

**FULL PAPER**

# Evaluation of acute calculus cholecystitis in relation to calcium, body mass index and lipid profile in sample of Iraqi women

Mina Mohamed<sup>a</sup> | Mohamed A.M. Albayati<sup>a</sup> | Mohamed A. Hamdawi<sup>b</sup><sup>a</sup>Department of Chemistry and Biochemistry, College of Medicine, Al-Nahrain University, Baghdad, Iraq<sup>b</sup>Department of Surgery, College of Medicine, Al-Nahrain University, Baghdad, Iraq

Gallstones are a widespread disease in many parts of the world, with an incidence rate of around 20%. Gallstones are more common among women of reproductive age than in men; the gap narrows after menopause, notably in fatty, fertile, forty-year-old women. Gallstones are unexpected before the age of twenty, but they can arise within people of different ages. Several more cases go undiagnosed because they really should not show any evidence or symptoms and can only be discovered by abdominal ultrasonography at random. This research focuses on whether there is a link between BMI and Calcium, Lipid Profile as Cholecystitis risk factors. A case-control study was carried in Baghdad between the beginning of March and the end of August 2021. In this study, 90 people were enrolled, although only 60 were diagnosed with Cholecystitis. Data were acquired employing a questionnaire from all patients attending a private ultrasonography clinic with various complaints. There was a highly significant statistical relation (P - value 0.001) between body mass index mean in Calculus Cholecystitis cases (30.07±5.26) and Acalculous Cholecystitis cases (29.02 ± 3.10), according to the findings. According to the findings, having a BMI of more than 25 is a decisive risk factor for gallstones. There is a connection between BMI and Acute Cholecystitis (Calculous Cholecystitis/ Acalculous). There is a significant increase in serum calcium in patients with Calculous and Acalculous Cholecystitis compared to controls, suggesting that serum calcium might be used as a biomarker for the disorder in Cholecystitis patients.

**\*Corresponding Author:**

Mina Mohamed

Email: [mena9455@gmail.com](mailto:mena9455@gmail.com)

Tel.: +009652806704

**KEYWORDS**

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**Introduction**

The most common effect is gallbladder inflammation (Cholecystitis), which arises in 10% of symptomatic cases. Right upper quadrant discomfort is common among patients with acute cholecystitis. Anorexia, nausea and vomiting are all possible complications. A 79 percent to 96 percent specificity for acute Cholecystitis is the

Murphy sign (inspiratory arrest on deep probing of the right upper quadrant). Fever, an elevated white blood cell count, and an elevated C-reactive protein are all inflammatory response indicators that are closely linked to acute Cholecystitis (Hirota M. *et al.*, 2017 and Miura F. *et al.*, 2017). Gallstones are associated with numerous well risk factors, including the patient's sexuality (primarily female) and age (the rate of

occurrence rises with age (Stender S, 2013). The estrogen hormone, which stimulates the secretion of even more cholesterol into the bile, may also have figured prominently in women who have suffered these periods at a higher rate (Radmard AR. 2015 and Reshetnyak. 2012) because obesity is also taken into account. Another risk factor, much as the hereditary component, The disease's occurrence is determined by the family's medical history of gallstones and many other health conditions such as rapid weight loss, pregnancy, and diabetes (Aslam HM. 2013).

## Results

The study included 90 patients, 60 of whom were cases, 29 labeled as Calculous Cholecystitis, and 31 with Acalculous Cholecystitis, while the ultrasonic examination results of the other 30 patients were normal. (Restraint) All of the patients were ladies above 18; the oldest patient was 70 years old. In both types of gallstone disease, Calculous ( $30.07 \pm 5.26$ ) and Acalculous ( $29.02 \pm 3.10$ ), there is a highly significant statistical association between BMI mean and Control ( $25.25 \pm 2.70$ ). Table 1 reveals the mean and standard deviation of body mass index (BMI) in Calculus Cholecystitis patients and patients with A Calculus cholecystitis.

**TABLE 1** Frequency table and Chi-Square tests testing the relationships of calcium status against groups

Subjects	BMI mean	BMI stander deviation	P value
Calculous Cholecystitis	30.07	5.26	<0.001
Acalculous Cholecystitis	29.02	3.10	
Control	25.25	2.70	

Calcium status in the study groups

**TABLE 2** Frequency table and Chi-square tests testing the relationships of calcium status against groups

	Variable	Calculous	Acalculous	Control
Calcium Status	High	17 (59%)	16 (52%)	2 (7%)
	Normal	2 (7%)	6 (19%)	13 (43%)
	Low	10 (34%)	9 (29%)	15 (50%)
	Total	29 (100%)	31 (100%)	30 (100%)

<sup>a</sup>Chi-square test of independence was used see if Calcium calciumstatus and group were independent. Calcium status had three levels: high, normal, and low. Calculous, Acalculous, and Control were the three levels in the group.

The Chi-square test revealed a significant relationship between Calcium Status and group, with an alpha value of 0.05,  $2(4) = 22.81$ ,  $p.001$ , implying that they are related. The high calcium status was higher than the expected values in Calculous and Acalculous groups, while normal and low calcium states were higher than the expected values in Controls.

The observed values for the following level combinations were smaller than expected. Normal calcium: (Calculous) and (Acalculous), low calcium:(Calculous) and (Acalculous), and high calcium status :(control). Table 3 presents the results of the Chi-square test.

**TABLE 3** Contingency Table with Chi-square Test of Independence for Calcium Status and group

N = 90 Calcium Status	Group		
	Calculous = 29	Acalculous = 31	Control = 30
<b>High Calcium</b>			
Observed Count	17.000	16.000	2.000
Expected Count	11.278	12.056	11.667
Chi-square Contribution	2.903	1.291	8.010
<b>Normal Calcium</b>			
Observed Count	2.000	6.000	13.000
Expected Count	6.767	7.233	7.000
Chi-square Contribution	3.358	0.210	5.143
<b>Low Calcium</b>			
Observed Count	10.000	9.000	15.000
Expected Count	10.956	11.711	11.333
Chi-square Contribution	0.083	0.628	1.186

Chi-square test of Independence Results:  $\chi^2 = 22.812$ ,  $df = 4$ ,  $p = 0.00014$ , Cramér's  $V = 0.356$

The level of high sensitivity CRP was much high in women with Calculous and Acalculous Cholecystitis ( $9.92 \pm 6.59$  mg/L) and ( $9.81 \pm 6.66$  mg/L) compared with the control group ( $1.94 \pm 1.15$  mg/L) (P value 0.001).

HDL-C concentrations in patients with calculous and acalculous cholecystitis were ( $35.28 \pm 9.54$  mg/dl) and ( $35.81 \pm 7.92$  mg/dl) respectively, compared with the control group ( $40.47 \pm 10.33$  mg/dl) with (P value = 0.071). However, there is a notable change in cholesterol levels among Calculous Cholecystitis and Acalculous Cholecystitis (p value 0.001) and average value ( $238.72 \pm 24.12$  mg/dl,  $198.24 \pm 50.06$  mg/dl,  $139.90 \pm 28.33$  mg/dl) and average value ( $228.65 \pm 33.09$  mg/dl,  $192.58 \pm 49.71$  mg/dl,  $159.00 \pm 35.33$  mg/dl)

## Discussion

Acute cholecystitis results from obstruction of the cystic duct, usually by a gallstone, followed by distension and subsequent chemical or bacterial inflammation of the gallbladder. People with acute Cholecystitis usually have unremitting right upper quadrant pain, anorexia, nausea, vomiting, and fever. Around 95% of people with acute Cholecystitis have gallstones (calculous Cholecystitis), and 5% lack gallstones (acalculous Cholecystitis). Severe acute

Cholecystitis may lead to necrosis of the gallbladder wall, known as gangrenous Cholecystitis (Indar AA *et al.*, 2012).

### *Demographic and clinical characteristics of the study groups*

The range of age for this study was (18-60) years old for three study groups Calculous, Acalculous, and Control, and the result showed a significant difference between study groups the mean. Standard deviation of the age for Calculous, Acalculous and Control are ( $46.86 \pm 10.82$  years), ( $47.55 \pm 11.38$  years), ( $30.90 \pm 8.43$  years) year respectively with (p-value > 0.001), which is very comparable to study by (Nakajima *et al.*, 2012) also showed there is a significant difference between study groups in an age in another study by (Bertoloti *et al.*, 2014).

The result of BMI in this study groups showed that's there is a significant difference the mean and standard deviation of BMI for Calculous, Acalculous and Control are ( $30.07 \pm 5.26$  kg/m<sup>2</sup>), ( $29.02 \pm 3.10$  kg/m<sup>2</sup>), ( $25.25 \pm 2.70$  kg/m<sup>2</sup>) with (pvalue > 0.001) This result showed BMI is higher in Calculous and Acalculous than Control's BMI which is the normal BMI is (18.50-24.99 Kg/m<sup>2</sup>). These results agree with study result that done by also another study by (Chen *et al.*, 2019) showed the same

result for BMI, when BMI is more than an optimal range that's mean individual is may be overweight or obese and also obesity include three grade, the obesity lead to metabolic syndrome and as we know is one of the risk factors of Acute Cholecystitis (polyzos *et al.*, 2020).

The waist circumference result shows there is a significant difference between the three study groups Calculous, Acalculous and Control so, the mean and standard deviation are (90.69±10.73 cm), (88.65±6.47 cm), (81.53±7.49 cm) with p-value>0.001 the result shows that the Calculous and Acalculous have wider waist circumference than the control group and this result agree with study done by (Khang *et al.*, 2019) that the comparable result and also agree with another study by (Tayyem *et al.*, 2019).

#### *Evaluation of serum level of calcium*

Calcium is a principal constituent of both cholesterol-rich and non-cholesterol-rich gallstone; surprisingly little is known about factors controlling biliary calcium level. In current study show there was a significant difference in serum level of Calcium was higher in patients with Calculous and Acalculous than those with Control

#### *Level of lipid profile in study groups: cholesterol*

The mean and standard deviation of total cholesterol in study groups Calculous, Acalculous and Control were (238.72±24.12 mg/dl), (228.65±33.09 mg/dl), (110.47±18.41 mg/dl) respectively with p-value >0.001 that shows there is a significant difference between groups, total cholesterol show an evaluation in a patient with Calculous and Acalculous in compared with a control group. This study revealed that high levels of total cholesterol were associated with increased Calculous and Acalculous risk, which agree with the finding of the significant association between the high levels of T.

Cholesterol and calculous risk may be attributed to differences in fat metabolism study done by (Min *et al.*, 2012), the current study provides evidence for widespread abnormalities in cholesterol homeostatic pathways in calculous. As those patients had an overall lipid profile increases. In particular, TC is highly influenced by the increased fat content of the Gallbladder

#### *Triglyceride*

The mean and standard deviation for triglyceride in three study groups Calculous, Acalculous and Control were (198.24±50.06 mg/dl), (192.58±49.71 mg/dl), (109.57±25.64 mg/dl) respectively, with p-value(> 0.001) in the current work serum triglyceride in Calculous and Acalculous were higher than the Control this result comparable with study by (Tokyo Guidelines (TG), known at that time as Tokyo Guidelines 2013 (TG13))

#### *High Density Lipoprotein-C (HDL-C)*

Present observations indicate that patientsCs with Calculus and Acalculous have significantly lower concentration of HDL-C than control Control, as seen inTable 3-5. A few studies have, however directly shown the relationship of HDL-C to Calculous, Acalculous, were have mean and standard deviation in three study groups (35.28±9.54 g/l), (35.81±7.92 g/l), (40.47±10.33 g/l) respectively. The present observations showed that low HDL-C levels might be associated with an increased risk of Calculus Cholecystitis are in line with the hypothesis that high HDL-C levels may extract a protective effect. Cholesterol back to liver by HDL-C through arteries for re-utilization and excretion. It is therefore credible that as total cholesterol levels increase, potentially stimulating increases in HDL-C levels, Calculus Cholecystitis risk subsequently decreases and vice versa. This is comparable with a study by (Airaghi *et al.*, 2017)

### Low Density Lipoprotein-C (LDL-C)

The mean and standard deviation for low-density lipoprotein in study groups Calculous and Acalculous and Control were (139.90±28.33 mg/dl), (159.00±35.33 mg/dl), (74.97±21.09 mg/dl) respectively, that show level of LDL-C elevated in Calculous and Acalculous compared with Control. Calculous Cholecystitis is linked closely to Metabolic Syndrome, which may partially explain why an elevated level of LDL-C appears to significantly increase the risk of Calculous Cholecystitis. (Sun *et al.*, 2016)

### Conclusion

We concluded that; The level of Serum Calcium can be used as a screening marker in women at high risk of cholecystitis being high in patients with cholecystitis than normal (Control) this may aid early detection of asymptomatic Cholecystitis, and there is a significant association between body mass index and Acute Cholecystitis regardless of stone development

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