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# Current nutritional status of the Polish population – focus on body weight status

Danuta Gajewska, Anna Harton

Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland

**ABSTRACT**

**Introduction:** The increasing prevalence of overweight, defined as excessive body weight, among different population groups is one of the most serious public health problems that Poland has to face. The aim of this paper was to review the recent data regarding the nutritional status of subpopulations of children, adolescents and adults in Poland.

**Material and methods:** The search was conducted using PubMed, Google Scholar, and Web of Sciences databases, as well as official websites of the Polish Ministry of Health, the National Institute of Public Health NIH – National Research Institute and the World Health Organization. Scientific publications in English and Polish, published between January 2020 and September 2023, were used as sources of information.

**Results:** The prevalence of overweight among children, adolescents and adults in Poland is relatively high. However, it should be noted that most studies were observational, the methods used for data collection varied (self-reported vs. measured), and BMI was a tool to measure body weight status. The prevalence of overweight among the paediatric population varies from 11% to 45%. Among adults, the prevalence of overweight exceeds 62% for men and 43% for women. The prevalence of higher-than-normal body mass increases with age. The COVID-19 pandemic increased the risk of abnormal body weight among both paediatric and adult populations.

**Conclusions:** Early prevention is essential in dealing with excessive body weight and the adverse health outcomes that may result therefrom. To address the weight gain problem across different populations, comprehensive and family-based obesity prevention programmes should be implemented.

**KEY WORDS:** obesity, children, adults, nutritional status, overweight.

**CORRESPONDING AUTHOR:** Danuta Gajewska, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Poland, e-mail: [danuta\\_gajewska@sggw.edu.pl](mailto:danuta_gajewska@sggw.edu.pl)

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**INTRODUCTION**

Excessive body weight is considered to be one of the main public health problems throughout the world [1]. There is a strong association of overweight, and in particular obesity, with a higher risk of several diseases, including cardiovascular disease, type 2 diabetes, metabolic syndrome, and some types of cancer. According to the World Health Organization's (WHO) official statistics, in 2016 around 39% (1.9 billion) of adults globally, aged 18 years and older, were overweight and 13.1% (over 650 million) were obese [2, 3]. By 2025, global obesity prevalence is predicted to reach 18% in men and

exceed 21% in women [2]. By 2030, it is predicted that 1 in 5 women and 1 in 7 men will be living with obesity. At the same time, the number of children and adolescents with excessive body weight is also increasing. In 2016 over 340 million children and adolescents aged 5-19 were overweight or obese. Particularly alarming are the data for the youngest population groups. In 2020 around 39 million children under the age of 5 were overweight or obese [1, 2]. In 2022 globally 37 million (5.6%) children under 5 years of age were overweight, with the highest prevalence in the Region of the Americas (8.5%) and the lowest prevalence in the African Region (3.9%) [2, 3].

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The main cause of the abnormal body weight is the disproportion between energy intake (calories) and energy expenditure, as the result of unhealthy diets and lack of physical activity. However, obesity is a complex disease with multifactorial aetiology and genetic, physiological, socioeconomic, and environmental contributors. It is defined as a chronic disease that requires medical attention and one of the risk factors for many diseases including type 2 diabetes, hypertension, stroke, coronary heart disease and certain types of cancer [4, 5].

Diagnosis of obesity is based on simple indicators such as body mass index (BMI), waist circumference, or waist-to-hip ratio [6]. However, these parameters have some limitations, including low sensitivity for detecting excess adiposity. BMI is only a measure of body weight relative to height and does not provide information about the body composition and body fat tissue/muscle mass proportion. Nevertheless, monitoring the nutritional status of the general population, as well as that of the tendencies in body weight changes in paediatric and adult subpopulations, is necessary for planning interventions, and to evaluate the effectiveness of public health campaigns.

According to the WHO, overweight includes pre-obesity and obesity. In the adult population, overweight is defined as a BMI of  $\geq 25.0$  kg/m<sup>2</sup>, while obesity implies a BMI of  $\geq 30.0$  kg/m<sup>2</sup>, and pre-obesity a BMI of 25.0-29.9 kg/m<sup>2</sup> [6]. The BMI categories for defining overweight among children and adolescents vary by age and gender. BMI for children is gender specific and age specific. BMI-for-age is used as a screening tool for overweight and obesity. Childhood obesity is defined as having a BMI  $\geq 95^{\text{th}}$  percentile for age and sex and severe obesity is defined as BMI  $\geq 120\%$  of the 95<sup>th</sup> percentile for age and sex [4].

The aim of this paper was to review the recent data regarding the nutritional status of subpopulations of children, adolescents and adults in Poland. In addition, we present data regarding changes in body mass during the COVID-19 pandemic.

## MATERIAL AND METHODS

The search was conducted using PubMed, Google Scholar, and Web of Sciences databases, as well as official websites of the Polish Ministry of Health, the National Institute of Public Health NIH – National Research Institute and the World Health Organization. Scientific publications in English and Polish, published between January 2020 and September 2023, were used as sources of information. The key words used in the search (single or in combination with the operators NOT, OR, AND) included: “nutritional status”, “health status”, “body weight”, “obesity”, “overweight”, “weight gain”, “weight loss”, “children”, “adolescents”, “adults”, “COVID-19 pandemic”. Studies with a sample size of at least 100 participants were included in the analysis. The search was

performed by two researchers. The protocol of the study was not registered.

## RESULTS AND DISCUSSION

### NUTRITIONAL STATUS OF POLISH CHILDREN AND ADOLESCENTS

The WHO's European Childhood Obesity Surveillance Initiative (COSI, round 5) indicated that, overall, 29% of children aged 7-9 years were found to have excessive body weight. Prevalence was higher among boys (31%) than girls (28%). The total prevalence of obesity among 7-9-year-old children was 12%, and more common in boys (14%) than girls (10%) [7]. The COSI study revealed that country-specific prevalence of obesity among children ranged from 1% in Tajikistan to 19% in Cyprus [7]. Childhood obesity (age 5-19 years) is expected to increase by 60% over the next decade, reaching 254 million by 2030 [2, 3].

In Poland, as in other countries, there is a growing percentage of children and adolescents with excessive body weight. According to the official WHO statistics, the prevalence of overweight children under 5 years in Poland was 6.0%, while the prevalence of obesity among children and adolescents (5-19 years) was 9.1% [3].

The results of selected studies which assessed the nutritional status of the paediatric population in several regions in Poland are presented in Table 1. Among nine studies included in this analysis, six relied on measured anthropometric parameters. In general, the prevalence of children/adolescents with excessive body mass increased with age (with some exceptions). Among Polish toddlers (13-36 months) living in Wielkopolska, 15% were underweight, 71% had normal body weight, while 5% were overweight, and 8% obese [8]. The prevalence of overweight and obesity among preschool children aged 5-6 years in Rzeszów (BMI  $\geq 85^{\text{th}}$  percentile) was 11.1%. Higher prevalence of excessive body mass and adiposity was reported according to body fat percentage (42.3% of children). Children with obese parents were more likely to have excessive body mass and adiposity than children having parents with normal body weight. Furthermore, lower levels of parental education, screen time of over 120 minutes per day, high birth weight ( $> 4000$  g) and caesarean section were associated with excessive body mass among children taking part in this study [9].

The study conducted among children from selected primary schools in Poland showed that 74.7% of children had a normal body weight and 17.1% had excessive body weight [10]. Almost one child in five had excess body weight. Obesity was found among 6.8% of children, whereas overweight was found among 10.3% of the study population. Excessively low body weight was present in 8.2% of all children in the study [10]. The results of the Childhood Obesity Surveillance Initiative (COSI) provided by the Institute of Mother and Child in Warsaw with the support of the WHO Country Office for Poland indicated that 32.3% of 8-year-old children were over-

TABLE 1. Nutritional status of Polish children and adolescents

Group (n)	Age (years)	Region of Poland	Data collection period	Body mass status based on BMI percentiles (%)			Method of data measurement	Source
				Underweight	Normal	Overweight		
Toddlers (520)	13-36 months	Greater Poland region (Wielkopolska)	May-July 2019	15	71	5	8	[8]
Preschool children (1172)	5-6	22 randomly selected kindergartens in Rzeszów	October-November 2018 - 2019	9.6 6.8 B 12.6 G	79.4 82.8 B 75.7 G	6.7 6.5 B 6.8 G	4.4 3.8 B 4.9 G	[9]
School children (908)	6-10	38 selected primary schools in Poland	September 2018 – March 2019	8.2	74.7	10.3	6.8	[10]
Children (2690)	8	Primary schools collected according to the WHO protocol	October 2018 – December 2020	nd	nd	18.3 B 19.2 G	17.6 B 9.4 G	[7]
Children (2227)	8	Primary schools collected according to the WHO protocol	The last quarter of 2021	3.1	nd	18.5	17.1	[11]
Adolescents (589)	10-13	Selected primary schools in the Silesian Province	2018-2019	21.84	35.37	16.44	26.35	[14]
Adolescents (381)	10-16	Public elementary schools in Sopot (Pomeranian Province)	2017-2019	5.2	68.5	18.6	7.6	[12]
School children (376)	6-10 11-15	Leżajsk in Podkarpackie Voivodeship (southeast Poland)	February-March 2020	4.1 2.7	73.3 74.7	18.6 19.8	3.6 2.7	[15]
Girls (109)	16 and 18 years	Complex of Schools and Institutions for Professional Education in Zielona Góra	nd	25.7	64.2	7.3	2.8	[16]

B – boys, G – girls, nd – no data

1 – Children's body mass and height were measured. 2 – Questionnaire completed by one of the children's parents. 3 – Anthropometric parameters of the child (body mass and height) were obtained from the child's medical record book (Health Card)

TABLE 2. Nutritional status of adults in Poland

Group (n)	Age (years)	Data collection period	Body weight according to BMI (%)			Methods of data collection	Source
			Underweight	Normal	Overweight		
Representative random sample of 2,000 people aged over 20	20 years and over	1-17 August 2022	nd	nd	52.0 62.1 M 42.6 W	13.6 15.7 M 11.7 W	2 [17]
Adults (1831)	18-96 representative nationwide sample	July 2019 – February 2020	1.1 0.2 M 2.0 W	40.3 50.3 M 49.7 W	42.2 52.4 M 32.0 W	16.4 16.5 M 16.2 W	1 [18]
Elderly (604)	65 and over	July 2019 – February 2020	1.3 M 4.3 W	20.3 M 33.9 W	55.3 M 40.1 W	20.3 M 21.7 W	1 [19]
Women (308)	70.35±16.97	October-November 2022	2.9	54.9	25.3	16.9	2 [20]

M – men, W – women, nd – no data

1 – Anthropometric parameters were measured, 2 – Anthropometric parameters were self-reported

weight, while 13.6% were obese [7]. According to more recent data, collected in 2021, the percentage of children aged 8 years with excessive body weight had increased to 35.6%. Inappropriate body weight was more prevalent in boys (38.8%) than in girls (32.2%) [11].

Early detection of childhood obesity is the first step in the management of abnormal body weight. Suligowska and Buczny [12] found that 31.0% of a group of Polish parents were not able to properly assess their children's BMI, especially when their children were overweight or obese. This research, undertaken within the framework of the SOPKARD-Junior project in Sopot, showed that parents of children with normal or higher than normal BMI perceived their children's weight as lower. Half of obese children were perceived by their parents as overweight, but not obese [12]. The misunderstanding of the problem may lead to the progression of obesity and early health complications. Excessive body weight from the earliest stages of life is a risk factor for the persistence of obesity. Furthermore, some researchers emphasize that more than 60% of overweight prepubertal children maintain the extra weight over adulthood, while childhood and adolescence obesity is associated with adverse health consequences later in life [13].

The study conducted among parents of children aged 10-13 years in the Silesian Province found that approximately 16% of children were overweight, and 26% were obese. Children living in rural areas were characterized by a significantly lower BMI compared to children living in urban areas [14]. The highest percentage of adolescents with excessive body mass in this study was found in the group of 11-year-old pupils (50.72%). Considering the small sample size in each age group and the method of data collection (a questionnaire completed by the parents) these data should be interpreted with great caution [14].

Similarly to the findings of the study of Matłosz *et al.* [9], children of parents with overweight or obesity were characterized by a higher BMI compared to children whose parents had normal body weight. This indicates that preventing and controlling excess weight in children and adolescents is very important and obesity prevention programmes should target the entire family. Apart from excessive caloric intake, several factors are involved in the development of childhood obesity, including skipping breakfast, drinking sugar-sweetened beverages, eating when not hungry and eating in front of the TV screen [13].

A cross-sectional study conducted among primary school students in Podkarpackie Voivodeship demonstrated that the majority of participants had normal body mass (74.2%), while 19.1% were overweight and only 3.2% were obese [15]. This study showed that sleeping time, playing computer games, watching movies, and using smartphones were among factors influencing the value of BMI. A relatively high prevalence of underweight and low prevalence of obesity were found among girls aged 16 and 18 years in the study carried out by Goluch and Korsak [16].

Data on the body weight status among the adult Polish population are presented in Table 2. According to the statistics published by the National Institute of Public Health National Institute of Hygiene – National Research Institute, in 2022, more than 65% of Poles were overweight (BMI  $\geq 25$  kg/m<sup>2</sup>) or obese (BMI  $\geq 30$  kg/m<sup>2</sup>). The prevalence of overweight in a random sample of the adult population was 62% for men and 43% for women. The prevalence of higher-than-normal body mass increases with age, reaching a peak between 75 and 84 years of age [17]. The risk of experiencing overweight or obesity depends on the level of education. Women with higher education have a two times lower risk of reaching an excessive body weight than those with lower education [17]. Higher prevalence of age-standardized obesity among Polish adults (18+ years) (23.1%) was reported by the WHO [3].

The study performed by Stoś *et al.* as a part of the Nationwide Dietary Survey in Poland revealed that 42.2% of adults were overweight, while 16.4% of them were obese [18]. More than half of males and one third of females were overweight. Likewise, it was found that the prevalence of overweight/obesity increased with age among both male and female adult populations. The study showed that several factors such as male population, older age, being occupationally active, living in rural areas and the presence of at least one chronic disease were linked to overweight/obesity [18].

Rychlik *et al.* assessed the prevalence of overweight and obesity among Polish elderly as part of the Nationwide Dietary Survey [19]. They found that more than 55% of men and 40% of women were overweight. The prevalence of obesity exceeded 20% among both men and women. Abdominal obesity was observed in 50% of men and 70% of women. According to the authors, waist circumference indicating an increased risk of metabolic complications was found in 44.1% of men and 67.5% of women [19]. A study conducted among women living in the Silesia Region revealed that the mean BMI increased by 1.38 kg/m<sup>2</sup> between 2011 and 2022 [20].

Excessive body weight in adults is associated with increased all-cause mortality. Some studies have found that people with obesity also have a four-fold higher risk of developing severe COVID-19 symptoms than people without obesity [21].

### THE IMPACT OF THE COVID-19 PANDEMIC ON BODY WEIGHT

Coronavirus disease 2019 (COVID-19) and the obligatory lockdown during the pandemic had a strong impact on the lifestyle of millions of people around the world, leading to potential higher incidence of weight gain (overweight, obesity) in younger people, and a risk of weight loss (malnutrition and sarcopenia) in older adults [22]. The review and meta-analysis by Bakaloudi

TABLE 3. Changes in body mass during COVID-19 pandemic

Population (n)	Age (years)	Changes in body mass (%)			Time of data collection	Methods of data collection	Source
		Decreased	No changes	Increased			
Children (294)	6-14	7.8	52.4	33.0	Before and during the pandemic	1	[24]
Adolescents (1333)	10-16	18.2	41.4	40.4	June 2020	2	[25]
Adults (183)	17-71	27.8	20.2	49.18	nd	2	[26]
Adults from 15 voivodeships (312)	41.12 $\pm$ 13.05 (mean $\pm$ SD)	21.72	32.41	45.86	29 April – 19 May 2020	1	[27]
Adults (312)	18-79	18.5 M 23.6 W	38.9 M 28.6 W	42.5 M 47.8 W	April-May 2020	2	[28]
Adults (1097)	18-71	18.6	–	29.9	April-May 2020	2	[29]
Adult women (1769)	18+	18.1	48.3	33.6	April-May 2020	2	[30]
Adults (290)	18-65	18.5 M 23.6 W	38.9 M 28.6 W	42.6 M 47.8 W	April-May 2020	2	[31]
Adults (2535)	18-65	15.7	50.4	33.9	May-June 2020	2	[32]

M – men, W – women, nd – no data

1 – questionnaire completed by one of the children's parents, 2 – anthropometric parameters were self-reported

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*et al.* [22] showed that the majority of studies that examined the impact of the COVID-19 pandemic lockdown on body status reported a tendency of an increase in body weight, with the largest increase, of more than 70%, in Iraq. The Polish studies included in this meta-analysis reported an increase of body weight in 29.9 to 45.9% of individuals and body weight loss in 18.6–21.7% of participants. Unfavourable changes in the distribution of BMI categories in the Polish population appeared to be higher in men than in women. Data on the body weight changes during COVID-19 are presented in Table 3.

According to IPSOS data research, performed online, across 30 countries, among a large population of 22 008 adults aged 16–74 years, globally around 50% of respondents reported changes to their body mass since the beginning of the pandemic. Weight gain (31%) was self-reported more frequently than weight loss (20%). In Poland, 23% of respondents reported weight gain, while 14% reported weight loss [23]. The maximum reported weight gain and loss during the quarantine period were 10 and 9 kg, respectively [24–28].

The studies emphasised that increased BMI during the COVID-19 lockdown was associated with unhealthy dietary patterns, including less frequent consumption of vegetables, fruits, and legumes, more frequent snacking and higher intake of meat, fast foods and alcohol [29–33]. In addition, social isolation and forced inactivity have significantly affected nutritional habits of children, adolescents and adults and could lead to an increase in obesity prevalence. Khan and Smith proposed defining this phenomenon as “covibesity” [34].

To avoid unhealthy weight gain, foods high in energy, fats, free sugars and salt should be limited. The distribution of macronutrients (the percentage of energy from fat, carbohydrates and protein) is also an important dietary factor contributing to the development of overweight and obesity. It should be underlined that overweight and obesity are largely preventable. In the prevention of unhealthy weight gain, the WHO recommends limiting fat intake to 30% of total energy or less for adults aged 20 years or over [35].

This study has some limitations. We included only recent studies published between 2020 and 2023. Certainly, inclusion of a larger number of studies in the analysis, as well as the comparison of the region-specific results with nationwide data, would improve the quality of this research. It should also be noted that the methods of data collection varied (self-reported vs. measured) and the presentation of the data made objective comparison difficult. Furthermore, the utility of BMI in measuring body fat or adiposity is limited. However, BMI is an inexpensive, non-invasive and simple screening tool to monitor tendencies and the change in the distribution of obesity in different populations over time. BMI is frequently used as both a screening and diagnostic tool for detecting excess body weight. It seems that instead of conducting individual studies covering small popu-

lations, it would be more appropriate to set up registers of data obtained from anthropomorphic measurements carried out by qualified medical personnel at the time of follow-up examinations.

## CONCLUSIONS

The prevalence of overweight and obesity among children, adolescents and adults in Poland is a growing public health problem. The COVID-19 pandemic additionally has further worsened the situation. As excessive body weight is associated with adverse health effects, comprehensive and family-based obesity prevention programmes should be implemented. Early prevention is crucial to reversing current trends.

## DISCLOSURE

The authors report no conflict of interest.

## References

1. WHO. World Health Organization. Obesity and Overweight. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight> (accessed: 15 October 2023).
2. WHO. World health statistics 2023: monitoring health for the SDGs, Sustainable Development Goals. World Health Organization, Geneva 2023. Available from: [https://cdn.who.int/media/docs/default-source/gho-documents/world-health-statistic-reports/2023/world-health-statistics-2023\\_20230519\\_.pdf](https://cdn.who.int/media/docs/default-source/gho-documents/world-health-statistic-reports/2023/world-health-statistics-2023_20230519_.pdf) (accessed: 15 October 2023).
3. WHO European Regional Obesity Report 2022. WHO Regional Office for Europe, Copenhagen 2022. Available from: <https://cdn.easo.org/wp-content/uploads/2022/05/01181745/WHO-EUROPEANOBESITYREPORT.pdf> (accessed: 15 October 2023).
4. Hampl SE, Hassink SG, Skinner AC, et al. Clinical practice guideline for the evaluation and treatment of children and adolescents with obesity. *Pediatrics* 2023; 151(2): e2022060640.
5. Ansari S, Haboubi H, Haboub N. Adult obesity complications: challenges and clinical impact. *Ther Adv Endocrinol Metab* 2020; 11: 2042018820934955.
6. WHO. Diet, nutrition and the prevention of chronic diseases. Report of a joint WHO/FAO expert consultation. WHO Technical Report Series No. 916. Geneva: World Health Organization; 2003. Available from: [http://whqlibdoc.who.int/trs/WHO\\_TRS\\_916.pdf](http://whqlibdoc.who.int/trs/WHO_TRS_916.pdf) (accessed: 24 October 2023).
7. WHO. Report on the fifth round of data collection, 2018–2020: WHO European Childhood Obesity Surveillance Initiative (COSI). Copenhagen: WHO Regional Office for Europe; 2022. Available from: <https://www.who.int/europe/publications/i/item/WHO-EURO-2022-6594-46360-67071> (accessed: 15 October 2023).
8. Wojtyła-Buciora P, Kapka-Skrzypczak L, Chęcińska-Maciejewska Z, et al. A nutritional assessment of children aged 1–3 years in the greater Poland (Wielkopolska). *J Health Inequal* 2020; 6(1): 32–39.
9. Małosz P, Wszyńska J, Asif M, et al. Prevalence of overweight, obesity, abdominal obesity, and obesity-related risk factors in Polish preschool children: a cross-sectional study. *J Clin Med* 2021; 10(4): 790.

10. Potempa-Jeziorowska M, Jonczyk P, Świętochowska E, Kurzajewski M. The analysis of the nutritional status and dietary habits among children aged 6-10 years old attending primary schools in Poland. *Int J Environ Res Public Health* 2022; 19(2): 953.
11. Fijałkowska A, Oblacińska A, Dzielska A, et al. Zdrowie dzieci w pandemii COVID-19 [Children's health in the COVID-19 pandemic.] Instytut Matki i Dziecka, Warszawa 2022.
12. Suligowska K, Buczny J. Obesity in Polish children and parents' perception of their children's weight status: the results of the SOPKARD-Junior Study. *Int J Environ Res Public Health* 2022; 19(8): 4433.
13. Maffeis C, Olivieri F, Valerio G, et al. The treatment of obesity in children and adolescents: consensus position statement of the Italian Society of Pediatric Endocrinology and Diabetology, Italian Society of Pediatrics and Italian Society of Pediatric Surgery. *Ital J Pediatr* 2023; 49: 69.
14. Jonczyk P, Potempa-Jeziorowska M, Świętochowska E, Kucharczyński M. Analysis of the nutritional status of children aged 10-13 years in the Silesian province, Poland, and correlation with socio-demographic factors. *Health Prob Civil* 2021; 15(2): 101-108.
15. Bartosiewicz A, Łuszczki E, Kuchciak M, et al. Children's body mass index depending on dietary patterns, the use of technological devices, the internet and sleep on BMI in children. *Int J Environ Res Public Health* 2020; 17(20): 7492.
16. Goluch Z, Korsak J. Ocena stanu odżywienia, sprawności fizycznej oraz częstotliwości spożycia produktów spożywczych przez dziewczęta w wieku 16 i 18 lat [Evaluation of the state of nutrition physical efficiency and frequency of consumption of food products by girls aged 16 and 18.] *Nauki Inżynierskie i Technologie. Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu. Wrocław: Uniwersytet Ekonomiczny we Wrocławiu; 2020, pp. 84-102.*
17. Wojtyński B, Goryński P (eds.). Health status of Polish population and its determinants 2022. National Institute of Public Health NIH – National Research Institute, Warsaw 2022.
18. Stoś K, Rychlik E, Woźniak A, et al. Prevalence and sociodemographic factors associated with overweight and obesity among adults in Poland: a 2019/2020 nationwide cross-sectional survey. *Int J Environ Res Public Health* 2022; 19(3): 1502.
19. Rychlik E, Woźniak A, Stoś K, Oltarzewski M. Nutritional status of the elderly in Poland. *Rocz Panstw Zakł Hig* 2022; 73(3): 275-283.
20. Białek-Dratwa A, Kokot T, Czech E, et al. Dietary trends among Polish women in 2011-2022 – cross-sectional study of food consumption frequency among women aged 20-50 in Silesia region, Poland. *Front Nutr* 2023; 10: 1219704.
21. Izcovich A, Ragusa MA, Tortosa F, et al. Prognostic factors for severity and mortality in patients infected with COVID-19: a systematic review. *PLoS One* 2020; 15(11): e0241955.
22. Bakaloudi DR, Barazzoni R, Bischoff SC, et al. Impact of the first COVID-19 lockdown on body weight: a combined systematic review and a meta-analysis. *Clin Nutr* 2022; 41(12): 3046-3054.
23. Bailey P, Purcell S, Calvar J, et al. Diet & health under COVID-19. Ipsos, 2021. Available from: [https://www.ipsos.com/sites/default/files/ct/news/documents/2021-02/diet-and-health-under-covid-19\\_0.pdf](https://www.ipsos.com/sites/default/files/ct/news/documents/2021-02/diet-and-health-under-covid-19_0.pdf) (accessed: 25 October 2023).
24. Krupa-Kotara K, Wojtas G, Grajek M, et al. Impact of the COVID-19 pandemic on nutrition, sleep, physical activity, and mood disorders of Polish children. *Nutrients* 2023; 15(8): 1928.
25. Kołota A, Głowska D. Analysis of food habits during pandemic in a Polish population-based sample of primary school adolescents: diet and activity of youth during COVID-19 (DAY-19) Study. *Nutrients* 2021; 13(11): 3711.
26. Dobrowolski H, Włodarek D. Body mass, physical activity and eating habits changes during the first COVID-19 pandemic lockdown in Poland. *Int J Environ Res Public Health* 2021; 18(11): 5682.
27. Błaszczuk-Bębenek E, Jagielski P, Bolesławska I, et al. Nutrition behaviors in Polish adults before and during COVID-19 lockdown. *Nutrients* 2020; 12(10): 3084.
28. Bolesławska I, Błaszczuk-Bębenek E, Jagielski P, et al. Nutritional behaviors of women and men in Poland during confinement related to the SARS-CoV-2 epidemic. *Sci Rep* 2021; 11(1): 19984.
29. Sidor A, Rzymiski P. Dietary choices and habits during COVID-19 lockdown: experience from Poland. *Nutrients* 2020; 12(6): 1657.
30. Drywień ME, Hamulka J, Zielinska-Pukos MA, et al. The COVID-19 pandemic lockdowns and changes in body weight among Polish women. A cross-sectional online survey PLife-COVID-19 Study. *Sustainability* 2020; 12(18): 7768.
31. Bolesławska I, Jagielski P, Błaszczuk-Bębenek E, et al. Lifestyle changes during the SARS-CoV-2 pandemic as predictors of BMI changes among men and women in Poland. *Nutrients* 2023; 15(11): 2427.
32. Białorudzki M, Izdebski Z. Changes in the body mass of adult residents of rural and urban areas in the initial months of the COVID-19 pandemic vs. their mental, physical and sexual health. *Ann Agric Environ Med* 2021; 28(4): 667-675.
33. Wiśniewski OW, Czyżniewski B, Żukiewicz-Sobczak W, Gibas-Dorna M. Nutritional behavior in European countries during COVID-19 pandemic – a review. *Nutrients* 2023; 15(15): 3451.
34. Khan MAB, Smith JEM. "Covibesity," a new pandemic. *Obes Med* 2020; 19: 100282.
35. WHO. Total fat intake for the prevention of unhealthy weight gain in adults and children: WHO guideline. World Health Organization, Geneva 2023. Available from: <https://www.who.int/publications-detail-redirect/9789240073654> (accessed: 15 October 2023).

#### AUTHORS' CONTRIBUTIONS

DG, AH prepared research concept and design of the publication. All authors took part in data collection. DG analysed and interpreted data. DG prepared the first draft of the article. DG, AH critically revised it. All authors approved the final text of the publication.