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IMPACT OF BMI ON LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT : Obesity is becoming a global issue and obese patients requiring intervention are increasing. In Basra, Iraq, this study looked at the association between BMI and the clinical result of elective cholecystectomy. According to their BMI, a total of 215 people with gallbladder illness related to gallstones who underwent LC were separated into three groups. A BMI of less than 25.0 kg/m^2 is considered normal, whereas a BMI of 25.0 to 29.9 kg/m^2 is overweight and a BMI of greater than 30.0 kg/m2 is obese. The open process conversion rate was 3.3 percent (7/215). The operational times of the three groups were not significantly different. The obese group, on the other hand, had a longer median time. Real problems were reported in 52 (24.2%) of the patients, with the OB group having a higher rate. Laparoscopic Cholecystectomy is a procedure that can be conducted safely in patients with high BMI without severe adverse results.

Key words : Laparoscopic cholecystectomy, laparoscopic surgery, cholecystectomy.

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INTRODUCTION

Currently, the primary treatment for symptomatic gallbladder disease is laparoscopic cholecystectomy (LP) (Ammori *et al*, 2001; The Southern Surgeons Club, 1991). The principal fact in favor of LC over open cholecystectomy is the advantage of the smaller incision, which reflects on shorter hospital stay and faster regain of activity (Keus *et al*, 2006).

Obesity is one of the most important global health problems, affecting around 310 million people worldwide (Speakman, 2004). In Iraq, the prevalence of OW was 31.3% and Obesity was 23.8% (Mansour *et al*, 2012).

Conventional surgical operations in patients with Obesity are associated with several complications, such as those linked to the respiratory system or risk of thromboembolism, as well as increased surgical site infection rates in addition to problems in progressing to the surgical destination (Obuchi *et al*, 2018).

Also, obesity had previously been considered a risk factor for conversion to open cholecystectomy (Frazee *et al*, 1992) and a relative contraindication to laparoscopic cholecystectomy (Weir and Jan, 2021). The goal of the current paper is to see how BMI affected the outcomes of laparoscopic cholecystectomy procedures and whether we need specific measures to reduce the risk if it is present.

PATIENTS AND METHODS

This is a prospective cohort study performed in Al-Basra Teaching Hospital in the periods from January 2019 to December 2019 involving all patients, who were operated on by the authors of this study.

All consecutive patients with gallstone disease, who were admitted for elective LC were enrolled in this study; informed consent was obtained from each patient enrolled in this study. All patients who need emergency surgery or intervention, pregnancy, those who need more than simple LC due to extra gallbladder disease or pathology, and those with previous hepatobiliary surgery.

The World Health Organization definition (Weir and Jan, 2021) was used to divide the patients according to their BMI values: standard (NR) with BMI <25.0 kg/m^2, overweight (OW) with BMI of 25.0 to 29.9 kg/m^2 and obese (OB) with BMI of 30.0 kg/m^2.

For every patient, the following data were obtained: age, gender, BMI, American Society of Anesthesiologist class (ASA), state of presentation (biliary colic, acute cholecystitis, chronic cholecystitis, or Post ERCP), duration of LC in minutes, liver function test (LFT), white

blood cell count (WBC), type of complications, hospital stay in hours, presence of associated comorbidities, and rate of conversion to open cholecystectomy.

Diagnosis and sorting of the patients were accorded the definitions of biliary diseases (Chung and Duke, 2018). Two patients required ERCP, one for common bile duct dilatation and the other for gallstone pancreatitis.

Complications were discussed as interpretive that related to the surgery itself or postoperative.

All data were transferred to the SPSS software program, version 20 (SPSS Inc. Released 2007, SPSS for Windows, version 20 Chicago) Differences between the groups were considered to be significant, if the P-value was less than 0.05 for data interpretation and statistical analysis.

RESULTS

A total of 215 patients were divided into three subgroups: NR, OW, OB consisted of 52 (82.7% females, 17.3% males), and 45 (80.0% females, 20.0% males), and 118 (81.4% females, 18.6% males), respectively.

Regarding the demographic features of the patients, the obesity group significantly included older patients than the other groups, with a median range of 42 years (Table 1),

There were 42 (19.5%) patients with a BMI ≥ of 40 kg/m^2 and 6 (2.8%) of them were morbidly obese with a BMI ≥ of 50 kg/m^2.

The other patient's features, such as ASA score, mode of presentation, LFT, WBC count, also revealed different distribution but without particular fashion among the three groups.

Diabetes mellitus, alone or associated with hypertension encountered more frequently in the obese group, as shown in Table 1.

Regarding the presentation mode, the higher the BMI, the higher the incidence of biliary colic and acute or chronic cholecystitis. There were 84 (51.2%) patients with biliary colic and 18 (64.2%) patients with chronic cholecystitis and 15 (71.4%) patients with acute cholecystitis in the OB group, while the percentage of biliary colic and chronic cholecystitis were similar in NR and OW groups.

The operational times of the three groups were not significantly different. The obese group, on the other hand, had a higher median time (Table 2).

Total complications were recorded in 52 (24.2%) patients (Table 1), which included procedure-related complications (as biliary tract injury, bleeding and difficult dissection) and others as anesthesia-related complications or less severe complications.

Procedure-related complications in the NR group were biliary tract injury in one patient (1.9%), bleeding in 3 (5.8%) patients, and difficult dissection in five (9.6%) patients.

A forty-two-year-old male with a BMI of 21.6 presented with acute cholecystitis suffered from complete CBD transaction due to obscure anatomy and difficult dissection, immediate conversion to laparotomy was performed, and the patient recovered and was discharged well after nine days.

Three patients developed bleeding because of cystic artery injury during dissection, and all were controlled without the need for conversion. In 5 patients (two females presented with biliary colic and three males, one presented with acute cholecystitis, and two with biliary colic), there were many adhesions creating difficulties in dissection in Calot's triangle mean duration of surgery was 43 minutes.

In the patients of the OW group, one (2.2%) female patient with acute cholecystitis developed bleeding from the liver bed, which was successfully controlled without the need for conversion. There was a problematic dissection in nine (20.0%) patients (5 males and four females) and the mean duration of surgery was 46 min.

While, there were 11 (9.3%) patients who sustained bleeding in the OB group, a female of 40 kg/m2 BMI presented with acute cholecystitis had massive bleeding due to portal vein injury demanded conversion to open surgery for repair. While the other ten patients (7 females and three males) suffered from bleeding due to cystic artery injury in 4 females and three males, the rest three females had liver bed bleeding. All these patients managed successfully without conversion.

In other 11 (9.3%) patients, there was a problematic dissection in 6 females and five males, conversion performed in 6 patients all were males. The duration of surgery was 54 min in the rest.

One female patient in the NR group developed pneumonia postoperatively, and one male patient developed atelectasis in the OW group. In contrast, 9 (7.6%) patients in the OG group, five males and four females, experienced complications and the causes were wound infection in 2 males and one female, atelectasis in 3 males, and two females. One female patient developed heart failure.

The rate of conversion to open procedure was 3.3% (7/215) and the features of patients demanded conversion

Table 1 : Summary of results and their P value results.

Characteristic	NR BMI <25.0 kg/m² (n= 52)	OW BMI=25.0-29.9 kg/m² (n= 45)	OB BMI >30kg/m² (n= 118)	P-value
Age (year) (Median)	35.5	35	42	0.008
Gender:				
Male	9 (17.3%)	9 (20.0%)	22 (18.6%)	0.944
Female	43 (82.7%)	36 (80%)	96 (81.4%)	
ASA class:				
1	39 (75%)	39 (86.7%)	91 (77.1%)	0.583
2	10 (19.2%)	4 (8.9)	17 (14.4%)	
3	3 (5.8%)	2 (4.4%)	10 (8.5%)	
Presentation:				
a. Biliary colic	42 (80.8%)	38 (84.4%)	84 (71.2%)	0.613
b. Acute cholecystitis	4 (7.7%)	2 (4.4%)	15 (12.7%)	
c. Chronic cholecystitis	5 (9.6%)	5 (11.1%)	18 (15.3%)	
d. Post ERCP	1 (1.9%)	0 (0.0%)	1 (0.8%)	
Duration of surgery (min.)(Median)	35	35	40	0.251
LFT:				
a. Normal	51 (98.1%)	43 (95.6%)	116 (98.3%)	0.610
b. Elevated Bilirubin	1 (1.9%)	2 (4.4%)	2 (1.7%)	
WBC count (Median)	5950.0	6700.0	7000.0	0.235
Complications:				
a. Difficult dissection	5 (9.6%)	9 (20.0%)	11 (9.3%)	0.166
b. Bleeding	3 (5.8%)	1 (2.2%)	11 (9.3%)	
c. Biliary tract injury	1 (1.9%)	0 (0.0%)	0 (0.0%)	
d. Postop. complications	1(1.9%)	1(2.2%)	9(7.6%)	
Conversion	1 (1.9%)	0 (0.0%)	6(5.1%)	0.064
Hospital stay (hour) (Median)	24	24	24	0.655
Associated diseases:				
a. Diabetes mellitus	41 (78.8%)	42 (93.3%)	95 (80.5%)	0.075
b. Hypertension	0 (0.0%)	1 (2.2%)	6 (5.1%)	
c. Sickle cell disease	4 (7.7%)	0 (0.0%)	6 (5.1%)	
d. Diabetes mellitus and hypertension	3 (5.8%)	0 (0.0%)	0 (0.0%)	
e. Others	3 (5.8%) 1 (1.9%)	2 (4.4%) 0 (0.0%)	10 (8.5%) 1 (0.8%)	

Table 2 : Operating time.

Group	Operating time in min.		
	30 ≤	> 30 to ≤ 60	< 60 to 140
NO	17	34	1
OW	12	29	4
OB	33	70	15
Total	62	133	20

summarized in Table 3, one male patient with acute cholecystitis was in the NR group and six patients (5 males and one female) were in the OB group and all except one patient were presented with acute cholecystitis.

DISCUSSION

Overweight and obesity are becoming more common, and their health consequences are a major public health problem around the world (Al-Hanawi *et al*, 2020) and as a result, the number of patients with excess weight

Table 3 : Patients needed conversion.

BMIG	Gender	Age	BMI	Presentation	Complication	ASA	Comorbidities
NR	Male	42	21.6	ac.cholecytitis	obscure anatomy	1	
OB	Male	67	32	ac.cholecytitis	obscure anatomy	3	DM,HYP
OB	Male	56	32	biliary colic	obscure anatomy	2	DM
OB	Male	45	37	ac.cholecytitis	obscure anatomy	2	HYP
OB	Female	32	40	ac.cholecytitis	bleeding	1	
OB	Male	39	41	ac.cholecytitis	obscure anatomy	1	
OB	Male	73	43	ac.cholecytitis	obscure anatomy	3	DM,HYP

requiring intervention or surgery increases. Therefore, it is essential to know the outcome of operations performed on such patients and compare them to those performed on patients who do not suffer from overweight or obesity.

A significant correlation between age and BMI and our age-related results are consistent with previous studies indicating weight gain in adults, especially in the 20 to 40 age group (Reas *et al*, 2007; Bahrain Medical Bulletin, 2002) (Table 1).

Gender, mode of presentation, WBC count, and LFT were different between the three groups. However, there were no clear trends in favor of a higher BMI in any group

Although it is known that obesity is associated, in addition to gall bladder disease, with other comorbidities like diabetes, cardiovascular disease, pulmonary complication and more (Pi-Sunyer, 2009; Yeom *et al*, 2019).

Our results showed a marginally significant difference of 0.075 between the groups, which may be due to our sample size. In the OB, there were 22(19%) patients with hypertension or diabetes (hypertension in 6 patients, diabetes in 6 patients, and both diseases seen in 10 patients).

It was suggested that the operative time increases with BMI (Nies *et al*, 1994; Chang *et al*, 2009; Tandon *et al*, 1994) because of difficulties in developing pneumoperitoneum and dissection of Calot's triangle. However, our series showed no statistically significant difference, although there was a longer median operative time in the obese group, and our result mimics that reached by Gliattli *et al* (1994).

The encountered intraoperative, postoperative complications showed no significant differences between the groups, although there were relatively more complications in the OB group, and this correlates with other studies that ascertained the safety of LC in obese patients (Chang *et al*, 2009).

The postoperative stay was similar in the three groups.

Our conversion rate was 3.3%, similar to others (Dunphy *et al*, 2017) and favorably compared to other results (Pajanen *et al*, 2012).

CONCLUSION

BMI is not a contraindication for Laparoscopic Cholecystectomy, which can be safely performed in patients with high BMI without severe adverse results.

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Author's contributions

M. A. Abdulla, S. K. Muslim and A.Z. Khalaf contributed to the design and implementation of the research, the analysis of the results, and the writing of the manuscript.

Declaration of conflicting interests

The authors declare no conflict of interest.

Patient consent and research ethics

The research strategy follows the 1975 Declaration of Helsinki's ethical criteria (6th revision, 2008). The ethical committees of the Training and Human Development Center of the Al-Health Directorate approved the study in 12-8-2020 numbers 301. All of the participants signed a written informed consent form.

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Yeom J, Kim J K and Crimmins E M (2009) Factors associated with Body Mass Index (BMI) Among Older Adults: A comparison study of the U.S., Japan and Korea. *Hanguk Nonyonhak* 2009; Consequences of obesity in the elderly. Obesity, in general, increases the risk of developing coronary heart disease [14], hypertension [15], diabetes [16], and obstructive sleep apnea [17], and has been linked to certain cancers [4], reduced life expectancy [18], and increased risk of premature mortality. *Hanguk Nonyonhak* **9**(4), 1479-1500.