna Sygit[1(B,D,E,F,G)], **Krzysztof Sieja**[2(A,B,C)], **Marian Sygit**[3(B,D,E,F)], **Katarzyna Pasierbiak**[4(D,E)]

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[4]Poddębickie Centrum Zdrowia SP. z o.o. Hospital, Vis Salus Foundation for the Promotion of Mental and Somatic Health, Poland

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

Summary

Background. Breast cancer is the most common malignant tumour in women in Poland. To reduce the risk of breast cancer, appropriate prevention is necessary. Numerous studies conducted over many years in Poland and throughout the world have demonstrated a significant effect of selenium on prevention of disease, including breast cancer in women. The following paper aims to present the literature on effects of selenium (Se) on prevention of breast cancer in women.
Material and methods. Based on national and international literature, the paper presents information on the role of selenium (Se) in prevention of breast cancer in women.
Results. Numerous studies conducted in research centres in Poland and abroad have shown that female patients with breast cancer and individuals with gastrointestinal cancer have significantly lower selenium concentration in their blood serum and whole blood, as well as significantly lower GSH - Px activity in plasma and red blood cells, compared to healthy women. Low selenium concentration may indicate an increased risk of breast cancer. Selenium is an essential co-factor in the production of antioxidant enzymes and may affect the development of cancer. Clinical trials which assessed selenium content in food showed that its supplementation reduced cancer mortality.
Conclusions. Results of numerous national and prospective international studies indicate that low selenium intake and/or concentration in serum/plasma/nails is a high-risk marker of the majority of cancers, including breast cancer in women.

Keywords: prevention, selenium, cancer, breast cancer

Streszczenie

Wprowadzenie. Nowotwór gruczołu piersiowego jest najczęstszym nowotworem złośliwym u kobiet w Polsce. Aby zmniejszyć ryzyko zachorowania na raka piersi niezbędna jest odpowiednia profilaktyka. Liczne badania prowadzone od wielu lat w Polsce i na świecie pokazały znaczące działanie selenu w profilaktyce chorób nowotworowych – w tym nowotworów piersi u kobiet. Celem niniejszej pracy jest przedstawienie w świetle literatury przedmiotu wpływu selenu (Se) na zapobieganie nowotworom gruczołu piersiowego u kobiet.
Materiał i metody. W pracy zaprezentowano na przykładzie dostępnej literatury przedmiotu (krajowej jak i zagranicznej) informacje dotyczące roli selenu (Se) w profilaktyce nowotworu gruczołu piersiowego u kobiet.
Wyniki. Liczne badania prowadzone w ośrodkach zarówno w Polsce jak i zagranicą wykazały, że u pacjentek z rakiem gruczołu piersiowego oraz u osób z nowotworami przewodu pokarmowego stwierdza się znamiennie niższą koncentrację selenu w surowicy, w pełnej krwi oraz znamiennie niższą aktywność GSH - Px w osoczu i krwinkach czerwonych w porównaniu do kobiet zdrowych. Niska koncentracja selenu może być wskaźnikiem zwiększonego ryzyka raka gruczołu piersiowego. Selen jest ważnym kofaktorem w produkcji enzymów antyoksydacyjnych i może wpływać na przebieg procesu nowotworowego. W próbach klinicznych związanych z oceną zawartości Se w pożywieniu wykazano, że suplementacja Se zmniejsza śmiertelność z powodu raka.
Wnioski. Wyniki licznych badań prospektywnych krajowych i zagranicznych wskazują, iż niskie spożycie selenu i/lub stężenia tego pierwiastka w surowicy/osoczu/paznokciach jest markerem wysokiego ryzyka zachorowania na większość nowotworów, w tym nowotworu gruczołu piersiowego u kobiet.

Słowa kluczowe: prewencja, selen, choroba nowotworowa, nowotwór piersi

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Introduction

High incidence of breast cancer in women motivates numerous research teams to look for causes of morbidity, as well as to search for preventive methods and effective therapeutic measures. Numerous studies conducted over many years in Poland and throughout the world have demonstrated a significant effect of selenium in the prevention of cancer, including breast cancer in women.

It has been proved that the chemical transformation of selenium into a methylated metabolite is an important step in achieving anti-cancer prevention. The studies based on carcinogenesis of breast cancer in an experimental model in rats suggest that methyl cysteine is a precursor of endogenous formation of methyl selenol, which enables blocking the clonal expression of precancerous lesions in the mammary gland [1,2]. The obtained results confirm that cellular intervention of selenium takes place in the early stages of carcinogenesis. Selenium reduces transformation of cancer cell colonies *in vivo.* Additionally, methyl selenecysteine (MSC) facilitates apoptosis. The same cellular response was obtained in studies on pre-cancerous cells of human breast cancer. An analysis of cDNA microarrays (a microarray – applicable to the study of a gene sequence) indicates that selenium is active in numerous molecular cell sites [1]. The following paper aims to present the literature on effects of selenium (Se) on prevention of breast cancer in women.

Selenium versus breast cancer in women

Breast cancer is the most common malignant tumour in women in Poland, where it accounts for about 12% of all cancers. It is the most common cancer among women in terms of the cause of death [3]. Every year, 12,000 new cases of this malignant tumour are diagnosed in Poland. Additionally, it causes 5000 deaths annually. It is estimated that currently 50,000-60,000 Polish women are affected by this type of cancer. It is expected that every 14th Polish woman will develop breast cancer in the future, while the incidence in most European countries is even higher. For example, in the United Kingdom – a country with almost twice the rate of incidence of breast cancer – every 9th woman will develop it. In contrast to other cancers, the chance to cure breast cancer increases significantly if it is diagnosed at an early stage. In Poland, *Early Breast Cancer Detection Program* was introduced in 2006, and there are already some visible changes in the structure of deaths. Thanks to the introduction of free screening tests for early detection of breast cancer, the number of deaths in recent years has remained stable [4].

The majority of studies on the relationship between selenium and cancer development focus on experimental, epidemiological and clinical research on breast cancer. Schrauzer et al. investigated the impact of diet which mimicked the diet of American, Bulgarian and Japanese women concerning selenium content on the incidence of virus-induced breast cancer in mice. The That study aimed to investigate the impact of a diet which mimicked the diet of a typical American, Bulgarian and Japanese woman, on the development of nodules in C3M mice after applying an oncogenic MMTV virus to mice's mammary gland. The largest number of nodules appeared in the group of mice which followed the American diet, i.e. rich in meat and fats, with little selenium (0.15 ppm). The fewest nodules developed in the group of mice on the Bulgarian diet. This correlates with epidemiological conclusions about lower incidence of breast cancer amongst Bulgarians, compared to residents of other European countries and the United States. The Bulgarian diet contained more selenium (0.25 ppm), less fat, meat, sugar, and more complex carbohydrates (cereal) than the American diet [5]. In mice on the Japanese diet, there was also a delayed occurrence of breast cancer, and its frequency was lower. In the Japanese menu, fish was the primary source of selenium. However, selenium contained in fish is not easily available biologically. Supplementation of selenium in the diet of Japanese women also reduced the incidence of breast cancer. Based on these studies, the authors propose recommendations to reduce the incidence of breast cancer through diet [6].

Studies by Pawłowicz et al. showed that female patients with breast cancer and individuals with gastrointestinal cancer had significantly lower selenium concentration in blood serum and whole blood, as well as significantly lower GSH - P_x activity in plasma and red blood cells, compared to healthy women. Low selenium concentration may indicate an increased risk of breast cancer [7].

Clinical studies conducted by Krsnjavi and Beker showed that selenium level in patients with breast cancer, compared to women with fibrocystic cysts and healthy women, was significantly lower. The above-mentioned authors concluded that identifying selenium level in blood serum may be useful as a non-invasive indicator in the clinical assessment of malignancy of breast cancer patients. Krsnjavi and Beker studied the level of selenium in blood serum in women with breast cancer, with mastopathy and in healthy subjects. There was no significant difference in the level of selenium in women with fibrocystic breast changes and healthy women. These results suggest that determination of selenium level in serum may be used as a non-invasive diagnostic parameter in clinical assessments of malignant breast tumour [8].

The same inverse correlation between selenium concentration in blood serum vs breast cancer incidence and significantly lower mean selenium concentration in serum of cancer patients vs the control group was found by Mc Connell et al. [9]. However, Basu et al. believed that the low level of A and E vitamins, beta-carotene and selenium in patients with breast cancer may be a consequence of the disease – rather than a symptom of cancer [10].

Epidemiological studies conducted in Sweden by a group of oncologists under the supervision of Hardell showed the preventive effects of selenium on the occurrence of breast cancer. The above-mentioned effect was more pronounced in post-menopausal women. For women before menopause, this trend was also observed, but it was not statistically significant, which may indicate that both groups vary – at least partly – regarding carcinogenesis mechanisms. GSH - P_x level in red blood cells was not a marker of breast cancer risk and did not correlate with the level of selenium in serum [11].

In an experimental development of breast cancer in animals, a chemical compound (abbreviated to DMBA) was applied. DMBA induces breast cancer in animals. Rats treated with DMBA developed breast cancer, as DMBA acts as a carcinogen. In 1992, in experimental studies on rats, Ip et al. demonstrated that chemically induced breast cancer development may be prevented by the use of 7,12-dimethylbenz(a)anthracene (DMBA) by regular use of garlic enriched with selenium [1].

In various types of malignant tumours, the expression of selenoproteins is reduced, especially when the level of selenium is low in serum. At this point, a unique role of CHEK kinases (checkpoint kinases) in the regulation of the cell cycle should be emphasized. CHEK kinases are essential proteins which delay progression of the cell cycle in normal and damaged cells. They can affect three phases of the cell cycle: G_1, S and G_2. It was found that the weakening of the CHEK2 gene function was associated with a two-fold increase in breast cancer in Ashkenazi Jewish women. Hereditary breast and ovarian cancers are more common in the Ashkenazi Jewish population than in other ethnic groups, which is determined genetically. CHEK2 is a gene responsible for the susceptibility to cancers of various organs. Mutations in the CHEK2 gene are associated with an increased risk of multiple organ cancers [12].

The observed risk increase is further deepened in case of a positive family history of cancer. A handful of studies indicate that the risk of cancer in individuals who carry CHEK2 mutation may be modified by many factors such as [13]:

- Family interview;
- Hormonal disorders;
- Other genetic factors;
- Environmental factors;
- Composition of the consumed nutritional products.

Various antioxidant agents contained in the diet have a significant effect as they serve as cancer prevention factors by reducing the oxidative state which is associated with cancer. The study results suggest that many factors – on their own or in combination with traditional chemotherapeutic agents – prevent the development of cancer by inhibiting the formation of cancer and contributing to its curing. Reduction of cancer risk and lack of cytotoxicity associated with high consumption of fruit and vegetables suggest that specific concentrations of antioxidants from food sources may have chemo-preventive effects on cancer. Selenium may be one of the critical chemo-preventive factors that lower the risk of cancer in individuals who carry CHEK2 mutation [14].

Selenium is an essential micro-nutrient, and its concentration in serum and tissues is regulated by homeostasis mechanisms, which have not been fully understood yet. Selenium exists in the body in the form of selenocysteine, which is a component of selenoproteins; it plays an important structural and enzymatic role, such as antioxidant activity. Oxidative cell damage is a general mechanism of cell and tissue damage. Oxidative stress in tissues is assumed to play an significant role in carcinogenesis. Therefore, identification of selenium concentration in cancerous tissues and surrounding healthy tissues is a particularly important issue. Selenium concentration in the breast cancer tissue in women and the surrounding unchanged tissues was investigated by Charalabopoulos et al. [15].

These authors stated that the concentration of selenium in women with breast cancer was 42.5 ± 7.5 μg/l in blood serum, while 67.6 ± 5.36 μg/l in the control group, selected according to age. The concentration of selenium in breast cancer tissue was 2660±210 mg/g^{-1} of the tissue, while in healthy tissue adjacent to cancer, it was 680±110 mg/g^{-1} ($P<0.001$). Thus, the concentration of selenium in the breast cancer tissue was four times higher than in the adjacent tumor-free tissue. This supports the hypothesis that the local effect of selenium in cancer tissue is one of the crucial mechanisms of anti-tumour activity. This idea is consistent with the antioxidant functions of selenium. It is not yet clear whether the increase in selenium concentration in cancer tissue is responsible for the decrease in selenium concentration in serum, which is usually found in patients with breast cancer or whether reduced selenium concentration in serum precedes the development of breast

cancer. Identification of a decreased selenium concentration in the blood serum of women with breast cancer and increased selenium concentration in breast cancer tissues is a discovery of great scientific importance. The above-mentioned changes may reflect some of the body's defence mechanisms against carcinogenesis in the breast gland.

Additionally, Charalabopoulos et al. studied the concentration of carcinoma embryonic antigen (CEA) in blood serum in women with breast cancer and a selected control female group. The concentration of CEA in the serum of women with breast cancer was 10±1.7 ng/ml (norm <2.5 ng/ml in healthy non-smokers and <3.5 ng/ml in healthy smokers). In contrast, CEA concentration in serum in the control group was 2.3 ng/ml (P<0.001). There was a highly significant difference (P<0.001) in selenium concentration in serum and CEA level in serum (<0.001) between the group of women with breast cancer and the control group of healthy women. There was also an inverse correlation between selenium concentration in serum and CEA level in serum in both groups. Low selenium concentration in serum amongst women with breast cancer may be attributed either to insufficient selenium intake with food, or the deposition of this microelement in breast cancer cells, or simultaneous occurrence of both of these processes [2,15].

Another significant term in oncology concerning breast cancer is protein kinase erb-2. It is a protein, coded by a gene that is often called HER2 (from human epidermal growth factor receptor 2), or HER2/neu. HER2 belongs to human epidermal growth factor receptors. HER2/neu is a human epidermal growth factor receptor 2 [16].

It has been shown that the amplification or overexpression of this oncogene plays a vital role in the development and progression of aggressive breast cancers. In recent years, this protein has become an important biomarker and the target of therapy in approximately 30% of women with breast cancer. Amplification or overexpression of the HER2/neu gene occurs in about 15-30% of breast cancers and is closely associated with a higher rate of relapse and poor prognosis. HER2 is the target of a monoclonal antibody called trastuzumab (proprietary name *Herceptin*). Trastuzumab is effective when HER2 is overexpressed in cancer tissue. A significant effect at the sub-cellular level is binding HER2 by trastuzumab and the growth of p27 protein, which inhibits cell proliferation [17].

Approximately 10-15 percent of breast cancer patients are diagnosed with the so-called 'triple negative breast cancer' (TNBC). This subtype of breast cancer is characterised by lack of expression of estrogen receptors, progestagen receptors, and the physiological HER2 receptor present on its surface (no HER2 receptor overexpression). It is a more aggressive form of breast cancer than cancer with the expression of hormone receptors. This subtype of breast cancer is particularly aggressive, associated with rapid relapses after treatment, a more frequent occurrence of distant metastases, and shorter survival compared to other types of breast cancer. The treatment of triple negative breast cancer depends on the stage of the disease. The choice of therapy is influenced by the presence of metastases, the size of the primary tumour and the results of detailed pathological tests, such as the degree of malignancy of the tumour, which determines the rate of tumour cell division. The treatment of triple negative breast cancer involves surgical methods, radiotherapy and chemotherapy [18].

In the treatment of TNBC patients, it is important to stop the process of formation of the network of blood vessels that supply nutrients to the tumour tissue (so-called angiogenesis). Most cases of triple negative breast cancer occur during the pre-menopausal period. Because of the 'triple negative nature' of cancer, TNBC patients are not candidates for hormone therapy or anti-HER2 therapy. Thus, their therapeutic options are insufficient. As already mentioned, there is not a large arsenal of drugs which may be used, as hormone therapy and drugs effective on HER2 are excluded. Therefore, the average survival time in this group is still shorter than in patients with other types of breast cancer. Chemotherapy is usually the standard procedure. The first line of drugs used in chemotherapy are taxanes, such as paclitaxel or docetaxel – alone or in combination with anthracyclines. Treatment of advanced breast cancer involves taxane drugs: paclitaxel (PXL), isolated initially from yew bark *Taxus brevifolia,* and its derivative, docetaxel (DXL). Docetaxel (proprietary name: *Taxorete, Company: Teva Pharma*) is a cytostatic drug belonging to the semi-synthetic taxane group, a derivative of the substance obtained from the common yew needle (*Taxus baccate*). Docetaxel breaks the microtubule network, which is necessary for vital cell functions during mitosis and interphase [3,18].

Phase II clinical trials showed a relatively high taxane activity in first-line therapy, but also in the 2nd and 3rd line of treatment in patients with anthracycline resistance. Taxanes and anthracyclines have a different mechanism of anti-cancer activity. Taxanes bind with tubulin, initiating the formation of microtubules, and then inhibit their depolymerisation. Additionally, they affect other biological processes, i.e. they stimulate apoptosis and inhibit angiogenesis, cell motility and metalloproteinase production, which may further increase their anti-cancer effects. Metalloproteinases belong to the super-family of proteolytic enzymes, which contain a catalytic zinc ion in their characteristic centre. The increase in metalloproteinases activity is associated with cancer.

Anthracyclines inhibit topoisomerase II, which in turn leads to increased DNA damage. A pressing issue is the toxicity of taxane-containing patterns (fatigue, asthenia, neurotoxicity – usually in the form of peripheral neuropathy). The occurrence of neurotoxicity depends on the dosage of the drug. Although patients tend to have a rapid favourable response to the use of taxanes, the development of early resistance to this group of drugs is also common. Hence the need to look for factors that could efficiently facilitate taxanes' efficiency and help overcome resistance. This is an urgent task, necessary for effective treatment – especially of the 'triple negative breast cancer' (TNBC) [19].

Selene is an effective low-toxicity anticarcinogen. Anti-cancer effect of selenium depends on its form and dosage. Methylselenic acid (MSA) is a potent compound containing 2. generation selenium. To date, only two experimental studies on mice regarding the use of methylselenic acid in combination with paclitaxel in the treatment of 'triple negative' breast cancer have been published. These are the works by Qi et al. [18] and Zeng et al. [20]. Qi et al. The authors concluded that methylselenic acid significantly facilitates the anti-cancer effect of paclitaxel in the treatment of 'triple negative breast cancer'. Paclitaxel is an organic chemical compound from the terpene alkaloids group of taxanes, with a cytostatic effect. It was introduced to oncological treatment for the first time in 1992 under the name Taxol (*Taxol; company: Bristol-Myers Squibb, BMS*). Methylselenic acid shows synergy with paclitaxel, facilitating the inhibitory effect of paclitaxel on the development of breast cancer [18].

The above-mentioned authors came to the following conclusions:

- MSA (methylselenic acid) synergistically facilitates the efficacy of paclitaxel in suppressing tumor growth by increasing the inhibitory effect of paclitaxel on tumour cells;
- MSA and paclitaxel synergistically inhibit tumour cell proliferation;
- MSA facilitates the effects of paclitaxel in the paclitaxel-induced suppression of the G_2/M phase cell cycle.
- MSA facilitates paclitaxel-induced apoptosis. Paclitaxel-induced G_2/M inhibition generally leads to increased apoptosis.

The results of experimental studies conducted by Li et al., on combined treatment with methylselenocysteine (MSC) with tamoxifen (Tamoxifenum) of breast cancer are very significant. In mice with transplanted MCF-7 breast cancer cell line, the combined treatment with MSC and tamoxifen inhibited the development of breast cancer by increasing apoptosis and reducing tumor angiogenesis [21]. Organic selenium may provide additional therapeutic benefits when used in combination with tamoxifen – both in prevention, as well as in complementary therapy.

Combination treatment with methylselenocysteine and tamoxifen (Tamoxifenum) used to treat transplantable breast cancer in mice inhibited the growth of cancer synergistically. This effect was more significant than when MSC alone or tamoxifen alone (Tamoxifenum) were used. The combination of MSC + tamoxifen significantly reduced the number of alpha (ERά) estrogen receptors, progesterone receptors (PR), D1 cyclin and the Ki67 index in cancer tissues. Additionally, the microvessel density decreased in the tumour, and apoptosis processes increased. Importantly, the methylselenic acid, which acts synergistically with tamoxifen, induces apoptosis via caspases in breast cancer cells. Caspases belong to the cysteine proteases family and play an important role in apoptosis (programmed cell death). These proteins are referred to as 'executioners' because of their role in the cell [20,21].

Selenium is an essential co-factor in the production of antioxidant enzymes and may affect the course of the cancer process. Clinical trials which assessed selenium content in food showed that its supplementation reduced cancer mortality. Harris et al. investigated whether dietary intake of selenium was associated with survival among 3,146 women who were diagnosed with invasive breast cancer, based on a population study conducted on a group of women in Sweden who underwent mammography (*Swedish Mammography Cohort*). An inverse relationship was found between selenium intake with food and specific mortality due to breast cancer and overall mortality. Women who had higher selenium intake displayed lower mortality rates compared to women who consumed smaller amounts of selenium in food (P=0.009). Comparing women with higher and lower doses of selenium in their diet, there was an inverse relationship between dietary selenium intake and mortality due to breast cancer. This correlation seems to be the largest among women who never smoked cigarettes (P=0.01). The results of the above authors' research suggest that selenium intake before the diagnosis of breast cancer may improve the mortality specific for this type of cancer, as well as the overall mortality rate of women [22].

Conclusions

Numerous epidemiological studies carried out in various countries, especially in the Scandinavian countries and the United States, showed a negative correlation between the amount of selenium consumed and the incidence of cancer in humans. The studies also showed a lower concentration of this microelement in the blood

of patients with oncological diseases, in comparison to the values obtained in healthy subjects [2,7,9,12,15,23,24]. Data from a meta-analysis of 49 prospective studies showed that the overall risk of cancer was 31% lower, and the risk of death from cancer was 45% lower in the groups with the highest exposure to selenium, compared to groups with the lowest exposure to selenium [23]. To sum up, the results of above-mentioned prospective studies indicate that low selenium intake and/or concentration of selenium in serum/plasma/nails is a high-risk marker of the majority of cancers.

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ORIGINAL PAPER
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KNOWLEDGE OF CORONARY ARTERIOSCLEROSIS RISK FACTORS AND THEIR OCCURRENCE AND THE LIFESTYLES OF THE FIRST-YEAR MEDICAL STUDENTS

ZNAJOMOŚĆ CZYNNIKÓW RYZYKA MIAŻDŻYCY TĘTNIC WIEŃCOWYCH, ICH WYSTĘPOWANIE ORAZ STYL ŻYCIA PROWADZONY PRZEZ STUDENTÓW PIERWSZEGO ROKU MEDYCYNY

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

Summary

Background. Coronary arteriosclerosis risk factors increase the probability of the coronary heart disease and accompanying complications to a significant extent, acting independently from other circumstances.
Material and methods. The study was conducted in a group of 250 students of the 1st-year medical studies, using an independently prepared questionnaire relating to the risk factors and particular lifestyles.
Results. 1. Level of knowledge of the examined students on coronary arteriosclerosis risk factors: obesity - 250(100%); reduced physical activity - 240(96%); smoking - 230(92%); unhealthy diet - 223(89%); elevated LDL cholesterol concentration - 218(87%); arterial hypertension - 210(84%). 2. Incidence of coronary arteriosclerosis risk factors in students: strong family history - 75(30%); excessive stress - 50(20%); reduced physical activity - 190(76%); smoking - 55(22%), alcohol abuse - 95(38%). 3. Lifestyle of the examined group of students: eating fast-food – 180 (72%); drinking energetic beverages – 82(33%); "trying" and using drugs – 88(35%); insufficient amount of sleep – 190(76%).
Conclusions. 1. Level of the examined students' knowledge on coronary arteriosclerosis risk factors is satisfactory. 2. Despite the satisfactory level of knowledge on risk factors, their incidence in the tested group is significant. 3. Majority of the examined students live a healthy lifestyle.

Keywords: risk factors, lifestyle, coronary disease

Streszczenie

Wstęp. Czynniki ryzyka miażdżycy tętnic wieńcowych to czynniki, które działając niezależnie od innych okoliczności, zwiększają istotnie prawdopodobieństwo wystąpienia choroby wieńcowej i jej powikłań.
Materiał i metody. Badanie przeprowadzono w grupie 250 studentów 1. roku medycyny za pomocą samodzielnie przygotowanej ankiety dotyczącej czynników ryzyka i stylu życia.
Wyniki. 1. Znajomość czynników ryzyka miażdżycy tętnic wieńcowych przez studentów badanej grupy: otyłość – 250 (100%), mała aktywność fizyczna – 240 (96%), palenie papierosów – 230 (92%), nieprawidłowe odżywianie – 223 (89%), zwiększone stężenie cholesterolu LDL – 218 (87%), nadciśnienie tętnicze – 210 (84%). 2. Występowanie czynników ryzyka miażdżycy tętnic wieńcowych u studentów 1. roku medycyny: obciążający wywiad rodzinny – 75 (30%), nadmierny stres – 50 (20%), mała aktywność fizyczna – 190 (76%), palenie papierosów - 55 (22%), nadużywanie alkoholu – 95 (38%). 3. Styl życia badanej grupy studentów: spożywanie posiłków fast-foodowych – 180 (72%), spożywanie napojów energetyzujących – 82 (33%), „próbowanie" i okresowe stosowanie narkotyków – 88 (35%), niewystarczająca długość snu – 190 (76%).
Wnioski. 1. Znajomość czynników ryzyka miażdżycy tętnic wieńcowych przez studentów badanej grupy jest zadowalająca. 2. Pomimo zadowalającej znajomości czynników ryzyka ich występowanie w badanej grupie jest znaczące. 3. Większość badanych studentów prowadzi „zdrowy" styl życia.

Słowa kluczowe: czynniki ryzyka, styl życia, choroba wieńcowa

Tables: 1
Figures: 13
References: 26
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Introduction

Prevalence of cardiovascular diseases is currently linked to civilisational progress, connected primarily with one's lifestyle. According to epidemiological data and scientific reports, each year the cardiovascular diseases contribute to the deaths of about 17 million persons around the world. Only in the European Union, they cause fatalities amounting to 24%, i.e. around 4 million people per year [1]. Also in Poland, the cardiovascular diseases occupy the first place in the rank of most common causes of deaths, overtaking cancer, despite the fact that their figures are decreasing. The number of Polish patients suffering from chronic coronary heart disease is estimated at 1.2 million individuals. Among the cardiovascular system conditions, the most common cause of death is the coronary heart disease and its complications, including a heart attack.

The ischemic heart disease is a broad term, which comprises all conditions of myocardial ischemia, regardless of the reason. The coronary artery disease includes conditions of myocardial ischemia caused by sclerotic vasoconstrictive changes in coronary arteries. In about 98% of cases, myocardial ischemia is conditioned by coronary arteriosclerosis, while the remaining 2% are due to other causes.

Coronary failure is a set of symptoms that result from disproportions between supply and the cardiac muscle's current demand for oxygen and energetic compounds. In physiological conditions, during an increased oxygen demand exhibited by the cardiac muscle (increase in the heart rate and tone of walls, elevated contractility), there is an increase in the flow rate in coronary arteries. If significant hemodynamic stenoses appear in epicardial arteries, the flow rate in the resting state may be maintained through compensational distension of a vascular bed, beyond the spot of stenosis. Then, a reduction of a coronary reserve takes place, resulting in incapability of providing oxygen in case of an increase of the myocardium demand.

Symptoms of angina pectoris appear when, as a result of stenoses in coronary arteries, the demand for oxygen and nutritious substances in the cardiac muscles is not covered to the fullest extent. Elevated vasoreactivity (a vasospasm in the spot of stenosis) of coronary arteries may also reduce blood flow, both in standard and increased demand conditions. A systolic component of a vessel seems to be responsible for periodic, seasonal and emotional character of the angina pectoris condition. It needs to be emphasised that dependencies between the presence of the stenosis and the systolic component of the vessel may change in each case. Cracks or erosion of atheromatous plaque contribute to generating blood clots which, as a consequence, may reduce or break blood flow in the vessel [2].

While acting independently from other circumstances, Risk factors cause a significant increase in the probability of a particular pathology, for example, a cardiovascular disease [3].

Extensive and long-standing studies have led to the identification of about 300 arteriosclerosis factors, which are more or less related to an increase of human proneness to clinically significant circulatory system diseases [4].

A major division of risk factors depends on how likely they are alterable. According to that principle, the first group consists of non-modifiable factors, which are resistant to all actions that would change their atherogenic effects. They comprise individual elements, such as age, sex, strong family history and metabolic disturbances determined genetically. The other group of risk factors contains those prone to modifiable actions, such as hypercholesterolemia, diabetes, arterial hypertension, malnutrition, smoking, physical inactivity and obesity. The fact that people can limit the adverse influences of the alterable factors on their health, through changing behaviour and lifestyle, should be motivating [5-6].

Material and methods

The examined group was composed of 250 (n=100%) students of the first-year medical studies, aged 19-26 ($\bar{x}$= 20.956 years old; SD = 1.530). Among them, there were 145 (58%) women and 105 (42%) men. The study was conducted in 2014 using an independently prepared survey questionnaire related to knowledge on coronary arteriosclerosis risk factors and their incidence in the examined students, as well as the data on their lifestyles. The questionnaire was anonymous, and participation in it voluntary. The questions included in the survey were closed ones, with an option to select one or several answers.

The results have been compiled in a spreadsheet. The analysis was carried out through calculating summary and descriptive statistics. As for the homogeneity of the examined group, there was no outliers analysis performed [7].

Results

General characteristics of the first-year medical students

The general characteristics of the examined students are presented in Table 1.

Table 1. General characteristics of the examined group of first-year medical students

Examined group		n;	%
Size of the examined group n, % of the group		250;	(100%)
sex	female	145;	(58%)
	male	105;	(42%)
age in years	**$\bar{x}$**	**±SD**	
19-26	20.956	1.530	

In the examined group women outnumbered men.

Characteristics of the first-year medical students with regard to their knowledge on coronary arteriosclerosis risk factors

The characteristics of the examined students with regard to their knowledge on coronary disease factors are presented in Figure 1.

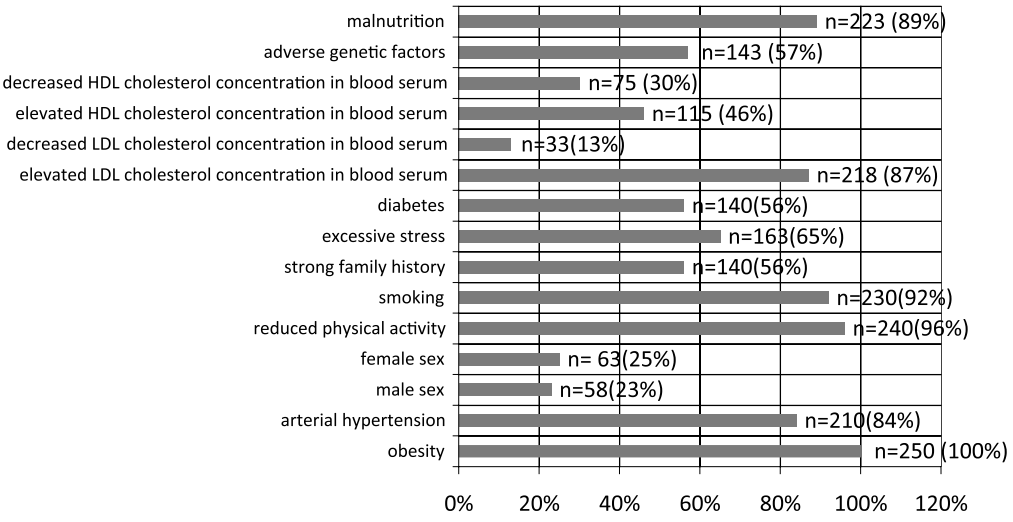

Figure 1. Characteristics of the examined group of first-year medical students with regard to their knowledge on the coronary arteriosclerosis risk factors (n=250)

All students were aware that obesity belongs to the group of coronary disease risk factors (250; 100%), but the fewest respondents knew that being male is also one of those factors (58; 23%). Unfortunately, a relatively sizeable group pointed to other conditions that do not pose the coronary disease risk factors.

Incidence of coronary arteriosclerosis risk factors in the examined first-year medical students

The characteristics of the examined students with regard to incidence of coronary disease risk factors are presented in Figure 2.

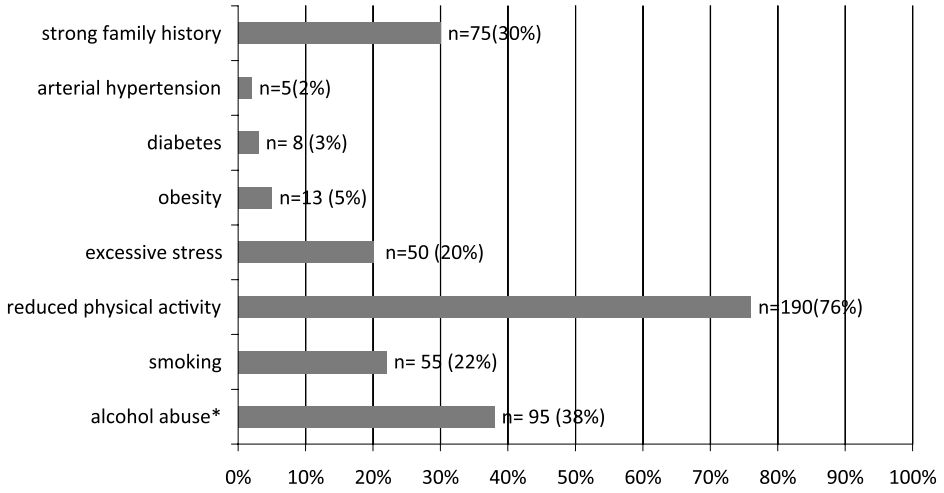

Figure 2. Characteristics of the examined group of first-year medical students with regard to incidence of coronary arteriosclerosis risk factors (n=250)

* consumption of alcohol at least once a week.

The following mostly alterable coronary disease risk factors were identified by the examined first-year medical students: reduced physical activity (190; 76%), alcohol abuse (95; 38%), smoking (55; 22%), and excessive stress (50; 20%).

Lifestyle of the first-year medical students

The characteristics of the examined group with regard to frequency of their physical activity amounting to at least 30 minutes are presented in Figure 3.

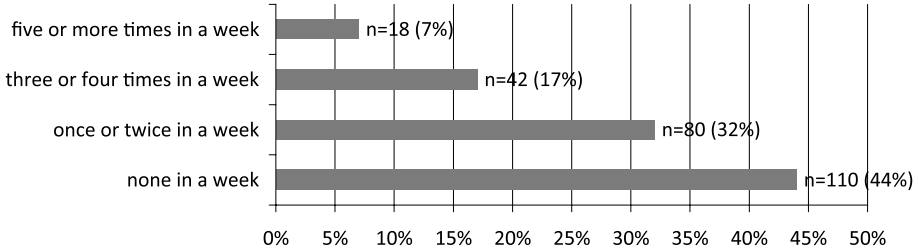

Figure 3. Characteristics of the examined group with regard to frequency of their physical activities reaching at least 30 minutes (n=250)

The most numerous group of the examined students do not get involved in physical exercises lasting at least 30 minutes even once a week (110; 44%), and only some of them do it five or more times per week in the indicated time span (18; 7%).

The characteristics of the examined students with regard to the number of meals per day are presented in Figure 4.

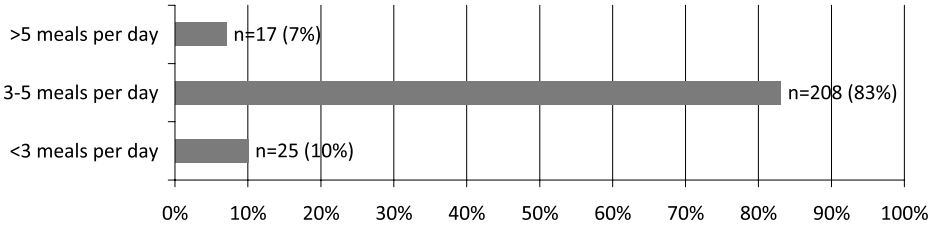

Figure 4. Characteristics of the examined group of first-year medical students with regard to the number of meals eaten during a day (n=250)

Most of the respondents have from three to five meals a day (208; 83%).

The characteristics of the examined students with regard to frequency of eating fast-food are presented in Figure 5.

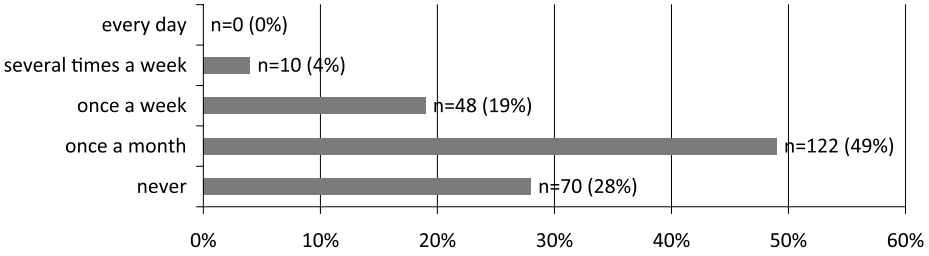

Figure 5. Characteristics of the examined group of first-year medical students with regard to frequency of eating fast-food (n=250)

Unfortunately, a significant group of the examined students (180; 72%) follow an unhealthy diet.

The characteristics of the examined students with regard to the amount of sleep are presented in Figure 6.

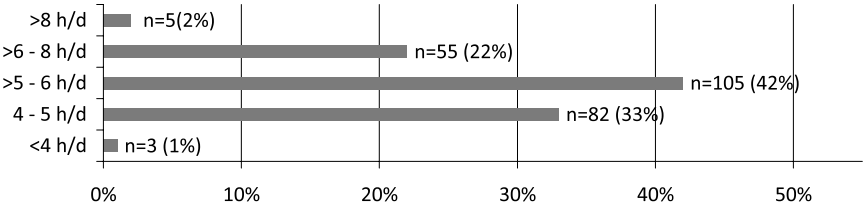

Figure 6. Characteristics of the examined group of first-year medcial students with regard to their amount of sleep (n=250)

A substantial majority of the examined students of the first year of medical studies sleep less than the recommended amount of time (190; 76%)

The characteristics of the examined students with regard to the quality of sleep are presented in Figure 7.

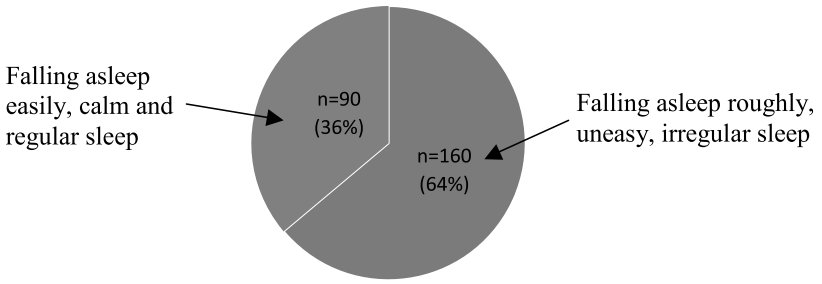

Figure 7. Characteristics of the examined group of first-year medical students with regard to their sleep quality (n=250)

More respondents find it hard to fall asleep, and their sleep is uneasy and irregular (160; 64%).

The characteristics of the examined students with regard to the amount of consumed coffee are presented in Figure 8.

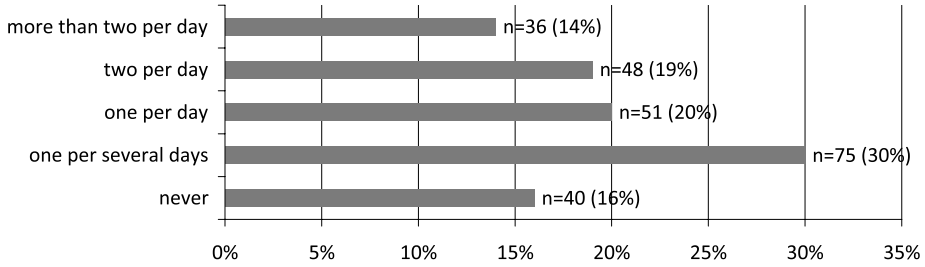

Figure 8. Characteristics of the examined group of first-year medical students with regard to the amount of consumed coffee, expressed in 200ml cups (n=250)

A significant majority of students drink coffee (210; 84%), and 1 in 3 drinks two or more cups per day (84; 33%).

Characteristics of the examined students with regard to the number of energetic beverages consumed during a day are presented in Figure 9.

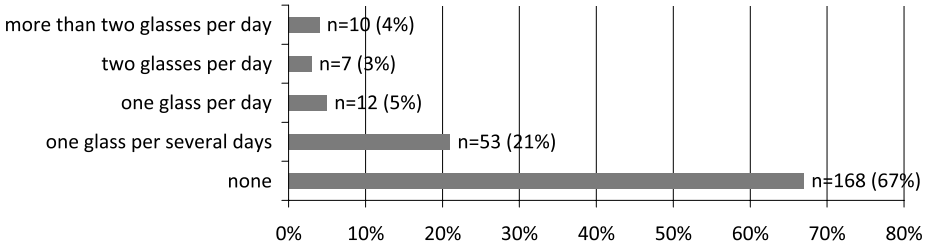

Figure 9. Characteristics of the examined group of first-year medical students with regard to the amount of consumed energetic beverages, expressed in 200ml cups (n=250)

The majority of the tested first-year medical students studies do not drink energetic beverages at all (168; 67%), but among those who do (82; 33%), there are also respondents who drink more than two glasses per day (10; 4%).

The characteristics of the examined students living in a cigarette smoke environment are presented in Figure 10.

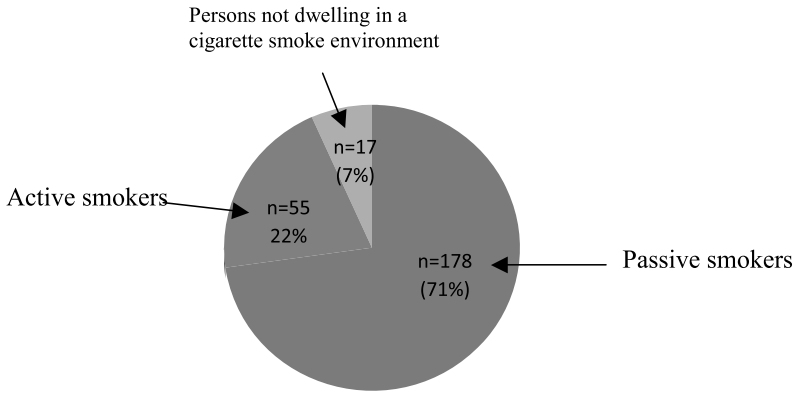

Figure 10. Characteristics of the examined group of first-year medical students with regard to dwelling in a cigarette smoke environment (n=250)

More than 90% of the examined students dwell in a cigarette smoke environment, but the number of active smokers is considerably lower than the number of passive ones (22% vs 71%).

The characteristics of the examined students dwelling in a cigarette smoke environment with regard to frequency of smoking are presented in figure 11.

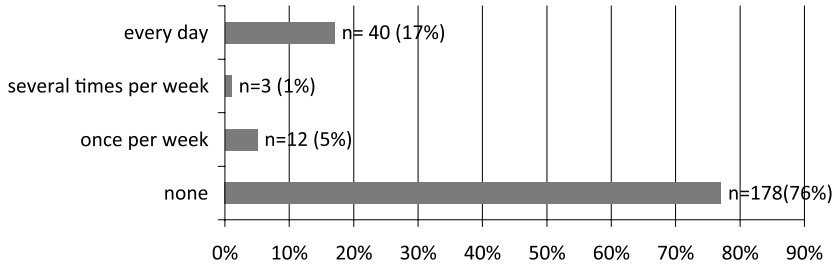

Figure 11. Characteristics of the examined group of first-year medical students dwelling in a cigarette smoke environment with regard to frequency of smoking cigarettes (n=233)

The majority of students exposed to cigarette smoke do not smoke cigarettes (178; 76%).

The characteristics of the examined students with regard to the use of drugs are presented in Figure 12.

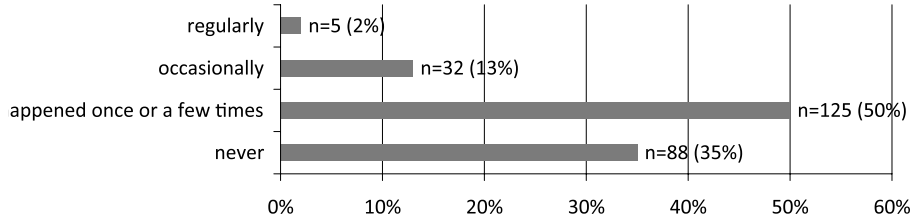

Figure 12. Characteristics of the examined group of first-year medical students with regard to drug use (n=250)

As many as 65% of the examined students "tried" drugs and, unfortunately, there are a few respondents who use the illegal substances regularly (2%).

The characteristics of the examined students with regard to the frequency of alcohol consumption are presented in Figure 13.

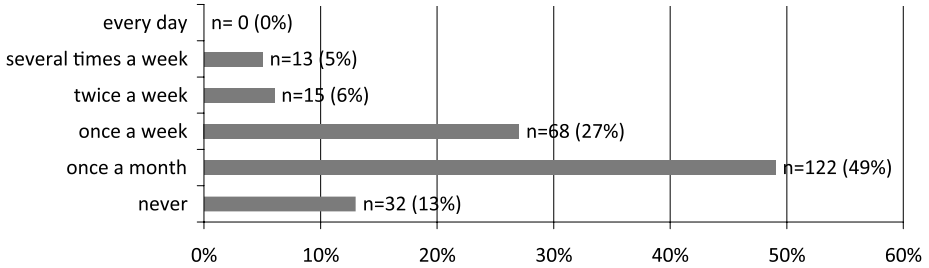

Figure 13. Characteristics of the examined group of first-year medical students with regard to frequency of alcohol consumption (n=250)

Almost 40% of the tested first-year medical students drink alcohol at least once a week.

Discussion

Interest in coronary arteriosclerosis risk factors arises from their influence on development and progression of the coronary disease, and the resulting mortality rate. Cardiovascular diseases risk factors have become a subject of numerous scientific papers. The level of knowledge on these factors held by various social groups is presently being evaluated in order to determine the level of awareness among the general public, to draw people's attention to how the risk factors increase and to the necessity of promoting health and living a healthy lifestyle.

The presented work is an attempt to evaluate the level of knowledge on coronary arteriosclerosis risk factors, and how they arise among the students of the first-year medical studies at the Medical University of Silesia in Katowice. The questionnaire devised by the author was to examine the lifestyles of the surveyed students, which may influence the potential development of cardiovascular diseases in the future. The examined group was not selected randomly. Persons who do medical courses are obliged to undertake pro-health behaviours that would be followed by others. By deepening own medical knowledge, they have several opportunities to promote pro-health behaviours among the general public.

Potvin L. undertook a task to determine the level of knowledge on cardiovascular diseases risk factors in the Canadian population. According to his analysis, only 60% of the respondents pointed to malnutrition, 52% smoking, 41% physical inactivity, 27% an elevated LDL cholesterol level in blood serum and 22% – arterial hypertension [8]. In the study conducted in the Venezuelan population, 67% of the respondents indicated that obesity might be such a factor and 27% pointed to arterial hypertension. 60% of the examined individuals declared that they had knowledge on cardiovascular diseases risk factors, and only 15% identified them correctly [9]. Also, Arredondo proved that the respondents' knowledge in the discussed matter is satisfactory in the studies conducted in the post-graduate medical students. Most of them would point to all coronary disease risk factors correctly [10]. In our studies, the coronary arteriosclerosis risk factors most often selected by the first-year medical students included obesity (250; 100%), reduced physical activity (240; 96%), smoking (230; 92%), malnutrition (223; 89%), elevated LDL cholesterol concentration in blood serum (218; 87%), arterial hypertensions (210; 84%), excessive stress (163; 65%), strong family history (140; 56%) and diabetes (140; 56%). Some students, i.e. 75 (30%), believed that the decreased HDL cholesterol concentration in blood serum is one of the risk factors. Fewer respondents (58; 23%) would indicate that being male sex is a coronary

arteriosclerosis risk factor. Unfortunately, quite a sizeable group of students selected the conditions which are not actually classified as risk factors, such as elevated HDL cholesterol concentration in blood serum (115; 46%); lowered LDL cholesterol concentration in blood serum (33; 13%), as well as being female (63; 25%). When compared to the populations described by other authors, the examined students looked good against others; however, it needs to be borne in mind that they are medical students who should know better.

Despite a satisfactory level of knowledge on the factors facilitating the coronary arteriosclerosis condition, the students themselves exhibit some of the described risk factors especially reduced physical activity (190; 76%), alcohol abuse (95; 38%), smoking (55; 22%), excessive stress (50; 20%), obesity (13; 5%), diabetes (8; 3%) and arterial hypertension (5; 2%).

As it turned out, the majority of students do not practice sports regularly, which is proved by numerous studies [11-14]. Our results confirmed this as well. Very few students do exercises at least 5 times a week for 30 minutes (18; 7%). Unfortunately, the biggest group of students do not exercise at all (110; 44%). Physical inactivity causes that excessive energetic supplies are accumulated as fatty tissue. Further, the students' sedentary lifestyle overloads bones; therefore, resulting in postural deformation. The insufficient physical activity of the examined students, as indicated in the paper, may lead to overweight and obesity especially when combined with wrong eating habits.

As suggested by other researchers, around 1/3 of all students do not eat regularly, and 1 in 5 students do not eat fruit and vegetables, while products rich in carbohydrates are consumed by almost half of the examined students [15-16]. Furthermore, the examined students tend to consume from three to five meals a day (208; 83%), while 1 in 10 students eats less frequently, i.e. 25 (10%) and 7% more often (n=17). Proper daily distribution of meals is of considerable importance for the correct functioning of the organism. It reduces the incidence of overweight and obesity and causes more effective and complete use of food ingredients. Uneven supply of energy and nutritious components may result in lower metabolic rates, contributing to a decrease of concentration, sleepiness, apathy, which is of great significance in case of students.

Furthermore, fast-food meals are widely popular with students. In some regions, they are consumed even by 90% of students [17]. Our examination suggests that almost half of the students consume such meals once a month (122; 29%), and almost 1/5 admit that they visit such fast-food venues more often, i. e. at least once a week (58; 23%). It needs to be borne in mind that fast-foods are, first of all, a source of calories and fat. If the fat is repeatedly heated, it emits harmful substances, for example, lipid peroxides, which accelerate atherosclerotic and carcinogenic processes. Such fat, despite its plant origin, abounds in trans fatty acids. They are as harmful to the body as the saturated fatty acids of animal origin, which means that they elevate the LDL cholesterol level, and reduce the HDL cholesterol concentration in blood serum.

The studies researching the duration of students' sleep show that its amount varies [18]. In the examined group of the first-year medical students, there were both some sleep more than 8 hours per day (5, 2%), which is the recommended amount of sleep, as well as those, who sleep from 6 to 8 hours (55; 22%), or less, i.e. from 5 to 6 hours (105; 42%), or 4 to 5 hours (82; 33%) per day. Among the examined students there was also a group of respondents who slept less than 4 hours per day (3; 1%). In our study, we proved that only 36% (n=90) of the students sleep calmly and fall asleep without any problems. It is a worrying phenomenon as disturbed, irregular and short sleep influences people's mental condition. Sleepy individuals become more nervous and are influenced by stress more quickly. Thus, neglecting sleep may lead to cardiovascular diseases, for example, arterial hypertension.

As for beverages, it is coffee that is drunk most frequently by students. Many of them drink it every day, even several cups [19]. In our examination, we found out that only 16% (40; 16%) of the students do not drink coffee at all, almost 1/3 of students drink one coffee some days a week (75; 30%), and more than a half of them drink it every day (135; 53%). 20% of the respondents (n=51) have two coffees per day, and 33% (n=84) drinks even more. A prevailing assumption was that there is a need to cut down on the amount of drunk coffee, as it contains caffeine, responsible for hypertension and heart diseases; however, it was proven that its moderate consumption does not need to exert an adverse influence on the cardiovascular system. Only when an individual consumes 4 cups of coffee per day, there may be an increased risk of coronary incidents, when compared to those drinking less than one cup per day [20-21].

The examinations carried out in the USA showed that most students drink energetic beverages, and almost half of them do it regularly [22]. Our study results were similar. Nearly 70% of students do not drink such beverages at all (168; 67%), and 21% drink around one cup a week (n=53). The remaining respondents do it more often (29; 12%). The energetic beverages elevate blood pressure and increase its viscosity, contributing to clots, which may lead to a brain stroke and heart attack.

The previous studies related to smoking in students found that a sizeable group of young people "tried" cigarettes, and many of them smoked habitually. A significant number of students are exposed to cigarette smoke

[23-24]. Similar results were obtained in our studies as the majority of students from the researched group do not smoke cigarettes at all (195; 78%), quite a sizeable group smokes regularly (55; 22%), and the majority smoke all the time (40; 16%). Almost all the examined students are exposed to cigarette smoke (233; 93%). Thus, it seems that avoiding tobacco and staying in a smoke-free environment become significant elements of a healthy lifestyle. Currently, cigarette smoking is a leading cause of premature death in the developed countries. Further, passive smoking causes the same complications as active smoking, including lungs cancer, cardiovascular diseases and such conditions as chronic obstructive lung disease, bronchitis and asthma.

Furthermore, studies on student behaviour show that many of them try drugs. Students most frequently use marijuana and cocaine, with cocaine and designer drugs remaining less popular [25-26]. In the study, we proved that as many as 65% of the first-year of medical students tried drugs (162; 65%). Half of the whole student group did it once or several times (125; 50%), while the others would use drugs occasionally (31; 13%). Unfortunately, there was also a group of the respondents who used drugs regularly (5; 2%). As for the cardiovascular system, drugs and designer drugs may accelerate the heart rate significantly and cause arrhythmia, for example, atrial fibrillation. They may also significantly increase arterial pressure and, as a consequence, cause cerebral hemorrhage, a heart attack or heart failure.

Finally, the study findings, indicate that young people use alcohol quite often. In another population of young people of Chile, as many as 85% admitted to drinking alcohol. Most of them stated that they had drunk alcohol within the last month [18]. Our questionnaire findings indicate that the students consume alcohol in similar amounts as the young Chileans, i.e. nearly half of them did it once a month (122; 49%), a little more than 1/4 of the respondents admitted to drinking alcohol once a week (68; 27%), and 1 in 20 students drink more frequently (13; 5%). Alcohol abuse plays a significant role in the development of cardiovascular diseases, disturbing rhythmicity of heart, lipid metabolism of the organism, and increasing blood pressure.

Summing up, it needs to be emphasised that the examined group was composed of first-year medical students, who are expected to possess extensive knowledge and awareness in the field of pro-health behaviour. The respondents' knowledge concerning coronary disease risk factors may be assessed as satisfactory; however, promoting healthy lifestyles to eradicate risk factors needs improving. The risk factors identified in the examined students are modifiable; hence their elimination, depending on one's behaviour, may reduce the probability of developing cardiovascular diseases in the future.

Conclusions

1. Level of knowledge in the examined students on the coronary arteriosclerosis risk factors is satisfactory, except for such factors as " being male" and "HDL cholesterol concentration".
2. Despite the satisfactory level of knowledge on the risk factors, their incidence in the examined group is significant.
3. Majority of the examined students live a healthy lifestyle. Still, there are too many individuals who smoke and live a sedentary lifestyle, which when combined with malnutrition and energetic beverages may suggest that they, as future doctors, need to be educated in terms of model healthy attitudes.

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OPPORTUNITIES AND THREATS IN THE POST-ANTIBIOTIC ERA

SZANSE I ZAGROŻENIA U SCHYŁKU ERY ANTYBIOTYKOWEJ

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

Summary

The following article reviews the issue of antibiotic resistance of microorganisms to meropenem in intensive care units in Ukraine. An increase in meropenem inefficiency against microorganisms in intensive care units has been observed in the last years. The data analysis suggests a significant predominance of gram-negative flora: A. baumannii, P. aeruginosa, Antimicrobial resistance happens when microorganisms change when they are exposed to antibiotics. Then, treatment becomes ineffective and infections persist in the body, increasing the risk of spreading to other persons. The new resistance mechanisms that are emerging and spreading globally cause that the so far applied methods of treatment do not work, threatening the human ability to resist common infectious diseases, which in turn results in prolonged infections or even death. Antimicrobial resistance occurs naturally over time, usually through genetic changes. However, the misuse and overuse of antimicrobials are accelerating this process. It has become common to overuse and misuse antibiotics both in people and animals, which are often prescribed without professional oversight. Antimicrobial resistance is a complex problem that affects all of society and is driven by many interconnected factors. Single, isolated interventions have limited impact. Coordinated action is required to minimise the emergence and spread of antimicrobial resistance.

Keywords: bacteria, resistance, antibiotics, globalisation

Streszczenie

Ze zjawiskiem antybiotykooporności mamy do czynienia w przypadku gdy bakteria nabierze oporności na dany antybiotyk. Stosowane wówczas leczenie staje się nieskuteczne a obecność samego drobnoustroju w ciele chorego może przyczynić się do jego rozpowszechnienia na inne osoby. Nowe mechanizmy nabywania oporności na antybiotyki sprawiają, że dotychczasowe sposoby leczenia wielu chorób zakaźnych przestają być skuteczne, czego następstwem są trwające znacznie dłużej zachorowania a nawet śmierć. Zjawisko nabywania oporności nie jest czymś nowym, gdyż wynika z naturalnych właściwości przystosowawczych bakterii jednakże niewłaściwe lub nadużywanie antybiotyków zarówno u ludzi jak i zwierząt znacznie przyspiesza ten proces. Problem antybiotykooporności stał się problemem ogólnoświatowym, dotyczącym wszystkich grup społecznych. Ze względu na złożoność problemu potrzebne są skoordynowane działania gdyż tylko takie mogą przyczynić się do zminimalizowania rozprzestrzeniania tego niekorzystnego zjawiska.

Słowa kluczowe: globalizacja, bakterie, oporność, antybiotyki

Tables: 0
Figures: 0
References: 21
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Introduction

Bacteria appeared on Earth about 2.5 billion years ago and acquitted an extraordinary ability to adapt to extremely unfavourable conditions. They can be found in the Antarctic ice, hot springs, and oceanic depths, which are inaccessible even to research robots. They are responsible for many desirable phenomena, for example, lactic or alcoholic fermentation or the synthesis of vitamins. On the other hand, they are accountable for a number of unfavourable processes, such as spoilage of food or rotting. The development of science in the nineteenth century provided much irrefutable evidence that microbes are responsible for causing a number of diseases in humans and animals [1].

The antibiotic era

The beginning of the antibiotic era is considered to be the year 1928, when a Scottish bacteriologist and physician, Sir Alexander Fleming, went on holiday leaving in his laboratory plates with a medium containing the Staphylococcus aureus strains, *Staphylococcus aureus*. After returning from vacation, Fleming saw mold

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growing on one of the tiles, which inhibited the growth of staph. The fungus on the plate belonged to the species *Penicillium notatum*; therefore, the mysterious substance secreted by the fungus was called penicillin. The lack of financial resources hindered any research on this substance at that time. However, ten years later, Australian pharmacist Howard Florey and German biochemist Ernst Chain isolated chemically pure penicillin. The following years brought mass-production antibiotic technology and clinical trials initiated by Norman Heatley [3]. In 1941, during the war, penicillin was introduced to treatment on a large-scale, causing a dramatic reduction in deaths of soldiers with infected wounds and bacterial complications. In addition to the use of penicillin on the front of World War II, the substance was also applied in civil medicine to combat a wide variety of infections, so far extremely difficult to fight. The discovery of antibiotics is often considered as one of the ten most significant discoveries of the 20th century, and the substances themselves are referred to as "miracle cures" [2].

The joy associated with the end of war operations coincided with the joy of the then world of scientific discovery of a new weapon against microbes. The three researchers involved in the discovery and use of penicillin were awarded the Nobel Prize in 1945, while Norman Heatley received the honorary doctor's degree in medicine at Oxford University in 1990. While conducting his Nobel lecture, Alexander Fleming talked about what led to discovering penicillin, but at the end warned the world that the improper use of his discovery would lead to a situation where microbes, initially sensitive, become resistant and the situation might get out of control. This message was however wholly ignored at that time [2].

Defining antibiotics

At this point, it is worth explaining what antibiotics are. In other words, they are substances that either kill bacteria or inhibit their growth. For the first time, the term 'antibiotics' was used by Russian microbiologist Selman Waksman, a later Nobel laureate, the discoverer of two other antibiotics - streptomycin and neomycin. Presently, antibiotics are defined as natural substances, semi-synthetic derivatives and synthetic analogues that, acting selectively on bacterial cell structures, are designed to cause bactericidal or bacteriostatic effects. Antibiotics are divided into groups based on various criteria such as the mode of action, chemical structure or activity spectrum. Some antibiotics cause inhibition of bacterial cell wall synthesis (the presented above penicillin and cephalosporins), whereas others inhibit protein production (chloramphenicol, tetracycline) as well as bacterial RNA and DNA nucleic acids (for example quinolones) [4].

In the 1940s, even small doses of penicillin were sufficient to successfully fight most bacterial infections. Over the years however, the antibiotic dose has been gradually increased until when it has finally been recognised that penicillin has ceased to be effective in infections. It was caused by the defensive reaction of bacteria to antibiotics, the so-called antibiotic resistance.

Bacterial resistance to antibiotics

It should be emphasised that the phenomenon of antibiotic resistance is not a new one that appeared after the use of antibiotics in medicine. Through evolution, bacteria have developed many mechanisms that defend them against the influence of adverse substances in the surrounding environment, and thus allowing for quick adaptation to adverse changes. It is estimated that until now only about 10% of antibiotics occurring naturally in nature have been discovered.

So far, five main strategies for bacterial resistance to antibiotics have been found. These include the following:

1. Enzymatic inactivation of the antibiotic by its hydrolysis and chemical modifications, e.g. acetylation,
2. Structural change of the drug interaction site by altering the amino acid sequence of the protein or its chemical modification, e.g. methylation,
3. Replacing the original target with a new molecule, depriving the affinity for the drug,
4. Decreasing permeability of the outer membrane of Gram-negative bacteria
5. Active removal of the drug from the inside of the bacterial cell (5.6).

Resistance to antibiotics in single bacteria would not be a great threat; however, the ability is passed to the next generations on a vertical path as a result of mutation, or a horizontal one, between bacterial cells of the same species, but also those distant from each other in phylogenetic terms. These mechanisms have been used successfully by bacteria for hundreds of thousands of years before man discovered the properties of antibiotics and began to use them on a massive scale in medicine. For example, Canadian researchers isolated bacteria from the bodies of animals preserved in permafrost which have the same genotypic markers that are considered to be the cause of the current spread of antibiotic resistance.

Errors in DNA replication in a bacterial cell called mutations cause that, if the change is unfavourable, the cell dies or its growth is slowed down. However, when the mutation is the result of bacterial adaptation to the

environment that is unfavourable to one another, the one that is better adapted survives and displaces those that are not mutated from the population. In turn, horizontal gene transfer can occur through conjugation, transformation and transduction. Conjugation occurs through physical contact of two bacteria and the transfer of DNA in the form of a plasmid. Transformation is the process by which a bacterium takes up the genetic material found in the external environment. Transduction occurs with the help of bacteriophages that carry DNA between related bacteria [7].

Staphylococcus aureus resistant to methicillin

The phenomenon of resistance to penicillin observed in the late 1940s caused that a new search for and synthesis of new antibiotics started. In 1959, methicillin was introduced to clinical practice, but a year later the spread of antibiotic-resistant staphylococci (MRSA) was observed, which is currently one of the most serious threats, especially in the case of nosocomial infections. The introduction of vancomycin in clinical practice temporarily solved the MRSA problem; however, already in 1996, the first MRSA strains resistant to this antibiotic were in Japan. The unprecedented opportunities for travel, including intercontinental one, made the staphylococcus strains resistant to vancomycin transfer both to Europe and the USA. Also, Linezolid, previously regarded as the "last resort" antibiotic in the treatment of MRSA infections, has ceased to be effective because strains that are resistant to it have already appeared.

Until the 1990s, MRSA infections were reported only in hospitalised patients, but over the past 15 years, they have been reported more and more often in out-patient patients or residents of nursing homes with contact with healthcare facilities. Since 2005, there have also been reports of the occurrence of MRSA in farm animals, mainly pigs, young cattle and poultry. In Poland, the share of MRSA in staphylococcal invasive infections in humans is between 20-25% and in animals at 3-5% [8-10].

Carbapenemase-producing enterobacteria

Over the last decade, the primary issue in the field of antibiotic resistance has become intestinal bacilli that produce the so-called carbapenemase, which makes them resistant to carbapenems, the last-resort agents in the treatment of their infections. In addition, they are also resistant to the vast majority of other drugs, and more often there is no therapeutic other option in treating infections caused by these microorganisms. For structural reasons, carbapenemases have been divided into 4 classes, of which carbapenemases A, B and D (11) are the most important.

The first strain of Klebsiella pneumoniae producing class A carbapenemase of the KPC family was isolated in the USA in 1996, and in 1999-2000 in Israel, Greece, Italy and numerous Latin American and Asian countries. In Poland, K. pneumoniae KPC was identified in May 2008 in a hospital in Warsaw. Until the end of 2012, the presence of these bacteria was found in the Holy Cross, Podlaskie, Lubelskie and Silesia Provinces. In total, in the period 2013-2014, there were reported 200 cases of KPC in our country.

Class B carbapenemases (metallo-beta-lactamases) were found in many species of environmental bacteria in the 1980s and in clinical cases have been studied since the 1990s, mainly in the Far East (Japan, South Korea, Taiwan, China) in *Pseudomonas aeruginosa*.

A more recent problem in the epidemiology of bacterial infections is the spread of strains of NDM carbapenemase-producing microorganisms (type "New Delhi"). They are commonplace especially in India and other countries of the Indian subcontinent, and numerous studies indicate the existence of their reservoirs in some countries of the Middle East, Africa and the Balkans. Since 2009, there has been an avalanche of reports of NDM bacillus transfer cases to Europe, North America and Australia from the above indicated world regions, which is due to medical tourism, conventional tourism and migration. These reports have become the cause of severe international tensions, going far beyond the field of medicine and epidemiology, and concerning primarily the socio-economic sphere. At present, NDM microbes are the biggest threat in the field of drug resistance in our country. The first case of Congolese origin was recorded in 2011 in Warsaw. At the end of 2012, the epidemic of K. pneumoniae NDM appeared in a hospital in Poznań, with no apparent source. In total, by mid-March 2015, 408 cases were confirmed [12-14]. The literature data indicate that the bla_{NDM} gene has been transferred from the opportunistic bacteria *Acinetobacter baumanii* to the *Enterobacteriaceae* family. The presence of this gene in conjugative plasmids makes the main method of spreading carbapenemases NDM is the horizontal transfer. It should be noted that a high transposition activity of elements containing bla_{NMD} (11) is also of great importance.

Class D carbapenemases include CHDL enzymes (carbapenem-hydrolysing class D beta-lactamase) found in the 1980s in Acinetobacter. In 2001, a new type of OXA-48 appeared in Turkey, which is mainly related to *Klebsiella pneumoniae* but also to *E. coli* and *E. cloacae*. There has been observed a rapid penetration of these

bacteria from Turkey and North Africa (Egypt, Morocco) to Europe in recent years, as well as induction of nosocomial infections in France, the Netherlands, Germany and Spain (11).

Enterococci resistant to vancomycin

An epidemiologically important group are also enterococci resistant to glycopeptide antibiotic and vancomycin (VRE), which, since their appearance in hospitals in the second half of the eighties of the twentieth century, are an increasingly serious problem in the effective treatment of infections caused by these microorganisms. The problem is also increasingly affecting our country, wherein many oncological and hematological centres there are invasive hospital infections, caused both by *Enterococcus faecium* and *Enterococcus faecalis*, which have acquired the vancomycin resistance often associated with moving genetic elements (conjugative transposons, plasmids).

Glycopeptide resistance genes can be located on a chromosome or transposon. The genes that are responsible for the resistance of enterococci to glycopeptides include the following: van A-E.

- van A – showing high resistance to vancomycin, teicoplanin,
- van B – resistant to vancomycin, sensitive to teicoplanin,
- van C – showing constitutive resistance to low concentrations of vancomycin while maintaining sensitivity to teicoplanin,
- van D – moderately resistant to vancomycin and sensitive or low resistant to teicoplanin,
- van E – resistant to vancomycin and teicoplanin.

Currently, the participation of VRE in enterococcal invasive infections in Poland is estimated at approx. 10%. The reason for additional concerns related to invasive infections caused by enterococci is the emergence of recently resistant strains to the drug of last resort, i.e. linezolid [15, 16].

Reasons for the increase in antibiotic resistance

Until recently, the problem of resistance was thought to affect only nosocomial infections. Presently, it is said to be, first of all, a problem of out-of-hospital infections. The very phenomenon of multi-drug resistance has led to the creation of new definitions in which the pathogens identified above are regarded as deadly threats. MDR strains are defined as those insensitive to three or more groups of antibiotics, XDR strains - strains sensitive to only one or two antibiotics, and strains resistant to all available drugs are included in the PDR group.

The most frequent reasons for the increase in antibiotic resistance indicated in the literature are the overuse and misuse of antibiotics, which results not only in the emergence of resistance, but most of all in its dynamic spread among microorganisms, including the surrounding environment. It has become a standard practice to prescribe antibiotics on demand for people suffering from diseases with viral aetiology, prescribing antibiotics "just in case" as well as (in case of patients) overusing those previously prescribed for other disorders or ceasing taking antibiotics after the initial symptoms disappear. Until now, the doctor who does not prescribe antibiotics has been perceived as one who neglects the patient and does not provide them due attention.

Other reasons for antibiotics acquiring resistance include:

- reducing the supply of new drugs effective in the treatment of infections,
- an increased number of patients with risk factors for infection,
- population ageing (higher numbers of patients in nursing homes and care units and treatment institutions),
- fast and mass transportation of the population and thus globalisation of the problem,
- insufficient use of microbiological diagnostics, exceptionally quick diagnostics and limited access to it in many centres,
- insufficient awareness of the issue in medical professionals, managers in health care and society (insufficient knowledge and awareness),
- excessive and inappropriate use of antibiotics outside human medicine sphere.

Antibiotic resistance as an non-medical problem

Lately, antibiotics have been increasingly used to fight infectious diseases in animals as well as breeding. Using antibiotics in farm animals is said to bring many beneficial effects as they affect not only their health but also stimulate growth. For this reason, they began to be referred to as antibiotic growth stimulators (ASW). In the same way as in human medicine, in the late 1940s, penicillin was used in veterinary medicine for treating udder infections in dairy cows. Soon, other effects of administering antibiotics were found, not necessarily therapeutic

ones. In 1946, while conducting studies on streptomycin, it was observed that the addition of this antibiotic to chicken feed increased their body weight gain. Shortly after, in 1949, similar effects of chlorotetracycline were discovered in both chickens and swine and other farm animals. Antibiotics, as preventive feed additives, which eliminated the unfavourable composition of the intestinal microflora, gradually introduced into the breeding practice, increased at the same time bioavailability and the animals receiving them grew much faster. Also in the breeding and veterinary practice, the phenomenon of antibiotic resistance was observed. For this reason, already in 1969, in the so-called Swann's report, there appeared a demand to separate antibiotics into the ones used in breeding and therapy. This led to the withdrawal of penicillin, streptomycin and tetracycline from animal husbandry in many European countries already in 1972-1974.

In recent years, several antibiotic growth promoters have been withdrawn. These include erythromycin, carfenin or oleandromycin. Despite the increasingly restrictive EU regulations that ban the use of antibiotics in animal nutrition, these substances are successfully used in the USA, South America, Russia and China. Currently, antibiotics are used on a massive scale in the breeding of aquatic animals, especially fish, mussels and shrimps, as well as in bee breeding. Fish farms, established on the coastal, saline waters of many countries of South America and Asia cover large areas and run intensive breeding businesses. On farms designed for prophylactic purposes, vast amounts of antibiotics are consumed, which are added directly to the water. This causes depositing of these substances in the water as well as bottom sediments. A large part of these substances is transferred to considerable distances due to sea currents. It is estimated that 1500x more antibiotic is used to produce 1 ton of salmon in South America than in Norway or Canada [17-20].

Antibiotics in the environment

Although in clinical practice the metabolic changes of antibiotics, their bioavailability and impact on the human body have been described, there has been little research so far on what happens to antibiotics once they have been released into the environment. The appearance of antibiotics in soil or water causes changes in the composition of the microflora of a given environment. In this way, the biological balance of a given ecosystem is disturbed, which leads to disturbances in the circulation cycles in many natural elements, including biogenic ones. Another danger is the presence of antibiotics in products and raw materials coming from different animals and consumed by humans. An immediate threat consists in triggering allergic reactions (e.g. to penicillin), carcinogenic ones (to oxytetracycline), nephropathy (gentamicin) and their effects on the microflora in the human digestive tract (immune disorders, bad vitamin, impaired absorption).

Where are we heading to?

To reduce the problem of antibiotic resistance that is increasingly commonplace in microorganisms, it is necessary to take global actions. Due to the importance of the issue, the fight against it has become a priority for organisations like the European Commission, the World Health Organization, the European Parliament, the Food and Drug Administration (FDA) and the Centre of Diseases Control and Prevention (CDC). As regards public health, drug resistance, in addition to combating influenza, HIV and tuberculosis, has become a priority. In Poland, the National Antibiotic Protection Programme was successfully implemented in the years 2011-2015. Also, several days ago, the Minister of Health accepted the new edition of the Programme for the years 2016-2020. Few people know that November 18 is the European Antibiotic Awareness Day, which aims to educate the public about their effects and risks that may arise from the inappropriate use of antibiotics and the danger of resistance build-up. As the results of research carried out by the National Medicines Institute show, there is an urgent need of implementing educational measures, which may indicate that Poland is at the forefront of the countries excessively prescribing antibiotics for cold, flu or a cough. As many as 50% of Poles think that antibiotics are effective in treating influenza, 38% assume that they also treat common cold and as many as 63% think that they fight viruses effectively [21].

The emergence of strains resistant to all antibiotics used so far heralds an inevitable decline of the antibiotic era and becomes a warning signal that should not be underestimated. In the last 20 years, only two new antibiotics have been created. Bearing in mind the cost of their production, including the need to perform many clinical trials for years, mathematical modelling or the need to search for organisms that produce natural antibiotics and come from extreme environments (sea depths, thermal waters), pharmaceutical companies are primarily interested in the production of over-the-counter drugs, whose consumption doubles each year becoming a net profit. The only thing that can be done is to rationally use the antibiotics that are currently available so that they can be successfully used by future generations. Therefore, before we reach for the antibiotic ourselves, let's think whether it is worth it. One can be young, beautiful and rich, but being healthy is the biggest asset.

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MEROPENEM RESISTANCE IN INTENSIVE CARE UNITS IN UKRAINE

OPORNOŚĆ NA LEK MEROPENEM U PACJENTÓW ODDZIAŁÓW INTENSYWNEJ OPIEKI MEDYCZNEJ NA UKRAINIE

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B. Data collection/entry
zebranie danych
C. Data analysis/statistics
dane – analiza i statystyki
D. Data interpretation
interpretacja danych
E. Preparation of manuscript
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F. Literature analysis/search
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Summary

The article reviews the issue of antibiotic resistance of microorganisms to meropenem in intensive care units in Ukraine. An increase in meropenem inefficiency against microorganisms in intensive care units has been observed in the last years. The data analysis suggests a significant predominance of gram-negative flora: A. baumannii, P. aeruginosa, K. pneumoniae, E. cloacae, E.coli. On average 30% of microorganisms are resistant to 5 and more basic antibiotics including meropenem. 40-80 % of the gram-negative flora in intensive care units in Ukraine are resistant to meropenem. This can be attributed to the free sale of antibiotics without prescription, patients' self-treatment, inadequate antibiotic therapy, and failure to comply with sanitary norms on the part of intensive care staff. Microbiological diagnostics of infectious pathogens also needs improvement. Unless proper measures are taken within a few years, meropenem as an antibiotic is likely to disappear in Ukraine.

Keywords: carbapenems, meropenem, antibiotic resistance, intensive care units

Artykuł przedstawia kwestię antybiotykooporności drobnoustrojów na lek meropenem u pacjentów szpitalnych oddziałów intensywnej opieki medycznej na Ukrainie. W ostatnich latach na ukraińskich oddziałach intensywnej opieki medycznej zaobserwowano znaczny wzrost oporności drobnoustrojów na meropenem, a tym samym coraz mniejszą skuteczność tego leku. Przeprowadzona analiza danych wskazuje na znaczną przewagę gram-ujemnej flory bakteryjnej oddziałów, w tym szczepów takich jak A. baumannii, P. aeruginosa, K. pneumoniae, E. cloacae czy E.coli. Odsetek szczepów opornych na działanie pięciu lub więcej podstawowych antybiotyków, w tym leku meropenem, wynosił średio 30%, a odsetek gram-ujemnych szczepów flory bakteryjnej ukraińskich oddziałów intensywnej opieki medycznej opornych na działanie samego meropenemu to aż 40 – 80%. Głównymi czynnikami powstawania antybiotykooporności w tym przypadku mogą być m.in. sprzedaż antybiotyków bez recepty, samoleczenie, niewłaściwa antybiotykoterapia oraz niespełnianie wymogów sanitarnych przez personel medyczny szpitali. Zdecydowanie należałoby również popracować nad diagnostyką mikrobiologiczną drobnoustrojów patogennych. Jeżeli w ciągu kilku kolejnych lat nie zostaną podjęte odpowiednie działania, meropenem prawdopodobnie zniknie z listy antybiotyków stosowanych na Ukrainie.

Słowa kluczowe: karbapenemy, meropenem, antybiotykooporność, oddziały intensywnej opieki medycznej

Introduction

The problem of microorganism resistance to carbapenems as stand-by antibiotics is one of the most global issues requiring prompt solution [1, 2]. This matter is also of much concern in post-Soviet countries, particularly Ukraine. Regrettably, the antibiotic resistance in Ukraine has been found to exceed the normal incidence in European countries and the USA [3]. Further, the prevalence of nosocomial infections in Ukraine (in the last decade 3-4 thousand cases per year; that is 0.08% [4], points to the lack of systemic solutions that would improve outcomes.

Though urgent and clinically vital, the problem of microorganism resistance to antibiotics, including carbapenems, has not been studied adequately in Ukraine so far. Until now, the incidence of antibiotic resistance of microorganisms taken from the in-patients of surgical hospitals has not been examined systematically. Few

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research works are available concerning the study of antibiotic resistance of clinical strains, mostly found in anesthesiology and intensive care units, which complicates adequate antimicrobial therapy. The available reports, both foreign and national, cannot substitute for thorough research on the spread of microorganism resistance to antibiotics in Ukrainian hospitals at the local, regional and country levels. This is due to significant difference in the use of antibiotics between Ukraine and other countries. With the lack of state-approved analogous research in Ukraine, an analysis of available scientific data on the subject is needed presently. The role of carbapenems in fighting various types of microflora, gram-negative in particular, can hardly be overestimated. Therefore, resistance to carbapenems might be a sign of antibiotic resistance problem on the whole. The authors have done a thorough data search regarding hospital microflora resistance to carbapenems specifically, and now they affirm that no other serious research, beside those mentioned in this paper, has been undertaken in Ukraine. Owing to the lack of research on the subject, the authors understandably come forward with a short analysis of the issue.

Material and methods

In the ex-Soviet Union, the Ministry of Healthcare issued official orders concerning sanitary and epidemiological standards in medical institutions [5-7], among which one can find the following orders of Ministry of Healthcare of Soviet Union: Order No. 720 of 31.07.1978 and Order No. 380 of 16.04.1975. In Ukraine, There were some attempts to handle the problem of antibiotic resistance in Ukraine in the past, specifically, Order No. 236 of Ministry of Healthcare of 4.04.2012 [8]. However, the data on the microorganism resistance to antibiotics in Ukraine hardly compares with those of the European Union countries as the determination of the sensitivity of microorganisms to antibiotics is implemented according to outdated Order No.535 of Ministry of Healthcare of the Soviet Union of 22.04.1985. The identification of isolated strains of microorganisms is performed according to generally accepted bacteriologic methods, following Bergey's classification (1997). Diagnostic microbiological methods, particularly the disco-diffusion method, are considered reliable in Europe. However, most of our data were obtained by using automated Vitek microbiological analyzers.

Since the primary objective of the paper is microorganism resistance to meropenem, the diagnostics of carbapenemases in Ukraine should be brought to the fore. However, the authors have failed to find any Ukrainian research on carbapenemases.

The early laboratory diagnostics of infectious diseases is essential. It takes at least 3 days to diagnose one or another disease at modern laboratories. At present, Ukraine lacks such laboratories though. Most of the available ones use obsolete equipment and manual methods of pathogen identification. As a result, the diagnostic process takes more than 3 days. Sometimes, the patient dies before the result comes to the doctor. Besides, the Orders listed above had some strict instructions to be followed. Adherence to the those regulations proved to be effective against purulent and septic diseases. Failure to comply with instructions was brought to hospital and department managers' notice by a list which regulated the categories of penalties. Theoretically, these orders are valid today although they are often ignored. It appears to be easier to ignore them and to conceal the existing sanitary and epidemiological situation.

In compliance with the Central Asian and Eastern European Surveillance of Antimicrobial Resistance (CAESAR) network, Ukraine created the All-Ukrainian Association of Infection Control and Antimicrobial Resistance, Ukrainian Committee of Antimicrobial Sensitivity Testing (UCAST) and Ukrainian Committee on Infection Control (UCIC). The formation of these structures was in line with the EU-Ukraine Agreement Association, by the WHO Global Strategy on Containment of Antimicrobial Resistance, the CAESAR Program, and the European Antimicrobial Resistance Surveillance Network EARS-Net. Despite the fact that the above-listed structures were instituted, the antibiotic resistance in Ukraine remains a pressing problem. The main issue is that antibiotic resistance in intensive care units is higher in Ukraine as compared with surgical and therapeutic departments in other countries [9].

Results and discussion

The WHO first global report of April 30, 2014 [10] contained a description of antibiotic resistance to 114 antibiotic drugs according to CDC data. The E.coli resistance to meropenem in France and Great Britain was found in less than 0.03% of cases, in Bulgaria – 0.06%, in Greece – 0.72%. The Carbapenem-resistant K.pneumoniae were observed in Austria, Denmark, Germany, Latvia, Lithuania and Sweden in 0% cases, in Spain and France – 0.16-0.17%, in Poland – 0.72%. The E.coli resistance to carbapenem in Poland equaled to 1.0%, and K.pneumoniae resistance did not exceed 2.0% [11].

Currently, gram-negative flora prevails in intensive care units in Ukraine [12]. Any analysis of microflora resistance to meropenem reveals negative dynamics. The research comprising the analysis of 4974 of strains of P. aeruginos was performed in 2009 [13]. The material was obtained from the purulence of in-patients in 97 surgical departments in 25 regions of Ukraine, Kyiv and Sevastopol. The highest resistance to meropenem was detected in Kharkiv (38.6%), Vinnytsia (32%) and Volyn (30.9%) regions, while the lowest one was found in Ivano-Frankivsk (6.1%) and Khmelnytsk (11.5%) regions.

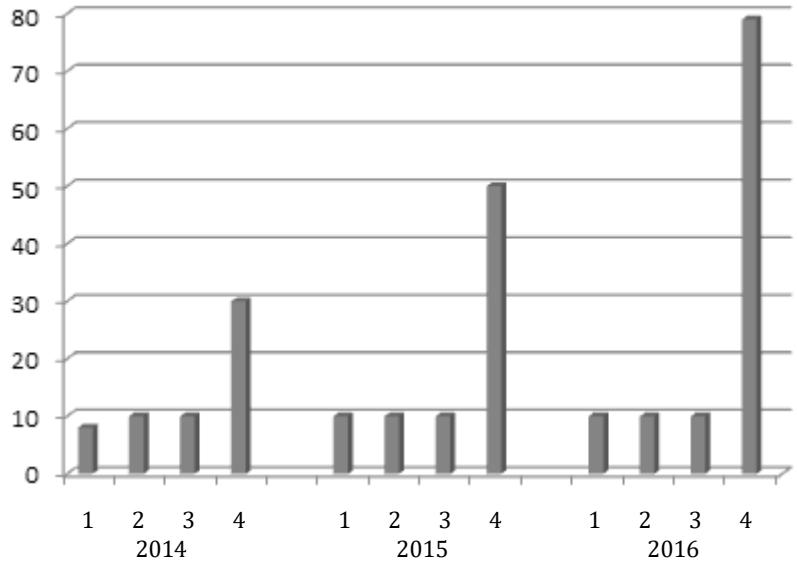
According to the data of the major Ukrainian research conducted in the years 2008 – 2010 [14], the resistance of E.coli to meropenem in Chernihiv region was 69.8 ± 7.0%, in Cherkasy region – 23.1 ± 4.06%, in Sumy region – 23.2 ± 5.64%, and in Kherson region – 22.3 ± 3.53% [15].

Further, the statistical data by the Ukrainian Centre for Control and Monitoring of the Diseases, Ministry of Healthcare of Ukraine, regarding the analysis of multiple resistant strains of microorganisms (insensitive to 5 and more basic antibiotics including carbapenem) [16], showed that the following problems in 2011: multiple resistant A. baumannii was found in 29.1% of cases, P. aeruginosa – 26.1%, K. pneumoniae – 12.7%, S. haemolyticus – 12.7%, E. cloacae – 7.9%, E. coli – 7.4%, S. aureus – 1.8%, others – 2.3%.

According to the other data from 2012 [13, 17, 18], the meropenem effectiveness against P. aeruginosa in the largest hospital of Donetsk was 46.8%.

The research by Kreniov K.Yu. [19] on the microflora dynamics in patients in the intensive care unit was implemented in Khmelnytsk Regional Hospital in the years 2013 – 2015, where 205 isolates were tested. In 2013, 79 isolates were analyzed, and 33.3% were found to be multiple resistant. 25% were A. baumannii resistant, 18% – P. aeruginosa and K. pneumoniae, 13% – S. epidermidis, E. coli and S. aureus. Gram-negative flora was found in 61%.

In 2015, 64 isolates were tested, 42 (63%) revealing multiple resistance. The list of multiple resistant was as follows: A. baumannii – 31.3%, P. aeruginosa – 24.7%, K. pneumoniae – 9.2%, S. epidermidis – 6.3%, E. faecalis – 3.2%, S. aureus – 1.6%. Gram-negative flora was observed in 82%.

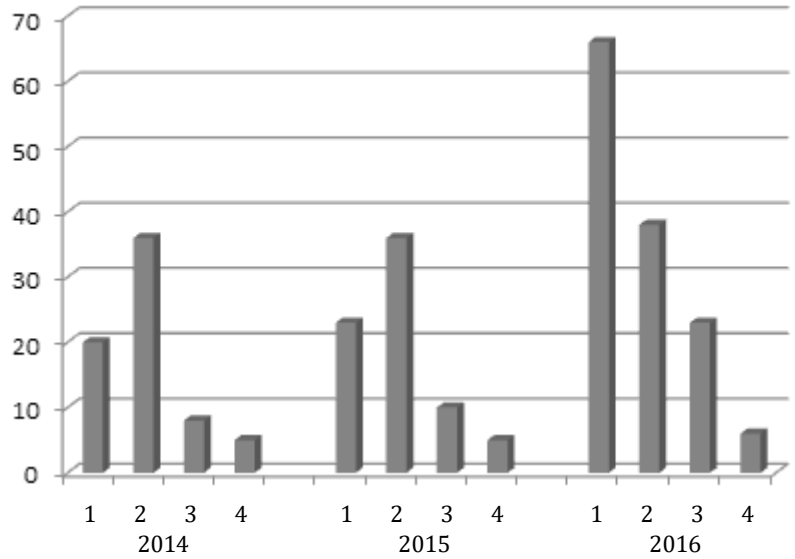


1 – Cefoperazone; 2 – Cefepime; 3 – Imipenem; 4 – Meropenem

Figure 1. Resistance of Klebsiella Pneumoniae to antibiotics in Khmelnitski region Hospital in 2014-2016

In 2014 and 2015, the meropenem resistance among A. baumannii isolates was 52% and 79% respectively; P. aeruginosa – 31% and 71%; K. pneumoniae – 50% and 79%; E. coli – 3% and 52.2%. Also, another research conducted in 2015 revealed similar data (12, 20). It showed that among those sensitive to meropenem were K. pneumoniae (58.3%), E. faecium (7.5%), A. baumannii (19%), P. aeruginosa (37.3%).

The most recent research (2016) by professor Nesterenko O.M. carried out in Kramatorsk revealed 60 % of carbapenem-resistant A.baumanii cases, whereas for K.pneumoniae and Enterobacter spp. the value was 70% and 67.73% respectively [21].



1 – Meropenem; 2– Cefoperazone; 3– Ceftazidine; 4– Polyresistent

Figure 2. Resistance of Pseudomonas aeruginosa to antibiotics in Khmelnitski region Hospital in 2014-2016

Another research study by Hrabák J. et al. 2014 [20] dealt with a Ukrainian patient who was admitted to a Czech hospital due to a severe traumatic brain injury during Euromaidan in 2014. In this particular case, A. baumannii was extracted. A. baumannii synthesized carbapenem-hydrolyzing class of D β-lactamase. A. baumannii was found to be resistant to ertapenem (MIC 12 mg/L), meropenem (MIC 24 mg/L) and imipenem (MIC 3 mg/L), amikacin, amoxicillin/clavulanic acid, ampicillin cefotaxime, ceftazidime, cefepime, ciprofloxacin, gentamicin, piperacillin/tazobactam, tobramycin and trimethoprim/sulfamethoxazole. However, it was susceptible to aztreonam, colistin and tigecycline. The authors of the paper stress that this particular research concerning to β-lactamases was unique.

Conclusions

The primary cause of the antibiotic resistance in Ukraine is the availability of antibiotics in any drugstore. Patients often resort to self-treatment without consulting a doctor. Sometimes, reserve antibiotics are prescribed by doctors for prophylaxis. Another factor increasing the antibiotic resistance in Ukraine is a wide and uncontrolled use of antibiotics as a nutritional supplement in stockbreeding.

Further, basic sanitary standards are not always kept to at intensive care units. The ways of transporting "dirty" and "clean" patients often intersect. According to the Ukrainian standards, 1 nurse should provide care to 4 patients, which also contributes to microflora contamination in the patients' surroundings. The elemental clean-up procedure is often neglected in intensive care units. Microorganisms are known to be carried with disinfectants. It is still common in Ukraine for an assistant nurse to use only one floor cloth for washing the whole the unit floor. The effect is evident. To the authors' view, the fact that antibiotics are available in Ukrainian drugstores without prescription is the major factor of high microorganism resistance to them, whereas in Poland prescribing antibiotics is restricted to certain categories of doctors. A Ukrainian patient can easily do without any prescription as purchasing medicines is not limited in any way. Antibiotic sale regulations which date back to the former USSR have not been cancelled so far. Finally, the lack of any control over drugstores selling antibiotics without prescription makes the situation even more severe.

The mentioned-above Czech research concludes that the problem of antibiotic resistance in Ukraine requires a serious consideration. It should be taken into account that with the Ukrainians crossing the borders of EU countries their microflora can bring about similar health hazards in these territories.

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

PHYSICAL ACTIVITY OF POLES IN THE LIGHT OF PUBLIC OPINION POLLS

AKTYWNOŚĆ FIZYCZNA POLAKÓW W ŚWIETLE BADAŃ OPINII PUBLICZNEJ

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

Summary

Background. The article aims to make a comparative analysis of the physical activity of Poles in the last fifty years in the light of public opinion polls carried out in the years 1960-2016 by the Centres for Public Opinion Research in Poland – CBOS and OBOP. Before the study was conducted, the following questions were formulated: Do Poles do sports or get involved in other activities demanding physical effort? What motivates them? What sports skills do they possess? What is their attitude towards the persons visiting the gym? Finally, have their PA changed in the researched period, and to what extent? In the analysis, the criteria of sex, age, education and material status were considered.
Material and methods. The following research methods were applied: a quantitative content analysis of secondary data, a qualitative content analysis, as well as comparative and analytical-descriptive methods.
Results. In the analysed period, the number of Poles regularly practising sports grew by 33.5% (from 6.5% in 1960 to 40% in 2013). The percentage of those who do not follow any activity comprises a third of adult Poles (34%); however, their number was twice lower in the year 2013 compared to the year 1960 (66%).
Conclusions. Before conducting the research, it was assumed that, despite popular opinion and the one presented in the media concerning the low physical activity in the society, the number of Poles taking up physical activity has decidedly risen in the last half-century. Having analysed the opinion polls data, it can be stated that the hypothesis was confirmed.

Keywords: physical activity, Poland, public opinion polls

Streszczenie

Wprowadzenie. Celem artykułu była analiza porównawcza aktywności fizycznej Polaków w ostatnim półwieczu - w świetle badań opinii publicznej, przeprowadzonych przez CBOS oraz OBOP w latach 1960-2016. Na wstępie procesu badawczego sformułowano następujące pytania: Czy Polacy uprawiali/ją jakiś sport bądź inne zajęcia lub ćwiczenia wymagające aktywności fizycznej? Jakimi kierują się motywacjami? Jakie posiadają umiejętności sportowe? Jaki jest ich stosunek do osób odwiedzających siłownie oraz czy i w jakim zakresie zmieniła się aktywność fizyczna Polaków w badanym okresie? Podczas analiz uwzględniono kryterium płci, wieku, wykształcenia oraz sytuacji materialnej.
Materiał i metody. Zastosowano wtórną ilościową analizę zawartości, jakościową analizę treści, metodę porównawczą oraz analityczno-opisową.
Wyniki. W analizowanym okresie o 33.5% wzrosła liczba Polaków regularnie uprawiających sport (1960: 6.5%, 2013: 40%). Chociaż odsetek osób pasywnych ruchowo obejmuje jedną trzecią dorosłych Polaków (34%) to w 2013 roku był on prawie dwukrotnie niższy niż w roku 1960 (66%).
Wnioski. W procesie badawczym przyjęto tezę, iż w ostatnim półwieczu - wbrew potocznym opiniom i sądom prezentowanym w mediach na temat niskiej aktywności ruchowej społeczeństwa - zdecydowanie wzrosła liczba Polaków podejmujących aktywność fizyczną. Teza została potwierdzona. Poświadczą to badania opinii publicznej.

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Słowa kluczowe: aktywność fizyczna, Polska, opinia publiczna

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Introduction

Because physical activity, alongside good health, is considered a condition for gaining primary social and professional competences, a means to achieve a better life quality of life or even a determinant of one's social status in a consumer society [1], there appears a question how the concept itself is understood. According to Barbara Kopff, PA is any bodily movement made by any skeletal muscles, associated with the energy expenditure that exceeds the resting energy expenditure. According to this definition, it may include all forms of physical exercise, i.e. recreational activity, sports, job-related activity, running a household and travelling (transportation), also on short distances - to work, school, or to do shopping [2]. The literature on the subject distinguishes several domains. These include professional sports; housework on house maintenance; transportation; recreation, sport and leisure-time PA [3]. In the following publication, physical activity of individuals is understood primarily as recreation undertaken in leisure time. Numerous studies on its connections with health show that in the present-day civilisation, apart from regular sleep and rest as well as a proper diet, systematic involvement in some form of activity has become an integral part of life. It is a way of life, a lifestyle to follow.

Thorstein Veblen defines lifestyle as spiritual attitudes prevailing at a given time or the dominant concept of life [4]. On the other hand, Leon Dyczewski sees it as a specific set of needs, values, strivings, preferences and behaviours typical of some social group or individuals that make them distinct from others [5]. Accordingly, lifestyle is "a way of being" that distinguishes a given community or individuals from others. It is noticeable in everyday behaviours; that is, repeated patterns that form more definite ones. Also, Andrzej Siciński describes a lifestyle in a similar way. In his understanding, it consists of behaviours, varied in their scope and form, motivations of these behaviours, as well as the functions their results, goals or instruments of these behaviours, which due to their interconnections are also meaningful [6]. All the above-mentioned definitions underline the significance of "power" that enables distinguishing communities or individuals from one another. Accordingly, it can be assumed that successive generations of Poles, due to different socio-cultural experiences, as well as the political and economic situation, exhibit a different or slightly different attitude to PA, as one of many elements of lifestyle. The recent years have brought many changes in the Poles' way of life, but are they visible in the respondents' activity? The following questions can be asked: are the prevalent opinions and those disseminated by the media about low physical activity reflected in public opinion polls? Are they just popular observations, somewhat or utterly unjustified according to the surveys?

Material and methods

The aim of the present article was a comparative analysis of the physical activity of Poles in the last fifty years, as indicated by public opinion polls carried out in the years 1960-2016 by the Public Opinion Research Centres in Poland, i.e. CBOS and OBOP. To come forward with justifiable findings, the following research methods were applied: a quantitative content analysis of secondary data, a qualitative content analysis, as well as comparative and analytical-descriptive methods.

At the beginning of the research the following questions were formulated:

- Do Poles practice any sport or other activities or exercises that require physical effort?
- What sports skills have they mastered?
- What is Poles' attitude to the people going to gyms and sports clubs?
- Whether and, to what extent, has the physical activity of Poles changed in the last 50 years?

Observing the growing number of participants in marathons, rallies, seeing more and more traffic on bicycle paths, or a great interest in skiing, swimming, football and other sports disciplines, one can assume that, contrary to popular opinions often conveyed by mass media about low motor activity of Poles, the percentage of those who are physically active in the society is systematically rising.

To answer the research problem, the analysis of the reports for the years 1960-2016 in the Public Opinion Research Centres archives (CBOS and OBOP) was made. The research process was divided into three stages, namely:

- Stage 1: A quantitative content analysis of the secondary data included in CBOS and OBOP reports. At this point, the primary focus was to search the archives for any report that would contain in their titles the word/keyword "activity". Then, a thorough quantitative content analysis of the reports' secondary data was carried out, and the range of the command words has been extended to include such items as "physical activity" and "sport".
- Stage 2: Qualitative and comparative analyses of the content of the reports was made to find any people's declarations and opinions on the physical activity of Poles.
- Stage 3: Discussion and conclusions indicated whether and to what extent the physical activity of Poles has changed in the last fifty years.

The publication presents comparative analyses of the declared physical activity of Poles in the last half-century, taking into account the criteria of gender, age, education and financial status.

Results

A quantitative content analysis of the secondary data of the CBOS and OBOP reports

By applying a quantitative content analysis of the secondary data of the CBOS and OBOP reports, the research material was collected. As indicated, the above-mentioned searches were conducted in the archives by entering the following configuration mode commands:

1. "activity",
2. "physical activity",
3. "sport".

The detailed data are presented in Table 1.

Table 1. Data in the CBOS and OBOP reports for years 1960-2016

Command words and keywords	CBOS Reports	OBOP Reports	Total
Activity	159	54	213
Including reports containing any content on the research problem	**4** [7,8,9,10]	**3** [11,12,13]	**7**
Physical Activity	**4** (4*) **0**	**2 (**1*) 1 [12,14]	**6** (5*) **1**
Including reports containing any content on the research problem	**4 (**4*) **0** [7,8,9,10]	**1** (1*) 0 [12]	**5** (5*) 0
Sport	39	94	133
Including reports containing any content on the research problem	**9 (**2*) **7** [9,10, 15,16, 17,18,19,20,21]	**11** (1*) **10** [12,22,23,24,25,26, 25,28,29,30,31]	**20** (5*) **17**

Source: own study: Data of the CBOS and OBOP reports for the years 1960-2016 [32, 33, 34, 35].
*The data have been indicated in another field of the table

The results of the complete quantitative content analysis of the secondary data of the CBOS and OBOP reports for the years 1960-2016 are presented in Table 2.

Table 2. CBOS and OBOP reports for years 1960-2016

Command words / keywords	CBOS	OBOP	Total
Stage 1: Command: Activity	4	3	7
Stage 2: Commands:			
Physical activity	0	0	0
Sport	7	10	17
Total	11	13	24

Source: own study

As shown in Table 2, the research material contained altogether 24 reports, including 11 surveys conducted by CBOS and 13 reports by OBOP. Such rich source material on the issue may indicate that the research centres held an interest in the problem of physical activity of Poles as well as point to its rank and significance in the life of the individuals and the society.

Qualitative and comparative analysis of the content of reports

The primary purpose of the qualitative study of the content of CBOS and OBOP reports was to try to answer the following research questions: do Poles practise any sport or other activities or exercises requiring physical effort? What are their motivations? What sports skills do they have? What is their attitude towards people attending gyms and sports clubs, and whether and to what extent has the physical activity of Poles changed in the last 50 years?

As stated above, a secondary quantitative analysis of the content was applied, which indicates that the author did not conduct the research herself but based on the results of surveys carried out by the CBOS and OBOP. This method may imply some incompleteness and patchiness of the data despite numerous possibilities that any comparative analysis of the material gathered at various time intervals may offer.

Poles' opinions on physical activity

Having the research problem in mind, a fundamental question concerned the physical activity of Poles. Do they do any sport or exercises related to the physical effort? Seeking answers to the above question, 24 surveys conducted by the CBOS and OBOP were analysed. Table 3 presents all the data that were recorded in the studies.

Table 3. Do you do any sport or other activity or exercise that requires physical effort?

Year	Yes, regularly	Yes, quite often	Yes, rarely	Not at all	No data
1960	6.5	10.2	16.1	63	4.2
1974	6	12	4	78	-
1997 OBOP	20	39	-	41	-
1997 CBOS	7	7	12	73	1
2000	20	12	16	42/52	-
2001	33	12	16	39	-
2002	9	14	18	59	-
I 2003	9	12	21	58	-
VIII 2003	1	14	21	53	-
2009	13	13	20	54	-
2013	40	-	26	34	-

Source: own study: Data of the CBOS and OBOP reports for the years 1960-2016 [11, 12, 15, 16, 17, 19, 22, 29].

The research has shown that the number of Poles regularly engaging in physical activity has changed dramatically in the last fifty years (1960-2013). An increase of 33.5% has been noted (from 6.5% in 1960 to 40% in 2013). However, the percentage of the respondents exercising quite often remained unchanged. It ranges from 10.2 to 14%. The respondents' declarations show that, since 1974, the number of people practising sport or other activities sporadically, or doing activities or exercises to maintain or improve physical fitness has been systematically increasing. An increase of 10% in this category has been noted, i.e. from 16.1% in 1960 to 26% in 13. However, every fifth respondent cares about their physical condition sporadically, only when having more time or being motivated. As for the obtained declarations, it appears that more than half of Poles did not do any sport or did not exercise at all in the years 1960 - 2009.

The percentage of passive individuals who do not undertake physical activity in any form is still high. Being inactive concerns only one-third of adult Poles (34%) and, as for 2013, the number was almost twice lower than in 1960, when 66% declared that they did not do any sports or exercise (in 1974 three-fourths of the respondents, i.e. 74%). The comparable data recorded for the year 1997 indicate that the number of inactive citizens stood at 73%. It should be noted though that the change concerns primarily those who got involved in a regular physical activity and, to a lesser extent, those who would engage in sports sporadically.

The analysed reports on Poles' involvement in sports may indicate that it is men who engage in physical activity more often than women. These differences are not significant as they range from 5% in 2009 and 2014 to 9% in the year 1997. The detailed data are presented in Table 4.

Table 4. Gender and physical activity (affirmative respondents' answers)

Have you done any sport or other activity requiring physical effort in the last year?	Woman	Man
1974	-	-
1991	-	-
1997	23	32
2000	-	-
2009	43	48
2013	63	69
2014 (winter sports)	5	10

Source: own study: Data of the CBOS and OBOP reports for the years 1960-2016 [10, 12, 19, 31].

As for stereotypes, physical activity is claimed to be the domain of young people. Thus, the next aspect of the research was to find out whether the results of the available surveys confirm this opinion. Due to the various age ranges covered by the OBOP and CBOS studies, the results were reported separately.

Table 5. Age and physical activity (positive answers)

OBOP	15- 19	20-29	30-39	40-49	50-59	60 and over 60 years old
1974	-	-	-	-	-	-
1997	71	37	30	22	20	7
2000	-	-	-	-	-	-

CBOS	-	18-24	25-34	35-44	45-54	55-64	65 over 65 years old
1974	-	44	43	12	11	5	-
2000	-	-	-	-	-	-	-
2003	-	74	-	-	-	-	16
2009	-	81	62	43	40	32	21
2013	-	95	81	75	60	56	35

Source: own study: Data of the CBOS and OBOP reports for the years 1960-2016 [10, 12, 17, 19, 22].

Table 5 shows that the physical activity of the examined persons decreases with age in all the studied periods. In the group of the youngest respondents (CBOS: 18-24; OBOP: 15-19), after the year 1997 sports were done by a vast majority of Poles, i.e. in 1974 – by 44%, 1997 – by 71%, 2003 – by 74%, 2009 – by 81% and in 2013 – by 95% respectively. The analysis of the data leads to the conclusion that PA increased twofold in the considered period. This may arouse surprise in the light of popularly held opinions on the youth's passivity and excessive involvement in mass culture and social media.

Further, the share of those who admit that they do not follow any physical activity tends to increase with the age of the respondents. In following subgroups, fewer and fewer are physically active and their numbers lower with age. Among the respondents in the 25 to 34 age group, those physically active in 1974 amounted to around 43%, while in seniors – to only 5%. Comparable trends are visible in the subsequent years and age groups. The most significant difference between the numbers who declare activity regarding physical activity in the youngest and the oldest respondents is noticeable in the year 1997. It falls within 64 percent, slightly less, i.e. 60% was recorded in 2009 and 2013. However, the smallest difference is visible in 1974 (only 39%). It should be emphasised that the question concerned all forms of physical activity that would improve physical fitness, including rehabilitation exercises. Bearing in mind the positive impact of PA on the functioning of the body in old age and the phenomenon of the so-called positive ageing, the above data may be of some concern. Physical effort delays the processes of dementia, and the course of Alzheimer's disease increases the subjective assessment of own health, provides a better frame of mind and allows for improvement in physical and psychological health [1].

The dependencies between the respondents' age and declared physical activity indicate that the respondents' PA decisively decreases with age, although, what should be emphasised as well, starting from the year 1974, the number of Poles undertaking some activity is systematically rising in all groups. An increase of 38% is visible in the 25-34 age group, 49% – in the 45-54 year-olds, 51% – in the 18-24 and 55-64 groups, and 63% – in those who are aged 35-44.

Besides, it is also worth noting that the critical moment in the 21st century in this systematically progressive process of turning away from PA was the generation aged between 25 and 34. At this age category, the percentage of those who would follow some fitness exercise dropped almost by half. One can assume that doing sports at that time was the domain of, above all, young people who were still at schools. Later on, the activity would reduce due to age, taking up professional work and a definite change of one's lifestyle [17]. Slightly different trends are noticeable after the year 2009. Namely, a six-fold increase in fitness activity of people aged 35-44 was visible. Accordingly, over the last fifty years, this ratio increased from 12% in 1974 to 75% in 2013.

The number of people practising sport regularly increases with the level of education. In addition to taking physical activity, one's position in the professional world, as well as higher income, also play their role. The detailed data are presented in Table 6.

Table 6. Education and physical activity (positive answers)

Year	Primary education	Vocational education	Secondary education	Tertiary education
1997	13	20	38	54
2003	28	-	-	53
2009	27	-	-	78
2013	42	59	73	88

Source: own study: Data in the CBOS and OBOP reports for the years 1960-2016 [10, 12, 16, 17, 19].

The patchy and incomplete data make it impossible to formulate any definite conclusions. However, Table 6 shows that people with higher education were the most physically active in the analysed period. More than half of them (54%) in 1997 and 88% in 2013 reported being involved in motor activity. Among the respondents with primary education, 58% did not do any sports. Gymnastics and sports activities were popular mainly in those professional and social groups whose work and lifestyle did not involve any significant physical effort.

It should be emphasised that during the considered period, in all the groups distinguished by education level, there is a systematic increase of approximately 30% in the number of those taking up physical activity. The highest growth was recorded among the respondents with vocational education (39%), while the lowest in those with primary education (29%). The comparable data were for the other two groups were 35% for the respondents with secondary education and 34% – tertiary.

The results lead to other questions, namely what effect the material status had on the Poles' PA and whether the respondents compensated for the absence of motor activity by passive interest in sports. The detailed data are presented in Table 7.

Table 7. Material status and interest in sport and physical activity (positive answers)

Year	Good		Average		Low		Very Low	
	I	PA	I	PA	I	PA	I	PA
1996	55/68	-	48/64	-	44/60	-	38/60	-
1997	58	50	-	26	-	16	-	9
2000	49/72	-	42/64	-	29/54	-	-	-
2003	-	-	-	-	-	34	-	-
2009	-	70	-	-	-	32	-	-
2013	-	77	-	61	-	44	-	-

(I - interest in a sport, PA - physical activity)

Source: own study: Data of the CBOS and OBOP reports for the years 1960-2016 [10, 12, 19, 26, 28, 29, 31].

Table 7 indicates that, among the respondents assessing their material status as good, 50% in 1997, 30% in 2009 and 23% in 2013 did not do any sport. Although the ratio of physically inactive people seems high, the downward trend recorded in the recent years is optimistic. However, the numbers of those who do not take any PA in the groups with the lowest incomes are at least two times higher (except for the year 1997), i.e.75% in 1997, 66% in 2003, 68% in 2009 and 54% in 2013). The above data may lead to the conclusion that the better the financial status of the respondents, the more involvement in physical activity and interest in sports. People with the lowest incomes show less interest in sport and doing it. It should be emphasised that in all groups tested in the analysed period - distinguished by the financial income, there is an increase in the number of those who get involved in physical activity, with the same or a slightly downward interest in sports.

To sum up, it might be noted that physical activity and care for fitness are, to a large extent, an element of lifestyle mostly for those who are well educated and represent the more affluent socio-occupational groups. Accordingly, the fittest are students and the so-called intelligentsia as well as managerial staff aged 35-44.

Declared motives for physical activity

The analyses show that two-thirds of the surveyed Poles (66%) in 2013 (the last year with available data on the issue) did some sport or physical exercise in the previous year. Among these, 40% got involved in physical activity regularly, while 26% sporadically. Given the above data, another question arises, namely motivated people to do sports.

The analysis of the available OBOP and CBOS sources does not provide a full answer. The problem of "motivation" was examined only once by the CBOS in the survey "Physical activity of Poles. Communication BS

/ 129/2013" [10]. The obtained data indicate that Poles take up physical effort mainly for health reasons (70%) and slightly fewer for pleasure (61%). Almost half of the respondents (47%) do sports to relieve stress, improve well-being and become fit. Also, for every third Pole (34%), PA is primarily a way of spending time together with family, friends or friends. Every fourth respondent (24%) shows interest in a slim figure. It is women more often than men who declare that they play sports to improve their appearance (28% vs. 19%), for better well-being, to relieve stress (51% vs 44%), and slightly more for health reasons (72% vs. 68%). Men, on the other hand, are more likely to take up sports activities for pleasure (63% against 59%). Further, it should be noted that physical exercise is more often a way to relieve stress and improve well-being for those with higher education than for representatives of other socio-demographic groups.

It is worth noting that motivations of people following particular sports disciplines are different. Cycling, gymnastics, running, fitness, swimming are primarily done for health. As for the gym, it is most often chosen for beauty and health reasons. Finally, to get pleasure, Poles dance, do winter sports, football, hiking and volleyball. It should be noted that the last provided choice is also treated as a way to spend time together with the loved ones. The detailed data are provided in Table 8.

Table 8. Declared reasons for taking up physical activity

For what reasons did you primarily practice this sport / these sports? Please indicate no more than two reasons									
In percentage									
	For health	**To look good and have an attractive figure**	**To feel better, relieve stress and be fit**	**To spend leisure time with friends and family**	**For pleasure, because I like it**	**One should do some sport these days**	**It is a necessity, a means of transport (bicycle), a part of school curriculum (PE)**	**Other**	**Difficult to say**
Cycling	53	9	28	14	44	1	16	2	1
Swimming	61	12	33	19	38	0	0	2	0
Running jogging	69	22	43	9	23	0	1	0	1
Walking	40	2	24	38	53	1	0	0	0
Playing football	40	4	20	37	53	1	5	0	0
Playing volleyball	34	6	19	40	48	1	3	3	0
Gymnastics fitness, aerobics	58	38	34	10	25	0	1	0	1
Winter sports (skiing, skating), snowboard)	31	0	37	36	51	0	1	1	0
Working out in the gym, bodybuilding	55	56	19	5	19	1	2	3	0
Dance	19	10	28	28	70	0	3	1	1

The shares in lines do not add up to 100, because the respondents could choose only two options.
The table contains the most important sports, done by at least 10% of the respondents. Source: CBOS 2013 [10].

As the analysis shows, cycling is the most often taken up activity (16%); followed and running (43%) done for health and better well-being (69%). Bodybuilding and gym exercises are regarded as forms of recreation, done to look good (56%). Further, dance is chosen for pleasure (70%), whereas volleyball is favoured by 40% of the respondents who treat it as a form of spending time together with family and friends. Last but not least are football (37%) and winter sports (36%), which are slightly less frequently [10].

Sports skills of Poles

For adult Poles, the most valued aspect of being physically active is health [36, 37]. Practical ways of taking care of own health, in addition to regular sleep, rest and proper diet, include some systematic forms of physical activity, which is conditioned by one's skills. Consequently, the next raised facet of the PA issue is the sports skills exhibited by Poles. The detailed data are presented in Table 9.

Table 9. Poles and their sport skills

Sports skills. Can you:	1994	2003	2013
cycle	93	94	97
dance:			
waltz	70	-	-
disco	48	-	-
rock and roll	44	-	-
swim	57	58	64
skate	-	45	51
ride a horse	26	-	-
ski	-	23	30
sail	13	-	-

Source: own study: The data of the CBOS and OBOP reports for the years 1960-2016 [10, 24, 16, 17].

The most common sporting ability among Poles is riding a bike. In all the analysed periods, it was pointed to by over 90% of the respondents, and this index is still growing. About 70% of the respondents can dance the waltz, less than half can dance disco or rock and roll. The swimming skill scores less. In 2013, the vast majority of the respondents (64%) claimed that they could swim (an increase of 7% compared to 1994). Half of the adult inhabitants of Poland can also skate (in 2003 – 45%, and in 2013 – 51%). Relatively fewer Poles have mastered skiing, i.e. in 2003 – 23% admitted doing that, whereas in 2013 – 30%). As for horse riding, 26% of the respondents would do that in 1994.

Respondents' opinions on people spending leisure time in the gym

What should also be emphasised is that the attitude of Poles towards those going to gyms and sports clubs has changed significantly over the last few years. Not so long ago, i.e. in 2003, the majority of the respondents were inclined to think that those who spend time in the gym focus too much on their appearance, ruin their own health with exhausting exercises and are at risk of bigorexia. In 2009, the proportions reversed; the dominant claims were that people exercising at the gym lead a healthy lifestyle, whose aim was to maintain or improve their physical fitness (table 10).

Table 10. Respondents' opinions on people spending leisure time in the gym

People spending their free time in the gym mostly:	Lead a healthy lifestyle by exercising	Ruin their health through strenuous exercises	Difficult to say
2003	38%	48%	14%
2009	47%	39%	14%

Source: own study based on [19].

Gyms are frequented mainly by men (36%), although every fourth woman (23%) would go there as well. In the youngest age group of the respondents (18-24), 70% would spend their leisure time there, those aged 25-34 would also take advantage of their services (over half of the respondents – 54%), whereas the older ones (35-44 years) less frequently (25%). This form of activity appealed to people with higher and secondary education (57% and 36% respectively). Gyms are very popular in the better-off Poles (with an income above PLN 1,500 per person in a family). Every second respondent in this group (50%) would visit a gym at least once. However, among those earning less than the national average, the same could be said about one in five Poles (21% -22%) [19].

Discussion and conclusions

Starting the research process, we assumed that in the last 50 years the number of Poles getting involved in physical activity has increased. A qualitative content analysis of the secondary data of 24 CBOS and OBOP surveys, selected through the secondary quantitative content analysis, confirmed the initial hypothesis. The comparative studies showed that in the last half century (1960-2013), the number of those who took up PA regularly increased, i.e. from 6.5% in 1960 to 40% in 2013; that is by 33.5%. The obtained data may also indicate that more than half of adult Poles did not do any sport or even made any physical effort in the years 1960-2009. The percentage of passive respondents is still high; it includes one-third of adult Poles (34%). However, it should be stressed that the number of those inactive in 2013 was almost twice lower than in 1960 (63%). In 2013, the majority of adult Poles (66%) took up some form of PA. Two-fifths of the respondents (40%) did it systematically (once a week and more often), while every fourth (26%) sporadically. Slightly different data are shown by the Eurobarometer report from 2013, which states that 52% of Poles avoided physical activity, whereas only 8% would do it systematically. However, the respondents would declare being involved in some other activity related to walking or cycling, as well as working at home or garden – 61% of the polled Poles would do that regularly or at least once a week [3, 38]. Thus, it can be assumed that the discrepancy between the data collected in the CBOS and OBOP surveys and the Eurobarometer findings results from a different methodology, i.e. a joint study of physical and recreational activity in the latter case. Analogical trends are indicated by the authors of the report by the Central Statistical Office which state that, although the level of total physical activity of Poles is not low, the level of recreational activity in the Polish society is below the average of the European Union countries [3, 39].

In each analysed period, women are more likely to admit that they do not engage in sports or physical exercise. These differences range from 5 to 9% (2009, 2014 and 1997 respectively). This result should not surprise. The comparison of statistical data from the Eurobarometer, the Central Statistical Office and other studies allow for concluding that physical activity is more often taken up by men than women [3, 38, 39].

While analysing the relationships between the age of the surveyed Poles and the physical activity they engage in, it should be noted that it is not surprising that their physical activity declines significantly with age. It is confirmed, among others, by the General Statistical Office (GUS) and Eurobarometer [38, 39]. Although sport is young people's domain, after they finish their education, their physical activity decreases as well. What was most striking though was that, since 1974, the number of Poles getting involved in motor activity has been systematically rising in all age groups, (an increase of 38% in the 25-34 age group; 49% in 45-54 year-olds; 51% in 18-24 and 55-64 year-olds; and 63% in the group 35-44 years). Additionally, there was a change in the age categories withdrawing from PA. In the early 21st century, it was visible mainly the period between 25-34 and 35-44 years (in 1974 – a drop from 43% to 12%). After 2009, there were minimal downward trends in the above-mentioned age groups. At the same time, it is necessary to emphasise the six-fold increase of PA in Poles aged 35-44 (from 12% in 1974 to 75% in 2013). It is this age group which records the greatest decrease in PA in the previous studies (before 2000). Eurobarometer [38] did not document this trend.

Furthermore, it is confirmed by the CSO and Eurobarometer [38, 39] that the most active persons in the analysed period were those with higher education (an increase from 54% in 1997 to 88% in 2013), while the most passive were primary school graduates (an increase from 13% in 1997 to 42% in 2013). The difference in percentage between the two groups is high as it reaches 46%. Thus, it may be concluded that the number of regular exercisers increases with the level of education. At the same time, it should be noted that there is a systematic increase in the active numbers of all surveyed participants representing different levels of education. The highest growth was observed in the persons with vocational education (39%), while the lowest in the respondents who finished a primary school (29%). Comparable data were gathered for the other two groups as well (with secondary education – 35%, and higher – 34%).

In addition, doing sports is correlated with high income. The above conclusion is confirmed both by the collected data (although patchy) and other available studies [3, 38, 39]. The respondents' material status determines their physical activity as well as the level of interest in sports. In turn, in those who do not do well, the number of persons making physical effort decreases proportionally with the assessment of own financial condition. In contrast, the respondents with the lowest income show less interest in sports as well as in sporting activities. At the same time, it should be emphasised that there is an increase in the number of people involved in physical activity in all the tested groups of respondents classified according to their financial situation, although the degree of interest in sport maintains at a similar level, with a slight downward trend.

Seeking answers to what causes and determines physical activity, it should be noted that no unambiguous answer can be given. The respondents' motivation depends on gender, education, material status and sports discipline. The analysed data show that the respondents would point to the following arguments: "for health

reasons" (70%), "for pleasure, I just like it" (61%), "for better well-being, to relieve stress, be in good shape" (47%), "this is a way of spending time with friends, family, friends" (34%) and finally "to look good, have a nice figure" (24%).

The data compiled by Eurobarometer statistics [38], the Central Statistical Office (SCO) [39] and other research [3] allow for stating that the most often quoted reason for taking up physical activity by Poles is the desire to improve health. The respondents are slightly less motivated by the desire to improve their physical condition. Besides, they are often guided by pleasure and a popular motif.

The most popular sporting skill of Poles is cycling (over 90% of the respondents). Other popular skills include dancing (70%), swimming (64%) and ice skating (51%). Relatively fewer Poles mastered skiing (30%) and horse riding (26% in 1994). However, according to the GUS data, cycling and swimming are the most popular skills [39].

Finally, Poles' attitude towards gym visitors has changed dramatically in the last decade. Since 2009, the majority of respondents would indicate that people exercising in the gym (which concerns mainly men) lead a healthy lifestyle, and their aim is not a focus on their appearance but maintaining or improving their physical fitness. Apart from the analysis of the motivation of those going to gyms, it is worth noting that more and more often health reasons are not mentioned when discussing physical activity. New arguments appear, i.e. taking care of one's appearance, slim figure and aesthetic body. The consequence of this trend, as well as the commercialisation of sport, is that PA significance is reduced as it is being treated as a fashionable element of lifestyle in a consumer society [3].

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EFFICIENCY OF THE ELDERLY PHYSICAL RECREATION PROGRAMME AIMED AT IMPROVING FUNCTIONAL EFFICIENCY AND QUALITY OF LIFE

EFEKTYWNOŚĆ PROGRAMU REKREACJI RUCHOWEJ OSÓB STARSZYCH W ZAKRESIE POPRAWY SPRAWNOŚCI FUNKCJONALNEJ I JAKOŚCI ŻYCIA

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

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Summary

Background. The study aimed to evaluate the effectiveness of the Physical Recreation Programme for the Elderly designed by Ewa Kozdroń intended to improve the functional efficiency and quality of life of women over 60 who participated in the programme.
Material and methods. The research involved 73 females aged 60-74 who participated in the Physical Recreation Programme for the Elderly. The research used the author's questionnaire, i.e. EQ-5D questionnaire and Functional Fitness Tests (FFT).
Results. The results of our research confirmed a positive relationship between participation in a regular physical activity, the declared level of functional fitness and the perceived quality of life.
Conclusions. A positive relationship was found in the study group between participation in regular physical activity, the declared level of functional fitness and the perceived quality of life.

Keywords: quality of life, physical activity, the elderly

Streszczenie

Wprowadzenie. Za cel badań postawiono próbę oceny efektywności Programu Rekreacji Ruchowej Osób Starszych (autorstwa Ewy Kozdroń) w zakresie sprawności funkcjonalnej i jakości życia kobiet po 60. roku życia, biorących udział w programie.
Materiał i metody. Badaniami objęto 73 kobiety w wieku 60-74 lata, biorące udział w Programie Rekreacji Ruchowej Osób Starszych. W badaniach wykorzystano autorski kwestionariusz ankiety, kwestionariusz EQ-5D oraz próby sprawnościowe FFFT.
Wyniki. Wyniki badań otwierdziły dodatnią zależność pomiędzy uczestnictwem w regularnej aktywności fizycznej, deklarowanym poziomem sprawności funkcjonalnej, a odczuwaną jakością życia
Wnioski. W badanej grupie stwierdzono dodatnią zależność pomiędzy uczestnictwem w regularnej aktywności fizycznej, deklarowanym poziomem sprawności funkcjonalnej, a odczuwaną jakością życia.

Słowa kluczowe: jakość życia, aktywność fizyczna, osoby starsze

Introduction

Increasing human life expectancy over the past several decades has resulted in enlarged 60+ generations in the developed countries. Old age is treated as a natural and necessary stage of human life, in which the organism undergoes involuntary motor processes underlying biological changes. They concern, among others, a reduced range of motion in the joints, lower muscle strength, a decreased motor ability to adapt to the environment, a slower reaction to the changing situations or impaired ability to perform more complex activities. One of the more visible symptoms of ageing are qualitative changes of spontaneous movements and their reduced speed [1].

The elderly tend to limit physical efforts in everyday life, pursue physical comfort (motor laziness), eliminate physical efforts as part of caring for own health. The response time to external stimuli as well as the smoothness and flexibility of the performed activities is extended. As a result of these unfavourable changes, the number of falls among the elderly increases. A higher mortality rate is also associated with a slowing-down reaction and a decrease in muscle strength. Further, limited mobility in the joints of the lower limbs and spine is more

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common with age. Accordingly, the ability to perform more complicated movements, e.g. asymmetrical ones or undertaking several actions at the same time, disappears. The muscular strength, endurance, speed and flexibility as well as physical fitness are significantly deteriorating, which affects physical fitness [2].

Between 50 and 60 years of age, the incidence of involuntary changes can be observed (mainly the ones that impact one's motor skills), although they tend to be less dynamic between 60 and 70 years of age. The weakening response to stimuli, deteriorating memory as well as sight and hearing, problems with maintaining balance most often lead to a loss of faith in one's own strength, capabilities and efficiency [3]. Between 65-74 years of age, the primary role of regular physical activity is to retain motor skills in independent functioning and participation in social life [4].

The changes taking place in the physical sphere, psyche and social status of an older person have a clear influence on their motor skills and physical activity [5,6,7]. These changes consist in reducing the speed of motor learning, lowering mental performance and severe changes in emotional adjustments. The high dynamics of cultural and social changes, the rapid pace of technical and IT progress often lead to a sense of isolation and alienation in the surrounding environment. All this means that the older generation withdraw from social life and live off the beaten track. There appear changes in old people's personality, i.e. narrowing interest in what happens around, a reduced mental activity, excessive caution in making decisions, assuming conservative attitudes towards new things, focusing on own matters, and finally a conviction about own infallibility as well as becoming emotional [6].

In conclusion, psycho-emotional changes related to ageing demonstrate a clear relationship between biological, health and social changes. One's dependence on the environment increases, whereas the attitudes, behaviours, needs for security change, causing withdrawal from the former forms of activity. There emerge hypochondriac tendencies, self-centeredness, need to be accepted and activated. At the same time, the elderly limit their contacts with other people, exhibit lower self-esteem and social prejudices. What seems positive is that they do not lack leisure time at that stage of life.

The most critical problems of older people consist in loneliness, diseases, disability, impoverishment and a sense of uselessness. All may lead to some marginalisation of the elderly as a social group, which is visible in their gradual elimination from active professional and social life at the time they retire. Therefore, it seems crucial that seniors remain active in everyday life for a long time, actively participating in social life and developing and pursuing their passions. This way, they can decide for themselves and feel satisfaction at the same time.

Also, regular physical activity has an indirect influence on life expectancy, improvement of physical fitness, mobility and extension of functional activity in daily life [8]. Functional ability, as well as general physical condition, are equally crucial for the quality of life in older age. Further, functional ability determines the ability to cope with the daily challenges [9, 10].

Summing up, it can be stated that particular attention should be paid to functional ability in older age because it can prevent senility and diseases of old age, as well as help in the rehabilitation process. A physical effort has a beneficial effect on the entire body. It stimulates the nervous system (relieves neurotic conditions and sleep disorders), respiratory system (improves the mobility of the chest, diaphragm and ventilation) and blood circulation (it causes the fibres of the heart muscle to grow and better supplies the heart and tissues). Regular physical activity can significantly contribute to slowing down the process of ageing and ensure greater self-reliance and independence in daily life. Thus, it becomes an opportunity to improve people's quality of life and the way they perceive life satisfaction – it is a chance for successful ageing [8,9].

The literature on the issue provides at least several different definitions of quality of life. Most authors emphasise the complexity of this issue, pointing both to the objective and subjective aspect of life quality [4,7,11,12,13]. In objective terms, the quality of life may comprise health and efficiency, whereas in objective ones, economic status, housing conditions, natural environment and social environment [14]. In subjective terms, it will refer to self-assessment of, for example, health, living conditions, contentment and happiness, hope or loneliness and independence in everyday life (also in terms of physical fitness) [7]. However, as Banka [15] informs, the relationship between the objective and subjective aspects cannot be unambiguously determined. The literature provides references to the complexity of the notion of quality of life. For example, authors Baumann, Seed and Forests [7,16,17] stress that life satisfaction in older people is conditioned by both objective and subjective aspects of the quality of life. According to Zielińska-Więczkowska and Kędziora-Kornatowska, it is the health condition of the individual, especially his/her level of physical fitness, which can be seen as a significant determinant of life satisfaction in the period of late adulthood. Other crucial aspects are life activity, the level of education, life optimism, family and the sense of coherence [18].

As for the functional ability, the literature defines the issue in more consistently. Functional fitness (ADL) is understood as the ability to be independent of others in fulfilling one's primary life needs [29]. According to *Webster's New World Medical Dictionary* [30], functional fitness refers to everyday activities, economic activities,

self-service, mobility and rest. Adamczyk, Sosnowski and Chmara-Pawlińska, [31] understand functional ability as the ability to deal with everyday activities. Performing a simple task requires the person's willingness and ability to perform, efficient nervous pathways as well as an efficient executive system, whereas the deficit of physical fitness adversely affects one's well-being and quality of life. Efficient, independent functioning is of great practical and emotional importance for the patient as it has a positive effect on his/her physical and mental condition and promoting a sense of independence [31].

All these definitions of functional efficiency share some common elements. These include moving around, eating, maintaining hygiene (e.g. washing), controlling the physiological activities (using the toilet), dressing up, preparing meals and hot drinks. Another term which the literature uses to refer to functional ability is activity efficiency [29].

Objective of the work

Bearing in mind the close relationships determined by the literature between the quality of life and physical activity of the elderly, the following study aims to evaluate the effectiveness of the Recreation Programme for the Elderly devised by Ewa Kozdroń with regard to functional abilities and quality of life of women aged 60 years and older who participated in the study.

Material and methods

The research was conducted in 2015 in a sample group participating in the Recreation Programme for the Elderly [19]. The study involved 73 women aged 60-74, who took part in a 6-month PA programme as well as a summer camp designed for seniors. Before joining the programme, its participants were to provide their written consent as well as the physician's or GP's statement indicating that there were no contraindications to undertake specific physical activity.

The research consisted of two parts: questionnaire surveys (subjective assessment) and performance tests (objective evaluation). The study was based on a diagnostic survey method using the author's questionnaire, which concerned self-assessment of own health and functional ability, including self-service, mobility and daily performance. The procedure consisted of three parts, i.e. self-assessment of one's health, physical fitness and physical activity. The respondents answered 10 questions about their well-being, functional ability and physical activity. The questions regarding self-assessment of own health and functional fitness were asked twice (precisely in the same form), before the commencement of physical activities and after participation in the camp's activities. This allowed for comparing the changes that occurred in the self-assessment of these two aspects after the regular physical activity cycle ended. The questionnaire was conducted by the interviewer (the author) using a direct technique, which allowed her to obtain additional information about the elderly's satisfaction gained during the classes and prevent the respondents from sharing their answers.

The EuroQol 5D test (examining the quality of life in relation to self-assessment of one's health and functional ability, www.pdsurg.bham.ac.uk) was used to evaluate the quality of life of the surveyed women. The test consisted of 5 questions about well-being and daily fitness on the day of the test on a scale from 0 to 100. Questions 1, 2 and 3 concerned everyday fitness, whereas questions 4 and 5 – the person's mood. The answers to the questions were given point values: a – there are no problems (3 p.), b – there appear some ailments (1 p.), c – there are constant ailments (1 p.).

The functional scale was assessed using the ADL (Activity of Daily Living) scale – the efficiency assessment scale in the field of everyday activities [20]. Functional fitness was examined in three aspects: personal self-service (P-ADL), instrumental ability (I-ADL) and mobility.

For an objective assessment of one's functional fitness, 4 activities were selected from *The Fullerton Functional Fitness* test, which enables evaluating all physiological properties that support and are necessary to maintain the independence and safe daily activity of the elderly. The test assessed aerobic fitness, flexibility, strength, agility and dynamic balance [21, 22]. The following exercises were made:

1. chair stand for 30 seconds (assessing the strength of the lower body, the number of repetitions);
2. 2-minute step (evaluating endurance, the number of right and left leg movements;
3. chair sit and reach (measuring the lower body flexibility);
4. arm curl (measuring the upper body flexibility).

The outcomes of the measurements of individual somatic and functional variables are presented in the form of arithmetic means and standard deviations. The differences between the mean values obtained before and after the programme were assessed by dependent-t test. A one-sided test was used as it was assumed that the exercise programme would improve the functional efficiency of the examined women.

The analysis of the questionnaire data was carried out using the chi-square function in a logarithmic form [23]. The interdependencies between the studied variables were evaluated using Pearson's correlation coefficients. The analysis applied statistical functions of the Excel spreadsheet. The level of $p \leq 0.05$ was considered as significant.

Results

The comparison of the findings obtained in the first stage of the test (before the beginning of the classes) and after the end of the camp is presented below.

Self-evaluation of the respondents' health

While comparing the self-assessment of the health of the examined women before taking regular physical activity and after the 6-month period of the PRROS programme and the camp, a positive relationship was observed in the self-perceived health level, which, however, it was not statistically significant. The observed differences in self-assessment of own health are as follows (before the program vs after the program): good health (12% vs 25%), good health (28% vs 40%), average (52% vs 32%), rather bad (8% vs 3%), bad – no indication.

Furthermore, the respondents would indicate their ailments before participating in the PRROS programme and after it ended. Both before the physical activities started and after the course ended, the women would often complain of back pain (77% vs. 67%), joint pain (59% vs. 60%), difficulty falling asleep (57% vs. 51%) and fatigue (41%) vs. 40%).

Functional ability

In the self-assessment of the functional ability of the respondents, there were positive changes after the PRROS programme had been completed. In the respondents' view, there was an improvement in the performance of daily activities – in preparing own meals, hot drinks, and doing heavy housework. The women would indicate that they had become more efficient and independent in moving and taking care of themselves (washing, dressing, cutting off nails). Detailed percentages of the respondents' answers before the commencement of the motor activities and after the end of the programme indicate the following progress in performing activates without assistance: going outside (87% vs. 88%), going up and down stairs (75% vs. 88%), moving around the apartment (85% vs. 89%), washing up, bathing (4% vs. 89%), getting dressed, putting on shoes (81% vs. 88%), doing heavy housework (5% vs. 80%), doing daily shopping (83% vs. 89%), moving around (93% vs. 97%). These changes were not statistically significant.

Self-evaluation of the quality of life

The seniors would most often (78-98%) declare no problems with regard to questions 1 - 3 or sometimes would feel pain or depression (questions 4 and 5). The figures of the respondents' answers to the questions (in percentage) are shown in figure 1.

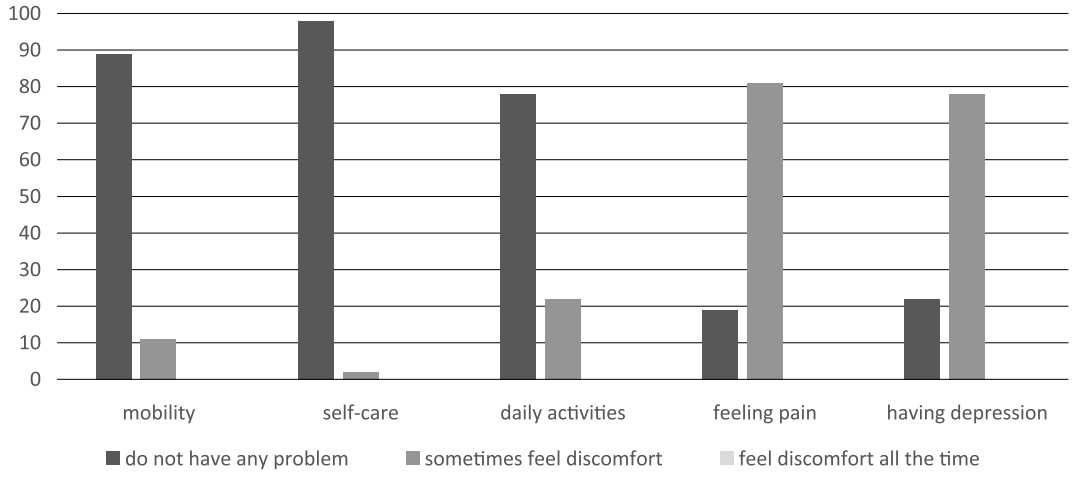

Figure 1. Self-assessment of life quality (questionnaire EQ-5D; n = 73)

The relationships between questions regarding daily fitness, well-being and self-assessment of own health indicate that, at the same level of declared health, there was a low but significant correlation between one's daily fitness and well-being (correlation coefficient: 0.333 **). A moderate but highly significant correlation (correlation coefficient: 0.490 ***) was found between self-assessment of own health and well-being, at the same level of daily fitness. However, when the declared well-being was the same, there was no significant relationship between daily fitness and self-assessment of own health (correlation coefficient: 0.184).

Objective evaluation of the functional efficiency level

An accurate objective assessment of the functional efficiency level of the studied group was made by applying the exercises recommended by *The Fullerton Functional Fitness Test*. The verification of the level of functional efficiency was necessary, as the respondents rated their daily performance very high.

The average results of the exercises are given in the table below (Table 1), broken down by the type of exercise and the date of measurement.

Table 1. Results of the fitness tests

Fitness test	Before the programme	After the camp	Norm (60 -74 years)
The 2-minute step (n)	92.0 (35 – 134)	121.3*** (62 – 173)	68 – 107
30-second chair stand (n)	19.9 (10 – 32)	28.8*** (20 – 38)	10 – 17
Back scratch (cm)	-1.96 (-24 – 10)	1.00** (-19 – 12)	-10 – 3,75
Chair sit nad reach (cm)	5.62 (-24 – 20)	8.25 # (-21 – 24)	-2,5 – 12,5

Explanation: **The 2-minute step** – the number of movement of left and right leg (one step) in 2-minute time; **30-second chair stand** – the number of getting-ups and sitting-downs (counted as movements) in 30 seconds; **Back scratch** – the distance between fingers (negative value when fingers touched one another, positive value when fingers did not touch one another); **Chair sit and reach** – the distance between toes and fingers.

The study showed that there was an improvement in all the aspects of the tested efficiency. The improvement concerned increased mobility of the upper and lower body, improved muscle strength of the lower limbs and endurance. As for the strength of the lower body, it increased by 32%, in endurance – by 44%, in the mobility of the upper body – by 51%, and in the mobility of the lower body – by 47% .

The changes in mobility as compared to the relevant norms are presented in the graph below (Fig.2).

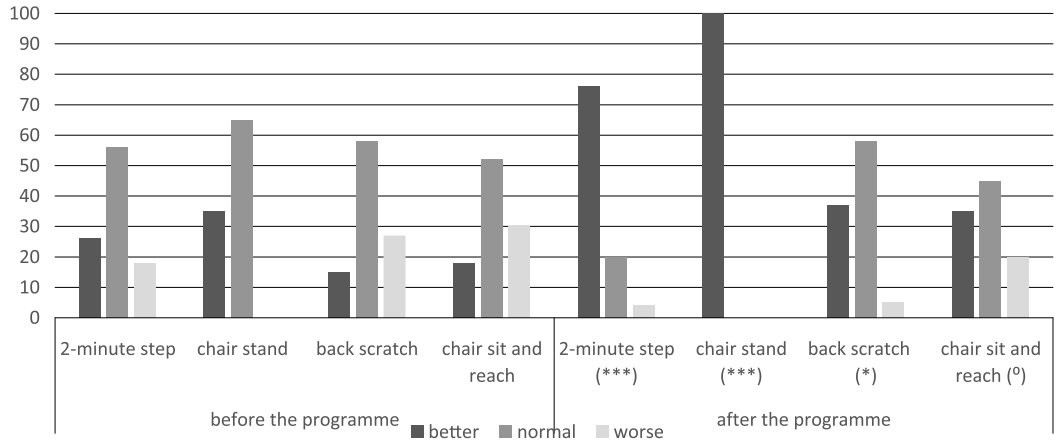

Figure 2. Percentage of the respondents showing changes in selected fitness tests *The Fullerton Functional Fitness Test* (n = 73) Significant difference after the programme: º p<0.05; * p<0.001

As for the standard norms, there was a noticeable improvement in efficiency in all tests' outcomes. Before the PRROS programme, 78% of the respondents were classified as not exceeding the norms (or just above standards) in all fitness tests, whereas after the camp ended as many as 99%. In addition, the levels of declared daily performance were compared with the objective fitness assessment. In the case of other fitness tests and functional efficiency self-assessment, there was no correlation between the declared level of functional efficiency and the outcomes of the fitness tests – the values of the correlation coefficients ranged from -0,078 to 0,150 and turned out to be insignificant.

Self-assessment of the quality of life and objective assessment of the level of functional ability

The results of fitness tests (objective evaluation) were correlated with the total self-assessment of the quality of life found in the EQ-5D questionnaire (subjective assessment). A positive correlation occurred only in relation to the perceived quality of life to the step test: r = 0.246. In the remaining efficiency tests, there were no significant dependencies – the correlation coefficients ranged from -0,108 to 0.071

Discussion

The basic life needs desired by the elderly comprise preserving one's independence, self-sufficiency and fitness. Thus, an essential element is an appropriate diagnosis of the health condition of an elderly person, his/her level of physical fitness, as well as determining which motor skills require compensatory measures.

It seems significant that the elderly population shows a considerable differentiation of health and level of physical fitness. Their efficiency, concerning instrumental activities in daily life (self-reported functions), personal care and mobility may positively impact enhancing daily performance [24].

As indicated by the analysed data, people who regularly get involved in physical activity assess the level of their functional efficiency better. It can therefore be concluded that physical activity has a significant impact on one's self-assessment of fitness in daily activities, as well as on a better perception of one's independence and self-care. It is also striking that those who have completed PRROS assessed their basic physical functions better (daily activities and self-service) even before taking up regular physical activity. This might be due to the fact that the volunteers participating in the programme had led a more active lifestyle than the others.

Independence in moving around and using transportation is also significant for the elderly. The research confirmed that the examined women were independent in this respect.

In addition to regular physical activity and health, age is the next crucial determinant of an appropriate level of functional fitness. People aged 60-74 years assessed their functional fitness as good.

According to Kostka [25], regular physical activity has a positive effect on the successful ageing process as well as on the proper functioning of the body. It is because taking regular physical activity impacts the respiratory and circulatory system positively, improves muscle flexibility and strength. Further, Kostka [26] underlines the importance of regular physical activity in the physical and mental well-being of the elderly as well as a self-perception of quality of life.

The quality of life of old people is very strongly related to health [24]. It should be remembered that its condition is determined by at least some factors, among which one may mention the pace of natural and individual ageing, past illnesses and injuries, as well as environmental factors. In Maddox's view [27], a proper assessment of health condition in elderly people is also their subjective description, where such self-assessment reveals both the subjective and objective aspects of health. Besides, self-evaluation of health impacts one's duration of life – those who assess their health negatively, live shorter, which is not the result of objective indicators [28].

Finally, the analysis carried out in the centres of physical therapy has shown that the persons who completed the 6-month cycle of motor activities and participated in the recreational camp declared a higher number of ailments than before taking up regular physical activity. This may be due to the fact that the persons' body awareness increased in the course of the study and moreover, their perception of own symptoms increased due to the accumulation of joint pains, troubled sleeping or tiredness.

The presented study confirmed that the women whose functional fitness tested objectively was higher assessed their quality of life better (r = 0.751). On the other hand, there was no correlation between the subjective assessment of own functional efficiency level and the subjective evaluation of the quality of life (r ranged from -0.154 to 0.018). This could indicate the level of subjectively assessed functional ability does not have a significant impact on the respondents' experienced quality of life. The studies carried out among inactive and active persons [19] showed that those who were fitter and more active in daily activities, as well as those feeling better or feeling less worried/depressed, assessed their health their quality of life more favourably.

The obtained results indicate that regular, instructor-directed physical activity improves the level of one's functional efficiency (self-service, mobility and performance), health and ultimately the quality of life of females over 60 years. It can, therefore, be said that the Elderly Recreation Programme has successfully influenced the change in the women's PA. Further, the participation in the course significantly improved the respondents' functional efficiency and quality of life.

Conclusions

1. There was a noticeable positive relationship between the respondents' regular physical activity and self-assessment of own health condition.
2. A positive relationship was found between participation in daily physical activity, the declared level of functional fitness and the experienced quality of life.
3. The study demonstrated a positive influence of regular physical activity on the self-assessment of quality of life and life satisfaction (statistically significant).
4. There was a positive correlation between the level of objective functional ability and the perceived quality of life in the elderly.
5. There was no significant relationship between the subjective assessment of functional ability and self-assessment of own quality of life.
6. It was demonstrated that the programme of regular physical activity adjusted to the needs of older people positively impacts their functional activity with regard to their mobility, self-service and daily performance.

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DETERMINANTS OF SELF-ASSESSMENT OF PHYSICAL FITNESS IN PERSONS AGED 45-89

DETERMINANTY SAMOOCENY SPRAWNOŚCI FIZYCZNEJ OSÓB W WIEKU 45-89 LAT

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

Summary

Background. Scientific studies on ageing have repeatedly shown positive correlations between physical activity and physical fitness and health. The following study shows that people who were involved in different forms of physical activity had higher self-assessment of own fitness, also in the long term. The aim of the study was to investigate the determinants of the self-assessment of physical fitness in people aged 45-89 years.
Material and methods. The study involved 300 persons aged 45-89 years, who were diagnosed with a diagnostic survey using the following research techniques: a questionnaire, interview and observation. The qualitative and quantitative analyses were based on the frequency of traits, chi-square independence tests, and multivariate correspondence analyses.
Results. Self-assessment of physical fitness depended on age, family roles and employment status. Higher levels of fitness were reported by (i) respondents engaged in recreational exercise and (ii) former professional athletes. Going on holidays in the previous year, travelling in the past and at present were also correlated with higher self-assessment of physical fitness.
Conclusions. Self-assessment of physical fitness seems to be a good indicator of the physical activity in the elderly. Positive self-assessment helps address the challenges of old age and seems to be crucial for successful ageing. Hence, there is a need to create programmes with a broader spectrum of influence to activate the elderly.

Keywords: elderly, self-assessment of physical activity, travelling

Streszczenie

Wprowadzenie. W badaniach naukowych, dotyczących procesu starzenia się, wielokrotnie wykazywano pozytywne związki aktywności fizycznej ze sprawnością fizyczną i zdrowiem. Osoby podejmujące różne formy aktywności fizycznej cechowała wyższa samoocena sprawności fizycznej, także w perspektywie długoterminowej. Celem pracy było poznanie uwarunkowań samooceny sprawności fizycznej osób w wieku 45-89 lat.
Materiał i metoda. Badaniami objęto 300 osób w wieku 45-89 lat. Zastosowano metodę sondażu diagnostycznego, z wykorzystaniem technik badawczych: kwestionariusza ankiety, wywiadu i obserwacji. W analizach jakościowych i ilościowych użyto: frekwencję cech, test niezależności chi-kwadrat oraz wielowymiarową analizę korespondencji.
Wyniki. Samoocena sprawności fizycznej badanych uwarunkowana była ich wiekiem, pełnieniem ról rodzinnych oraz aktywnością zawodową. Wyższą samooceną sprawności fizycznej cechowały się osoby, które obecnie podejmowały rekreacyjnie wysiłek fizyczny, a w przeszłości uprawiały sport wyczynowy. Respondenci wyjeżdżający na wczasy w ostatnim roku, odbywający podróże w przeszłości i obecnie mieli wyższe samooceny sprawności fizycznej.
Wnioski. Samoocena sprawności fizycznej wydaje się być dobrym wskaźnikiem zróżnicowanej aktywności fizycznej osób starszych. Pozytywna samoocena sprawności fizycznej wpływa na możliwości podejmowania nowych wyzwań, które mają istotne znaczenie w przebiegu procesu pomyślnego starzenia się. Istnieje zatem potrzeba tworzenia programów aktywizacji seniorów o szerokim spektrum.

Tables: 3
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Słowa kluczowe: osoby starsze, samoocena sprawności fizycznej, aktywność fizyczna, podróżowanie

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Introduction

Ageing usually leads to a significant decrease in physical activity and physical fitness, significantly affecting the ability to perform daily activities and reducing self-reliance [1]. This is related to the changes in the musculoskeletal system, loss of muscle strength, impaired motor coordination, and reduction in cardiovascular performance. Studies show that increased susceptibility to fractures and fear of falling [2] can seriously affect successful ageing.

The physical activity of Poles, especially those 80+, is not impressive compared to other EU countries. The most active are Scandinavians, especially Swedes, with the highest percentage of centenarians [3]. However, the phenomenon of longevity is more complicated. Usually, it is women who live longer, regardless of their place of residence and lower activity than in men [4]. Self-reliance seems to be the basis for satisfactory ageing. It depends on good health, which in turn depends not only on genetic factors but also on appropriate pro-health behaviours. Unfortunately, the elderly usually reduce physical activity to the most necessary daily activities such as shopping, cooking, or cleaning. Relatively high physical activity in the old age is a factor guaranteeing a longer and better life. It allows for maintaining autonomy, keeping in shape for many years and maintaining a high quality of life [5,6]. Physical activity is directly related to the sphere of everyday life but also helps meet other psychological needs. In addition, it is one of the most important modifiable risk factors for many diseases [7,8]. Finally, good health and physical activity are essential for professional and social competencies that determine the quality of life [9]. Physical fitness is ensured solely by physical activity, an indispensable element of pro-health prevention measure, and part of treatment in many diseases. Scientific studies have often proved the beneficial effect of moderate physical activity on physical fitness and health [10] and the self-assessment of physical fitness and health [11,12]. Those who systematically exercise also perceive their health status positively, as well as experience a better physical and mental well-being [13,14]. For example, in an exercise programme for 235 adult and elderly Belgians, there was a significant effect of physical activity on the total self-assessment (improved physical fitness, physical competences, and attractiveness), both in the short- and long-term [15].

Positive self-assessment is perceived not only as the primary element of mental health, but also as a preventive measure, protecting against the effect of negative behaviours and habits, and contributing to the improved health and positive social actions. Low self-assessment is often associated with the low level of pro-health behaviours and usually deteriorates with age [16]. Positive self-assessment of physical fitness influences the ability to undertake various actions and reflects self-esteem. It has a crucial role in successful ageing as a marker of multiple health dimensions (physical, psychological, social, and spiritual). Self-assessment is also an element of self-knowledge [13]. It includes physical health, mental state, social relations, self-reliance, and perception of the environment. Relating to the broad field of human experience, it depends on numerous factors, such as financial status, occupation, health status, living conditions, personal relations, political and cultural climate, environmental conditions, and physical activity. Researchers emphasise that the ability to self-assess own physical fitness is a significant educational achievement [17].

The aim of this paper was to establish the determinants of self-assessment of physical activity in persons aged 45-89.

Material and methods

For the past few years, research on the physical activity of the elderly has been conducted in the Department of Physical Culture of the Poznań Academy of Physical Education in Gorzów Wielkopolski and the Faculty of Physical Culture and Health Promotion in the University of Szczecin. As part of the physical, social and cultural activation of the elderly, students interviewed their parents and grandparents using a specially prepared questionnaire. The results were used to design an exercise programme corresponding to the needs of the respondents. The study, using a purposeful sampling, involved 300 adults and the elderly. The sample group was divided into three age categories: 45-59 years (mature age), 60-74 years (early old age) and 75-89 years old (late old age).

The study was conducted as a diagnostic survey using a questionnaire and interview. The information obtained was supplemented by observations and non-categorised interviews conducted in students. The qualitative and quantitative analysis was performed using standard statistical methods: frequency of traits, chi-square independence tests, and correspondence analyses [18]. The analyses used Statistica 12 software [StatSoft, Inc. 2015 Statistica for Windows]. Statistical significance of the studied relationships was set at $p \leq 0.05$.

Results

The self-assessment of own physical fitness was analysed against the demographic variables (Table 1).

Table 1. Demographic determinants of physical fitness in the respondents (χ^2 test of independence)

Characteristics	Self-assessment of physical fitness (%)				Total (n=300)		p for the χ^2 test
	High (35)	Moderate (191)	Low (66)	I don't know (8)	n	%	
Age (years):							
45-59	15.3	74.5	8.2	2.0	98	32.7	
60-74	13.6	62.9	22.1	1.4	140	46.7	
75-89	1.6	48.4	40.3	9.7	62	20.7	0.0000
Sex:							
Female	10.2	61.3	25.8	2.7	186	62.0	
Male	14.0	67.5	15.8	2.7	114	38.0	non-significant
Place of residence:							
Urban	12.2	68.9	16.5	2.4	164	56.6	non-significant
Rural	11.1	57.1	28.6	3.2	126	43.4	
Marital status:							
Single	24.1	55.2	20.7	-	29	9.7	
Married	12.9	67.3	17.3	2.5	202	67.8	
Widowed	1.7	53.3	40.0	5.0	60	20.1	-
Divorced	14.3	85.7	-	-	7	2.4	
Role in the family:							
Grandfather	13.2	63.2	21.0	2.6	76	25.3	
Grandmother	10.0	57.4	29.3	3.3	150	50.0	
Father	16.2	75.7	5.4	2.7	37	12.3	0.0263
Mother	10.8	78.4	8.1	2.7	37	12.3	
Employed:							
Yes	19.0	71.6	8.6	0.9	116	39.1	0.0000
No	7.2	58.0	30.9	3.9	181	60.9	

The self-assessment included the following categories: 'very high', 'high', 'moderate', 'low', 'very low' and 'I don't know'. Due to the small number of people with very 'high' and 'very low' scores, these results were included in the 'high' and 'low' categories, respectively. High levels of physical fitness were reported by 11.6% respondents, moderate by 63.7% and low by 22% of the respondents. Only 2.7% of the surveyed persons were not able to make an assessment. There was a statistically significant relationship between self-assessment and the age of the respondents. Moderate scores were most common (46.7%), but their share declined with age, whereas the share of low scores increased with age. In the oldest group, more people who had difficulty self-assessing own physical fitness. The majority of the respondents were women (62%), urban dwellers (56.6%) and married (67.8%). There was a large proportion of widowed people (20.1%). Grandmothers accounted for 50.1% of the respondents, grandparents – half of that number (25.1%), with the rest being parents (24.8%). There was a statistically significant relationship between self-assessment of physical fitness and one's family role. Fathers and mothers was more often reported moderate physical fitness.

A statistically significant relationship was also observed between the scores and employment status. 39.1% of the respondents were employed and assessed their fitness to be mainly high and moderate (19%, 71.6% respectively). As stated above, the respondents reported primarily moderate fitness levels (Table 1). Such results were also predominant in all those who indicated their preferred forms of leisure time (Table 2).

Table 2. Leisure activities and the self-assessment of physical fitness in the respondents (χ^2 test of independence)

Leisure activities	Self-assessment of physical fitness (%)				Total		p for χ^2 test
	High	Moderate	Low	I don't know	n	%	
Reading	9.9	62.8	25.6	1.7	172	57.3	non-significant
Gardening	10.5	68.0	18.3	3.2	153	51.0	non-significant
Physical recreation	17.3	67.3	12.7	2.7	150	50.0	0.0000
Family visits	10.5	63.4	23.9	2.2	134	44.7	non-significant
Meeting friends	6.5	71.5	20.3	1.6	123	41.0	0.0400
Hobby	14.7	63.2	21.1	1.0	95	31.7	non-significant
Social activism	12.3	64.4	23.3	-	73	24.3	non-significant
Travelling	8.2	78.1	12.3	1.4	73	24.3	0.0242
University of Third Age, Senior Clubs	16.7	63.3	20.0	-	30	10.0	non-significant

* The % table does not add up to 100 because the respondents could make several choices

The most frequently mentioned leisure activities included reading, gardening and physical recreation. In the latter case, that relationship was statistically significant. Those who participated in physical activity were slightly more likely to report their fitness as high and less likely to describe it as low. A substantial proportion of the respondents spent free time with their family (44.7%), which resulted in low health assessments (23.9%). A similar number preferred spending leisure time with friends (41.5%), which caused that moderate and low scores dominated in this group. More than one-third of the respondents spent their leisure time pursuing own hobbies. Slightly fewer respondents declared social activism (24.3%) and even fewer participated in University of the Third Age classes, Senior Clubs and other forms of activity (10%). All those activities did not show any correlation with self-assessment of physical fitness, which however was visible in case of travelling. 78.1% of those who had travelled within the previous 12 months declared moderate fitness, with 12.3% reporting low level of fitness. Respondents showed different behaviours towards physical activity and health care in the past (Table 3).

Table 3. Relationship between physical fitness and physical activity and pro-health behaviours in the past (χ^2 test of independence)

Physical activity	Self-assessment of health (%)				Total		p for χ^2 test
	High	Moderate	Low	I don't know	n	%	
Physical education classes	12.4	64.0	21.0	2.6	267	92.4	non-significant
Physical recreation	12.9	65.8	18.7	2.7	225	75.3	non-significant
Travelling (in the previous year)	15.3	71.7	11.8	1.2	170	66.9	0.0000
Rehabilitation	9.0	60.2	28.3	2.4	166	67.5	non-significant
Sanatorium	10.2	57.6	30.5	1.7	118	52.2	non-significant
Holidays (within the past 12 months)	17.0	73.2	8.9	0.9	112	47.3	0.0000
Professional athlete	20.5	69.2	9.0	1.3	78	26.2	0.0000

The majority of the respondents had participated in physical education classes (92.4%) and almost ¾ in various forms of physical recreation. However, these activities did not impact the current self-assessment of physical fitness. Travelling in the last year, however, significantly correlated with the self-assessment of physical fitness. In this group, 71.7% rated their fitness as average, 15.3% as high and 11.3% as low. This form of activity, involving 66.9% respondents, was associated with physical fitness. More than half of them had undergone rehabilitation and sanatorium treatment, especially those reporting low fitness. Holiday trips were associated with higher self-reported fitness. There was also a significant correlation between previous athletic career and declared fitness. Former athletes reported high levels of physical fitness more than two times more often than low fitness.

The relationships between self-assessments of physical fitness and leisure activities of the respondents with different socio-demographic characteristics were presented comprehensively using a multivariate analysis of correspondence (Figure 1), combined with the chi-square test of independence (Table 1,2).

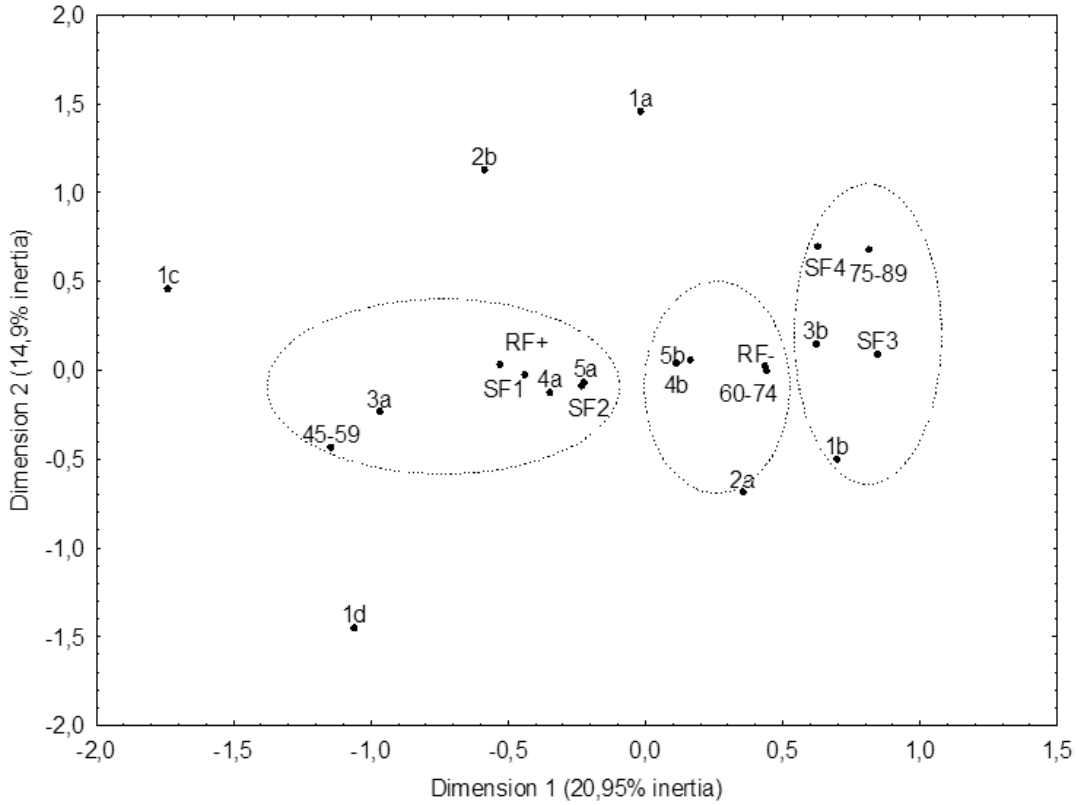

Figure 1. The relationship between self-assessment of physical fitness and leisure activities in the context of social determinants (multiple correspondence analysis - MCA)

The selected dimensions accounted for 35.85% of the total $\chi 2$. Two dimensions in space were taken into account in the graphic analysis, and the categories of self-assessment (SF1 – 'high', SF2 – 'moderate', SF3 – 'low', SF4 – 'I do not know'), age of patients (45-59, 60-74, 75-89 years), current participation (or lack thereof) in physical recreation (RF +; RF-) were established. People with high (SF1) and moderate (SF2) self-assessment of physical fitness more often participated in physical recreation (RF+), were employed (3a), preferred travel as a leisure activity (4a), as well as meetings with friends (5a), and were aged 45-59 years. Women (2a) who did not participate in physical activities (RF-), were aged 60-74, did not travel (4b) and did socialise in free time (5b). Those who rated their physical fitness as low (SF3) or unable to assess (SF4), were 75-89, did not work (3b), and played the role of the grandmother in the family (1b). Peripheral positions were occupied by grandparents (1a), fathers (1c), mothers (1d), and men (2b) (Figure 1).

The selected two dimensions (first and second) accounted for 36.07% of the total χ^2. High (SF1) and moderate (SF2) self-assessment of physical fitness was reported by people aged 45-59, employed (3a), previously taking part in physical recreation (4a), travelling in the last 12 months (5a), going on holidays in the same period of time (6a), with some experience in competitive sport (7a), taking part in physical education classes in the past (8a).

Low assessment of fitness (SF3) was more often reported by people who were aged 75-89, did not travel in the last year (5b), as well as did not participate in physical education classes (8b) in the past.

An inability to self-assess physical fitness (SF4) was more often reported by women (2a) who were grandmothers (1b), unemployed (3b), had not participated in physical recreation in the past (4b), had not gone on holidays in the last year (6b), and had not been involved in competitive sport in the past (7b). The peripheral position was occupied by grandparents (1a), fathers (1c), mothers (1d), and men (2b) **(**Figure 2).

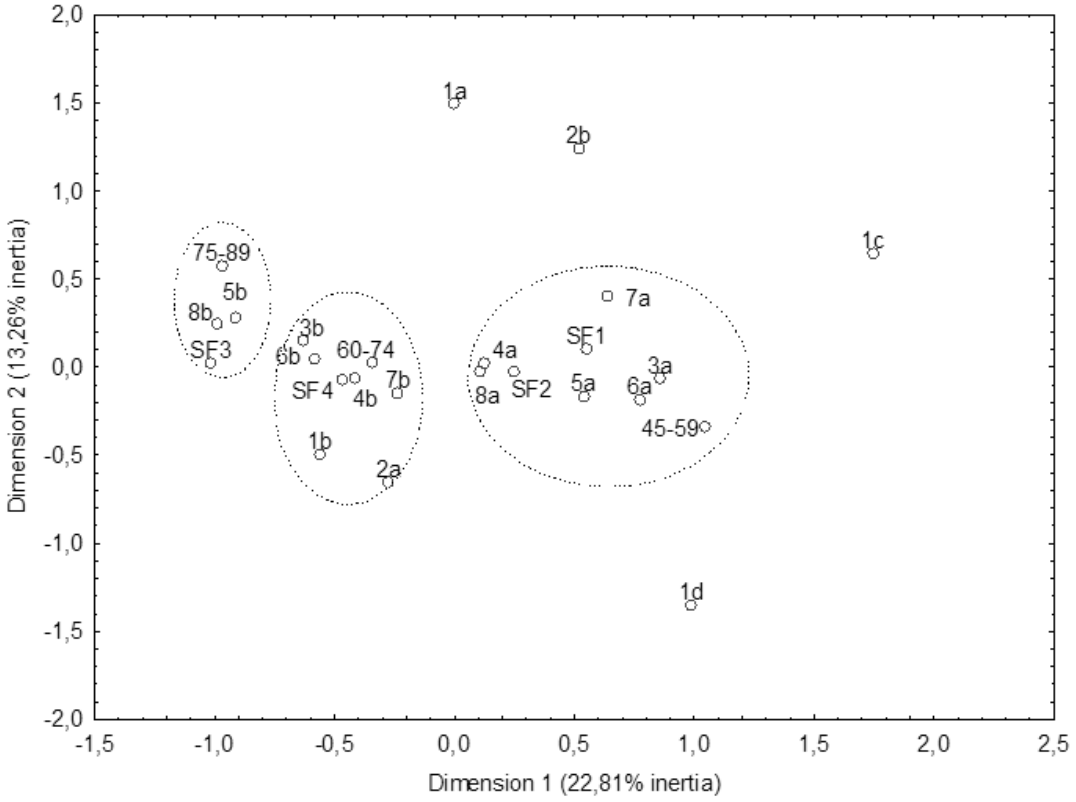

Figure 2. Relationship between self-assessment of physical fitness, physical activity, and health (MCA)

Discussion

Research shows that regular physical activity in the elderly is associated with the higher quality of life, enhanced motor abilities, increased self-reliance, better performance of daily duties and improved psycho-physical well-being. Systematic physical activity not only decreases the death rate but also prolongs the period of independence and autonomy in daily life, and improves the quality of life of the elderly [13,19,20]. In our study, we showed that the self-assessment of physical fitness was age-related. Most of the respondents reported moderate scores (46.7%), but this proportion decreased with age. The oldest group showed most difficulty in self-assessing their physical fitness. These problems – despite the low numbers of persons having such challenges – may be associated with diseases leading to reduced physical activity and deteriorated physical fitness. Their physical inactivity may have been caused by a worse state of health, disability, fear of exercise, and lack of specific pro-health habits in the former lifestyle periods.

The results of this study confirm [21] that no physical activity was reported more frequently in the oldest age groups, starting from the 65-69 group. A deficiency of physical activity in the early old age was reported by less than every other respondent, whereas in the group of 90+ it was reported by 9 out of 10. The decrease in regular and sporadic physical activity correlated with age. Those aged 80-84 reported it to be 14.3% lower than in the 75-79 group. In addition, women were less active than men, and rural residents reported lower levels than urban dwellers. The age-related decline in physical activity, both among women and men, confirms the results of other studies from all over the world [22,23]. Older people also preferred less intensive forms of movement, tailored to individual capabilities. Most of the respondents went for regular walks, practised Nordic walking or attended organised activities. Currently, these are the most common forms of physical activity in the elderly [24].

The respondents involved in physical recreation demonstrated significantly higher self-assessment of physical activity. Moderate levels of fitness were more often reported by fathers and mothers, while low levels by grandfathers and grandmothers. This comes as no surprise as family roles are age-related. At the same time, the family environment offers a specific system of support and help. The family makes it easier for the elderly to adapt to old age, providing a sense of security and a source of emotional and financial support. A special role in the family is played by grandmothers, very influential figures in terms of pro-health behaviours in the young generation. A physically active grandmother who encourages family members to be active in leisure time is

a lifelong asset, a person teaching the family how to assess own physical fitness and apply suitable exercise.

The elderly, even those who reach the late old age, often spend their free time helping in raising their grandchildren. These people highly value their lives, with physical fitness as the essential element that enables full participation in the family life [25].

In our study, we found a significant correlation between employment status and the self-assessment of physical fitness. 39.1% of the respondents were employed, and in this group, the scores were mainly high and moderate (19% and 71.6%), compared to the dominance of low and moderate values in the non-working group. In the study by K. Bałandynowicz-Panfil [26], 70% of the persons working in the retirement age (whether entitled or not to receive a pension) described their fitness as good or very good, compared to 48% of those who worked and received a pension at the same time. Among the non-working elderly, the rate ranged from 7.6% in disabled pensioners to about 43% in non-working non-pensioners. In the group of pensioners, those who worked tended to report higher levels of health than those who did not.

Retirement changes a person's social role. It has a strong influence on their relationships, changes own self-assessment, and often prevents travelling. In our study, however, travels were one of the most preferred leisure activities. In addition, if in the earlier stages of their lives the respondents were highly active, had hobbies or engaged in volunteering, they were likely to continue and develop their pursuits after retirement. In the light of the statistical analyses [27], the active leisure of those living in the countryside is most often followed by people aged 65-69, acquiring new skills by people aged 55-59, whereas sport/physical activities – by people aged 55-59 and 60-64 years. People who are motivated to go on tourist trips by health-related reasons are interested in health treatments such as rehabilitation treatments, massages, healing baths, weight loss diets, diet meals and participation in physical activity classes. The results of our research indicate that over half of the respondents had undergone rehabilitation and treatment at sanatorium within the last 12 months, especially those with low self-assessment of physical fitness. Holiday trips were associated with higher scores.

Furthermore, tourism of the elderly begins to play an increasingly important role in the tourist market as it is a group with considerable income and free time and a variety of preferences. It was found that about one-fifth of those 65+ had gone for a tourist trip in the previous year, compared to 2/5 in the entire study population. In the 65+ group, trips were mostly domestic (almost 75%), i.e. visits to family, relatives, and friends (50%) [27].

In our study, the self-assessment of physical fitness seemed to be a real indicator of physical activity and the ability of older people to perform various tasks. Its level is determined by various demographic, current and previous free-time preferences, but above all the current physical activity.

Deficiency of physical activity is one of the most significant modifiable risk factors for many diseases [28,29]. Therefore, pro-health education seems to be most natural and most effective measures aimed at improving the health status of the society [30]. Pro-health behaviours, especially physical activity, need to be propagated and promoted to enhance fitness and self-reliance of the elderly, resulting in successful ageing. It is also necessary to create comprehensive projects to activate the elderly and help them adapt to their changing needs and expectations.

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PART III. OTHER
DZIAŁ III. RÓŻNE

INCLUSION OF PELOTHERAPY IN THE TREATMENT OF PATIENTS WITH LUMBAR DISCOPATHY TREATED WITH LOW-FREQUENCY MAGNETIC FIELD AND KINESITHERAPY

OCENA WPŁYWU WŁĄCZENIA BOROWINOTERAPII DO LECZENIA PACJENTÓW Z DYSKOPATIĄ LĘDŹWIOWĄ ZABIEGAMI POLA MAGNETYCZNEGO NISKIEJ CZĘSTOTLIWOŚCI I KINEZYTERAPII

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

Summary

Background. The study aims to evaluate the effect of the pelotherapy in the treatment of patients with lumbar discopathy treated with low-frequency magnetic field and kinesitherapy.
Material and methods. The study involved 79 persons randomly divided into 2 groups. The patients from group I (39 individuals) were subjected to pelvic therapy, low-frequency magnetic field and kinesitherapy. Those in the other group (40 individuals) were exposed to low-frequency magnetic field and kinesitherapy. To compare and assess the changes in both samples, the VAS pain scale and the Roland-Morris Disability Index were used, as well as the fingers-floor test to examine the range of mobility.
Results. There were no statistically significant differences between the examined groups ($p > 0.05$). Both groups benefited from the therapy. In the first one, there was a reduction in pain – Me = 1.0 point in the VAS scale and, according to the Roland-Morris Questionnaire, the degree of disability was reduced by Me = 1.0 point. A more significant increase in the range of motion of the lumbar spine was observed in group II, in which the range of mobility increased by Me = 2.0 cm in the fingers-to-floor test.
Conclusions. Incorporation of a pelotherapy into the treatment which consisted of low-frequency magnetic field and kinesitherapy did not significantly result in achieving a better therapeutic outcome.

Keywords: kinesitherapy, lumbar spine, discopathy, pelotherapy, low-frequency magnetic field

Streszczenie

Wprowadzenie. Celem pracy była ocena wpływu włączenia borowinoterapii do leczenia pacjentów z dyskopatią lędźwiową za pomocą pola magnetycznego niskiej częstotliwości i kinezyterapii.
Materiał i metody. W badaniu udział wzięło 79 osób, których losowo podzielono na 2 grupy. Pacjenci z I grupy (39 osób) poddani zostali zabiegom borowinoterapii, pola magnetycznego niskiej częstotliwości oraz kinezyterapii. Pacjenci z II grupy (40 osób) poddani zostali zabiegom pola magnetycznego niskiej częstotliwości i kinezyterapii. W celu porównania zachodzących zmian wykorzystano skalę bólu VAS, Indeks Niepełnosprawności Rolanda-Morrisa, ponadto oceniano zakres ruchomości w teście palce-podłoga.
Wyniki. Pomiędzy badanymi grupami nie zaobserwowano istotnych statystycznie różnic ($p>0,05$). W obu badanych grupach, w wyniku terapii, uzyskano zmniejszenie dolegliwości bólowych o Me= 1,0 punktu w skali VAS oraz zmniejszenie stopnia niepełnosprawności o Me = 1,0 punktu w Kwestionariuszu Rolanda-Morrisa. Większy wzrost zakresu ruchomości kręgosłupa lędźwiowego zaobserwowano w II grupie badanej u której zakres zwiększył o Me = 2,0 cm w teście palce-podłoga.
Wnioski. Włączenie borowinoterapii do schematu leczenia w postaci pola magnetycznego niskiej częstotliwości i kinezyterapii nie wpłynęło istotnie statystycznie na uzyskanie lepszych wyników terapii.

Słowa kluczowe: kinezyterapia, kręgosłup lędźwiowy, dyskopatia, borowinoterapia, pole magnetyczne niskiej częstotliwości

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Introduction

Spine pain syndromes are a crucial clinical, social and economic problem, the solutions of which should be sought in devising appropriate methods of diagnosis, prevention and treatment. They are one of the leading causes of reducing the ability to perform work [1,2], which results in a deterioration of patients' quality of life, as well as increased funds necessary for financing long-term treatment. One of the main causes of spinal pain is discopathy.

The study aimed to evaluate the inclusion of pelotherapy in the treatment of patients with lumbar discopathy treated with physiotherapeutic procedures such as low-frequency magnetic field and kinesitherapy treatments.

Material and methods

The research was conducted in the years 2011-2013 at the Medical Center DMP in Lublin, after the approval to perform it was obtained from the Bioethical Committee of the Medical University in Lublin (KE-0254/2/2011). The study involved 79 patients, aged 18 to 65 years, diagnosed with discopathy in the lumbar region of the spine.

The research was prospective, and the patients were randomly assigned to two groups after medical qualification. Those in the first group (39 persons) were subjected to mud therapy, a low-frequency magnetic field and kinesitherapy, whereas the patients from the other group (40 persons) were treated with low-frequency magnetic field therapy and kinesitherapy.

The pulsed electromagnetic field (PEMF) therapy used a magnetic field of 3.8 mT induction, at frequency of 25 Hz, rectangular pulse of 10 ms duration and a break time of 30 ms. The treatments were performed with a magnetotherapy device BTL-5920 Magnet (manufacturer: BTL Poland, Ltd.) using a solenoid-shaped applicator. The duration of the procedure increased in the following treatment days and would vary from 15 to 20 minutes.

The treatments with the therapeutic mud were made using pre-made wraps of BIOCHEM Michalik GP in Bochnia. The peat mass, with the degree of humification value H = 5, was heated in the water kitchen to the temperature of about 42°C, and then applied to the patient's lumbar area. The treatment lasted 20 minutes.

Kinesitherapy consisted of performing exercises to strengthen the muscles involved in the stability of the trunk and the coordination of the diaphragmatic breathing track. Depending on the patients' individual needs, static stretching was also applied. The exercises were performed after the physiotherapeutic procedures under the supervision of a qualified physiotherapist. The exercise time would increase progressively from 15 to 30 minutes, which varied depending on the difficulty in their performance.

To compare the changes occurring under the influence of the treatment, the severity of pain was assessed twice, before and after the therapy, using the VAS pain scale [3,4], whereas the degree of disability was examined using the Roland-Morris Questionnaire (ODI) [5]. The range of the lumbar spine mobility was also assessed using the fingers-floor test [6,7].

The Microsoft Office 2013 (Excel programme) and the Stat Statictica PL programme by StatSoft (version 9.0) were used to perform calculations. To check the distribution of variables, the Kolmogorov-Smirnov test was applied, and to compare the differences between the analogous parameters, non-parametric tests were used. They considered statistically significant variations assuming the significance level was less than 0.05 ($p < 0.05$).

Results

The study was attended by 79 people, including 45 women (57%) and 34 men (43%). The youngest examined person was 29 years old, whereas the oldest – 65 years old. The mean age of the respondents was 54 years. Most of the patients – 63 persons (80%) were urban residents, while the remaining ones, i.e. 16 people (20%) came from the countryside. The majority were professionally active – 46 respondents (58%), while 33 respondents (42%) were not.

The most frequent pain symptoms were observed in those over 40 years of age – 36 persons (46%), whereas 26 patients (33%) had suffered from them since they were 30. The largest number of respondents – 29 persons (37%), suffering from the lumbar spine pain, had been treated for over 20 years, 21 people (27%) – for over 5 years, 18 persons (23%) – for over 10 years. At the same time, 57% of the respondents (45 persons) claimed that the back pains were the reason for their absence from work (several times), and only 21 of the examinees (27%) never took sick leave because of the symptom.

The changes in pain intensity in both groups were statistically significant ($p < 0.05$). The median pain in the first study group (pelotherapy, PM, kinesitherapy) was reduced from 4.5 to 4.0 points in the VAS scale after the treatment. 31 patients reported a reduction of pain (79.5%), 6 individuals (15.5%) did not see any change in the level of pain, whereas 2 patients (3%) experienced worsening of the symptoms. In the other group (the one

treated with the magnetic field, kinesitherapy), the median pain intensity was reduced from 5.0 to 4.0 on the VAS scale. In 36 individuals (90%) pain was reduced, in 3 respondents (7.5%) its level did not change, and in 1 person (2.5%) the symptoms worsened (Figure 1). The median scale reduction in the level of perceived pain in both groups was Me = -1.0, which was not statistically significant as for the variation between the groups (p> 0.05) (Table 1).

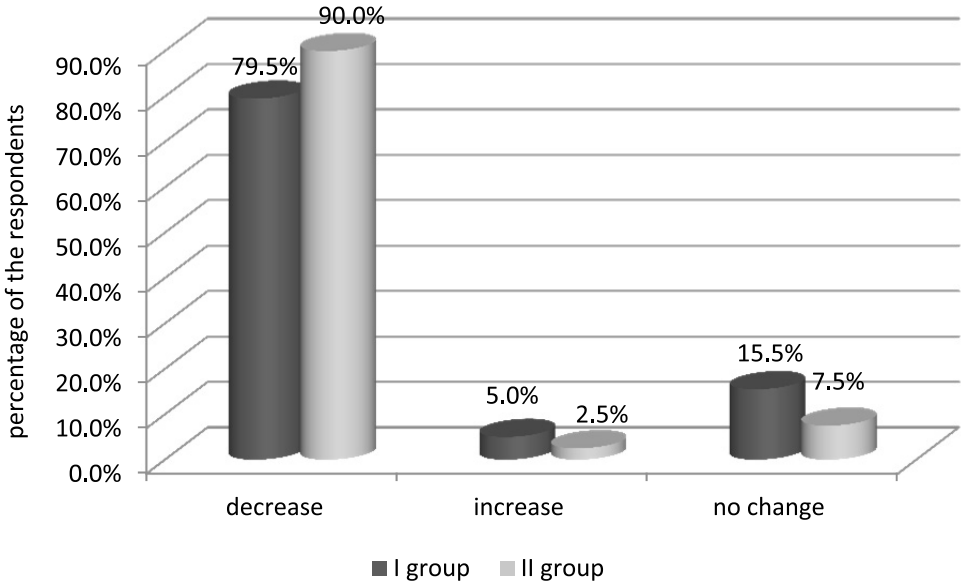

Figure 1. Change in the pain severity in the VAS scale

Table 1. Change in pain intensity in the VAS scale (n=79)

Group	Descriptive parameters					
	N	Me	Q1	Q2	Mean	SD
I group (mud, MF, kinesitherapy)	39	**–1.0**	–2.0	–0.5	–1.3	1.11
II group (MF, kinesitherapy)	40	**–1.0**	–2.0	–0.5	–1.3	1.43
Statistical significance	group I vs group II					p>0.05

In both groups, a statistically significant increase in the finger mobility test was also observed (p <0.05). In group I (pelotherapy, MF, kinesitherapy), the range increased from Me = -8.0 cm before the therapy to Me = -5.0 cm after the treatment. The mobility range increased in 24 respondents in this group (61%), decreased in 3 persons (8%), and in 12 (31%) remained unchanged. In group II (PM, kinesitherapy), the range of motion in the fingertip-to-floor test increased from Me = -9.0 cm to Me = -6.0 cm after the therapy. The increase in the range of motion was found in 27 patients (67.5%), in 6 respondents (15%) there was a decrease in mobility, and in 7 patients (17.5%) the mobility range remained unchanged. (figure 2). A more significant reduction in the level of the perceived pain was observed in group 2, in which the range was increased by Me = 2.0 cm, and in group I – by Me = 1.5 cm (Table 2).

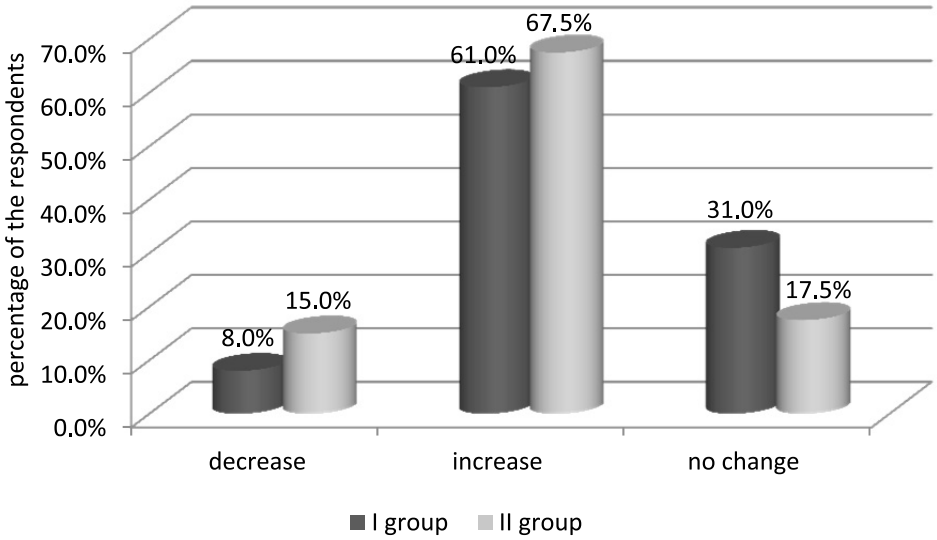

Figure 2. Change in the lumbar spine movement in the fingertip-to-floor test

Table 2. Change in the spine mobility in the fingers-to-floor test (n = 79)

Group	Descriptive parameters					
	N	Me	Q1	Q2	Mean	SD
I group (mud, MF, kinesitherapy)	39	**– 1.5**	–3.0	0.0	–1.9	3.13
II group (MF, kinesitherapy)	40	**–2.0**	–5.0	0.0	–2.8	5.38
Statistical significance	group I vs group II					p>0.05

In both groups, the change in the degree of disability measured by the Roland-Morris scale was statistically significant (p <0.05). In the first study group (pelotherapy, PM, kinesitherapy), the degree of disability decreased from Me = 6.0 points before the therapy to 4.0 points after the treatment. The degree of disability in 21 respondents (54%) in this group decreased, in 10 (26%) increased, whereas and in 8 persons (20%) there was no change. In the other study group (pelotherapy, kinesitherapy), the degree of disability decreased from Me = 6.5 points to 5 points after the treatment. Also, a reduced level of disability was found in 26 respondents (65%) in group II, there was an increase in the value of disability indicator in 9 individuals (22.5%), and in 5 persons (12.5%) it remained unchanged (figure 3). In both groups, the median change in the degree of disability by the Roland Morris scale was 1.0 point, which indicates that the difference between the groups was not statistically significant (p> 0.05) (Table 3).

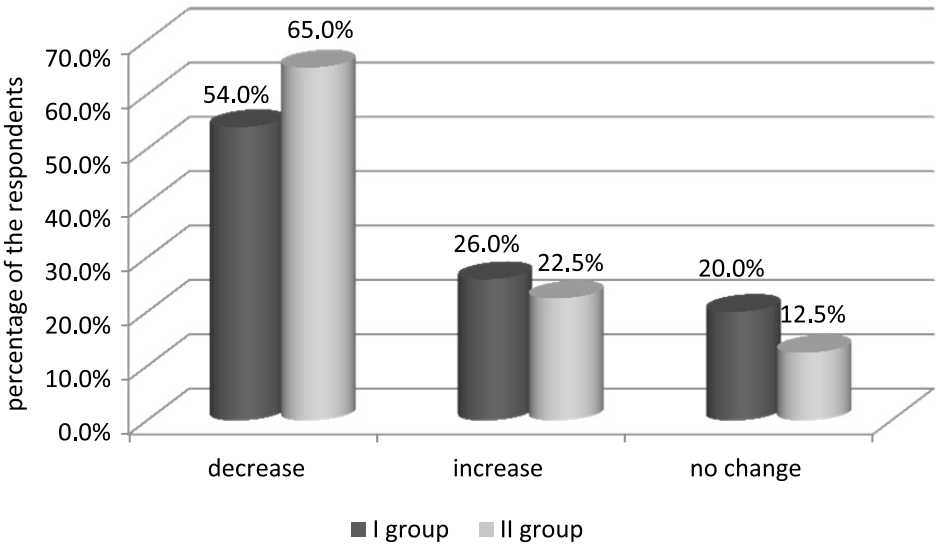

Figure 3. Change in the degree of disability in the Roland-Morris scale

Table 3. Change of the degree of disability by the Roland-Morris Questionnaire (n = 79)

Group	Descriptive parameters					
	N	Me	Q1	Q2	Mean	SD
group I (magnetic field, mud, kinesitherapy)	39	**–1.0**	–3.0	1.0	–0.9	3.13
group II (MF, kinesitherapy)	40	**–1.0**	–3,0	0.0	–1.0	2.66
Statistical significance	group I vs group II					p>0.05

Discussion

The therapy of combined physiotherapeutic treatments is often used to treat the symptoms of discopathy, due to the low cost of such treatment, as well as good short- and long-term results. As Komori et al. claim, about 80% of patients with discopathy can be successfully treated conservatively [8]. What our research confirmed was that pain could be significantly reduced, and one's flexibility and mobility improved

Many authors support the view that the combination of physiotherapeutic, kinesitherapeutic or balneological methods in treatment produces better results than when patients are treated with the exclusive use of one method [9,10,11,12]. A particular role in the treatment of discopathy is played by balneotherapy treatments, among which mud therapy is the most commonly used one. The healing properties of peat are primarily due to the presence of the composition of humic compounds. Colloidal properties of these acids cause that mud can keep heat for a long time, bind water, affect sorption and exchange capacities [13]. Thanks to these features mud therapy has anti-inflammatory, antibacterial and analgesic effects, reduces edema and provides better blood supply [14].

Due to its physicochemical properties, mud may affect thermal and chemical mediators, which makes the therapy more effective than regular thermal treatment. This property is confirmed by Sarsan et al., who compared the effectiveness of mud compresses and warm wraps in the treatment of osteoarthritis symptoms [15]. The studies showed that mud compresses proved to be more efficient in reducing pain or stiffness, improving functioning in daily life.

Also, Ponikowska et al. asserts the efficacy of mud therapy in patients with degenerative spine disease [14]. The study involved 30 patients who underwent iontophoresis and had mud-baths therapy with peat extract. The control group was treated using a placebo that would not differ in colour or smell from the peloid preparation. Patients from both groups also underwent kinesitherapy. Two series of 12-15 treatments were performed. In both groups, clinical improvement was found since the placebo treatment also had some therapeutic effects. However, in the study group, pain decreased by an average of 2.27 points on the VAS scale, and in the control one only by 1.72 points. The authors also noted a more significant improvement in the quality of life in patients in the study group. The remaining parameters which were examined (fingertip-to-floor test, stiffness, WOMAC test, Likert test, pain after walking) did not change statistically significantly in any of the studied groups.

Similar results were obtained by Mordak et al. [16], who assessed the impact of peat compresses on pain and mobility of the lower spine in the people with degenerative lumbar spine disease. As a result of 10 pelotherapeutic treatments, they achieved a reduction in pain at the VAS scale by 35% (average 0.7 degrees) and an increase in bending in 17% of the patients, in rotation in 30% of the respondents and range of the fingers-floor test in 37% of respondents.

Conclusions

The inclusion of a pelotherapy in the treatment of patients with discopathy treated with the use of low-frequency magnetic field and kinesitherapy did not significantly affect the patients' well-being and bring better therapeutic results.

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ORIGINAL PAPER
ORYGINALNY ARTYKUŁ NAUKOWY

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CHARACTERIZATION OF *STAPHYLOCOCCUS EPIDERMIDIS* ISOLATES CULTURED FROM PATIENTS WITH INFECTED HIP PROSTHESES

CHARAKTERYSTYKA IZOLATÓW *STAPHYLOCOCCUS EPIDERMIDIS* WYHODOWANYCH OD PACJENTÓW Z ZAKAŻENIAMI ENDOPROTEZ STAWU BIODROWEGO

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

Summary

Background. Coagulase negative staphylococci are at the forefront of etiologic agents of periprosthetic joint infections (PJIs). The purpose of the study was to characterise causative isolates (n=19) of Staphylococcus epidermidis (SE) – with emphasis on their phenotypic and genotypic heterogeneity. **Material and methods.** The isolates were cultured from multiple samples obtained perioperatively during revision surgery from 14 patients with clinically and/or microbiologically proven PJI. Phenotypic heterogeneity included variations of colony morphologies, drug resistance patterns and/or the capability of the biofilm formation and was verified by the DNA fingerprinting assay. **Results.** Phenotypic discrepancies were observed between isolates cultured from 5 patients (35.7%). The genotyping assay identified 3 pairs of isolates as unrelated; single pairs were genetically related and indistinguishable. The biofilm production was detected in 17 isolates, among which 5 (29.4%) were proficient biofilm formers harbouring the icaADBC genes. Additionally, one ica-positive isolate produced a moderate, protease-sensitive biofilm. The remaining isolates were moderate biofilm producers among which four developed protease-sensitive biofilms. **Conclusions.** The majority of PJIs are monoclonal; nevertheless, phenotypic diversity of SE is a frequent phenomenon which can complicate the diagnostic proceeding. Adherence ability is an important pathogenic trait of SE although the chemical composition of the resultant biofilm, its intensity and regulation of development can vary.

Keywords: prosthetic joint infection, *Staphylococcus epidermidis*, biofilm, heterogeneity

Streszczenie

Wprowadzenie. Gronkowce koagulazo-ujemne są wiodącymi czynnikami etiologicznymi zakażeń okołoprotezowych. Celem pracy była charakterystyka izolatów (n=19) Staphylococcus epidermidis (SE) ze szczególnym uwzględnieniem ich fenotypowej i genotypowej heterogenności. **Materiał i metody.** Izolaty gronkowców zostały wyhodowane z materiałów klinicznych pobranych śródoperacyjnie od 14 pacjentów, u których zakażenie endoprotezy stawu biodrowego zostało potwierdzone klinicznie i/lub mikrobiologicznie. Fenotypową heterogenność definiowano w oparciu o odmienne cechy morfologii kolonii bakteryjnych, profile lekowrażliwości izolatów i/lub ich zdolność tworzenia biofilmu w warunkach in vitro i weryfikowano ją na postawie genotypowania. **Wyniki.** Fenotypowe rozbieżności zaobserwowano pomiędzy izolatami SE wyhodowanymi od 5 (35.7%) pacjentów. W oparciu o wyniki genotypowania za genetycznie niespokrewnione uznano 3 pary izolatów, pojedyncze pary zaś za spokrewnione i nieodróżnialne/klonalne. Wytwarzanie biofilmu zostało potwierdzone dla 17 badanych izolatów, wśród których 5 (29.4%) wytwarzało intensywny biofilm i posiadało geny icaADBC. Ponadto, jeden izolat SE ica+ wytwarzał umiarkowany, wrażliwy na działanie proteazy biofilm. Pozostałe izolaty wytwarzały biofilm umiarkowany. Cztery z nich charakteryzowały się tworzeniem biofilmu wrażliwego na działanie proteazy. **Wnioski.** Większość PJIs ma charakter monoklonalny, niemniej jednak zmienność fenotypowa SE pozostaje częstym zjawiskiem, co może utrudniać diagnostykę zakażeń wywoływanych przez te drobnoustroje. Zdolność adherencji jest ważną cechą warunkującą patogenność SE, aczkolwiek skład chemiczny powstającego w jej wyniku biofilmu oraz jego intensywność i regulacja mechanizmów wpływających na jego tworzenie mogą różnić się pomiędzy izolatami.

Słowa kluczowe: zakażenie okołoprotezowe, *Staphylococcus epidermidis*, biofilm, heterogenność

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Introduction

Prosthetic joint replacement surgery (arthroplasty) is considered one of the most successful orthopaedic procedures since each year it substantially improves the quality of life for thousands of patients. Nevertheless, infections of prosthetic joints, although rare, are among the most devastating complications of arthroplasty [1-3]. In the prior studies, we investigated various aspects of the pathogenesis and the diagnosis of prosthetic joint infections (PJIs). We reported the significance of the combination of sonication and conventional culture for the identification of microorganisms involved in the aetiology of these infections [4]. We investigated the spectrum of causative agents of PJIs and analysed their antibiotic resistance profiles [5]. We also studied an aspect of the pathogenesis of PJIs linked to naturally occurring microbial subpopulations called small-colony variants (SCVs) [6] which exhibit physiologic, biochemical, and colonial morphologies different from usual isolates [7].

In the present study, we focused on the characterisation of *S. epidermidis* isolates representing the normal phenotype with emphasis on their phenotypic and genotypic heterogeneity. *S. epidermidis* is a predominant species among coagulase-negative staphylococci (CNS) involved in the aetiology of PJIs [1, 8, 9]. Phenotypic heterogeneity of the investigated isolates was based on the observation of variations concerning colony morphologies, drug resistance patterns and/or the capability of the biofilm formation. The prevalence of the *ica* operon which encodes for the polysaccharide intercellular adhesion (PIA) - the most common molecule involved in intercellular adhesion during the biofilm formation by *S. epidermidis* [2] - was also examined. Phenotypically distinct isolates were characterised genetically to verify the nature of infection associated with the possibility of variation of the causative strain on the phenotypic level, genetic instability of a single infectious clone or a polyclonal mixture of strains.

Material and methods

To address the purpose of the study, we employed 19 isolates recovered from 14 patients with PJIs. The patients underwent their prosthetic hip joint revision procedures in the period between April 2010 and January 2012 at the Orthopaedics and Traumatology Ward of the Clinical Hospital in Lublin, Poland, and at the Public Clinical Hospital in Otwock, Poland. The clinical samples collected for microbiological studies included: synovial fluid (SVF), at least three intraoperative periprosthetic tissue samples (PTs) per patient and the sonicate fluid (SF). The SF was obtained after the sonication of explanted prostheses in order to disintegrate bacterial biofilm on the implants. The laboratory proceedings aimed at the cultivation of underlying pathogens were described in detail in our previous publications [4-5]. All staphylococcal isolates were considered clinically significant following the PJI definition by Parvizi et al. [10]. The isolates were identified to the species level using commercially available biochemical tests (API, BioMérieux, France); their antibiotic resistance profiles were determined according to the European Committee on Antimicrobial Susceptibility Testing (EUCAST) recommendations. The isolates used in this study are presented in Table 1.

Repetitive sequence-based PCR (rep-PCR)

Genetic relatedness between phenotypically divergent *S. epidermidis* isolates was verified by the Rep-PCR (Diversilab *Staphylococcus* DNA fingerprinting kit BioMérieux, France). The procedure of staphylococcal DNA isolation, its amplification conditions as well as the analysis of the rep-PCR products were described in our previous publication [6].

Biofilm production

The ability of cultured *S. epidermidis* isolates to produce biofilm was assessed by the PCR detection of the *icaADBC* genes and phenotypically - with the use of the quantitative microtiter plate assay (MPA). The procedure of bacterial DNA isolation and as well as the *ica* primer sequences and the amplification conditions are included in our previous publication [6]. The MPA was followed by the addition of trypsin in order to investigate protein-mediated mechanisms of the biofilm production [6]. For all methods, a reference strain of *S. epidermidis* ATCC 35984 was used as a positive control.

Table 1. Characterisation of *S. epidermidis* isolates involved in the etiology of PJIs

Isolate no. n=19	Type of specimen			Resistance profile	Genotyping results	*ica* genes (PCR)	Biofilm production *in vitro*	Biofilm sensitivity to protease
	SF	SVF	PT (no.)					
Isolates cultured from patients with presumed aseptic implant loosening								
A17	+	+	-	E, SXT, GM*	ND	-	moderate	yes
A18	+	NC	+ (3)	MET , MLS_B, SXT, FA*	ND	-	moderate	no
A19	+	+	+ (4)	MET	ND	-	moderate	no
A26a	+	+	-	MET, MLS_B	related	-	moderate	no
A26b	+	-		MET		-	moderate	no
A40a	+	+	+ (1)	MET	unrelated	-	moderate	no
A40b	+	-	-	Full sensitivity		-	moderate	no
Isolates cultured from patients with clinically septic implant loosening								
S1a	+	NC	+ (3)	Full sensitivity	unrelated	-	-	-
S1b	-		+ (1)	MET, MLS_B, SXT, CIP, GM*		*icaADBC*$^+$	strong	no
S2	+		+ (2)	Full sensitivity	ND	*icaADBC*$^+$	strong	no
S3	-		+ (1)	FA	ND	*icaADBC*$^+$	strong	no
S5a	-		+ (1)	MET, MLS_B, SXT*	unrelated	-	moderate	yes
S5b			+ (1)	MLS_B, SXT		*icaD*$^+$	-	-
S7	+		+ (3)	MET, E	ND	*icaADBC*$^+$	strong	no
S8a	+		+ (2)	MET, SXT, MLS_B, RA, CIP, GM*	indistinguishable	*icaADBC*$^+$	strong	no
S8b	-		+ (1)	MET, SXT, MLS_B, RA, CIP, GM*		*icaADBC*$^+$	moderate	yes
S11	+		+ (1)	Full sensitivity	ND	-	moderate	no
S14	-		+ (2)	MLS_B	ND	-	moderate	yes
S19	+		+ (3)	MET, GM, CIP*	ND	-	moderate	yes

NC – material not collected; ND – not done; S-F – sonicate fluid; SVF – synovial fluid; PT – periprosthetic tissue (number of tissue samples from which growth of the bacterial isolate was obtained); **+/-** : positive/negative culture result; MET- methicillin; MLS_B –macrolides, linkosamides and group B streptogramins; GM - gentamicin; SXT – co-trimoxazole; CIP – ciprofloxacin; FA – fusidic acid; E – erythromycin; RA – rifampicin; * - multidrug resistance (resistance to at least three groups of antimicrobial agents); a, b – used to distinguish between phenotypically divergent *S. epidermidis* isolates

Results and discussion

Staphylococci are known for their pronounced phenotypic variability including a variety of properties such as colony morphology, growth rate, antibiotic susceptibility or the biofilm production [20]. This phenomenon is assumed to provide an evolutionary advantage which helps the bacteria to adapt to changing environmental conditions [21]. Our study revealed phenotypic discrepancies between *S. epidermidis* isolates cultured from 5 patients (35.7%) (Table 1). These isolates were subsequently identified as unrelated (3 pairs), related (1 pair) or indistinguishable (1 pair) (Figure 1).

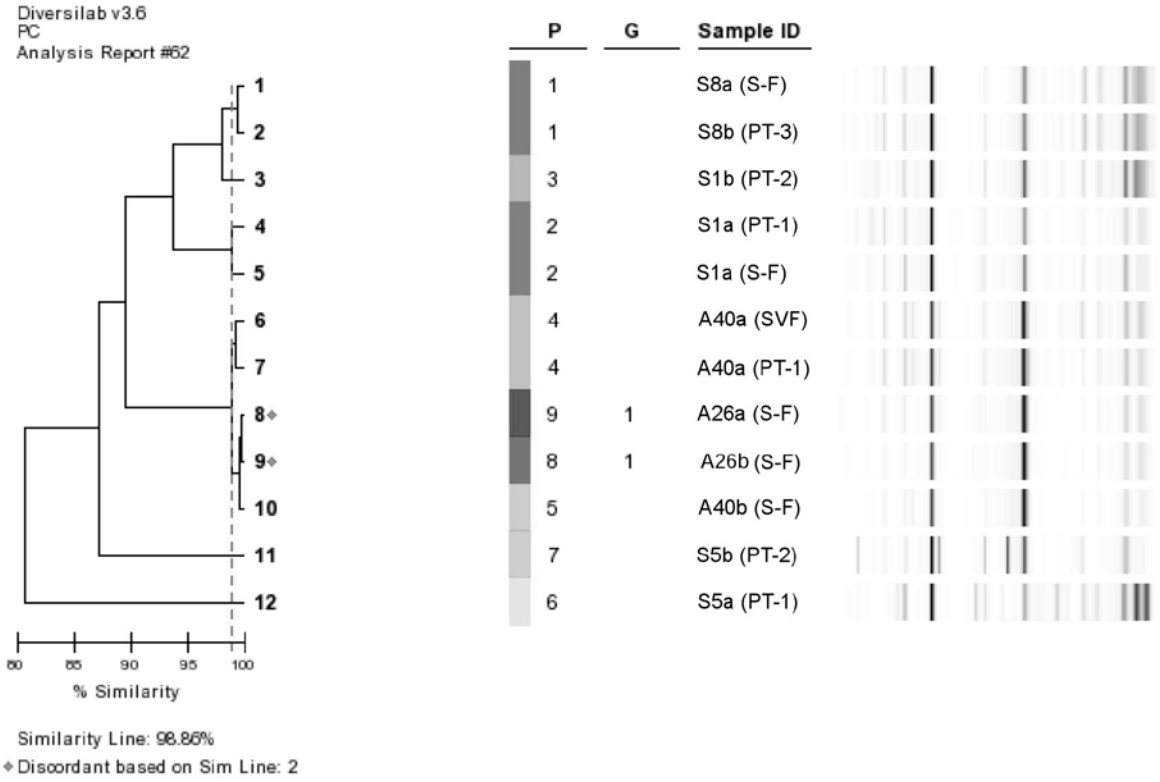

Figure 1. The rep-PCR fingerprinting results of phenotypically distinct *S. epidermidis* isolates

P – pattern; G – group;
S-F - sonicate-fluid
PT- periprosthetic tissue
SVF – synovial fluid
Designations of isolates and interpretation of the molecular fingerprinting assay:
Unrelated pairs:
S1a (S-F) and S1a (PT-1) –unrelated to S1b (PT-2)
A40a (SVF) and A40 a (PT-1) – unrelated to A40b (S-F)
S5a (PT-1) and S5b (PT-2)
Related pairs:
A26a (S-F) and A26b (S-F)
Indistinguishable pairs:
S8a (S-F) and S8b (PT-3)

Hence, we conclude that most PJIs were in fact monoclonal; polyclonal infections were reported for the minority of the patients (21%). Interestingly, this observation coincided with the rate (20%) of polyclonal PJIs caused by *S. epidermidis* in the study of Nilsdotter-Augustinsson et al. [16]. Galdbart et al. [3], who compared the genomes of phenotypically divergent *S. epidermidis* strains detected in pus and infected tissue specimens from 14 patients with chronic PJIs, also noted that most patients were infected by a single *S. epidermidis* clone which subsequently underwent rearrangements that yielded derivatives with divergent phenotypes and, occasionally, divergent macrorestriction patterns.

S. epidermidis causes PJIs primarily through its ability to adhere to prosthetic materials with subsequent biofilm formation which is considered a critical step in the development and maintenance of these infections

due to interference with the host immune system and antimicrobial agents. Many *S. epidermidis* strains produce a poly-N–acetylglucosamine (PNAG) homopolimer also named PIA that surrounds and connects staphylococcal cells in a biofilm. Its biosynthesis is accomplished by the gene products of the *ica* locus [8, 11, 12]. Although initial reports suggested the predominant role the *ica* gene cluster in the pathogenesis of device-related infections and proved its usefulness as a marker of the invasive capacity of *S. epidermidis* [13, 14] further studies have brought conflicting results. It has been recognized that the PIA is not essential for the biofilm formation in all *S. epidermidis* strains [15, 16] as in some strains the biofilm production can be mediated additionally or exclusively by specific surface proteins ([2, 11, 17, 18]. The results of our study have fit in the trend undermining the ubiquitous incidence and the key role of the *ica* operon as a marker of pathogenicity involved in the biofilm formation by clinical strains of *S. epidermidis*. We identified a complete set of the *ica* genes in staphylococcal isolates cultured from 5 patients (35.7%) (Table 1); this observation is in line with data published by Nilsdotter-Augustinsson *et al.* [16] who identified the *ica* operon in *S. epidermidis* cultured from 5 out of 15 patients (33.3%) with hip prosthesis infections. It should be noted that, in our study, the presence of the *ica* genes was detected only among isolates cultured from patients with a sinus tract accompanying the implant failure but not from those whose prosthesis loosening was presumed aseptic due to the lack of clinical manifestations of an ongoing PJI. Hence, it is conceivable that the *ica*-positive *S. epidermidis* can be responsible for more aggressive, clinically overt course of PJIs as they were the most profuse biofilm producers in the applied *in vitro* assay. Our results have also demonstrated that all four (*icaA* – *icaD*) *ica* genes are required for the synthesis of the functional PIA as one isolate which harboured the *icaD* gene only, was biofilm-negative. The *icaADBC*-negative *S. epidermidis* isolates (n=12), in turn, showed a moderate degree of the biofilm production in the *in vitro* assay with the exception of one isolate which did not demonstrate the biofilm formation capability, at least under applied *in vitro* conditions. The sensitivity of the biofilm to trypsin was observed for four *ica*-negative isolates (36.3%) (Table 1). This observation was suggestive of the involvement of alternative, protein-mediated mechanisms of the biofilm formation. The finding of a moderate degree of adhesion was also consistent with observations made earlier by Rohde *et al*. [18] implying that the PIA-independent biofilms are weaker than those associated with the production of the polysaccharide adhesin. According to the authors, 27% of all biofilm-positive *S. epidermidis* strains identified in their study produced protease-sensitive biofilms indicating that protein factors can be sufficient for the biofilm formation in PJIs. On the other hand, our observation that seven *ica*-negative isolates sustained their moderate adherence ability after treatment with the proteolytic enzyme can be suggestive of the involvement of other factors like carbohydrates other than PIA, teichoic acids, or nonspecific physicochemical forces in the biofilm production [19].

Additionally, we identified one *ica*-positive isolate which most probably did not express the PIA. Its biofilm formation was presumably based on protein-mediated mechanisms since the adherence ability was lost after the application of the protease and the biofilm was not as robust as biofilms produced by other *ica*-positive isolates including its clonal counterpart (Table 1): This finding exemplifies variable biofilm production on the phenotypic level which can occur even within the same strain and is consistent with observations made previously [16, 19].

One case of the polyclonal infection detected in our study is also worth noting in more detail – one intrapatient strain cultured from the SF and three types of PTs was biofilm-negative and sensitive to all antimicrobials tested whereas another strain cultured from a single PT sample was not only multidrug-resistant but also *ica*- and biofilm-positive (Table 1). We assume of the clinical significance of both strains due to the number of clinical samples which yielded the growth of the former strain and the pathogenic potential (multidrug resistance, biofilm production) of the latter. Moreover, collection of the clinical samples and microbiological diagnostic proceedings were conducted under rigorously aseptic conditions. This finding clearly indicates the necessity of a thorough investigation of all colony morphologies due to the risk of infection with bacterial strains differing in their pathogenic potential including antibiotic resistance pattern.

Conclusions

The majority of PJIs are monoclonal, nevertheless, phenotypic diversity of SE is a frequent phenomenon which can complicate the diagnostic proceeding. The ability to produce biofilm appears to remain a key virulence trait of *S. epidermidis* involved in the pathogenesis of PJIs but, as it has been demonstrated, the regulation of its production, its intensity and chemical composition may be variable – even within the same strain. The knowledge on the possibility of infection caused by phenotypically and, occasionally, by genetically distinct isolates, should expand directions of the laboratory proceedings aimed at the isolation, characterisation and eradication of etiologic agents of PJIs.

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When reporting experiments on human subjects, authors should indicate whether the procedures followed were in accordance with the Helsinki Declaration of 1975, as revised in 2000 (concerning the ethical principles for the medical community and forbidding releasing the name of the patient, initials or the hospital evidence number) and with the ethical standards of the responsible committee on human experimentation (institutional and national). The authors presenting case studies are obligated not to disclose patients' personal data. Regarding photographs, in case of any doubt that the picture inadequately protects the patient's anonymity his/her consent is required for publication.

Conflict of interest

Authors are expected to describe sources of the research funding, a role of the potential sponsor in planning, executing and analysis of the study, and the influence (bias) which the funding organization had on the content of the article. Other relationships (such as employment, consultancies, stock ownership, honoraria, paid expert testimony) providing potential sources of conflict of interest in relation to the submitted article should also be revealed.

Ghostwriting, guest authorship and plagiarism policy

"Health Problems of Civilization" has procedures in place to prevent ghostwriting, guest authorship, and plagiarism.

Preparation of manuscripts

The paper should be written in English and be communicative, clear and concise, while maintaining the classic layout.

Work layout

The texts of the submitted articles should not exceed:

- In original papers and in review papers, 4400 words including tables and references – about 20 sheets, typewritten, double-spaced, 11 point font, 30 items of literature;
- In case studies, 1000 words including tables and references – about 7 sheets, typewritten, double-spaced, 11 point font, 10 items of literature;
- In editorial, 1500 words excluding references – about 10 sheets, double-spaced, 11 point font, 15 items of literature, without summary and key words, tables and figures can be included, sections can be included;
- In book reviews, 750 words, without sections, summary and key words.

Papers exceeding the required length or the number of items of literature will be individually considered by the Editor-in-Chief.

Original papers should be organized in a standard form with separate:

- Title (in Polish and English)
- Key words (from the Medical Subject Headings [MeSH] catalogue of the Index Medicus; in Polish and English)
- Summary (150-250 words; in Polish and English, structured)
- Background
- Material and methods
- Results
- Discussion
- Conclusions
- Disclosures and acknowledgements
- References.

Case studies should be divided to the following sections:

- Title (in Polish and English)
- Key words (from the Medical Subject Headings [MeSH] catalogue of the Index Medicus; in Polish and English)
- Summary (150-200 words; in Polish and English, structured)
- Introduction
- Case description
- Conclusions
- References.

Review papers should be divided to the following sections:

- Title (in Polish and English)
- Key words (from the Medical Subject Headings [MeSH] catalogue of the Index Medicus; in Polish and English)
- Summary (150-250 words; in Polish and English)
- Introduction
- Aim of the work
- Brief description of the status of knowledge
- Conclusions
- References.

Tables

Tables should be numbered according to their sequence in the text. The text should include references to all tables.

Each table should be provided in a separate file.

Illustrations

Each figure should be provided in a separate file, not included in the text.

Figures should preferably be provided in the TIF or EPS format. JPG is also acceptable.

All figures, whether photographs, graphs or diagrams, should be numbered consecutively throughout.

Citation and references

References should be quoted in square brackets in order of citation.

The reference list should be arranged in the order in which the citations appear in the text. If the number of authors exceed 6, after the sixth name "et al." should be written.

Journal citation:

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

Journal with a supplement number:

Zajkowska J. Lyme borreliosis – guidelines of treatment and expectations of patients. Przegl Epidemiol. 2008; 62(Suppl.1): 142–151 (in Polish).

Journal volume with part number:

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

Journal issue with part number:

Ahrar K, Madoff DC, Gupta S, Wallace MJ, Price RE, Wright KC. Development of a large animal model for lung tumors. J Vasc Interv Radiol. 2002;13(9 Pt 1):923-8.

Online journal citation:

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

Electronic Publish Ahead of Print:

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

Book:

Biernat E. Aktywność fizyczna mieszkańców Warszawy. Na przykładzie wybranych grup zawodowych. Warszawa: Oficyna Wydawnicza SGH; 2011 (in Polish).

Chapter from a book:

Piątkowska M. Uczestnictwo Polaków w aktywności fizycznej w porównaniu do innych krajów Unii Europejskiej. In: Buśko K, Charzewska J, Kaczanowski K., editors. Współczesne metody badań aktywności, sprawności i wydolności fizycznej człowieka. Warszawa: Akademia Wychowania Fizycznego w Warszawie; 2010. p. 38-57 (in Polish).

Forthcoming/In press:

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

Materials published online without DOI number:

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

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Duties and responsibilities of authors

The author is obliged to prepare and send the article in accordance with the requirements set out in the journal Editor. Moreover the author is obliged to submit editorial complemented by a statement which will be included:

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Editors are responsible for deciding which of the articles are accepted for publication. Editors act in a balanced, objective and fair way while carrying out their expected duties, without discrimination on grounds of gender, sexual orientation, religious or political beliefs, ethnic or geographical origin of the authors.

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WSKAZÓWKI DLA AUTORÓW/REGULAMIN PUBLIKOWANIA

- Czasopismo *Health Problems of Civilization*

Cele i zakres

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

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

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

Wymagania etyczne

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

Konflikt interesów

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

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„Health Problems of Civilization" stosuje procedury, które zapobiegają wystąpieniu zjawisk „ghostwriting", „guest authorship" oraz plagiatu.

Przygotowanie manuskryptów

Artykuł powinien być napisany w j. angielskim, powinien być komunikatywny, przejrzysty i spójny, a także utrzymywać klasyczny wygląd edycyjny.

Wygląd pracy

Teksty przesłanych artykułów nie powinny przekraczać:

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

Artykuły przekraczające wymaganą długość lub liczbę pozycji literatury będą rozstrzygane w drodze indywidualnej decyzji Redaktora Naczelnego.

Oryginalne artykuły naukowe powinny zawierać następujące elementy:

- Tytuł (w j. polskim i j. angielskim)
- Słowa kluczowe (z Medical Subject Headings [MeSH], katalog Index Medicus; w j. polskim i j. angielskim)
- Streszczenie (150-250 słów, w j. polskim i j. angielskim, podzielone na części)
- Wprowadzenie
- Materiał i metody
- Wyniki
- Dyskusja
- Wnioski
- Ujawnienia i uznania
- Bibliografia

Studia przypadków powinny zawierać następujące elementy:

- Tytuł (w j. polskim i j. angielskim)

- Słowa kluczowe (z Medical Subject Headings [MeSH], katalog Index Medicus; w j. polskim i j. angielskim)
- Streszczenie (150-200 słów, w j. polskim i w j. angielskim, podzielone na części)
- Wstęp
- Opis przypadku
- Wnioski
- Bibliografia

Artykuły przeglądowe powinny zawierać następujące elementy:

- Tytuł (w j. polskim i j. angielskim)
- Słowa kluczowe (z Medical Subject Headings [MeSH], katalog Index Medicus; w j. polskim i j. angielskim)
- Streszczenie (150-250 słów, w j. polskim i j. angielskim)
- Wstęp
- Cel pracy
- Krótki opis stanu wiedzy
- Wnioski
- Bibliografia

Tabele

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

Każda tabela powinna być przesłana w osobnym pliku.

Ilustracje

Każdy rysunek powinien być wysłany w osobnym pliku, nie zawartym w tekście.

Obrazki najlepiej przesłać w formacie TIF lub EPS. Format JPG jest także dozwolony.

Wszystkie obrazki, zarówno fotografie, wykresy, jak i diagramy, powinny być ponumerowane kolejno, zgodnie z pojawieniem się w tekście.

Cytaty i bibliografia

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

Bibliografia powinna być ułożona w kolejności cytowania w tekście. Jeżeli liczba autorów przekracza 6, po 6 nazwisku należy dopisać „et al.".

Cytowanie czasopisma:

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

Czasopismo – suplement:

Zajkowska J. Lyme borreliosis – guidelines of treatment and expectations of patients. Przegl Epidemiol. 2008; 62(Suppl.1): 142–151 (po polsku).

Tom czasopisma z numerem części:

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

Cytat z czasopisma online:

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

Publikacja elektroniczna przed drukowaną:

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

Książka:

Biernat E. Aktywność fizyczna mieszkańców Warszawy. Na przykładzie wybranych grup zawodowych. Warszawa: Oficyna Wydawnicza SGH; 2011 (in Polish).

Rozdział z książki:

Piątkowska M. Uczestnictwo Polaków w aktywności fizycznej w porównaniu do innych krajów Unii Europejskiej. In: Buśko K, Charzewska J, Kaczanowski K., editors. Współczesne metody badań aktywności, sprawności i wydolności fizycznej człowieka. Warszawa: Akademia Wychowania Fizycznego w Warszawie; 2010. p. 38-57 (in Polish).

Zapowiedzi/w druku:

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

Materiały opublikowane online nieposiadające numeru DOI:

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

Proces recenzji

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

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panel redakcyjny, bazując na przygotowanych pytaniach. Recenzent ma również możliwość przesyłania oddzielnych komentarzy umieszczonych w tekście artykułu

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Adres do korespondencji

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