Depression and Self Esteem in Patients with Morbid Obesity: The Effect of Sleeve Gastrectomy

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Abstract: Obesity is a major health problem worldwide. It has been associated with high prevalence of depression and low self-esteem. Laparoscopic sleeve gastrectomy, a bariatric procedure, is simple and effective in weight reduction with few complications. We studied depression and self esteem in patients with morbid obesity before and after laparoscopic sleeve gastrectomy. **Methods:** Depression, self-esteem and physical health were assessed in 64 patients with morbid obesity (Group I) before the surgery compared with 64 matched healthy subjects (Group II) and 1 year after the surgery (N=61) to detect any changes in these parameters after the surgery. Depression was diagnosed by the Mini International Neuropsychiatric Interview (MINI) and it's severity was assessed by the hospital anxiety and depression scale - depression sub-scale (HADS-D). Self-esteem was assessed by Rosenberg self esteem scale (RSE), and physical health was assessed by physical domains of Short-Form 36 (SF-36) Questionnaire. **Results:** There was a high prevalence of depression 29.68% (19/64) with HADS-D mean score **(**7.08 ± 2.51**)**, low self esteem and a poor physical health in patients with morbid obesity compared with control group. One year after laparoscopic sleeve gastrectomy, all these parameters improved (P<0.001) and the improvement in depression and self-esteem was significantly correlated with reduction in BMI (r= 0.41, -0.39, respectively) and improved physical health (r= -0.43, 0.33, respectively). **Conclusion:** There was high prevalence of depression and low self-esteem in patients with morbid obesity and LSG improves all these parameters as a result of both reduction in BMI and improved physical health after the surgery.

[Saleh M. Aldaqal and Mohammad G. Sehlo. **Depression and Self Esteem in Patients with Morbid Obesity: The Effect of Sleeve Gastrectomy**] Journal of American Science 2011; 7(12):1116-1123]. (ISSN: 1545-1003). http://www.americanscience.org. 141

Key wards: Depression, self-esteem, morbid obesity, sleeve gastrectomy**.**

1. Introduction:

Obesity is a major health problem worldwide. It not only affects physical health, but also has a great impact on mental health.

Several studies have examined the link between obesity and mental health problems. A two-causal relationship have been proposed. Some researchers suggested that mental health disorders lead to obesity through an eating disorder [1,2], whereas others thought that obesity leads to depression through its impact on physical health [3].

It has also been reported that depressive symptomatology flows mainly from poor physical health to depression rather than in the reverse direction [4]. Thus the association between depression and obesity seems to be strongest for those with severe obesity [5,6], with a substantial improvement in depression seen after weight loss [7].

It has been proven that obese patients have an increased risk of anxiety and depression. They may also suffer from low-self esteem. Several studies have shown improvement in these parameters after different methods of weight reduction [7-10]. Since the introduction of Bariatric procedures, it has been shown that they can achieve long-term weight loss, thus improving the quality of life and decreasing mortality rates.

There are many types of bariatric procedures. They are classified into restrictive or mal-absorptive procedures. Laparoscopic Sleeve Gastrestomy LSG, a restrictive operation, has acquired a unique position in bariatric surgery. It is as effective in weight reduction compared to other bariatric procedures, with significantly lower rates of complications.

LSG works by various mechanisms. It is a restrictive procedure that reduces the size of the stomach, thereby, reducing its volume, making it less distendable during eating and hence generates a feeling of fullness and early satiety with minimal oral intake [11]. Also, **Langer *et al.*** [12], found that the transaction of fundus and greater curvature of the stomach leads to reduction in the level of ghrelin hormone, a potent appetite stimulator. They reported significantly reduced level of ghrelin following LSG at one and six months respectively. Compared to other restrictive procedures, LSG has better patient tolerance, no postoperative adjustment of band, and less regurgitation [13]. LSG is also much superior to mal-absorptive procedures as there is no nutritional deficiency, no stomach ulceration or dumping syndrome and comparable weight loss [14]. We hypothesized that LSG can improve depression and low-self esteem. This can be achieved through reduction of BMI and hence improvement in self-reported physi-

cal health of obese patients, which in-turn improves their mental health. We are unaware of any reports in the literature that have specifically evaluated the effect of LSG, as a treatment method for depression, self-esteem and self-reported physical health in morbidly obese patients.

The aim of our study was to:

- Evaluate the prevalence of depression, self-esteem and self-reported physical health in morbidly obese patients compared to matched healthy subjects
- Assess depression, self-esteem and self-reported physical health in morbidly obese patients before and after LSG.
- Assess the effect of physical health on depression and self-esteem

2. Materials and Methods

Study Design

In a prospective cohort study conducted over a 2 year period (October 2009 – 2011), 64 morbidly obese patients designated "Group I – Study group" were accepted for bariatric surgery according to the guidelines of the American Association of Bariatric Surgery [15]. That is BMI > 40 or BMI 35 – 40 if associated with co-morbid condition like diabetes, hypertension or when 6 months of life style modification and medical treatment have failed to produce sustained adequate weight loss and age between 18 to 65 years.

The "Group II - Control group" consisted of 64 matched healthy, non-obese subjects.

The 2 groups were interviewed 2 weeks prior to operating on the study group for physical and psychological assessment. Their BMI and mental health, specifically, depression, self-esteem, and self-reported physical health were evaluated. Sociodemographic data (age, gender, nationality, state of employment, marital state, education and socioeconomic status) was also obtained using a questionnaire developed by the study team.

Psychological assessment was done using internationally standardized scales, mentioned below, and comparison between the 2 groups was done.

After obtaining ethical approval and informed consents, the study group was operated on. They were re-interviewed 1 year after the procedure (N=61) in the surgery outpatient clinic of KAU hospital to re-assess and hence detect any changes in depression, self esteem and self-reported physical health.

Obese Participants - Group 1

Patients were randomly selected from the surgical ward at King Abdualaziz University Hospital, Jeddah, KSA. Detailed history of their obesity was obtained. This included the duration of obesity, dietary history, and failed lifestyle modifications they have undertaken. They were then assessed preoperatively for co-morbid conditions such as diabetes, and hypertension. Their medications and its doses were recorded. We had 12 diabetic patients on treatment, 20 hypertensive patients on treatment and 4 patients with infertility.

Subjects were weighed on an electrical scale to the nearest 0.1kg while wearing light clothes and bare footed. Height was measured in bare feet to the nearest 1mm by using a stadiometer in a standing position. Body mass index (BMI) was calculated as weight divided by height squared (Kg/m^2). The study group (Group I - N=64) was then subdivided into 5 groups according to their BMI: Group 1 consisted of 9 patients with BMI 35 - 40, group 2 consisted of 13 patients with BMI 41-50, group 3 consisted of 23 patients with BMI 51 – 60, group 4 consisted of 11 patients with BMI 61 – 70 and group 5 consisted of 8 patients with BMI 71 – 76.

Exclusion criteria for the study included the following: Any cognitive deficit, any co-morbid psychiatric illness with depression (e.g. psychosis, anxiety), substance abuse, other concomitant serious medical problems (except that secondary to morbid obesity) and language barrier.

LSG procedure was explained to the patients with benefits and possible complications. Informed consent was obtained from all participants for the surgery, participation in the study, and for regular follow up to 1 year after the procedure. Ethical approval was obtained from the local ethical committee of King Abdulaziz University Hospital.

The Surgical Technique

LSG was performed by an experienced bariatric surgeon. A five-trocar technique was used. An Optiview trocar TM was inserted through a 1 cm supraumbilical incision. Abdominal cavity was assessed, and was insufflated with CO_2 reaching a pressure of 14 mmHg. The operating ports were then inserted under direct vision. Liver was retracted cranially to expose gastroesophageal junction. A point on the greater curvature, 5 cm proximal to the pylorus was identified as a distal extent of the resection. Vessels along the greater curvature were divided up to the angle of His using a Harmonic scalpel TM. A 34 Fr bougie is inserted trans-orally to level of the distal stomach. Linear cutting staplers were used to vertically transect the stomach, and thus create a narrow gastric lumen with an estimated capacity of 50-80 ml. The resected stomach is placed in a bag and extracted. A routine gastrograffin swallow is done for all patients in POD 1. Oral fluids are commenced if the test results were normal.

Measurement Tools

Assessment of Depression

Diagnosis of depression was made using the Mini International Neuropsychiatric Interview (MINI) [16], which is a standardized psychiatric examination method according to DSM-IV criteria. The severity of depression was determined using a Subscale of the Hospital Anxiety and Depression sale (HADS-D) [17] as a self-reported questionnaire. In our study we used 7 out of 14 questions for assessment. Each item was scored on a four point scale from zero (not present) to three (considerable), giving a total of 21 scores for depression. Scores of > 8 represent possible depression. A cut-off score of 8 points was found to give an optimal balance between sensitivity and specificity at about 0.80 for depression [18].

HADS was developed and validated specifically for use in the physically ill and does not rely on somatic symptoms of depression. The somatic items might be scored positively by people with medical illness regardless of the presence of depression, thus potentially overestimating the prevalence of depression [19].

Assessment of Self-esteem: This was done using Rosenberg self-esteem scale (RSE), which is composed of 10 items [20]. Each scores 4 points, giving a scale range of 10 to 40. Higher scores reflect higher self-esteem. RSE is frequently used to assess feelings of self-acceptance and self worth. It's reliability is (0.74 and 0.77)[21].

Assessment of Self-reported physical health: A generic HRQL instrument, Short Form questionnaire (SF-36) [22], was used to assess physical health related to the quality of life. There are 4 physical domains with physical component summary; each scores 0 (worst possible health status) to 100 (best possible health status). The 4 domains are physical functioning, role physical, bodily pain and general health.

A number of studies have addressed content, concurrent, criterion, construct and predicted validity indicating that the SF-36 includes 8 of the most frequently represented health concepts [23-25]. Published reliability statistics have exceeded the minimum standard of 0.70 recommended for measures used for group comparisons, and most have exceeded 0.80, while reliability estimates for the domain scores usually exceed 0.90.

3. Results

Prior to performing LSG in the study group, our results demonstrated no statistically significant difference in the sociodemographic data of the study group (N=64 Group I - obese patients) compared to the control group (Group II – healthy subjects) (Table 1). Thus eliminating any confounding variables that may affect our results.

However, there was a highly statistically significant higher mean scores of BMI, HADS-D and a highly statistically significant lower mean scores of RSE, SF-36 physical domains in group I obese patients compared with group II (Table 2).

Nineteen patients (29.68%) from group I were diagnosed with depression and scored above 8 in HADS-D, but their scores were mildly elevated, with a mean score of (7.08 ± 2.51). 6 out of the 19 depressed obese patients were on antidepressants.

The smallest difference between the 2 groups in the SF-36 physical domains was much higher than 5 points (Table 2). All these difference remained statistically significant after adjustment of the clinical confounders (as hypertension, diabetes and infertility). After classifying our study group (group I) according to their BMI, we found that higher BMI is associated with statistically significant increase in the severity of depression (indicated by higher mean scores of HADS-D), as well as statistically significant decrease in self esteem (indicated by lower mean scores of RSE) and a statistically significant poorer physical health (indicated by lower mean scores of physical component summary) (Table 3).

Pearson's correlation test was used to examine the relationship between obesity (BMI) with depression (HADS-D) and self-esteem (RSE), and the relationship between physical health with depression and self-esteem. We examined this relationship preoperatively and post-operatively in group I. Preoperatively, we found a significant positive correlation between BMI scores and HADS-D scores (r= 0.62) and a significant negative correlation between physical component summary scores and HADS-D scores (r= - 0.74) (Table 4). There was also a significant negative correlation between BMI scores and RSE scores (r= - 0.68) and a significant positive correlation between physical component summary scores and RSE scores (r= 0.54) (Table 4).

A year post-LSG in obese patients (N= 61) (3 cases were dropped out for not following up), there was a significant positive correlation between BMI scores and HADS-D scores (r= 0.14) and a significant negative correlation between physical component summary scores and HADS-D scores (r = - 0.43) (Table 6). There was also a significant negative correlation between BMI scores and RSE scores (r= - 0.39) and a significant positive correlation between physical component summary scores and RSE scores (r= 0.33) (Table 6).

There was a highly statistically significant decrease in BMI and HADS-D mean scores and a highly statistically significant increase in RSE and all SF-36 physical domains mean scores in group I obese patients 1 year after LSG than before the operation (Table 5).

Table 1 : Sociodemographic data comparison between Group I (obese patients) and Group II (control group)

Variable	Group I (N = 64)		Group II N = 64		t	p	CI (95%)
Age	Mean ± SD 36.04 ± 5.58		Mean ± SD 37.83 ± 4.71		- 1.69	0.09	- 3.8 – 0.30
	Group I		Group II		χ^2		P
	No	%	No	%			
Gender					0.92		0.33
Male	17	26.56	22	34.37			
Female	47	73.44	42	65.63			
Nationality					2.78		0.095
Saudi	46	71.87	37	57.81			
Non Saudi	18	28.13	27	42.19			
State of Employment					2.13		0.14
Employed	36	56.25	44	68.75			
Non Employed	28	43.75	20	31.25			
Marital status					0.04		0.84
Married	47	73.44	46	71.87			
Single	17	26.56	18	28.13			
Education					0.70		0.40
Educated	60	93.75	62	96.87			
Non Educated	4	6.25	2	3.13			
Socioeconomic Status					0.86		0.35
High	44	68.75	39	60.93			
Low	20	31.25	25	39.07			

Table 2: BMI, HADS-D, RSE and SF-36 physical sub-scales mean scores comparison between groups I and II

Variable	**Group I (N = 64)** Mean ± SD	**Group II N = 64** Mean ± SD	**t**	**p**	**CI (95%)**
BMI	54.46 ± 12.09	22.56 ± 1.52	18.13	< 0.001	28.40 – 35.38
HADS-D	7.08 ± 2.51	3.88 ± 1.43	7.66	< 0.001	2.37 – 4.03
RSE	15.58 ± 2.96	25.15 ± 4.27	- 12.73	< 0.001	-11.05 – - 8.07
Physical Functioning	40.92 ± 5.88	83.48 ± 4.08	- 41.16	< 0.001	-44.61 – - 40.51
Role Physical	34.23 ± 5.54	80.33 ± 2.25	- 53.40	< 0.001	-47.81 – - 44.39
Bodily Pain	36.02 ± 5.87	82.73 ± 2.68	- 50.08	< 0.001	-48.56 – - 44.85
General Health	32.90 ± 3.57	75.44 ± 1.45	- 76.35	< 0.001	-43.64 – - 41.43
Physical component summary	36.02 ± 4.94	80.83 ± 1.76	- 59.13	< 0.001	-46.31 – - 43.30

BMI indicates body mass index, HADS-D indicates hospital anxiety - Depression scale - Depression subscale, and RSE indicates Rosenberg self-esteem scale.

Table 3: Group I (pre-op) HADS-D, RSE and SF – 36 physical component summary mean scores according to BMI grades

	HADS-D	RSE	Physical Component Summary
BMI			
35 – 40	5.33	18.01	41.17
41 – 50	5.82	17.27	39.18
51 – 60	6.69	16.56	35.25
61 – 70	8.67	12.44	33.89
71 – 76	9.83	12.17	30.33
* P. Value	0.006	< 0.001	< 0.001

*Based on Kruskal – wallis test

Table 4:Pearson's correlation between HADS-D and BMI, SF-36 physical component summary and between RSE and BMI, SF-36 physical component summary in group I obese patients preoperatively (N = 64)

	HADS - D
BMI	*
Physical component summary	0.74 *
	RSE
BMI	0.68 *
Physical component summary	0.54 *

*P < 0.001

Table 5: BMI, HADS-D, RSE and SF-36 physical subscales mean scores comparison between obese patients before laparoscopic sleeve gastrectomy operation and 1 year after the operation.

Variable	Obese patients before operation (N=64) Mean ± SD	Obese patients 1 year after operation (N=61) Mean ± SD	Paired - t	P	CI (95 %)
BMI	54.46 ± 12.09	28.64 ± 2.56	14.56	< 0.001	21.61 – 28.56
HADS-D	7.08 ± 2.51	3.89 ± 1.98	16.45	< 0.001	2.94 – 3.76
R S E	15.58 ± 2.96	24.13 ± 3.01	- 12.19	< 0.001	- 9.71 - - 6.95
Physical Functioning	40.92 ± 5.88	72.84 ± 2.32	- 36.42	< 0.001	- 33.63 - - 30.10
Role Physical	34.23 ± 5.54	71.15 ± 2.17	- 44.60	< 0.001	- 38.88 - - 35.51
Bodily Pain	36.02 ± 5.87	69.42 ± 7.22	- 26.64	< 0.001	- 35.40 - - 30.42
General Health	32.90 ± 3.57	67.04 ± 3.73	- 44.58	< 0.001	-35.69 - - 32.61
Physical Component summary	36.02 ± 4.94	70.20 ± 4.88	- 24.81	< 0.001	- 36.27 - - 31.68

Table 6: Pearson correlation between HADS-D and BMI, SF-36 physical component summary and between RSE and BMI, SF-36 physical component summary in group I obese patients, 1 year after laparoscopic sleeve gastrectomy (N=61)

		HADS-D
BMI		0.41 *
Physical component summary		- 0.43 **
P = 0.006	** P = 0.004	
		RSE
BMI		- 0.39 *
Physical component summary		0.33 **

* P = 0.008 ** P = 0.02

4. Discussion

To the best of our knowledge, this is the first study that examines the effect of laparoscopic sleeve gastrectomy, as a treatment option for morbid obesity, on depression, self-esteem and physical health in our population. Our results show that 29.68% (19/64) from our morbidly obese study group (group I) had depression. Most of those patients have had several failed attempts of life style modification, and thus decided to have LSG to reduce their weight and improve their quality of life.

Similar findings have been reported in literature, **Halmi *et al.,*** [26] Found a lifetime prevalence of 47.5% for any axis I psychiatric diagnosis among morbidity obese patients seeking gastric bypass. **Wadden and Stunkard**[27] reported that 10 Minnesota multiphasic personality inventory (MMPI) studies on treatment seeking obese people > 75% overweight, found at least mild elevations on the depression scale and less frequently, on other MMPI clinical scales. **Simon *et al.,*** [28] reported that nearly one out of four cases of obesity is associated with a mood or anxiety disorder but the causal relationship and complex interplay between the two is still unclear. Many studies reported that obesity has been associated with an increased lifetime risk for major depression and panic disorder or agoraphobia, particularly among females [29,30].

Our findings suggest that obese patients have lower self-esteem compared to matched healthy subjects (Table 2). We also found that greater BMI in obese patients is linked to increased depression and lower self-esteem (Table 3) consistent with several other studies [31-33]. There are 2 studies in the literature that have reported that the association between obesity and depression is strongest for those with severe obesity [5,6]. Our results also reveal a positive (direct) relationship between BMI and depression and inverse relationship between BMI and self-esteem (Table 4). A review of 35 studies [34] of self-esteem and adiposity concluded that studies on adolescents have consistently shown an inverse relationship between self-esteem and overweight or obesity. A Study has also shown improvement in self-esteem in adolescents following an obesity treatment program [8]. . A cross-sectional prospective cohort done on 1278 adolescents, revealed an inverse association between self-esteem and BMI in both males and females [35]. Also **Martin *et al.,*** [36] found that in adolescent females, the self-esteem of middle-weight group was significantly higher than the self esteem of the high-weight group, the correlation of the obesity index and self esteem indicated that as weight increased self-esteem decreased.

In our current study, the physical health of obese patients (group I) was markedly impaired, as indicated by lower mean scores in all SF-36 physical domains compared with the control group (group II). The smallest difference between the 2 groups in the SF-36 physical domains was highly above 5 points, exceeding what is suggested that the difference of 3-5 points should be considered to represent the minimal clinically important difference for SF-36 scores [37]. Also there was inverse relationship between depression and physical health and a positive relationship between self-esteem and physical health (Table 4). This is consistent with **Gayman *et al.,*** [4] who reported that depressive symptomatology has been reported to flow mainly from poor physical health to depression rather than in the reverse direction. One theory is that obesity mainly influences mental health through its impact on self reported physical health which is defined as physical functioning, physical role functioning and bodily pain [3].

Following analysis of our results of pre-LSG and 1 year post-LSG, we found significant reduction in weight and a significant improvement in depression, self esteem and physical health. The number of

depressed patients have reduced from 19 before the operation to 2 patients 1 year after the operation.

Also, we found that 10 out of 12 diabetic patients in our study group, and 19 of 20 hypertensive patients were completely cured and stopped their medications 1 year after the operation. Also 3 out of 4 patients with infertility were completely cured 1 year following LSG.

Our correlation study results, 1-year post-LSG, show a direct relationship between BMI and depression, and an inverse relation between physical health and depression. Also, an inverse relation between BMI and self-esteem, and a direct relation between physical health and self-esteem. These findings support our hypotheses that the improvement in depression and self-esteem in group I obese patients after the operation is related to both weight reduction and improved physical health. Obesity impairs body image, and may be stigmatizing, this may lead to increased risk of anxiety and depression.

These findings are consistent with many studies; many studies have shown reductions in symptoms of anxiety and depression after different types of obesity surgery [9,10, 38,39]. **Mellin *et al.*,** [8] suggested that with one treatment program for adolescent obesity resulting in improved self-esteem. **Dixon *et al.*,** [7] reported that improvement in self-reported physical health was significantly correlated with a decrease in the beck depression inventory score after lap band surgery. In the SOS study, the degree of weight loss predicted a greater improvement in the HADS depression score after bariatric surgery [10].

We did not agree with **Andersen *et al.*,**[40] who reported that the Δ BMI was not significantly correlated with the Δ HADS scores. This may be due to that our sample of obese patients was more obese (with higher BMI) than their sample. Also, we did not agree with **Dymek *et al.*,** [41] who reported that improvement in depression was found as early as 2 to 4 weeks after Roux-en-Y gastric bypass, despite no changes in self-reported physical health had occurred. But this rapid improvement may have been caused by rapid weight loss after the surgery but to be sustained improvement in depression, it must be added to weight loss an improvement in self-reported physical health as we hypothesized.

Conclusion:

Our findings suggest that patients with morbid obesity showed a high prevalence of depression, low self esteem and a poor physical health and this was significantly correlated with increased BMI and decreased physical health. 1 year after laparoscopic sleeve gastrectomy, there was a great reduction in BMI, depression and a great improvement in self esteem and physical health. The improvement in depression and self esteem was significantly correlated to both reduction in BMI and improvement in physical health.

Disclosure of benefit:

The authors have no conflict of interest, and are not supported/funded by any Drug Company.

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