

Incidence and aetiology Of Gallstones Formation After Laparoscopic Sleeve Gastrectomy

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ABSTRACT

Background: Gallstones have been shown to develop in patients who experience rapid weight loss after dietary restriction and bariatric surgery . Data regarding gallstone development after Sleeve Gastrectomy, however, are limited. Pure restrictive surgery such as laparoscopic sleeve gastrectomy should result in less gallstone formation because the food continues to follow the normal gastrointestinal transit maintaining the enteric-endocrine reflex

Methods: In this study, 40 patients had been followed up after undergoing bariatric surgery for assessment of gallstone formation and results found according to sex, age, DM, hyperlipidemia, type of surgery, relation to BMI, rate of weight loss, timing of gallstone formation.

Results: After one year of Sleeve Gastrctomy operation 8 patients developed gallstones while 32 patient were free from gallstone formation . **According to** Rate of weight loss, **6 cases who loosed** More than 25% of their weight after one year of Sleeve Gastrctomy operation **developed** gallstones, while 1 case from whom loosed less than 25% of their weight came with the same diagnosis . The P-value of this study was 0.025 which is significant

Conclusion:. Gallstones are a common complication after rapid weight loss from laparoscopic sleeve gastrectomy. Routine prophylactic cholecystectomy is recommended for weight reduction during laparoscopic sleeve gastrectomy

1- Introduction:

Study determines the incidence of and potential risk factors related to the development of gallstones following laparoscopic sleeve gastrectomy. The data of patients who underwent laparoscopic sleeve gastrectomy at a single center due to morbid obesity between January 2014 and December 2017 was retrospectively reviewed and analyzed. The patients were divided into two groups, as those with gallstones

detected on ultrasound at 12 months and those without gallstones. Data of the two groups was compared. BMI did not differ significantly between patients with positive (+) and negative (-) ultrasound findings. Aside from age, hypertension, and coronary artery disease, other preoperative parameters showed no significant association with the development of gallstones in USG (-) and USG (+) patients. The present study identified no significant relationship between a decrease in BMI following LSG and the postoperative development of gallstones. Preoperative hypertension and coronary artery disease were found to be significantly related to the development of gallstones after surgery. The authors suggest that patients with preexisting CAD and hypertension in the preoperative period must be followed-up with ultrasound more meticulously. (1,2).

Traditional risk factors for gallstone formation in the general population are not predictive of symptomatic gallstone formation after bariatric surgery. Weight loss of more than 25% of original weight was the only postoperative factor that can help selecting patients for postoperative ultrasound surveillance and subsequent cholecystectomy once gallstones were identified. (3).

Gallstone formation is common after LSG though incidence of complicated stones is small. This is despite not using gallstone-lowering prophylaxis. The low conversion rate also questions the relevance of surveillance screening, as most patients with new gallstones remain asymptomatic at least in the short-term follow-up. Gallstones are a common complication after rapid weight loss from SG. Our data suggest that gallstone formation during the weight loss period is not associated with amount or rate of weight loss both during the early or late postoperative period. (4).

Compared with other bariatric procedures, sleeve gastrectomy is the more physiologic treatment because it does not involve malabsorption, abnormal tracts, blind tracts, or the placement of a foreign body. This procedure is widely performed laparoscopically. (5).

2- Patient and Method

Our prospective study was conducted in General Surgery Department of Benha University Hospital after an approval from the research ethics committee in Benha Faculty of Medicine and all patients signed arabic informed consents that they were involved in this study.

A total of 40 patients with a history of recently performed sleeve gastrectomy was recruited to our study .

Inclusion criteria:

1. Morbidly obese patients with no history of performing cholecystectomy.
2. Morbidly obese patients without evidence of GB stones.

Exclusion criteria:

1. Morbidly obese patients with history of cholecystectomy.
2. Morbidly obese patients with evidence of GB stones.
3. a history of cardiovascular disease (CVD),
4. secondary cause of obesity

All patients meeting the inclusion criteria was subjected to our study after proper history taking (Name ,Age, Sex, Address, Body mass index is 35 or higher) full clinical examination required preoperative investigations Laboratory as CBC, lipid profile, liver & kidney functions, Imaging as pelvi-abdominal US.

Patients had been informed about the techniques and the complications with a written consent.

All patients were subjected to bariatric procedures after complete history taking and full sheet

when Body mass index (BMI) was 40 or higher patient was cosidered (extreme morbid obesity) while (BMI) from 35 to 39.9 before surgery was consedered (morbid obesity)

Transabdominal ultrasound (US) was performed in all patients preoperatively to rule out gallstones or sludge.

Pelvi-abdominal US after bariatric surgery was in every visit each month . All studied patients were followed up postoperatively once monthly for one year by examination and investigations every visit.

The primary outcome measure was the formation of symptomatic gallstones according to the ultrasound

Study end point was assessment of incidence of gall bladder stone after sleeve gastrectomy

3- Results:

There mean age of patients was 37 . and 27 patients were females

(table 1). After one year of Sleeve Gastrctomy operation 8 patients developed gallstones while 32 patient were free from gallstone formation

According to incidence of weight loss, **19 cases who loosed** More than 25% of their weight after one year of Sleeve Gastrctomy operation **and** whom loosed less than 25% were 21 which is significant

According to sex, 5 females developed gallstones After one year of Sleeve Gastrctomy operation, while 2 males came with the same diagnosis . The P-value of this study was **0.27** which is insignificant as shown in figure (1).

Table (1) General characteristic

Age (years)	Mean \pm SD	31 \pm 8
Gender	Males	n (%) 13 (32.5%)
	Females	n (%) 27 (67.5%)
BMI	Morbid obesity	n (%) 20 (50.0)
	extreme morbid obesity	n (%) 20 (50.0)
Total		40

***BMI = Body mass index**

* morbid obesity ((BMI from 35 to 40), extreme morbid obesity (BMI >40)

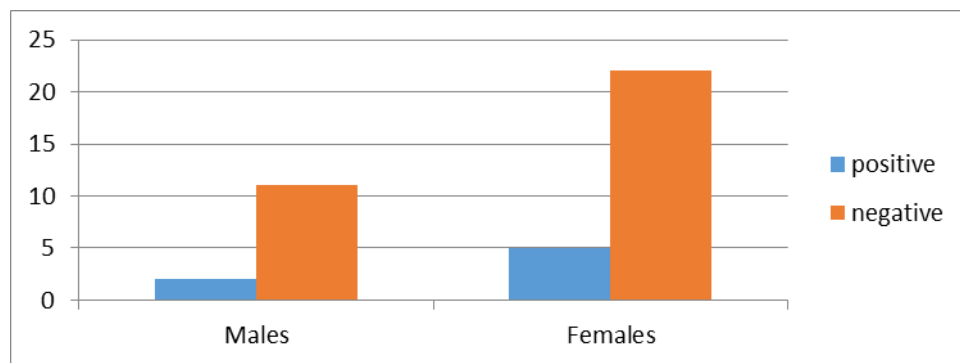


Figure 1: Diagram showing the incidence of gallstone formation after bariatric surgery according to sex.

According to BMI, one case of previously morbid obesity developed gallstones After one year of Sleeve Gastrctomy operation, while 6 cases with **preoperative extreme morbid obesity** came with the same diagnosis . The P-value of this study was 0.037 which is significant as shown in figure (2).

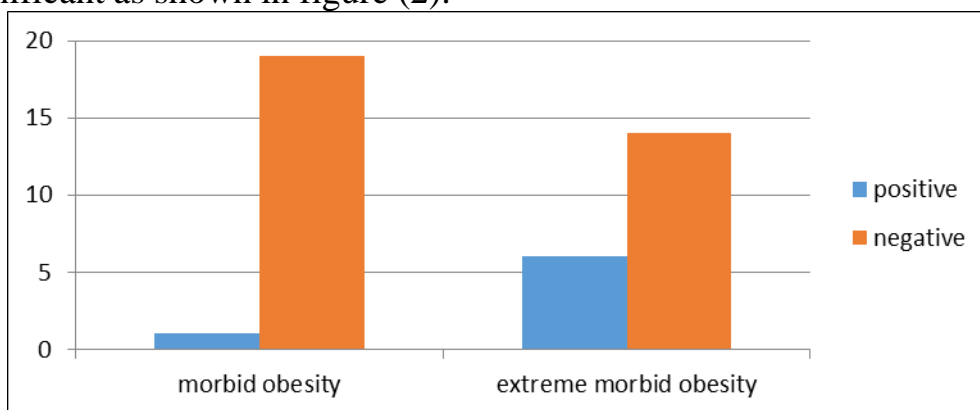


Figure 2: Diagram showing the incidence of gallstone formation after bariatric surgery according to BMI.

According to Rate of weight loss, 6 cases who loosed More than 25% of their weight after one year of Sleeve Gastrctomy operation **developed** gallstones, while 1 case from whom loosed less than 25% of their weight came with the same diagnosis . The P-value of this study was 0.025 which is significant as shown in figure (3).

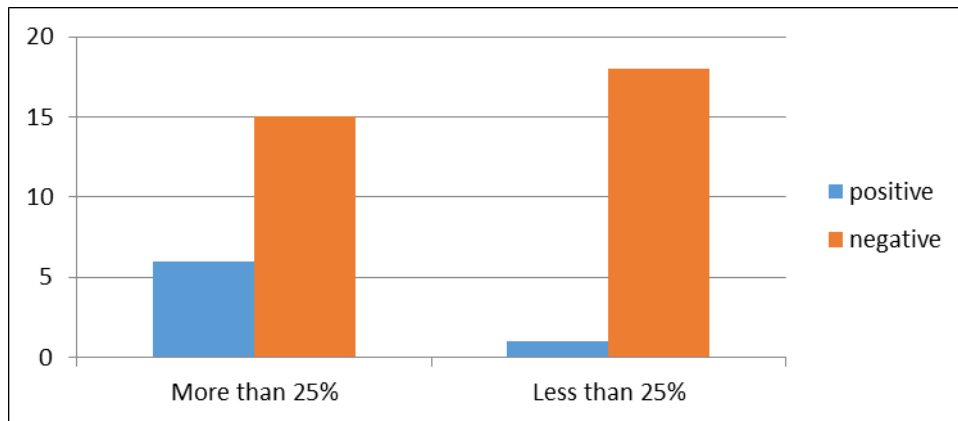


Figure 3: Diagram showing the incidence of gallstone formation after bariatric surgery according to rate of weight loss.

3- Discussion:

Despite the beneficial effects of bariatric surgery, bariatric patients are prone to the formation of gallstones with a postoperative cumulative risk of 30–53 %—an observation that still gives rise to concern in the scientific community.(6)

The estimated prevalence for gallstones in the general population varies between different ethnicities, whereas higher rates have been observed in Caucasian, Hispanic, and Native American origin . In Europe, the overall prevalence for cholelithiasis was 19 % in women and 9 % in men, respectively .(7)

Gallstone formation itself depends on several risk factors . In the general population, several risk factors for gallstone formation are known to increase with age with a cut-off of 40 years, female gender, obesity, and rapid weight loss as the most important contributors . According to a former study, the risk for gallstone formation during active weight loss increases dramatically above a weight loss of 1.5 kg per week . (8)

The mechanisms why weight loss periods—due to very low calorie diet or bariatric surgery—actually promote gallstone formation is poorly understood, although changes in gallbladder bile composition with increased content of bile mucin have been reported . (9)

Most of the present studies investigating postoperative gallstone formation are retrospective and focus on a followup period from months to 5 years after bariatric surgery . (9)

Sleeve Gastrectomy emerged as the first part of a staged duodenal switch procedure and subsequently became a stand-alone restrictive bariatric surgery. It is performed by removing a part of the stomach along the greater curvature without disrupting the biliary system, innervation, or food passage. Given the lower risk of complications after SG compared with Roux-en-Y Gastric Bypass (RYGB) and greater weight loss than

adjustable gastric band (AGB), the use of SG as a treatment for morbid obesity in the United States has rapidly increased . (10)

Gallstones have been shown to develop in patients who experience rapid weight loss after dietary restriction and bariatric surgery . Data regarding gallstone development after Sleeve Gastrectomy, however, are limited. Until now, only one study reported the incidence of symptomatic gallstones after SG compared to RYBG and found no significant difference between the two groups . (11)

Theoretically, it was said that cholelithiasis should be more common after gastric bypass than after a purely restrictive procedure such as sleeve gastrectomy. (12).

Pure restrictive surgery such as laparoscopic sleeve gastrectomy should result in less gallstone formation because the food continues to follow the normal gastrointestinal transit maintaining the enteric-endocrine reflex (13).

The aim of this study was to evaluate the incidence of gallstones formation after laparoscopic sleeve gastrectomy as a common complication to rapid weight loss during one year period after operation.

In this study, 40 patients had been followed up after undergoing bariatric surgery for assessment of gallstone formation and results found according to sex, age, DM, hyperlipidemia, type of surgery, relation to BMI, rate of weight loss, timing of gallstone formation.

In the present study, There mean age of patients was 37 . and 27 patients were females (67.5%). Half of patients came with morbid obesity (BMI from 35 to 40), and the other half with extreme morbid obesity (BMI >40)

In the same with **Sioka, et.al., (14)** study which was done on 150 patients The median age was 40 years (range 18–62) and the median BMI was 46.1 (range 35–61). Patients in this study were predominantly female (79%).. In (Li, et.al., 2009) study the mean age was 42.9 years(range, 17–81 years) for group A, and 370 (74.6%) of thepatients were women

In the present study, After one year of Sleeve Gastrctomy operation 7 patients developed gallstones (17.5%) . In **Li et.al., (11)** study which was done on 670 patients postoperative gallbladder disease was present in (25.3%) of patients. In **Manatsathit, et.al., (15)** study which was done on 253 patients the incidence of symptomatic gallstones was 22.9% (22/96) including 13 patients biliary colic, 5 patients with cholecystitis, 3 patients with obstructive jaundice, and one patient with pancreatitis.

In the present study, According to sex, 5 females developed gallstones After one year of Sleeve Gastrctomy operation, while 2 males came with the same diagnosis . The P-value of this study was 0.27 which is insignificant .According to age, 4 cases Less than 40 y. presented with gallstone formation After one year of Sleeve Gastrctomy operation, while

3 cases More than 40 y. came with gallstone . The P-value of this study was 0.75 which is insignificant

In **Manatsathit, et.al., (15)** study which was done on 253 patients There were no significant differences between the two groups by gender, race or mean age, initial BMI or initial weight. Lipid profile values were also similar in both groups.

In the opposite side **Stampfer et al., (16)** reported that risk factors for gallstone formation after bariatric surgery such as female gender and increasing age were well known to surgeons.. Stampfer et al study was done Among 90,302 women aged 34-59 y at baseline followed from 1980 to 1988, 2122 cases of newly diagnosed symptomatic gallstones occurred during 607,104 person-years of follow-up and observed a striking monotonic increase in gallstone disease risk with obesity; women with a body mass index (BMI) greater than 45 kg/m² had a sevenfold excess risk compared with those whose BMI was less than 24 kg/m². Women with a BMI greater than 30 kg/m² had a yearly gallstone incidence of greater than 1%

In the present study, According to BMI, one case of previously morbid obesity developed gallstones After one year of Sleeve Gastrctomy operation, while 6 cases with preoperative extreme morbid obesity came with the same diagnosis . The P-value of this study was 0.037 which is significant

The risk of gallstone formation increased 8-fold in patients with BMI more than 40 kg/m², it also increased 5-fold in patients who underwent bariatric surgery compared with normal population. **(17)**.

The results of **Grover et al., (18)** that said gallstones formation increased 8-fold in patients with BMI more than 40 kg/m².

In the present study, According to Rate of weight loss, 6 cases who loosed More than 25% of their weight after one year of Sleeve Gastrctomy operation developed gallstones, while 1 case from whom loosed less than 25% of their weight came with the same diagnosis . The P-value of this study was 0.025 which is significant.

The postoperative factor of weight loss of more than 25% of original weight was found to be associated with gallstone formation **(11)**.

Also more than a 24% loss of original body weight was found to be a significant risk factor for gallstone formation **(19)**

In our group of patients, the postoperative factor of weight loss of more than 25% of original weight was found to be associated with symptomatic gallstone formation, those patients with weight loss of more than this were likely to become symptomatic even if they were not symptomatic at the time of gallstone detection. These patients had to do cholecystectomy once gallstones were identified despite being asymptomatic.

The prevalence of cholesterol gallstones was high among obese persons. Weight loss further increased the risk of gallstones: the prevalence of new gallstones reached more than 30% within 12-18 months after gastric bypass surgery. The increased occurrence of stones was commonly because of supersaturation of bile with cholesterol, due to an increased synthesis by the liver and secretion into bile (19).

Identification of predictive factors for gallstone formation after weight reduction surgery might be important in selecting patients for certain prophylactic interventions as regular ultrasound surveillance for gallstones. (20).

Several studies also further attempted to identify risk factors associated with gallstone formation after bariatric procedures and consistently demonstrated that, unlike general population, conventional risk factors for gallstone development such as age, gender, and diabetes were not associated with gallstone formation during rapid weight loss after bariatric surgery, in fact, it was believed that more rapid and higher amount of weight loss contributed to higher incidence of gallstones. (11).

4- References:

1. **Torgerson JS, Lindroos AK & Naslund I et al., (2003)** Gallstones, gall bladder disease and pancreatitis: cross-sectional and 2-year data from the Swedish Obese Subjects (SOS) and SOS reference studies. *Am J Gastroenterol* 98:1032-1041.
2. **Özdaş S, Bozkurt H (25 May 2019).** Factors Affecting the Development of Gallstones Following Laparoscopic Sleeve Gastrectomy.
3. **MacLean LD, Rhode BM, Nohr CW (Apr 2000).** *Ann Surg.* Late outcome of isolated gastric bypass. 231 (4):524-8.
4. **Li VK1, Pulido N, Fajnwaks P, et al (Jul 2009).** Predictors of gallstone formation after bariatric surgery: a multivariate analysis of risk factors comparing gastric bypass, gastric banding, and sleeve gastrectomy.;23(7):1640-4.
5. **Hayoz C1, Hermann T1, Raptis DA2, et al (5 Jul 2018).** Comparison of metabolic outcomes in patients undergoing laparoscopic roux-en-Y gastric bypass versus sleeve gastrectomy - a systematic review and meta-analysis of randomised controlled trials.;148:w14633

6. **Gustafsson U, Benthin L, Granstrom L, et al.** Changes in gallbladder bile composition and crystal detection time in morbidly obese subjects after bariatric surgery. *Hepatology*. 2005;41(6):1322–8.
7. **Attili AF, Carulli N, Roda E, et al.** Epidemiology of gallstone disease in Italy: prevalence data of the Multicenter Italian Study on Cholelithiasis (M.I.COL.). *Am J Epidemiol*. 1995;141(2):158–65.
8. **Everhart JE, Khare M, Hill M, Maurer KR.** Prevalence and ethnic differences in gallbladder disease in the United States. *Gastroenterology*. 1999;117(3):632–9.
9. **Warschkow R, Tarantino I, Ukegini K, Beutner U, Guller U, Schmied BM, et al.** Concomitant cholecystectomy during laparoscopic Roux-en-Y gastric bypass in obese patients is not justified: a meta-analysis. *Obes Surg*. 2013;23(3):397–407.
10. **Hutter, M.M. Schirmer, B.D. Jones, D.B., et al.** First report from the American College of Surgeons Bariatric Surgery Center Network: laparoscopic sleeve gastrectomy has morbidity and effectiveness positioned between the band and the bypass., *Ann. Surg.* 254 (2011) 410–20; discussion 420–2.
11. **Li, Vicky & Pulido, Nestor & Martinez-Duarte, et al. (2009).** Symptomatic gallstones after sleeve gastrectomy. *Surgical endoscopy*. 23. 2488-92. 10.1007/s00464-009-0422-6.
12. **Rubino F, Gagner M, Gentileschi P, Kini S, Fukuyama S, FenDiamond E (2004)** The early effect of the Roux-en-Ygastric bypass on hormones involved in body weight regulation glucose metabolism. *Ann Surg* 240:236–242.
13. **Jones KB Jr (1995)** Simultaneous cholecystectomy: to be or not to be. *Obes Surg* 5:52–54.
14. **Sioka, E., Zacharoulis, D., Zachari, E., Papamargaritis, D., Pinaka, O., Katsogridaki, G., & Tzovaras, G. (2014).** Complicated Gallstones after Laparoscopic Sleeve Gastrectomy. *Journal of Obesity*, 2014, 1–5.
15. **Manatsathit, W., Leelasinjaroen, P., Al-Hamid, H., et al. (2016).** The incidence of cholelithiasis after sleeve gastrectomy and its association with weight loss: A two-centre retrospective cohort study. *International Journal of Surgery*, 30, 13–18.
16. **Stampfer MJ, Maclure KM, Colditz GA, Manson JE, Willett (1992)** Risk of symptomatic gallstones in women with sev Obesity after surgery. *Am J Clin Nutr* 55:652–658.
17. **Jonas E, Marsk R, Rasmussen F, Freedman J. (2010)** Incidence of postoperative gallstone disease after antiobesity surgery:population-based study from Sweden. *Surgery for Obesity and Related Diseases* 6. 2010; 54- 58.

18. **Grover BT, Kothari SN. (2014)** Biliary issues in the bariatric population. *Surg Clin North Am.* 2014; 94: 413-425.
19. **Erlinger, Serge. (2000)** —Gallstones in obesity and weight loss. *European Journal of Gastroenterology & Hepatology* Vol. 12, No. 12, 2000, pp. 1347-52.
20. **Scott DJ, Villegas L & Sims TL et al., (2003)** Intraoperative ultrasound and prophylactic Ursodiol for gallstone prevention following laparoscopic gastric bypass. *Surg Endosc* 2003;17(11):796-802.