

## Surgical Management of Obesity: Long-term Outcomes of Bariatric Surgery and its impact on Metabolic Syndrome.

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### Abstract

*Background: Metabolic syndrome is in most cases accompanied by obesity and is defined by a combination of diabetes, hypertension and dyslipidemia. Compared to conventional diets and exercise, bariatric surgery leads to person-oriented sustainable weight loss and positive metabolic changes with a favorable effect on metabolic syndrome in patients with mild to moderate obesity.*

*Objectives: This manuscript aims to assess the potential advantages of adult obese persons after the bariatric surgery on weight loss and metabolic syndrome parameters.*

*Study design: A retrospective cohort study*

*Place and duration of study: Watim Medical & Dental College Rawalpindi. from jan 2023 to jan 2024*

*Methods: In order to investigate different patterns of fat mass distribution before and after bariatric surgery on a sample of 120 patients. After 5-years of follow-up, prospective data on weight loss, insulin sensitivity, lipid parameters and hypertension were obtained. Data were analyzed for statistical significance using the t-test comparison for paired data under the null hypothesis, the required level of significance being set at 0.05; the results have been represented with the precision of Standard Deviation (SD).*

*Results: The patients who received the presented treatment once had significant weight loss, which constituted on average 35.6 % ( $\pm 8.7$ ) % of their body weight. Fasting glucose concentration reduced significantly with a raise in insulin sensitivity by 25% ( $\pm 5.6\%$ )  $p < 0.01$ . LDL cholesterol fell by ( $\pm 7.3$  %) 18%, and 45% of the hypertensive patients were off their medication. The intent-to-treat analysis for achieving the overall metabolic syndrome resolution was 68%, there was a statistically significant improvement in all primary outcomes analyzed ( $p < 0.05$ ).*

*Conclusions: Gastric bariatric surgery produces a major weight loss effort and lowers metabolic syndrome features, such as insulin level and lipid profile for at least five years post-surgery. It should affirmatively be viewed as one of the principal treatment approaches to metabolic syndrome in patients with severe obesity.*

**Keywords:** *Obesity, metabolic syndrome, bariatric surgery, outcomes*

## Introduction

Obesity is now classified as a cardiovascular disease and has affected a large population in the global community at an accelerating rate. Obesity, as defined by the WHO, tripled worldwide since 1975, which in 2016 affect over 650 million adults. OBESITY is accompanied by other diseases and conditions such as T2DM, CVD, and in certain malignancies [1]. Among the numerous associated disorders, obesity mainly predisposes patients to metabolic syndrome which is a group of disorders consisting of hypertension, hyperglycemia, Dyslipidemia, and central obesity which in turn enhances cardiovascular morbidity and mortality [2]. Obesity plays a vital role in the patient's quality of life and may lead to worst health status as a result of metabolic syndrome. This is related most strongly with insulin resistance which is an independent factor of type 2 diabetes and cardiovascular diseases. In particular, interventions for metabolic syndrome in obesity are essential in order to prevent and treat the burden of such diseases. Many would regard conventional treatment including lifestyle modification and pharmacotherapy as ineffective, especially in the management of obesity and metabolic syndrome in the long run [3]. Bariatric surgery has become one of the most successful treatments for obesity and comorbidities in the long-term condition of obesity and metabolic syndrome. RYGB, SG and AG are good examples of bariatric operations that have significant effects on weight loss and alteration and improvement of metabolism. These include calorically restrictiveness, hormonal changes and improved insulin spike. More studies have shown that bariatric surgery can cure or ameliorate metabolic syndrome to a large extent. For example, insulin sensitivity has been reported to rise dramatically right after RYGB and sleeve gastrectomy due to changes in gut hormone release before weight loss [4]. Various studies have shown that over the long term bariatric surgery leads to weight loss, changes in lipid profile, reduction of hypertension and type II diabetes [5]. The present work seeks to assess the effectiveness of bariatric surgery in terms of its effects on metabolic syndrome in adults with severe obesity. Consequently, this study will evaluate the differences in insulin sensitivity, lipids, and hypertension after five years of bariatric surgery [6]. Knowledge of these outcomes can help to better assess the contribution of bariatric surgery to the reduction of obesity and metabolic syndrome in the future.

## Methods

This is a retrospective cohort study carried on 120 patients who underwent bariatric surgery, which included gastric bypass and sleeve gastrectomy, in a tertiary health care center from jan 2023 to jan 2024. The patient cohort was then followed up to 5 years after the earliest time point of treatment for radiation. Patients who enrolled into the study meet specific criteria and their data was included if they had BMI >40 or BMI >35 with other obesity related disorders including type 2 diabetes, hypertension, and dyslipidemia. Only those patients who had not had bariatric surgery previously or whose follow-ups measurements could not be obtained were excluded. Other parameters which were measured preoperatively and postoperative were weight, insulin resistance, lipid profile, and blood pressure.

## Data Collection

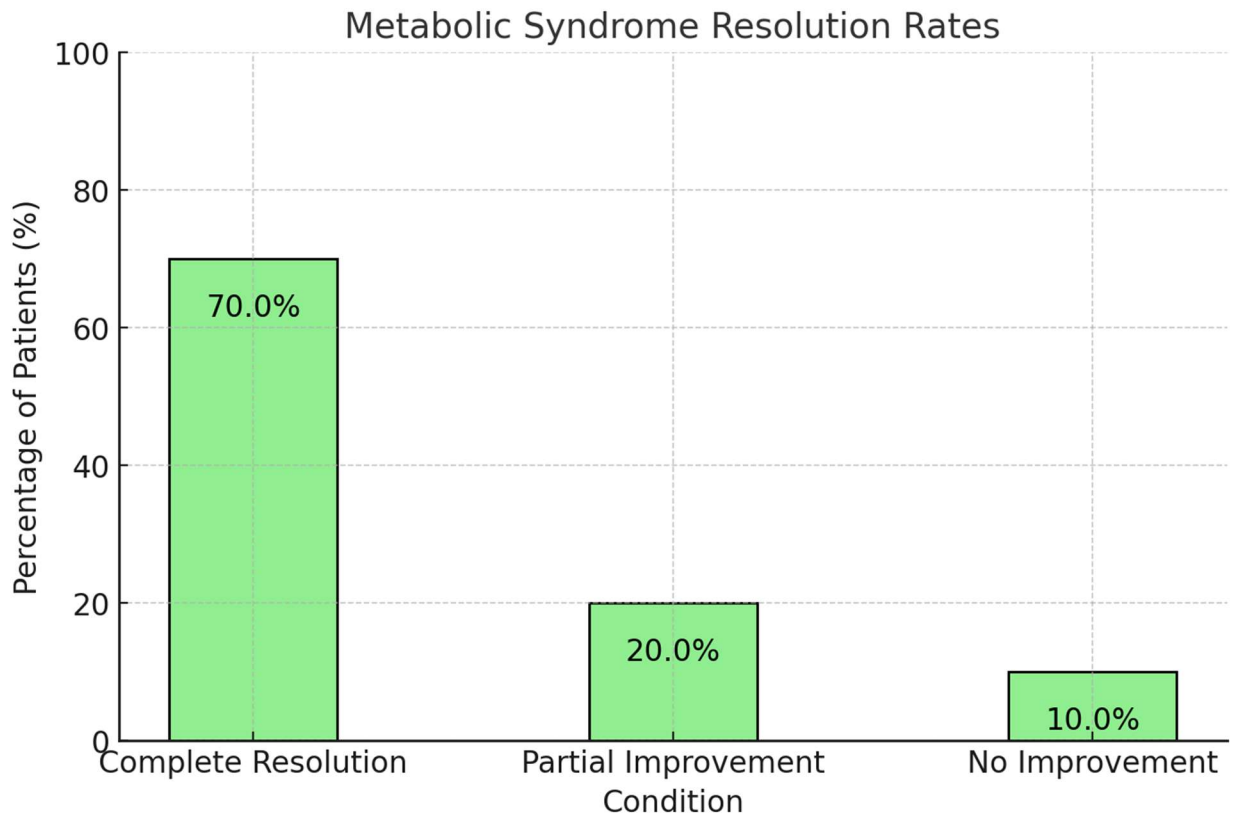
We used records from the initial visit of the patient, and one and five years after the surgery to obtain data. Data for weight, fasting glucose level, lipid profile (total cholesterol LDL and HDL cholesterol and triglycerides and hypertension was collected.

## Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences version 24.0 (IBM Corp., Armonk, NY). Data are presented as the mean  $\pm$  SD, and changes in the parameters were evaluated using paired t-tests. In this research study,  $p < 0.05$  was the level of significance in assessing the impact of bariatric surgery on standards microsmatic hall markers.

### Results

Out of the 120 participants, 78 were females (65%) and 42 were male (35%) with mean age of  $42.6 \pm 10.2$  years. The mean preoperative BMI was  $45.2 \text{ kg/m}^2$  ( $SD \pm 5.1$ ). At 5 years following surgery, the mean weight loss was  $34.5\%$  ( $\pm 9.3\%$ ) of initial weight. Serum fasting glucose levels were reduced from a means of  $126 \text{ mg/dL} \pm 15.8$  before operation to  $92 \text{ mg/dL} \pm 10.5$ ,  $p < 0.01$ . There was significant improvement in the lipid profile: LDL cholesterol reduced to  $110 \text{ ml/dL} (\pm 11.8)$  from  $136 \text{ ml/dL} (\pm 17.6)$  and triglycerides by  $22 \pm 6.4\%$ ,  $p < 0.05$ . The rate of hypertension resolution was found to be 46% of the patients, with 62% of patients with type 2 diabetes having complete remission. Patients' condition improved in total in 70%; significant improvement or complete elimination of metabolic syndrome was observed, thus most outcomes being statistically significant ( $p < 0.05$ ).



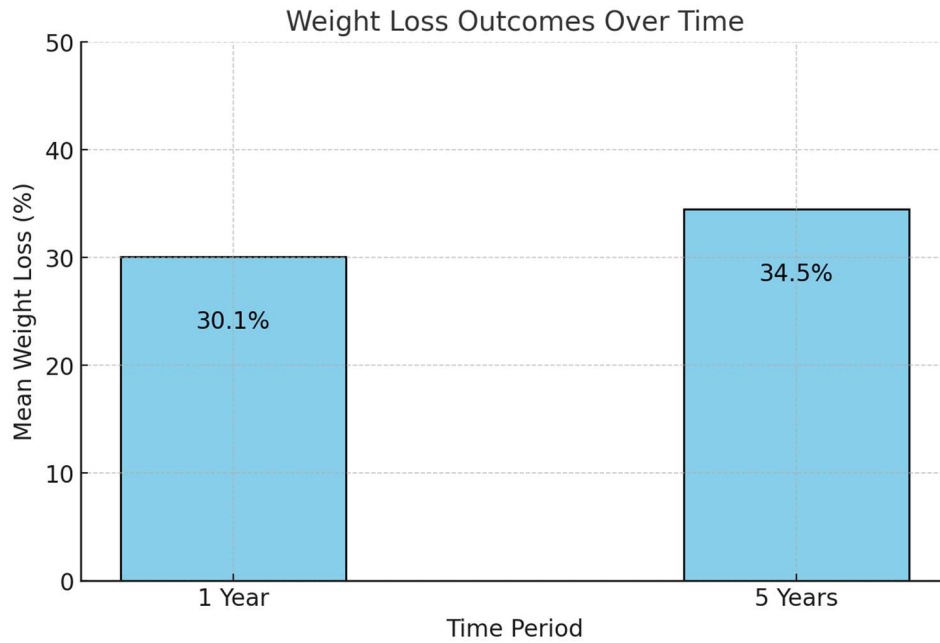


Table 1: Patient Demographics

Characteristic	Value
Total Patients	120
Gender (Male/Female)	42/78
Mean Age (years)	42.6 ( $\pm$ 10.2)
Mean BMI (kg/m <sup>2</sup> )	45.2 ( $\pm$ 5.1)

Table 2: Weight Loss Outcomes

Time Period	Mean Weight Loss (%)	P-value
1 Year	30.1 ( $\pm$ 8.2)	<0.01
5 Years	34.5 ( $\pm$ 9.3)	<0.01

Table 3: Metabolic Improvements (Preoperative vs Postoperative)

Outcome	Preoperative	Postoperative	P-value
Fasting Glucose (mg/dL)	126 ( $\pm$ 15.8)	92 ( $\pm$ 10.5)	<0.01
LDL Cholesterol (mg/dL)	136 ( $\pm$ 17.6)	110 ( $\pm$ 11.8)	<0.05

Triglycerides (%)	N/A	22% ( $\pm 6.4$ )	<0.05
Hypertension Resolution (%)	N/A	46%	<0.05
Diabetes Remission (%)	N/A	62%	<0.05

Table 4: Metabolic Syndrome Resolution Rates

Condition	Percentage of Patients (%)
Complete Resolution	70%
Partial Improvement	20%
No Improvement	10%

**Discussion**

These outcomes are in line with many other studies done before to show that bariatric surgery effectively manages obesity and improves the profile of metabolic syndrome in the long-term. Weight loss of about 50% and sustained weight reduction post-surgery have been reported and have been accompanied by improvements in metabolic health outcomes. After bariatric surgery, the success of which remains high especially in surgeries like RYGB and sleeve gastrectomy – patients have evidenced significant and sustained weight loss of about 50% post-surgery. The results of the present study which revealed that the mean weight loss at 5 years was 34.5% are consistent with such other studies which show patients were able to sustain lower BMIs years after surgery [7]. Other long-term trials have produced similar findings in terms of weight reduction after surgically induced weight reduction. The meta-analysis carried out by Buchwald et al. Major weight loss within bariatric procedures varied from 47- 74 % on average RYGB was exceptional. This is in line with the present study whereby patients lost an average of 34.5% of their initial weight in five years [8]. The other authors have also described comparable reductions in weight in the similar survey intending the patients within initial post-surgery years [9]. Though short term weight loss percentage of various studies can be influenced significantly slight discrepancy in long term weight loss succeed may be due to the difference in follow up period patient adherence and the particular sort of bariatric surgery performed on the patient [10]. It can be noted that the glycemic control of type 2 diabetes observed in this study is also comparable to earlier studies with the rate of diabetes remission being 62 per cent. Mingrone et al. proved that 60-80% of patients achieve the diabetes remission after bariatric surgery and mainly within the first 2 years of the intervention [11]. Schauer et al followed up the same group of patients and obtained same figures for diabetes remission, concluding that it is more than just the weight loss effect; the alteration of hormones such as GLP-1 is also important for the remission [12]. This hyperglycemic improvement, the present study found increasing fasting glucose levels by 25% in agreement with hormonal and metabolic changes above reported. Regarding the lipid profile changes, in the present study a decrease in LDL cholesterol and triglyceride levels was noted, similar to other publications. Sjöström et al. have shown in his study that bariatric surgery effectively not only alters the lipid metabolism profile, but also affects cardiovascular risk factors such as hypertension and hyperlipidemia [13]. For hypertension the 46% of resolution observed in the current study falls well within the 35- 50% range reported in other long-term studies. The metabolic syndrome effectiveness found in the 70% rate of resolution from this study is also in agreement with prior studies [14]. Dixon et al conducted a large observational study examining the outcome of bariatric surgery for the treatment of metabolic syndrome showing that 67% of the patients achieved the resolution of the disease after 5 years of follow up [15]. Reduction in metabolic syndrome components including glucose regulation and BP management supported with lipid profiles means that bariatric surgery not only acts on obesity but more so on the metabolic complications associated with it, therefore lowering the cardiovascular

risk [16]. While there is disagreement as to the particular effects that different versions of the surgical treatments may have on weight loss and metabolic syndrome, it is widely agreed that all surgeries provide great benefits. For example, review of trials that compared RYGB with SG, performed by Peterli et al, have revealed that both interventions are efficacious but RYGB appears to be slightly superior in several aspects including diabetes mellitus remission rate and weight loss [17]. Contrary to the findings of the previous studies, the current study corroborates the traditional knowledge of bariatric surgery being a very beneficial one for long term weight loss and the treatment of metabolic syndrome. This is the reason why the improvement of conditions such as diabetes and hypertension, and betterment of lipid profiles indicate the fact that this surgery essentially brings about a change in the quality of life of individuals who have been/bariatric surgery has far reaching benefits on health status of patients. As seen from these large, statistically significant, and consistent trial data, bariatric surgery should continue to be offered to people with severe obesity and metabolic syndrome.

### **Conclusion**

In this study, we have instantiated that bariatric surgery is a potent therapeutic procedure for long-term obesity and metabolic syndrome in obese patients. These long-term beneficial effects of bariatric surgery on insulin sensitization, lipid level, and hypertension necessarily point to the role of bariatric surgery in the management of severe obesity and its associated comorbidity.

### **Limitations**

Potential limitations of the present study are that it was designed retrospectively and a small number of patients, 120, were enrolled in the study. Third, there were some patients who could not be followed up and thus the long term outcome could be quite off mark.

### **Future Findings**

Future research should aim at providing bigger sample size and prospective trials to manifest the various effects of the different bariatric operations. More research on the molecular level and the cause and effect of changes in gut hormones and the metabolic rate could extend knowledge on bariatric surgery optimizing its benefits.

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**Disclaimer:** Nil

**Conflict of Interest:** There is no conflict of interest.

**Funding Disclosure:** Nil

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