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HEALTH AND NUTRITIONAL BEHAVIOR OF A SELECTED GROUP OF SOUTH-EASTERN POLAND PATIENTS: A PILOT STUDY

ZACHOWANIA ZDROWOTNE I ŻYWIENIOWE WYBRANEJ GRUPY PACJENTÓW Z POLSKI POŁUDNIOWO-WSCHODNIEJ: BADANIE PILOTAŻOWE

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Summary

Background. The growing number of people with excess body weight is one of the most important global health issues. The increase in the number of people with excess weight and obesity leads to a shortened life expectancy.

Material and methods. The aim of this pilot study was to use a questionnaire survey to determine the lifestyle of the people in a group of 84 Polish patients from south-eastern Poland, including diet, physical activity, and health. The pilot studies were carried out from December 2021 to January 2022 in a family doctor's clinic among people in search of advice, who willingly volunteered themselves for the study.

Results. The results of the study showed that 33% of women and 44% of men have excess body weight. Economic status statistically significantly affects the incidence of overweight and obesity. However, the level of education does not have a statistically significant effect on body weight. The irregularity of meals among the respondents was often explained by irregular work and many responsibilities. Our research also showed a low physical activity of the studied population.

Conclusions. Improper nutrition combined with other anti-health behaviors make it significant to introduce intensive health education programs.

Keywords: obesity, physical activity, nutrition, patients

Streszczenie

Wprowadzenie. Wzrastająca liczba osób z nadmierną masą ciała jest jednym z najważniejszych globalnych problemów zdrowotnych. Wzrost liczby osób z nadwagą i otyłością prowadzi do skrócenia średniej długości życia.

Materiał i metody. Celem badań pilotażowych było określenie za pomocą ankiety kwestionariuszowej stylu życia w 84-osobowej grupie polskich pacjentów z południowo-wschodniej Polski z uwzględnieniem diety, aktywności fizycznej i stanu zdrowia. Badania pilotażowe przeprowadzono od grudnia 2021 do stycznia 2022 w poradni lekarza rodzinnego wśród chętnych osób szukających porady lekarskiej.

Wyniki. Wyniki badań wykazały, że 33% kobiet i 44% mężczyzn ma nadwagę. Status ekonomiczny statystycznie istotnie wpływa na występowanie nadwagi i otyłości. Natomiast poziom wykształcenia nieistotnie statystycznie nie ma wpływu na masę ciała. Nieregularność posiłków wśród respondentów była często tłumaczona nieregularnością pracy i wieloma obowiązkami. Z naszych badań wynika również niska aktywność fizyczna badanej populacji.

Wnioski. Niewłaściwe odżywianie w powiązaniu z innymi zachowaniami antyzdrowotnymi oraz małą aktywnością fizyczną sprawiają, że ważne jest wprowadzenie intensywnych programów edukacji zdrowotnej.

Słowa kluczowe: otyłość, aktywność fizyczna, odżywianie, pacjenci

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Introduction

The World Health Organization (WHO) has described the growth of obesity as the biggest public health problem. According to estimates, 35% of adults over 20 years of age are overweight and 11% are obese [1]. Despite the fact that 2.8 million adults die every year due to overweight or obesity, the prevalence of obesity is high and continues to grow [1]. The situation is worst in the European Region, where overweight and obesity affect almost 60% of adults and one in three children (29% of boys and 27% of girls) [2].

Nutrition is an example of the absolute necessity in peoples' lives regardless of gender, race, or socio-economic status. Nutrition has many functions: it is necessary to meet the basic needs of the body such as growth and development and maintenance of body functions, and it has a positive effect on mood and is part of the tradition, culture, and customs as well as being a crucial factor as a prophylactic in the prevention of many diseases [3,4].

To maintain normal health, it is essential to eat a few meals each day consisting of a variety of products that will provide us with the right amount of energy and necessary nutrients. Meals should be varied in order to provide approximately sixty necessary ingredients: amino acids, polyunsaturated fatty acids, sugars, minerals, vitamins and water. Neglect of these rules terms of quantity and quality of food leads to the disruption of the functioning of the body, resulting in the development of disease [5].

Excessive consumption of food leads to overweight and obesity, and these often lead to the development of numerous health problems including cardiovascular and gastrointestinal diseases, diabetes, psychiatric disorders, depression, and eating disorders. Among the most oft-mentioned cardiovascular diseases are hypertension and ischemic heart disease, and those among the diseases of the gastrointestinal tract are gastric reflux disease, nonalcoholic fatty liver disease and cancer of the esophagus and colon [6,7].

According to reports by the WHO, almost 70% of all deaths worldwide are non-communicable diseases, which include the most common civilization diseases, such as obesity, heart disease, cancer, and neurological disorders. Improper lifestyle is the main risk factor for these diseases – inadequate diet, lack of physical activity, and the use of stimulants [8].

The incidence of non-communicable diseases is systematically increasing, which is why early prevention in the form of proper nutrition and physical activity is so important. According to research conducted by the National Institute of Public Health – National Institute of Hygiene in Warsaw, Poland, the change in the structure of incidence of various cancers results primarily from changes in diet and physical activity among the Polish population over the last 50 years [9].

The available literature data shows that there is a relationship between deficiencies of vitamins D, B12, folic acid, omega-3 fatty acids and an increased concentration of homocysteine in the blood serum and the functioning of the human brain, which in turn leads to the appearance of disorders such as dementia, vascular diseases, diseases of the central nervous system, and widely-understood depressive disorders. In addition, it is worth adding that there are also reports of a link between eating behaviors and the development of depression and mental disorders [10,11].

Therefore, the aim of the study was to evaluate the health and nutritional behavior of a selected patient population in terms of their social status. The conducted research attempts to answer the questions: (1) Is there a relationship between health and nutritional behaviors and social status? (2) What food preferences does the surveyed population express in terms of sustainable development? (3) What relationships are observed between the level of overweight and obesity and the health awareness of the respondents? This was a pilot study designed to determine clarity of the survey questions, and whether the respondents are willing to answer them.

Material and methods

The pilot studies were carried out from December 2021 to January 2022 in a family doctor's clinic among people searching of advice, who willingly volunteered themselves for the study. The inclusion criterion for the study was the consent of the patients to participate in the project. After giving their consent, the respondents answered the questions. Patients' health behavior and dietary preferences were examined by way of the health and nutritional interview questionnaire. People were asked about their place of residence, education, profession, marital status, the number of people making up the household, including children under eighteen, and household income per person. Moreover, the individual frequency of physical activity among the surveyed respondents was assessed.

The questionnaire "Health and nutritional behavior of population" was used in the survey. The survey consisted of forty-seven questions, among which were both closed and open questions. Questions about nutrition focused on the number of meals per day, diet consumed, the taking of supplements, preparations, and slimming aids, types of foods and beverages consumed and frequency of consumption. In the survey there were also questions about the subjective assessment of the regularity of meals and potential causes of irregular consumption of meals throughout the day. Other questions related to the kinds of snacks during the day and the quantities of them. Questions about physical activities were focused on the types of cultivated forms of exercise and the frequency of them, but also the type of work and the potential intensity of physical activity associated with it. The next part of the survey focused on the respondent's health status. The respondents were asked about health problems, chronic diseases, and thyroid problems as well as hormone and steroid treatments that could affect the diet and weight of the subjects. Because the questionnaire was anonymous, it allowed us to obtain reliable surveys.

The study was conducted on a group of eighty-four patients, who agreed to fill out a questionnaire. This strategy has been very helpful to the family doctor due to the knowledge gathered about the patients' behavior and the potential health risks that they face. This strategy was also beneficial for patients, due to useful information related to their state of health and recommendations for the future.

Body Mass Index (BMI)

BMI was calculated based on data included in the range of 16.00-40.00 kg/m². It was assumed that BMI value from 17.00 to 18.49 kg/m² corresponds to underweight, BMI between 18.50-24.99 kg/m² is normal weight, BMI 25.00-29.90 (kg/m²) is categorized as overweight, and a BMI over 30.00 kg/m² is categorized as obesity (30.00-34.99 kg/m² – Class I obesity, 35.00-39.99 kg/m² – Class II obesity, and ≥40 kg/m² – Class III obesity).

Ethics

The study was carried out in accordance with the approval of the Bioethics Committee No. 5/2021 issued by the Bioethics Committee of the Calisia University. In addition, the data was conducted in accordance with the Helsinki Declaration [12]. Personal and participant data were anonymized in accordance with the general regulation on the protection of personal data of the European Parliament (GDPR 679/2016).

Statistical analysis

The Statistica 13.3 (StataCorp LP., College Station, TX, USA) software was used to perform the statistical analysis. For all tests $p < 0.05$ was presumed. The data for qualitative variables are shown as percentages (%) and numbers (n) by using a chi-square test.

Results

In the study group, 68% of the respondents were women and 32% men. Age ranged from 18 to 76 years. About 17% of the respondents were residents of a village, while 71% were residents of a city with over 100,000 inhabitants. 46.5% were married, and about 40 % were unmarried. The height of the surveyed subjects ranged from 152 cm to 192 cm, and their weight from 45 to 132 kg. 65.6% of the respondents had a university degree, 30% a secondary education, and the remainder had vocational or primary education. Approximately 9% of the respondents were not employed, and about 5% were engaged at home. The remaining part did some paid work. Number of people forming households was equal to 1 for 12% of the respondents, 2 for 14%, 3 for 39.5%, 4 for 22.5%, and 5 or more for 12%. In 70% of the households there were no children under 18 years of age. The respondents were also asked to assess their financial situation: 38% lived modestly based on their income. In addition, they also claimed that they were able to maintain the basic necessities of life. In contrast, 31% said that in order to pay their bills or seasonally purchase, for example, clothing, shoes, etc., they had to live more modestly. Among those surveyed, approximately 24% were characterized by a 450-899 PLN income, and 26% by a 900-1,299 PLN income per household member.

Based on the height and weight of the respondents, the BMI for each one was calculated. Among the respondents 7.1% were underweight, 56% were of normal weight, 29.8% were overweight and 7.1% were obese.

Comparing the BMI and gender in the study group, 33% of the women and 44% of the men were overweight and obese. The proportion of persons in the normal range in both groups was similar – about 55%, as shown in Table 1.

Table 1. BMI relationship with gender of the respondents (n=84, $\chi^2=3.456$, $p=0.178$)

BMI	Sex		Total
	Women	Men	
Underweight	9 (10.5%)	0 (0.0%)	6 (7.1%)
Normal weight	47 (56.1%)	47 (55.6%)	47 (56.0%)
Overweight and obese	28 (33.3%)	37 (44.4%)	31 (36.9%)
Total	84 (100.0%)	84 (100.0%)	84 (100.0%)

In addition, when analyzing the results, there were no observed statistical differences between level of education and body weight ($\chi^2=2.034$, $p=0.917$). It was also found that higher income per one person in the household increased the proportion of overweight and obese householders (Table 2).

Table 2. The correlation between BMI and income per one person in the household (n=79, $\chi^2=8.841$, $p=0.716$)

BMI	Income per capita in household (in PLN)							Total
	To 450	450-899	900-1299	1300-1699	1700-2000	2000-2999	3000-3999	
Underweight	11 (14.3%)	4 (5.0%)	7 (9.1%)	7 (9.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (6.3%)
Normal weight	57 (71.4%)	51 (65.0%)	43 (54.5%)	43 (54.5%)	20 (25.0%)	45 (57.1%)	40 (50.6%)	44 (55.7%)
Overweight and obese	11 (14.3%)	24 (30.0%)	29 (36.4%)	29 (36.4%)	59 (75.0%)	34 (42.9%)	39 (49.4%)	30 (38.0%)
Total	79 (100.0%)	79 (100.0%)	79 (100.0%)	79 (100.0%)	79 (100.0%)	79 (100.0%)	79 (100.0%)	79 (100.0%)

Nutrition

About 60% of the respondents rated their nutrition during childhood and at present as either good or particularly good. Approximately 84% of the respondents rated the amount of food consumed by them as sufficient, and 12% as excessive. Approximately 16% of the respondents currently use a nutritional diet (a diet that provides essential nutrients), and 20% admitted to using a diet in the past. Among the most frequently mentioned, there were such diets as the Dukan, protein, or Copenhagen diet.

The survey evaluated the frequency of consumption of a given food during the day. About 80% of the respondents eat breakfast and dinner daily, 70% eat dinner, and only 44% of the respondents routinely eat second breakfast and about 20% the daily afternoon tea.

Also, the frequency of consumption of specific foods was examined. The results are presented in Table 3.

Table 3. The frequency of consumption of specific foods (n=84)

Food	Frequency of consumption											
	More than once a day		Every day		2-5 times a week		Few times a month		Once a month or less		Not at all	
	n/%	n/%	n/%	n/%	n/%	n/%	n/%	n/%	n/%	n/%	n/%	
Pork	1	1.2%	4	4.8%	37	44.0%	26	31.0%	11	13.1%	2	2.4%
Beef	0	0%	0	0%	0	0%	23	27.4%	40	47.6%	17	20.2%
Poultry	2	2.4%	4	4.8%	38	45.2%	32	38.1%	6	7.1%	2	2.4%
Fish	0	0%	1	1.2%	8	8.3%	37	44.0%	30	35.7%	6	7.1%
Pork sausage	1	1.2%	15	17.9%	42	50.0%	8	9.5%	10	11.9%	3	3.6%
Poultry sausage	1	1.2%	6	7.1%	30	35.7%	17	20.2%	12	14.3%	12	14.3%
Dark bread	2	2.4%	25	29.8%	20	23.8%	24	28.6%	5	6.0%	6	7.1%
White bread	8	9.5%	18	21.4%	29	34.5%	13	15.5%	12	14.3%	2	2.4%
Dairy	4	4.8%	27	32.1%	32	38.1%	16	19.0%	2	2.4%	1	1.2%
Couscous	0	0%	2	2.4%	22	26.2%	44	52.4%	11	13.1%	1	1.2%
Potatoes	0	0%	6	7.1%	30	35.7%	38	45.2%	5	6.0%	2	2.4%
Noodles	0	0%	2	2.4%	23	27.4%	45	53.6%	10	11.9%	2	2.4%
Vegetables	9	10.7%	41	48.8%	28	33.3%	5	6.0%	0	0%	0	0%
Fruits	6	7.1%	27	32.1%	34	40.5%	14	16.7%	2	2.4%	0	0%
Mineral water	20	23.8%	35	41.7%	17	20.2%	4	4.8%	4	4.8%	2	2.4%
Juice	5	6.0%	16	19.0%	26	31.0%	19	22.6%	11	13.1%	3	3.6%
Beverages	1	1.2%	2	2.4%	15	17.9%	25	29.8%	21	25.0%	17	20.2%
Coffee	20	23.8%	21	25.0%	12	14.3%	7	8.3%	8	9.5%	14	16.7%
Alcohol beverages	0	0%	0	0%	4	4.8%	38	45.2%	31	36.9%	7	8.3%
Sweets	2	2.4%	11	13.1%	36	42.9%	23	27.4%	8	9.5%	1	1.2%
Potato chips	0	0%	1	1.2%	13	15.5%	33	39.3%	23	27.4%	10	11.9%

Notes: *n – number of persons.

Beef was the meat eaten most rarely, with about 20% of the respondents that never ate it. Pork and poultry were more regularly consumed. Fish consumption also was insufficient – about 35% of the respondents consumed it once a month or less and up to 7% in general did not eat fish. Vegetables and fruit were eaten but not too often. About 58% of the respondents consumed vegetables daily, and 6% a few times a month. About 40% of the respondents ate fruit daily, while about 20% ate fruit a few times a month or less. Coffee was more popular, as about 50% of the respondents consumed coffee on a daily basis, and half of them drank it several times a day.

The respondents were also asked about the quality of consumed products. Approximately 30-40% bought products of average quality. The respondents were asked about their subjective assessment of diet and about 50% of the respondents identified it as good and 25% as average, but 40% would like to change their eating habits primarily by improving the regularity of meals and proper nutritional balance.

The comparison of BMI in the respondents with their subjective assessment of food intake is given in Table 4.

Table 4. The correlation of BMI and subjective assessment of food intake (n=84, $\chi^2=6.761$, $p=0.149$)

Self-assessment of food quantity consumed	Underweight	Normal weight	Overweight and obese	Total
Too little	14 (16.7%)	4 (4.3%)	0 (0.0%)	3 (3.6%)
Enough	70 (83.3%)	73 (87.2%)	68 (80.6%)	71 (84.5%)
Too much	0 (0.0%)	7 (8.5%)	16 (19.4%)	10 (11.9%)
Total	84 (100.0%)	84 (100.0%)	84 (100.0%)	84 (100.0%)

The table shows that overweight people were twice as likely to have a large amount of food intake compared with people of normal weight. In people who determined their consumption as too little, their mean BMI was 19.2, for people who consumed enough food the average BMI was 23.9, and for eating too much it was 28.1. People with normal weight denied themselves extra snacks during the day twice as often as did overweight people ($\chi^2=13.097$, $p=0.109$).

State of health

Another section was devoted to a survey assessing the state of health. About 20% of the respondents identified their health as particularly good, 50% as good, 30% as average or bad. About 20% of the respondents suffered from various chronic diseases, and about 8% were characterized by disorders of the thyroid gland having an indirect effect on weight. Among the ailments that the respondents feel daily or 1-5 times a week: 35% stated anxiety, 40% indicated fatigue and up to 45% reported stress. About 21% of the respondents had used hormonal therapy, and 9.5% used it currently. About 5% of the respondents were undergoing treatment for depression and 9.5% received anti-allergy treatment.

The comparison of BMI with health self-assessment indicated that overweight people were five times more likely to describe their health as poor compared with people who were underweight or of normal weight, and were two times less likely to describe their health as particularly good (Table 5).

Table 5. The correlation between BMI and self-assessment of health (n=83, $\chi^2=8.981$, $p=0.175$)

Health status	Underweight	Normal weight	Overweight and obese	Total
Very good	42 (50.0%)	18 (21.3%)	8 (10.0%)	16 (19.3%)
Good	42 (50.0%)	39 (46.8%)	45 (53.3%)	42 (49.4%)
Average	0 (0.0%)	25 (29.8%)	23 (26.7%)	22 (26.5%)
Rather bad	0 (0.0%)	2 (2.1%)	8 (10.0%)	4 (4.8%)
Total	84 (100.0%)	84 (100.0%)	84 (100.0%)	84 (100.0%)

Activities

The third section of the questionnaire concerned the physical activity of the respondents. The results clearly show that about 67% had never exercised, 49% had never run, 42% had never swum, and 40% rode a bike a few times a year or less. The physical activity indicated most often by the respondents was a walk for an hour or

more a day. About 18% of the respondents walked every day, 32% walked 1-5 times a week, and 20% took longer walks as many as a few times a year. The remaining 30% took a walk a few times a month.

High physical activity at work or while doing housework was reported by 25% of the respondents, while about 45% reported minimal effort, and about 30% reported no effort.

Comparing the frequency of specific physical activities in relation to BMI, it was found that a person with normal weight was about three times more likely to go bicycling quite frequently (1-5 times per week) than those who were overweight. Overweight people ride a bike on an only occasional basis, about 1-3 times a month or less ($\chi^2=12.877$, $p=0.231$).

Discussion

From the point of view of sustainable development, the nutritional behavior of the studied population is not consistent. Unfortunately, Polish consumers are in favor of meat products such as pork 2-5 times a week (44%) and poultry 45.2% from 2 to 5 times a week. Fish consumption is observed at a low level of 44% several times a month, and 35.7% once or less a month, which indicates too much consumption of saturated fat in the diet. Daily consumption of processed poultry (7.1%) and pork (17.9%) is observed at an elevated level. Daily consumption of fruit (32.1%) and vegetables (48.8%) is also not satisfactory. The consumption of sweetened drinks and juices was observed at a level of about 19.0% per day, while the consumption of mineral water was about 41.7% per day, which is not satisfactory from the point of view of proper health behavior. Based on the analyzed results, it can be concluded that the diet of Poles – the studied population – is rich in products containing simple sugars and saturated fatty acids, which has a direct impact on the level of overweight and obesity in the studied population. The latest EU recommendations call for a change of eating habits in order to positively affect the health of the population and also to help counteract the negative effects of climate change [13,14]

Being overweight is one of the most common health problems related to lifestyle. Excess weight is a key risk factor for many cardiovascular, respiratory, and gastrointestinal diseases and for diabetes type II. It can also cause premature death. A GUS (Central Statistical Office in Poland) survey from 2019 showed that 61% of men (44.8% of whom are overweight, 16.6% of whom are obese) and almost 45% of women (29.4% of whom are overweight, 15.2% of whom are obese) had excess body weight. Currently, the proportion of Polish men with excess body weight is among the highest in the European Union [15]. Our study also confirms that more men (44%) than women (33%) have excess body weight.

A varied diet is extremely important for health [16]. The more diversified the food, the more likely that all the necessary components are provided in the appropriate amounts. Accordingly, a balanced diet promotes health, helps with pharmacological treatment, and reduces the risk of mortality [17]. A healthy, well-balanced diet rich in fruits and vegetables and physical activity are an important part of a healthy lifestyle crucial for the prevention of many diseases [18].

The quantities of acceptable food products determine nutritional standards. In many Polish households some of the standards are exceeded, especially in terms of meats, sugar, sweets, and eggs [19]. However, Poles consume milk and dairy products, fruits and vegetables and fish in lower amounts. Most differences are observed in the results of eating habits, but they are often also linked to the economic situation. Households with lower incomes tend to consume simple, non-processed foods compared to the products consumed in wealthier households [19]. According to the FAO, in 2019 the consumption of fruit in Poland was one of the lowest among the countries of the European Union (two times lower than the average). Low consumption of fruit is associated with the financial situation of consumers. In low-income households the consumption of fruit was two times lower compared to the families with the highest incomes [20]. As reported by Dame D. Hutton, chair of Foods Standards Agency in their study “Diet and Nutrition Survey”, higher income people were at lower risk of obesity associated with

facilitated access to healthy food and due to a healthy diet desire/craze [21]. Our results indicate, however, that it was more common for people with a higher income to suffer from excess weight and obesity, but this may be due to the small sample size.

The research of Uramowska-Żyto et al. [22], conducted in Poland, shows that the villagers are healthier eaters due to the frequent consumption of dairy products and vegetables compared to urban residents. The prevalence of overweight and obesity among urban residents is a result of their consumption of larger amounts of processed foods and sugar-sweetened beverages and their lower physical activity compared to the villagers [22]. Other studies have also confirmed the differences in the diet of the inhabitants of towns and villages in the context of fruit and vegetable intake. Villagers eat more vegetables (18% difference), but less fruit (19% difference) compared to urban residents. However, this result should be treated with caution due to the limited number of participants from the rural areas in the study. In terms of consumption of vegetables Poland came in eighth place in the classification of countries of the European Union [23]. Numerous other studies have shown an inverse association of residence in the country or in a small town with low quality diet [24,25]. Our research showed a similar trend; however, our survey showed a higher percentage of people with excess body weight or obesity.

Education is also a crucial factor in a healthy lifestyle. Education allows for a better understanding of health issues and the influence of diet and physical activity on the body. Along with better education there comes increased knowledge of nutrition and improved maintenance of health [21]. Niedźwiedzka et al. [26] have studied the composition of the diet of the elderly persons, showing a strong correlation between socioeconomic status and varied diets. The level of education also affects the variety of food consumed; the higher the education level, the greater varying of food is fostered [26]. Our results showed no significant correlation between level of education and body mass. It is currently related to intensive professional work causing deterioration of diet regularity and the constantly shifting times of eating at late evening and night hours [27]. Our results also show that the irregularity of meals, and inadequate consumption of specific foods were often explained by the respondents as being due to irregular, stressful professional life and many responsibilities.

A sedentary lifestyle and lack of physical activity during leisure time are crucial factors in the development of cardiovascular diseases, which are the main cause of death in Poland and throughout the world. Only 9% of EU citizens exercise five times a week or more, while 27% neglect to undertake physical activity of any kind, such as walking, cycling, or cultivating a garden [28]. The percentage of people exercising regularly in Poland is equal to 6%, while 49% have no involvement in exercise activity, and 17% engaged in no recreational physical activity [23]. For good health, WHO recommends people aged 18-64 years to have 150 minutes per week of physical activity of moderate intensity or 75 minutes of intense exercise [29]. Unfortunately, our research also shows an alarmingly low level of physical activity in the population of Lublin. Approximately 67% of the respondents never exercised, and about 40% had never run or swum, and the most common physical activity was a daily walk, which 18% of the respondents declared.

Improper nutrition in combination with other anti-health behaviors such as smoking, consumption of hard alcohol or low physical activity causes a high incidence of diet-related diseases in Poland [30-32]. This in turn produces a negative impact on health systems, the environment, economic development, community well-being and the quality of life. WHO forecasts predict a steady increase in the body weight of the Earth's human inhabitants, which will shorten those inhabitants life expectancy [33]. Hence, the WHO has introduced a global action plan on physical activity: more active people for a healthier world. Alarmingly, there have been consistent increases in the prevalence of overweight and obesity both in the European Region [2] and on worldwide [33]. Moreover, no European Member State is on track to reach the target of halting the rise in obesity by 2025 [2]. Therefore, the results of these studies will allow us to undertake further obesity and overweight inhibition strategies in the population of south-eastern Poland in terms of proper nutrition. In turn, the WHO introduced a global action plan on physical activity: more active people for a healthier world [33].

Conclusions

In our pilot study, the obtained results were related to the relationship between health and nutritional behaviors and social status. We did not obtain significant differences. However, observing the food preferences of the surveyed population, we found that the respondents prefer pork and poultry meat and processed products, and the consumption of high-sweetened beverages instead of water was observed, which unfortunately is not beneficial from the point of view of a balanced diet. In addition, we observed, when comparing the BMI of patients with their self-assessment of health, that overweight people, compared to people with normal body weight and underweight, described their health as “bad” five times more often, and two times more as “particularly good”. For these reasons, education programs as a form of prevention of overweight and obesity are needed to intensify health.

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References:

1. World Health Organization. Fact sheets no 311: obesity and overweight [Internet]. Geneva: World Health Organization; 2020 [access 2021 Dec 15]. Available from: <http://www.who.int/mediacentre/factsheets/fs311/en/>
2. World Health Organization. WHO European Regional Obesity, report 2022 [Internet]. Geneva: World Health Organization; 2022 [access 2022 Nov 10]. Available form: <https://apps.who.int/iris/bitstream/handle/10665/353747/9789289057738-eng.pdf>
3. Gawęcki J, Hryniewiecki L. [Human nutrition. Basics science of nutrition]. Warszawa: PWN; 1998 (in Polish).
4. Dawson RS. The truth about obesity, exercise, and nutrition. *Pediatr Ann.* 2018; 47(11): e427-e430. <https://doi.org/10.3928/19382359-20181022-01>
5. Gorzelak M, Pierzak M. Lifestyle and health. *J Education, Health Sport.* 2017; 7(11): 268-280.
6. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales V, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *Jama,* 2003; 289(1): 76-79. <https://doi.org/10.1001/jama.289.1.76>
7. Katta N, Loethen T, Lavie C J, Alpert MA. Obesity and coronary heart disease: epidemiology, pathology, and coronary artery imaging. *Curr Probl Cardio.* 2021; 46(3): 100655. <https://doi.org/10.1016/j.cpcardiol.2020.100655>
8. World Health Organization. Noncommunicable diseases and their risk factors. Geneva: WHO [access 2021 Dec 13]. Available from: <https://www.who.int/ncds/en/>
9. Jarosz M, Rychlik E, Stoś K, Charzewska J. [Nutrition standards for the Polish population and their application]. Warsaw: National Institute of Public Health - National Institute of Hygiene; 2020 (in Polish).
10. Marx W, Lane M, Hockey M, Aslam H, Berk M, Walder K, et al. Diet and depression: exploring the biological mechanisms of action. *Mol Psych.* 2021; 26(1): 134-150. <https://doi.org/10.1038/s41380-020-00925-x>
11. Bremner JD, Moazzami K, Wittbrodt MT, Nye JA, Lima BB, Gillespie CF, et al. Diet, stress, and mental health. *Nutrient.* 2020; 12(8): 2428. <https://doi.org/10.3390/nu12082428>

12. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *Jama*. 2013; 310(20): 2191-2194. <https://doi.org/10.1001/jama.2013.281053>
13. Béné C, Fanzo J, Haddad L, Hawkes C, Caron P, Vermeulen S, et al. Five priorities to operationalize the EAT – Lancet Commission report. *Nature Food*. 2020; 1(8): 457-459. <https://doi.org/10.1038/s43016-020-0136-4>
14. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. J. Food in the Anthropocene: the EAT – Lancet Commission on healthy diets from sustainable food systems. *The Lancet*. 2019; 393(10170): 447-492. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)
15. Central Statistical Office. [Health status of the Polish population in 2019]. Warsaw: Centrl Statistical office; 2021 (in Polish).
16. Mete R, Shield A, Murray K, Bacon R, Kellett J. What is healthy eating? A qualitative exploration. *Public Health Nutr*. 2019; 22(13): 2408-2418. <https://doi.org/10.1017/S1368980019001046>
17. Guenther PM, Reedy J, Krebs-Smith SM. Development and evaluation of the healthy eating index-2005. *J Am Diet Assoc*. 2008; 108(11): 1896-901. <https://doi.org/10.1016/j.jada.2008.08.016>
18. Koehler K, Drenowatz C. Integrated role of nutrition and physical activity for lifelong health. *Nutrient*. 2019; 11(7): 1437. <https://doi.org/10.3390/nu11071437>
19. Podolec B, Ulman P, Wałęga A. [Attempt of assessment of diversification of food consumption in Poland based on the results of household budget surveys]. *Acta Universitatis Lodziensis. Folia Oeconomica*. 2011; 253: 225-237 (in Polish).
20. Central Statistical Office. [Situation of households in 2020, in the light of results the household budget survey]. Warsaw: Central Statistical Office; 2021 (in Polish).
21. Nelson M, Erens B, Bates B, Church S, Boshier T. Low-income diet, and nutrition survey. London: TSO; 2007.
22. Uramowska-Żyto B, Kozłowska-Wojciechowska M. [Nutrition behavior of poor families]. *Roczniki PZH*. 2003; 54(2): 221-229 (in Polish).
23. Wojtyniak B, Goryński P, Moskalewicz B. [The health situation the Polish population and its implications]. Warsaw: National Institute of Public Health; 2012 (in Polish).
24. Wierzbicka E, Roszkowski W. [Specific diets use and dietary habits of selected groups of elderly people]. *Żywnienie Człowieka i Metabolizm*. 2004; 31(2 Suppl): 17-28 (in Polish).
25. Szponar L, Sekuła W, Rychlik E, Ołtarzewski M, Figurska K. [The study of individual food intake and nutritional status of households]. Warsaw: National Institute of Public Health; 2003 (in Polish).
26. Niedźwiedzka E, Wądołowska L. Analysis of food intake variety in relation to the socio-economic status of elderly Polish citizens. *Probl Hig Epidemiol*. 2010; 91(4): 576-584.
27. Narojek L, Ostrowska A. [Nutritional behavior urban families in the new social and economic situation]. *Żywnienie Człowieka i Metabolizm*. 1997; 4: 437-447 (in Polish).
28. TNS Opinion & Social. [Eurobarometer 72.3, Sport and Physical Activity]. TNS Opinion & Social; 2009 (in Polish).
29. Okely AD, Kontsevaya A, Ng J, Abdeta C. 2020 WHO guidelines on physical activity and sedentary behavior. *Sports Med Health Sci*. 2021; 3(2): 115-118. <https://doi.org/10.1016/j.smhs.2021.05.001>
30. Grzybowski A, Grzybowski P, Mrzygłód S, Trafalska E. [Nutritional conditioning of health status of productive age according to nutritional standards and habits]. *Problemy Higieny Epidemiologii*. 2007; 88(1): 1-6 (in Polish).
31. Pikała M, Janik-Koncewicz K, Zatoński WA. Educational inequalities in mortality due to alcoholic liver disease in Poland. *J Health Inequal*. 2020; 6(2): 134-138. <https://doi.org/10.5114/jhi.2020.103229>

32. Janik-Konieczny K, Parascandola M, Bachand J, Zatoński M, Przewoźniak K, Zatoński W. E-cigarette use among Polish students: findings from the 2016 Poland Global Youth Tobacco Survey. *J Health Inequal.* 2020; 6(2): 95-103. <https://doi.org/10.5114/jhi.2020.103223>
33. World Health Organization. Global strategy on diet, physical activity and health [Internet]. Geneva: World Health Organization; 2019 [access 2021 Dec 22]. Available from: <https://www.who.int/dietphysicalactivity/pa/en/>