

**ORIGINAL ARTICLE****Assessment of Nutritional Status among Obese Patients Who Underwent Bariatric Surgery**Esraa Salah Abdallah<sup>1\*</sup>, Shereen Eassa Mohamed<sup>2</sup>, Samar Sayed Ahmed<sup>3</sup>, Mona Sami Hamed<sup>4</sup><sup>1</sup> Demonstrator of Community Medicine and Public Health, Faculty of Medicine Suez University<sup>2</sup> Professor of Community Medicine and Public Health, Faculty of medicine, Zagazig University<sup>3</sup> Assistant Professor of Community Medicine and Public Health, Faculty of Medicine, Suez University<sup>4</sup> Lecturer of Community Medicine and Public Health, Faculty of Medicine, Zagazig University**\*Corresponding author:**

Esraa Salah Abdallah

Demonstrator of Community

Medicine and Public Health,

Faculty of Medicine, Suez

University.

**Email:**[esraasalah78e@gmail.com](mailto:esraasalah78e@gmail.com)

Submit Date 2021-09-18

Revise Date 2021-10-26

Accept Date 2021-11-15

**ABSTRACT****Background:** Bariatric surgery has a major role in treatment of obesity for patients with a history of unsuccessful trials to lose weight, as it gives the most successful results in achieving goals of weight reduction.**Aim and objectives:** The aim of this study was assessment of nutritional deficiencies through assessment of nutritional status among bariatric surgery patients.**Methods:** A case control study was conducted on 3 groups (32 participants in each group), Bariatric surgery individuals (12-18 months after surgery), Obese on diet individuals and Obese without diet individuals at Zagazig city from the beginning of Dec. 2019 to the end of Sep. 2020. Nutritional status was assessed using Subjective Global Assessment (SGA) Questionnaire.**Results:** The mean age was  $32.41 \pm 7.51$  years. Females were about 3/4 of all groups. Most of the studied bariatric surgery group had Gastrectomy surgery and Gastric Bypass (68.8 % and 15.6 %) respectively. 75% of bariatric surgery group were severely malnourished while (62.5%) and (75%) of obese with diet and obese without diet groups respectively were moderately malnourished. **Conclusion:** Nutritional deficiencies are very common after bariatric surgeries more related to sleeve gastrectomy than balloon procedures.**Keywords:** Obesity, Bariatric surgery, Diet management modalities, Nutritional deficiency.**INTRODUCTION**

Obesity is a worldwide issue which has a great interest of public health professionals. It affects worldwide 500 million people as estimated by the World Health Organization and this burden expected to rise to one billion obese globally by 2030 [1]. Over the past three and half decades, the worldwide prevalence of obesity has nearly doubled [2]. After Saudi Arabia and the United Arab Emirates, Egypt has the third highest obesity prevalence in the Middle East and North Africa region. Egyptians are particularly prone to central obesity, which is most likely hereditary. In 6 Egyptian Governorates and including 2313 adults aged 25 years and older, the national hypertension

survey program in Egypt reported that 50% of people surveyed have central obesity [3].

According to Wirth et al. [4]; Patients should not be advised to take drugs unless they follow a basic program consists of (healthy diet, regular exercise or obtain a behavioral therapy). In contrast with nonsurgical treatments, bariatric surgery is currently the most effective treatment modality for morbid obesity. Prolonged weight loss and improved obesity-associated comorbidities and quality of life are the primary advantages of bariatric surgery [5].

On the other hand, there are disadvantages of this operation such as postoperative malnutrition, protein, minerals and vitamins deficiencies that always occur as a result of decreased consumption of food and nutrients absorption [6]. Nutritional complications associated with bariatric surgery can be prevented by life-long nutritional monitoring with the administration of multi-vitamins and mineral supplements according to the patient's needs [7]. Despite of all these disadvantages, it is approved that patients who undergo bariatric surgeries have a rapid loss of weight occurring from 18-24 months after the operation, they also can keep 50-60% of that loss up to 10-14 years. Patients after the procedure can also experience lifestyle changes, better health and major improvements in quality of life [6].

### AIM OF THE WORK

Assessment of nutritional deficiencies among obese patients who underwent bariatric surgery.

### METHODS

The study was case control study, conducted at Zagazig city, from 2019 till 2021 and data were collected from 3 groups, group I is the case group and group II & III are the control group, Group I (Post bariatric surgery individuals), Group II (Obese on diet individuals) and Group III (Obese without diet individuals). The sample consisted of 96 participants divided into 3 groups 32 participants in each group who fulfilled the inclusion criteria; Both sexes, Age between 18 and 65 years, BMI exceeding 40 kg/m<sup>2</sup>, BMI exceeding or equal 35 kg/m<sup>2</sup>, when diagnosed with obesity-related diseases, including type 2 diabetes, hypertension, lipid disorders, and obstructive sleep apnea, Participants in bariatric surgery group who passed 12-18 months after surgery, Control group comparable as regard age, sex and presence of comorbidities. Exclusion criteria covered individuals with diseases affect quality of life such as: Malignancy or myocardial infarction and Psychiatric disorders, and individuals who underwent bariatric surgery in less than 12 months. Written informed consent was obtained from all participants, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Fieldwork:

The fieldwork started at the beginning of December 2019 to the end of September 2020. All

participants were personally interviewed by the investigator through a previously scheduled semi structured face to face interview and were asked to participate in the current study and fill the questionnaires after providing their verbal informed consent then the field work shifted to online google form questionnaire due to lockdown after COVID\_19 pandemic at the beginning of April 2019.

The link of google form

<https://docs.google.com/forms/d/1h0OWgaJZVM9mDMqbOIFjUp9MFiy2tdTnprqKJ9ErdY/edit>

### Study description:

The data were collected by different tools:

#### I. An interview questionnaire

All subjects who participated in the study fulfilled the following questionnaire which took about 20-30 minutes to be completed.

**A. Subjective Global Assessment Guidance for Body Composition Questionnaire** assessing nutritional status based on features of patient history (weight change, diet intake change, gastrointestinal symptoms, functional capacity and physical examination (loss of subcutaneous fat and muscle wasting) [9].

#### II. Anthropometric assessment

##### The weight and height

**A- Body weight:** was measured once by a digital scale for the nearest 1/2 kg. Participants were bare footed and with light clothes. The scale was placed on a hard flat surface and checked for zero balance before measurement [10].

**B- Height:** standing height was measured once, the reading was recorded in centimeters to the nearest 5 mm [10], without shoes the backbone against the wall, the line should be at the angle of the eye and ear tragus is horizontal and a mark on the wall was done at that level. The distance between the mark on the wall and the floor was measured by a scaled tape [11].

Body mass index or BMI is calculated by taking a person's weight, in kilograms, divided by their height, in meters squared or  $BMI = \text{weight (in kg)} / \text{height (m)}^2$  [12] and classified into five different categories, where BMI above 30 kg/m<sup>2</sup> classified as obese, if BMI above 35 kg/m<sup>2</sup> with significant obesity-related co-morbidities or above 40 kg/m<sup>2</sup> is called morbid obesity [13].

#### Statistical analysis:

Data was collected, tabulated, and analyzed statistically by computer using Statistical

Package of Social Services version 22 (SPSS). Qualitative data were represented as frequencies and relative percentages. Quantitative data were expressed as mean ± SD (Standard deviation). Suitable statistical tests were done after checking of normality, Chi square test and ANOVA test were used to calculate difference between qualitative and quantitative variables, respectively.

**RESULTS**

Table 1 shows that age of the studied group I range from 21 – 44 years old with mean 32.41 ± 7.51 years and ¾ of them were females (75%), also in group II their age ranging from 23 – 46 years old with mean 35.41 ± 7.12 years and 75% of them were females, there was no statistically significant difference between studied groups regarding age and sex.

Table 2 shows that Body Mass Index among group I range from 21.3 – 49.31 with mean 31.72 ± 6.51 kg/m<sup>2</sup> and 43.8 % of them had BMI less than 30, while in group II ranging from 35.08 – 49.95 and 62.1 % of them had BMI 35-39.9 (obesity class II), there was highly statistically significant difference between the studied groups regarding Body Mass Index.

Table 3 shows that (71.9%) of group I had inadequate nutrient intake, (46.9) of group I had severe subjective loss of weight during the past 6 months.

15.6% of group I had hollowed eyes, depression, and dark circles. (34.4%) of group I had obvious ribs and prominent clavicle as shown in table 4.

Table 5 shows that the most common symptoms affecting oral intake in group I and group III is feeling full quickly (46.9%) & (23.7%) respectively and in group II is dental problems (21.9%).

Table 6 shows that (75%) of Group I were severely malnourished (evidence of wasting and progressive symptoms) (SGA C) and (75%) of Group III were Mild/moderately malnourished (some progressive nutritional loss) (SGA B) with high statistically significant difference between the studied groups.

81.8 % of gastrectomy patients were severely malnourished (evidence of wasting and progressive symptoms) VS (50 %) of balloon surgery patients were Mild/moderately malnourished (some progressive nutritional loss) with high statistically significant difference between operated patients as shown in table 7.

**Table (1): Demographic characteristics of the studied groups (No=96).**

Item	Group I (N=32)		Group II (N=32)		Group III (N=32)		X <sup>2</sup> /F test	p-value	
	No.	%	No.	%	No.	%			
<b>Sex</b>									
<b>Male</b>	8	25.0	8	25.0	12	37.5	1.61	0.446 (NS)	
<b>Female</b>	24	75.0	24	75.0	20	62.5			
<b>Age (Years)</b>									
<b>Mean ± SD</b>	32.41 ± 7.51		35.41 ± 7.12		36.34 ± 6.07		5.26	0.072 (NS)	
<b>Range</b>	21 – 44		23 – 46		25 – 47				

χ<sup>2</sup>: chi-square test.

F test: ANOVA

NS: Not significant.

**Table (2): Body Mass Index of the studied groups**

Item	Group I (N=32)		Group II (N=32)		Group III (N=32)		F test / X <sup>2</sup>	p-value	
	No.	%	No.	%	No.	%			
<b>Body Mass Index (kg/m<sup>2</sup>)</b>									
<b>Mean ±SD</b>	31.72 ± 6.51		40.30 ± 5.32		42.82 ± 6.27		29.51	0.000* (HS)	
<b>Range</b>	21.3 – 49.31		35.08 – 49.95		35.46 – 53.33				
<b>Body Mass Index Classification</b>									
<b>Overweight</b>	14	43.8	0	0.0	0	0.0	70.75	0.000*	

Obese class I	10	31.3	0	0.0	0	0.0		(HS)
Obesity class II	4	12.5	21	65.6	12	37.5		
Morbid obese	4	12.5	11	37.9	20	62.5		

$\chi^2$ : chi-square test

\*P < 0.05 is significant.

HS: highly significant.

F test: ANOVA

**Table (3): Subjective Nutritional Global Assessment among the studied groups.**

Variable	Group I (N=32)		Group II (N=32)		Group III (N=32)		X <sup>2</sup>	p-value
	No.	%	No.	%	No.	%		
<b>Nutrient intake</b>								
Inadequate nutrient intake	23	71.9	9	28.1	12	37.5	13.67	0.001*
<b>Non fluid weight change past 6 months</b>								
<5%loss or weight stability	1	3.1	29	90.6	32	100.0	79.97	0.000*
5-10% loss without stabilization or increase	2	6.3	0	0.0	0	0.0		
>10%loss and ongoing	29	90.6	3	9.4	0	0.0		
<b>Subjective loss of weight during the past 6 months</b>								
None or mild	4	12.5	12	37.5	24	75.0	33.25	0.000*
Moderate	13	40.6	14	43.8	8	25.0		
Severe	15	46.9	6	18.8	0	0.0		
<b>Weight change past 2 weeks</b>								
Increased	5	15.6	7	21.9	0	0.0	36.58	0.000*
No change	15	46.9	25	78.1	32	100.0		
Decreased	12	37.5	0	0.0	0	0.0		

**Table (4): Subjective Nutritional Global Assessment among the studied groups (Conc.)**

SGA	Item	Variable	Group I (N=32)		Group II (N=32)		Group III (N=32)		X <sup>2</sup>	p-value
			No.	%	No.	%	No.	%		
Functional capacity	Fatigue and progressive loss of function	Reduced capacity	15	46.9	21	65.6	20	62.5	2.65	0.265
		Reduced capacity	Difficulty with normal activities	14	93.3	21	100.0	16	80.0	5.16
	Bed/chair-ridden		1	6.7	0	0.0	4	20.0		
Subcutaneous fat	Under the eyes	Hollowed look, depression, dark circles	5	15.6	0	0.0	8	25.0	13.77	0.008*
	Obvious ribs	Yes	11	34.4	4	12.5	0	0.0	14.69	0.001*

	<b>Sides of trunk</b>	Very prominent	4	12.5	0	0.0	0	0.0	27.47	0.000*
<b>Muscle wasting</b>	<b>Clavicle</b>	Protruding/Prominent bone	11	34.4	6	18.8	0	0.0	34.85	0.000*
	<b>Quadriiceps</b>	Prominent knee, severe depression medially	4	12.5	7	21.9	4	12.5	5.90	0.207
	<b>Interosseous muscle between thumb and forefinger</b>	Flat or depressed area	3	9.4	3	9.4	0	0.0	8.06	0.089

$\chi^2$ : chi-square test.

\*: statistically significant.

SGA: Subjective global assessment.

**Table (5): Symptoms affecting oral intake among the studied groups.**

Item	Group I (N=32)		Group II (N=32)		Group III (N=32)		X <sup>2</sup>	p-value
	No.	%	No.	%	No.	%		
<b>Symptoms affecting oral intake</b>								
Pain on eating	6	18.8	0	0.0	4	12.5	6.25	0.044*
Vomiting	6	18.8	0	0.0	4	12.5	6.25	0.044*
Dysphagia	5	15.6	0	0.0	0	0.0	10.54	0.005*
Constipation	10	31.3	3	9.4	4	12.5	6.14	0.046*
Anorexia	9	28.1	0	0.0	0	0.0	19.86	0.000*
Dental problems	3	9.4	7	21.9	4	12.5	2.17	0.337
Nausea	7	21.9	0	0.0	4	12.5	7.59	0.022*
Diarrhea	2	6.3	0	0.0	0	0.0	4.08	0.130
Feels full quickly	15	46.9	4	12.5	0	0.0	23.75	0.000*

$\chi^2$ : chi-square test.

\*: statistically significant.

**Table (6): Subjective Nutritional global Assessment rating between the studied groups (No=96).**

Subjective Global Assessment Rating	Group I (N=32)		Group II (N=32)		Group III (N=32)		Chi-square test X <sup>2</sup>	p-value
	No.	%	No.	%	No.	%		
• B	8	25.0	20	62.5	24	75.0	17.45	0.000* (HS)
• C	24	75.0	12	37.5	8	25.0		

(B) Mild/moderately malnourished (some progressive nutritional loss)

(C) Severely malnourished (evidence of wasting and progressive symptoms)

**Table (7): Subjective Nutritional Global Assessment in relation to type of bariatric surgery.**

Subjective Global Assessment Questionnaire	Butterfly		Balloon		Gastric Bypass		Gastrectomy		X <sup>2</sup>	p-value
	No.	%	No.	%	No.	%	No.	%		
<b>B</b>	3	100.0	1	50.0	0	0.0	4	18.2	11.87	0.008* (HS)
<b>C</b>	0	0.0	1	50.0	5	100.0	18	81.8		

(B) Mild/moderately malnourished (some progressive nutritional loss).

(C) Severely malnourished (evidence of wasting and progressive symptoms).

χ<sup>2</sup>: chi-square test.

### DISCUSSION

This case control study was conducted on 96 participants, divided into 3 groups, (32) participants in each group, Post bariatric group, Obese with diet program group and Obese without diet group. The mean age of Post bariatric group was 32.41 ± 7.51 years, the surgery has positive role on young age to live more physically active life and increase self-esteem. Similar to our finding, Akkayaoğlu et al. [14], reported that the mean age of post bariatric patients was 36.34 ± 10.89 years.

When analyzing the relationship between bariatric surgery and its impact on weight loss, we found that this operation has been shown to be quite useful [15]. The mean BMI of post bariatric surgery group was 31.72 ± 6.51 kg/m<sup>2</sup>, this is in agree with Castanha et al. [15], who reported that mean BMI of bariatric surgery group was 31.05 ± 6.03 kg/m<sup>2</sup>. Castanha et al. [15], also reported that the majority of bariatric surgery group had BMI less than 30 kg/m<sup>2</sup>, which agree with the current study, as 43% of the current study participants in post bariatric surgery group were categorized to have BMI less than 30 kg/m<sup>2</sup>.

In the current study, females showed a high representative sample as the percentage of female participation among the studied groups was 75%, 75%, and 62.5%, respectively, this is in agree with Silva et al. [6], who demonstrated that the high percentage of female involvement in diet programs and bariatric surgeries is due to personal aesthetic motivation and stigma from the society which rising the beauty pattern of lean women. This may be also attributed to peer and partner’s pressure. Men, unlike women, are more likely to seek this resource when their everyday physical activities are compromised [15].

Protein deficiency is the most serious macronutrient complication linked with bariatric surgeries. Following bariatric surgery, many

patients experience intolerance to protein-rich food due to various factors such as a smaller stomach, changes in bilio-pancreatic function, and altered gut structure, all of which result in poor protein digestion and absorption. Most patients are placed on a strict liquid diet and are unable to take large amounts of food during the early post-operative phase, which can be worsened by protracted vomiting in some individuals. Because of these factors, post-bariatric patients are at a high risk of developing protein malnutrition due to insufficient protein intake and absorption [16].

Bector et al. [17], used subjective global assessment tool for nutritional assessment in medical ICU to identify the prevalence of malnutrition among adult critically ill medical patients at admission to a tertiary care medical ICU and to determine whether nutritional status at admission to the ICU as assisted by the SGA, predicts clinical outcomes in the critically ill patients. Retrospective data were collected by Bector et al. [17] from medical charts of 57 consecutive patients admitted to the medical ICU requiring mechanical ventilation at a tertiary care center over a 6-month time period.

This study used subjective global assessment tool for nutritional assessment in patients who underwent bariatric surgery and showed (75%) of post bariatric surgery group were severely malnourished (evidence of wasting and progressive symptoms) and the most common symptoms was feeling full quickly (46.9%) with high statistically significant difference between comparable groups.

This study showed that (81.8 %) of gastrectomy patients were severely malnourished (evidence of wasting and progressive symptoms) while (50 %) of balloon surgery patients were Mild/moderately malnourished (some progressive nutritional loss) with high statistically significant difference between operated patients. Although sleeve gastrectomy *merely* reduces the stomach

volume without causing intestinal malabsorption, it does result in faster gastric emptying. As a result of the rapid gastrointestinal passage, nutritional deficiencies may develop [18].

**Castanha et al. [15]** noted that malnutrition is usually due to food intake restriction, food intolerance and physiological impact of anatomical changes food, and lack of adherence to multivitamins therapy. Thus, Supplemental vitamins and minerals must be given to bariatric surgery patients, as well as clinical and nutritional monitoring to detect probable nutritional deficiencies. This is in agree with our results that showed presence of symptoms affecting nutrients intake such as feeling full quickly (46.9%), constipation (31.3%), anorexia (28.1%), vomiting (18.8%), pain on eating (18.8%) and dysphagia (15.6%). This study showed that (71.9%) of post bariatric surgery group had inadequate changes in nutrient intake and (90.6%) of them lost more than 10% of their weight in the past six months. As seen in the present study, postoperative nutritional complications are frequent, requiring professionals to be prepared to make early diagnosis and treatment thus obtaining the best results.

The method of nutritional supplementation should consider malnutrition severity and the risk to the patient. In mild conditions, adequate calories and protein may be provided through oral supplements. Severe conditions require more invasive techniques [19].

After considering previous studies, a time period of 12-18 months after surgery was chosen because this was the time period in which definitive results following the operation could be seen [8].

## CONCLUSION

Based on the data collected in the study it was demonstrated that nutritional deficiencies are very common after bariatric surgeries more related to sleeve gastrectomy than balloon procedures.

## RECOMMENDATIONS

- Further studies on micronutrient and vitamins deficiencies e.g., Vitamin D and vitamin B12 among post bariatric surgeries are recommended.
- Health education on nutritional requirements programs.

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### *To Cite:*

Abdallah, E., Mohamed, S., Ahmed, S., Hamed, M. Assessment of Nutritional Status among Obese Patients who Underwent Bariatric Surgery. *Zagazig University Medical Journal*, 2024; (256-263): -. doi: 10.21608/zumj.2021.95002.2349