

# 1    **Prevalence and Management of Gall Stones In Sleeve Gastrectomy**

## 2    **ABSTRACT**

### 3    **INTRODUCTION :-**

4    Obesity is a public health problem with increased prevalence, recent exciting studies linked **cholelithiasis** to obesity and reduction of weight.  
5    Abdominal Ultrasound is essential preoperative work up to reveal cholelithiasis-related obesity . The objective of this study is to determine the  
6    incidence of cholelithiasis in morbidly obese patients , pre-and post Laparoscopic Sleeve Gastrectomy (LSG) and to evaluate the outcome of  
7    concomitant cholecystectomy when laparoscopic sleeve gastrectomy is combined with cholecystectomy in the same setting .

### 8    **MATERIAL & METHODS :-**

9    This retrospective study was applied on 221 cases of laparoscopic sleeve gastrectomies, performed for morbid obesity in King Abdulaziz  
10    University Hospital , Jeddah, Saudi Arabia , from January 2013 to December 2015.

11    Preoperative preparation including trans-abdominal ultrasound to rule out cholelithiasis was fulfilled. Patients with symptomatic Cholelithiasis  
12    were informed about the possibility of performing combined (concomitant) cholecystectomy with the sleeve gastrectomy.

### 13    **RESULTS :-**

14    33 out of 221 (15%) of the morbidly obese patients , who were admitted for LSG had cholelithiasis , 28/221 (12.7%) were diagnosed  
15    preoperatively , while 5/221 (2.3%) developed it postoperatively .

16    The age of the cholelithiasis group ranges between 19-51 years , with a mean of 37.4 year old. 28 females, 5 males were involved in the study  
17    which represent 85 % , 15% for females and males respectively.

### 18    **CONCLUSION :-**

19    This study illustrated the high incidence of gall stones before sleeve gastrectomy indicates abdominal ultrasound as an essential preoperative  
20    work up, while advised to be done selectively for the symptomatic cases during follow-up period based on the low incidence of postoperative  
21    cholelithiasis . Our study also highlighted the successful management of concomitant cholecystectomy when laparoscopic sleeve gastrectomy is

22 combined with cholecystectomy in the same setting.

23 **KEY WORDS** :- Obesity , Cholelithiasis , sleeve gastrectomy , concomitant cholecystectomy

24 **INTRODUCTION :-**

25 Obesity, a condition that has impact on public health , due to increasing frequency of extreme obesity, the demand for bariatric surgery is  
26 emphasized(1). Recent exciting studies linked cholelithiasis to obesity and reduction of weight. Morbid obesity has a high incidence of gallstone  
27 formation, and it should be routinely ruled out preoperatively with ultrasonography. Rapid weight loss after surgery for the treatment of morbid  
28 obesity is also associated with a high incidence of gallstone formation. (2)

29 The objective of this study is to determine the incidence of cholelithiasis in morbidly obese patients , pre-and post Laparoscopic Sleeve  
30 Gastrectomy (LSG) ,and to evaluate outcome of concomitant cholecystectomy when laparoscopic sleeve gastrectomy is combined with  
31 cholecystectomy in the same setting .

32 **MATERIAL & METHODS**

33 This retrospective study was applied on 221 cases of laparoscopic sleeve gastrectomies, performed for morbid obesity in King Abdulaziz  
34 University Hospital , Jeddah. Saudi Arabia , from January 2013 to December 2015.

35 Preoperative preparation including full blood works, trans-abdominal ultrasound to rule out cholelithiasis and upper Gastro-intestinal endoscopy  
36 were fulfilled. Eligibility for surgery was defined according to the 1991 NIH consensus criteria for bariatric surgery. Patients with symptomatic  
37 Cholelithiasis were informed about the possibility of performing combined (concomitant) cholecystectomy with the bariatric procedure.

38 Vertical Sleeve Gastrectomy was performed by a skilled, well trained laparoscopic surgery team. The mean operative time was estimated for all  
39 cases, in addition to the mean hospital stay period. In-patient medications were only Intra-venous fluids , low molecular weight Heparin and  
40 Proton-pump inhibitor, the latter was prescribed as a home medication after discharge from the hospital for 2 weeks, no Ursodeoxycholic acid  
41 was prescribed according to our protocol. Patients were instructed to come to the out-patient clinic for follow-up at intervals of a week, month, 3,  
42 6 months and also at a year time. The demographic data for each patient, as age, gender and Body Mass Index (BMI) were collected in a data  
43 sheet. Incidence of gall bladder diseases and time between sleeve operation and starting the biliary symptoms were documented. Approval from  
44 the hospital ethical committee was obtained; data was entered and analyzed by SPSS–IBM version 22.

## RESULTS :-

This study included 221 morbidly obese patients , who were admitted in KAUH through the out-patient clinic from January 2013 to December 2015. The age ranges between 18-68 years, with a mean of 34 years old. 144 females, 77 males were involved in the study which represent 65 %, 35% for females and males respectively, the mean BMI was 40.9 KG/m2.

**Table 1 : - Gender distribution of Lap.Sleeve Gastrectomy and Cholelithiasis cases :-**

Total 221 (100%)	Males 77 (35%)	Females 144 (65%)	Sleeve gastrectomy cases
33 (100%)	5(15%)	28(85%)	Cholelithiasis cases

33 out of 221 patients showed cholelithiasis (14.9%) of all sleeve gastrectomies ,the age of those cases with cholelithiasis has ranged between 19-51 years , with a mean of 37.4. As regarding gender, 28/ 33 females and 5/33 males were involved in the study, that represents 85%,15% for female and males respectively .

**Table 2: - Gender distribution of Cholelithiasis cases Pre –and Post LSG :-**

Total 28/33 (84.8%)	Females 23	Males 5	Preoperative Cholelithiasis
5/33 (15.2%)	5	0	Post-perative Cholelithiasis
33 (100%)	28 (85%)	5 (15%)	TOTAL NUMBER OF PATIENTS

28 out of 33 patients of symptomatic cholelithiasis were discovered during the preoperative preparation, 17 of them had undergone

concomitant cholecystectomy and sleeve gastrectomy simultaneously, while 6 cases were deferred to be done later, due to technical difficulties , therefore 5 cases had laparoscopic cholecystectomy before coming to do sleeve gastrectomy , on the other hand another 5 cases developed gall stones postoperatively during follow-up at different intervals.

The mean BMI of cholelithiasis cases was 45.29kg/m. while the mean BMI for the whole group who had sleeve gastrectomy was 45.9 KG/m<sup>2</sup> , p.value 0.55.

The operative time for all cases of sleeve gastrectomy ranged between 106 to 316 minutes , the mean was 143 minutes, while it was prolonged in the concomitant cholecystectomy and sleeve gastrectomy with a range between 115 to 398 minutes(Mean:204 minutes). The hospital stay was 2-3 days for all cases. The period of time between sleeve gastrectomy and cholecystectomy for the patients who developed gall stones has ranged between 5-41 months, mean of 21.7 month, all were done laparoscopically, with no conversion to open or need of ERCP preoperatively.

## **DISCUSSION :**

Obesity has a major concern among physician, due to its large influence on metabolic and hepatic diseases. Cholelithiasis is the primary expression of obesity in the hepatobiliary system(2), and it is a well-recognized complication of rapid weight reduction (3). Obesity and rapid weight loss are major risk factors for the development of cholelithiasis (4), that could be explained by the higher cholesterol saturation of gallbladder bile (5).

Cholelithiasis has a higher significant incidence in the white race, and in women, with no significant differences in age (6), it is considered as an epidemic disorder in Arabian Gulf States, in bariatric surgery the incidence of symptomatic gallstones, and timing of cholecystectomy are still not well established yet(7). The general population has 5% documented incidence of cholelithiasis , while it is significantly high in obese population reaching 45% (9) ,(8). After bariatric surgery, weight reduction is considered to be the only predictive factor to postoperative gallstone formation (2),(10). 35–38% of patients with morbid obesity develop gallstones as they lose weight after bariatric surgery (11),(12).

The significant observation in the literature review, regarding prevalence of gallstones is that, the preoperative cholelithiasis is anticipated in higher incidence than during the postoperative period, due to that finding it should be routinely ruled out preoperatively with trans-abdominal ultrasonography(2).

Preoperative (LSG) gall stones were found at different incidences in literatures ,Li et al(2009) showed 32.2% (13), 31.2% in Sioka et al( 2014) (7), but it was low as 1.8% according to Arias et al (2009) (14), our study showed that (12.7%) had symptomatic gall stones preoperatively.

84 Post Laparoscopic Sleeve Gastrectomy, gall stones had ranged between 3.8 % and 5.8%.(13),(14),(15), (7).therefore, our study illustrated only  
 85 5 out of 221 cases (2.3%) developed cholelithiasis postoperatively , that low incidence can explained by the failure of long post-operative  
 86 follow-up which depends mainly on the patient's compliance , the limitation period of our study .

87 Table -3 :- Difference between incidences of Cholelithiasis Pre- and Post- LSG :-

	<b>Preoperative cholelithiasis</b>	<b>Post-perative cholelithiasis</b>
<b>Li et al , 2009</b>	32.8 %	3.8 %
<b>Sioka et al, 2014</b>	31.2 %	5.8 %
<b>Arias et al, 2009</b>	1.8 %	3.8 %
<b>Uglioni et al , 2009</b>	N/A	3.8 %
<b>Our Study</b>	12.7 %	2.3 %

88 Despite the near results of incidence of post LSG cholelithiasis , thus there is a large debate about the peak incidence of symptomatic gallstones  
 89 and the timing of cholecystectomy which still with controversy(3),according to Deitel and Petrov, the incidence of postoperative symptomatic  
 90 cholelithiasis had peaked at 16 months after bariatric surgery , which is similar to the peak frequency reported earlier by Amaral et al after  
 91 gastric bypass at 16 months as well(11), Miller et al study showed nearly the same figure at 15 months post gastric restrictive procedures (2),  
 92 other studies reported that no patient underwent cholecystectomy earlier than 9 months or later than 23 months after LSG (7) . Our results were  
 93 different as the range was from 5-41 months, mean : 21.75 months.

94 Preventive therapy for gallstone formation in bariatric surgery as medical therapy, or relatively high-fat diet should be practiced , Festi et al  
 95 reported a relatively high-fat intake could prevent gallstone formation, probably by maintaining an effective gallbladder emptying, which could  
 96 counterbalance lithogenic mechanisms acting during weight reduction(5)(16), Erlinger ,Gebhard et al studies had supported that  
 97 trial(17),(18),therefore that higher-fat regimen could lead to failure of the surgical procedure with inadequate weight loss by following the  
 98 relatively high-fat regimen (19)(20) .

99 Ursodeoxycholic acid has been advocated as a preventive measure for the gallstone formation (7), it seems to inhibit the development of biliary  
 100 cholesterol crystals (5). The optimum dose for gallstone prophylaxis appears to be 600 mg/d, or 4 to 5 mg/kg fo 6 months (21)(22), suspension

form which is more preferable than the previously large capsule form of UDCA, which is effective and has few adverse drug reactions (2), but its use has not been very popular yet due to its cost (23). Mc et al, in a meta-analysis, referred to the reduction rate of cholelithiasis formation by the protective use of Ursodiol therapy(24).

The setting of cholecystectomy in relation to LSG as routine , concomitant, or delayed cholecystectomy, remains an ongoing therapeutic dilemma, the published data about them is not illuminating, and relied only on local institution practice (7). A routine synchronous cholecystectomy during bariatric surgery is still recommended by some centers (26), to avoid the presumed technical difficulties during subsequent cholecystectomy (7). In contrast to the opinions favoring routine cholecystectomy, other surgeons only recommend the removal of the gallbladder in the presence of gallstones,(11)(26) justified by the fact of the relatively low incidence of postoperative symptomatic gallstones.

Nowadays, the conservative approach of reserving cholecystectomy only for symptomatic disease offers as a safe modality of treatment (27),(28) , Laparoscopic cholecystectomy(LC) in bariatric patients may be technically challenging and not straightforward procedure due to suboptimal port placement , difficult body habitus and using different approach, in addition to the potential risks of lengthening the operative time, increased morbidity, and prolonged hospital stay (7).

Our experience proved the above mentioned technical difficulties of the concomitant cholecystectomy due to the set-up of the operation , patient habitus that results in prolongation of the operative time , but actually the hospital stay was not affected, with no postoperative complications , among 23 cases of symptomatic cholelithiasis , 17 patients had successful concomitant cholecystectomy with the LSG , while 6 patients were deferred due to technical difficulties and huge hepatomegaly.

On the other hand, the setting of delayed cholecystectomy after LSG has the advantage that the different body habitus and the reduced weight facilitated the subsequent cholecystectomy (7).

Asymptomatic gallstones (silent gallstones) represent a dilemmatic regimen, as the natural history of asymptomatic gallstones may remain asymptomatic (29),(30). Furthermore, recent trend advices that, concomitant cholecystectomy should be considered only in symptomatic gallstones (31).

## **SUMMARY FOR TREATMENT OF CHOLELITHIASIS-ASSOCIATED SLEEVE GASTRECTOMY**

**1- Preventive (No cholelithiasis) :-** Medical :- Ursodeoxycholic acid

Fat-rich diet (needs more studies)

**Surgical :-** Routine cholecystectomy (debatable)

**2- Definitive :- (cholelithiasis) :-** Concomitant / Delayed cholecystectomy

### CONCLUSION :-

Cholelithiasis showed increased prevalence in obesity, It is generally accepted that gallstone formation is correlated with obesity as well as weight loss (2), our study showed that 15% of LSG patients had cholelithiasis , 12.7% were found preoperatively , while 2.3% developed gall stones postoperatively. That higher incidence of gall stones before sleeve gastrectomy indicates abdominal ultrasound as an essential preoperative work up, while it is advised to be done selectively for the symptomatic cases during follow-up. Our study also highlighted the successful management of concomitant cholecystectomy when laparoscopic sleeve gastrectomy is combined with cholecystectomy in the same setting . The preventive measures against gall stone formation, needs more studies .The current policy regarding management of cholelithiasis in LSG of the bariatric patient is not validated needs further evaluation as well (7).Concomitant cholecystectomy if feasible is an excellent choice , otherwise delayed cholecystectomy is the option.

## REFERENCES:-

**1 - Brolin RE.** Update: NIH consensus conference. Gastrointestinal surgery for severe obesity.

*Nutrition.* 1996;12:403–404.

2- Miller K, Hell E, Lang B, and Lengauer E : Gallstone Formation Prophylaxis After Gastric Restrictive Procedures for Weight Loss A Randomized Double-Blind Placebo-Controlled Trial, AnnSurg.2003 Nov; 238(5): 697-702.

3- Bennion LJ, Grundy SM. Risk factors for the development of cholelithiasis in man (second of two parts). *N Engl J Med*. 1992;307:798–

800.

4- Keilani Z M, El Djouzi S, Kuwada T S , Gersin K, Simms C , Stefanidis D: What Are the Incidence and Timing of Cholecystectomy After Bariatric Surgery? Poster Presentations , SAGES Meeting (Society of American Gastroenterology and Endoscopic Surgeons) Program Number: P503, 2012. View at Publisher, View at Google Scholar.

5- Festi D, Colecchia A, Larocca A, et al. Review: low caloric intake and gall-bladder motor function. *Aliment Pharmacol Ther.* 2000;14(Suppl 2):51–53.

6- Shiffman ML<sup>1</sup>, Sugerman HJ, Kellum JM, Brewer WH, Moore EW. Gallstone formation after rapid weight loss: a prospective study in patients undergoing gastric bypass surgery for treatment of morbid obesity. Am J Gastroenterol. 1991 Aug;86(8):1000-5.

7- Sioka E, Zacharoulis D, Zachari E, Papamargaritis D, Pinaka O, Katsogridaki G, and Tzovaras G. Complicated Gallstones After Laparoscopic Sleeve Gastrectomy, *Journal of Obesity*, Volume 2014 (2014),

8- Dittrick G.W, Thompson J. S., Campos D., Bremers D., and Sudan D. “Gallbladder pathology in morbid obesity,” *Obesity Surgery*, vol. 15, no. 2, pp. 238–242, 2005.

9- De Oliveira C. I. B., Chaim E. A., and Da Silva B. B., “Impact of rapid weight reduction on risk of cholelithiasis after bariatric surgery,” *Obesity Surgery*, vol. 13, no. 4, pp. 625–628, 2003.

10- Li V. K., Pulido N., Fajnwaks P., Szomstein S., Rosenthal R., and Martinez- Duartez P. “Predictors of gallstone formation after bariatric surgery: a multivariate analysis of risk factors comparing gastric bypass, gastric banding, and sleeve gastrectomy,” *Surgical Endoscopy*, vol. 23, no. 7, pp. 1640–1644, 2009.

11- Deitel M, Petrov I. Incidence of symptomatic gallstones after bariatric operations.

*Surg Gynecol Obstet.* 1987;164:549–552.

12- Shiffman ML, Sugerman HJ, Kellum JM, et al. Changes in gallbladder bile Composition Following gallstone formation and weight reduction. *Gastroenterology.*1992;103:214–221.

13 - Li V. K. M., Pulido N., Martinez-Suarte P. et al., “Symptomatic gallstones after

Sleeve gastrectomy,” *Surgical Endoscopy*, vol. 23, no. 11, pp. 2488–2492, 2009.



- 171       **14-** Arias E., Martínez P. R., Li V. Ka Ming, Szomstein S., and Rosenthal R. J.,  
172       “Mid-term follow-up after sleeve gastrectomy as a final approach for morbid obesity,” *Obesity Surgery*, vol. 19, no. 5, pp. 544–548,  
173       2009.
- 174       **15-** Uglioni B., Wölnerhanssen B., Peters T., Christoffel-Courtin C., Kern B., and Peterli R., Midterm results of primary vs. secondary  
175       Laparoscopic Sleeve Gastrectomy (LSG) as an isolated operation,” *Obesity Surgery*, vol. 19, no. 4, pp. 401–406, 2009.
- 176       **16-** Festi D, Colecchia A, Orsini M, et al. Gallbladder motility and gallstone formation  
177       In obese patients following very low calorie diets .Use it (fat) to lose it (well). *Int J Obes Relat Metab Disord*. 1998;22:592–600.
- 178       **17-** Erlinger S. Gallstones in obesity and weight loss. *Eur J Gastroenterol Hepatol*.  
179       2000;12:1347 – 1352.
- 180       **18-** Gebhard RL, Prigge WF, Ansel HJ, et al. The role of gallbladder emptying in Gallstone formation during diet-induced rapid weight  
181       loss. *Hepatology*.1996;24:544–548.
- 182       **19-** Hsu LK, Sullivan SP, Benotti PN. Eating disturbances and outcome of gastric  
183       bypass surgery: a pilot study. *Int J Eat Disord*. 1997;21:385–390.
- 184       **20-** Deitel M. Avoidance of weight regain after gastric bypass. *Obes Surg*. 2001;11:474.
- 185       **21-** Shiffman ML, Kaplan GD, Brinkman-Kaplan V, et al. Prophylaxis against gallstone formation with ursodeoxycholic acid in patients  
186       participating in a very-low-calorie diet program.  
187       *Ann Intern Med*. 1995;122:899–905.
- 188       **22-** Sugerman HJ, Brewer WH, Shiffman ML, et al. A multicenter, placebo-controlled, randomized, double-blind, prospective trial of  
189       prophylactic ursodiol for the prevention of gallstone formation following gastric-bypass-induced rapid weight loss. *Am J Surg*. 1995;169:91–  
190       96.
- 191       **23-** Benarroch-Gampel J., Lairson D. R., Boyd C. A., Sheffield K. M., Ho V., and

Riall T. S. “Cost-effectiveness analysis of cholecystectomy during Roux-en-Y gastric bypass For morbid obesity,” *Surgery*, vol. 152, no. 3, pp. 363–375, 2012.

**24-** MC U., Talingdan-Te M. C., Espinosa W. Z., Daez M. L., and Ong J. P.,

“Ursodeoxycholic acid the prevention of gallstone formation after surgery: a meta-analysis,” *Obesity Surgery*, vol. 18, no. 12, pp. 1532–1538, 2008.

**25-** Schmidt JH, Hocking MP, Rout WR, et al. The case for prophylactic

Cholecystectomy concomitant with gastric restriction for morbid obesity.

*Am Surg.* 1988;54:269–272.

**26-** Jones KB Jr. Simultaneous cholecystectomy: to be or not to be. *Obes Surg.* 1995;5:52–54.

**27-** O'Brien P. E. and Dixon J. B., “A rational approach to cholelithiasis In bariatric surgery: Its application to the laparoscopically place adjustable gastric band,” *Archives of Surgery* vol. 138, no. 8, pp. 908–912, 2003.

**28-** Patel J. A., Patel N. A., Piper G. L., Smith III D. E., Malhotra G., and Colella J.J.,

“Perioperative management of cholelithiasis in patients Presenting for laparoscopic Roux-en-Y gastric bypass: have we reached a consensus?” *American Surgeon*, vol. 75, no 6. pp. 470–476, 2009

**29-** Ransohoff D. F. and Gracie W. A. “Treatment of gallstones,” *Annals Of Internal Medicine*, vol. 119, no. 7, part 1, pp. 606–619, 1993.

**30-** Gibney E. J., “Asymptomatic gallstones,” *British Journal of Surgery*, vol. 77, no. 4, pp. 368–372, 1990 .

**31-** Worni M., Guller U., Shah A. et al., “Cholecystectomy concomitant with laparoscopic gastric bypass: a trend analysis of the nationwide inpatient sample from 2001 to 2008,” *Obesity Surgery*, vol. 22, no. 2, pp. 220–229, 2012.