

# Dietary Assessment and Patients Perspective Reasons for Diet and Exercise Adherence Post Bariatric Surgery

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## Research note

**Keywords:** Bariatric surgery, Dietary adherence, Physical activity, Adherence, Barriers

**Posted Date:** August 31st, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-59427/v1>

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**Version of Record:** A version of this preprint was published on November 11th, 2020. See the published version at <https://doi.org/10.1186/s13104-020-05373-y>.

# Abstract

**Objective:** Obesity prevalence is increasing and as an outcome; bariatric procedures are on the rise. Previous articles about bariatric surgery disclosed tremendous results. This study aims to estimate the rate and identify the reasons behind poor adherence to diet and exercise in post-bariatric patients.

**Results:** Majority (85.5%) of our patients scored “good”, 12% scored “fair”, and only 2% scored “excellent”. None scored “needs improvement”. Fruits had a mean of  $1.51 \pm 0.79$  and vegetables  $1.78 \pm 0.76$ . The main reasons for patient non-adherence to healthy eating were: low self-discipline (48%), lack of motivation (28%), availability of healthy food, and being too busy to prepare healthy meals; both (25%). (55.9%) of the study subjects engaged in physical activity. Lack of time (47%), low self-discipline (38%), and weather (32%) were the primary reasons for not exercising regularly.

## Introduction

A global epidemic has occurred; it has been yielded by poor dietary choices, high caloric diet, low physical activity, or systemic disease.<sup>[1]</sup> “Obesity” is defined as body mass index (BMI) of more or equal to  $30\text{kg}/\text{m}^2$ . It is a major health disease that carries a high risk of many chronic diseases such as diabetes mellitus, hypertension, and cardiovascular diseases.<sup>[2]</sup> In Saudi Arabia, the prevalence of obesity is increasing, and it is projected to reach 41% in men, and 78% in women by 2022.<sup>[3]</sup>

Bariatric surgery has shown a rising success in the treatment of obesity.<sup>[4]</sup> It has been the most effective solution to many who have found it ineffective to lose weight through exercise, diet, and other non-surgical means.<sup>[4]</sup> Roughly 15,000 bariatric surgeries are performed annually in Saudi Arabia.<sup>[5]</sup> Anti-obesity surgery promotes rapid, significant, and sustainable weight loss along with the remission of obesity-related comorbidities, and it reduces the overall mortality rate by 24.6%.<sup>[4,6]</sup>

Good compliance to diet and exercise after bariatric surgery is essential to upsurge weight loss, prevent weight gain, avoid malnutrition, and improve quality of life.<sup>[7]</sup> Sarwer et al. found that post bariatric patients with good dietary adherence were able to lose 28% of their body weight more than those who did not properly adhere.<sup>[8]</sup> Yet, a multi-center study of young adults who underwent bariatric surgery revealed that dietary adherence has declined over the years.<sup>[9]</sup> In one study conducted in sleeve gastrectomy patients the rate of poor adherence reached 74% by the end of the first year, mainly in low consumption of fruits, vegetables, legumes, and cereals.<sup>[10]</sup> Similarly, in another study of post gastric bypass surgery patients poor dietary choices increased crucially from 11% to 37% in the second-year.<sup>[11]</sup>

Bariatric surgery is the most effective treatment in morbidly obese patients, but it is not a panacea, and it should be incorporated with two large domains; “diet and exercise”.<sup>[12]</sup> As the incidence of obesity is increasing, we aim in this study to estimate the rate and identify the reasons behind poor adherence to diet and exercise in patients who underwent bariatric surgery.

# 1. Methods

After acquiring the ethical approval from the hospital administration and local IRB no. H-04-Q-001, all patients who underwent bariatric surgery from the beginning of 2017 to August 2020 at King Fahd Specialist Hospital (KFSH), Qassim, Saudi Arabia, were selected and a total of three hundred ninety-nine individuals gave their consent to participate. Patients were interviewed via telephone, scheduled for 10-15 minutes per interview. Inclusion criteria were: patients aged above 18 years old who had bariatric surgery in a period not less than six months.

First, demographic information including age, gender, occupation, marital status, living status, level of income, level of education, self-reported post-operative weight, number of obese members in the family, if they had any, and level of physical activity, were obtained. Other parameters, including the type of surgery, preoperative height, and weight, were retrieved from the patients' medical files.

The Healthy Eating Assessment, a "ten-question" questionnaire adapted from Paxton et al.<sup>[13]</sup>, measures the overall health benefit score by identifying eating patterns over the past few weeks. Each question is scored out of 5, and the total score was computed by summing the score of each question, the highest being 50 and the lowest being 10. A higher score implies that a healthier lifestyle is being practiced. It categorized patients into four groups: needs improvement (score 10-19), fair (score 20-29), good (score 30-39), and excellent (score 40-50). A patient who categorizes into either the "needs improvement" or "fair" groups needs to seek help to make better health choices. Lastly, we investigated the reasons why they are not following a healthy diet or exercising regularly.

## Statistical analysis

Data collected were analyzed using SPSS version 19.0. Quantitative variables presented as mean  $\pm$  SD and qualitative variables as frequency and percentages. The Student's t-test and ANOVA were used to compare normally distributed continuous variables, Chi-square test ( $\chi^2$ ) used to test the association between the categorical variables. A p-value of less than 0.05 denoted a statistically significant value.

# 2. Results

A total of 399 patients, with an average age of  $35.21 \pm 10.45$ , underwent bariatric surgery with a recovery period of at least six months. 390 (98%) had sleeve gastrectomy, and 9 (2%) had a mini-gastric bypass. Mean preoperative BMI was  $46.66 \pm 12.74$  kg/m<sup>2</sup>, and the post-operative BMI was  $30.91 \pm 6.54$  kg/m<sup>2</sup>. Gender distribution was as follows, 178 (44.6%) were male, and 221 (55.4%) were female. 68% had at least one obese member in the family with a mean of  $2.42 \pm 1.64$ . The majority were educated, while only 12 (3%) were not. More than half of the study subjects engaged in physical activity. The majority, 341 (85.5%), of the study sample scored "good", 50 (12%) scored "fair", and only 8 (2%) scored "excellent". None of the samples investigated scored "needs improvement". Subscales of healthy eating assessment; the overall mean of healthy foods in eating habits was  $3.38 \pm 1.00$ . The mean value of fast/fried food and packed snacks high in fat/salt/or sugar was  $4.83 \pm 0.5$ , sweetened beverages  $4.28 \pm 1.02$ , chips or

crackers  $4.63 \pm 0.69$ , desserts  $4.59 \pm 0.66$ , and added fats to food  $3.97 \pm 0.85$ . Furthermore, healthy food choices as fruits had a mean of  $1.51 \pm 0.79$ , vegetables  $1.78 \pm 0.76$ , dairy products  $1.66 \pm 0.80$ , and finally meat/fish/beans with a mean value of  $2.8 \pm 1.57$ . Participants characteristics and health dietary assessment are presented in Table 1

Table 1  
Participant Characteristics and health dietary assessment (n = 399)

Variables	Mean ± SD / n (%)
Mean age (years) ± SD	35.21 ± 10.45
Gender n (%)	178 (44.6%)
Male	221 (55.4%)
Female	
Occupation n (%)	192 (48.1%)
Employed	33 (8.3%)
Student	83 (20.8%)
Housewife	9 (2.3%)
Retired	82 (20.6%)
Unemployed	
Marital status n (%)	145 (36.3%)
Single	254 (63.7%)
Married	
Living status n (%)	33 (8.3%)
Living alone	366 (91.7%)
Living with family/other	
Income n (%)	35 (8.8%)
Low	286 (71.7%)
Medium	78 (19.5%)
High	
Education level n (%)	12 (3.0%)
Non educated	71 (17.8%)
Less than high school	316 (79.2%)
High school and higher education	

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<b>Variables</b>	<b>Mean ± SD / n (%)</b>
Mean BMI (kg/m <sup>2</sup> ) ± SD	46.66 ± 12.74
Preoperative	30.91 ± 6.54
Current BMI	
Obese member in the family n (%)	272 (68.2%)
Yes	127 (31.8%)
No	
Mean number of obese members in the family	2.42 ± 1.64
Type of surgery n (%)	390 (97.7%)
Sleeve gastrectomy	9 (2.3%)
Mini gastric bypass	
Health dietary assessment total score n (%)	8 (2%)
Excellent	341 (85.5%)
Good	50 (12.5%)
Fair	0 (0%)
Needs Improvement	
Subscales of healthy eating assessment	3.38 ± 1.005
Overall mean of healthy foods in eating habits	4.83 ± 0.490
Fast/fried food or packaged snacks high in fat/salt/ or sugar	1.51 ± 0.786
Fruits	1.78 ± 0.759
Vegetables	4.28 ± 1.025
Sweetened beverages	4.63 ± 0.689
Chips or crackers	4.59 ± 0.663
Sweet food or desserts	3.97 ± 0.850
Amount of added fat to food	1.66 ± 0.801
Dairy products	2.80 ± 1.572
Meat/fish/beans	

Variables	Mean ± SD / n (%)
Obtain ≥ 30 minutes per day in physical activity n (%)	223 (55.9%)
Yes	176 (44.1%)
No	

Table 1 Participant characteristics and health dietary assessment (n = 399)

Regarding the variables that were associated with the health benefit score, only three had a significant association; gender, occupation, and marital status with p-values of 0.027, 0.027, and 0.006, respectively. The mean age of patients was not statistically significant between health benefit score categories ( $33.10 \pm 11.85$  vs.  $35.36 \pm 10.27$  vs.  $40.38 \pm 8.80$ , p-value = 0.172). [See additional file 1]

The main reasons for patient non-adherence to healthy eating were: low self-discipline (48%), lack of motivation (28%), availability of healthy food, and being too busy to prepare healthy meals; both had the same percentage (25%) (Fig. 1). On the other hand, lack of time, low self-discipline, and weather were the primary reasons for not exercising regularly, (47%), (38%), and (32%), respectively (Fig. 2).

### 3. Discussion

By means of structured interviews via the phone, we ran a retrospective study on 399 bariatric patients to assess their dietary eating habits and reasons for poor compliance. Majority of the patients 98% had sleeve gastrectomy and only 2% received mini gastric bypass. The mean age was  $35.21 \pm 10.45$ , in which 178 (44.6%) were male, and 221 (55.4%) were female. Bariatric surgery is already known to be very effective. The “forced behavioral changes” in the first few months post-surgery leads to a rapid weight loss. But what about the long run? Gastric and intestinal adaptation are expected to occur two years following the surgery.<sup>[14]</sup> Freire et al. revealed some weight gain in the second year, second to the fifth year, and over five years to be 14.7%, 69.7%, and 84.8%, respectively.<sup>[15]</sup> It might be influenced by the reduction in the frequency of dumping symptoms, resolution of food intolerances, and return to preoperative eating and other lifestyle patterns that initially contributed to weight gain.<sup>[16]</sup>

In the present study, the final score of healthy eating assessment was relatively acceptable, as the majority 341 (85.5%) scored “good”, 50 (12%) scored “fair”, and none had scored “needs improvement”. General nutritional guidelines post-surgery prioritize protein intake, minimizing high carbohydrate and high fat foods, eliminating caloric beverages, and increasing the consumption of fruits and vegetables.<sup>[17]</sup> Fruits and vegetables provide the body with a wide range of nutrients.<sup>[18]</sup> In our study, the average intake of fruits and vegetables were “once daily”  $1.51 \pm 0.79$ , and  $1.78 \pm 0.76$ , respectively. These averages are lower than the recommended. Low consumption of fruits and vegetables has been reported in other

extended follow up studies.<sup>[18, 19]</sup> Inadequate nutritive intakes may lead to haematological, metabolic, and neurological disorders.<sup>[20-22]</sup>

A high percentage of patients in our study had an obese family member 272 (68.2%) with an average of  $2.42 \pm 1.64$  per family. Frequency of drinking sweetened beverages is "once daily"  $4.28 \pm 1.02$ . However, we did not measure the quantity of food/drink assumed thus, once daily can either be in high quantity affecting patients' weight loss or in minimum to satisfy the appetite. Out of this large sample size eight patients scored "excellent" which represents 2% only. A comprehensive nutritional education should be delivered for all, both obese and non-obese, supporting those who need to make healthier dietary choices and to improve body health reaching maximum bariatric treatment's efficacy.

"What keeps you away from eating healthier?" Well, 48.4% reported poor self-discipline as their main barrier. Loss of control over eating is a proxy for binge eating, as post-bariatric patients cannot consume large quantities of food in one sitting.<sup>[17]</sup> Saunders observed that many patients report feelings of loss of control over eating after bariatric surgery and, in some cases, weight gain after several years.<sup>[23]</sup> Changing the mindset over binge eating is quite tough and challenging. It necessitates big support from a dietitian, a psychologist, and a family member. Nevertheless, patient's motivation and willingness to lose weight are important for the surgery to be effective.<sup>[24, 25]</sup> Diet adherence showed to be successful when patients are highly motivated.<sup>[26]</sup> Unfortunately, around thirty percent of our patients report a lack of motivation. More interestingly, a minority of patients, all were female, stated that they stopped being strict over their lifestyle not to lose more weight for their own perspective of body image, and preventing having excess skin.

An increase in physical activity after bariatric surgery is beneficial and effective for weight loss, maintaining lost weight, and improving body composition.<sup>[27, 28]</sup> It is highly recommended to start physical activity before and after the surgery to preserve lean body mass, boost cardiometabolic risk factors, and increase cardiovascular capacity as well as aerobic performance.<sup>[29, 30]</sup> It is advised to exercise at least 150 minutes per week.<sup>[31]</sup> Patients who exercise can lose on average 3.6 kg higher than the 1.5 kg of parallel meta-analysis study of non-surgical weight loss.<sup>[27, 32]</sup> In our study, only 55.9% obtained  $\geq 30$  minutes per day of physical activity, which is similar to what has been reported in other studies.<sup>[9, 15, 18]</sup> On the other hand, 47% of patients stated lack of time as their primary reason for not exercising regularly, followed by low self-discipline and weather, which counted for 38%, and 32%, respectively. In another study, the most commonly endorsed external barriers were time and weather.<sup>[33]</sup>

To conclude, 399 patients were assessed post bariatric surgery for dietary habits and reason of poor compliance. Majority scored "good" on the healthy eating assessment and while none had scored "needs improvement", only 2% scored "excellent". Poor dietary habits were found to be associated with fruits and vegetables. The main reasons for patient non-adherence were most commonly: low self-discipline, followed by a lack of motivation. When it comes to physical activity, a little more than half of the patients obtained  $\geq 30$  minutes per day of physical activity. Lack of time, low self-discipline, and weather were the

primary reasons for not exercising regularly. As the surgical population is growing, a global drive should be taken to reduce the prevalence of obesity worldwide. We call for more randomized control trials headed to correct addressed reasons for poor adherence. We recommend the use of new technology to support and motivate patients through video appointments, group therapy, and smartphone applications. Hand in hand, toward outstanding results, future with fewer diseases, more self-satisfaction, and better quality of life.

## **Limitations**

A limitation is a single-center and patient-report based study. Patients may have reported adherence in a socially desirable manner, and it may also involve recall bias. Yet, the large number of patients being interviewed and the patient-perspective reasons for difficulty adhering gives valuable information improving the long-term results of bariatric surgery.

## **Declarations**

## **Ethics approval and consent to participate:**

This study received ethical approval from Qassim Regional Research Ethics Committee, SA, ref. no.: 1441-895024. Approval was obtained from the hospital administration to access bariatric clinics' database at KFSH and verbal and written consent was taken. All potentially identifying data were anonymised.

### **Consent for publication:**

Not applicable.

### **Availability of data and materials:**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### **Competing interests:**

The authors declare that they have no competing interests.

## **Funding:**

Not applicable.

## **Authors' contributions:**

BSA guided, advised, and supervised the research group. BSA, NAA, FAA, MAA, AAA, MAA contributed to the conception of the study and formulated the proposal. NAA, FAA, MAA, AAA, MAA were responsible for data acquisition and entry. AMW was responsible for analysing the data. All authors contributed towards writing, reading, and approving the final manuscript.

## Acknowledgements:

We would like to extend our gratitude to all the participants for their patience, high spirit, and cooperation.

## Abbreviations

BMI: Body mass index; KFSH: King Fahd Specialist Hospital.

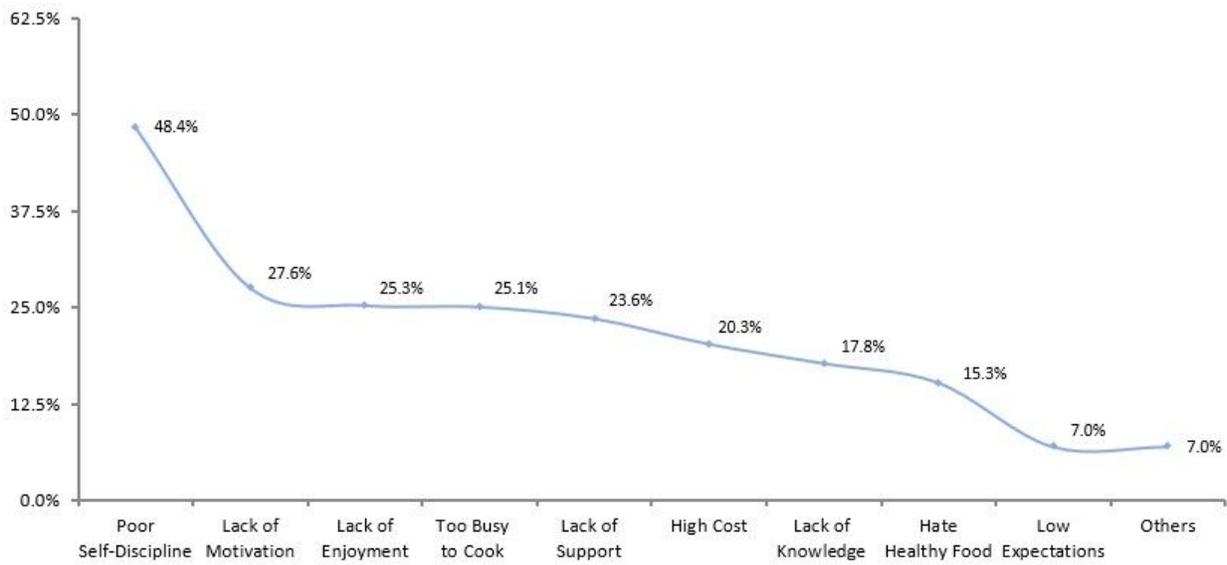
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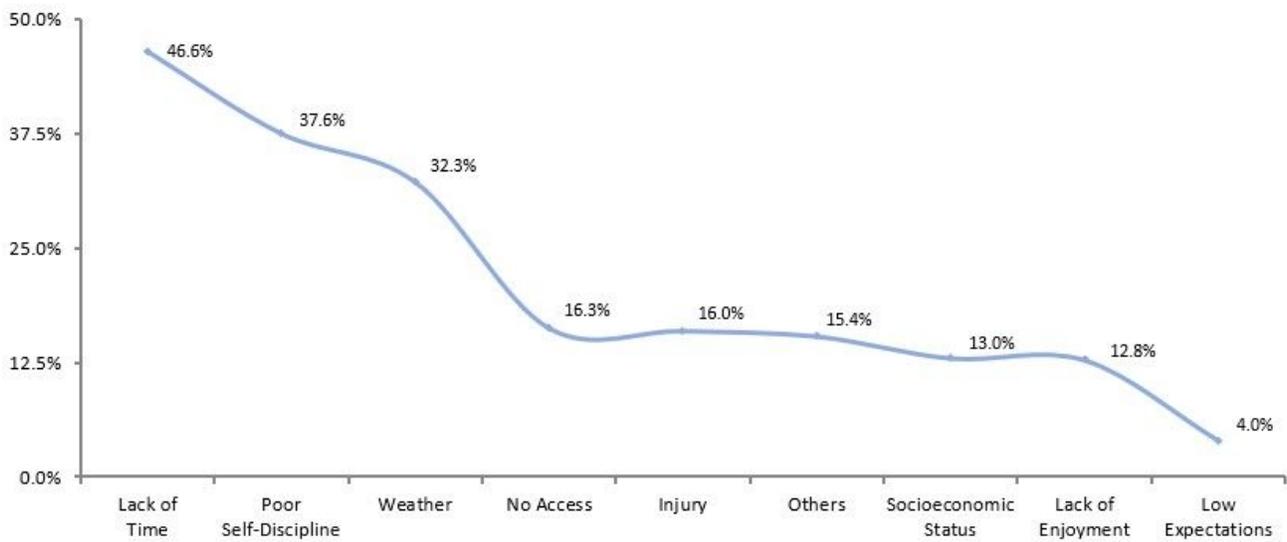
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## Figures



**Figure 1**

Reasons for not following a healthy diet



**Figure 2**

Reasons for not exercising regularly

## Supplementary Files

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