

## Factors Associated with Delayed Weight Reduction among Post Bariatric Surgery Patients

Marwa Khalil Hafez<sup>1</sup>, Naglaa Abd Allah Abd El Hafeez<sup>2</sup>, Mohamed Hany Ashoor<sup>3</sup>, Medhat Mohamed Anwar<sup>4</sup>

<sup>1</sup> (Lecturer, Medical Surgical Nursing Department, Faculty of Nursing, Alexandria University, Egypt.)

<sup>2</sup> (Lecturer, Medical Surgical Nursing Department, Faculty of Nursing, Alexandria University, Egypt.)

<sup>3</sup> (Lecturer, Experimental and Clinical Surgery department, Medical Research Institute, Alexandria University, Egypt.)

<sup>4</sup> (Professor, Experimental and Clinical Surgery Department, Medical Research Institute, Alexandria University, Egypt.)

Corresponding Author: Marwa Khalil Hafez

**Abstract:** Currently, bariatric surgery offers the long-term weight loss and maintenance for the morbidly obese. Several factors could be associated with patients' disability to achieve successful weight loss after the surgery. **Objective:** The purpose of this study was to identify the factors associated with delayed weight reduction among post bariatric surgery patients. **Setting:** This study was conducted at the Outpatient Surgical Department-Medical Research Institute Hospital, Alexandria University, Egypt. **Subjects:** A convenience sample of 100 adult surgical patients who had undergone bariatric surgeries, was selected from patients showing up at the study setting for follow up. **Tool:** Post-bariatric surgery patient assessment sheet was developed and used to collect the necessary data related to factors which might lead to delayed weight reduction among post bariatric surgery patients. **Results:** 72 out of 100 post bariatric patients had delayed weight reduction. The main factors associated with their delayed weight reduction were found to be related to preoperative BMI, onset of obesity, preoperative weight loss, postoperative duration and postoperative compliance to dietary instructions ( $P = .000, .048, .000, .017$  and  $.016$ ) respectively. **Conclusion:** It was concluded that, not all post bariatric surgery patients had the same successful outcomes due to several factors. Educating patients undergoing bariatric surgery about the factors which may hinder postoperative weight loss and raising their compliance with postoperative weight reduction care plans should be advocated.

**Keywords:** Bariatric surgery, Delayed weight reduction, Post bariatric surgery patients, Weight reduction.

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### I. Introduction

Obesity is characterized by abnormal or excessive fat accumulation that may impair health. The current most broadly utilized criteria for classifying obesity and overweight is the body mass index (BMI). It can be calculated using a person's weight in kilograms divided by the square of height in meters ( $\text{kg}/\text{m}^2$ ) which ranges from underweight or wasting ( $<18.5 \text{ kg}/\text{m}^2$ ) to severe or morbid obesity ( $\geq 40 \text{ kg}/\text{m}^2$ ). Obesity is a BMI greater than or equal to  $30 \text{ kg}/\text{m}^2$ . Worldwide obesity has nearly tripled since 1975 and is linked to more deaths worldwide than underweight. It is a complex and largely preventable disease affecting, over a third of the world's population today. As expected, by 2030 nearly 38% of the world's adult population will be overweight and another 20% will be obese<sup>(1,2)</sup>.

Likewise, obesity greatly increases risk of several chronic diseases such as type 2 diabetes, cardiovascular diseases. It could also increase the risk of some cancers as endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon cancers, musculoskeletal disorders especially osteoarthritis, depression as well as mortality. Obesity presents a major challenge to chronic disease prevention and health across the life course around the world<sup>(2,3)</sup>.

Obesity can be generally preventable by making the choice of healthy diet and standard physical activity. However, over the long term, these strategies alone are not constantly effective for weight reduction. A little percentage of individuals who participate in weight loss programs lose significant amounts of weight and maintain that loss for a long period. Unfortunately, conventional strategies for weight reduction are ineffectual for accomplishing and keeping significant weight reduction. Surgical treatment of obesity known as bariatric surgery or weight loss surgery is currently considered the most effective treatment for morbid obesity resulting in durable and sustainable weight loss<sup>(4-6)</sup>.

Bariatric surgery is classified as restrictive procedures that limit the amount of food intake by reducing the size of the stomach, and malabsorptive procedures interfering with the absorption of food from the digestive tract. Whatever the type, small incisions could be done laparoscopically than those required for the traditional open approach (laparotomy). It should be considered for all patients with a BMI of more than 40 kg/m<sup>2</sup> and for those patients with a BMI of more than 35 kg/m<sup>2</sup> with obesity-related co-morbid conditions<sup>(7, 8)</sup>.

Fortunately, most obesity-related medical conditions could be improved after surgery. These conditions could be as diabetes, sleep apnea, hypertension, sexual functioning, remission of depression and anxiety symptoms, as well as reduced mortality rate<sup>(9)</sup>. Additionally, quality of life, self-image, and mobility are reported to be better. Some studies have recommended that psychological health can improve after bariatric surgery<sup>(10-12)</sup>. In this context, it started to be considered as the main powerful elective treatment of obesity.

Not only the essential high level of surgical skill is required for preventing anastomotic complications (e.g., Thrombosis and leak) but preoperative nurses' role should be advocated<sup>(13)</sup>. In fact the nurse has to explain diet restrictions preoperatively, that has to be followed after recovery from surgery. High protein foods and a minimum of 1.5-2 L fluids should be consumed daily. Foods high in carbohydrates are usually avoided when possible during the initial weight loss period<sup>(14-16)</sup>. Additionally, to achieve successful weight loss after surgery, preoperative health education of patients about exercise and physical activity must be reinforced postoperatively. Moreover the preoperative nursing instructions given to patients, has to be followed by patients' evaluation in their follow up in schedule of visits postoperatively.

It is important to stress that not all patients lose weight successfully, despite the precise surgical technique, nursing efforts and regular follow-up. Hence, it is so important for all nursing care providers learn more about the predictors related to bariatric surgery outcomes<sup>(17, 18)</sup>. As a mirror of fact, patients are not uniform in weight loss after the surgery, and some patients do not achieve or are unable to maintain expected weight losses<sup>(19-21)</sup>. While the reasons are not well understood, some patients may either regain weight or have delayed weight loss after bariatric surgery.

Henceforth, bariatric results of the treatment depend on several factors. It is also not clear which factors have the greatest impact on the results of bariatric surgery. This explains the importance of identifying these factors, thus collaborative work of the surgeon, nurse and patient would prevent the risks of delayed weight reduction postoperatively, and its associated co-morbidities<sup>(22, 23)</sup>.

**Aim of the study:**

This study aimed to identify the factors associated with delayed weight reduction among post bariatric surgery patients.

**Research question:**

What are the factors associated with delayed weight reduction among post bariatric surgery patients?

## **II. Material And Methods**

**Material:**

**Research design:**

A descriptive design was used to conduct this study.

**Setting:**

This study was conducted at the Surgical Outpatient Clinics Department of the Medical Research Institute Hospital, Alexandria University, Egypt.

**Subjects:**

A convenience sample of 100 adult surgical patients who underwent bariatric surgeries, selected from patients showing up at the surgery clinic for follow up. EPI INFO program was used to estimate the sample size applying the following parameters:

1. Population size = 360 for 3 months.
2. Expected frequency = 50%
3. Acceptable error = 10%
4. Confidence co-efficient = 95%
5. Minimum sample size = 76

**The patient inclusion criteria were:**

- Adult male and female patients who underwent bariatric surgeries.
- Aged 18- 65 years old.
- Patients who had 6 months and over postoperative duration were considered eligible for the study. This duration was specified since it has been indicated by Christopher et al (2014) the maximum time for bariatric patients to achieve successful weight reduction postoperatively<sup>(24)</sup>.
- Patients with controlled chronic diseases.

- Patients who are not on insulin or corticosteroid therapy.

**Tool of the study:**

"Post-bariatric surgery patient assessment sheet" was developed by the researchers after reviewing the related literature; for the purpose of the study<sup>(17-25)</sup>. It included two main parts:

**Part I: Sociodemographic characteristics sheet:**

This sheet was developed to obtain patient's sociodemographic characteristics as age, sex, occupation, level of education, and marital status.

**Part II: Post-bariatric delayed weight reduction related factors structured questionnaire:**

This questionnaire aimed to assess the necessary data about the factors related to delayed weight reduction post-bariatric surgery. It was divided into three groups of factors as follows:

**1- Preoperative factors:**

These factors consisted of preoperative body mass index, onset of obesity (childhood, convalescence and adulthood), family history of obesity, past history of following diet regimen, eating disorders (overeating and night eating or both), and scheduled preoperative weight loss regimen.

**2- Clinical factors:**

Those comprised smoking, associated medical disorders (as diabetes mellitus, cardiovascular disorders, osteoarthritis), presence of psychiatric disorders, bariatric surgery type (malabsorptive and restrictive) and postoperative duration (more than or equal 6 months to a year and more than a year).

**3- Factors related to patient's compliance with postoperative instructions:**

It consisted of several factors included; their postoperative follow up with the dietician, and compliance with dietary instructions as well as following exercises.

**Methods:**

1. An official permission was secured from the study setting administrative staff to carry out the study.
2. The study tool was revised by five experts in the fields of Medical Surgical Nursing and Surgery to test the tool for content validity, completeness and clarity of the items, and the necessary modifications were carried out accordingly.
3. Reliability of the tool was tested using Cronbach's Alpha Coefficient Test (= 0.87) which indicated that, the tool was reliable.
4. A pilot study was initially carried out on ten patients prior to the actual data collection to assess the clarity and applicability of the tool and to identify the difficulties that may be encountered during data collection. These patients were excluded from the study sample.

**5. Ethical considerations:**

An ethical Committee permission was obtained to conduct the study. The purpose of the study was explained to all the studied patients, and their approval and readiness to be included in the study were obtained initially before participation. All patients were assured about the privacy and confidentiality to participate in the study.

**6. Data collection:**

Data was collected within three months, during the period between November 2017 and January 2018.

✓ **Patient's personal interview:**

- a. It was conducted throughout the patients' visits for follow up at the Outpatient Surgery Clinics for 15-20 minutes.
- b. The studied patients' sociodemographic and clinical data were initially obtained. These data included onset as well as family history of obesity, presence of psychiatric disorders and/or eating disorders, and past history of diet regimens.
- c. Patients were asked about the varieties of food intake and carrying out exercises to determine their compliance with dietary and physical activity recommendations.
- d. Anthropometric measurements:
  - Patients' weight in kilograms and height in square meter were measured using the clinic's scale and BMI was calculated.
  - BMI was estimated to determine patient's success of surgery as regards weight reduction. According to Binda et al (2016) the success of surgery was recognized by a BMI less than or equal 30 Kg/ M<sup>2</sup>. All patients with BMI more than 30 Kg/ M<sup>2</sup> were considered to have delayed weight reduction<sup>(22)</sup>.

✓ **Review of patient’s medical record:**

- a. This was carried out to obtain the necessary data about the surgery as type and postoperative duration, patient’s preoperative BMI, scheduled preoperative weight loss regimen and associated medical diseases.
- b. The patient’s schedule of postoperative visits was reviewed in order to determine adherence to follow up with a dietician.

**Statistical analysis:**

- Statistical analysis was done using IBM SPSS statistics program version 21<sup>(26, 27)</sup>.
- Quantitative data were described by mean, median, standard deviation, minimum and maximum, while categorical variables were summarized by frequency and percent.
- The Chi-square test was used to study significant association between two categorical variables. Fisher’s exact and Monte-Carlo tests were used if more than 20% of total expected cell counts <5.
- The independent sample t test was used to detect significant differences in the mean or median quantitative variables between two groups of patients.
- All statistical tests were judged at 0.05 significance level.

**III. Results**

**Table (1)** presents that nearly three quarters of the studied patients (72%) had postoperative BMI more than 30 Kg/m<sup>2</sup>. They did not achieve successful weight reduction outcomes and had delayed weight reduction post bariatric surgery. The rest of the patients (28%) had post bariatric successful weight reduction.

**Table (1): Frequency Distribution of the Studied Patients in Relation to Postoperative BMI**

Postoperative BMI	Post bariatric study subjects (N= 100)	
	No	%
25 - ≤ 30 Kg/m <sup>2</sup>	28	28.0
>30 - < 35 Kg/m <sup>2</sup>	46	46.0
35 - < 40 Kg/m <sup>2</sup>	24	24.0
40 - ≥ 45 Kg/m <sup>2</sup>	2	02.0
<b>Total non-delayed weight reduction group (&lt; 30 Kg/m<sup>2</sup>) = (28) patients.</b>		
<b>Total delayed weight reduction group (&gt;30 Kg/m<sup>2</sup>) = (72) patients.</b>		

**Table (2)** shows that the age of patients who had not delayed weight reduction ranged from 18 up to 64 years, whereas it ranged from 20 - 49 years in patients who had delayed weight reduction. Females were more than males. They constituted 85.7 % and 75.0 % of non-delayed and delayed weight reduction patients respectively. More than half (53.6 %, 52.8%) of both groups were unemployed. The majority of patients (42.9 %, 52.8 %) in both non-delayed and delayed weight reduction groups had university level of education respectively. More than half of the patients (57.1 %, 59.7 %) of non-delayed and delayed weight reduction groups respectively were remarried. There were no statistical significant associations between both groups regarding sociodemographic characteristics.

**Table (2): Frequency Distribution of the Studied Patients in Relation to Sociodemographic Characteristics**

Sociodemographic Characteristics	Non-delayed weight reduction (N= 28)		Delayed weight reduction (N= 72)		Statistical test
	No	%	No	%	
<b>Age(in years)</b>					
Min - Max	18 - 64		20 - 49		T = .087
Mean ± SD	34.75 ± 9.091		34.54 ± 11.244		P = .930
<b>Sex</b>					
Male	4	14.3	18	25.0	X <sup>2</sup> = 1.349 P = .246
Female	24	85.7	54	75.0	
<b>Occupation</b>					
Unemployed	15	53.6	38	52.8	X <sup>2</sup> = .775 P = .679
Sedentary	7	25.0	23	31.9	
Non-sedentary	6	21.4	11	15.3	
<b>Level of education</b>					
Illiterate	0	0.0	1	1.4	FET P = .715
Primary	10	35.7	22	30.6	
Secondary	6	21.4	11	15.2	
University	12	42.9	38	52.8	
<b>Marital status</b>					

Single	10	35.7	28	38.9	FET P = .160
Married	16	57.1	43	59.7	
Divorced	2	7.1	0	0.0	
Widow	0	0.0	1	1.4	

T = Student t test X<sup>2</sup> = Chi square test FET = Fisher's Exact Test

Table (3) presents that the preoperative BMI was from 40 up to less than 45 Kg/m<sup>2</sup> in more than half of both non-delayed and delayed weight reduction studied patients representing 53.6 % and 56.9 % respectively. The majority had no family history of obesity in both groups as reported by 67.9 % and 72.2 % respectively. Considerable numbers of patients, i.e. 53.6 % and 72.2 % in the non-delayed and delayed weight reduction groups respectively got obese during childhood. It is noticed from the table that 89.3 % and 90.3 % of the non-delayed and delayed weight reduction patients, respectively underwent diet regimens in the past. All the patients of the non-delayed weight reduction group (100%) underwent preoperative weight loss regimens compared to 72.2 % of the delayed weight reduction group. Interestingly, the majority of patients (64.3 % and 76.4 %, respectively) in both groups had the same types of eating disorders (overeating and night eating disorders). It appears from the table that the preoperative BMI, onset of obesity and preoperative weight loss regimens affected significantly the delay in the weight reduction outcome of patients postoperatively where P = .000, .048 and .000, respectively.

Table (3): Distribution of Preoperative Factors Associated with Delayed Weight Reduction Post Bariatric Surgery

Preoperative factors	Non-delayed weight reduction (N= 28)		Delayed weight reduction (N= 72)		Test of significance
	No	%	No	%	
<b>Preoperative BMI</b>					X <sup>2</sup> = 28.153 P = .000*
35 - < 40 Kg/m <sup>2</sup>	13	46.4	12	16.7	
40 - < 45 Kg/m <sup>2</sup>	15	53.6	41	56.9	
≥ 45 Kg/m <sup>2</sup>	0	0.0	19	26.4	
<b>Family history of obesity</b>					X <sup>2</sup> = .187 P = .666
Absent	19	67.9	52	72.2	
Present	9	32.1	20	27.8	
<b>Onset of obesity</b>					X <sup>2</sup> = 5.699 P = .048*
Childhood	15	53.6	52	72.2	
Adolescence	8	28.6	12	16.7	
Adulthood	5	17.9	8	11.1	
<b>Past history of diet regimen</b>					FET P = 1.000
Absent	3	10.7	7	9.7	
Present	25	89.3	65	90.3	
<b>Preoperative weight loss regimens</b>					X <sup>2</sup> = 12.806 P = .000*
Done	28	100.0	52	72.2	
Not done	0	0.0	20	27.8	
<b>Eating disorders</b>					FET P = .585
Absent	2	7.1	3	4.2	
Overeating	1	3.6	2	2.8	
Night eating	7	25.0	12	16.7	
Both	18	64.3	55	76.4	

X<sup>2</sup> = Chi square test FET = Fisher's Exact Test\* = Significant at P ≤ 0.05

Table (4) displays that the majority of patients in non-delayed and delayed weight reduction groups were non-smokers (85.7 % and 75.0 % respectively). The majority of patients in the non-delayed weight reduction group had no associated medical disorders (92.9), while more than three quarter of patients in the delayed weight reduction group had associated medical disorders. Moreover, the vast majority of patients in the non-delayed and delayed weight reduction groups had psychiatric disorders (92.9 % and 81.9 % respectively). Moreover, 92.9 % of the non-delayed weight reduction group and 93.1 % of delayed weight reduction patients had a restrictive type of surgery. In addition, 32.1 % of patients in the non-delayed weight reduction group had equal or more than 12 months as a postoperative duration compared to 56.9 % of patients who had delayed in weight reduction post-surgery. Statistically significant differences were elicited due to associated medical disorders and postoperative duration where P = .000 and .017 respectively.

**Table (4): Distribution of Clinical Factors Associated with Delayed Weight Reduction Post Bariatric Surgery**

Clinical factors	Non-delayed weight reduction (N= 28)		Delayed weight reduction (N= 72)		Test of significance
	No	%	No	%	
<b>Smoking</b>					
Non-smoker	24	85.7	54	75.0	X <sup>2</sup> = 1.349 P = .246
Smoker	4	14.3	18	25.0	
<b>Associated medical disorders</b>					
Absent	26	92.9	16	22.2	X <sup>2</sup> = 19.115 P = .000*
Present	2	7.1	56	77.8	
<b>Psychiatric disorders</b>					
Absent	26	92.9	59	81.9	FET P = .222
Present	2	7.1	13	18.1	
<b>Bariatric surgery type</b>					
Malabsorptive	2	7.1	5	6.9	FET P = 1.000
Restrictive	26	92.9	67	93.1	
<b>Postoperative duration</b>					
6 - < 12 months	19	67.9	31	43.1	X <sup>2</sup> = 10.212 P = .017*
≥ 12 months	9	32.1	41	56.9	

FET = Fisher's Exact Test X<sup>2</sup> = Chi square test\* = Significant at P ≤ 0.05

It can be noticed from the table (5) that more than half of patients in the non-delayed and delayed groups had follow ups with dieticians, which was not monthly (60.7 % and 68.1% respectively). As regards compliance of patients to dietary instructions postoperatively, it appears that 60.7 % of patients in the non-delayed weight reduction group and 41.7 % of patients in the delayed group were compliant with postoperative dietary instructions. Regarding the postoperative exercises, the majority of patients in both non-delayed and delayed weight reduction groups were not complying (67.9 % and 59.7 % respectively). A statistical significant difference was noticed between the two study group patients due to their following of dietary instructions where P = .016.

**Table (5): Distribution of Factors Related to Patient's Compliance to Post Bariatric Surgery Instructions:**

Factors related to patient's compliance to postoperative instructions	Non-delayed weight reduction (N= 28)		Delayed weight reduction (N= 72)		Test of significance
	No	%	No	%	
<b>Follow up with dietician</b>					
Absent	5	17.9	8	11.1	X <sup>2</sup> = .874 P = .646
Not monthly	17	60.7	49	68.1	
Monthly	6	21.4	15	20.8	
<b>Dietary instructions</b>					
Followed	17	60.7	30	41.7	X <sup>2</sup> = 11.968 P = .016*
Not followed	11	39.3	42	58.3	
<b>Exercises instructions</b>					
Followed	19	67.9	43	59.7	X <sup>2</sup> = .566 P = .499
Not followed	9	32.1	29	40.3	

X<sup>2</sup> = Chi square test\* = Significant at P ≤ 0.05

#### IV. Discussion

Patients undergoing bariatric surgery have different degrees of weight loss postoperatively. A wide variety of factors may play a role in influencing weight loss outcomes. Identifying the factors associated with postoperative delayed weight loss can enhance preventing its occurrence among bariatric surgery patients<sup>(28-30)</sup>. So, this study aimed to identify factors associated with delayed weight reduction among post bariatric surgery patients.

The most important finding of this study showed that the majority of the study subjects had delayed weight reduction after bariatric surgery. This finding stands in line with the finding of Binda et al (2016) who assessed the prognostic factors for weight loss outcomes after bariatric surgery in a similar study and demonstrated the same findings<sup>(22)</sup>. Furthermore, Magro et al (2008) reported in a study conducted on morbidly obese patients at the Obesity Surgery Center in Brazil that delayed weight reduction outcomes were observed in the majority of the patients who underwent bariatric surgeries<sup>(25)</sup>.

The majority of the studied patients were females, do not work and married. These factors might be the cause of hindering patient's readiness to lose weight. As females usually have more familial and psychological

stress than males and had decreased physical activity, since they do not work. These findings are supported by Livhits et al (2011) who stated that female gender is correlated with post bariatric surgery patients' poor weight loss outcomes. He claimed that there is a causal relationship between psychosocial stressors and delayed weight loss after bariatric surgeries especially for female bariatric patients. In addition, the importance of support groups postoperatively was stressed<sup>(31)</sup>.

In the current study, the main significant factors of delaying weight loss among post bariatric patients were preoperative BMI, onset of obesity, preoperative weight loss (table 3), associated medical disorders, postoperative duration (table 4) and postoperative compliance to dietary instructions (table 5). The present study revealed that high preoperative BMI had a significant negative relation to postoperative weight loss outcome. The majority of patients in the delayed weight reduction group had preoperative BMI more than 40 - < 45 Kg/m<sup>2</sup> and  $\geq 45$  Kg/m<sup>2</sup>. They had difficulty to lose weight and needed a longer time to achieve it because of the expected lower level of activity in heavier patients. This result was supported by Christopher et al (2014) who found that the higher the preoperative BMI, the more delayed weight reduction after surgery<sup>(24)</sup>.

The present study showed that the majority of delayed weight reduction group had a childhood onset of obesity. Being obese since childhood may lead to an early onset of the metabolic disorders, lack of healthy eating habits and exercise. This result was supported by Sillen and Andersson (2017), in a recent similar study conducted on 281 patients. Who claimed that childhood obesity could be associated with lifelong reduced physical activity, decreased self-esteem, depression, and social isolation, which may further cause failure to lose weight after surgery<sup>(17)</sup>.

Preoperative weight loss regimen as a preparation should be recommended at least two weeks preoperatively since it had a significant effect on postoperative weight loss outcomes. It can help in enhancing the patient's compliance to dietary and exercise regimen postoperatively. This puts on responsibility and readiness on patients, for the sake of improving surgery weight loss outcomes. In the same context, this study showed that all patients (100%) in the non-delayed weight reduction group successfully underwent a preoperative weight loss regimen, which had a significant difference between both of the study groups. This finding stands in line with Binda et al (2016) who had found in a similar study that the mean postoperative BMI was lower in patients who undergone preoperative weight loss regimen than in patients without this preparation<sup>(22)</sup>. However, this finding was not in agreement with a study conducted by Christopher et al (2014) who found that losing weight on a preoperative schedule showed no significant impact on postoperative outcomes<sup>(24)</sup>.

In relation to the clinical factors, there were a statistical significant association between associated medical diseases, postoperative duration and weight reduction outcomes postoperatively. The findings of the current study revealed that, the majority of delayed weight loss patients had present medical diseases. These findings come in line with Sillen and Andersson (2017) and Campos et al (2009), who had found that, the presence of medical disorders had adverse effects on postoperative weight loss outcomes<sup>(17, 30)</sup>. Furthermore, the majority of delayed weight loss subjects had one year or more postoperative duration. It has been noticed that the longer the postoperative duration, the poorer the adherence to postoperative instructions, the more is falling back to poor eating habits and even regaining weight. In this regard, Bastos (2013) who stated that, longer postoperative duration more than 2 years affected significantly the outcome of bariatric surgery. Unfortunately, 18 subjects out of his studied 64 patients who underwent bariatric surgery had failed in losing their weight and started a weight reduction regimen after one year postoperatively<sup>(23)</sup>.

As regards factors related to patient's compliance with postoperative instructions, the present study revealed that following dietary instruction had a positive significant association with weight reduction outcomes postoperatively. The majority of delayed weight reduction group of subjects had no compliance with postoperative dietary instructions. This result was inline with the fact and logical relationship between following a dietary regimen and weight reduction post bariatric surgery. This finding was in line with Binda et al (2016) who confirmed a significant effect of compliance to dietary instructions on weight reduction outcomes postoperatively<sup>(22)</sup>.

## **V. Conclusion:**

It can be concluded from the present study that, most of the patients who underwent bariatric surgery had delayed weight reduction. The main factors drawn from the study associated with delayed weight reduction among post bariatric patients were preoperative BMI, onset of obesity, preoperative weight loss, associated medical disorders, postoperative duration and postoperative compliance to dietary instructions.

## **Recommendations:**

Based on the findings of the present study the following recommendations are suggested:

1. The importance of educating patients undergoing bariatric surgery about the factors which may affect their goal to achieve successful postoperative weight loss is highly advocated.

2. Nurses' role regarding post bariatric patients in following postoperative dietary instructions, exercises and follow up schedules to ensure maximum positive results of surgery should be emphasized.
3. Further studies are needed to be conducted to confirm the current study results and elicit other factors affecting weight reduction outcomes post bariatric surgery.

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