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Comparative Study on Nutritional Intake and Nutritional Status of Elective Pre- and Post-operative Bariatric Surgery Patients

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Abstract

Obesity is a global epidemic affecting populations worldwide. Bariatric surgery is effective in treating morbid obesity in individuals who fail to lose weight even after modifying lifestyle, dietary habits, and pharmacotherapy. To provide better health care management pre- and post-bariatric surgery, it is imperative to establish the nutritional status of patients before surgery. The aim of this study was to assess and compare pre- and post-surgery nutritional status of bariatric candidates. Obesity is the basis for cluster of non-communicable diseases creating an enormous socioeconomic and public health burden. For this, laparoscopic bariatric procedures; sleeve gastrectomy, Roux-en Y Gastric Bypass, and Mini Gastric Bypass were done for treating obesity and other related co-morbidities. The medical records of 50 subjects were reviewed for this study. Mean age and body mass index are 42.2 ± 12.9 (kg/m^2) and 42.77 ± 7.9 (kg/m^2), respectively. The pre-surgery mean intake of energy, carbohydrate, protein, and fat was 3048 ± 485.4 (kcal/d), 200.4 ± 40.1 (g/d), 101.6 ± 17.02 (g/d), and 156.09 ± 108.4 (g/d), respectively, which were above Recommended Dietary Allowances. The mean intake of energy, carbohydrate, protein, and fat was significantly decreased post operatively ($P > 0.001$) to 1400 ± 99 (kcal/d), 132.1 ± 22.3 (g/d), 69.9 ± 3.6 (g/d), and 30.9 ± 6.4 (g/d), respectively. Low intake of fiber, Vitamin A (74%), and Vitamin C (32%) was observed during pre-operative condition. The findings in this study advocates nutritional intervention and tailored supplementation pre- and post-bariatric surgery for promising results.

Keywords: Bariatric surgery, Body mass index, Mini gastric bypass, Roux-en Y gastric bypass, Sleeve gastrectomy

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Introduction

The prevalence of obesity in India is increasing continuously and recent data show that between 13% and 50% of the urban population and 8–38.2% of the rural population suffers from obesity. Obesity is more commonly seen in women compared to men and is increasing in children and adolescents.[1] It was reported that more than 135 million Indians suffer from obesity.[2] the prevalence rates of obesity and central obesity reportedly vary from 11.8 to 31.3% and 16.9 to 36.3%, respectively, as per the Indian Council of Medical Research-INDIA B study conducted in 2015.[3] The main contributing factors are sedentary lifestyle, consumption of junk foods. The increase in obesity has led to increase in associated comorbidities such as type 2 diabetes mellitus, hypertension, dyslipidemia, coronary heart disease, non-alcoholic fatty liver disease, obstructive sleep apnea, arthritis, and certain cancers. Hence, it is important to diagnose and initiate early treatment to halt the progressive increase in body weight and development of comorbidities.[4] Obesity is now recognized as a disease and bariatric and metabolic surgery has emerged as a valid treatment for morbid obesity.[5] The 1991 National Institutes of Health guidelines recommended consideration of bariatric surgery in patients with a body mass of >40 or >35 with serious obesity-related comorbidities. Bariatric surgery is performed on the stomach and/or intestines with the intent of resolution of metabolic syndrome such as obesity, type 2 diabetes mellitus (DM), hypertension, and dyslipidemia. In 1999, Dr. Shrihari Dhorepatil performed the first bariatric surgery in India in the form of an open vertical banded gastroplasty (VBG).[6] Bariatric surgery can be classified into three main categories: Restrictive, malabsorptive, and the combination of the two. Restrictive surgery intends to reduce the volume of food intake and to cause an early satiety; malabsorptive surgery, instead, shortens the digestive tract, and reduces calorie and nutrient absorption.[7,8] Laparoscopic-adjustable gastric banding and VBG are examples of restrictive surgery, whereas biliopancreatic diversion and duodenal switch are primarily malabsorptive and Roux-en-Y gastric bypass (RYGB) represents a combination of restrictive and malabsorptive surgery.[9] Bariatric surgery is an effective treatment option for severely obese patients for whom weight loss has been problematic with conventional pharmacotherapy and/or lifestyle intervention-based treatment. Effective weight loss can be achieved in morbidly obese patients after undergoing bariatric surgery by adhering to diet. There will be complete resolution or improvement of comorbidities in patients with diabetes, hyperlipidemia, hypertension, and obstructive sleep apnea.

The aim of this study is to assess the nutrient intake and nutritional status of patient's pre- and post-bariatric surgery patients.

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Methodology

The study was conducted in a multi-specialty hospital. A total of 50 subjects who have undergone bariatric surgery were selected. All patients who were willing to participate in the study were included by taking a written consent. Data were collected from the subjects 1 year after surgery using a pretested questionnaire, comprising general information, dietary habits, nutrient intake, food frequency, and related information. Anthropometric measurements, namely, height (cm) and weight (kg) were recorded and body mass index (BMI) was computed using the formula to classify the grades of obesity. With the help of 3-day dietary recall method, dietary information was collected from subjects. Macro- and micro-nutrients including energy, carbohydrate, protein, fat, fiber, Vitamin A, Vitamin C, calcium, and iron were computed from the dietary intake information. Frequency of consumption of foods was assessed with food frequency questionnaire. All the clinical parameters such as complete blood picture, lipid profile, serum electrolytes, liver function tests, and other reports were taken from the case sheets of the patients.

Statistical analysis

The data were analyzed by standard statistical procedures. Descriptive statistics, namely, mean ± Standard Deviation, coefficient of variation was done using MS Excel. Difference between mean values of pre- and post-surgery was analyzed using paired *t*-test.

Results

The demographic characteristics and anthropometric data of patients are shown in Table 1. The study included a total of 50 patients in which 44% were male and 56% were females. Mean age was 42.2 ± 12.9. In a similar study conducted by Lee *et al*. mean age was 40.6 ± 10.3 years.[10] Pre-operative weight and BMI were 115.8.2 ± 20.5 and 42.77 ± 7.9, respectively, in the present investigation. Post-operative mean weight and BMI were 91.5 ± 10.4 and 32.44 ± 2.6, respectively. Mean BMI and mean body weight in a study done by Raj *et al*. were 43.25 ± 7.4 kg/m^2 and 113.85 ± 22.45 kg, respectively.[11] Higher BMI is associated with greater risk of malnutrition. Proper perioperative care may diminish the impact of malnutrition on adverse effects and length of stay.[12] Three types of surgical procedures have been done, namely, sleeve gastrectomy 40%; RYGB 12%; and mini gastric bypass surgery 48%. In a study conducted by Buchwald *et al*., the most commonly performed procedures were RYGB 46.6%; sleeve gastrectomy 27.8%; and adjustable gastric banding 17.8%.[13]

Comorbidities include arthritis (88%), asthma (16%), DM (24%), high triglycerides (TGs) (28%), elevated cholesterol (40%), hypertension (48%), gastric reflux (56%), shortness of breath (92%), and sleep apnea (92%). The percentage of subjects suffering from comorbidities pre- and post-surgery is compiled in Table 2. Postsurgically most of the patients have completely resolved their comorbidities such as shortness of breath and asthma. Hypertension and diabetes were found to be completely resolved in 92% and 73% of patients, respectively. Post-surgery comorbidity status is depicted in Figure 1.

Table 3 shows biochemical parameters of both the genders. High TG (160.5 ± 57.06) were seen in female subjects, high low-density lipoprotein (LDL) (133.6 ± 31.2) in male subjects, low serum Vitamin B12, and high fasting plasma glucose in both the genders.

The pre-surgery mean intake of energy, carbohydrate, protein, and fat was 3048 ± 485.4 (kcal/d), 200.4 ± 40.1 (g/d), 101.6 ± 17.02 (g/d), and 156.09 ± 108.4 (g/d), respectively, which were above recommended dietary allowances (RDA). The intake of energy, carbohydrate, protein, and fat was significantly decreased postoperatively ($P > 0.001$) to 1400 ± 99 (kcal/d), 132.1 ± 22.3 (g/d), 69.9 ± 3.6 (g/d), and 30.9 ± 6.4 (g/d), respectively. Table 4 exhibits comparative nutrient intakes pre- and post-surgery Another study reported that pre-surgery, mean energy, protein, fat, and carbohydrate intake were 2710.7 ± 1275.7 (kcal/d), 114.2 ± 48.5 (g/d), 110.6 ± 54.5 (g/d), and 321.6 ± 176.1 (g/d), respectively.[14] Mean intake of fiber was low before surgery but increased after surgery from 25.68 ± 3.06 to 43.6 ± 4.5. Intakes of calcium, Vitamin A and Vitamin C were below RDA and improved from 678.2 ± 95.5,

Table 1: Characteristics and anthropometric data of study sample

Parameters	*Pre-surgery baseline*	*Post-surgery*
Gender (Female)	56%	-
Age (years)	42.2±12.9	-
Height (m)	164.8±8.4	-
Weight (kg)	115.8±20.5	91.5±10.4
BMI (kg/m2)	42.77±7.9	32.44±2.6
Excess weight loss (%)		
10–20	-	60
21–30	-	18
31–50	-	22

BMI: Body mass index

Table 2: Comparison of comorbidity status

Comorbidities	*Pre-surgery*	*Post-surgery*
Arthritis (%)	88	14
Asthma (%)	16	-
High cholesterol (%)	40	9
Depression (%)	56	12
Diabetes mellitus (%)	24	6
High triglycerides (%)	28	15
Hypertension (%)	48	3
Reflux (%)	56	20
Shortness of breath (%)	92	-
Sleep apnea (%)	92	3

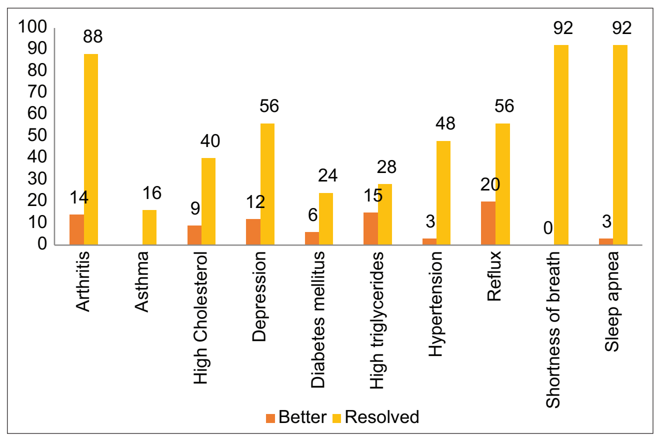

Figure 1: Post-surgery comorbidity status of bariatric surgery patients

Table 3: Comparisons between male and female candidates for clinical parameters

Biochemical parameter (reference value)	*Mean±SD*	*Coefficient of variance (%)*	*Mean±SD*	*Coefficient of variance (%)*
	Male		*Female*	
Hemoglobin (M: 13–17 g%; F: 12–15 g%)	14.5±0.6	4.34	11.5±1.21	10.95
PCV (83–101 fl)	43.6±2.2	5.22	37.17±9.3	25.02
RBC (3.8–4.8 mil/µl)	5.21±0.2	5.56	5.13±0.4	18.7
MCV (83–101 fl)	83.3±1.8	2.16	83.9±2.3	7.7
MCH (27–32 pg)	32.4±1.2	39.1	26.7±1.2	4.5
WBC (4500–11000cells/µl)	9593.6±1728	18	9509±1138	11.9
Platelet (1.5–4.4 lakhs/µl)	3.51±0.5	15	3.64±0.6	18.4
SGPT (<45 IU/lit)	28.3±13.1	46.2	29.4±10.9	37.2
SGOT (<35 IU/lit)	34.9±16.5	47.2	33.5±14.9	44.3
ALP (40–129 IU/lit)	92.1±23.9	26	106.7±30.2	28.3
TB (0.3–1.2 mg/dl)	0.7±0.2	28.5	0.835±0.3	37.9
DB (<0.2 mg/dl)	0.12±0.04	36.6	0.164±0.08	48.7
IB (upto 1.0 mg/dl)	0.6±0.18	30	0.671±0.2	37.2
Total protein (6.5–8.5gm/dl)	7.35±0.6	8.84	7.314±0.8	10.9
Albumin (3.5–5.2 gm/dl)	4.13±0.5	14.2	4.2±0.4	11.6
Globulin (2.5–3.5 gm/dl)	3.25±0.32	9.8	3.2±0.4	12.7
A/G	1.27±0.21	16.53	1.29±0.2	20.1
Cholesterol (<200 mg/dl)	198.9±43.9	22.1	192.5±26.8	13.9
Triglycerides (up to 150 mg/dl)	130.9±61.9	47.3	160.5±57.06	35.5
HDL (40 mg/dl)	30.18±5.3	17.5	30.5±3.8	12.5
LDL (up to 130 mg/dl)	133.6±31.2	23.35	124.6±33.3	26.7
VLDL (up to 30 mg/dl)	39.97±17.7	44.28	35.8±17.1	47.7
C/HDL (up to 4)	6.638±1.2	19.3	6.41±1.3	21.2
Creatinine (0.66–1.09mg/dl)	0.8±0.04	5	0.65±0.18	27.6
B12 (180–914 ng/ml)	170.09±75	44	164.5±32.9	20
Folate (>3 ng/ml)	9.35±1.83	19.5	7.565±2.1	28.9
Serum ferritin (13–120 ng/dl	85.9±37	43.07	103.7±34.5	33.2
FPG (72–110 mg/dl)	118.45±28	23.6	157.1±53.9	34.3
TSH (0.34–5.60 µIU/ml)	4.18±1.1	26.5	2.57±0.88	34.2
Cortisol (µg/dl)	6.55±3.4	52.6	8.18±3.1	37.8
Sodium (137–145 mMol/L)	137±2.06	1.5	135.6±2.9	1.7
Potassium (3.5–5.1mMol/L)	4.3±0.3	7.07	4.5±0.56	12.4
Calcium (8.6–10.6 mg/dl)	9.46±0.5	6.23	9.7±0.40	4.1

SGOT: Serum glutamic-oxaloacetic transaminase, SGPT: Serum glutamic pyruvic transaminase, ALP: Alkaline phosphatase, TB: Total bilirubin, IB: Indirect bilirubin, DB: Direct bilirubin, LDL: Low-density lipoprotein, HDL: High-density lipoprotein, VLDL: Very low-density lipoprotein, FPG: Fasting plasma glucose, TSH: Thyroid-stimulating hormone

Table 4: Comparisons of nutrient intakes pre- and post-surgery

Nutrient	*RDA range*	*Before*		*After*		*t-value*
		Mean±SD	*Coefficient of variance (%)*	*Mean±SD*	*Coefficient of variance (%)*	
Energy/day (k.cal)	1660–2110	3048±485	15.9	1400±99	7.07	16.6[a]
Carbohydrate/day (g)	130	200.4±40.1	20	132.1±22.3	16.9	2.3[b]
Protein/day (g)	45.7–54	101.6±17.02	16.7	69.9±3.6	19.5	9.1[a]
Fat/day (g)	20–25	156.09±108.4	69.6	30.9±6.4	19	5.7[a]
Fibre/day (g)	40	25.68±3.06	12.2	43.6±4.5	10.4	1.4[b]
Calcium/day (mg)	800	678.2±95.5	16.7	825.28±51.9	6.28	1.7[b]
Iron/day (mg)	11–15	28±4.3	15.4	31.3±1.8	5.7	1.2[b]
Vitamin-A/day (µg)	390–460	251.5±32.9	13.08	383.5±40.09	10.4	1.7[b]
Vitamin-C/day (mg)	55–65	46.9±8.1	17.3	61.6±8.4	13.7	1.2[b]

[a]Significant at $P>0.001$, [b]significant at $P>0.005$

251.5 ± 32.9 and 46.9 ± 8.1 to 825.28 ± 51.9, 31.3 ± 1.8 and 13.7, respectively. In another study, intakes for iron, calcium, folic acid, Vitamin B12, and Vitamin B1 were below the Dietary Reference Intake recommendations for 46, 48, 58, 14, and 34% of the study population, respectively.[14] Figure 2 depicts food frequency intakes of the patients.

Discussion

The present study investigated the anthropometric changes, comorbidities and dietary intake of macro- and micro-nutrients in pre- and post-bariatric surgery conditions and assessed the changes between two intervals. Whereas, the clinical status was assessed only before surgery. Etiology of obesity, complications, biochemical parameters were documented from the case files of the patients. Anthropometric measurements such as height, weight, and BMI were noted. Dietary intakes were assessed using food frequency and 24 h recall methods. All the patients in this study are leading a sedentary lifestyle. Obesity is a metabolic disorder mainly caused by over eating, lack of physical activity, psychological stress, and improper dietary habits such as eating more junk foods, fast foods, fatty foods, and consuming carbonated drinks. Engaging regular physical activity is strongly associated with better health outcomes and has been shown

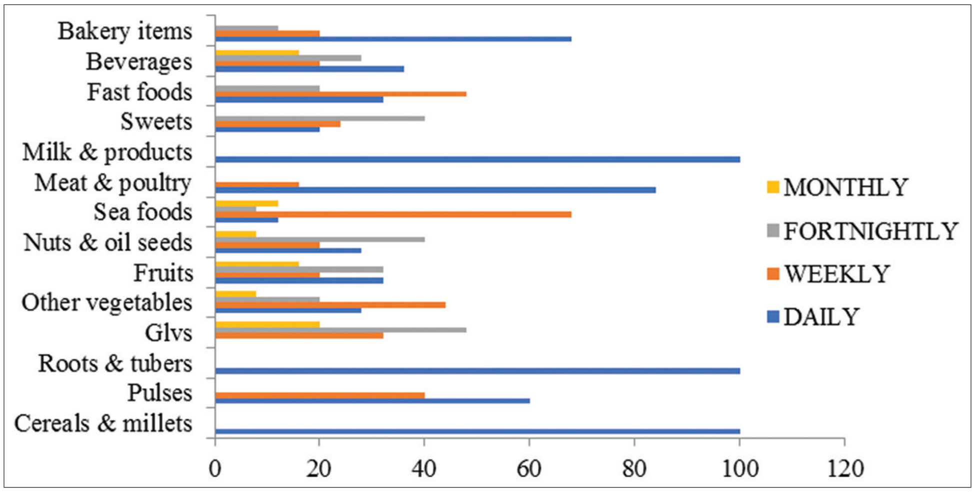

Figure 2: Food frequency of subjects before surgery

to reduce the negative effects associated with overweight and obesity.[14]

The BMI of all the patients is between 35 and 75 kg/m^2. Patients with greater BMI are at higher risk of malnutrition and they require more attention from the medical staff.[15] The findings showed that weight and BMI reduced to a significant level after surgery. The quantum of weight loss after bariatric surgery varies with type of surgery and patient compliance. At least 50% excess weight loss qualifies for success of a surgery.[16] In a study done by Buchwald *et al*., the average weight loss after gastric band (48%) and after biliopancreatic diversion (97%) reflect two ends of the success spectrum of the bariatric surgery. In this study, 22% of subjects have lost 50% of excess weight after surgery.[8]

The mean of blood parameters is normal compared to the standard value. The lipid profile of some patients is more than the standard level especially cholesterol, LDL, and TGs. Fasting plasma glucose levels are more than the standard value. All the other parameters were observed to be fluctuating from the standard value. Majority of patients were found to have shortness of breath and sleep apnea. Most of them were having depression, reflux disease, joint pains, and arthritis. The remission of comorbidities also showed an encouraging response.

The percentage remission of diabetes post-surgery was 75% in RYGB patients as the surgery alters the gut hormone glucagon like peptide-1 (GLP-1) which can increase insulin production. However, many studies have shown higher diabetes remission rates in the laparoscopic gastric bypass group compared to the laparoscopic sleeve gastrectomy group.[17,18] Improvement in hyperglycemia was observed almost immediately after RYGB, in part due to increased release of GLP-1 and possibly other incretins.[19] In a meta-analysis of randomized controlled trials done by Jian-Fang Li also showed similar results.[20]

Vest *et al.* in their study concluded that bariatric surgery is beneficial in reducing risk factors for cardiovascular disease.[21] The improvement in dyslipidemia appears to be related not only to the percentage of excess weight loss but also to the decrease in insulin resistance.[22] In the present investigation, only few patients were found to have high cholesterol and triglycerides even after the surgery. In a study done by Williams *et al*. concluded that triglyceride and LDL-cholesterol decrease and high-density lipoprotein-cholesterol increases after LAGB, RYGB, and BPD surgery.[23]

In the present study, 20% of subjects were found to have gastroesophageal reflex disease (GERD) post-surgery. GERD is the major cause of impaired quality of life after bariatric surgery and may be associated with a decrease in physical functioning as well as an increase in mental and emotional problems, resulting in poorer social functioning.[24,25] Several anatomical structures of the gastroesophageal junction comprise the antireflux barrier. The most important are the lower esophageal sphincter and the sling fibers at the cardia, along with the diaphragmatic crura. Alterations in the anatomy of either of these are thought to be associated with the occurrence of reflux symptom.[26]

Assessment of dietary habits revealed that majority of subjects were cereals and pulses on regular basis. On the contrary, consumption of fruits and vegetables was very low. In congruence with the prevalence of morbid obesity condition, daily basis of red meats and poultry was found to be alarmingly high. Consumption of non-vegetarian food was in line with consumption of junk food, bakery items, and sweets.

It is interesting to note that majority of changes in dietary habits were observed in post-surgical condition. Healthier eating habits observed were higher consumption of fruits, vegetables, fish, skimmed milk products coalesced with the lower intake of baked foods, junk foods, sweets, and soft drinks. The results of the present study are in line with study by Ullrich *et al*. and were rise in healthy food consumption (poultry, fish, and vegetables) and a drop in unhealthy foods (chocolate and soft drinks) in 44 patients undergoing gastric bypass.[27]

As most bariatric procedures include the reduction of the volume of the stomach and/or the creation of a small gastric pouch which bring about post-operative gastric edema, the ingestion of solid foods in the 1st days after surgery is very difficult or impossible. Therefore, to avoid or minimize regurgitation and vomiting, most post-operative nutritional protocols suggest a liquid or very soft diet in the 1st days after surgery and a very gradual increase in food consistency in the 1st post-operative weeks.[28] In a study it was reported that very low calorie ketogenic diets are effective for weight loss and safe in non-surgical contexts.[29]

With respect to the macronutrient intake, energy, protein, and the intakes were very high before surgery. However, in post-surgery patients after 1 year of follow-up all the nutrient intakes were comparable to recommended intakes. There was significant decrease in energy intake post-surgery from 3048 ± 485 to 1400 ± 99 k.cal/day. Preceding studies observed that energy intake 1 year after bariatric surgery was around 1000-1300 kcal/day.[30] Current guidelines recommend a minimal target for protein intake after bariatric surgery of 60 g/day and up to 1.5 g/kg ideal body weight/day.[31] The high inadequacy of dietary Vitamin C intake 46.9 ± 8.1 mg/day was in accordance with the findings of the previous studies.[32] and might be caused by the low quality of the diet with low fruit and vegetable intake of the individuals. Intake of dietary fiber improved from 25.68 ± 3.06 (g/d) to 43.6 ± 4.5 (g/d) which is mainly due to consumption of fruits and vegetables.

The anatomic changes obtruded by malabsorptive surgery increase the risk for various vitamin and mineral deficiencies, which can occur commonly within the 1st year after surgery. Micronutrient deficiencies in patients with severe obesity could be attributed to a poor-quality, non-varied, high-calorie and high-fat diet. For example, excessive simple sugar, milk products or fats could lead to a deficit of Vitamin B1.[33] Micronutrient deficiency can be defined as plasma level below the reference range recommended.

Recent studies have revealed that despite of supplementation, deficiency of Vitamin B12, calcium, folate, fat soluble vitamins, thiamin, and Vitamin D is common after bariatric surgery.[30,34] Since nutritional deficiencies are common among obese individuals, nutritional assessment, and optimization before bariatric surgery is crucial to avoid further deterioration post-surgery. Vitamin B12 deficiency can be diagnosed if the laboratory cut-off is <350 pg/ml.[35] Vitamin B12 deficiencies can occur after bariatric surgery procedures that bypass the lower stomach. Impairment of vitamin B12 absorption after RYGB results from decreased digestion of the protein-bound cobalamins and impaired formation of intrinsic factor-Vitamin B12 complexes required for absorption.[36] In this study, certain symptoms such as lack of concentration, weakness, and fatigue reflected micronutrient deficiency but only in few subjects. According to a study, nearly two-thirds of the patients developed Vitamin B12 deficiency 1 year after surgery.[37]

Proteins, Vitamin A, Vitamin C, arginine, zinc, and selenium play an important role in wound healing, and their deficiency is linked to reduced collagen synthesis, capillary weakness, lower plasma levels of glutathione, and a higher risk of infections due to impaired phagocytosis and complement activity.[7] In this study, nutritional deficiencies were found to exist in patients prior to bariatric surgery. Intakes of Vitamin C and Vitamin A were low, suggesting more consideration towards intake of these micronutrients.

Late dumping is generally seen after surgery which is due to reactive hypoglycemia and can often be managed with nutritional manipulation or be treated prophylactically by having the patient eat a small snack.[38] However, in the present study, none of them have reported dumping syndrome post-surgery.

Vitamin and mineral deficiencies occur within the 1st year after weight loss surgery, and it is of paramount importance to analyze the patient's nutritional status before any post-bariatric contouring procedures.[7] The nutritional management of bariatric surgery patients is complex and should be carried out for the long-term. Heber *et al*. recommends patients who have undergone malabsorptive obesity surgical procedures should have Vitamin D, calcium, phosphorus, PTH, and alkaline phosphatase levels followed every 6 months and have a dual-energy x-ray absorptiometry for bone density performed yearly until stable.[38]

Nutrition plays a central role in post-bariatric patients. A careful nutritional analysis should be performed during the preoperative exams to detect possible nutritional deficiencies, and an appropriate intervention should be planned.[39] Dietetic review for reassessment and dietary intervention in the years following bariatric surgery, along with micronutrient monitoring and supplementation form an integral part to ongoing nutritional care to identify, prevent and treat micronutrient deficiencies.[40]

Conclusions

Bariatric surgery has emerged as one of the novel and notable areas for decreasing the prevalence of morbid obesity yielding enticing contributions to health and disease. Morbid obese populations have hypercaloric malnutrition with multiple nutrient deficiencies and comorbidities. Bariatric surgery creates lifelong changes in physiology and anatomy of the GI tract which have profound influence on nutrient intake and nutritional status. Now, it is clear that nutritional deficiencies are crucial in influencing the nutritional status and a correction is prerequisite to avoid further deterioration post-surgery.

In this study, nutritional deficiencies were found to exist in patients prior to surgery but improvement in intakes was observed post-surgery due to counseling. Recently, pre surgery weight loss, malnutritional assessment, correction of micronutrient deficiencies and their impact on post-surgery have been widely studied, but with divergent outcomes, anticipate further exploration. Morbidly obese patients have achieved effective weight loss after undergoing bariatric surgery. A substantial majority of patients with diabetes, hyperlipidemia, hypertension, arthritis, and obstructive sleep apnea experienced complete resolution or improvement.

It is important to note that nutritional management should be tailored to patient requirement to prevent deficiencies in micronutrient levels. Accompanying change in quality of life and comorbidities remission, bariatric surgery offers a gratifying experience when appropriate multidisciplinary postoperative follow-up and a long-term nutritional and medical aid are judiciously combined. Further micronutrient research post-bariatric surgery is required, and dietitians have important contributions along with the medical team. The compelling roles of nutritional status and nutrient intakes should be probed from nadir to zenith, to facilitate ideal dietary treatment strategies scalable for personalized preventive medical nutrition therapy for bariatric surgery patients**.** It is important to consider that nutritional supplementation should be tailored to prevent micronutrient deficiencies. It is advocated that all patients should undergo compulsory pre-operative nutritional counseling and nutritional investigations and that nutritional follow-up be continued lifelong.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to research, authorship, and/or publication of this article.

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