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Aktywność fizyczna w profilaktyce chorób przewlekłych młodzieży akademickiej

Streszczenie

Studia to okres w życiu człowieka, wyznaczony zazwyczaj przedziałem wieku 19-25 lat. To czas przejścia z bytowania w domu rodzinnym, gdzie zapewniona była troska oraz opieka rodziców i wkroczenie w samodzielne życie. Kształtujące się w tym okresie nowe wzorce polegające często na nabywaniu niepożądanych zwyczajów żywieniowych i nieprawidłowych zachowań, mogą skutkować pogorszeniem zdrowia absolwentów w kolejnych dekadach życia.

Z przeprowadzonej metaanalizy wynika, że niekorzystna sytuacja zdrowotna ludności Polski związana jest z częstym występowaniem chorób przewlekłych. Sytuacja ta argumentuje konieczność wprowadzenia szybkich działań mających na celu rozpoznawanie czynników wpływających na wzrost zachorowań. Uzasadnione jest zdiagnozowanie tego zjawiska wśród młodzieży akademickiej, obciążonej czynnikami ryzyka jak: nadciśnienie tętnicze, dyslipidemia, upośledzona tolerancja glukozy, mała aktywność fizyczna.

Populację osób w wieku 20-34 lat charakteryzuje niska wiedza na temat niefarmakologicznych metod zapobiegania chorobom przewlekłym, co potwierdzają m. in. wielośrodkowe ogólnopolskie badania stanu zdrowia ludności WOBASZ oraz NATPOL-PLUS.

Zdrowotne korzyści wynikające z aktywności fizycznej są coraz lepiej rozpoznawane i doceniane. Wysiłek fizyczny wpływa na ciśnienie krwi, poprawia wskaźniki gospodarki lipidowej, zmniejsza insulinooporność, sprzyja utrzymaniu prawidłowej masy ciała, a także poprawia ogólną sprawność i samopoczucie. Wpływ wysiłku fizycznego na organizm jest niezaprzeczalny, stąd konieczność zwłaszcza podczas studiów, zwrócenia większej uwagi na codzienną, spontaniczną aktywność fizyczną.

Słowa kluczowe: studenci, choroby układu krążenia, cukrzyca, zespół metaboliczny, aktywność fizyczna.

Physical activity in the prevention of chronic diseases of academic students

Abstract

Academic studies cover usually a period of life between 19 and 25 years of age. It is the time of transition from living in the family home under the care of parents to becoming an independent adult. New habits developed in this period are often extrapolated to improper nutritional attitudes and inappropriate patterns of behavior that may result in health deterioration among graduates in their future lives.

The meta-analysis has revealed that an unfavorable health condition of the Polish population is connected with a high incidence of chronic diseases. It calls for immediate actions aimed at identifying factors that contribute to an increasing incidence of diseases. It is justified to diagnose this phenomenon among university students burdened with such risk factors as arterial hypertension, dyslipidemia, impaired glucose tolerance or low physical activity.

The population of 20-34-year-olds has low awareness of the non-pharmacological methods of preventing chronic diseases, as indicated by multicenter national studies WOBASZ and NATPOL-PLUS on health population.

Health benefits of physical activity are more and more recognized and appreciated. Physical exertion influences blood pressure, improves lipid parameters, decreases insulin resistance, helps to maintain proper body mass, and improves general physical and mental state. The influence of physical exertion on the body is indisputable. Therefore, it is necessary to pay more attention to everyday spontaneous physical activity especially during studies.

Keywords: students, cardiovascular diseases, diabetes, metabolic syndrome, physical activity.

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INTRODUCTION

Academic studies are a period in life that usually falls between 19 and 25 years of age. This is a long-term phase of education, usually taking place away of family, when weakening of family ties is observed and peer group influence is strengthened. This is also usually a period of transition from living in the family home, where parental care was provided, into an independent life. New behavioral patterns are emerging at that time, often involving the acquisition of unwanted habits and incorrect behavior, which can result in the deterioration of health of graduates in the following decades of life [1-3].

Epidemiological data indicate adverse health situation of the Polish population associated with a high incidence of chronic diseases. This situation argues the need for swift action to identify factors influencing an increase in the incidence of these diseases. It is reasonable to diagnose this phenomenon, and in particular to determine the percentage of students carrying risk factors such as hypertension, dyslipidemia, impaired glucose tolerance, improper nutrition, obesity, and low physical activity. The studies designed to identify the risk factors very often detect unnoticed pathological conditions in people with a sense of „subjective" health. The probability of chronic non-infectious diseases is the greater, the longer the impact of negative factors that cause them. Early diagnosis is particularly important in the prevention of non-infectious chronic diseases. Such actions should be taken already in the school, and the costs of omission are predictable in advance and are not acceptable.

Although, available literature [1-7] can facilitate creating a general picture of a lifestyle of students and enables description of their state of health, most of the studies concern selected issues and examined populations of students are in different age. Determining how health of the students changes during their studies and to what extent it depends on the environmental, diet or physical activity factors, may help to describe the actual condition of students in terms of the development of chronic diseases and risk prediction for people with higher education later in life.

Current research studies confirm the existence of a close correlation between the people's health of all ages and means of nutrition, environmental factors and socio-demographic and physical activities [8,9]. This knowledge becomes essential, especially in preventing and delaying the onset of symptoms of chronic diseases in young people.

Polish population aged 20-34 has low awareness of non-pharmacological methods of preventing chronic diseases, as evidenced by nationwide multicenter studies WOBASZ [10] and NATPOL-PLUS [11] on population health.

Cardiovascular diseases

The main public health problem in our country is cardiovascular diseases (CVD) [12]. In the coming decade an increase in the number of people at risk for CVD is expected, among which coronary heart disease (CHD) is at the prominent place.

Clinical symptoms of CHD are caused by atherosclerosis. The development of the disease depends on many factors, most of which are susceptible to preventive interventions. These are elevated concentration of lipids and lipoproteins in the blood and reduced levels of HDL cholesterol. Factors that can be reduced or eliminated are obesity (mostly abdominal), hypertension, abnormal nutrition, and low physical activity. However, the factors that cannot be changed include age (over 40), male gender, and genetic predisposition [13]. According to McGill and NcMahan [14], risk factors mutually enhance the effects of their actions, so even a small reduction of one or more of them in the early stages of the disease reduces the risk of atherosclerosis and its complications.

There is ample evidence that early atherosclerotic lesions may appear in childhood [15,16], but symptoms that may be the cause of death occur more often after 40 years of age [15-19]. Clinical observations show that there is a relationship between the incidence of risk factors in childhood and adolescence and the incidence of CHD symptoms in adults [16,20].

Based on epidemiological studies, it was found that the elevated level of blood pressure is one of the most important risk factors for CHD [21]. Hypertension (HT) is one of the most common diseases associated with damage of the endothelium and vascular endothelial dysfunction, overactive sympathetic nervous system and the hormonal secretion of pressor agents. Genetic and environmental factors also play an important role in HT etiology. The HT in the Polish population occurs in approximately 50 and 40% of men and women, respectively, which corresponds to approximately 8 million adults in Poland [22]. In children, HT is much less common than in adults and affects 1-2% of the population under 18 years of age [23,24]. Complications associated with HT depend on its severity, duration, and associations with other factors of atherosclerosis. It has been shown that HT, next to hyperinsulinemia and dyslipidemia, when occurred in childhood often persists into adulthood, especially in obese patients. This was confirmed by study of Krzych et al. [25], which showed that of 532 students, those with diagnosed HT were more often overweight compared to healthy respondents (32% vs. 11%) as well as they had more frequent lipid abnormalities (18% vs. 6%), and their diet was dominated by highly salted (40% vs. 29%) and high-fat products (78% vs. 59%). Kemper in his works [26] devoted to longitudinal investigations on the development, physical performance and health of children and adolescents between the ages of 13 to 22 also found that there is a correlation between the prevalence of CHD risk factors (blood pressure and body fat) in childhood and the incidence of the disease in later life.

Therefore, prevention is extremely important. It is suggested that the prevention of atherosclerosis at a young age should be based primarily on the change of potentially ill-balanced diet, increasing physical activity, and early detection and treatment of hypertension [27]. Therefore, preventive measures have already been taken at the stage of primary school and high school students, in the course of 2003-2005 Children Education Program Chance for a young heart. Its introduction was justified by the growing number of overweight children and the awareness that changes in the blood vessels start at an early age [17]. It also seemed reasonable to determine the prevalence of risk factors for CHD in other age groups. In 2000, the Committee

on Prevention of the Polish Cardiac Society published the principles of prevention in CHD, focusing on the identification and control of risk factors of this disease in all people after 20 years of age [28].

Based on the studies of the U.S. National Institutes of Health a diet was developed, the major effect of which, in addition to the reduction of blood pressure of about 8-14 mmHg, is a simultaneous decrease in concentration of total cholesterol, LDL cholesterol and triglycerides. The DASH diet (Dietary Approach to Stop Hypertension) is based on low-fat dairy products, foods with reduced content of cholesterol, vegetables, fruits and sea fish. The essence of this diet is to reduce energy and sodium consumption [29]. Numerous studies have shown that the DASH diet is causing a decrease in blood pressure [30]. It should be noted that in the prevention of CHD, only the combination of physical activity and diet gives significantly better results than the sole abiding by the dietary restrictions.

Diabetes

Diabetes represents 90-95% of the total carbohydrate metabolic disorders resulting from a total lack of insulin or insulin resistance. Its incidence in recent years is alarmingly increasing, as shown by epidemiological studies [12,31,32].

The essence of type 1 diabetes is insulin deficiency in the organism, caused by pancreatic β cell damage. Primarily it is a condition of children and young people, generally up to 20 years of age, and the only effective preventive measure is insulin administration, proper nutrition and physical activity.

Patterson et al. [33] presented estimates of the incidence of type 1 diabetes in children under 14 years of age in Europe by 2020. Based on the EURODIAB database he estimated that if similar incidence will be sustained, the number of new cases in children under 5 years of age will double, and for children under 14 it will increase by 70% between 2005 and 2020. Statistical analysis showed that in the years 1989-2004, 12,465 children were diagnosed in Poland and over the next 16 years (2005-2025) 46,600 of new diabetes cases are expected, with a clear shift of the age of onset towards earlier years. This means nearly 4-fold increase in new diabetes cases, which in the Polish population is evenly distributed between both sexes [32,34].

The observations carried out in 1999-2000 in selected provinces (Małopolska, Lublin, Łódź) demonstrated that the prevalence of type 2 diabetes, estimated for the whole population of our country, was 5.4%, which corresponded to over 2 million people. Half of them suffered from diabetes, which was not detected or recognized [35]. According to WHO, type 2 diabetes is currently affecting 180 million people around the world. It is estimated that by 2030 this number will be doubled [36].

Type 2 diabetes is a disease determined by both genetic and environmental factors, where age is a significant risk factor. The prevalence of diabetes in a group of 40-year-olds is evaluated at 3-5%, while among 60-year-olds it can be as high as 20-30% [37]. What is alarming, however, is that the metabolic disorders of type 2 diabetes occur at a younger age [38]. Diabetes occurring in young people is a particular type of metabolic disorder (MODY - Maturity Onset Diabetes of Youth), and its clinical picture corresponds to type 2 diabetes [39]. Its development is influenced by low physical activity of today's young people, which favors the accumulation of adipose tissue and impaired glucose tolerance.

An effective way to prevent type 2 diabetes is a behavioral intervention. The studies carried out in recent years have shown that lifestyle modification, based on implementation of regular physical activity, caused weight reduction by about 5-10%, which in 2-3 years reduced the risk of developing diabetes by 58% [40]. The effectiveness of diet and exercises was confirmed by Swedish (Malmö Study), and Chinese (Da Qing) studies [41,42]. The latter studies showed that in 577 patients with impaired glucose tolerance, slightly increased physical activity resulted in reducing the incidence of diabetes by 15%, and in a group additionally applying diet by 21%. Another work that emphasized the importance of lifestyle changes were Finnish Diabetes Prevention Study (FDPS) [43] and the American Diabetes Prevention Program (DPP) [44]. Both programs resulted in the reduction of risk of diabetes by several dozen percent, and they were most effective in the oldest group (risk reduction by 71%), and more effective in men (65%) than women (54%).

The diagnosis of diabetes, regardless of type, does not disqualify patients for sports. However, an effort may be associated with a danger of losing consciousness due to post-workout hypoglycemia, hence the need of finding an optimal way to control the effort. It has been shown that education reduces the incidence of both acute and chronic complications of diabetes. It creates an opportunity to improve the quality of life [45], unfortunately, the expected level of knowledge is not always satisfactory [46]. A prerequisite of safe sport trainings is nutrition adapted to a given exercise situation [47].

The metabolic syndrome

Metabolic syndrome (MS) as reported by Reaven [48] is the coexistence of a number of metabolic abnormalities such as insulin resistance, hypertension, and elevated blood lipids. The most recent criteria for the metabolic syndrome come from 2009 [49]. They are an attempt to unify U.S. and international guidelines, and are the official position of the International Diabetes Federation (IDF), the National Heart, Lung, and Blood Institute (NHLBI), the American Heart Association (AHA), the World Heart Federation (WHF), International Atherosclerosis Society (IAS) and the International Association for the Study of Obesity (IASO). According to the new definition, to identify the metabolic syndrome, 3 out of 5 of the following criteria should be identified:

- abdominal obesity for the European population depending on the guidelines ≥102 cm or ≥94 cm for men and ≥88 cm or ≥80 cm for women,
- abnormal fasting glucose concentration in plasma (≥100 mg/dl),
- high blood pressure (≥130/85 mmHg),
- reduced HDL cholesterol levels (M<1.0 mmol/L (40 mg/dl), W<1.3 mmol/L (50 mg/dl),
- increased triglycerides (≥1.7 mmol/L (150 mg/dl).

Based on available epidemiological studies, the prevalence of the metabolic syndrome can be considered epidemic. In 2004, Cameron published a report on the prevalence of MS [50]. He found that in the age group of 20-25 years, the incidence of MS among urban populations in males was 8% in India up to 24% in the U.S. and in women from 7 to 43% in France and Iran, respectively. An interesting discovery was that the prevalence of MS depended significantly on age. For example, in the United States, the incidence increased from 7% in people aged 20-29 years to 43% in the 60-69-year-olds [18,50]. Also in the Polish population, in which prevalence of MS was estimated in the WOBASZ study [51], a relationship between the frequency of its occurrence and age was observed. In the population within 20-39 years interval 10% of men and 4% of women were diagnosed with metabolic syndrome while at the age of 40-59 years, it was 28 and 24%, respectively. MS is increasingly being recognized in children [52]. Data from the NHANES III studies indicate that the incidence of the metabolic syndrome at the age of 12-19 years was 4.2% [53], and could result from the exacerbation of diabetes and obesity incidence in this age group. Retrospective Bogalusa Hart Study indicated increased incidence of MS in adults, in whom lipid disorders, hypertension and elevated fasting insulin levels occurred already in childhood [54]. Young Finns Study, in turn, has shown that visceral obesity in children and adolescents can predict the risk of developing MS and hypertension in adulthood. Arguments for the importance of obesity and high blood pressure in the etiology of MS have been provided by the analysis of death causes of the population of North American Indians published by Franks et al. [55]. It showed that metabolic abnormalities typical of MS in childhood and adolescence were associated with the development of CHD as early as in the fourth decade of life.

Most reports indicate that MS, and particularly abnormal lipid and carbohydrate metabolism, when co-existing with hypertension, predispose to increased risk of CHD and stroke [56]. In a study by Dekker et al. [57] the risk of CHD was two times higher in patients with MS than in those without this syndrome. Isomaa et al. and others [58] analyzed the occurrence of MS in the Finnish population and its relationship with CHD and found that patients with MS were three times more likely to be diagnosed with CHD. These authors also observed that in patients diagnosed with MS and the accompanying type 2 diabetes, dyslipidemia significantly increased the risk of this disease while in patients with normal glucose tolerance hypertension was a risk factor.

Similar results were obtained by Sattar et al. [59] in the West of Scotland Coronary Prevention Study. Among men diagnosed with four or more features of the metabolic syndrome, CHD occurred three times more frequently than in the subjects with no metabolic abnormalities. The relationship of CHD with metabolic syndrome was also confirmed by data from large population-based studies, the Framingham Offspring Study and San Antonio Heart Study [19].

The impact of MS on the risk of occurrence of cardiovascular events was assessed by analyzing the results of 11 European prospective studies. The evaluation included 6,156 men and 5,356 women aged 30-89. They have shown that the incidence of MS increased the risk of death from diseases of the cardiovascular system 2.2 and 2.7 times in men and women, respectively [60].

The role of physical activity in the prevention of chronic diseases

Activities aimed at preventing chronic diseases, especially MS, and its consequences – atherosclerosis, type 2 diabetes, coronary heart disease – should include, in addition to pharmacological treatment and treatment of comorbid conditions, primarily the lifestyle modification that will increase physical activity.

Physical activity means the movement of the body, caused by contraction of skeletal muscle that increases energy expenditure above resting values. An exercise, in turn, is a physical activity performed in a repeated manner, according to a certain pattern, the aim of which is to increase the fitness of your body. The body's response to exercises depends on many factors such as the type of an effort performed (dynamic, static, mixed), the overall health of the person undergoing physical exertion, gender and age, emotional state, environmental conditions (altitude above sea level, climate, etc.).

For many years, physical activity and exercises are known to have a beneficial effect on the body. Dozen years of observations of seventeen thousand Harvard alumni population aged 35-74, conducted in the 60s and 70s of the last century, have shown that the risk of death has decreased with the increase in energy expenditure during physical activity [61,62]. Pioneering observations of Morris et al. and colleagues [63] on the effect of the type of work for the risk of myocardial infarction have shown that the most active conductors of double-decker buses had lower incidence of coronary heart disease, and those who were affected, developed less severe symptoms. Similar relationships were described by Kahn [64] for postmen working in Washington.

The results of numerous scientific studies carried out in many countries with diverse, large groups, proved unequivocally that in healthy adults of both sexes, physical activity of moderate intensity plays an important role in the prevention of CHD, as well as in decreasing the risk of death for this reason [65]. The results also indicate that this is caused mainly by the reduction of blood pressure, hence the elimination of the most important risk factor for CHD.

The results of the meta-analysis, of 47 studies involving 2,543 patients, revealed that regular exercises significantly decreased mean arterial pressure, both systolic and diastolic, in patients with hypertension as well as in healthy subjects, but the effect was less pronounced in the elderly [66].

Respectively greater physical activity associated with energy expenditure at the level of at least 1000 kcal/week, can significantly reduce the risk of developing CHD [67,68]. Moderate, regular aerobic exercises such as walking, swimming and cycling are recommended most days of the week. Intense isometric exercises, such as weight lifting, can cause a large increase in pressure and are contraindicated. The work of Leon et al. [69] has shown that even a small daily recreational physical activity (10-30 minutes) significantly reduces the risk of dying from CHD. Ishikawa-Takata et al. group [70] demonstrated that more significant for the reduction of blood pressure is the total duration of the physical

activity per unit of time, e.g. during the week, rather than its frequency. According to these authors, even 30-60 minutes of exercise a week is sufficient to reduce both systolic and diastolic blood pressure in patients with hypertension. Lee et al. [71] also found that one hour of walking per week reduces the risk of CHD.

Similarly, introduction of regular physical activity has become the main aspect of the prevention of diabetes. Among the recommended physical activities are brisk walking, cycling, swimming and tennis. However, the study of Morrato et al. [72] indicated that people from the risk group are reluctant to start physical activities and that this attitude is even more decisive after the diagnosis of the disease.

As recommended by the American College of Sports Medicine, people with diabetes should practice 3 to 5 times a week for 20-60 minutes aerobic training exercises at 55-60% of maximum heart rate (HR). People with excess body fat are also recommended to extend the duration of exercise for one hour while reducing its intensity [73]. Exercise that is less intense, but stretched in time allows to burn glucose gradually. This avoids the sudden hypoglycemia, and better utilization of fatty acids saves glycogen supplies, rapid recovery of which after exercise carries the risk of hypoglycemia. An important element of the recurrent efforts is an education on how to monitor blood glucose levels. According to Colberg and Swaln [74], increased effort, especially in those with advanced diabetes, forces the individual assessment of required insulin therapy, and the ability to prevent hypoglycemia occurring during or (more often) after the exercises.

The role of physical activity in the prevention and treatment of MS is the subject of numerous studies carried out throughout the world. Despres et al. [75] suggested that systematically performed exercises by obese or overweight individuals lead to a reduction in the amount of fat accumulated inside the abdominal cavity and, consequently, reduction in MS factors, regardless of dietary restrictions. By contrast the studies of Ekelund et al. [76], found that the effect of physical activity on the reduction of risk factors for MS can be independent of body fat reduction and improvement of physical fitness. Kraus et al. [77] drew similar conclusions showing that endurance training, in addition to reducing body fat, has a beneficial effect on the concentration of blood lipids, resulting in a reduction of total and LDL cholesterol while increasing levels of high-density lipoproteins (HDL), especially HDL-2. Particular importance in shaping the post-training changes in plasma lipids is played by an increase in the activity of lipoprotein lipase enzyme in muscles and adipose tissue that catalyzes the breakdown of plasma triglycerides.

The observations of Janssen et al. [78], in turn, demonstrate that the incorporation of the physical effort to the program of obesity reduction, based on a low-calorie diet, did not have a significant effect on body fat content and MS parameters in women as opposed to men who had an aggregation of some effects of the diet and efforts [79]. Other studies have found greater improvement of the lipid profile in women when combined diet and exercises were applied than diet alone [80].

CONCLUSION

Health benefits of physical activity are more and more recognized and appreciated. Bouchard et al. [81] in the document of nearly 1,000 pages have demonstrated that there is much substantial evidence showing the health potential of physical activity. Published recommendations for physical activity are based largely on evidence of the relationship between physical activity, often treated as a recovery factor, and cardiovascular diseases, diabetes, hypertension, etc.

Physical activity is one of the basic human needs in every stage of life. Nowadays, the development of technology makes life easier every day, not only for adults, but also for people at young age. Due to technical progress, there has been a significant reduction in physical activity in everyday life. Change of the work rhythm, mechanization, devices that help maintaining a household, and finally widely available means of transport, to a large extent limit our physical activity. The use of scientific and technology advancements makes physical activity increasingly marginalized. It has been replaced by sedentary activities such as working at the computer or watching television. Young people are involved in sports less and less. Sedentary life style favors the accumulation of body fat, muscle weakness, or impaired blood supply in many organs, particularly the brain and heart.

Exercises affect blood pressure, improve lipid parameters, reduce insulin resistance, promote healthy body weight, and improve overall performance and well-being. An effect of exercise on the body is undeniable, hence the need, especially during academic studies, to pay more attention to the everyday, spontaneous physical activity. Change in the way of living by eliminating unwanted habits and anti-healthy behaviors, which can significantly reduce the beneficial effect of physical activity, is strongly advisable.

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The work was performed in the framework of a funded by Ministry of Science and Higher Education research project nr. DS-172 of the Faculty of Physical Education and Sport in Biała Podlaska, Józef Piłsudski University of Physical Education in Warsaw.