ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 03 | March - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

THE IMPACT OF BODY MASS INDEX ON SEVERITY OF ACUTE CALCULOUS CHOLECYSTITIS

General Surgery

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ABSTRACT

INTRODUCTION: Acute Calculous cholecystitis(ACC) represents >90% of all cases of acute cholecystitis and accounts for 3–11% of hospital admissions. Obesity is defined as global epidemic by WHO. Obesity is an established risk factor for the cholesterol gallstone and subsequent cholecystectomy. Despite many reports on association of body-weight to gallstone disease, the effect of body-weight in severity of the cholecystitis has been rarely reported. Hence, this study was undertaken to assess the severity of association between the body mass index and severity of acute Calculous cholecystitis.

OBJECTIVES:

1. To compare the association of obesity with severity of acute cholecystitis.
2. To study the associated pathological changes in the gall-bladder.

METHODOLOGY: A cross-sectional study was carried out over a period of 18months from October2019-July2021 in the department of general-surgery, Bapuji Hospital, Chigateri General Hospital, Davangere among 50 obese-patients with acute cholecystitis along with obesity(BMI >25kg/sq.mt) undergoing cholecystectomy. The data analysis was done using IBM statistical-package for social sciences(IBM SPSS). **RESULTS:** The mean age of the study population was 45.22±9.25yrs. The mean BMI of the patients was 29.85±2.76 Kg/sq.mt. 56% were overweight, 38% were obese classI and 6% were obese classII. Based on Tokyo guidelines2013 on acute cholecystitis in the present study 32% had GradeI (mild), 54% had GradeII (moderate) and 14% cases had GradeIII (severe) cholecystitis. There was a statistical significant association between BMI and severity of cholecystitis with more severe cases with increased BMI. Among 50cases posted for laparoscopic-cholecystectomy 18%cases were converted to open-cholecystectomy. **CONCLUSION:** Obesity is a documented risk factor for the formation of gall-stone and BMI is used as a tool to measure obesity. In our study we found a positive association of body mass index and severity of acute CALCULOUS cholecystitis.

KEYWORDS

Acute Calculous cholecystitis, Cholecystitis, Obesity, Gall bladder.

INTRODUCTION:

Gallstones are common biliary-tract pathology presenting to a surgeon. Although most patients with gallstones remain asymptomatic for long period, 1-4% of those patients per year suffer biliary colics.[1,2] ACC eventually may develop in about 20% of those symptomatic patients if left untreated. Around 60% of patients with ACC are women; however, ACC develops more frequently in men and tends to be more severe.[3]

ACC accounts for 3–11% of hospital admissions and carries a mortality of about 0.8%.[4] ACC represents >90% of all cases of acute cholecystitis, the remaining include aCalculous, xanthogranulomatous, and other variations of acute cholecystitis.

Obesity is becoming the leading metabolic disease in the world and is defined as global epidemic by WHO. Body Mass Index is the most widely used indicator for the obesity.

The main risk factor for the gall-stones include obesity, oral contraceptive pills, pregnancy, hereditary, diabetes-mellitus, dyslipidemia, drugs, rapid weight loss etc.[5]

Obesity is often well-established risk factor for the cholesterol gallstone and subsequent cholecystectomy.[6] The increased cholesterol synthesis or secretion associated with glucose intolerance and insulin resistance. Gall bladder hypomotility secondary to obesity or autonomic neuropathy has also been proposed as one of the mechanisms.[7]

According to the Tokyo Guidelines 2013,[8] the diagnostic criteria based on the following:

(a) Local signs of inflammation:Murphy-sign, right upper quadrant mass/pain or tenderness.
(b) Systemic signs of inflammation:Fever, elevated protein C, elevated WBC
(c) Imaging findings, characteristic of acute cholecystitis.

METHODOLOGY:

After obtaining IEC clearance Cross-sectional study, carried out over a period of 18 months from October 2019 to July 2021 in 50 obese patients with ACC in Department of General Surgery, Bapuji Hospital, Chigateri General Hospital, attached to J.J.M. Medical College, Davangere.

Inclusion Criteria:

- Patients with acute Calculous cholecystitis along with obesity (BMI >25Kg/m^2)
- Patients of all ages and both sexes

Exclusion Criteria:

- Patients with acalculous cholecystitis.
- Patients with complications of cholecystitis viz. CBD stones, gallstone pancreatitis, septic complications.

All the patients underwent routine investigations, BMI was calculated using the formula after checking the weight and height of the patients. WHO BMI classification applied.

- Overweight –BMI ≥ 25-29.9 kg/sq.mt. Obesity –BMI ≥ 30 kg/ sq.mt
- Obesity classI –BMI 30 to 34.9 kg/ sq.mt
- Obesity classII –BMI 35 to 39.9 kg/ sq.mt
- Obesity classIII –BMI ≥ 40 kg/ sq.mt

Based on the findings and lab investigations Severity of acute cholecystitis is classified into 3 grades based on TOKYO guidelines 2013 on ACC:

Gradeiii (severe) Cholecystitis:
Associated With Dysfunction Of Any One Of The Following Organs/systems:
-Cardiovascular dysfunction(hypotension requiring treatment with dopamine ≥5µg/kg per min, or any dose of norepinephrine)
-Neurological dysfunction(decreased level of consciousness)
-Respiratory dysfunction (PaO2/FiO2 ratio <300)
-Renal dysfunction(oliguria, creatinine>2.0mg/dl)

-Hepatic dysfunction(PT-INR>1.5)
-Hematological dysfunction(platelet count<100,000/mm3).

Grade Ii(moderate) Cholecystitis:
Associated With Any One Of The Following:
- Elevated Wbc (>18000/mm^3)
-Palpable tender mass in the right upper-quadrant
-Duration of complaints >72hours
-Marked local inflammation(gangrenous-cholecystitis, pericholecystic abscess, hepatic abscess, biliary peritonitis, emphysematous cholecystitis).

Gradei (mild) Cholecystitis:
Does not meet the criteria of GradeIII/Grade II cholecystitis. It can also be defined as acute-cholecystitis in a healthy patient with no organ dysfunction and mild inflammatory changes in the gallbladder, making cholecystectomy a safe and low-risk operative procedure.

Sample Size Estimation:
Based on previous studies, for the present study the prevalence of cholecystitis was taken at 3%
Estimated prevalence (p) = 3%
Confidence interval (CI) = 95%
Absolute precision (d) = 5%
Using the standard formula for proportion = $[(Z_{\alpha/2})^2 \times p \times q] / d^2$
Sample size (n) = $(Z_{\alpha/2})^2 \times p \times (1-p) / d^2$
= $(1.96 \times 1.96) \times 3 \times 97 / 5 \times 5$
= $1117.9 / 25 = 44.7$

Taking Additional 10% Cases, The Final Sample Size For The Present Study Was Rounded To 50
Data collected was entered into MS-Excel 2013 spreadsheet. The collected data was analyzed using IBM statistical package for social sciences(IBM SPSS) version-23 softwar (trail-version).

Continuous variables were reported as mean±standard deviation(SD) while categorical variables was expressed as absolute values and percentages.

Chi-square test was applied to find the significant difference between two groups and P-value less than 0.05 was considered statistically significant.

Intra- OP Pictures:

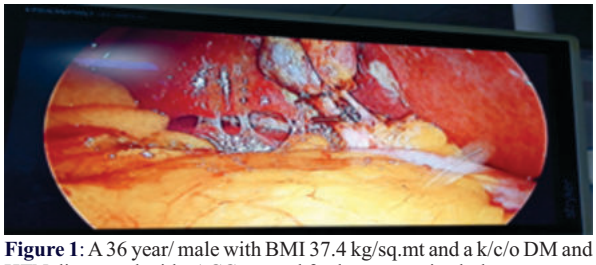

Figure 1: A 36 year/ male with BMI 37.4 kg/sq.mt and a k/c/o DM and HTN diagnosed with ACC, posted for laparoscopic cholecystectomy and intraoperatively severe adhesions were present and the lap was done successfully with no post-op complications.

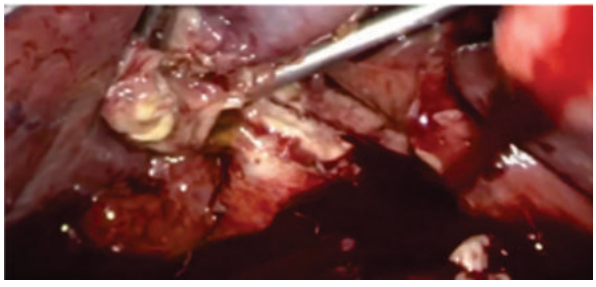

Figure 2: A 45 year/female with BMI 28.7 kg/sq.mt and a k/c/o DM diagnosed with ACC,posted for laparoscopic cholecystectomy. Empyema gall bladder was noted hence, later converted to open cholecystectomy.

RESULTS:
The mean age of the study population was 45.22±9.25 yrs.
Male to female ratio in the study was 1:1.38.

Table 1 : Distribution Of The Study Population Based On Body Mass Index:

Body Mass Index (Kg/mt2)		No of cases	Percentage
Overweight	25.0– 29.9	28	56%
Obese ClassI	30.0– 34.9	19	38%
Obese ClassII	35.0– 39.9	3	6%
Total		50	100%

The mean BMI of the patients was 29.85 ± 2.76 Kg/sq.mt. 56% were overweight, 38% were obese class I and 6% were Obese class II.

Table2: Distribution Of Patients Based On Severity Of Cholecystitis:

	No of cases	Percentage
Mild ACC	16	32%
Moderate ACC	27	54%
Severe ACC	7	14%
Total	50	100%

Based on Tokyo guidelines 2013 on ACC in the present study 32% had Grade I (mild), 54% had GradeII (moderate) and 14cases had GradeIII (severe)cholecystitis.

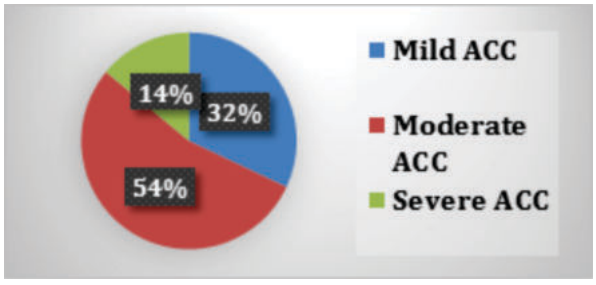

Figure3: Pie chart of severity of ACC:

Table3: Association between body mass index and severity of cholecystitis

BMI (Kg/mt2)	Mild ACC	Moderate ACC	Severe ACC
Overweight	12 (70.6%)	15 (57.7%)	1 (14.3%)
Obese classI	5 (29.4%)	10 (38.5%)	4 (57.1%)
Obese classII	0	1 (3.8%)	2 (28.6%)
Total	17 (100%)	26 (100%)	7 (100%)
Chi-square =11.006, p – value =0.026(Sig.)			

In mild cholecystitis cases, 70.6% were overweight and 29.4% were obese class I. In moderate cholecystitis cases, 57.7% were overweight, 38.5% were obese class I and 3.8% were obese class II. In severe cholecystitis cases, 14.3% were overweight, 57.1% were obese class I and 28.6% were obese class II. There was a statistical significant association between BMI and severity of cholecystitis.

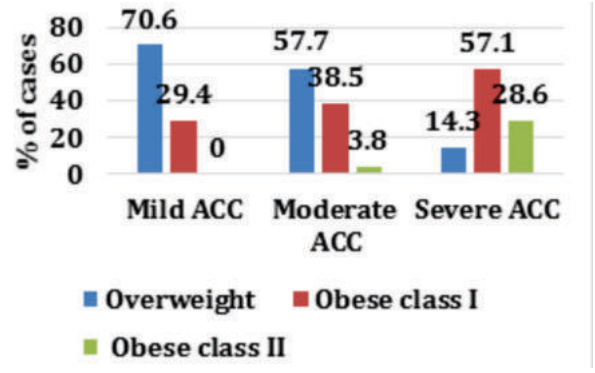

Figure 4: Bar graph showing association between BMI and severity of cholecystitis:

Among 50cases posted for laparoscopic-cholecystectomy 18% cases were converted to open-cholecystectomy. In the present study 4% had surgical site infections, 2% cases had port-hernia and 2% had urinary complications post-operatively.

Pathological Changes In Gallbladder:
Gallbladder size was normal in 32%, enlarged in 56%, and fibrotic in 12% of the specimens. The gallbladder wall thickness was <3mm in

44% and >3mm in 56% cases. On microscopic evaluation,the majority of cases had chronic inflammation, of which acute on chronic cholecystitis was predominant comprising 74%. In 22% of cases there was acute cholecystitis with cholelithiasis and chronic cholecystitis with metaplasia was seen in 4% cases.

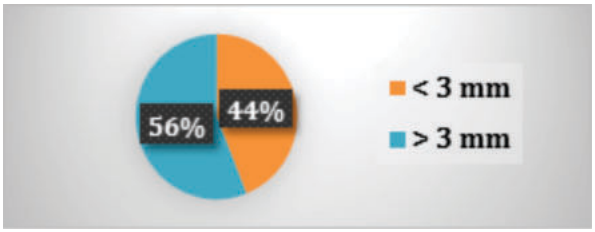

Figure 5: Pie chart -GB wall thickness:

DISCUSSION:

The mean BMI of the patients was 29.85±2.76 Kg/sq.mt. Similar to the study by Diaz-Rosales JD et al.,[10] where the mean BMI of study population was 31.8±6.1 kg/sq.mt. Enami Y et al.,[9] had reported that the mean BMI of obese cases was 28.2±3.2 kg/sq.mt.

Based on Tokyo guidelines2013 on acute cholecystitis in the present study 32% had GradeI(mild) cholecystitis, 54% had GradeII(moderate) and 14% had GradeIII(severe) cholecystitis. A study by Shrestha BB et al.,[11] reported that in obese cases, 23.3% had Grade I (mild) cholecystitis, 30% had Grade II (moderate) cholecystitis and 46.7% cases had Grade III (severe) cholecystitis.

In contrast, Lee HK et al.,[12] had found that there was no significant association between BMI and the severity of cholecystitis. Chauhan VV et al.,[101] had also reported that there was no significant association between BMI and the severity of cholecystitis. This contrast results may be due to the fact that other lithogenic conditions like diabetes mellitus, hyperlipidaemia which was high in the present study when compared to other studies who found no association between BMI and the severity of cholecystitis.

Limitations:

-This is a clinical observational study, so larger sample size will be required to assess the influence of body weight and obesity on severity of cholecystitis.

-Comparison with non-obese patients /general population was not done in our study.

CONCLUSION:

Obesity is a documented risk factor for the formation of gall stone and BMI is used as a tool to measure the body fatness or obesity. In our study we found a positive association of body mass index and severity of acute Calculous cholecystitis.

List Of Abbreviations:

ACC- Acute Calculous cholecystitis
BMI- Body mass index
GB- Gallbladder
WHO- World health organization

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