

# Racial Differences in Weight Loss, Payment Method, and Complications Following Roux-en-Y Gastric Bypass and Sleeve Gastrectomy

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## ABSTRACT

**Objectives:** Obesity affects approximately one-third of the US adult population. Although more black adults are considered to be obese compared to white adults, black adults are less likely to undergo bariatric surgery for weight loss. Black adults typically lose less weight and are more prone to adverse events following bariatric surgery than white adults. The objectives of this study were to compare weight loss, payment methods, and early postoperative complications between black and white adults.

**Design:** A retrospective chart review of 420 Roux-en-Y gastric bypass (RYGB) patients and 454 sleeve gastrectomy (SG) patients (all female) was conducted. A mixed-model analysis was used to assess statistical significance of differences in weight loss between surgeries and races. A Chi-square test was used to assess racial differences in payment method (insurance or private pay) and postoperative complications by operation. Statistical significance was set as  $P \leq 0.05$ .

**Results:** RYGB patients lost significantly more weight at 26, 52, 78, and 104 weeks postoperatively compared to SG patients. White females (WF) lost significantly more weight than black females (BF) at 26, 52, 78, and 104 weeks postoperatively. WF experienced more minor and major complications in the perioperative period than BF, but BF experienced more minor and overall complications in the postoperative period than WF. A greater percentage of black patients had insurance coverage compared to white patients for both surgeries.

**Conclusion:** WF appear to lose more weight than BF regardless of surgery, but both races experience surgical complications. Black patients may be less likely to undergo bariatric surgery without insurance coverage.

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**Keywords:** Bypass; Endocrinology; Obesity; Race; Roux-en-Y gastric bypass; Sleeve gastrectomy; Weight loss

## INTRODUCTION

Obesity has become an epidemic in the United States (US) over the past three decades. Data from the 2007 to 2008 National Health and Nutrition Examination Survey (NHANES) showed that approximately one in three adults in the US are classified as obese [1]. Factors such as genetics [2, 3], environment [2, 3], lifestyle [3], education, income, and race [4, 5] contribute to the obesity epidemic. Currently, bariatric surgery is the most effective treatment for obesity and obesity-related comorbid conditions such as type 2 diabetes and cardiovascular disease [6, 7].

This retrospective review focused on two bariatric operations performed in the US: the laparoscopic Roux-en-Y gastric bypass (RYGB) and the laparoscopic sleeve gastrectomy (SG). The laparoscopic RYGB was developed in the 1990s and has become one of the most commonly performed bariatric operations because it results in significant long-term weight loss [8]. The SG was originally the first step in a two-step bariatric procedure, but its success in inducing weight loss has led to its emergence as a primary procedure [8, 9]. Studies have demonstrated that RYGB and SG patients reach their weight nadir between 12 and 24 months postoperatively [10–13], and although some weight regain typically occurs, they are able to maintain significant weight loss over time [11, 13, 14].

The majority of patients who undergo bariatric surgery are white [15], although black adults have a higher obesity rate than white adults (32.6% vs. 44.1%, respectively) [1]. Weight loss following bariatric surgery has been shown to differ between sexes and races. Males have been shown to lose more weight than

females [16], and white adults have been shown to lose more weight than black adults [17–22]. The majority of individuals who qualify for bariatric surgery (low-income racial minorities without private insurance coverage) are the least likely to undergo surgery [4, 23]. A retrospective study of over 37,000 patients found that black patients were more likely to have postoperative morbidities than white patients, thus leading to significantly greater readmission rates and higher medical costs [24].

The objective of this study was to compare weight loss, payment method, and early postoperative complications between patients who underwent either the RYGB or the SG between 2000 and 2010 in a private community practice. The authors made the following hypotheses: 1) RYGB patients would lose more weight than SG patients; 2) white females (WF) would lose more weight than black females (BF); 3) white patients were more likely to have insurance coverage than black patients; and 4) black patients would have a greater incidence of complications than white patients.

## METHODS

This study was based on chart reviews and, therefore, it was exempted by the Pennington Biomedical Institutional Review Board.

A retrospective chart review of 420 RYGB patients and 454 SG patients (all female) was conducted to compare weight loss, payment method (insurance or private pay), and the incidence of early postoperative complications. Overall, there were 732 WF and 142 BF. The charts were collected from a single, private community practice. Patients were divided by their surgical group and then subdivided by race. Race was self-reported by the patients.

Preoperative weight and body mass index (BMI) were recorded the day before or the day

of surgery. Postoperative weights were recorded for all time points available in the charts. The percent loss of initial body weight loss (%WL) was calculated using the equation  $([\text{preoperative weight} - \text{current weight}] / \text{preoperative weight} * 100)$  in intervals of 1–4 weeks, 5–12 weeks, 13–26 weeks, 27–52 weeks, 53–78 weeks, and 79–104 weeks. A mixed effects model was used to investigate racial differences in weight loss among females in the two surgical groups.

### Statistical Analysis

Chi-square tests were employed to assess racial disparities in overall, minor, and major perioperative and early postoperative complications as well as in payment method. Perioperative complications were those occurring during surgery, and early postoperative complications were defined as those occurring within the first 6 weeks following surgery. Complications were classified as minor or major under the suggestion of the surgeons and the guidance of the American Society on Metabolic and Bariatric Surgery (see Appendix).

Payment method (insurance or private pay) was recorded if documentation was provided in the chart. Statistical significance was set as  $P \leq 0.05$ .

## RESULTS

### Preoperative Characteristics

The preoperative characteristics of female patients who underwent the RYGB or SG are shown in Table 1. WF were significantly older than BF in both surgical groups. BF SG patients weighed significantly more before surgery, and thus had a greater BMI than WF SG patients. There were no differences in preoperative weight and BMI between WF and BF RYGB patients. For patients who had a documented preoperative BMI, 77.9% (554/711) of WF and 88.2% (120/136) of BF had a BMI  $\geq 40$  kg/m<sup>2</sup>.

### Weight Loss

Overall, RYGB patients lost a significantly greater percentage of weight at 26 ( $P = 0.01$ ), 52 ( $P < 0.0001$ ), 78 ( $P < 0.0001$ ), and 104 ( $P < 0.0001$ ) weeks

**Table 1** Preoperative characteristics for Roux-en-Y gastric bypass and sleeve gastrectomy female patients

	Roux-en-Y gastric bypass		Sleeve gastrectomy	
	White females	Black females	White females	Black females
<i>n</i>	325	95	407	47
Age, years	40.2 ± 10.9*	37.9 ± 9.5	44.1 ± 11.2**	39.9 ± 10.2
Weight, kg	125.9 ± 47.6	129.0 ± 47.0	118.9 ± 52.9***	131.0 ± 71.6
BMI, kg/m <sup>2</sup>	46.5 ± 7.3	47.2 ± 7.5	44.0 ± 8.3**	48.3 ± 10.6
BMI, range	35.5–74.0	36.0–72.3	28.8–75.2	29.3–73.0
BMI $\geq 40$ , %	90.9	93.3	68.0	78.3

Age, weight, and BMI summarized as mean ± standard deviation

All statistical comparisons are between races in same surgical group

BMI body mass index

\*  $P = 0.02$

\*\*  $P = 0.006$

\*\*\*  $P = 0.008$

compared to SG patients. WF lost a significantly greater percentage of weight at 26 ( $P = 0.04$ ), 52 ( $P = 0.001$ ), 78 ( $P = 0.05$ ), and 104 weeks ( $P = 0.05$ ) than BF, but there was not a significant differential effect of surgery on weight loss in females when compared by race (Table 2).

**Payment Method**

There were differences in payment methods between races (Table 3). Regardless of race, a greater percentage of RYGB patients were covered by insurance (85.8% vs. 10.0%, respectively), and a greater percentage of SG patients were

private pay (90.0% vs. 14.2%, respectively). Significantly more black patients had insurance coverage compared to white patients for both the RYGB (94.9% vs. 83.3% [ $P = 0.0086$ ] and the SG (32.6% vs. 7.6% [ $P < 0.0001$ ], respectively).

**Complications**

Several statistically significant differences in overall, minor, and major complications were found between WF and BF (Table 4). In RYGB patients, significantly more WF experienced a major perioperative complication compared to BF (10.4% vs. 3.2%,  $P < 0.05$ ). In SG patients,

**Table 2** Mean percent weight loss induced by Roux-en-Y gastric bypass or sleeve gastrectomy in white and black females by week of follow-up visit

Week	Roux-en-Y gastric bypass		Sleeve gastrectomy	
	White females	Black females	White females	Black females
4	7.2 ± 2.8 (145)	7.7 ± 2.2 (54)	7.2 ± 2.2 (349)*	6.4 ± 2.5 (43)
12	14.0 ± 3.8 (71)	13.0 ± 3.4 (30)	13.2 ± 3.2 (183)**	11.0 ± 2.6 (13)
26	23.7 ± 5.2 (77)***	21.5 ± 4.2 (15)	21.2 ± 6.2 (145)	18.8 ± 5.9 (12)
52	36.1 ± 7.7 (80)	34.6 ± 8.6 (12)	29.4 ± 8.2 (114)	25.6 ± 7.9 (7)
78	42.6 ± 7.8 (26)	42.1 ± 9.0 (4)	33.6 ± 8.1 (29)***	23.3 ± 10.9 (5)
104	45.6 ± 6.8 (16)	43.2 ± 7.7 (2)	31.6 ± 10.7 (32)	26.1 ± 16.1 (4)

Weight summarized as mean percent total body weight loss ± standard deviation ( $n$ )

$P$ -values pertain to significance of differences between females in same surgical group

\* $P = 0.04$

\*\* $P = 0.005$

\*\*\* $P = 0.05$

**Table 3** Number (%) of white and black females who underwent the Roux-en-Y gastric bypass or sleeve gastrectomy categorized by payment method

	Roux-en-Y gastric bypass		Sleeve gastrectomy	
	Insurance*	Private pay	Insurance**	Private pay
White females	239 (83.3)	48 (16.7)	30 (7.6)	365 (92.4)
Black females	75 (94.9)	4 (5.1)	14 (32.6)	29 (67.4)

Data summarized as  $n$  (%)

\* $P = 0.009$

\*\* $P < 0.0001$

**Table 4** Mean percent of peri- and early postoperative complications in white and black females who underwent Roux-en-Y gastric bypass or sleeve gastrectomy

	Roux-en-Y gastric bypass		Sleeve gastrectomy	
	White females	Black females	White females	Black females
Perioperative (%)				
Minor	9.8	6.3	0*	4.3
Major	10.4**	3.2	0	0
Postoperative (%)				
Minor	4.6	17.9	3.2***	0
Major	4.0	8.4	1.0	2.1

Statistical differences are between white and black females in the same surgical group

\*  $P < 0.005$

\*\*  $P < 0.05$

\*\*\*  $P < 0.001$

significantly more BF experienced a minor perioperative complication compared to WF (4.3% vs. 0%,  $P < 0.005$ ) as well as minor, early postoperative complications (17.9% vs. 4.6%,  $P < 0.005$ ). There was no significant difference in overall complications between WF and BF in the perioperative period, but significantly more BF experienced a complication in the early postoperative period than WF (18.3% vs. 6.1%,  $P < 0.001$ ).

## DISCUSSION

NHANES data from 2007 to 2008 illustrated that a greater percentage of BF were obese (BMI  $\geq 30$  kg/m<sup>2</sup>) compared to WF (49.6% and 14% vs. 33.0% and ~6%, respectively) [1]. It also showed an increasing prevalence in class III, or morbid obesity (BMI  $\geq 40$  kg/m<sup>2</sup>) in BF (14%) and WF (~6%) [25]. Similarly, the current study showed a greater number of BF with a BMI  $\geq 40$  kg/m<sup>2</sup> than WF. Bariatric surgery is currently the only effective surgery for this class of obesity [26].

Overall, BF lost less weight than WF following the RYGB and the SG in the postoperative

period up to 2 years. These results support the findings of other studies which showed that BF lost less weight than WF following the gastric bypass [19, 21, 27, 28], adjustable gastric band [22], and vertical-banded gastroplasty [20]. This study also showed greater weight loss in WF at 1 year following the RYGB than other studies (36.1% vs. 30% and 32%) [11, 29]. Data on racial differences in weight loss among female patients undergoing the SG had not previously been investigated.

Postoperative weight loss may depend on a combination of psychosocial and physiological factors. White adults are more likely to recognize obesity as a health issue [30] and desire a lower body weight [31] than black adults. These differences are most likely due to cultural views concerning body weight since obesity appears to be more widely accepted in the black culture, and obese BF may have a more positive self-image than obese WF. Black adults may feel that obesity does not negatively affect their quality of life and thus, they may not seek bariatric surgery as early as it is needed to prevent obesity-related comorbidities [24]. Obese BF typically have

significantly greater total body weight and fat mass compared to WF, and they lose less weight and fat mass following the RYGB [28].

Socioeconomic factors such as income, education level, and insurance coverage play a role in determining which bariatric surgery-eligible individuals will choose to undergo an operation [5]. More than one-third of the individuals who meet the National Institutes of Health criteria for bariatric surgery are under- or uninsured [5] and have significantly lower incomes and education levels than those who are not morbidly obese [5, 23]. A disproportionate number of these individuals are black [23] or another nonwhite race [5]. In contrast, our study had a greater percentage of black bariatric patients who were insured compared to white patients. There were a greater percentage of private-pay white RYGB and SG patients which suggests that more white patients were able to pay out of pocket for their surgery compared to black patients. Morbidly obese individuals who qualify for but are unable to undergo surgery are at a disadvantage because they are more likely than their counterparts who do undergo surgery to remain obese and develop additional comorbidities [32]. The current study also showed the disparity in insurance coverage between the RYGB and the SG. Significantly more individuals, regardless of race, were insured for the RYGB compared to the SG, which is most likely because the RYGB is a more established procedure. However, weight loss does not appear to be affected by payment method, i.e., self-pay patients do not lose more weight than patients with insurance [33, 34].

In this study, more BF experienced early postoperative complications than WF. This is consistent with previous studies that found black patients are at an increased risk of experiencing a complication [24]. A large retrospective review also showed that black

patients are more likely than white patients to experience a surgical complication, and thus they typically undergo longer hospital stays, endure greater hospital costs, and are more likely to be readmitted to the hospital following surgery [24]. BF may be more prone to surgical complications due to their greater abdominal adiposity [28]. The relationship between abdominal fat and the incidence of complications should be explored. Harvin et al. concluded that race was a predictor of weight loss at 2 years in RYGB patients [17]. Similar to Harvin's results, WF in this study maintained a greater weight loss at 2 years than BF.

This study had several limitations. The data were compiled retrospectively, and very few charts contained follow-up information past 2 years postoperatively. Because of the limited long-term follow-up, the sample size decreased over time. The sample was predominantly white so the information on black patients was proportionately less.

Although the RYGB was shown to result in greater %WL than the SG, both surgeries resulted in >25% weight loss at 2 years. This study showed that WF lost more weight than BF following bariatric surgery, especially the SG. Thus, the RYGB may be a better option for BF with a significant amount of weight to lose. WF and BF experienced complications, but the SG resulted in fewer overall complications. Lastly, the results show a disproportionate number of insured versus self-pay patients and suggest that among self-pay patients, BF are less likely to undergo bariatric surgery than WF.

This retrospective chart review has highlighted several clinical messages. Although class III obesity is a treatment challenge in general, it is a particular challenge in BF patients. BF not only have a higher prevalence of class III obesity, but also tend to be younger and heavier when presenting for surgical treatment.



BF have a higher prevalence of postoperative complications, and they seem to have more limited access to surgical intervention, probably due to socioeconomic issues and more limited access to medical insurance that covers the surgery compared to WF. Thus, it would appear that RYGB, which gives greater weight loss, may be the preferable operation for a greater proportion of BF compared to WF with class III obesity.

## CONCLUSION

This retrospective chart review compared 420 females (23% black) who had a RYGB to 454 females (10% black) who had a SG for class III obesity. The black females had a higher mean BMI and a lower mean age. BF are less likely to undergo surgery without insurance coverage, possibly for socioeconomic reasons. The higher prevalence of class III obesity, the greater severity at a lower age, and the inferior weight loss in BF compared to WF suggests that RYGB, which sees more weight loss than SG, may be the preferred surgery more frequently in BF.

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**Conflict of Interest.** The authors have no conflict of interest to disclose.

## APPENDIX

**Surgical complications (minor or major), derived under the suggestion of the surgeons and the guidance of the American Society on Metabolic and Bariatric Surgery**

**Minor complications:** Gout, nausea and vomiting, dehydration, hypokalemia, hematoma, hypo-/hyperglycemia, ileus, anastomotic edema, elevated hepatic transaminases, gastroparesis, and abdominal wall abscess.

**Major complications:** Stricture, leak, hematemesis, small bowel obstruction, hernia, small bowel incarceration, gastrointestinal bleed, hypotension, cardiac ectopy, bradycardia, tachycardia, pouch laceration, pneumothorax, pneumonia, hypoxemia, azotemia, heart failure, CO<sub>2</sub> narcosis, ventricular bigeminy, pulmonary venous congestion, septicemia, shock, ulcer (anastomotic, peptic), mesenteric venous thromboses, deep vein thromboses, pulmonary emboli, hernia, adhesions, and death.

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