International Surgery

The effect of Covid-19 on bariatric surgery patients in Türkiye: the risk, weight gain, psychological symptoms

--Manuscript Draft--

Manuscript Number:	INTSURG-D-25-00022
Full Title:	The effect of Covid-19 on bariatric surgery patients in Türkiye: the risk, weight gain, psychological symptoms
Article Type:	Original Article
Keywords:	Obesity; Covid-19; bariatric surgery; psychological; physiological
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Abstract:	Introduction The COVID-19 pandemic has created significant effects both psychologically and physiologically around the world. Since obesity causes respiratory disorders, psychological disorders, and comorbidities, obese individuals are at higher risk for complications of the COVID-19 virus. The aim of this study is to compare the physiological and psychological effects against COVID 19 infection between patients who underwent BS during the pandemic period and patients who did not. Method A total of 307 participants were included in this study. The COVID-19 Psychological Distress Scale and a survey consisting of 40 questions were administered to the participants. Patients were divided into two groups: those who underwent bariatric surgery (Group BS) and those who did not undergo surgery (Group NBS). Data were analyzed using SPSS (Statistical Package for Social Sciences). Results In this study, it was found that bariatric surgery significantly reduced the severity of physiological and psychological symptoms associated with Covid 19 ($p=0.00$). It was also seen to reduce the presence of obesity-related diabetes, hypertension, sleep apnea, asthma and insulin resistance. The use of vitamin D, vitamin C, multivitamin, protein powder, iron, vitamin B12 and zinc was found to be statistically significantly higher in patients who underwent bariatric surgery ($p<0.05$). Conclusion According to the results of this study, the bariatric surgery group has a lower risk of

	physiological and psychological symptoms against the COVID-19 virus compared to the non-surgery group, thanks to the management of chronic diseases and improvement of some psychological symptoms.

The effect of Covid-19 on bariatric surgery patients in Türkiye: the risk, weight gain, psychological symptoms

ABSTRACT

Introduction: The COVID-19 pandemic has created significant effects both psychologically and physiologically around the world. Since obesity causes respiratory disorders, psychological disorders, and comorbidities, obese individuals are at higher risk for complications of the COVID-19 virus. The aim of this study is to compare the physiological and psychological effects against COVID 19 infection between patients who underwent BS during the pandemic period and patients who did not.

Method: A total of 307 participants were included in this study. The COVID-19 Psychological Distress Scale and a survey consisting of 40 questions were administered to the participants. Patients were divided into two groups: those who underwent bariatric surgery (Group BS) and those who did not undergo surgery (Group NBS). Data were analyzed using SPSS (Statistical Package for Social Sciences).

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Conclusion: According to the results of this study, the bariatric surgery group has a lower risk of physiological and psychological symptoms against the COVID-19 virus compared to the non-surgery group, thanks to the management of chronic diseases and improvement of some psychological symptoms.

Keywords: Obesity, Covid-19, bariatric surgery, psychological, physiological

INTRODUCTION

Coronavirus disease (COVID-19) emerged in Wuhan at the end of December 2019 and was named COVID-19 by the World Health Organization (WHO) on February 11, 2020. The outbreak was declared a pandemic by the WHO on March 11, 2020 (1). Obesity is also a serious and rapidly increasing health problem that causes millions of deaths worldwide (2). Obesity is associated with comorbidities such as diabetes mellitus

and cardiovascular diseases. In addition, it is a possible risk factor in terms of hospitalization and mortality due to COVID-19 (3). Furthermore, since obesity leads to respiratory problems, it has been reported that the need for mechanical ventilation and mortality rate increase in the presence of COVID-19 infection (4).

Bariatric surgery (BS) is accepted as the most effective and successful long-term obesity treatment for obesity. The most commonly used surgical methods in this regard are sleeve gastrectomy and Roux-en-Y gastric bypass (RYGB) (5). BS reduces obesity-related comorbidities with weight loss (6). Since general lung functions improve with BS, COVID-19 infection is reported to be milder in patients undergoing BS. In addition, intensive care admission, mechanical ventilation, and mortality rates decrease (7, 8).

Apart from the physiological effects of COVID-19 infection, negative economic, social, and psychological effects have also been observed (9, 10). Financial instability also leads to emotional and mental health problems. Social isolation practiced within the scope of pandemic measures has led to an increase in the number of people experiencing anxiety, fear, stress, anxiety, and depression due to important lifestyle changes. Studies in the literature report that mood disorders, anxiety disorders, somatoform disorders, and eating disorders are more common in obese individuals than non-obese individuals (11, 12). In this context, it is estimated that individuals with obesity are affected by the psychological effects of COVID-19 infection at a higher rate (13).

The objective of this study was to compare the physiological and psychological effects of COVID-19 infection on patients who underwent BS during the pandemic period and patients who did not. The main hypothesis of this study is that performing BS during the pandemic period can reduce the negative psychological and physiological effects of patients due to COVID 19 infection.

MATERIALS and METHODS

This study was conducted between October 1, 2019 and September 30, 2020 with the approval of the Private Avrasya Hospital Ethics Committee (Approval date/no: ...../902) on patients admitted to the Obesity and Metabolic Surgery Center between July 24 and August 15, 2021. Study inclusion criteria were determined as follows;

1. Being between the ages of 18-60 years

2. Being a patient residing in Turkiye

3. Being voluntary to participate in the study and giving written informed consent.

Exclusion criteria were determined as follows;

1. Patients residing outside Turkiye

2. Patients whose written informed consent could not be obtained

3. Patients thought to be unable to provide reliable results with the diagnosis of psychiatric disease

4. Patients who underwent BS by September 30, 2020 and period less than 6 months after surgery.

In this study, the files of 624 patients admitted to the Obesity and Metabolic Surgery Center between October, 2019-September 30, 2020 were analyzed retrospectively. 292 of these patients were excluded from the study due to their residence abroad/passing less than 6 months following BS, while 25 of them were excluded due to the possibility of not giving reliable results due to psychological symptoms due to the presence of psychiatric diseases. 307 patients included in the study were divided into 2 groups according to whether they underwent BS or not. Groups:

Group BS (n=157): Bariatric Surgery

Group NBS (n=150): Non-Bariatric Surgery

Written informed consent was obtained from all patients included in the study. COVID-19 Related Psychological Distress Scale was applied to all patients included in the study by phone. In this study, the COVID-19 Related Psychological Distress Scale developed by Feng et al. (**14**) was used. This scale consists of 12 items and is two-dimensional. Items 1, 4, and 6 on this scale constitute the fear and anxiety dimension, and items 5, 7, and 12 constitute the suspicion dimension. The total score obtained from all items shows the psychological distress level experienced by the individual regarding COVID-19. The scores obtained from the scale vary between 12 and 60. A high score obtained from the scale shows that psychological distress is at a high level. The scale is a 5-point Likert-type scale (1: Strongly disagree- 5: Strongly agree). Turkish version of this scale was developed by Ay et al. (**15**). This questionnaire was conducted by the same specialist psychologist who did not know whether BS was performed. The COVID-19 Related Psychological Distress Scale is shown in Table 1.

Table 1. COVID-19 Related Psychological Distress Scale.

Demographic data (age, gender, surgery status, type of surgery, obesity-related chronic diseases) of the patients were recorded. In the questionnaire conducted by phone call, the patients' COVID-19-related PCR test status, result, hospitalization, duration, height/weight before COVID-19, and height/weight status at the time of the questionnaire were recorded. A questionnaire including the most common physical symptom severity in the COVID-19 virus was conducted and recorded. In this questionnaire, the most common physical symptoms of the COVID-19 virus such as loss of taste and smell, fever, cough, shortness of breath, nausea and vomiting, weakness and fatigue, and joint pain were asked with a Likert-type form as "none-low-moderate-very high". Regarding the use of proteins-vitamins, the use of vitamin D, vitamin C, vitamin B12, multivitamins, magnesium, protein powder, iron, and zinc was asked as yes-no questions. Pre- and post-pandemic chronic disease status (Type 2 Diabetes, hypertension, sleep apnea, asthma-shortness of breath, insulin resistance, and heart diseases) was asked as yes-no questions.

Statistical analysis: SPSS 26.0 (Statistical Package for Social Sciences) program was used to evaluate the study data. Pearson's Chi-Square test was used to examine the groups formed according to the surgery variable in terms of infection status, chronic disease status, vitamin use, and severity of physical-psychological symptoms. Moreover, frequency analysis and descriptive statistical analysis were performed for demographic variables.

RESULTS

When the demographic data of the patients were examined, 191 (62.2%) participants were male, and 116 (37.8%) were female. 38.8% of the participants were between the ages of 18-30 years (n=119), 45.3% 31-50 years (n=139) and 16% 51-60 years (n=49). It was determined that 141 individuals (45.9%) underwent sleeve gastrectomy, 11 (3.6%) gastric bypass, and 5 (1.6%) revision surgery. The number of participants between the ages of 38-50 years was found to be significantly higher than other age groups (**p=0.00**). The number of male patients was found to be statistically and significantly higher than female patients (**p=0.00**). The number of patients who underwent sleeve gastrectomy surgery was statistically significantly higher than other surgery types (**p=0.00**). The demographic data of the patients are presented in Table 2.

Table 2: Demographic data of the patients

When COVID-19 infection and hospitalization status of the patients were examined, the number of patients who had PCR tests in Group BS was statistically and significantly higher (**p=0.01**). The number of negative PCR test results was statistically and significantly higher in Group BS (**p=0.01**). Although the number of hospitalizations was higher in Group NBS in patients with positive PCR tests, no statistically significant

difference was determined (p=0.46). No statistically significant difference was revealed between the two groups in terms of the number of hospitalization days (p=0.55). COVID-19 infection and hospitalization status of the patients are given in Table 3.

Table 3. Covid-19 infection and hospitalization status.

The presence of diabetes, hypertension, sleep apnea, asthma, and insulin resistance was found to be statistically and significantly higher in Group BS before the pandemic (**p=0.00**). However, no statistically significant difference was determined in terms of the presence of heart disease (p=0.44). During the pandemic period (1.5 years following the onset of the pandemic), no statistically significant difference was found between the two groups in terms of diabetes, hypertension, sleep apnea, asthma, insulin resistance, and heart disease (p>0.05). Chronic disease status of the patients is shown in Table 4.

Table 4. Chronic disease status.

When the protein, vitamin, and mineral use status of the patients was examined, the use of vitamin D, vitamin C, multivitamins, protein powder, iron, vitamin B12, and zinc was found to be statistically and significantly higher in Group BS (respectively; **p=0.04, p=0.01, p=0.00, p=0.00, p=0.00, p=0.00, p=0.00**). No statistically significant difference was found between the two groups in terms of magnesium use (p>0.05). The protein, vitamin, and mineral use status of the patients is given in Table 5.

Table 5. Protein, vitamin and mineral use status.

When the COVID-19 psychological distress and physiological symptom severity were examined, Group NBS's psychological symptom and physiological symptom severity mean scores were found to be statistically and significantly higher (respectively; **p=0.023, p=0.001**). A statistically significant positive correlation was determined in the correlation analysis conducted in terms of physiological and psychological symptoms (**p=0.005**). The COVID-19 related psychological distress and physical symptom severity of the patients are shown in Table 6.

Table 6. COVID-19-related psychological distress and physical symptom severity.

When the BMI values of the patients were examined, Group BS's mean BMI values were found to be statistically and significantly higher before the pandemic (**p=0.00**). No statistically significant difference was found between the mean BMI values of the two groups during the pandemic (p=0.72). There was an increase in

Group NBS's mean BMI values during the pandemic period (from $\bar{x}$=24.92 to $\bar{x}$=25.10). Pre- and post-pandemic mean BMI values of the patients are given in Table 7.

Table 7. Pre- and post-pandemic mean BMI values.

DISCUSSION

In this study, it was revealed that bariatric surgery significantly reduced the severity of COVID-19-related physiological and psychological symptoms (p=0.00). Furthermore, it was found to reduce the presence of obesity-related diabetes, hypertension, sleep apnea, asthma, and insulin resistance. The use of vitamin D, vitamin C, multivitamins, protein powder, iron, vitamin B12, and zinc was found to be statistically and significantly higher in patients undergoing bariatric surgery.

It is known that obesity has physiological and psychological negative effects on human health, and bariatric surgery is highly important in the treatment of obesity (**12, 16**). It is reported that obesity is a risk factor for COVID-19, and the severity of the disease is positively correlated with a higher BMI (**17-19**). In our study, a significant decrease was detected in the severity of COVID-19 physical symptoms in patients who underwent bariatric surgery. Moreover, studies have reported that a higher BMI leads to an increased risk of medical complications, length of hospital and intensive care stay, and the use of mechanical ventilation for COVID-19 infection (**20, 21**). In our study, the number of hospitalizations was lower in patients who underwent bariatric surgery, but no statistically significant difference was revealed. However, the number of negative PCR tests was found to be significantly higher in patients with bariatric surgery.

It is associated with many comorbidities such as obesity, diabetes, hypertension, sleep apnea, asthma, and cardiovascular diseases and is reported to cause a decrease in respiratory functions due to pulmonary resistance, lung volume, and decrease in respiratory muscle strength (**22-24**). Therefore, it is argued that bariatric surgery contributes to the improvement of respiratory functions (**25**). Jenkins et al. (**7**) state that bariatric surgery reduces adipose tissue, improves respiratory function, and increases inflammatory markers in immune system function which may be a protective factor against COVID-19. In our study, it was revealed that there was a decrease in many comorbidities, including respiratory-related comorbidities, in patients with bariatric surgery during the pandemic period. This result suggests that bariatric surgery may contribute to reducing the risk of shortness of breath, the most common symptom associated with COVID-19, thanks to its positive effect on respiratory tract disorders.

In the meta-analysis conducted by Buchwald et al. (**26**), it was reported that bariatric surgery was associated with 61.2% weight loss and enabled significant improvement in various specific comorbidities including diabetes, hypertension, obstructive sleep apnea, and hyperlipidemia. In our study, a significant decrease was observed in the mean BMI index in patients with BS and a significant improvement in the presence of obesity-related diabetes, hypertension, sleep apnea, asthma, and insulin resistance.

In the study conducted by Sockalingam et al. (**27**), it is stated that approximately 70% of bariatric surgery candidates have a lifetime psychiatric disease history. Furthermore, the COVID-19 virus is reported to primarily cause negative emotional reactions such as anxiety, fear, and anger in people and to increase people's stress levels (**28**). This further increases COVID-19 pandemic-related stress. In the study conducted by Sisto et al. (**29**), it was stated that the participants were concerned about the pandemic and especially about the health of their relatives. Traumatic events such as the death of a relative increase the stress of the person and trigger weight gain. At this point, the importance of reducing the severity of psychological distress associated with COVID-19 increases even more. Our study also revealed that bariatric surgery during the pandemic period significantly reduced the severity of COVID-19-related psychological distress. This result suggests that bariatric surgery during the pandemic period is very important in terms of reducing the psychological and physiological negativities associated with COVID-19.

In the study conducted by Yaribeygi et al. (**30**), it was reported that the immune system of individuals under stress was impaired and the risk of contracting the disease was higher. In our study, it was determined that the mean physiological symptom scores associated with COVID-19 were lower in patients with bariatric surgery. Vitamins and minerals such as vitamin D, A, and zinc are known to have an important effect in terms of strengthening the immune system (**31, 32**). In line with the results obtained in our study, it is thought that high rates of vitamin, mineral, and protein use in patients with bariatric surgery may strengthen the immune system and contribute to the decrease in the severity of physiological symptoms related to COVID-19. In the study conducted by Yildiran and Ayyildiz (**33**), it is also reported that vitamin D is associated with mental health and its deficiency may cause depression. Our study suggests that the high use of vitamin D in patients with bariatric surgery may contribute to the decrease in the severity of COVID-19-related psychological distress.

Conclusion: Obesity is reported to have negative physiological and psychological effects on human health and to be a risk factor for COVID-19. In line with the results obtained from our study, bariatric surgery in patients with obesity during the pandemic period significantly reduces the severity of COVID-19-related physical

symptoms and psychological distress. It also enables a significant improvement in obesity-related comorbidities. Therefore, it is thought that bariatric surgery practices did not pose a risk during the pandemic period. On the contrary, they provided positive physical and psychological effects.

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TABLES

Table 1. COVID-19 Related Psychological Distress Scale.

1.	When I talk to someone I don't know, I suspect that they have the COVID-19 virus.
2.	I am afraid of traveling to a place with a high number of COVID-19 cases.
3.	I get worried when I see an increase in the number of COVID-19 patients in the news.
4.	I think that going to hospitals frequently increases the risk of contracting the COVID-19 virus.
5.	I am afraid to see doctors and nurses who have worked with COVID-19 patients.

6.	Frequent use of planes, trains, buses or other public transportation can cause COVID-19
7.	I think it increases the risk of getting caught.
8.	If I learn that someone has a fever, I suspect they have the COVID-19 virus.
9.	I suspect.
10.	If I see someone vomiting, I suspect they have the COVID-19 virus.
11.	If I see someone without a mask, I suspect they have the COVID-19 virus.
12.	I suspect the COVID-19 virus is more concentrated there when there are people around.

Table 2: Demographic data of the patients

		n	**Percent**	***p***
Age	18-30	119	38.8%	***.00**
	31-50	139	45.3%	
	51-60	49	16.0%	
Sex	Male	191	62.2%	***.00**
	Female	116	37.8%	
Surgery status	Yes	157	51.1%	
	No	150	48.9%	
Type of surgery	Sleeve gastrectomy	141	45.9%	***.00**
	Gastric Bypass	11	3.6%	
	Revision surgery	5	1.6%	
	Non-surgery	150	48.9%	

***p<0.05**

Table 3. Covid-19 infection and hospitalization status.

	Surgery status		
	Yes	**No**	***p***

PCR testing	Yes	115 (73.2%)	90 (60%)	***0.01**
	No	42 (26.8%)	60 (40%)	
PCR results	Positive	41 (26.1%)	42 (28%)	***0.01**
	Negative	74 (47.1%)	48 (32%)	
	No testing	42 (26.8%)	60 (40%)	
Hospitalization	Yes	7 (4.5%)	11 (7.3%)	0.46
	No	36 (22.9%)	29(19.3%)	
	Negative test result/No testing	114 (72.6%)	110(73.3%)	
Hospitalization days	1-15 days	8 (5.1%)	10 (6.7%)	0.55
	No hospitalization	149 (94.9%)	140 (93.3%)	

***p<0.05**

Table 4. Chronic disease status.

	Pre-pandemic (pre-surgery for patients undergoing surgery)					**1.5 years after the pandemic**				
	Surgery		**No surgery**			**Surgery**		**No surgery**		
Disease	**Yes**	**No**	**Yes**	**No**	***p***	**Yes**	**No**	**Yes**	**No**	***p***
Diabetes	29 (18.5%)	128 (81.5%)	2 (1.3%)	148 (98.7%)	***0.00**	2 (1.3%)	155 (98.7%)	8 (5.3%)	142 (94.7%)	**0.05**
Hypertension	26 (16.6%)	131 (83.4%)	4 (2.7%)	146 (97.3%)	***0.00**	6 (3.8%)	151 (96.2%)	14 (9.3%)	136 (90.7%)	**0.05**
Sleep apnea	38 (24.2%)	119 (75.8%)	3 (2%)	147 (98%)	***0.00**	4 (2.5%)	153 (97.5%)	11 (7.3%)	139 (92.7%)	**0.05**

Asthma-dyspnea	35 (22.3%)	122 (77.7%)	2 (1.3%)	148 (98.7%)	***0.00**	4 (2.5%)	153 (97.5%)	8 (5.3%)	142 (94.7%)	0.20
Insulin resistance	82 (52.2%)	75 (47.8%)	6 (4%)	144 (96%)	***0.00**	9 (5.7%)	148 (94.3%)	14 (9.3%)	136 (90.7%)	0.23
Heart diseases	5 (3.2%)	152 (96.8%)	2 (1.3%)	148 (98.7%)	***0.44**	4 (2.5%)	153 (97.5%)	10 (6.7%)	140 (93.3%)	0.08

***p<0.05**

Table 5. Protein, vitamin and mineral use status.

	Using status	**Surgery Status**		***p***
		Yes	**No**	
Vitamin D	**Yes**	114 (72.6%)	92 (61.3%)	***0.04**
	No	43 (27.4%)	58 (38.7%)	
Vitamin C	**Yes**	108 (68.8%)	82 (54.7%)	***0.01**
	No	49 (31.2%)	68 (45.3%)	
Multivitamin	**Yes**	110 (70.1%)	40 (26.7%)	***0.00**
	No	47 (29.9%)	110 (73.3%)	
Magnesium	**Yes**	51 (32.5%)	41(27.3%)	0.32
	No	106 (67.5%)	109 (72.7%)	
Protein powder	**Yes**	113 (72%)	12 (8%)	***0.00**
	No	44 (28%)	138 (92%)	
Iron	**Yes**	73 (46.5%)	28 (18.7%)	***0.00**
	No	84 (53.5%)	122 (81.3%)	
Vitamin B12	**Yes**	89 (56.7%)	59 (39.3%)	***0.00**
	No	68 (43.3%)	91 (60.7%)	
Zinc	**Yes**	61 (38.9%)	32 (21.3%)	***0.00**
	No	96 (61.1%)	118 (78.7%)	

***p<0.05**

Table 6. COVID-19-related psychological distress and physical symptom severity.

	Surgery Status	n	Median (x̄)	*p*	Pearson Correlation	p (2 tails)
Physical symptoms	**Yes**	**157**	**138.06**	***.001**	**.160****	**.005**
	No	**150**	**170.68**			
Psychological symptoms	**Yes**	**157**	**142.76**	***.023**	**.160****	**.005**
	No	**150**	**165.76**			

***p<0.05**

****. The correlation is significant at the 0.01 level (2-tailed).**

Table 7. Pre- and post-pandemic mean BMI values.

	Surgery status	n	Median	Median BMI (x̄)	*p*
Pre-pandemic BMI	**Yes**	**157**	**197.67**	**34.34**	***.00**
	No	**150**	**108.29**	**24.92**	
BMI during pandemic (1.5 years after pandemic)	**Yes**	**157**	**155.77**	**26.05**	**.72**
	No	**150**	**152.15**	**25.10**	

***p<0.05**

BMI: Body mass index

The effect of Covid-19 on bariatric surgery patients in Türkiye: the risk, weight gain, psychological symptoms

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Word count: 2436

Table count: 7

Figure count: 0

Graphic count: 0

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Keywords: Obesity, Covid-19, bariatric surgery, psychological, physiological

Author contributions: AD: Analysis, interpretation, writing the article, critical revision of the article, and literature review. **UK**: Study design, analysis, interpretation, writing the article, critical revision of the article, and literature review.

Conflict of Interest and Funding: I and all authors have no conflict of Interest and financial support.

Availability of Data and Materials: The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Ethics Approval and Consent to Participate: Signed informed consent was obtained from the patients included in this article and is available upon request. This study was conducted on patients who applied to the Clinical Obesity and Metabolic Surgery Center between 01 October 2019 and 30 September 2020, with the approval received from Private Avrasya Hospital Ethics Committee (Approval date/no:...../902). It was held between 15 August 2021 and 15 August 2021.The study was conducted in accordance with the Declaration of Helsinki.