International Journal of Research and Review
www.ijrrjournal.com E-ISSN: 2349-9788; P-ISSN: 2454-2237

Original Research Article

Changes in Lipid Profile in Pre and Post Bariatric Surgery

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ABSTRACT

Aim: The aim of the present study was to assess the effect of bariatric surgery on lipid profile of patients by comparing pre and post operative parameters
Methods: 40 obese patients who were undergoing bariatric surgery were recruited for the present study. Body mass index (BMI), serum cholesterol, triglyceride, HDL and LDL levels were measured before and after three months following the bariatric surgery.
Results: The mean±SD of age of the patients was 37.89±12.7years.The mean BMI recorded prior to surgical intervention was 45.42±5.67 and the mean BMI post-operatively was 37.22±2.34. Assessments showed a statistically significant increase in the serum level of HDL and a statistically significant decrease in the serum level of triglycerides, but no significant change in the serum level of cholesterol or LDL was noted. Moreover, results showed a positive correlation between serum LDL variations and changes in BMI.
Conclusions: Our findings concluded that bariatric surgery improves weight loss and BMI.
Keywords: Sleeve gastrectomy, Bariatric surgery, lipid profile.

INTRODUCTION

"Overweight" and "Obesity" refers to abnormal, excessive fat accumulation in an individual's body leading to general health impairment. [1] Body mass index (BMI) is the most commonly used parameter to calculate the individual's weight status. According to World Health Organization (WHO), BMI higher than or equal to 25 kg/m2 is suggested as overweight and BMI higher than or equal to 30 kg/m2 indicates obesity. [2] There are multiple factors playing role in pathophysiology of overweight and obesity including Genetics, heredity, environmental and psychological factors, lack of adequate physical activity and hormonal imbalances. The most common factor is the imbalance between calorie intake and expenditure by physical activity. [3]

Obesity is linked with raised cardiovascular risk factors such as hypertension, type 2 diabetes mellitus and dyslipidemia. [4] Obesity is the third preventable cause of death worldwide, following tobacco usage. [4] Lipid profile parameters suggesting obesity includes increased serum level of total cholesterol, low-density lipoprotein (LDL) cholesterol, very low density lipoprotein (VLDL) cholesterol, triglycerides, apolipoprotein B and a reduction in serum high-density lipoprotein (HDL) cholesterol. [5]

Dattilo et al. [6] in their study showed that a weight loss of 1 kg leads to reduction in serum total cholesterol by 0.05 mmol/L and LDL cholesterol by 0.02 mmol/L and an

increase in HDL cholesterol by 0.009 mmol/L. The most widely accepted management of obesity include either of them alone or combination of the following: Diet planning, exercising, behavioral therapy (e.g., treating underlying psychological enablers of eating disorders), pharmacotherapy and surgical intervention. [7] Bariatric surgery is indicated in morbid obesity (BMI higher than 40kg/m2) and severe obesity (BMI = 35 - 40 kg/m2) with co-morbid diseases such as diabetes or hypertension. [8]

Bariatric surgery has been proven to be successful treatment modality in reaching long-term health benefits and decreased mortality rates. Bariatric surgery leads to enhanced glucose metabolism and decrease in cardiovascular risk. [9] Lipid concentrations are improved following bariatric surgery. [10]

Till now, many studies have assessed the effects of bariatric surgery on lipid profile with varying results on the improvement of lipid profile components. Therefore, the present study aimed to assess the effects of two different methods of bariatric surgery, namely laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass, on lipid profile before and after three months of the procedure.

METHODOLOGY

Study participants:

40 obese patients undergoing bariatric surgical procedure were recruited for the study. These patients were diagnosed with either morbid or severe obesity and were chosen by simple random sampling technique from all surgical candidates. Institutional approval of ethics committee was taken and each patient received detailed information regarding the research before the surgery. Informed consent was received from each patient before enrolling them for the study.

The inclusion criteria were 1) patients who have undergone pre-surgical workup, 2) age from 20 - 62 years 3) female patients should not be pregnant, 4) not priorly treated for high cholesterol or triglyceride levels prior to being chosen as a surgical candidates. Each patient was evaluated by routine blood tests, upper-endoscopy (evaluating the presence of gastroesophageal reflux disease, hiatal hernia, gastritis, and *H. pylori* infection status), ultrasonographic assessment of the whole abdomen with particular focus on the liver and the gallbladder (mainly for the presence or absence of cholelithiasis).

Exclusion criteria included 1) Age below 20 or above 62 years, 2) Patient not willing to participate 3) Previous history of bariatric surgery, 4) patient is not compliant to visit for 3 months, 5) endocrinal diseases like hyperthyroidism and hypothyroidism, Cushing's syndrome and hyperprolactinemia 6) Hepatic diseases resulting in elevated liver transaminase or hepatomegaly in abdominal ultrasono-graphy.

Surgical intervention:

All the patients underwent either sleeve gastrectomy (SG) or Roux-en-Y gastric bypass surgery. The technique of surgery was opted by the team of bariatric surgeons (irrespective of the present study) for each patient depending on thorough pre-surgical consultation, interviews and clinical assessments.

Data collection:

The interview was taken and prepared questionnaire was asked to fill by the patients. Anthropometric specifications including weight and height were evaluated by minimal clothing and without shoes followed by the calculation of BMI for the diagnosis of obesity. Serum levels of total cholesterol, triglyceride, LDL and HDL were measured. These measurements were taken before and after three months of the bariatric surgery.

Statistical Analysis:

Data were tabulated and examined using the Statistical Package for Social Sciences Version 20.0 (IBM SPSS Statistics for Mac, Armonk, NY: IBM Corp, USA). Descriptive statistical analysis had been carried out in the present study. Results on continuous

measurements are presented as Mean±SD. The statistical power calculation was based on the assumption that the data were normally distributed. For categorical variables frequency distribution were recorded. Univariate statistical analysis and Spearman test were applied. P value of less than 0.05 was considered significant.

RESULTS

In the present study, 40 subjects were recruited who underwent bariatric surgery. The mean±SD of age of the patients was 37.89±12.7years (age range: 20 - 62 years old); 36 females were enrolled in the study and remaining 4 were males.

The mean BMI recorded prior to surgical intervention was 45.42±5.67 and the mean BMI post-operatively was 37.22±2.34. The recorded parameters of lipid profile before and after 3 months of bariatric surgeries are described in Table 1. It was resulted that lipid profile parameters before surgery were very high as compared to after surgical intervention.

Univariate comparisons showed significant differences in serum levels of HDL and triglyceride before and after surgery (P <0.01 and P <0.02 respectively), but no significant differences in the serum levels of cholesterol and LDL were noted (P <0.362 and P < 0.411 respectively).

Investigations showed no correlation between BMI changes and changes in serum levels of total cholesterol, triglyceride and HDL (r = 0.234, r = 0.267 and r = 0.254, respectively), but change in serum LDL was positively correlated with change in BMI (r = 0.367). Table 2 summarizes the results of other univariate comparisons of the study variables.

Table 1: Clinical and anthropometric measurements of the study population before and after 3 months of the procedure (n=40)

Parameters	Mean ±SD	Min	Max	P value
Weight (Kg)				<0.001*
Pre op	123.23±11.13	96	181	
Post op	98.12±9.83	73	128	
BMI (Kg/m2)				<0.001*
Pre op	45.42±5.67	37.21	64.29	
Post op	37.22±2.34	30.19	56.02	
Serum total cholesterol (mg/dL)				0.362#
Pre op	196.75±30.23	127	285	
Post op	189.12±37.87	118	312	
Serum triglycerides (mg/dL)				0.02*
Pre op	154.51±65.21	57	297	
Post op	105.76±46.12	46	265	
Serum LDL (mh/dL)				0.411#
Pre op	116.21±14.15	79	178	
Post op	113.23±25.16	53	220	
Serum HDL (mg/dL)				0.01*
Pre op	46.46±11.12	25	76	
Post op	51.12±13.67	34	85	

*Statistically significant, # statistically non significant, p value is significant at < 0.05

Table 2: Univariate comparison of study variables

Variables	Age	BMI changes
Changes in serum level of cholesterol	r = 0.056	r = 0.234
Changes in serum level of triglyceride	r = 0.213	r = 0.267
Changes in serum level of HDL	r = 0.231	r = 0.254
Changes in serum level of LDL	r = 0.024	r = 0.367*
BMI changes	r = 0.134	-

*Correlation is significant at 0.05 level

DISCUSSION

The present study has evaluated the effect of two methods of bariatric surgery on lipid profile changes. The serum levels of HDL and triglyceride were found to have significant difference when compared before and after surgery. No significant differences were found in the serum levels of total cholesterol and LDL before and after the surgery. Univariate analysis showed a positive correlation between changes in serum LDL and BMI.

Toolabi et al. [11] in their findings showed significant improvement in lipid profile components one year after surgery which is in accordance with the results of present study. Peluso et al. [12] stated that hyperlipidemia was found to be improved in

80% - 100% (n = 400) of the obese patients who underwent gastric bypass surgery.

The most important reason for the differences among the results of the above mentioned studies are because of the type of bariatric surgery and duration of the study. In the studies with long-term follow-ups (2 years and more), the studies have shown improvement in all components of lipid profile. [13] Therefore, examination of lipid profile requires a longer course of follow-up visits post-operatively.

The causes for improvement of lipid profile in bariatric surgery are caloric restriction, weight loss, endocrine changes and malabsorption. [6] The correlation between weight loss and lipid level changes is controversial as varying results are shown by the studies. [14]

The present study has demonstrated a positive correlation between change in serum LDL and change in BMI. Another mechanism could be endocrine changes. It has been stated by the previous studies that there is an increase in serum level of adiponectin in patients having undergone gastric bypass surgery. In the present study adiponectin level was not evaluated.

This limitations of the present study includes that 1) the type of surgeries were not randomly assigned, 2) lesser number of male patients, 3) some confounding factors affecting serum lipid profile including physical activity, dietary habits, alcohol consumption, or smoking status were not considered as an exclusion criteria in the present study.

It should be noted that this surgery is performed only when other treatment modalities with different mechanisms have already failed to achieve proper weight management.

CONCLUSION

Within the limitations of the present study it could be concluded that there is significant improvement in the serum levels of HDL and triglyceride before and after the surgical intervention. Furthermore, it has also been demonstrated that there exist a positive correlation between changes in serum LDL and changes in BMI.

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How to cite this article: Khan U, Ghosh A, Pramod J. Changes in lipid profile in pre and post bariatric surgery. International Journal of Research and Review. 2019; 6(12):80-84.

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