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Pandemic changes in work, rest, physical activity and diet versus nutritional status of respondents

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Abstract

The aim of the study was to determine how the COVID-19 pandemic affected the nutritional status of the respondents through changes in work mode, physical activity and diet among residents of the Tarnów region.

Material and methods. The study was conducted using the diagnostic survey method, and the tool was the author's questionnaire. The study was conducted in January-February 2022, using the Google Forms platform. In total, data were collected from 414 people. The questionnaires were filled out mostly by women (67.9% vs. 32.1%). The average age of respondents was 31.9 years (± 13.52).

Results. Those who worked remotely and in hybrid mode had the highest percentages declaring an increase in food intake during the COVID-19 pandemic (65.0% and 59.7%, respectively). The highest percentages of those who indicated a deterioration in the quality of their food intake were those who worked remotely (60.0%) and hybrid job (45.5%), while those who did not work were the group that most often among the others indicated an improvement in the quality of their food (23.4%). Respondents with remote and hybrid jobs

were the most likely to report a reduction in their activity level (72.5% and 58.4%, respectively). Considering the BMI of those surveyed before the COVID-19 pandemic and now, there is an apparent decrease in the percentage of those with a normal BMI in favor of overweight and obesity.

Conclusions. During the COVID-19 pandemic period, the percentages of overweight and obese people increased. People working remotely and in hybrid mode not only increased the amount of food they consumed, but also began to consume lower-quality products, as well as more often reporting reduced levels of physical activity.

Keywords: obesity, nutritional status, diet, physical activity, pandemic

Introduction

Obesity, due to its impact on the body and its association with many diseases (e.g. type 2 diabetes, hypertension, cardiovascular and liver diseases, sleep apnea, cancers) is an important social problem. According to the latest World Health Observatory data collected in 2016, more than 1.9 billion adults were overweight, and 650 million of them were obese. The global prevalence of obesity nearly tripled between 1975 and 2016, with a significant increase in most countries, including those considered low- and middle-income. As a result, the global spread of obesity has been called a pandemic [1].

The sudden epidemic and global spread of COVID-19 represents one of the most serious social and public health challenges in the modern world. Researchers emphasize that social strategies implemented to combat COVID-19 could have a long-term negative impact on worsening the obesity epidemic [2]. In recent years, obesity rates have increased in low- and middle-income countries and those affected by the economic crisis, as unhealthy foods have become more available and affordable [3]. Moreover, eating behavior may be influenced by declining mental health, to which reduced social interaction and loneliness may contribute. Psychosocial reactions to stress have been found to increase energy intake [4], and people with limited social interactions are more likely to be obese [5]. In addition, emotional eating, often used to alleviate negative feelings, may increase under circumstances of psychological stress [6]. Finally, closing fitness centers and limiting organized sports, combined with the need for social distance, can make it more difficult to lead an active lifestyle.

Studies have shown that obesity weakens the immune system, making an individual susceptible to infectious diseases. Obesity proved to be a strong risk factor for severe illness during the COVID-19 pandemic; people with COVID-19 and obesity were shown to have an increased risk of severe illness, hospitalization and death [7]. As obesity is a modifiable risk factor of COVID-19, one of the goals of public health authorities should be to achieve normal body weight at the population level, which can reduce the adverse effects of non-communicable and infectious diseases, including COVID-19 [1].

From an epidemiological point of view, the use of social isolation to combat the COVID-19 pandemic appears to be effective, but these actions can have a serious negative impact on other health indicators. The aim of this study was to determine how the COVID-19 pandemic affected the nutritional status of the respondents through changes in work mode, physical activity, and dietary patterns in individuals in the Tarnów region.

Material and methods

The inclusion criterion was: minimum age of 18 years, consent to participate in the study, correctly completed survey questionnaire. Due to failure to meet the age criterion and/or missing data in the questionnaire, 8 participants were excluded from the analysis. The total number of participants that were included in the analysis was 414.

The study was carried out using the diagnostic survey method, and the tool was the author's questionnaire. The questionnaire consisted of 22 questions. The questions concerned socio-demographic data (including a question about the change of work mode during the COVID-19 pandemic: stationary, remote, hybrid) and changes related to the COVID-19 pandemic: in terms of physical activity, in terms of the quantity and quality of meals consumed, reasons for changes in the above-mentioned eating habits, height and weight (before the COVID-19 pandemic and now). Using the subjects' height and weight data, the BMI before the COVID-19 pandemic and at the time of completing the questionnaire was calculated, as well as the average change in the number of kilograms during the COVID-19 pandemic period was determined. The National Institute of Health (NIH) now uses BMI to define a person as underweight ($<18,5$ kg/m²), normal weight (18,5-24,9 kg/m²), overweight (25,0-29,9 kg/m²), or obese ($\geq 30,0$ kg/m²) [8].

The study was conducted in January-February 2022 via social media using the Google Forms platform. A link to the survey was made available on groups for residents of Tarnów and the region.

The study was conducted in accordance with ethical principles (including adherence to the principles of the Declaration of Helsinki).

Calculations were performed using Excel and Statistica. Relationships between the two variables were tested using the chi-square test of independence, ANOVA and Spearman's correlation. The statistical analyses assumed a significance level of $p = 0.05$.

Results

The questionnaires were filled out mostly by women (67.9% vs. 32.1%). The average age of respondents was 31.9 years (± 13.52), the youngest respondent was 19 years old, and the oldest was 88 years old. The ratio of those living in rural and urban areas was similar (42.0% vs. 58.0%). Most people declared secondary education (50.7%) and higher education (31.2%). The remaining people had primary education (8.2%) and vocational education (8.9%) - Table 1.

Table 1. Characteristics of the study group

Variables	n	%
Age [mean 31.91 \pm 13.52 years; min. 19; max. 88]		
Sex		
Female	283	67.9%
Male	134	32.1%
Place of residence		
urban	240	58.0%
rural	174	42.0%
Education		
primary	34	8.2%
vocational	210	8.9%
secondary	133	50.7%
higher	37	31.2%
Type of work performed		
Mixed	96	23.2%
Office	92	22.2%
Not working	149	36.0%
Physical	77	18.6%
Nature of work performed		
Remote	40	9.7%
Not working during pandemic	128	30.9%
Hybrid	77	18.6%
Stationary	169	40.8%

Respondents were asked about the amount of food they consume compared to before the COVID-19 pandemic. Respondents mostly declared that they were currently taking the same amounts of food as before the COVID-19 pandemic ($n=188$; 45.4%), with a slightly smaller percentage admitting that they were consuming more food ($n=185$; 44.7%). There was a correlation between the nature of work during the COVID-19 pandemic and the change in the amount of food consumed during this period - those who worked remotely and hybridly significantly more often declared an increase in food consumption during the COVID-19 pandemic (65.0% and 59.7%) compared to those who worked stationary or did not work at all (36.7% and 39.8%) - Table 2.

Table 2. The existence of a relationship between change in food intake and nature of work during COVID-19 pandemic

Nature of work during COVID-19 pandemic	Change in the amount of food consumed compared to the period before COVID-19 pandemic			Statistic
	Less n (%)	Same amounts n (%)	More n (%)	
Not working	16 (12.5)	61 (47.7)	51 (39.8)	Chi2 =23. 71 p=0.0006
Hybrid work	9 (11.7)	22 (28.6)	46 (59.7)	
Stationary work	14 8.3	93 (55.0)	62 (36.7)	
Remote work	2 (5)	12 (30)	26 (65.0)	

According to 47.8% ($n=198$), their meal quality was not changed since the start of the COVID-19 pandemic, deterioration of meal quality was declared by 34.3% ($n=142$) of respondents, and improvement - by

17.9% (n=74). There was a correlation between the nature of work in the COVID-19 pandemic and the change in the quality of meals consumed - the highest percentages of those who indicated a deterioration in the quality of meals consumed performed remote work (60.0%) and hybrid work (45.5%), while those who did not work were the group that most often among the others indicated an improvement in the quality of their meals (23.4%) - Table 3.

Table 3. The existence of a relationship between change in the quality of meals consumed and nature of work during COVID-19 pandemic

Nature of work during COVID-19 pandemic	Change in the quality of meals consumed compared to the period before COVID-19 pandemic			Statistic
	Not changed n (%)	Worse n (%)	Better n (%)	
Not working	61 (47.7)	37 (28.9)	30 (23.4)	Chi2 =27.28 p=0.00013
Hybrid work	27 (35.1)	35 (45.5)	15 (19.5)	
Stationary work	96 (56.8)	46 (27.2)	27 (16.0)	
Remote work	14 (35.0)	24 (60.0)	2 (5.0)	

They were further asked about changes in the way they prepare meals during the COVID-19 pandemic. The largest percentage (n=160; 38.6%) responded that nothing changed and they continued to prepare wholesome meals (as before the COVID-19 pandemic). A significant percentage (n=99; 23.9%) believed that the COVID-19 pandemic affected this aspect of their lives positively - only now are they exerting themselves to prepare a full meal on their own. An equally high percentage (n=98; 23.7%) declared that since the COVID-19 pandemic they have been consuming more prepared foods and meals. The remaining 13.8% (n=57) indicated that nothing changed and they continue to consume mainly ready-made products and meals.

The next question was: "What influenced your negative dietary changes during the COVID-19 pandemic?". The largest percentage of respondents (36.1%; n=150) indicated that they had more time to snack. Also, a high percentage of respondents indicated that they had stress symptoms and depressive symptoms as a reason for snacking (39.1%; n=121) (Figure 1).

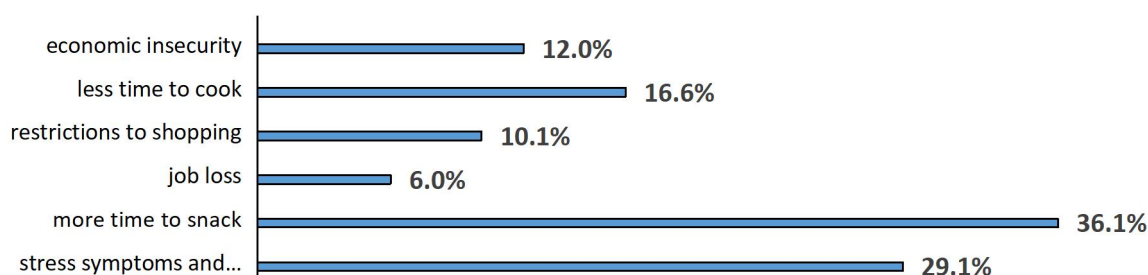


Figure 1 Factors influencing negative dietary changes during the COVID-19 pandemic

The majority of respondents (51.7%; n=214) estimated that their physical activity decreased during the COVID-19 pandemic. There was a correlation between the nature of the work performed during the COVID-19 pandemic and the change in the level of physical activity during this period - those with remote and hybrid jobs reported a decrease in activity levels in the highest percentage (72.5% and 58.4%, respectively) - Table 4.

Table 4. The existence of a relationship between change in physical activity and nature of work during COVID-19 pandemic

Nature of work during pandemic	Change in physical activity during pandemic			Statistic
	Not changed n (%)	Decreased n (%)	Increased n (%)	
Not working	37 (28.9)	68 (53.1)	23 (18.0)	Chi2 =15.55 p=0.02
Hybrid work	19 (24.7)	45 (58.4)	13 (16.9)	
Stationary work	67 (39.6)	72 (42.6)	30 (17.8)	
Remote work	7 (17.5)	29 (72.5)	4 (10.0)	

On average, the body weight of the respondents increased by 2.88 kg (\pm 6.14 kg); before COVID-19 pandemic: mean 23.35 kg (\pm 4.46 kg), min.14.78, max. 45.25 vs. currently: mean 24.34 kg (\pm 4.72 kg); min.15.94,

max. 45.2. Considering the BMI of the respondents before the COVID-19 pandemic and now, there is an apparent decrease in the percentage of subjects with a normal BMI in favor of overweight and obesity (Table 5).

Table 5. Comparison of BMI of respondents before the COVID-19 pandemic versus now

BMI interpretation*	Before COVID-19 pandemic	Currently	Statistic
Underweight <18,5 kg/m ²	10.9% (n=45)	7.5% (n=31)	Chi2=5.6839 p>0.05*
Normal 18,5-24,9 kg/m ²	56.5% (n=234)	53.6% (n=222)	
Overweight 25,0-29,9 kg/m ²	23.9% (n=99)	27.1% (n=112)	
Obesity ≥30,0 kg/m ²	8.7% (n=36)	11.8% (n=49)	

* The result is not significant

Spearman correlation analysis showed that the higher BMI the subjects had before the COVID-19 pandemic, the higher BMI they had at the time of the survey. The relationship is strong (r=0.89).

Analysis by ANOVA test showed the following relationships (Table 6):

- respondents whose physical activity decreased during the COVID-19 pandemic gained more weight than those whose physical activity levels did not change, and these in turn gained more than those whose levels increased,
- respondents who consume more food than before the COVID-19 pandemic gained more weight than people who consume the same amount of food, and these in turn gained more weight than people who consume less food than before the COVID-19 pandemic,
- respondents whose meal quality is worse than before the COVID-19 pandemic gained more weight than those whose meal quality did not change, and these in turn gained more than those whose meal quality improved in the COVID-19 pandemic.

Table 6 Change in body weight [kg], change in physical activity, quantity of food and quality of food consumed during pandemic

Variables		N	Body weight change: Mean (SD) [kg]	ANOVA
Change in physical activity during COVID-19 pandemic	Not changed	130	2.1 (6.2)	< 0.00001
	decreased	214	4.5 (5.3)	
	increased	70	-0.6 (6.4)	
Change in food quantity during COVID-19 pandemic	Less than before pandemic	41	-4.9 (9.14)	< 0.00001
	The same	188	1.7 (4.36)	
	More	185	5.7 (4.89)	
Change in quality of food intake during COVID-19 pandemic	The same	198	1.9 (4.7)	< 0.00001
	Worse	142	5.8 (6.5)	
	Better	74	-0.28 (6.4)	

Discussion

The way to cope with the effects of the COVID-19 pandemic crisis and the need to spend more time at home is to consume excessive amounts of food, indulge yourself with food, and consequently develop obesity and overweight [9]. The National Centre for Nutrition Education draws attention to a very important problem that has arisen during the pandemic, namely increasing overweight and obesity. Obesity is associated with chronic inflammation and may contribute to a worse course of infections, including COVID-19 [10]. Even before the COVID-19 pandemic, Polish society was already in the process of intense weight gain - between 2009 and 2020, a woman gained an average of 7 kg over a period of 11 years, while a man gained 8 [11-12]. The

average Polish woman weighed 70 kg in January 2020, while a Pole weighed 86 kg. In practice, this means that the average Polish resident is overweight.

According to Poznan University of Medical Sciences researchers, more than 43.0% of Polish adults and almost 52% (out of a group of 1,097 people) reported consuming more food and snacks during the lockdown. These trends were more common in overweight and obese people. [13]. A similar proportion of respondents included in the self-analysis admitted that they had eaten more food during the COVID-19 pandemic (44.7%). Flaudias et al. surveyed 5738 undergraduate students for problematic eating behaviour related to the COVID-19 pandemic. They showed that students whose scores indicated a probable eating disorder were more likely to report higher levels of overeating. In addition, higher body dissatisfaction was associated with a higher likelihood of reporting paroxysmal overeating in the past seven days [14].

Olearczyk and Walewska-Zielecka, who studied the impact of the COVID-19 pandemic on selected areas of health, lifestyle and well-being of 2266 employees in Poland, showed that for 14% of respondents, the COVID-19 pandemic harmed nutrition (regularity and quality), for 26% a positive one, and 60% of respondents felt no change [15]. These results differ from those of the author's study, which found that the quality of meals eaten during the COVID-19 pandemic worsened in 34.3%, improved in 17.9% and remained unchanged in 47.8% of the subjects.

Analysis of our own research has shown from the start of the pandemic until February 2022, a reduction in the proportion of people with a normal BMI in favour of overweight and obesity. In addition, the respondents gained an average of 2.88 kg. The National Institute of Public Health - National Institute of Hygiene has published a report on the health situation in Poland in 2020. During the COVID-19 pandemic period from spring to autumn 2020, 28% of Poles aged 20 or older (28% of men and 29% of women) said they had increased their body weight. Men aged 20-44 and women aged 45-64 were the most likely to gain weight. Better educated people were more likely to gain weight [16]. According to Bogdanski [9], the rate of weight gain further increased in the COVID-19 pandemic, causing average weight gains of Poles between 3 and 6 kg. On the other hand, the Dailyfruits study "The Impact of Remote Work on the Eating Habits of Poles" shows that as many as 44% of Poles gained weight at home office. Most (39%) between 4 and 6 kg. Nearly one in three employees (31%) admitted that they were emotionally eating during the COVID-19 pandemic. Nearly half of the employees who noted that they gained weight during home office declared that they were eating worse compared to before the change in work mode [17]. The Medicover Foundation study "Work. Health. Economy. Perspective 2020" confirms that less than half of workers have a normal BMI [18].

The majority of respondents included in the authors' study (51.7%) estimated that their physical activity had decreased during the pandemic, regardless of the nature of their work. Studies by other authors confirm that Poles significantly reduced their physical activity during the pandemic. This has contributed significantly to the weight gain of our country's population. As many as 42% of Poles surveyed have gained an average of 5.7 kg in weight, according to the Ipsos COVID 365+ survey. [19].

The Gdansk School of Banking, in cooperation with SW Research, released the results of a study that examined how Poles' eating habits changed during the COVID-19 pandemic. Nearly half of the respondents worked remotely during this time, and 27.3% did not work or study at all, so it can be assumed that they also spent this time at home. The vast majority of respondents improved their meal regularity, cut back on sugary drinks and started drinking more water. And while as many as one-third of respondents rate the dietary changes positively, just as many complain of increased weight during the COVID-19 pandemic. This is partly due to the fact that staying indoors makes it much easier to succumb to the temptation of compulsive snacking. It is also partly due to the fact that for most of those surveyed, the COVID-19 pandemic either had no impact on physical activity or affected it negatively [20].

Conclusions

The present study indicates that during the quarantine associated with the COVID-19 pandemic, a significant proportion of people experienced a change in eating habits manifested as an increase in food intake and a decrease in food quality, which is particularly evident in the hybrid and remote working group. Those working remotely and in a hybrid job were also more likely to report reduced physical activity levels. This is all the more worrying as physical activity helps mitigate home-office's adverse effects. Due to the above negative habits increased overweight and obesity rates during the COVID-19 pandemic.

Future research is needed to understand whether the lockdown associated with COVID-19 resulted in long-term reinforcement of adverse habits (regarding nutrition and physical activity) and associated health problems.

Well-designed health programs responding to the current problems of employees can translate into the development of habits of entire families.

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