Int Surg 2025;**109:**66–73
DOI: 10.9738/INTSURG-D-25-00022.1

The Effect of COVID-19 on Bariatric Surgery Patients in Türkiye: The Risk, Weight Gain, Psychological Symptoms

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Introduction: The COVID-19 pandemic has created significant effects both psychologically and physiologically around the world. Because 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 was to compare the physiological and psychological effects against COVID-19 infection between patients who underwent bariatric surgery during the pandemic period and patients who did not.

Methods: 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 2 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 had a lower risk of physiological and psychological symptoms against the COVID-19 virus compared

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with the nonsurgery group, thanks to the management of chronic diseases and improvement of some psychological symptoms.

Key words: Obesity – COVID-19 – Bariatric surgery – Psychological – Physiological

Coronavirus disease (COVID-19) emerged in Wuhan at the end of December 2019 and was named COVID-19 by the World Health Organization on February 11, 2020. The outbreak was declared a pandemic by the World Health Organization 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, because 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 treatment for obesity. The most commonly used surgical methods in this regard are sleeve gastrectomy and Roux-en-Y gastric bypass.[5] BS reduces obesity-related comorbidities with weight loss.[6] Because 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, 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 nonobese 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 in patients who underwent BS during the pandemic period and patients who did not. The main hypothesis of this study was that performing BS during the pandemic period could 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: 12.04.2022-2022/902) 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 and 60 years
2. Being a patient residing in Türkiye
3. Being a voluntary participant in the study and giving written informed consent

Exclusion criteria were determined as follows:

1. Patients residing outside Türkiye
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 a 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 1, 2019, and September 30, 2020, were analyzed retrospectively. A total of 292 of these patients were excluded from the study due to their residence abroad/being less than 6 months after BS, and 25 of them were excluded due to the possibility of not giving reliable results because of psychological symptoms due to the presence of psychiatric diseases. A total of 307 patients included in the study were divided into 2 groups according to whether they underwent BS or not: 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. The COVID-19–Related Psychological Distress Scale was applied by phone to all patients included in the study. In this

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.

study, the COVID-19–Related Psychological Distress Scale developed by Feng *et al*[14] was used. This scale consists of 12 items and is 2-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 to 5: strongly agree). The 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.

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 polymerase chain reaction (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) was used to evaluate the study data. Pearson's χ^2 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 and 30 years (n = 119), 45.3% were between 31 and 50 years (n = 139), and 16% were between 51 and 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 and 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.

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 ($P = 0.46$).

Table 2 Demographic data of the patients

	n	Percent	*P*
Age			0.00*
18–30	119	38.8	
31–50	139	45.3	
51–60	49	16.0	
Sex			0.00*
Male	191	62.2	
Female	116	37.8	
Surgery status			
Yes	157	51.1	
No	150	48.9	
Type of surgery			0.00*
Sleeve gastrectomy	141	45.9	
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, n (%)		
	Yes	No	*P*
PCR testing			0.01*
Yes	115 (73.2)	90 (60)	
No	42 (26.8)	60 (40)	
PCR results			0.01*
Positive	41 (26.1)	42 (28)	
Negative	74 (47.1)	48 (32)	
No testing	42 (26.8)	60 (40)	
Hospitalization			0.46
Yes	7 (4.5)	11 (7.3)	
No	36 (22.9)	29 (19.3)	
Negative test result/No testing	114 (72.6)	110 (73.3)	
Hospitalization days			0.55
1–15 days	8 (5.1)	10 (6.7)	
No hospitalization	149 (94.9)	140 (93.3)	

*$P < 0.05$.

No statistically significant difference was revealed between the 2 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.

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 2 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.

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 2 groups in terms of magnesium use ($P > 0.05$). The protein, vitamin, and mineral use status of the patients is given in Table 5.

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 ($P = 0.005$). Table 6 shows the COVID-19–related psychological distress and physical symptom severity of the patients.

When the body mass index (BMI) values of the patients were examined, the mean BMI values of Group BS 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 2 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.

Discussion

In this study, it was revealed that BS 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 BS.

It is known that obesity has physiological and psychological negative effects on human health, and BS is highly important in the treatment of

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

Values are n (%) unless otherwise indicated. Statistically significant p values are written in bold.
*$P < 0.05$.

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 BS. 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 BS, but no statistically significant difference was revealed. However, the number of negative PCR tests was found to be significantly higher in patients with BS.

Table 5 Protein, vitamin and mineral use status

		Surgery status, n (%)		
	Using status	Yes	No	*P*
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)	

Statistically significant p values are written in bold.
*$P < 0.05$.

COVID-19 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 BS contributes to the improvement of respiratory functions.[25] Jenkins *et al*[7] state that BS 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 BS during the pandemic period. This result suggests that BS 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 BS 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 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 BS 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

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	0.001*	0.160[a]	0.005
	No	150	170.68			
Psychological symptoms	Yes	157	142.76	0.023*	0.160[a]	0.005
	No	150	165.76			

*$P < 0.05$.
[a]The correlation is significant at the 0.01 level (2-tailed).

pandemic-related stress. Sisto *et al*[29] 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 BS during the pandemic period significantly reduced the severity of COVID-19–related psychological distress. This result suggests that BS during the pandemic period is very important in terms of reducing the psychological and physiological negativities associated with COVID-19.

Yaribeygi *et al*[30] 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 BS. Vitamins and minerals, such as vitamin D, vitamin 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 BS 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 BS may contribute to the decrease in the severity of COVID-19–related psychological distress.

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	0.00*
	No	150	108.29	24.92	
BMI during pandemic (1.5 years after pandemic)	Yes	157	155.77	26.05	0.72
	No	150	152.15	25.10	

*$P < 0.05$.

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, BS 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 BS practices did not pose a risk during the pandemic period. On the contrary, they provided positive physical and psychological effects.

Acknowledgments

Author contributions: Ali Durmuş: Analysis, interpretation, writing the article, critical revision of the article, and literature review. Ugur Kesici: Study design, analysis, interpretation, writing the article, critical revision of the article, and literature review. The authors have no conflict of interest or financial support. The data that support the findings of this study are available from the corresponding author, upon reasonable request. 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 October 1, 2019, and September 30, 2020, with the approval received from Private Avrasya Hospital Ethics Committee (Approval date/no: 12.04.2022-2022/902). It was held between August 15, 2021, and July 24, 2021. The study was conducted in accordance with the Declaration of Helsinki.

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