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ORIGINAL PAPER

IMPACT OF THE COVID-19 PANDEMIC ON LIFESTYLE HABITS AND BODY WEIGHT OF MILITARY FLYING PERSONNEL OF THE POLISH ARMED FORCES

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Abstract

Background: The aim of this study was to assess whether and to what extent the coronavirus disease (COVID-19) pandemic affected the lifestyle and body weight of military flying personnel. **Material and Methods:** The study involved 930 Polish soldiers – members of aircrew. The study was conducted by using a survey designed by the author, as part of the implementation of the National Health Programme 2021–2025. The survey used the research technique computer assisted web interview. **Results:** Approximately half of the soldiers surveyed (49%) declared that they did not contract COVID-19. Analysis of the results on the frequency of consumption of selected food items showed that most food items respondents consumed at similar levels during the pandemic, compared to the pre-pandemic period. There was a positive increase in the frequency of consumption of nuts, fresh fruit and vegetables in 14.8%, 15.9% and 19% of respondents, respectively. More than 20% of those surveyed declared that they consumed less restaurant meals, fast food, sweets and sugary drinks. The vast majority of the respondents (77.6%) answered that they did not feel more negative emotions compared to the pre-pandemic period COVID-19 and emotions did not affect their diet. The frequency of physical activity remained the same for 71.9% of soldiers, while 14.9% respondents said they played sport less often than before the pandemic. Overweight was diagnosed in 50.2% of respondents, while 12.8% were obese. More than half of the respondents (56%) declared that their weight had not changed during the COVID-19 pandemic, 25.1% declared that their weight had increased and 8.9% that it had decreased. **Conclusions:** The COVID-19 pandemic condition did not disrupt the existing lifestyles of most military flying personnel. More than half of the military flying personnel surveyed reported no effect of the COVID-19 pandemic on weight change. A quarter of soldiers reported weight gain, which was associated with negative changes in diet and physical activity. Med Pr Work Health Saf. 2025;76(2)

Key words: obesity, lifestyle, physical activity, COVID-19, pandemic, military flying personnel

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INTRODUCTION

The new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease (COVID-19), first emerged in December 2019 in Wuhan, China, and quickly spread worldwide. On March 4, 2020, the first case of coronavirus was detected in Poland, and on March 20, 2020, the Minister of Health declared an epidemic state in Poland, lasting until July 1, 2023. As of March 3, 2024, there were 6 660 557 cases of COVID-19 and 120 573 deaths in Poland [1].

Various country-specific prophylactic measures have been taken around the world to limit the number and severity of cases in the community so that health systems remain viable and able to provide medical care to patients during the ongoing pandemic. To limit the spread of SARS-CoV-2 infection, various restrictions and rules have been put in place, including frequent hand washing, wearing of protective masks, maintaining social distance, quarantines including short-term and medium-term lockdowns, voluntary curfew at home, restriction of gathering, cancellation

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of planned social events including sporting events, use of movement bans, closure of airspace and national borders [2]. The lockdown has not spared Poland either.

The COVID-19 pandemic caused visible changes in lifestyles, health status and interpersonal relationships. While the restrictions put in place have been effective to some extent in reducing the transmission of SARS-CoV-2 infections, they have also increased the prevalence of mental health disorders, including but not limited to anxiety and depressive symptoms as a result of prolonged social isolation and chronic stress related to, among other things, fears for the health and lives of oneself and loved ones, loss of work and livelihood, and more. Elevated stress, in turn, is often associated with higher energy demands, unhealthy eating patterns, including fat- and sugar-rich "food cravings" and higher alcohol consumption, which can lead to weight gain and increased risk of obesity [3,4].

The risk of contracting COVID-19 may also have influenced daily food shopping and consumption behaviour. For example, during the pandemic, people may have tried to minimise the risk of infection by limiting their shopping in stationary shops in favour of using delivery services, and buying more packaged food, which is perceived to be more hygienic, but with a longer shelf life, which in turn limits the consumption of fresh food [5].

Social isolation has disrupted daily routines. Increased sedentary lifestyles and time spent in front of a screen, as well as limited food availability and choice, may have led to changes in eating habits and weight gain [6].

Restricted access to sports facilities may also have contributed. The pandemic's ban on the use of available sports and leisure facilities (swimming pools, gyms, fitness clubs) and even parks, forests or health paths adversely affected physical health and fitness levels, which in turn may have contributed to a significant reduction in the body's immune system, thereby promoting the incidence of various infections [7].

Today, it is known that a reduction in physical activity has contributed significantly to the weight gain of the Polish population. As many as 42% of Poles gained an average of 5.7 kg in weight during the COVID-19 pandemic, according to the Ipsos Covid 365+ survey [8], conducted in the first quarter of 2021, on a nationwide sample of 1004 people, representative of age, gender and size of locality. The Ipsos Covid 365+ survey showed that the problem of being overweight or obese affected 1 in 2 people in Poland.

Due to the restrictions, orders and prohibitions resulting from the outbreak of an epidemic condition in the territory of the Republic of Poland, the Minister of Defence has exempted all professional soldiers subject to the physical fitness test in 2020 and 2021 [9].

During the pandemic, restrictions were also introduced on the use of sports facilities within military units, which may have had the effect of reducing regular physical activity in this professional group. The period of the pandemic was therefore not a time conducive to undertaking systematic sporting activity, which is particularly important in military service, which, due to the nature of the tasks carried out, requires soldiers to be highly mentally and physically fit.

Regular physical activity as well as a high quality of sleep are key factors in maintaining the optimal performance of military crew members, given the physiological demands of the flight environment and the occupational stresses of the specific military lifestyle. Regular physical exercise, together with adequate rest, proper nutrition and a high quality of sleep, are capable of improving the physical performance of the body, strengthening its immune defences and its tolerance to endure greater loads [10].

A worrying phenomenon in the military community is the increasing prevalence of overweight and obesity that has been observed for years [11–13]. The problem of excessive body weight also affects soldiers in Poland [14] and is already observed at the stage of education in military academies [15].

Research carried out by the Military Institute of Aviation Medicine (MIAM) as part of the 2016–2020 National Health Programme found the prevalence of overweight in 49.3% and obesity in 17.3% of soldiers [16]. As for military flying personnel, the prevalence of overweight and obesity varied according to the assessment criterion; they were present in 63.5% of soldiers when body mass index (BMI) was the diagnostic criterion and in 52.5% when body fat percentage was the diagnostic criterion; abdominal obesity was present in almost half (47%) of the soldiers studied according to waist circumference size index and in 62.5% according to waist-to-height ratio [17]. Importantly, overweight and obesity, in addition to causing numerous health complications, may also contribute to reduced combat capability.

The impact of the introduced COVID-19-related restrictions on body weight and lifestyle, including diet and physical activity of military aircrews in Poland, has not yet been studied. Hence, the aim of this study was to assess whether and to what extent the COVID-19

pandemic has affected the previous lifestyle and weight change of military flying personnel using the author's questionnaire.

MATERIAL AND METHODS

Study group

The survey included 1130 soldiers – members of the military flying staff, from various types of the Polish Armed Forces, which accounted for 62% of the total population. Due to missing data, 930 people were included in further analyses. The majority of those surveyed were military flying personnel serving in the Air Force (79.8%), with the smallest group being Special Forces soldiers (2.4%). Military flying personnel serving in the Land Forces accounted for 10.2% and in the Navy for 7.6% of the respondents.

The subjects were soldiers who were undergoing mandatory periodic examinations at the Laboratory of Dietetics and Obesity Treatment of the MIAM and had expressed their willingness to participate in the research conducted as part of the National Health Programme for 2021–2025, which implements Operational Objective 1. Prevention of overweight and obesity. Project topic: "Promoting proper nutrition and physical activity among uniformed services." The main objective of the project is to conduct comprehensive educational interventions among the uniformed services on proper nutrition and the benefits of regular physical activity, and to implement measures to prevent the development of overweight and obesity among Polish soldiers.

The research was conducted between June 2021 and December 2022. Any member of the military flying personnel who was undergoing a medical examination at MIAM during this period was invited to be examined. No one refused to participate in the study. The research was anonymous. All procedures were approved by the Institutional Review Board of the MIAM, Warsaw, Poland (decision No. 8/2021 of 11 August 2021). All participants provided informed consent.

Methods

The study was conducted using a proprietary questionnaire, developed in the Dietetics and Obesity Treatment Laboratory at MIAM, as part of the implementation of the National Health Programme 2021–2025, directed by email to participating soldiers.

Prior to the survey, the questionnaire was approved by the experts of the Department of Military Health Services, who coordinate the substantive implementation of the National Health Programme. The survey used the computer assisted web interview, a web-based survey. It was made available through the ProfiTest tool (LABSEE Robert Borowski, Olecko, Poland), which is a secure solution in the context of the European Union rules on the protection of personal data. The study was anonymous.

The first page of the questionnaire contained brief information on the purpose of the research and concise instructions for completing it. The questionnaire contained basic questions on socio-demographic data (gender, age, education, marital status, place of residence, type of armed forces) and 28 closed questions on lifestyle changes during the COVID-19 pandemic. Questions in the questionnaire included: whether respondents were ill with COVID-19 during the pandemic period, what symptoms they experienced during the illness, whether and how long they were in quarantine, whether their body weight changed during the pandemic (possible answers to choose from were: "stayed the same," "increased by ... kg," "decreased by ... kg," "don't know"), whether they made changes to their diet, including frequency of consumption of selected foods compared to before the COVID-19 pandemic (possible answers to choose from were: "same frequency of consumption," "higher frequency of consumption," "lower frequency of consumption" or "no consumption"), whether the regularity of their food intake had changed, whether they consumed dietary supplements, what type of physical activity they undertook during the COVID-19 pandemic (respondents chose from a given list of 14 physical activities, they could select ≥1 answer, there was also an option to answer "other," where respondents could enter a type of physical activity that was not listed). The survey also included questions about step monitoring, time spent in front of the TV, computer (including work and leisure activities), smartphone and time spent sleeping (h/day) during the pandemic and whether this had changed compared to the time before the pandemic. Respondents were also asked whether they smoked and whether the pandemic had an impact on the number of cigarettes smoked.

Anthropometric examinations were performed during routine periodic examinations of military flying personnel at MIAM in Warsaw, at the Dietetics and Obesity Treatment Laboratory. Body height was measured with an anthropometer (Holtain, Crosswell, United Kingdom [UK]), to the nearest 1 mm, in a standing upright position, without shoes. Body weight was determined in underwear alone, after emptying the bladder. Participants were categorized on the basis of BMI based on

World Health Organization (WHO) criteria [18]. Three groups were created: BMI in the range 18.5–24.9 kg/m^2 (normal), BMI in the range 25–29.9 kg/m^2 (overweight) and BMI ≥30 kg/m^2 (obese).

Statistical analysis

For quantitative variables, the mean (M) value, standard deviation (SD), median (Me), the first and third quartiles (Q1–Q3), min. and max were calculated. Compliance with the normal distribution of quantitative variables was checked using the Shapiro–Wilk test. Since the distribution of the analyzed quantitative variables did not follow a normal distribution, the quantitative results are presented as median and quartile ranges – Me (Q1–Q3). In order to analyse the relationship between body weight change during a pandemic and the analyzed variables, the subjects were additionally divided into 3 groups: body weight unchanged, body weight increased and body weight decreased. The Kruskal–Wallis analysis of variance was used to check the differences between the 3 groups for quantitative variables. To check for differences between groups for qualitative variables, the χ^2 test was used. In addition, Cramér's V coefficient was calculated to assess the strength of the relationship for qualitative variables. It was assumed that the value of Cramér's V ≤0.05 means no association, >0.05 and ≤0.10 weak, >0.10 and ≤0.15 moderate, >0.15 and ≤0.25 strong, >0.25 very strong association [19].

The analyses were performed in the PS IMAGO PRO 9 program (IBM SPSS Statistics 29; Predictive Solutions, Cracow, Poland); the level of statistical significance was assumed to be $p < 0.05$.

RESULTS

The characteristics of the study group are included in Table 1. The median age of the subjects was 36 (30–42) years. The youngest soldiers were 20 and the oldest were 59 years old. The respondents were predominantly male, accounting for 93.9%. This percentage reflects the incidence of men in the general population of the Polish Army. The normal body weight was 37% of the soldiers. Among the respondents, 80.4% were university educated. Most of the respondents were married (71.4%), the smallest group were widowers (1 person). The overwhelming majority of soldiers (>80%) lived in places ≤500 000 inhabitants, only 19.9% lived in towns with more inhabitants. Among the respondents, most lived with a spouse/partner (80.2%) and with children (57.1%), 11.4% of respondents lived alone.

Table 1. Characteristics of the military flying personnel examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

Variable	Participants (N = 930)	
	n	%
Gender		
male	873	93.9
female	57	6.1
BMI		
18.5–24.9 kg/m^2	344	37
25–29.9 kg/m^2	467	50.2
≥30 kg/m^2	119	12.8
Marital state		
single	214	23
married	664	71.4
divorced	51	5.5
widowed	1	0.1
Education		
higher	748	80.4
secondary	163	17.5
student	17	1.8
other	2	0.2
Place of living		
village	201	21.6
town		
<50 000 citizens	250	26.9
50 000–150 000 citizens	134	14.4
151 000–500 000 citizens	160	17.2
>500 000 citizens	185	19.9
Living with		
husband/wife/partner	745	80.2
children	531	57.1
other family members	51	5.5
roommate	42	4.5
alone	106	11.4
Type of Armed Forces		
Air Force	742	79.8
Land Forces	95	10.2
Navy	71	7.6
Special Forces	22	2.4

Approximately half of the soldiers surveyed (49%) declared that they did not contract COVID-19. A positive polymerase chain reaction test for SARS-CoV-2

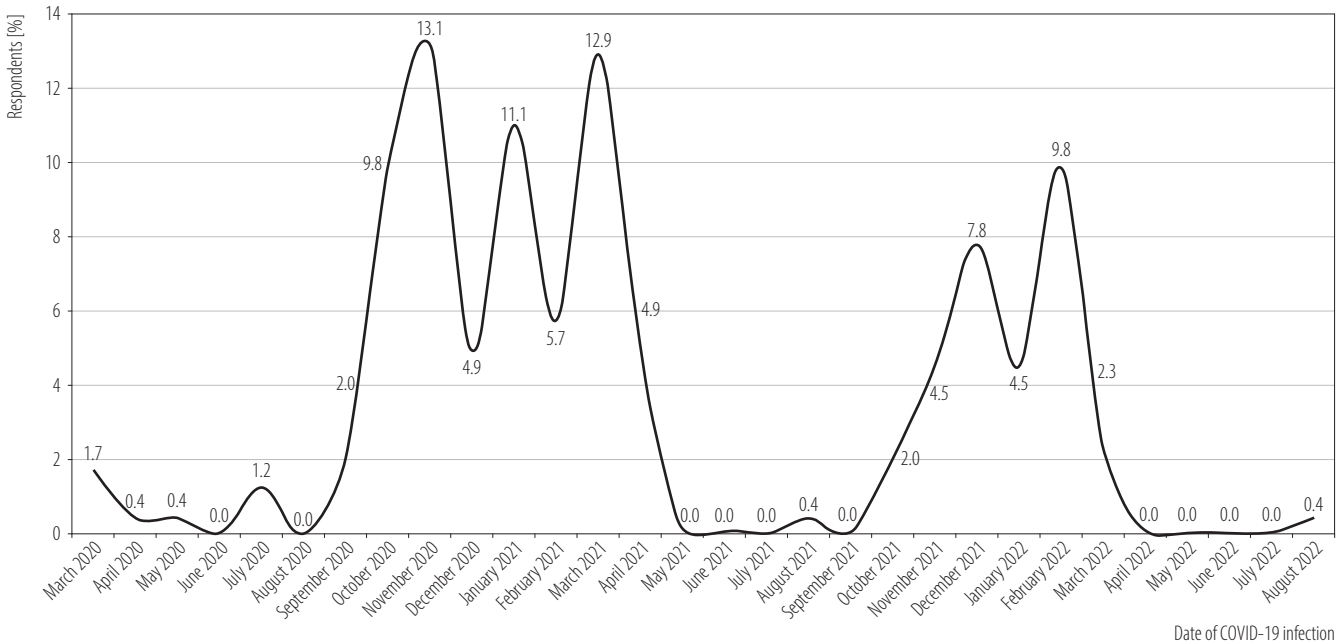

Figure 1. Date of infection of COVID-19 subjects (N = 326) – group of military flying personnel examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

virus was obtained by 35.1% of those surveyed. The rest of the soldiers responded that they did not know if they had become ill. Most became ill during autumn 2020 and spring 2021 (Figure 1).

The majority of soldiers surveyed (88.5%) responded that they did not work remotely during the pandemic. Almost half of the soldiers (44.9%) declared that they had arrived in quarantine. The median time spent in quarantine was 10 (10–14) days. Among those ill with COVID-19, the most frequently mentioned symptoms were feeling cold (38.2%), fever (34.2%), muscle pain (34.2%), loss of smell/taste (31.3%), headache (27.1%), runny nose (25.6%), cough (23.6%) and sore throat (21.6%).

Analysis of survey results on the frequency of consumption of selected food items showed that most food items military flying personnel consumed at similar levels during the pandemic, compared to the pre-pandemic period (Table 2). It was noted that 14.4% of respondents reported an increase in the consumption of eggs, 14.8% of nuts, 15.9% of fresh fruit and 19% of fresh vegetables. As can be seen in Table 2, >20% of those surveyed declared that they consumed less restaurant meals, fast food, sweets and sugary drinks, compared to the pre-pandemic period.

The vast majority of respondents (85.5%) declared that they had not changed the amount of food consumption compared to the pre-pandemic period COVID-19 (Table 3). Only 8.3% of respondents answered that they consumed more food, the rest that they consumed less. Only 11.3% of soldiers declared that they snacked more often between meals compared to the time before the pandemic. More than half of the respondents (55.8%) did not notice a change in this aspect. The majority of soldiers (85.4%) did not notice that the pandemic had affected their meal regularity. Only 8.9% of respondents increased the regularity of their meals. No change in terms of self-preparation and regularity of meals compared to the earlier period before the pandemic was observed in 84.8% of respondents. Only 11% of the respondents declared that they prepared meals themselves more often than in the pre-pandemic period.

In the survey conducted, 34.6% of the soldiers surveyed said they were currently taking dietary supplements. Among those taking dietary supplements, only 15.3% of those surveyed responded that the pandemic had influenced their decision to take them.

Interestingly, 77.6% of the respondents answered that they did not feel more negative emotions compared to the pre-pandemic period COVID-19. The vast majority of the respondents (92.5%) declared that the emotions associated with the duration of the pandemic did not affect their diet. Only 39% of the soldiers surveyed declared that they had tried to influence their immunity by changing their diet (Table 3).

Another issue analysed was physical activity. When asked whether the frequency of physical activity had

Table 2. Frequency of consumption of selected foods during the COVID-19 pandemic compared to pre-pandemic period by military flying personnel (N = 930) examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

Food product	Answers [%]			
	same frequency of consumption	higher frequency of consumption	lower frequency of consumption	no consumption
Meat and charcuterie	84.9	3.4	10.5	1.1
Fish and seafood	80.3	11.4	6.3	1.9
Milk and dairy products	80.9	9.1	7.8	2.2
Eggs	80.9	14.4	4	0.8
Cereal products made from refined flour	75.9	4.2	15.1	4.8
Cereal products made from whole grain flour	78.8	11.3	7.2	2.7
Rice and groats	81.4	11	5.6	2
Fresh fruit	77.6	15.9	6	0.4
Fresh vegetables	77	19	3.8	0.2
Fruit juices	75.1	9.6	9.2	6.1
Vegetable juices	74.8	8	5.7	11.5
Frozen processed fruit and vegetable products	77.2	6.2	7.3	9.2
Nuts and seeds	77	14.8	6.3	1.8
Legume plants	82.5	5.7	8.2	3.7
Plant-based substitutes for animal products	66	6.6	5.3	22.2
Restaurant dishes	55.9	13.7	24.6	5.8
Sweets	59.8	9.4	21.8	9
Salty snacks	67.1	7.2	17.5	8.2
Fast foods	54.9	7.7	24.4	12.9
Ready-made instant foods	45.4	3.9	14.7	36
Sweet drinks	52.4	4.9	21.2	21.5
Alcohol	67.5	5.2	18	9.4

changed during the pandemic compared to previous years, 71.9% of the respondents declared that it had remained the same, while 14.9% of the respondents said that they did sport less frequently (Table 3). Less than half of the soldiers surveyed (43.2%) responded that they monitored the number of steps taken per day. The median number of steps taken by respondents per day was 10 000 (8000–12 000) steps during the pandemic, with the majority of respondents (72.8%) stating that the number of steps they took had not changed compared to the state before the pandemic (Table 3).

Analysis of the data showed that the most common forms of physical activity chosen during the pandemic by the surveyed military flying personnel were walking, running and cycling (Figure 2). Only 1.5% of the respondents declared that they did not engage in any physical activity during this period. As can be seen in Figure 2, fitness classes, yoga and tennis were found to be the least popular forms of physical activity from among those mentioned in this group of respondents.

On average, respondents spent 1 (0.5–2) h/day watching TV, 2 (1–4) h/day in front of a computer screen and 2 (1–3) h in front of a phone/smartphone screen. Compared to the time before the pandemic, >81% reported that this was similar to the time they spent on these activities before the pandemic (Table 3).

For sleep, the soldiers surveyed declared that they devoted an average of 7 (7–8) h/day. Compared to the pre-pandemic period, 90.4% of respondents, reported that they slept the same amount of time as before the pandemic. A similar proportion (86.1%) declared that they felt no change in sleep quality (Table 3). Almost 88.8% of

Table 3. Changes in dietary behaviour and selected aspects of lifestyle during the COVID-19 pandemic compared to pre-pandemic period in a group of military flying personnel examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

Question	Answer [%]
During the COVID-19 pandemic, compared to earlier years, the amount of food you consume is... (N = 930)	
unchanged	85.5
more	8.3
less	6.2
During the COVID-19 pandemic, compared to earlier years, you snack between meals... (N = 930)	
unchanged	55.8
more	11.3
less	13.1
I don't snack at all	19.8
During the COVID-19 pandemic, compared to earlier years, you prepare your own meals... (N = 930)	
unchanged	84.8
more often	11
less frequently	4.2
During the COVID-19 pandemic period, compared to earlier years, your regularity of meal consumption has remained... (N = 930)	
unchanged	85.4
is bigger	8.9
is smaller	5.7
Did the emotions associated with the duration of the COVID-19 pandemic affect your need to eat? (N = 930)	
no	92.5
yes, I have a greater need to eat	6.6
yes, I have less need to eat	0.9
Do you take dietary supplements? (N = 930)	
no	65.4
yes	34.6
If so, has the ongoing COVID-19 pandemic, influenced your decision on dietary supplementation? (N = 322)	
no	84.7
yes	15.3
Did you feel more negative emotions during the pandemic? (N = 930)	
no	77.6
yes	22.4
Did the emotions associated with the duration of the pandemic affect your diet? (N = 930)	
no	92.5
yes, I have a more need to eat	6.7
yes, I have less need to eat	0.8
Have you tried to affect your immunity by changing your diet? (N = 930)	
no	61
yes	39

Table 3. Changes in dietary behaviour and selected aspects of lifestyle during the COVID-19 pandemic compared to pre-pandemic period in a group of military flying personnel examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022 – cont.

Question	Answer [%]
During the COVID-19 pandemic, compared to previous years, you undertake physical activity... (N = 930)	
unchanged	71.9
more often	13.2
less frequently	14.9
Do you monitor the daily number of steps? (N = 930)	
no	56.8
yes	43.2
Compared to the time before the COVID-19 pandemic, the number of steps taken is... (N = 402)	
no change	72.8
more	19.1
less	8.1
Compared to the time before the COVID-19 pandemic, the amount of time spent in front of the TV is... (N = 930)	
unchanged	81.7
more	7.7
less	10.6
Compared to the time before the COVID-19 pandemic, the amount of time spent in front of a computer screen is... (N = 930)	
unchanged	81.6
more	13.2
less	5.2
Compared to the time before the COVID-19 pandemic, the amount of time spent in front of a smartphone/phone screen is... (N = 930)	
unchanged	82.9
more	15.5
less	1.6
Do you smoke cigarettes? (N = 930)	
yes	11.2
no	88.8
If you smoke, do you smoke during the COVID-19 pandemic period compared to previous years... (N = 104)	
no change	71.3
more	13.9
less	14.8
How much time do you spend sleeping per day, compared to before the COVID-19 pandemic? (N = 930)	
unchanged	90.4
more	2.6
less	7
During the period of the COVID-19 pandemic, compared to previous years, has the quality of your sleep remained... (N = 930)	
unchanged	86.1
worsened	10
improved	3.9

Figure 2. Responses of the flying military personnel (N = 930) to the question on the type of physical activity undertaken during the COVID-19 pandemic period, examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

the soldiers surveyed declared that they did not smoke cigarettes at all. Smokers had smoked for an average of 10 (7–20) years, smoking an average of 10 (10–20) cigarettes per day. Among the cigarette smokers, 71.3% declared that the amount they smoked remained the same compared to the time before the pandemic (Table 3).

The majority of subjects had excess body weight on the day of the survey, i.e., 50.2% were overweight and 12.8% suffered from obesity, according to WHO classification (Table 1). More than half (56%) of the study participants declared that their weight did not change during the COVID-19 pandemic, while 25.1% declared that their weight increased during this time (Figure 3).

Among those who indicated that their body weight had increased, there was an increase of median 4 (3–6) kg. In contrast, among those who declared that their body weight had decreased, there was a decrease of median 4 (2–6) kg.

No change in body weight during the COVID-19 pandemic on the day of the survey declared 74.9% of normal-weight military flying personnel (Figure 4). Changes in body weight were declared by 25.1%, of which, it seems significant, 14.7% reported an increase in weight. In the overweight group, 58.1% of respondents declared no change in body weight and 41.8% a change, with 32.2% an increase. The largest group that declared a change in body weight during the COVID-19 pandemic was the group with a BMI ≥30 kg/m^2. An increase in body weight was reported by as many as 48.6% of obese soldiers, while a decrease was reported by 9.5% of respondents.

The characteristics of the subjects divided into 3 groups according to the declared change in body weight or lack of weight change during the COVID-19 pandemic are shown in Table 4. Importantly, there were no significant

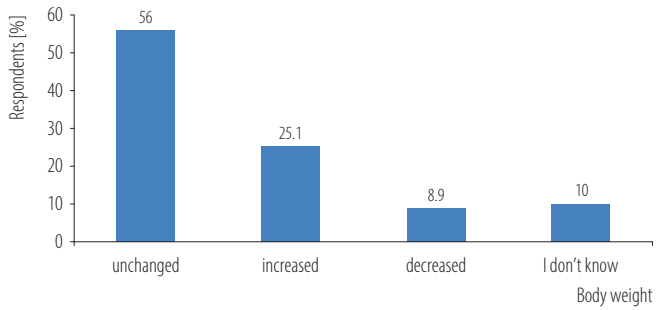

Figure 3. Responses on weight change during the COVID-19 pandemic compared to the pre-pandemic period in a group of military flying personnel (N = 930) examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

differences ($p > 0.05$) between the ages of the subjects in each group.

Taking into account the result of the χ^2 test and the strength of the relationship based on the Cramér's V coefficient (strong and very strong) it was noted that re-

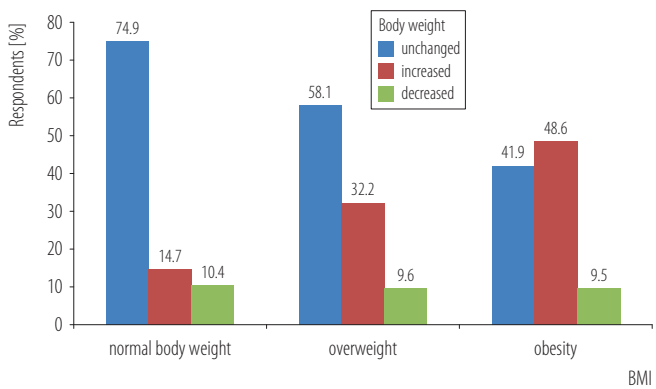

Figure 4. Declaration of weight change in relation to subjects' body mass index (BMI) – group of military flying personnel (N = 930) examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

Table 4. Characteristics of military flying personnel divided into 3 groups according to declared weight change or lack of weight change during the COVID-19 pandemic, examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

Variable	Participants (N = 837)*							p
	total				with body weight unchanged (N = 521)	with body weight increased (N = 233)	with body weight decreased (N = 83)	
	M±SD	Me (Q1–Q3)	min.	max	Me (Q1–Q3)	Me (Q1–Q3)	Me (Q1–Q3)	
Age [year]	36.4±8	36 (30–42)	20	59	36 (30–41)	37 (31–44)	35 (29–42)	0.0993
Body weight [kg]	83.7±12.2	83 (76–90)	46	161	81 (75–88)	88 (81.3–95)	83.1 (77–88.5)	<0.0001
Height [cm]	178.5±6.5	178 (174–183)	156	200	178.5 (174–183)	178 (174–182)	180 (175–183)	0.2532
BMI [kg/m^2]	26.2±3.5	25.8 (24–28.1)	14.5	55.7	25.3 (23.6–27.2)	27.5 (25.4–29.6)	25.4 (24–27.7)	<0.0001

p – Kruskal-Wallis test.
* People who did not know how their body weight changed during the pandemic were not included in the analysis (N = 93).

spondents who declared that their body weight increased during the COVID-19 pandemic were more likely to declare that they had increased the frequency of consumption of sweets, and restaurant dishes compared to people who declared that their body weight decreased or remained unchanged during the COVID-19 pandemic (Table 5). The respondents who declared that their body weight decreased during the COVID-19 pandemic were more likely to declare that they had reduced the frequency of consumption of fast food, salty snacks and sweetened beverages compared to those who declared that their body weight increased or remained the same during the COVID-19 pandemic (Table 5).

A similar analysis was performed in relation to the answers obtained to questions regarding changes in eating behaviour and selected aspects of lifestyle. It was shown that soldiers who declared that their body weight increased during the COVID-19 pandemic were more likely to declare that during the COVID-19 pandemic, compared to previous years, they ate more food in general and snacked more often between meals, were less likely to be physically active and took fewer steps during the day. They also spent more time in front of the TV and computer compared to those who reported that their body weight decreased or remained the same during the COVID-19 pandemic (Table 6).

DISCUSSION

The COVID-19 pandemic and its associated restrictions caused many lifestyle changes for people around the world. The impact of the pandemic included the closure of jobs and social infrastructure. Military personnel also bore the additional burden of prolonged quarantine periods and frequent testing, as commanders were forced to meet even the demands of overseas missions.

This study attempts to answer the question of whether and how the COVID-19 pandemic affected body weight and lifestyle habits of Polish military flying personnel. To the best knowledge, this is the first study of its kind.

It was shown that the frequency of consumption of selected food items by military flying personnel was at a similar level during the pandemic, compared to the pre-pandemic period. There was a positive increase in the frequency of consumption of nuts, fresh fruit and vegetables in 14.8%, 15.9% and 19% of respondents, respectively. It was found that the pandemic, compared to the pre-pandemic period, did not significantly alter the frequency of physical activity undertaken by military flying personnel, as well as the length and quality of sleep, the use of dietary supplements and the frequency of smoking.

It was shown that >56% of the respondents reported no change in body weight during the pandemic, 25% noticed an increase, while 9% of the soldiers observed a decrease. Most people who declared weight changes during the pandemic had a diagnosis of obesity. It was found that as many as 14.7% of normal-weight subjects on the day of the survey, 32.2% of overweight subjects and 48.6% of obese subjects experienced an increase in body weight during the COVID-19 pandemic. Soldiers who declared that their body weight increased were significantly more likely to declare adverse dietary and lifestyle changes, relative to those who declared that their body weight decreased or remained the same during the COVID-19 pandemic. Most people who declared weight body decreased during the pandemic had a normal body weight during the study period.

Table 5. Frequency of consumption of selected foods during the COVID-19 pandemic relative to pre-pandemic time by military flying personnel, according to declared change in body weight, examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

Food product	Participants (N = 837)* [n (%)]			p	Cramér's V
	with body weight unchanged (N = 521)	with body weight increased (N = 233)	with body weight decreased (N = 83)		
Meat and charcuterie				<0.0001	0.13 (moderate)
I consume the same	449 (86.2)	195 (83.7)	62 (74.7)		
I consume more	9 (1.7)	18 (7.7)	3 (3.6)		
I consume less	56 (10.7)	18 (7.7)	18 (21.7)		
I do not consume	7 (1.3)	2 (0.9)	0 (0)		
Fish and seafood				0.0017	0.11 (moderate)
I consume the same	436 (83.7)	171 (73.4)	63 (75.9)		
I consume more	52 (10)	32 (13.7)	14 (16.9)		
I consume less	22 (4.2)	27 (11.6)	4 (4.8)		
I do not consume	11 (2.1)	3 (1.3)	2 (2.4)		
Milk and dairy products				0.0005	0.12 (moderate)
I consume the same	443 (85)	170 (73)	62 (74.7)		
I consume more	36 (6.9)	34 (14.6)	7 (8.4)		
I consume less	31 (6)	22 (9.4)	13 (15.7)		
I do not consume	11 (2.1)	7 (3)	1 (1.2)		
Eggs				0.0001	0.13 (moderate)
I consume the same	442 (84.8)	172 (73.8)	61 (73.5)		
I consume more	64 (12.3)	45 (19.3)	12 (14.5)		
I consume less	11 (2.1)	13 (5.6)	10 (12)		
I do not consume	4 (0.8)	3 (1.3)	0 (0)		
Cereal products made from refined flour				0.0002	0.13 (moderate)
I consume the same	417 (80)	157 (67.4)	59 (71.1)		
I consume more	14 (2.7)	21 (9)	2 (2.4)		
I consume less	63 (12.1)	43 (18.5)	18 (21.7)		
I do not consume	27 (5.2)	12 (5.2)	4 (4.8)		
Cereal products made from whole grain flour				0.0194	0.10 (weak)
I consume the same	432 (82.9)	169 (72.5)	59 (71.1)		
I consume more	47 (9)	33 (14.2)	13 (15.7)		
I consume less	28 (5.4)	23 (9.9)	9 (10.8)		
I do not consume	14 (2.7)	8 (3.4)	2 (2.4)		
Rice and groats				0.0076	0.10 (weak)
I consume the same	439 (84.3)	173 (74.2)	65 (78.3)		
I consume more	47 (9)	36 (15.5)	11 (13.3)		
I consume less	21 (4)	21 (9)	6 (7.2)		
I do not consume	14 (2.7)	3 (1.3)	1 (1.2)		
Fresh fruit				0.0001	0.13 (moderate)
I consume the same	428 (82.1)	157 (67.4)	62 (74.7)		
I consume more	69 (13.2)	49 (21)	16 (19.3)		
I consume less	20 (3.8)	27 (11.6)	5 (6)		
I do not consume	4 (0.8)	0 (0)	0 (0)		

Table 5. Frequency of consumption of selected foods during the COVID-19 pandemic relative to pre-pandemic time by military flying personnel, according to declared change in body weight, examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022 – cont.

Food product	Participants (N = 837)* [n (%)]			p	Cramér's V
	with body weight unchanged (N = 521)	with body weight increased (N = 233)	with body weight decreased (N = 83)		
Fresh vegetables				0.0009	0.12 (moderate)
I consume the same	423 (81.2)	163 (70)	57 (68.7)		
I consume more	83 (15.9)	52 (22.3)	23 (27.7)		
I consume less	13 (2.5)	18 (7.7)	3 (3.6)		
I do not consume	2 (0.4)	0 (0)	0 (0)		
Fruit juices				<0.0001	0.16 (strong)
I consume the same	427 (82)	148 (63.5)	52 (62.7)		
I consume more	37 (7.1)	31 (13.3)	11 (13.3)		
I consume less	30 (5.8)	40 (17.2)	11 (13.3)		
I do not consume	27 (5.2)	14 (6)	9 (10.8)		
Vegetable juices				<0.0001	0.15 (moderate)
I consume the same	420 (80.6)	153 (65.7)	50 (60.2)		
I consume more	32 (6.1)	23 (9.9)	13 (15.7)		
I consume less	19 (3.6)	25 (10.7)	5 (6)		
I do not consume	50 (9.6)	32 (13.7)	15 (18.1)		
Frozen processed fruit and vegetable products				0.0016	0.11 (moderate)
I consume the same	420 (80.6)	159 (68.2)	64 (77.1)		
I consume more	26 (5)	23 (9.9)	2 (2.4)		
I consume less	30 (5.8)	23 (9.9)	11 (13.3)		
I do not consume	45 (8.6)	28 (12)	6 (7.2)		
Nuts and seeds				0.0072	0.10 (weak)
I consume the same	422 (81)	162 (69.5)	58 (69.9)		
I consume more	63 (12.1)	46 (19.7)	18 (21.7)		
I consume less	26 (5)	22 (9.4)	6 (7.2)		
I do not consume	10 (1.9)	3 (1.3)	1 (1.2)		
Legume plants				0.0366	0.09 (weak)
I consume the same	431 (82.7)	188 (80.7)	68 (81.9)		
I consume more	33 (6.3)	9 (3.9)	7 (8.4)		
I consume less	34 (6.5)	30 (12.9)	7 (8.4)		
I do not consume	23 (4.4)	6 (2.6)	1 (1.2)		
Plant-based substitutes for animal products				0.0060	0.10 (weak)
I consume the same	370 (71)	135 (57.9)	47 (56.6)		
I consume more	35 (6.7)	16 (6.9)	6 (7.2)		
I consume less	23 (4.4)	15 (6.4)	6 (7.2)		
I do not consume	93 (17.9)	67 (28.8)	24 (28.9)		
Restaurant dishes				<0.0001	0.17 (strong)
I consume the same	323 (62)	95 (40.8)	42 (50.6)		
I consume more	51 (9.8)	58 (24.9)	10 (12)		
I consume less	115 (22.1)	64 (27.5)	30 (36.1)		
I do not consume	32 (6.1)	16 (6.9)	1 (1.2)		

Table 5. Frequency of consumption of selected foods during the COVID-19 pandemic relative to pre-pandemic time by military flying personnel, according to declared change in body weight, examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022 – cont.

Food product	Participants (N = 837)* [n (%)]			p	Cramér's V
	with body weight unchanged (N = 521)	with body weight increased (N = 233)	with body weight decreased (N = 83)		
Sweets				<0.0001	0.22 (strong)
I consume the same	356 (68.3)	101 (43.3)	36 (43.4)		
I consume more	26 (5)	49 (21)	5 (6)		
I consume less	93 (17.9)	64 (27.5)	31 (37.3)		
I do not consume	46 (8.8)	19 (8.2)	11 (13.3)		
Salty snacks				<0.0001	0.18 (strong)
I consume the same	385 (73.9)	131 (56.2)	43 (51.8)		
I consume more	20 (3.8)	35 (15)	6 (7.2)		
I consume less	73 (14)	48 (20.6)	28 (33.7)		
I do not consume	43 (8.3)	19 (8.2)	6 (7.2)		
Fast foods				<0.0001	0.20 (strong)
I consume the same	316 (60.7)	108 (46.4)	34 (41)		
I consume more	21 (4)	42 (18)	4 (4.8)		
I consume less	110 (21.1)	56 (24)	35 (42.2)		
I do not consume	74 (14.2)	27 (11.6)	10 (12)		
Ready-made instant foods				<0.0001	0.14 (moderate)
I consume the same	256 (49.1)	88 (37.8)	30 (36.1)		
I consume more	11 (2.1)	19 (8.2)	3 (3.6)		
I consume less	61 (11.7)	40 (17.2)	22 (26.5)		
I do not consume	193 (37)	86 (36.9)	28 (33.7)		
Sweet drinks				<0.0001	0.19 (strong)
I consume the same	307 (58.9)	95 (40.8)	33 (39.8)		
I consume more	12 (2.3)	27 (11.6)	2 (2.4)		
I consume less	85 (16.3)	65 (27.9)	29 (34.9)		
I do not consume	117 (22.5)	46 (19.7)	19 (22.9)		
Alcohol				<0.0001	0.14 (moderate)
I consume the same	372 (71.4)	140 (60.1)	46 (55.4)		
I consume more	17 (3.3)	26 (11.2)	3 (3.6)		
I consume less	86 (16.5)	47 (20.2)	20 (24.1)		
I do not consume	46 (8.8)	20 (8.6)	14 (16.9)		

Differences between groups were considered significant when the χ^2 test value was <0.05 and when the strength of the Cramér's V coefficient relationship was strong or very strong.
* People who did not know how their body weight changed during the pandemic were not included in the analysis (N = 93).
p – χ^2.

The COVID-19 pandemic was accompanied by an increasing prevalence of obesity and overweight, and a rising prevalence of diabetes and pre-diabetic conditions among active service members. These largely preventable conditions can negatively impact military recruitment, retention and readiness. Confirming this, a study by Stiegmann et al. [20] assessing trends in the prevalence of overweight, obesity and diabetes among all active U.S. military service members, including those in the Navy, Air Force and Marine Corps, between 2018 and 2021, before and after the start of the COVID-19 pandemic, found an increase in the prevalence of obesity among active service members, from 16.1% to 18.8%. Taking into account both obesity and overweight, the prevalence

Table 6. Changes in dietary behaviour and selected aspects of lifestyle during the COVID-19 pandemic compared to pre-pandemic period according to the declared change in body weight of military flying personnel examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022

Question	Participants (N = 837)* [n (%)]			p	Cramér's V
	with body weight unchanged (N = 521)	with body weight increased (N = 233)	with body weight decreased (N = 83)		
During the COVID-19 pandemic, compared to earlier years, the amount of food you consume is...				<0.0001	0.33 (very strong)
unchanged	496 (95.2)	161 (69.1)	54 (65.1)		
more	9 (1.7)	58 (24.9)	7 (8.4)		
less	16 (3.1)	14 (6)	22 (26.5)		
During the COVID-19 pandemic, compared to earlier years, you snack between meals...				<0.0001	0.31 (very strong)
unchanged	329 (63.1)	102 (43.8)	30 (36.1)		
more	22 (4.2)	71 (30.5)	5 (6)		
less	50 (9.6)	33 (14.2)	30 (36.1)		
I do not snack at all	120 (23)	27 (11.6)	18 (21.7)		
During the COVID-19 pandemic, compared to earlier years, your regularity of meal consumption has remained...				<0.0001	0.16 (strong)
unchanged	474 (91)	171 (73.4)	68 (81.9)		
is bigger	32 (6.1)	36 (15.5)	9 (10.8)		
is smaller	15 (2.9)	26 (11.2)	6 (7.2)		
Do you feel more negative emotions during the COVID-19 pandemic?				<0.0001	0.17 (strong)
no	429 (82.3)	155 (66.5)	66 (79.5)		
yes	92 (17.7)	78 (33.5)	17 (20.5)		
Did the emotions associated with the duration of the COVID-19 pandemic affect your diet?				<0.0001	0.24 (strong)
no	512 (98.3)	181 (77.7)	78 (94)		
yes, I have a more need to eat	6 (1.2)	48 (20.6)	4 (4.8)		
yes, I have less need to eat	3 (0.6)	4 (1.7)	1 (1.2)		
Do you take nutritional supplements?				0.2284	0.06 (weak)
no	338 (64.9)	159 (68.2)	48 (57.8)		
yes	183 (35.1)	74 (31.8)	35 (42.2)		
If you are taking supplements, has the ongoing the COVID-19 pandemic influenced your decision to supplement your diet? (N = 278)[a]				0.0060	0.19 (strong)
no	154 (88.5)	52 (73.2)	30 (90.9)		
yes	20 (11.5)	19 (26.8)	3 (9.1)		
Are you trying to influence your immunity through diet during the COVID-19 pandemic?				0.0014	0.13 (moderate)
no	337 (64.7)	131 (56.2)	38 (45.8)		
yes	184 (35.3)	102 (43.8)	45 (54.2)		

Table 6. Changes in dietary behaviour and selected aspects of lifestyle during the COVID-19 pandemic compared to pre-pandemic period according to the declared change in body weight of military flying personnel examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022 – cont.

Question	Participants (N = 837)* [n (%)]			p	Cramér's V
	with body weight unchanged (N = 521)	with body weight increased (N = 233)	with body weight decreased (N = 83)		
During the COVID-19 pandemic, compared to previous years, you undertake physical activity...				<0.0001	0.26 (very strong)
unchanged	429 (82.3)	115 (49.4)	48 (57.8)		
more often	57 (10.9)	38 (16.3)	20 (24.1)		
less frequently	35 (6.7)	80 (34.3)	15 (18.1)		
Compared to the time before the COVID-19 pandemic, the number of steps taken is… (N = 354)				<0.0001	0.23 (strong)
unchanged	166 (80.2)	58 (54.7)	29 (70.7)		
more	35 (16.9)	26 (24.5)	11 (26.8)		
less	6 (2.9)	22 (20.8)	1 (2.4)		
Compared to the time before the COVID-19 pandemic, the amount of time spent in front of the TV is...				<0.0001	0.17 (strong)
no change	455 (87.3)	170 (73)	64 (77.1)		
more	20 (3.8)	39 (16.7)	3 (3.6)		
less	46 (8.8)	24 (10.3)	16 (19.3)		
Compared to the time before the COVID-19 pandemic, the amount of time spent in front of a computer screen is...				<0.0001	0.13 (moderate)
unchanged	452 (86.8)	168 (72.1)	66 (79.5)		
more	50 (9.6)	52 (22.3)	9 (10.8)		
less	19 (3.6)	13 (5.6)	8 (9.6)		
Compared to the time before the COVID-19 pandemic, the amount of time spent in front of a smartphone screen is...				0.0019	0.10 (weak)
unchanged	450 (86.4)	177 (76)	64 (77.1)		
more	66 (12.7)	53 (22.7)	16 (19.3)		
less	5 (1)	3 (1.3)	3 (3.6)		
Do you smoke cigarettes?				0.1122	0.07 (weak)
no	462 (89.4)	200 (85.8)	77 (93.9)		
yes	55 (10.6)	33 (14.2)	5 (6.1)		
If you smoke, do you smoke during the COVID-19 pandemic period compared to previous years… (N = 92)[b]				0.1491	0.12 (moderate)
unchanged	44 (81.5)	21 (63.6)	2 (40)		
more	4 (7.4)	6 (18.2)	1 (20)		
less	6 (11.1)	6 (18.2)	2 (40)		
How much time do you spend sleeping per day, compared to before the COVID-19 pandemic?				0.0003	0.11 (moderate)
unchanged	487 (93.5)	198 (85)	68 (81.9)		
more	7 (1.3)	12 (5.2)	4 (4.8)		
less	27 (5.2)	23 (9.9)	11 (13.3)		

Table 6. Changes in dietary behaviour and selected aspects of lifestyle during the COVID-19 pandemic compared to pre-pandemic period according to the declared change in body weight of military flying personnel examined at the Military Institute of Aviation Medicine in Warsaw, 2021–2022 – cont.

Question	Participants (N = 837)* [n (%)]			p	Cramér's V
	with body weight unchanged (N = 521)	with body weight increased (N = 233)	with body weight decreased (N = 83)		
During the COVID-19 pandemic, compared to previous years, the quality of your sleep…				<0.0001	0.13 (moderate)
unchanged	470 (90.2)	180 (77.3)	69 (83.1)		
worsened	33 (6.3)	43 (18.5)	8 (9.6)		
improved	18 (3.5)	10 (4.3)	6 (7.2)		
Have you been ill with COVID-19?				0.0022	0.10 (weak)
no	268 (51.4)	116 (49.8)	28 (33.7)		
yes	177 (34)	76 (32.6)	46 (55.4)		
I dont't know	76 (14.6)	41 (17.6)	9 (10.8)		

Differences between groups were considered significant when the χ^2 test value was <0.05 and when the strength of the Cramér's V coefficient relationship was strong or very strong. p – χ^2.

* People who did not know how their body weight changed during the pandemic were not included in the analysis (N = 93).

[a] Sample size minus 14 people who did not answer this question.

[b] Sample size minus 1 person who did not answer the question.

increased from 65.5% in 2018 to 67.3% in 2021. The researchers found the largest relative increase in obesity prevalence in the youngest (<30 years) age categories.

According to a report by the National Institute of Public Health – National Research Institute [21], during the pandemic period from spring to autumn 2020, 28% of Poles aged ≥20 years (28% of men and 29% of women) reported an increase in body weight; a similar result was observed in this study. According to the cited report [21], women aged 45–64 years were the most likely to have increased their body weight (36%), while men aged 20–44 years were the most likely to have increased their body weight (30%), with a slight difference from the group 45–64 years (29%). Weight gain was found more frequently among the better educated (i.e., those with tertiary or secondary/post-secondary education were 2.5 times more likely to have increased weight than those with lower or middle school education). Weight gain was more frequently observed among men living in urban areas than in rural areas (30% vs. 25%), while the opposite was true for women (28% vs. 31%).

At the same time, 13% of the study group (14% of men and 12% of women) reduced their body weight, 4% more than recorded in this survey. According to the authors of the report, this effect was favoured by age <45 years (in this group, it occurred in 17% of men and 18% of women) and education at the basic vocational level. The researchers also concluded that the potential causes of this phenomenon should be sought primarily in changes in diet and the level of physical activity during this period. While 78% of Poles declared that they had not changed their eating habits (although 10% had increased the proportion of fast food or sweet and salty snacks in their diet), changes in the intensity of physical activity affected 57% of men and 47% of women. In the study presented here, a similar proportion of military flying personnel declared changes in dietary habits. Indeed, the frequency of consumption of fast food products increased by 8% of the soldiers, sweets by 9% and salty snacks by approx. 7% of the respondents. As for a reduction in the intensity of physical activity during the pandemic period, this was declared by a significantly smaller proportion of the soldiers surveyed compared to the general population.

In Nour and Altintaş surveys [22], a systematic review including 40 studies with a total population of 5 681 813 people from 22 countries to determine determinants of obesity during the 2019–2023 COVID-19 pandemic showed that sedentary lifestyles, unhealthy dietary habits (eating a low-quality or unbalanced diet, sugary drinks, snacking, excess salty foods, drinking fizzy drinks, overeating and lower water intake), reduced hours of sleep, excessive stress, depression, anxiety,

lowered mood, age, male gender educational status, ethnic minorities and Internet and social media addiction were identified as risk factors for obesity during the COVID-19 pandemic.

All studies included in the review reported weight changes during the pandemic. The mean weight gain ranged from M±SD 0.04±1.18 to M±SD 2.8±3.7, and the prevalence of weight gain ranged from 17.9% to 52.2%. Nevertheless, some studies included in the review showed that the determinants of weight gain decreased during COVID-19 blockade.

In the study by Janssen et al. [23] on the change in food consumption during the COVID-19 pandemic during the first lockdown period in Denmark, Germany, and Slovenia showed that, depending on the type of food, 15–42% of survey participants changed their food consumption frequency during the pandemic compared to the pre-pandemic period. In all countries surveyed, the food categories with the highest rates of change were frozen foods, canned foods and cakes and biscuits; food categories with lower rates of change included bread, alcoholic beverages and dairy products. Respondents in all 3 countries shopped less frequently during lockdown and there was an overall decrease in the consumption of fresh foods, while there was an increase in the consumption of foods with a longer shelf life in Denmark and Germany. The authors observed divergent trends in all food categories analysed, with some people decreasing and others increasing the frequency of consumption, showing that the pandemic had a differential impact on people's lifestyles and food consumption patterns, which this study also confirmed.

The COVID-19 pandemic could have significant consequences for the mental health of military personnel, a population already exposed to mental stress. This was confirmed in a study of French military personnel [24], which showed an increase in the number of psychotropic medications dispensed (by 3% for anti-anxiety medications, by 12% for antidepressants and by 13% for sleeping medications) in 2020 and 2021 compared to 2019 for this group. The authors emphasize that a particularly sharp increase in the dispensed number of psychotropic drugs occurred during the first lockdown. The cited study hypothesizes that fewer consultations with mental health specialists may have partially explained these results.

Another study to examine anger levels among former UK military personnel during the COVID-19 pandemic found, in 14.4% of respondents, significant difficulties with anger, and in 24.8% of respondents, anger levels escalated during the pandemic [25]. Perceived anger was associated with factors such as financial difficulties, additional/new caregiving responsibilities and COVID-19 bereavement.

The various psychological and social factors associated with the COVID-19 pandemic may also have influenced eating behaviour. Regardless of where people lived, i.e., even in areas with a relatively low risk of disease, they were constantly informed of the health and life risks associated with COVID-19, which could have been a source of severe stress, especially for highly vulnerable people. In order to cope with the tension, stress and negative emotions experienced, some people may have used a low-adaptive, avoidant coping style, manifested, i.e., by excessive eating or alcohol consumption. For example, during a lockdown in Italy, it was shown that people increased their consumption of processed "comfort foods," such as chocolate, crisps and other snacks [5,26]. A study in Denmark also observed an increase in emotional eating during lockdown, manifested, i.e., by increased consumption of biscuits and alcohol [27]. In contrast, in Norway, it was found that consumption of foods and beverages with high sugar content was higher in those with higher COVID-19 concerns and general psychological stress compared to the general population [28].

In this study almost 80% of the military flying personnel surveyed responded that they did not feel more negative emotions compared to before the COVID-19 pandemic, and 85% declared that the emotions associated with the duration of the pandemic did not affect their diet. Interestingly, in this study, in contrast to the works cited above, >20% of soldiers declared that they consumed less fast food, sweets and sugary drinks during the pandemic, and >17% consumed less salty snacks, foods referred to as "comfort foods."

Although during the COVID-19 pandemic, many people had significantly more leisure time than usual due to reduced work activity, this did not translate into increased physical activity. As a result of the spread of the coronavirus and the high risk to health and life, the public was cut off from various services, including sport. And while not every physical activity requires the use of professional equipment and facilities, the restrictions introduced also restricted the ability to move freely and move outdoors, which ultimately affected the level of physical activity of Poles. Only selected groups, such as members of the national team or athletes participating in sports competition, could use sports facilities during the prevailing restrictions. Restrictions on

the use of sports facilities in military units also affected soldiers of the Polish Army.

The MultiSport Index 2020 study [29] shows that due to the first lockdown in spring 2020, the physical activity of Poles fell by 4 percentage points. The main reason for the drop in activity was the closure of sports facilities. When they reopened in the summer of 2020, activity increased by 2 percentage points to 62% at that time. In addition, regardless of the epidemiological situation, the study found that 73% of physically active people did not want to give up physical activity and continued to do so whenever possible. Similar observations were made in this study, where the same percentage of soldiers (72%) declared that, compared to previous years, the pandemic had not affected their frequency of physical activity. However, 15% of the soldiers surveyed admitted that their frequency of physical exercise had decreased. Significantly more often such a response was given by those who declared that their body weight increased during the COVID-19 pandemic. Walking, running and cycling appeared to be the most common forms of physical activity chosen by the respondents during the pandemic, activities that can be done at all times, despite closed sports facilities.

Study of Alves do Amaral and Pujol Vieira dos Santos [30], which aimed to compare the physical fitness level of soldiers (N = 800) of the 3 Military Police Battalion from Brazil before and during the COVID-19 pandemic, showed a significant decline in their performance as assessed by variables of cardiorespiratory and localized muscle resistance. According to the authors, the observed decline in the performance of members of the military personnel may have been due to a decrease in physical activity, influenced by social isolation. With the advent of the pandemic, Brazil introduced restrictions on physical exercise in groups inside the barracks, which was common among soldiers. Another factor that did not mobilize people to engage in physical activity was the cancelled test periodically assessing the physical fitness of military personnel, which also occurred in the Polish army.

Although in all parts of the world, a decline in the level of physical activity in adults has been found in the general population, as well as a significant increase in so-called sedentary behaviour, associated with TV viewing and use of electronic and social media [31,32], this study found that the amount of time spent sitting in front of a TV, computer or phone screen increased in only 7.5%, 13.9% and 14.9% of military flying personnel, respectively.

During the COVID-19 pandemic, sleep disorders affected a significant portion of the general population [33,34]. For example, in a study by Pérez-Carbonell et al. [35], conducted among 844 UK adults, 69.4% reported a change in sleep pattern, less than half (44.7%) reported refreshing sleep, and 45.6% were sleepier than before lockdown. The most frequently reported symptoms were "disturbed sleep" (42.3%), "unintentional falling asleep" (35.2%), "difficulty falling asleep," "maintaining sleep" (30.9% and 30.8%, respectively), and "later bedtimes" (30%). In contrast, this study showed that in the vast majority of military flying personnel surveyed, the pandemic did not affect either the length (i.e., 90.4%) or quality (i.e., 86.1%) of sleep.

This result is consistent with the study by Guru et al. [36], which aimed to assess physical activity levels and sleep quality in military aircrews during pandemic COVID-19 at a fighter training facility in India. The authors found good sleep quality in >86% of the flight crews studied.

In conclusion, although the results obtained in the presented study are optimistic and do not provide alarming data indicating adverse changes in the lifestyles of the most of members of Polish military flying personnel as a result of the COVID-19 pandemic, it seems that during emergencies, supervisors should be particularly cautious and vigilant in order to be able to identify in time the risk factors for the deterioration of soldiers' health, including their weight gain, and take effective remedial and preventive measures. In order to maintain the good health of military flying personnel, including during the pandemic period, the importance of regular sports activities, fitness examinations and periodic medical examinations cannot be overlooked.

Limitations of the study

The limitations of the presented study are typical of self-report surveys. In the present study, a self-administered questionnaire was used to assess lifestyle behaviour, due to the lack of available validated questionnaires dedicated to assessing the impact of the pandemic on soldiers' behaviour at the time of the study design.

The results obtained are based on respondents' declarations, which may not always be in line with the facts. This should therefore be borne in mind when interpreting the results and drawing final conclusions.

The study lacked a control group of non-military personnel. The inclusion of a comparison group would have provided insight into whether the observed effects were specific to military flying personnel or more general.

CONCLUSIONS

- The COVID-19 pandemic condition did not disrupt the previous lifestyles of most Polish military flying personnel.
- It has been shown that the SARS-CoV-2 coronavirus pandemic, compared to the period before its outbreak, did not significantly change the frequency of physical activity undertaken by the surveyed soldiers, the length and quality of their sleep, the use of dietary supplements or the frequency of smoking.
- Divergent trends were observed in the categories of food consumed analysed, with some individuals decreasing and others increasing the frequency of consumption of different types of products, showing that the pandemic had a differential impact on food consumption patterns in this professional group.
- More than half of the military flying personnel surveyed reported no effect of the COVID-19 pandemic on weight change.
- Particular attention from a public health point of view should be paid to people with excess body weight, as the phenomenon of weight gain during the pandemic period especially affected obese people in the study group. Such an approach would make it possible to compensate for the health inequalities also observed in the population of professional soldiers.

AUTHOR CONTRIBUTIONS

Research concept: Agata Patrycja Gaździńska
Research methodology: Agata Patrycja Gaździńska
Collecting material: Agata Patrycja Gaździńska
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Interpretation of results: Agata Patrycja Gaździńska, Paulina Baran
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