

NUTRITIONAL AND LIFESTYLE FACTORS DETERMINING THE PROBLEM OF OVERWEIGHT AND OBESITY AMONG TEENAGERS AND YOUTH DURING THE COVID-19 PANDEMIC – A COMPARATIVE SURVEY STUDY AMONG POLES AND BELARUSIANS

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ABSTRACT

Introduction: The prevalence of obesity is increasing worldwide, especially among youth. The main cause of obesity in young people is a combination of excessive caloric intake and reduced physical activity. In addition to individual dietary and physical activity behaviors, genetic predisposition, socioeconomic and environmental factors, and comorbidities may contribute to obesity.

Aim: The study aims to examine and compare the factors determining food preferences and habits as well as the occurrence of overweight and obesity among teenagers and youth in Poland and Belarus.

Material and methods: An anonymous questionnaire consisting of 58 questions based on the Eating Behavior Questionnaire (QEB) was used. Responses were received from 700 young people from Poland and 690 from Belarus, some of whom were rejected. The data was collected in May and June 2021 and analyzed in the Statistica program (statistically significant results at $p < 0.05$). The research was financed by a grant from the Polish National Agency for Academic Exchange.

Results: The study group was divided into four groups in terms of age and nationality: Poles <20 years old (428 people), Belarusians <20 years old (222 people), Poles 20-29 years old (210 people), and Belarusians 20-29 years old (295 people). The correct BMI had 66.7%, 74.3%, 70.7%, and 71.2% of the respondents, respectively ($p = 0.057$; $p = 0.888$). In both age groups, in the Mann-Whitney U test, there are significant differences in the number of meals per day ($p < 0.001$) - Poles eat 4 or 5 meals a day more often, and Belarusians 3. In the chi-square test, both age groups showed a significant statistical difference ($p < 0.001$) in the question about eating breakfast every day - Poles eat breakfast more often than Belarusians. The Mann-Whitney U test showed no differences in sleep duration between the respondents from both countries ($p = 0.453$; $p = 0.905$).

Conclusions: The results of the research indicate a strong need to implement educational programs to raise the awareness among young people about healthy eating. Obesity, skipping breakfast, too few meals during the day, and their incorrect composition indicate the direction of pro-health policy, which will be conducive to making the right food choices for youth.

Keywords: overweight; obesity; children; youth; COVID-19 pandemic.

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INTRODUCTION

Over the last decades, the prevalence of overweight and obesity among teenagers and adolescents has risen. According to the World Health Organization (WHO), global overweight and obesity rates have risen more than four-fold from 1975 to 2016 (4% and 18%, respectively) [1]. In the World Health Organization (WHO) European Region, 60% of adults, and one-quarter of adolescents (10-19 years old) are affected by overweight and obesity [2]. Furthermore, approximately 8% of children aged under five years old and a third of school-aged children are overweight or obese. Although rising trends in obesity are noted worldwide, there are international and regional variations in obesity prevalence in European teenagers and adolescents.

The main cause of childhood obesity is a combination of the excessive intake of calories and reduced physical activity [3]. It is associated with dietary habits, which are formed in family environments before adulthood. Poor eating-related habits such as skipping breakfasts, lack of time for preparing meals, low family meal frequency, and eating too late before bedtime are factors contributing to weight gain [4,5,6]. Furthermore, food advertising, and widespread access to supermarkets or takeaway outlets with fast foods, processed foods, and addictive high-sugar can increase consumption in children and have a role in obesity development [7]. The family plays a role in the development of childhood obesity is observed in the postnatal stage of life, but also in the prenatal period. As described, obesity among children is associated with maternal obesity and gestational diabetes [3]. Therefore, diet education about the significance of developing healthy eating habits and lifestyle is important among children, adolescents, and adults. In addition, according to studies, not getting enough sleep could promote overconsumption of food. Consuming more food is observed during emotional eating and stressful situations. As described, stressful situations via behavioral and biological pathways can promote obesity [8]. In addition to genetics, individual behaviors in diet and physical activity, socioeconomic, and environmental factors, and comorbidities can promote obesity [9]. Taking medications including steroids and endocrine disorders such as hypothyroidism, hypopituitarism, Cushing syndrome, or polycystic ovary syndrome (PCOS) are conditions which can promote obesity.

During the coronavirus 2019 (COVID-19) pandemic isolation, teenagers had higher exposure to obesity risk factors including spending sedentary time [10]. It was associated with staying at home/home isolation, spending less time on sports at school or outdoors, and more snacking [10].

Excessive body weight of children and adolescents increases the risk of psychological disorders, chronic diseases - type 2 diabetes mellitus, cardiovascular diseases, and certain cancers [3]. It also has social and economic consequences [10,11]. Obese teenagers and adolescents are more prone to obesity in adulthood than those with the correct Body Mass Index (BMI). Determining factors that impact behavior and development of obesity would prevent weight gain and its complications among children, adolescents, and future adults. Notably, most obesity risk factors are potentially modifiable, so require modification of lifestyle.

AIM OF THE STUDY

The study aims to investigate and compare factors determining food preferences and eating habits, physical activity, and the prevalence of overweight and obesity among teenagers and adolescents in Poland and Belarus – citizens of countries of similar origin (Caucasian race), but living in different political and economic conditions during the COVID-19 pandemic. The obtained results will indicate the directions of pro-health policy, which will be conducive to making the right nutritional choices for youth.

MATERIAL AND METHODS

The study was possible thanks to the grant from National Agency for Academic Exchange NR:PPN/WYM/2019/1/00075/DEC/1. The consent of the Bioethics Committee of Medical University of Lublin was obtained (resolution KE-0254/29/2021, date: 25 February 2021). The study used a survey of 58 questions based on the Questionnaire of Eating Behaviour (QEB). The questionnaire covered an examination of: (A) eating habits (14 questions), (B) food consumption frequency (28 questions), (C) lifestyle and anthropometric parameters (10 questions), (D) demographic data (8 questions). The survey consisted of open questions, single-choice questions, and multiple-choice questions. The consent to participate in the study was obtained from each participant. In Poland, the Polish-language version was used, while in Belarus, the Belarusian version was used. Before the start of the international study, the questionnaire was standardized on a group of Polish students at the Chair and Department of Epidemiology and Clinical Research Methodology of Medical University of Lublin.

In Belarus, questionnaires on nutrition and risk factors for the development of overweight and obesity among school teenagers were collected with the help of the scientific team of the Department of Public Health and Health Services of Grodno State Medical University. The questionnaires were collected in May and June 2021 using the direct interview method, which was allowed by the regulations in force in this country during the COVID-19 pandemic. In the Polish part of the project, an application was submitted to the Bioethics Committee of Medical University of Lublin for consent to conduct the research and publish the results. The questionnaire was uploaded and shared on the Google online survey platform. According to the rules of social distancing and e-learning due to the COVID-19 pandemic in Poland, a link to the questionnaire on nutrition and risk factors for the development of overweight and obesity was sent to 88 schools in May and June 2021. They were schools and educational institutions run by the city of Lublin. The addresses of the units were obtained from the Internet from the website of the Lublin City Hall. Moreover, the questionnaire was widespread in Poland using social media. The campaign was publicized by publishing information on the website of the Medical University of Lublin (www.umlub.pl). 700 questionnaires from Poland and 690 questionnaires from Belarus were collected in total. It was decided to analyze the results of people in two age groups, teenagers up to 19 years of age and adolescents between 20 and 29. Answers from people aged 30 and more were rejected. Overall 638

questionnaires were analyzed from the Polish population and 517 from the Belarusian population. Some questions were not included due to a lack of answers from one side. It should be emphasized that the project was carried out in the difficult epidemiological and political situation in this country, which was a great challenge for everyone.

The collected research material was statistically processed using the Statistica 13.1 Statsoft program. Quantitative variables are described through the mean, standard deviation, as well as minimum and maximum values. Results are rounded to one decimal place. Based on the anthropometric data, BMI was calculated for each respondent. The chi-square and U Mann-Whitney tests were used. The obtained results of the analysis were considered statistically significant at $p < 0.05$.

RESULTS

There was no statistically significant difference between the age of Poles and Belarusians in a group < 20 years ($p = 0.084$). Nevertheless, the statistical significance was observed for a group ≥ 20 years ($p < 0.001$). The mean age of over 20 group from Belarus was 22.1, and from Poland 23.2. Similarly, there was no statistically significant difference between the sex of Poles and Belarusians in a group < 20 years ($p = 0.632$). The statistical significance was observed for a group ≥ 20 years ($p < 0.001$). In the over 20 age group women were 88% vs 58% in the under 20 group. There were no statistical differences in the number of people with normal BMI in any of the age groups ($p = 0.057$; $p = 0.888$, respectively).

The percentage of respondents with incorrect BMI is worrying. Only 74.3% and 71.2% (respectively, in two age groups) of Belarusians had normal BMI. Overweight was observed in over 14% and more than 2.5% of respondents were obese. However, about 10% of Belarusians were underweight, which was also worrying. In Poland, these results were even more disturbing. As many as 67.1% and 71.6% (respectively, in two age groups) of Poles had normal BMI. The percentage of overweight and obesity among young people hovers around 6.0% to 14.4% and 2.9% to 3.8%, respectively.

It is worrying that more than half of Belarusians do not eat meals at regular times of the day and the majority of them do not eat breakfast every day. When asked about the frequency of meals during the day, the majority of surveyed Belarusians indicated 3 meals a day. Only 1/3 of respondents from Belarus eat their last meal 2 hours before going to bed, which is a correct eating habit. Almost half of the respondents do not pay attention to the time of the last meal. In our study, more than 50% of respondents from Belarus admitted to snacking between meals at least once a day. The majority of Poles eat meals more regularly, 3 or 4 times a day. Furthermore, most of them always eat breakfast, which is a good dietary habit. Unfortunately, over a third of Polish responders do not pay attention to the time of the last meal before bedtime, which is indicative of insufficient sleep hygiene. The frequency of daily snacking is comparable between Polish and Belarusian, but the problem is more visible in teenagers. The statistics show that Poles over 20 years old eat more regularly and snack less compared to the younger age group.

Over 80% of respondents from Belarus indicated that they eat home-cooked dinner every day,

which seems to be a positive habit. Young people from Belarus do not use sweeteners to sweeten beverages, and about 36% do not sweeten tea or coffee at all. Among people who sweeten beverages, it is most common to use at least 2 teaspoons of sugar. When asked about a typical day of the week in terms of nutrition, young people under 20 most often indicated Friday, and young people over 20 – Tuesday, on which they usually eat 3 meals. The difference may be because the younger ones go to school and the older ones study, which means that they have a different rhythm of the week related to, for example, travelling home. It is disturbing that over a dozen young Belarusians do not eat any fruits or vegetables on their typical day. The majority eat fruits or vegetables 1 or 2 times a day. The majority of respondents do not eat fast food on their typical day; however, fast food is eaten by about 14%. Fortunately, also in Poland over 80% eat home-cooked dinners every day. What is especially relevant, 60% of Poles over 20 years old do not use sugar or sweeteners for hot drinks at all. If they do sweeten, they usually use 1 teaspoon of sugar or honey. On the other hand, 1/3 of Polish teenagers do not sweeten at all, and another 1/3 use 2 or even more teaspoons for each hot drink. As a typical day in terms of diet, most Poles under 20 years old choose Monday, and over 20 years old – Monday, Tuesday, and Thursday. The declared number of meals on these days is 3 or 4 per day. In Poland, like in Belarus, over a dozen teenagers do not eat fruits or vegetables on their typical day. In a group of young adults, the daily consumption of fruits and vegetables is higher. Fast food consumption also revealed a disparity between age groups. 1/4 of Polish respondents under 20 years old and almost 18% of Poles over 20 years old admitted to having this type of meal on their typical day. What is especially disturbing, the above statistics show some serious abnormalities in eating habits in the group of youths, who are in their growth period.

The largest percentage of responders from Belarus eat light bread once or a few times a week, while above 40% of them never eat wholemeal bread. In Belarus, a more positive distribution of the data concerns the consumption of buckwheat, oatmeal, whole grain pasta, or other coarse grains, because in both age groups they are most often eaten several times a week (36% and 31%) or once a week (29% and 32%), compared to white rice, plain pasta or small groats, which is eaten mostly 1-3 times per month (43% and 44%). In Poland, the largest number of responders eat white bread several times a week, but there are also certain differences between age groups. Almost 1/4 of youths under 20 years old eat it several times every day, while in the group over 20 years old this percentage is considerably lower and hovers around 10%. On the other hand, Poles in both age groups are more likely to choose a wholemeal bread and about 1/3 of responders eat it several times a week, which is a significant difference compared to Belarus. The results are not so favorable when it comes to coarse grain products. More Poles than Belarusian do not eat them at all. Teenagers most often eat buckwheat, oatmeal and whole grain pasta 1 to 3 times a month and young adults more frequently. However, Poles much more often choose white rice, plain pasta, small groats and about half of responders eat them mainly several times per week.

About 2/3 of Belarusian youths eat fast foods 1-3 times per month. However, it should be noted that the percentage of responders who never eat fast food is

higher than those who eat it once or several times a week. The frequency of consuming fried meals is also worrying. About 45% of Belarusian responders indicated that they eat fried foods several times a week. Poles also most often eat fast foods several times a month. However, the number of Polish youths, who do not eat them at all is significantly lower. What is worrying, about 10% of both age groups consume fast foods at least several times a week. Additionally, fried foods are equally popular in Poland. They are eaten mostly a few times a week but in about 7-11% of cases at least once a day.

Regarding dairy consumption, most Polish and Belarusian teenagers and young adults drink milk or fermented milk a few times a week. Cottage cheese and processed cheese consumption is diverse. The largest percentage of Belarusian responders eat it several times per month and about 15% at least once a day. Among Polish responders, the majority of them also eat cottage cheese several times per month, while cheeses are eaten usually a few times a week.

A particularly important in the diet of teenagers and adolescents is complete protein contained in lean meat and fish. About a third of adolescents and young adults in Belarus eat white meat several times a week, and another third do it less than once a week. Unfortunately, eating fish a few times a week is much less common and is declared by less than 4% of responders. Additionally, the frequent consumption of processed meat is also worrying. Cold cuts and sausages are eaten mainly a few times a week. Legumes, e.g. beans, peas, soybeans, and lentils, are another good source of proteins in a diet and might be an excellent alternative to meat. Unfortunately, about 40% of Belarusian youths never eat legumes and only about 10% do it more than once a week. Approximately half of the Polish responders consume white meat a few times a week. The frequency of eating fish is similar to the Belarusian group – less than 7% of responders eat them a few times a week. Furthermore, more Polish responders eat processed meat at least once a week than Belarusian individuals. Consumption of legumes is higher in Poles, but less than 10% eat them every day.

The majority of both Polish and Belarusian youths eat them few times a week. Only about 11% of Belarusian responders eat vegetables and less than 10% of responders eat fruits more than once a day. Among Polish responders, these values are higher - about 30% and less than 20%, respectively. The vast majority of Belarusian and Polish responders drink fruit, vegetable, or fruit and vegetable juices a few times a week or more seldom.

Fortunately, more than half of young people in Belarus and Poland never eat powdered or ready-made soups and canned meat.

Most Belarusian and Polish responders eat sweets more than once a week, of which about 1/3 of Belarusian and Polish teenagers do so at least once a day. In addition, about 2/3 of Belarusian youths drink sweetened hot drinks every day. On the other side, about 22% of Polish teenagers and 41% of responders aged 20-29 never drink this type of drink. In Belarus, sweetened carbonated or non-carbonated drinks are more popular and about 45% of responders drink them up to 3 times per month. Fortunately, in both populations, energy drinks do not gain popularity among young people. More than half of them never drink energy drinks and only less than 3% do so several times a day. Over 40% of responders from Belarus drink mineral water several

times a day, which seems to be a positive habit. However, more than 5% of people do not drink it at all. In the Polish group, more than 75% of responders declare that they drink water multiple times during the day, while less than 2% never drink water.

The analysis of lifestyle-related questions showed significant disturbing phenomena widespread among youths in both age groups, for example sleep deprivation, limited physical activity and the hours-long computer use widespread among youths in both age groups.

More than half of Belarusians on weekdays sleep between 7 and 8 hours. Unfortunately, more than 30% of responders in both age groups regularly get less than 6 hours of sleep. On weekends, most responders sleep 9 hours or more. Over 60% of Polish responders sleeping between 7 and 8 hours a day on weekdays, while about 27-30% of responders spend less than 6 hours sleeping. Similarly to Belarusians aged <20 years old, over half of Polish teenagers sleep more than 9 hours per weekday. More than half of Polish respondents aged 20-29 years on weekends sleep between 7-8 hours.

In Belarus, the problem of spending long hours in front of a screen is also less pronounced, because almost half of responders in both age groups use the TV and computer 2 hours or less a day. Additionally, the number of young Belarusians who use these technologies for more than 6 hours a day does not exceed 10%. In contrast, in Poland, only less than 8% of responders spend less than 2 hours a day watching a screen. Out of the rest, they usually spend on average watching TV or in front of a computer for 6-8 hours a day.

Almost 2/3 of Belarusians rate their daily physical activity in school and at work as moderate, which means that about half of the time they are in motion. Unfortunately, still about 30% of youths spend the vast majority of school and work time in a sitting position. Additionally, in their free time, most of them choose moderate physical activity lasting between 2 and 3 hours a week. Only about 1/6 of responders do sports more regularly and for more than 3 hours a week. Among Polish responders aged < 20 years, rates of small (defined as spending more than 70% of the time sitting) or moderate physical activity in school and at work were similar (44.6% vs. 45.1%, respectively). The majority of the other subgroup – Poles 20-29 years old has little activity at school or work. Furthermore, almost half of Polish responders declare that they spend 2-3 hours a week of their free time on physical activity. Spending more time on activity was noted among approximately 29% of Polish teenagers and 20% of Poles aged 20-29 years.

When asked directly about eating habits, the majority of Belarusians admitted that they eat meals away from home with a frequency of not more than 3 times per month and about 1/4 do not eat out at all. Similarly to Belarusians, most Poles eat out between once – 3 times per month and only about 1/10 of responders never do it. In addition, responders' diet on weekends differs slightly or not at all compared to weekdays.

DISCUSSION

According to Lalonde's health field concept, the most important factor affecting health is a lifestyle, in which proper diet and eating habits occupy an important area [12]. A consequence of improper lifestyle habits is overweight and obesity among youth. Additionally, the

scale of the teenagers' underweight problem is more than twice widespread in Poland compared to Belarus.

It is worrying that more than half of Belarusians do not eat meals at regular times of the day and the majority of them do not eat breakfast every day. According to other studies, skipping breakfast was positively related to an increase in BMI and excess weight [13]. When asked about the frequency of meals during the day, the majority of surveyed Belarusians indicated 3 meals a day. Only 1/3 of respondents from Belarus eat their last meal 2 hours before going to bed, which is a correct eating habit. Almost half of the respondents do not pay attention to the time of the last meal. It is worth noting that fewer meals during the day and long breaks between them might lead to snacking, which is another irregularity in eating habits [14].

The analysis of the quality of consumed meals showed that some eating habits of teenagers and young adults in Poland and Belarus require adjustments. The largest percentage of responders from Belarus eat light bread once or a few times a week, while above 40% of them never eat wholemeal bread. In Belarus, a more positive distribution of the data concerns the consumption of buckwheat, oatmeal, whole grain pasta, or other coarse grains. More Poles than Belarusian do not eat coarse grain products at all. According to the stance of the Polish National Center for Nutritional Education cereal, especially whole grain products, should be an ingredient of most meals of teenagers and adolescents, because they are an excellent source of energy thanks to providing complex carbohydrates. They also contain B vitamins (necessary for the proper functioning of the nervous system, helping in concentration and learning), various minerals - e.g. magnesium, zinc, iron (a positive effect on physical development, well-being and the ability to learn), and dietary fiber (supporting the work of the digestive system, helping to maintain a healthy body weight) [15].

Vegetables and fruits should be eaten several times a day as part of meals and snacks because they are the main source of vitamins (mainly vitamin C, β -carotene, and folates), minerals, fiber, and natural antioxidants [15], whereas the majority of both Polish and Belarusian youths eat them few times a week. Among Polish responders, these values are higher - about 30% and less than 20%, respectively. Juices that do not contain added sugar can be a beneficial element of the daily diet of teenagers and adolescents, provided that this diet is properly balanced [15]. The vast majority of Belarusian and Polish responders drink fruit, vegetable, or fruit and vegetable juices a few times a week or more seldom. The universal thirst-quenching drink in the daily diet should be water [15]. Over 40% of responders from Belarus drink mineral water several times a day, which seems to be a positive habit. In the Polish group, more than 75% of responders declare that they drink water multiple times during the day.

The analysis of lifestyle-related questions showed significant disturbing phenomena widespread among youths in both age groups, for example sleep deprivation, limited physical activity and the hours-long computer use widespread among youths in both age groups. The unfavorable changes in lifestyle observed in our study are most likely connected to the outbreak of the COVID-19 pandemic, which limited our mobility and ushered us into the era of distance learning and remote

working. Reports from various countries and regions, including China, Europe, and the U.S., have documented increased weight gain among teenagers and adolescents during the COVID-19 pandemic compared with the rate before the pandemic [16]. What is especially relevant, other researchers have revealed that obesity is a highly prevalent comorbidity in severe cases of COVID-19 in teenagers and adolescents and is an important predisposing factor for increased mortality rate in this group of patients [17].

More than half of Belarusians on weekdays sleep between 7 and 8 hours, which seems to be a positive habit. Unfortunately, more than 30% of responders in both age groups regularly get less than 6 hours of sleep. On weekends, most responders sleep 9 hours or more, which may suggest the need to "sleep off" the lack of rest from the previous week. Over 60% of Polish responders sleep between 7 and 8 hours a day on weekdays, while about 27-30% of responders spend less than 6 hours of sleep. According to other studies, there is a close relationship between the quality and length of sleep and the risk of obesity. Having poor sleep, in either amount or timing, is associated with difficulty in controlling appetite. In addition, sleep problems in teenagers are linked to obesity, which leads to metabolic syndrome, diabetes, or hypertension in the early stages of life [18].

In Belarus, the problem of spending long hours in front of a screen is also less pronounced, because almost half of responders in both age groups use the TV and computer 2 hours or less a day. Additionally, the number of young Belarusians who use these technologies for more than 6 hours a day does not exceed 10%. In contrast, in Poland, only less than 8% of responders spend less than 2 hours a day watching a screen. Out of the rest, they usually spend on average watching TV or in front of a computer for 6-8 hours a day. Similarly, in the study by Król et al. comparing the physical activity of students in three countries, Belarusian students obtained the highest average amount of energy expenditure related to moderate and intensive activity, compared to students from Poland [19].

CONCLUSIONS

The results of the research indicate a strong need to implement educational programs raising the awareness of young people about healthy eating, both in Poland and in Belarus. Not only obesity but also malnutrition are the problems of contemporary youth from Poland and Belarus. Skipping breakfast, too few meals during the day, incorrect composition, snacking between meals, and eating too late before bedtime are some of the main irregularities in the nutrition of the surveyed people. It is worrying that the respondents admit that they lead a sedentary lifestyle, which the COVID-19 pandemic may have contributed to. The work confirms the literature data that in Belarus fewer people suffer from obesity than in Poland, and more than in Poland have a normal BMI (both on the basis of the BMI of the respondents and obesity in the family). Obesity in Poland is more widespread than in Belarus, which is probably due to more meals a day, better material conditions, and a less correct lifestyle in Poland. It is probably influenced by an incorrect lifestyle. The results indicate the need for a new direction in health policy, which will be conducive to making the right nutritional

choices for teenagers and adolescents.

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