



A Cross-Sectional Study of Weight Loss and Metabolic Outcomes in Patients Undergoing Bariatric Surgery

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Abstract Background: Obesity is a growing global health challenge associated with significant morbidity, mortality and economic burden. Conventional management strategies such as lifestyle modification and pharmacotherapy often fail to achieve sustainable results in patients with morbid obesity. Bariatric surgery has emerged as the most effective intervention, offering not only durable weight reduction but also improvement or remission of obesity-related comorbidities including type 2 diabetes, hypertension and dyslipidaemia. However, variations in outcomes between different surgical procedures such as sleeve gastrectomy and gastric bypass remain an area of clinical interest. **Objective:** To evaluate weight loss and metabolic outcomes in patients undergoing bariatric surgery, with comparison between sleeve gastrectomy and gastric bypass procedures. **Methods:** This cross-sectional analytical study included 345 patients who underwent bariatric surgery. Patients aged 18-65 years with morbid obesity were enrolled, while those with prior bariatric or gastrointestinal surgery and incomplete records were excluded. Baseline demographic and clinical data were collected and postoperative weight loss and metabolic outcomes were assessed at 6 and 12 months. Weight loss was measured using total weight loss percentage (%TWL) and excess weight loss percentage (%EWL). Metabolic remission was defined as normalization of parameters without pharmacotherapy. Data were analysed using SPSS version 26, with $p < 0.05$ considered significant. **Results:** Of the 345 patients, 198 (57.4%) underwent sleeve gastrectomy and 147 (42.6%) gastric bypasses. The mean baseline BMI was 44.3 ± 6.7 kg/m². At 12 months, mean %TWL was 27.8 ± 7.1 in the sleeve group and 29.7 ± 7.6 in the bypass group ($p = 0.02$), while mean %EWL was 60.4 ± 12.1 vs. 65.2 ± 12.5 ($p = 0.01$). Complete remission of type 2 diabetes was achieved in 61.2% of sleeve patients and 68.7% of bypass patients, with a greater HbA1c reduction observed after bypass ($p = 0.03$). Hypertension resolved in 52.9% and 58.0% of sleeve and bypass patients, respectively, while dyslipidaemia normalized in 45.7% and 51.9%. Postoperative complications were generally low, though slightly higher after bypass (30%) compared to sleeve (21%). **Conclusion:** Both sleeve gastrectomy and gastric bypass result in significant weight loss and improvement in metabolic comorbidities, with gastric bypass demonstrating modestly superior outcomes. Bariatric surgery should be considered not only as a weight reduction procedure but also as a metabolic treatment option for patients with morbid obesity.

Key Words Bariatric Surgery, Sleeve Gastrectomy, Gastric Bypass, Weight Loss, Metabolic Outcome

INTRODUCTION

Obesity is a complex, multifactorial disease that has reached epidemic proportions worldwide. It is now regarded as one of the leading preventable causes of morbidity and mortality, with a global prevalence that continues to rise at an alarming pace [1]. The World Health Organization estimates that 39% of adults are overweight and 13% are obese, reflecting more than 650 million individuals living with obesity as of 2016 [2]. This burden is not limited to developed nations; low- and middle-income countries are experiencing rapid increases due to urbanization, sedentary lifestyles and dietary transitions toward high-calorie, processed foods [3]. In South Asia, obesity is particularly concerning as individuals tend to develop metabolic complications such as type 2 diabetes and hypertension at relatively lower BMI thresholds compared to Western populations [4]. The health consequences of obesity extend far beyond excess body weight. It is a key driver of the metabolic syndrome, which encompasses insulin resistance, dyslipidaemia, hypertension and central adiposity [5]. Moreover, obesity significantly increases the risk of non-communicable diseases, including cardiovascular disease, osteoarthritis, non-alcoholic fatty liver disease, chronic kidney disease and various malignancies [6,7]. The economic burden is equally staggering, with healthcare costs related to obesity and its complications accounting for billions of dollars annually in both direct and indirect expenditures [8]. Conventional approaches to weight reduction include dietary modification, physical activity, behavioural interventions and pharmacotherapy. While these strategies are essential for initial management, their long-term effectiveness is often limited, with most patients regaining weight within five years [9]. Pharmacological agents provide only modest weight loss and are frequently associated with side effects that limit adherence [10]. In contrast, bariatric surgery has emerged as the most effective treatment for sustained weight loss in patients with morbid obesity, particularly those who fail conservative therapies [11].

Several bariatric procedures are currently in practice, with Roux-en-Y gastric bypass (RYGB) and laparoscopic sleeve gastrectomy (LSG) being the most widely performed [12]. These procedures not only restrict gastric capacity but also induce profound hormonal changes, including alterations in ghrelin, glucagon-like peptide-1 (GLP-1) and peptide YY, which collectively contribute to appetite suppression, improved insulin sensitivity and enhanced satiety [13]. Beyond hormonal changes, bariatric surgery has been shown to modulate gut microbiota composition, bile acid metabolism and inflammatory pathways, which further enhance its metabolic effects [14]. The clinical outcomes of bariatric surgery are well-documented. Studies have consistently shown that patients achieve an average excess weight loss (EWL) of 50-70% within two years of surgery, with durability extending beyond a decade in many cases [15]. Furthermore, metabolic improvements are profound; remission of type 2 diabetes is observed in up to 60-80% of patients, often occurring within days to weeks post-surgery, independent of weight loss [16]. Hypertension improves in

approximately 50-70% of cases, while dyslipidaemia shows resolution or significant improvement in nearly 60% of patients [17]. The Swedish Obese Subjects (SOS) study, one of the largest prospective trials, demonstrated not only reductions in weight and metabolic risk factors but also significant decreases in overall mortality and incidence of cardiovascular events among surgically treated patients compared to matched controls [18-24]. Despite the abundance of international evidence, regional data remain limited, particularly in South Asian countries where obesity-related diseases develop earlier and at lower BMI thresholds [19]. Cultural factors, dietary patterns and genetic predisposition may influence surgical outcomes and thus local evidence is essential to guide patient selection and optimize care [20]. Furthermore, while most global studies emphasize long-term weight loss, there is a growing need to investigate short- and medium-term metabolic outcomes, especially in populations with high baseline prevalence of type 2 diabetes and hypertension [23-30].

Given this background, the present study seeks to evaluate weight loss and metabolic outcomes in a cohort of 345 patients undergoing bariatric surgery. By assessing both anthropometric changes and improvements in diabetes, hypertension and lipid profile, this study aims to contribute valuable regional data and provide insights into the effectiveness of bariatric procedures in managing obesity and its related comorbidities.

Objective

To evaluate weight loss and metabolic outcomes in patients undergoing bariatric surgery, with comparison between sleeve gastrectomy and gastric bypass procedures.

METHODS

Study Design

This was a cross-sectional analytical study. Study is ethical approved by ethical comity of university.

Duration

The study was carried out over a period of one year from 2024 January to 2025 August.

Sample Size

A total of 345 patients undergoing bariatric surgery were included. Data is collected with collaboration with eastern region.

Sampling Technique

Non-probability consecutive sampling was used to recruit eligible participants.

Inclusion Criteria

- Adult patients aged 18 to 65 years
- Both male and female patients
- Patients undergoing primary bariatric surgery (laparoscopic sleeve gastrectomy or Roux-en-Y gastric bypass)

- Patients with at least 6 months of postoperative follow-up data available

Exclusion Criteria

- Patients with previous bariatric or gastrointestinal surgery
- Patients with secondary obesity due to endocrine disorders (e.g. Cushing's syndrome, hypothyroidism)
- Patients lost to follow-up before 6 months postoperatively
- Patients with incomplete medical records

Data Collection

Data were collected from the medical records of patients who underwent bariatric surgery and fulfilled the eligibility criteria. Demographic details including age, gender and baseline anthropometric measurements such as height, weight and body mass index (BMI) were recorded. Preoperative clinical data were obtained regarding the presence of comorbid conditions including type 2 diabetes mellitus, hypertension and dyslipidaemia. Postoperative follow-up records at 6 and 12 months were reviewed to assess weight loss outcomes and metabolic improvements. Weight reduction was quantified using total weight loss percentage (TWL%) and excess weight loss percentage (EWL%). Metabolic outcomes were determined by the resolution or improvement of diabetes, hypertension and dyslipidaemia, based on both clinical examination and laboratory investigations. Diabetes remission was defined as fasting blood glucose <126 mg/dL and HbA1c <6.5% without antidiabetic therapy, hypertension remission as blood pressure <140/90 mmHg without antihypertensive medication and dyslipidaemia improvement as normalization of serum lipid levels without lipid-lowering drugs. Patients with incomplete records or loss to follow-up before six months were excluded from the analysis.

Statistical Analysis

All data were entered and analysed using Statistical Package for the Social Sciences (SPSS) version 26. Continuous variables such as age, BMI, TWL% and EWL% were presented as mean±standard deviation (SD), while categorical variables including gender distribution and remission of comorbidities were expressed as frequencies and percentages. The Chi-square test was applied to compare categorical outcomes between subgroups, while independent sample t-test was used for continuous variables. A p-value of less than 0.05 was considered statistically significant. Results were further stratified by gender and type of surgery to explore subgroup differences in weight loss and metabolic outcomes.

RESULTS

Out of 345 patients, 198 underwent sleeve gastrectomy and 147 gastric bypasses. The average age was around 41 years in both groups. Females made up the majority (64% in sleeve vs. 57% in bypass). Most patients were urban residents, accounting for 60% in the sleeve group and 63% in the

bypass group. The mean baseline BMI was nearly identical at 44 kg/m² in both groups. None of the differences were statistically significant, showing that both groups were comparable at baseline (Table 1).

Patients in the sleeve group had a mean weight of 122 kg and a waist circumference of 121 cm, compared to 120 kg and 120 cm in the bypass group. The average duration of obesity was about 10 years in both groups. A family history of obesity was present in 43% of sleeve patients and 42% of bypass patients, while smoking was reported by roughly 1 in 5 patients in both groups. These values highlight a well-balanced distribution of baseline clinical features between the two surgical cohorts (Table 2).

Table 1: Baseline Demographic Characteristics of Patients (N = 345)

Variable	Sleeve Gastrectomy (n = 198)	Gastric Bypass (n = 147)	p-value
Age (years, mean±SD)	41.2±9.4	42.4±9.0	0.28
Gender			
Male	72 (36.4%)	63 (42.9%)	0.25
Female	126 (63.6%)	84 (57.1%)	
Residence			
Urban	118 (59.6%)	92 (62.6%)	0.61
Rural	80 (40.4%)	55 (37.4%)	
Baseline BMI (kg/m ² ±SD)	44.1±6.9	44.7±6.5	0.47

Table 2: Baseline Clinical Characteristics

Variable	Sleeve Gastrectomy (n = 198)	Gastric Bypass (n = 147)	p-value
Weight (kg, mean±SD)	122.1±19.2	120.5±18.1	0.41
Waist circumference (cm±SD)	121.3±14.5	119.8±13.7	0.37
Duration of obesity (years)	9.8±4.2	10.1±4.0	0.52
Family history of obesity	86 (43.4%)	62 (42.2%)	0.82
Smoking status (current)	39 (19.7%)	27 (18.4%)	0.75

Table 3: Weight Loss Outcomes at 6 and 12 Months

Outcome	Sleeve Gastrectomy (n = 198)	Gastric Bypass (n = 147)	p-value
Weight at 6 months (kg±SD)	93.6±15.7	90.4±14.8	0.05
Weight at 12 months (kg±SD)	87.9±14.7	84.8±13.6	0.04*
BMI at 12 months (kg/m ² ±SD)	32.1±5.3	30.8±5.2	0.03*
Total weight loss (%)	27.8±7.1	29.7±7.6	0.02*
Excess weight loss (%)	60.4±12.1	65.2±12.5	0.01*
≥50% EWL achieved (%)	146 (73.7%)	118 (80.3%)	0.18

Table 4: Diabetes Outcomes at 12 Months (n = 220 with Diabetes)

Outcome	Sleeve Gastrectomy (n = 121)	Gastric Bypass (n = 99)	p-value
Complete remission	74 (61.2%)	68 (68.7%)	0.22
Partial improvement	36 (29.8%)	22 (22.2%)	
No improvement	11 (9.0%)	9 (9.1%)	
HbA1c reduction (%)	1.9±0.7	2.2±0.8	0.03

Table 5: Hypertension and Dyslipidaemia Outcomes at 12 Months

Comorbidity	Outcome	Sleeve Gastrectomy	Gastric Bypass	p-value
Hypertension	Complete remission	55 (52.9%)	47 (58.0%)	0.48
	Partial improvement	28 (26.9%)	21 (25.9%)	
	No improvement	21 (20.2%)	13 (16.0%)	
Dyslipidaemia	Complete normalization	48 (45.7%)	40 (51.9%)	0.38
	Partial improvement	34 (32.4%)	27 (35.1%)	
	No improvement	23 (21.9%)	10 (13.0%)	

Table 6: Overall Postoperative Complications and Adverse Events

Complication / Adverse Event	Sleeve Gastrectomy (n = 198)	Gastric Bypass (n = 147)	p-value
Nausea/vomiting	26 (13.1%)	24 (16.3%)	0.44
Surgical site infection	8 (4.0%)	9 (6.1%)	0.39
Anastomotic leak	3 (1.5%)	5 (3.4%)	0.27
Nutritional deficiency	12 (6.1%)	15 (10.2%)	0.17
Readmission within 30 days	7 (3.5%)	8 (5.4%)	0.39
Any complication	41 (20.7%)	44 (29.9%)	0.06

At 6 months, sleeve patients weighed 94 kg on average, while bypass patients were slightly lighter at 90 kg. By 12 months, the mean weight dropped further to 88 kg in the sleeve group and 85 kg in the bypass group. Correspondingly, BMI decreased to 32.1 in sleeve patients and 30.8 in bypass patients. On average, sleeve patients lost 28% of their body weight, while bypass patients lost 30%. Excess weight loss was also greater after bypass (65%) compared to sleeve (60%). About three-quarters of sleeve patients and four-fifths of bypass patients achieved at least 50% excess weight loss. These results suggest that gastric bypass led to slightly superior weight reduction at one year (Table 3).

Among the 220 patients with diabetes, 61% of those who underwent sleeve gastrectomy and 69% of those who had gastric bypass achieved complete remission at 12 months. Partial improvement occurred in 30% of sleeve patients and 22% of bypass patients. Roughly 1 in 10 patients in both groups showed no change. Mean HbA1c reduction was nearly 2% after sleeve and slightly higher (2.2%) after bypass, a statistically significant difference. This indicates that while both surgeries were highly effective for diabetes control, bypass offered modestly better improvement (Table 4).

Of the 185 patients with hypertension, remission was achieved in 53% of the sleeve group and 58% of the bypass group, with about a quarter in each group showing partial improvement. Roughly 1 in 5 sleeve patients and 1 in 6 bypass patients had persistent hypertension. For dyslipidaemia, nearly half of sleeve patients (46%) and just over half of bypass patients (52%) achieved complete normalization, while one-third in both groups showed partial improvement. Persistent dyslipidaemia was seen in 22% of sleeve and 13% of bypass patients. Overall, gastric bypass demonstrated a trend toward better control of hypertension and dyslipidaemia, though differences were not statistically significant (Table 5).

Complications were generally infrequent in both groups. Nausea or vomiting occurred in 13% of sleeve patients and 16% of bypass patients. Surgical site infections were observed in 4% and 6%, respectively. Anastomotic leaks were rare, occurring in 2% of sleeve and 3% of bypass patients. Nutritional deficiencies were slightly more common after bypass (10%) compared to sleeve (6%). Readmission within 30 days was required in only 4-5% of cases. Overall, 21% of sleeve patients and 30% of bypass patients experienced any complication, but the difference was not statistically significant. These findings indicate that both procedures are safe, with a slightly higher complication trend in bypass (Table 6).

DISCUSSION

This cross-sectional study evaluated weight loss and metabolic outcomes in 345 patients who underwent bariatric surgery, comparing sleeve gastrectomy and gastric bypass procedures. Our findings demonstrate that both surgical approaches led to significant weight reduction and improvement in obesity-related comorbidities, with gastric bypass showing slightly superior outcomes in terms of excess weight loss, BMI reduction and diabetes control. In terms of baseline characteristics, the two groups were comparable in age, gender distribution and BMI, ensuring that observed differences in outcomes were primarily attributable to the type of surgery. This comparability strengthens the validity of the findings. The mean baseline BMI of 44 kg/m² in our study is consistent with thresholds reported in previous research, where patients undergoing bariatric surgery typically present with morbid obesity [22]. Regarding weight loss, our results showed a 28% total weight loss after sleeve gastrectomy and 30% after gastric bypass at one year, with excess weight loss of 60% and 65%, respectively. These results are in line with previous research, which reported excess weight loss between 55-70% at one year, with gastric bypass often producing slightly greater reductions than sleeve gastrectomy [23]. The higher proportion of patients achieving ≥50% EWL in the bypass group (80% vs. 74%) further supports the effectiveness of this procedure.

Metabolic outcomes were equally encouraging. In patients with type 2 diabetes, 61% of those in the sleeve group and 69% in the bypass group achieved complete remission at 12 months, with significant reductions in HbA1c levels. Previous research has similarly shown remission rates of 60-80%, often higher following gastric bypass compared to sleeve gastrectomy [24]. The superior glycaemic improvement seen in bypass patients in our study mirrors these findings and underscores the role of altered gut hormones and nutrient flow in promoting rapid metabolic benefits beyond weight loss alone. Hypertension outcomes revealed remission in approximately half of patients across both groups, consistent with earlier studies where rates ranged from 50-70% at one year. For dyslipidaemia, normalization was achieved in 46% of sleeve patients and 52% of bypass patients, again in agreement with previous research, which found significant lipid profile improvements following

both procedures, with marginally better outcomes after bypass [25]. These improvements are clinically meaningful, as they translate into reduced cardiovascular risk. Postoperative safety was also evaluated, with overall complication rates of 21% in the sleeve group and 30% in the bypass group. Although higher in bypass patients, most complications were minor, such as nausea and nutritional deficiencies, while major events such as anastomotic leak and infection were rare. These findings are consistent with previous research, which has shown slightly higher complication risks after bypass, but within acceptable limits, reinforcing the relative safety of both procedures when performed in experienced centres [26]. Taken together, the results of our study align closely with those of previous research, further validating the role of bariatric surgery as an effective treatment for morbid obesity and associated comorbidities [27]. The slightly greater weight loss and metabolic improvements observed in gastric bypass patients highlight its potential superiority in certain patient populations, though sleeve gastrectomy remains a valuable option with lower complication trends and comparable long-term outcomes.

CONCLUSIONS

It is concluded that bariatric surgery is a highly effective intervention for achieving substantial weight loss and improving metabolic outcomes in patients with morbid obesity. Both sleeve gastrectomy and gastric bypass demonstrated significant reductions in body weight, BMI and excess weight, along with meaningful improvements in type 2 diabetes, hypertension and dyslipidaemia within one year of follow-up. Gastric bypass showed modestly superior results in terms of excess weight loss and diabetes remission, though sleeve gastrectomy provided comparable benefits with slightly fewer complications. These findings reinforce the role of bariatric surgery as not only a weight reduction strategy but also a powerful metabolic therapy.

Limitations

Limitations of this study include its cross-sectional design and reliance on one-year follow-up, which may not capture long-term weight regain or durability of comorbidity remission. In addition, data on lifestyle modifications, adherence to follow-up and nutritional supplementation were not fully explored, which may have influenced outcomes. Future longitudinal studies with extended follow-up and multicentre cohorts are needed to provide a more comprehensive understanding of the long-term benefits and risks of bariatric surgery in this population.

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