

# Impact of COVID-19 pandemic on bariatric patients in Podlaskie Voivodeship in Poland

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## ABSTRACT:

**Introduction:** The first case of COVID-19 (Coronavirus Disease 2019) in Poland was reported on March 4, 2020 and resulted in cancellation of bariatric procedures during the lockdown in Poland. The lockdown caused difficult access to all means of medical care.

**Aim:** The study was conducted to show the impact of COVID-19 pandemic on bariatric patients' status in one of the Polish regions.

**Methods:** The survey was designed and distributed to bariatric patients. The questionnaire was divided into two parts: demographic characteristics of participants and the impact of the pandemic on bariatric patients.

**Results:** 116 bariatric patients participated in the survey. As many as 109 of them (94%) reported at least one accompanying disease. The mean value of the willingness to undergo the bariatric procedure among women was 8.8 ( $\pm 2.2$  SD) and among men 8.5 ( $\pm 2.3$  SD). The mean value of the impact of COVID-19 pandemic on the willingness to undergo the bariatric procedure in the group of women was 3.0 ( $\pm 3.0$  SD) and in the group of men  $-3.2$  ( $\pm 3.0$  SD). Statistical analysis shows that there is no statistically significant difference between those dates.

**Conclusions:** Despite the pandemic and higher risk of mortality and complications after COVID-19 infection, bariatric patients declare a high level of willingness to undergo the bariatric procedure and the impact of COVID-19 pandemic does not play an important role in their decision-making process concerning the bariatric procedure. Delay of surgery can significantly increase the disease load in these patients, so cancelling or postponing treatment is not advised.

## KEYWORDS:

bariatric surgery, COVID-19, lockdown, obesity, pandemic

## ABBREVIATIONS

**ACE2** – Angiotensin-converting enzyme 2

**BMI** – Body Mass Index

**COVID-19** – coronavirus disease 2019

**FRC** – functional residual capacity

**ICU** – Intensive Care Unit

**SARS-CoV-2** – Severe Acute Respiratory Syndrome Coronavirus 2

**WHO** – World Health Organization

## INTRODUCTION

The first case of coronavirus disease 2019 (COVID-19) emerged from Wuhan, China in December 2019. It caused the outbreak of pneumonia of unknown cause, characterized as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). World Health Organization (WHO) assessed it as a pandemic on March 11, 2020 [1]. The first case of COVID-19 in Poland was reported on March 4, 2020 and by the 23<sup>rd</sup> of April, 2021 the pandemic resulted in more than 2 700 000 cases and 64 000 deaths [2].

Undeniably, the appearance of COVID-19 has changed all fields of medicine, including bariatric care. The cancellation of surgical procedures during the lockdown in Poland dated from March 17, 2020 to May 18, 2020 caused difficult access to all means of medical care. As far as it is known, obese patients are more vulnerable to COVID-19 infection. The obesity-induced adipose tissue inflammation is leading to metabolic dysfunction potentially resulting in dyslipidemia, insulin resistance, type 2 diabetes mellitus, hypertension, and cardiovascular disease. What is more, obesity can play a significant role in COVID-19 transmission and the duration of virus shedding [3]. The most alarming is the fact that BMI (Body Mass Index)  $> 25$  kg/m<sup>2</sup> is a risk factor for mortality in COVID-19 [4–6]. The prevalence of obesity is constantly increasing and bariatric procedures are acknowledged as the most effective treatment solutions for morbidly obese patients [7]. At this point, we are not able to assess the long-term complications caused by COVID-19 infection among obese patients.

Considering the scale of the problem, the aim of the study was to show the impact of COVID-19 pandemic on bariatric patients' status in one of the Polish regions.

## AIM

The study was conducted to show the impact of COVID-19 pandemic on bariatric patients' status in one of the Polish regions.

## MATERIAL AND METHODS

To explore the effects of COVID-19 pandemic on obese patients, an anonymous, voluntary telephone or online survey based on a self-designed, structured questionnaire was conducted. The survey was conducted between the 18<sup>th</sup> of November and the 18<sup>th</sup> of December 2020 among patients who had been scheduled for bariatric surgery between the 17<sup>th</sup> of March 2020 and the 18<sup>th</sup> of December 2020.

Comprehensive instructions on how to complete the survey were included at the beginning of the questionnaire.

The questionnaire included multiple choice, rating scale and open-ended questions. The order of questions was randomized in each part of the survey.

## INCLUSION AND EXCLUSION CRITERIA

The inclusion criteria for the study were patients with Polish nationality, aged between 18 and 65 years old, who were qualified for bariatric surgery at the Department of General Surgery at a tertiary hospital in Poland. The patients disqualified from bariatric surgery were excluded from the study.

## SURVEY

The questionnaire was divided into two sections: demographic characteristics of the participants and clinical part. The first part gathered data on age, gender, residence, height, body weight, duration of being obese and family history of obesity. Questions in the second part concerned the impact of the pandemic on bariatric patients, including the level of: willingness to undergo the procedure, impact of the COVID-19 pandemic on willingness to undergo surgical treatment, fear of COVID-19 infection, psychological burden connected with the fear of the COVID-19 pandemic.

Survey included questions about body mass changes during the pandemic, contact with people who suffered from COVID-19, changes in patients' eating routine and everyday activity, postponement or cancellation of the procedure and the reason for that. Following questions regarded other patient's diseases, previous weight loss methods, type of work and everyday physical activity (Tab. I.).

## ETHICAL CONSIDERATIONS

The designed survey was fully anonymous. Personal data of the participants were not collected during the study. The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments (Forta-

leza). Participants were informed about the aim of the study and their informed consent was obtained. The study was approved by the Bioethics Committee of the Medical University of Białystok (the reference number of the consent: APK.002.306.2020.).

## STATISTICAL ANALYSIS

Results are presented as numbers with percentages, means with standard deviation or medians, when appropriate. The responses to each item were entered in a Microsoft Excel spreadsheet and analyzed using the statistical program GraphPad Prism 8.0.1. Data were tested using the Mann-Whitney test, the Kruskal-Wallis test or Wilcoxon test depending on the quantum of data to be compared. P-value < 0.05 was used to indicate statistical significance.

## RESULTS

### Participants

The survey was fulfilled by 116 (94%) participants among 123 patients. The study group included 69 females (60%) and 47 males (40%). The average age of patients was  $44.4 \pm 11.52$  years. The mean BMI among the respondents was  $46.46 \pm 7.1$  kg/m<sup>2</sup>. The analysis of the group showed that 109 patients (94%) reported at least one accompanying disease. The most frequent comorbidities were: arterial hypertension (59%), dyslipidemia (40%) and non-alcoholic fatty liver disease 43 (37%). The prevalence of comorbidities is presented in Tab. II.

### Onset of obesity

The prevailing response in both groups, men and women, was "since childhood" and it concerned 28 (41%) women and 22 (47%) men. The second most prevalent factor given by women was pregnancy – 20 (29%).

### Contact with COVID-19

Our study showed that 65 (56%) respondents confirmed contact with COVID-positive people and 51 (44%) denied it. What is more, 47 (100%) male patients declared contact with COVID-19. The fear of COVID-19 infection declared by respondents obtained a mean value 4.33 (possible answers were on a scale from 1 to 10). Data collected from patients reporting contact with COVID-19 were no statistically different from data from patients with no contact with COVID-19.

### The willingness to undergo the bariatric procedure

The results of the survey demonstrate that the mean value of the willingness to undergo the bariatric procedure (possible answers were on a scale from 1 to 10) among women was  $8.8 (\pm 2.2$  SD) and among men  $8.5 (\pm 2.3$  SD). Taking the group of women into consideration, the mean willingness to undergo the bariatric procedure in the following age ranges was: 18–33 y.o. –  $7.6 (\pm 3.1$  SD), 34–49 y.o. –  $9.0 (\pm 1.9$  SD) and 50–65 y.o. –  $9.2 (\pm 1.6$  SD). When it comes to men, the mean values in the age ranges were: 18–33 y.o. –  $8.6 (\pm 2.0$  SD), 34–49 y.o. –  $9.1 (\pm 2.1$  SD) and 50–65 y.o. –  $7.7 (\pm 2.6$  SD).

Tab. I. Survey.

## SURVEY

**The impact of SARS-CoV-2 pandemic on bariatric patients**

SARS-CoV-2 pandemic is an extraordinary epidemiological situation, which significantly affected the lifestyle of all Poles, especially those dealing with obesity. The main goal of patients undergoing bariatric procedures is to improve the quality of life and reduce the symptoms accompanying obesity. We would like to answer the question of the impact of the pandemic on the health of bariatric patients. It is completely anonymous and participation in it is voluntary. Filling in the questionnaire is equivalent to consent to participate in the study. The results of the survey will be used only for scientific studies. We would like to thank you for completing the questionnaire.

**I. Demographic characteristics****1. Age:****2. Sex:**

- male  
 female

**3. Residence:**

- city under 20 thousand inhabitants  
 city over 20 thousand inhabitants  
 village

**4. Height:****5. Weight (the biggest in life):****6. Since when are you obese?**

- since childhood  
 after pregnancy  
 after a disease was diagnosed/after an accident  
 after lifestyle/ work change  
 other

**II. Clinical questions****1. Do you do sports?**

- Yes, at least twice a week  
 Occasionally – a few times a month  
 No

**2. What are the other diseases you suffer from?**

- Arterial hypertension  
 Type 2 diabetes mellitus  
 Osteoarthritis  
 Obstructive sleep apnea  
 Varicose veins  
 Dyslipidemia  
 Esophageal varices  
 Coronary artery disease  
 Myocardial infarction  
 COPD – Chronic obstructive pulmonary disease  
 Gastro-esophageal reflux disease  
 Gastric ulcers  
 Hemorrhoids  
 Cholelithiasis  
 Nephrolithiasis  
 Non-alcoholic fatty liver disease  
 Depression  
 PCOS – Polycystic ovarian syndrome  
 Insulin resistance

- Hyperthyroidism
- Hypothyroidism
- Gout
- Other

**3. On a scale from 1 to 10 (i.e. from very low to very high) how would you rate your willingness to undergo the procedure?**

1	2	3	4	5	6	7	8	9	10

**4. Did the date of surgery change due to the COVID-19 pandemic?**

- Yes, the treatment was performed sooner than scheduled
- Yes, the treatment was performed later than scheduled
- The treatment was not performed
- No

**5. If yes (in question 4), how long was the treatment postponed by?**

- 1–4 weeks
- 1–2 months
- 2–4 months
- 4–6 months
- >6 months

**6. Why was the date of the treatment postponed?**

- My test for COVID-19 was positive
- My doctor's test for COVID-19 was positive
- I was in quarantine
- I resigned from surgery
- Scheduled surgeries were cancelled

**7. On a scale from 1 to 10 (i.e. from none to enormous), how do you assess the impact of the COVID-19 pandemic on your willingness to undergo treatment?**

1	2	3	4	5	6	7	8	9	10

**8. On a scale from 1 to 10 (i.e. from none to hard to bear), how do you assess your fear of COVID-19 infection?**

1	2	3	4	5	6	7	8	9	10

**9. Did the period of the greatest sanitary and epidemiological exacerbations (20.03.2020–20.04.2020) affect your diet routine?**

- Yes, I was eating more than earlier
- Yes, I was eating less than earlier
- No, there was no impact

**10. Did the period of the greatest sanitary and epidemiological exacerbations (20.03.2020–20.04.2020) affect your physical activity routine?**

- Yes, there was a slight decrease
- Yes, there was a huge decrease
- Yes, there was a slight increase
- Yes, there was a huge increase
- No, there was no impact.

**11. Did anyone from your surroundings (family, work, neighbors) suffer from COVID-19?**

- Yes
- No

**12. How did your weight change, taking into account the period from the beginning of the COVID-19 pandemic to the time of the operation (lost/put on weight. How much?)**

.....

Statistical analysis shows that the difference between women and men in the willingness to undergo the bariatric procedure was not statistically significant ( $P = 0.45$ ). In addition, there was no difference between the age ranges among men and women ( $P > 0.05$ ) (Fig. 1.).

### The impact of COVID-19 pandemic on the willingness to undergo the bariatric procedure

The results illustrate, that the mean value of the impact of SARS-CoV-2 pandemic on the willingness to undergo the bariatric procedure (possible answers were on a scale from 1 to 10) in the group of women was  $3.0 (\pm 3.0 \text{ SD})$  and in the group of men –  $3.2 (\pm 3.0 \text{ SD})$ . Among women the mean values were as follows for the following age ranges: 18–33 y.o. –  $3.1 (\pm 2.9 \text{ SD})$ , 34–49 y.o. –  $2.8 (\pm 2.8 \text{ SD})$  and 50–65 y.o. –  $3.1 (\pm 3.4 \text{ SD})$ , while among men the mean values were: 18–33 y.o. –  $2.3 (\pm 2.5 \text{ SD})$ , 34–49 y.o. –  $3.0 (\pm 3.2 \text{ SD})$  and 50–65 y.o. –  $3.8 (\pm 3.1 \text{ SD})$ .

Statistical analysis shows that the difference between women and men in the impact of SARS-CoV-2 on the willingness to undergo the bariatric procedure was not statistically significant ( $P = 0.55$ ). What is more, there was no difference between the age ranges among men and women ( $P > 0.05$ ) (Fig. 2.).

### Lifestyle changes during lockdown

The results of the survey show that 61 (53%) respondents do not practice sport or any other activity on a daily basis at all and 14 (12%) of them do it very rarely. As many as 29 (25%) respondents of the survey declared a significant increase in food intake and 38 (33%) reported a dramatic decrease in everyday physical activity during the lockdown. Considering the period of time between the beginning of the COVID-19 pandemic and the date of the bariatric procedure, 45 (39%) respondents declared weight increase.

## DISCUSSION

We are for the first time to show the impact of COVID-19 pandemic on bariatric patients in Poland with reference to their subjective opinions. Due to the COVID-19 pandemic, most bariatric procedures were postponed as it was officially recommended [8]. Consent to the bariatric procedure is voluntary, so the willingness to perform it is one of the most crucial factors of patient's decision.

The study revealed that bariatric patients show significant difficulty in adhering to preoperative guidelines. Weight gain in the period prior to the bariatric procedure is an indication of lack of patient's cooperation which constitutes a relative contraindication to the procedure.

The group of obese individuals is at a high risk of comorbidities. The contribution of adipose tissue has been determined to be significant during infectious diseases such as COVID-19. The visceral fat inflammatory adipokines' overexpression can disrupt the immune system, impair chemotaxis, or modify macrophage differentiation. It leads to the dysregulation of anti- and proinflammatory adipokine secretion and plays a serious role in the cytokine storm in patients with severe COVID-19 infection. Angiotensin-converting enzyme 2 (ACE2) is the main objective factor of

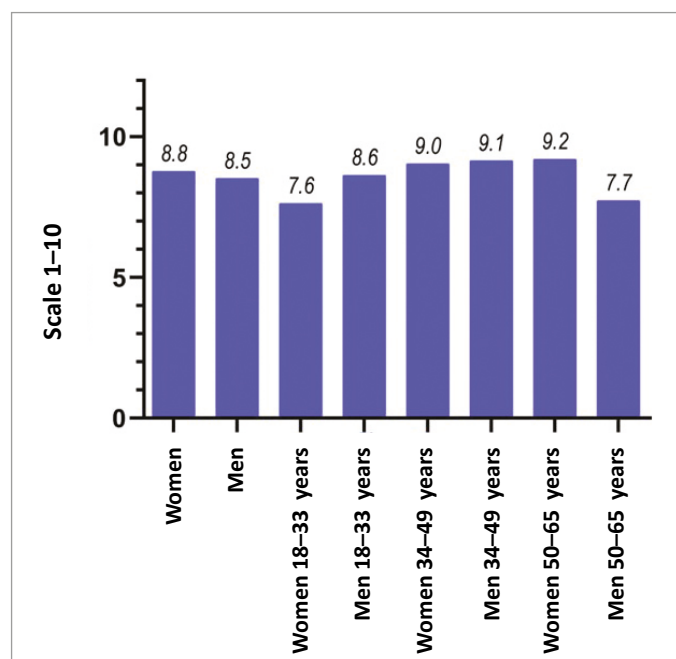


Fig. 1. The willingness to undergo the bariatric procedure.

COVID-19, and the level of its expression in adipose tissue is higher than in lung tissue [9] What is more, adiponectin was declared as a predictive factor for mortality in critically ill patients on Intensive Care Unit (ICU) admission [10]. Moreover, obesity in terms of managing the COVID-19 infection, is connected with numerous potential mechanisms that augment the risk of critical illness and death from COVID-19. They include respiratory compromise – understood as reduced functional residual capacity (FRC), obesity hypoventilation, pulmonary restriction and reduced chest compliance. Next, mechanisms responsible for that are critical care limitations such as prone position difficulties, problems with intubation, higher ventilatory pressures required and impaired pulmonary perfusion comprising endothelial insult, vascular thrombosis and angiogenesis [11].

Obesity is also related to a substantially higher all-cause mortality in white adults [12].

Patients after bariatric surgery are not at enlarged risk of SARS-CoV-2 infection compared to the general population. Bariatric surgery decreases fat stores, improves comorbidities, and hence makes patients less susceptible to severe outcomes if they develop SARS-CoV-2 infection. Delay of surgery can significantly increase the disease load in these patients [9].

It has been endorsed as a novel, independent risk factor of hospitalization, intensive care unit admission and mortality during 2009 H1N1 influenza pandemic and other respiratory viral infections such as rhinovirus, parainfluenza and coronavirus [13, 14]. The study demonstrates that despite the pandemic and higher risk of mortality and complications after SARS-CoV-2 infection, bariatric patients declare a high level of willingness to undergo the bariatric procedure and the impact of COVID-19 pandemic does not play an important role in their decision-making process concerning the bariatric procedure.

After astounding and abrupt origin of COVID-19 pandemic, it has suddenly become a period of lifestyle change, being a strong

Tab. II. The prevalence of comorbidities.

	ALL
N (%)	116 (100%)
Males/females	47 (40%)/69 (60%)
Mean age, years $\pm$ SD	44.4 $\pm$ 11.52
Median age	42.00
Mean BMI kg/m <sup>2</sup> $\pm$ SD	46.46 $\pm$ 7.1
<b>Age ranges – n (%)</b>	
18–33	23 (20%)
34–49	50 (43%)
50–65	43 (37%)
<b>Onset of obesity</b>	
<b>Women:</b>	
childhood	28 (41%)
disease/accident	9 (13%)
lifestyle/work change	2 (3%)
for no particular reason	10 (15%)
pregnancy	20 (29%)
<b>Men:</b>	
childhood	22 (47%)
disease/accident	4 (9%)
lifestyle/work change	11 (23%)
for no particular reason	10 (21%)
<b>Comorbidities</b>	
Arterial hypertension	68 (59%)
Type 2 diabetes mellitus	26 (22%)
Osteoarthritis	37 (32%)
Obstructive sleep apnea	19 (16%)
Varicose veins	31 (27%)
Dyslipidemia	46 (40%)
Esophageal varices	1 (1%)
Coronary artery disease	8 (7%)
Myocardial infarction	5 (4%)
Chronic obstructive pulmonary disease	4 (3%)
Gastroesophageal reflux	35 (30%)
Gastric ulcers	7 (6%)
Hemorrhoids	23 (20%)
Cholelithiasis	28 (24%)
Nephrolithiasis	7 (6%)
Non-alcoholic fatty liver disease	43 (37%)
Depression	14 (12%)
Polycystic ovary syndrome	1 (11%)
Insulin resistance	7 (6%)
Hyperthyroidism	3 (3%)
Hypothyroidism	7 (6%)
Gout	3 (3%)
Other	23 (20%)

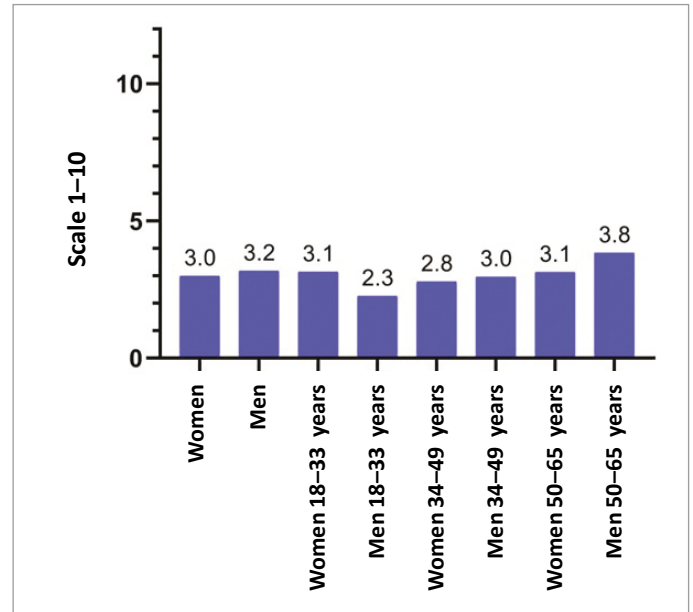


Fig. 2. The impact of COVID-19 pandemic on the willingness to undergo the bariatric procedure.

stress factor affecting all fields of life. Restrictions ended with almost four billion people under lockdown and caused a decrease in everyday physical activity and diet changes among the majority of the world's human population. Moreover, this introduced additional emotional stress and financial problems, which may contribute to an even more rapid development of obesity [15, 16]. Increased BMI was associated with lower vegetable and fruit consumption, more frequent snacking and higher vulnerability to alcohol, fast-food and meat consumption [17]. The results of the survey confirm the above studies.

## LIMITATIONS

There were some limitations that need to be underlined. The study was conducted only in one facility, therefore, there was a low number of respondents. Second, the responses were subjective and based on personal interpretation of the questions by the participants. Consequently, in the small age groups of this study, they may not reflect the general trend. Another limitation was the time of conducting the study, compared to terms of patients' operations, which were different for various participants and could not be averaged. Therefore, the same emotional factors might have been different at the time of operation and during survey.

## CONCLUSIONS

The research shows that despite the pandemic and higher risk of mortality and complications after SARS-CoV-2 infection, bariatric patients declare a high level of willingness to undergo the bariatric procedure, and the impact of COVID-19 pandemic does not play an important role in their decision-making process concerning the bariatric procedure.

Due to the noticeable lifestyle changes during the pandemic such as greater food intake and decrease in physical activity among the bariatric patients, the process of qualification to the bariatric procedure should be conducted very meticulously and the recommended

values for weight loss should be implemented to increase patients' motivation before and after the procedure. As the research shows, bariatric patients tend to neglect their strive for healthy lifestyle, even in the presence of the pandemic. Therefore, weight gain prior to the bariatric procedure can lead to more frequent complications during

surgery and deterioration of the expected results of bariatric surgery. In conclusion, the group of bariatric patients is a high-risk group not only because of greater mortality due to COVID-19 infection, but also because they do not attach much importance to the external factors such as global pandemic.

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