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Correlation Between Age, Initial Body Mass Index (BMI) with Excessive Weight Loss in Very Early Postoperative Period

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Abstract

Introduction. As a major outcome of bariatric surgery, weight loss can be affected by many factors, such as sociodemographic, behavioral problems, genetics, patient status, and the surgical technique. However, limited data were available. This research aimed to seek a correlation between age and BMI with excessive weight loss after bariatric surgery.

Method. Cross–sectional study design from 2 bariatric centers in Jakarta, using data from 2018–2022. Percentage Excessive Weight Loss (%EWL) 3 months was an outcome measurement tool.

Results. Of 87 subjects enrolled with male to female ratio was 1:4. Age ranged from 14–62 years (median 39 years). Type 1 obesity, type 2 obesity, and type 3 were 37.9%, 20.6%, and 28.7%, respectively. Bariatric surgeries include gastric balloon (10.3%), endoscopic sleeve gastrectomy (ELSG) (8%), laparoscopic sleeve gastrectomy (LLSG) (41.3%), sleeve gastrectomy with duodenojejunal bypass (1.1%), Roux en Y gastric bypass (RYGB) (31%), single anastomosis duodeno–ileal bypass (SADI) (8%). In the 3rd month postoperative, it was found 29.8% of participants with %EWL ≥50%: mean %EWL LLSG 46.7% (41.6–51.9%), mean %EWL RYGB 45.5% (40.5–50.7%). Correlation analysis showed a reverse correlation between BMI with %EWL (r = −0.294, p 0.006) and age showed a weak correlation to %EWL (r = 0.063, p 0.565)

Conclusion. In the 3rd month, the higher the BMI, the lower %EWL found. Age barely correlates with weight loss.

Keywords: Bariatric surgery, weight loss, body mass index, age

Introduction

Bariatric surgery is a group of surgical procedures used to modify the stomach and intestines to treat obesity and its comorbidities. Since 1966, bariatric surgery has been a viable solution for patients with morbid obesity, resulting in significant weight loss and improved comorbidities associated with obesity.[1] Bariatric surgery is recommended for individuals with a body mass index (BMI) of 30–34.9 kg/m^2 with metabolic disease, those with a BMI of ≥35 kg/m^2 regardless of comorbidities, and for the Asian population who have a BMI ≥27.5 kg/m^2.

The field of bariatric surgery is evolving rapidly, resulting in frequent changes to the procedures performed. There are at least five common procedures performed in the United States, namely, sleeve gastrectomy (LSG), Roux–*en*–Y gastric bypass (RYGB), adjustable gastric band (AGB), biliopancreatic diversion with duodenal switch (BPD/DS), single anastomosis duodeno–ileal bypass with sleeve gastrectomy (SADI–S). Sleeve gastrectomy and RYGB are the most commonly performed bariatric surgeries worldwide, accounting for 90% of all procedures.[2]

Weight loss after bariatric surgery as a major outcome can be influenced by various factors, including socio–demographics, genetics, patient status, behavioral issues, and surgical technique.[3] An example of socio–demographics in question is the patient's age. The effectiveness of bariatrics remains debated in older patients, with some studies suggesting it is not as effective as in younger patients.[3–6] The other issue is that a higher initial BMI reduces effectiveness in bariatric surgery.[7–10] No research has been conducted on bariatric surgery in Indonesia. The study aimed to determine the correlation between age, initial BMI, and excessive weight loss after three months of bariatric surgery.

Method

This study employs a cross–sectional design using secondary medical records of all bariatric patient managed in two centers (Sumber Waras Hospital and Pondok Indah Hospital, Jakarta) from 2018–2022. The independent variables were age (years), initial body weight, and type of bariatric procedure. The dependent variable was body weight in three months postoperative. Despite data on body weight, height (cm) data was also collected and used to calculate BMI as a parameter to determine the type of obesity. This data may predict the weight in the first year.[11] This data was collected via phone or in–person visits, and data without weight measurements at three months postoperative were excluded. Excessive weight loss percentage (%EWL) was set as an output to measure the amount of weight loss in postoperative bariatric patients globally. The percentage of EWL is obtained by the following formula:

$$\frac{\text{initial weight} - \text{weight at observation}}{\text{initial weight} - \text{ideal body weight (Devine)}} \times 100\%$$

Excessive weight loss is considered successful if there is a reduction of ≥50% of the initial body weight in the first year.[3] Devine's formula, has become the most widely used method for both academic and medical purposes to calculate ideal body weight. In male: ideal body weight (kg) = 50 + 2.3 per inch over five feet (60 inches), and in female: ideal body weight (kg) = 45.5 + 2.3 per inch over five feet (60 inches)

The correlation coefficient (r) test was used to analyze the correlation using SPSS 16.0 software. When two variables have a correlation strength of 0.0–<0.2, it is considered very weak. 0.2–<0.4 is weak, 0.4–<0.6 is moderate, 0.6–<0.8 is strong, and 0.8–1.00 is very strong. Positive correlation means that as variable A increases, variable B either increases (in a positive correlation) or decreases (in a negative correlation). The committee of ethic approved the study (05A/RSSW/KoM.EP/EC/III/2023)

Results

Of 185 bariatric surgeries proceeded in two centers in 2018–2022, 87 patients (47%) who had weight data after three months postoperative (table 1).

Table 1. Subjects' characteristics

Characteristics	(n = 87)	Percentage
Gender		
Male	18	20.7%
Female	69	79.3%
Age Mean 38.57±10.35		
<35 years	33	38%
≥35 years	54	62%
Type of obesity		
Not obese	11	12.6%
Type I Obesity	33	37.9%
Type II Obesity	18	20.6%
Type III Obesity	25	28.7%
Type of procedure		
Gastric Balloon	9	10.3%
ELSG	7	8%
Sleeve Gastrectomy	36	41.3%
Sleeve DJB	1	1.1%
RYGB	27	31%
SADI	7	8%

%EWL third months postoperative mean 43.3±16.8

Procedure	Min–Max	Mean
Gastric balloon	0–67.9	27.7
ELSG	9.4–88.8	45.3
Sleeve gastrectomy	25.8–85.5	46.7
Sleeve DJB	6.2	6.2
RYGB	26.4–82.1	45.5
SADI	28.1–43.8	34.7

Most subjects were females, averaging 38.5 years old (95% CI 36.37–40.38), and obesity type 1 (37.9%). In this study, various procedures were performed, especially sleeve gastrectomy (41.3%). In the 3rd month observation postoperatively, the average %EWL was 43.3% (95%CI 39.8–46.9), and %EWL ≥50% was as much as 28.9%. The correlation of age with %EWL (n = 87) using Pearson's correlation test showed no significance with r = 0.063 (very weak correlation), p = 0.565 (>0.05). The correlation test between initial BMI and %EWL (n = 87) using Spearman's correlation test showed a significant finding (p = 0.006 [<0.05]) with r = –0.294 (reversal).

A correlation test was performed between age, initial BMI, and weight loss (%EWL) within three months postoperatively. Pearson's correlation showed the correlation of age and %EWL insignificant, with a very weak correlation, and Spearman's correlation showed an inverse correlation between initial BMI and %EWL (Table 2).

Table 2. Correlation of age and initial BMI with %EWL

Variable	n	%EWL
Age	87	p = 0.565 (>0.05),* r = 0.063 (very weak correlation)
Initial BMI	87	p = 0.006 (<0.05),** r =–0.294 (reversal)

* Pearson's correlation, ** Spearman's correlation

Furthermore, subgroup analysis proceeded on the procedure's initial BMI and %EWL. A significant correlation was shown in the RYGB procedure but not in sleeve gastrectomy.

Table 3. Correlation of initial BMI and %EWL to the procedure

Initial BMI	n	%EWL
Sleeve gastrectomy	36	p = 0.498, r =–0.117 (reversal)
RYGB	27	p = 0.03 (<0.05), r = 0.416 (moderate correlation)

Discussion

This study showed no significant correlation between age and %EWL in the third month following the surgery. However, some studies show that younger patients tend to lose more weight than older ones during the same period. In the Pfefferkorn study, participants were divided into five different age groups ranging from less than 30 to over 60 years old, with a mean follow-up time of 3.6 years. The study found a decreasing trend in the percentage of excessive body mass index loss in the older age group of participants.[12] van de Lar divided subjects' age at 40 with a follow–up of more than two years, concluding that subjects under 40 experienced significant weight loss.[13] It is possible that a correlation may not be detected in the early postoperative period, but it could be discovered over an extended period

The percentage of EWL patients with LSG and RYGB procedures was relatively similar (LSG 25–85%, average 46.7% vs. RYGB 26–82%, average 45.5%). However, the result of the correlation test for each procedure was that we found an inverse correlation between BMI and %EWL in LSG and a positive correlation between BMI and %EWL in patients with RYGB. Previously, it was believed that the mechanism differences between LSG and RYGB could be explained, but recently, Carswell et al. found no sugar and fat malabsorption in the RYGB procedure.[14] Also, there was a higher glucagon-like peptide 1 (GLP–1) plasma level during the RYGB procedure than LSG.[1] GLP–1 reduces hunger and increases satiety and visceral malaise. 15 The inverse correlation in LSG is like previous several studies.[16]

The study lacks uniformity in body weight data collection post–surgery; some were obtained from patient information, while others were from hospital measurement results.

Conclusions

In the third month of observation, it is generally known that individuals with a higher initial BMI tend to experience a lower %EWL. Age showed only a weak correlation with weight loss. It is recommended to perform bariatric surgery earlier in the course of obesity in order to achieve more favorable outcomes.

Disclosure

The authors declare no conflict of interest.

Role of authors

Conceptualization PI, Data curation J, Formal analysis FI, Funding acquisition FI, Investigation FI, Methodology FI, Project administration FI, Resources J, Software FI, Supervision PI, Validation J, Visualization FI, Writing original draft preparation FI, Writing review and editing PI.

Abbreviations

ESG	Endoscopic Sleeve Gastrectomy
LSG	Laparoscopic Sleeve Gastrectomy
SG w DJB	Sleeve Gastrectomy with Duodenojejunal Bypass
RYGB	Roux en Y Gastric Bypass
SADI	Single Anastomosis Duodeno Ileal Bypass
%EWL	Percentage Excessive Weight Loss
BMI	Body Mass Index
GLP–1	Glucagon Like Peptide 1

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