

Cholecystitis with Special Reference to Cholelithiasis: A Clinical Study

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Abstract: *Acute cholecystitis (AC) is often associated with gall stones. Accurate diagnosis of cholecystitis requires a multifactorial, systematic approach. Objectives:* The aim of the present study was to describe epidemiology, modes of clinical presentation, diagnostic tools and intraoperative findings of symptomatic acute cholecystitis. **Methods:** The present prospective observational study was conducted on 40 patients with symptoms of acute cholecystitis. A detailed clinical history and physical examination was recorded. **Hematological and biochemical studies along with abdominal ultrasonography and laparoscopic cholecystectomy were conducted. Results and Discussion:** Maximum incidence was observed in the female consuming vegetarian diet. Physical examination revealed tenderness in right hypochondrium, pain in epigastric region followed by dyspepsia, positive Murphy's sign and palpable gall bladder. Anemia was observed in 7.5% female patients of acute cholecystitis and 11% leukocytosis without fever. Deranged SGPT and SGOT were observed in 22.5% and 37.5% respectively and 10% higher alkaline phosphatase. The abdominal ultrasonography revealed multiple stones in the lumen of gall bladder in 82.5% cases and in neck of gall bladder. Histopathology report showed 80% Acute calculous cholecystitis, 15% chronic calculous cholecystitis and 5% Acute acalculous cholecystitis. **Conclusions:** Higher incidence of acute cholecystitis associated with cholelithiasis was observed in females consuming vegetarian diet. Diagnosis of cholelithiasis can be achieved through various ancillary techniques.

Keywords: Acute cholecystitis, Clinicopathological findings, Cholelithiasis, Laparoscopic Cholecystectomy

1. Introduction

Cholecystitis is the inflammation of the gall bladder (GB), which is a commonly encountered recurrent disease of hepatobiliary system. Acute cholecystitis (AC) is a common reason for abdominal emergency, often associated with gall stones and urgent surgical intervention is often needed to reduce serious morbidity and mortality⁽¹⁾. AC is responsible for acute abdominal pain in 10% cases and females are most commonly affected⁽²⁾. Acute Cholecystitis is divided into acute calculous and acute acalculous cholecystitis. Acalculous cholecystitis occur without stone formation and more than 90% of cases of AC are due to cholelithiasis and 5 - 15% cases of acalculous cholecystitis occur of all cases of AC⁽³⁾. Impaired metabolism of cholesterol, bilirubin, bile acid as well as impaired gallbladder functions like motility, contraction and impaired reabsorption in the bowel is associated with the formation of gallstones in the hepatic bile duct, common bile duct or gall bladder⁽⁴⁾. Gallstones can obstruct the cystic duct, which can cause gallbladder distension and biliary colic. Prolonged obstruction results in inflammation, infection and even ischemia leading to acute cholecystitis. Accurate diagnosis of cholecystitis requires a multifactorial, systematic approach that involves a detailed history, physical exam, serologic tests, and imaging. Ultrasound imaging provides diagnostic information for acute and chronic cholecystitis⁽⁵⁾. Laparoscopic cholecystectomy is considered as standard treatment of patients with symptomatic gallstone disease who are surgically fit⁽⁶⁾.

The Tokyo Guideline 2018 (TG18) diagnostic criteria for AC include three components: (A) local signs of inflammation (e. g., Murphy's sign or right upper quadrant (RUQ) mass/pain/tenderness); (B) systemic signs of inflammation (e. g., fever, elevated C - reactive protein, elevated white blood cell [WBC] count); and (C) imaging findings⁽⁷⁾.

Here we reported the clinical study on cholecystitis with special reference to cholelithiasis.

2. Objectives

The present study was conducted with the aim to describe epidemiology, modes of clinical presentation, diagnostic tools and intraoperative findings of symptomatic acute cholecystitis as well as various pathological alterations in gall bladder and complications after surgery.

3. Methods

The present prospective observational study was conducted on patients presented in outdoor or emergency department of Bawa Hospital, Ludhiana, with symptomatic cholecystitis from 1st March, 2023 to 30th September, 2023. Informed consent was obtained from all the patients for this publication of data and images. Forty (40) cases of acute cholecystitis having symptoms which were treated by laparoscopic surgery were included in this study. Patients with stones in gallbladder or neck of gall bladder and

pancreatitis diagnosed by ultrasonography are included in this study. The patients having abdominal pain due to gastroenteritis or other reasons were excluded from this study.

A detailed clinical history and physical examination was recorded in a questionnaire prepared for the study, which included epidemiological factors such as age, sex, marital status and dietary status etc. of the patients. All the patients were appropriately examined for clinical presentation and blood examination like hemoglobin, total leukocyte count, differential leukocyte count, routine urine examination, kidney function tests, liver function tests, random blood sugar, ECG were conducted at the time of presentation of patient. Radiological examination like ultrasound abdomen and endoscopic retrograde cholangiography (ERCP) (in cases of suspected CBD calculus) was done in two cases before surgery was done. These patients after confirmation of symptomatic gallbladder stones, underwent laparoscopic cholecystectomy.

Diagnosis of acute cholecystitis was done from clinical history, clinical examination and by various hematological and biochemical tests supported by ultrasonography. The confirmation of calculus or acalculous cholecystitis was made during surgery by examination of the gall bladder and its contents and final diagnosis by histopathological examination of removed gall bladder tissues.

Post - operative findings in acute cholecystitis were observed during surgery, which included adhesions of gall bladder with omentum, dilatation of bile duct, distension of gall bladder, mucocele, hepatomegaly, lymphadenopathy, presence or absence of stone, number of stones and polyps of gall bladder were recorded. The tissues were submitted for histopathological examination. All the data collected were appropriately analyzed using suitable statistical methods.

Statistical analysis:

The data were recorded in tabular form and described analyzing frequency and proportion for categorical variables, the mean and standard deviation for quantitative variables.

4. Results and Discussion

The present study was conducted at Bawa Hospital, Ludhiana from 1st March, 2023 to 30th September, 2023, a total of 40 patients ranging from 23 years to 75 years with mean (40 ±15) years were included for the study. In the present study, an overall maximum incidence of 57.50% (23/40) was observed in the age group of 20 - 35 years followed by 17.50% (17.50/40) in 36 - 50 years; however, no case was reported below 20 years and above 80 years of age (Table 1, Fig 1). The study is in correlation with Sangma and Mark, they observed 45% cases in the age group of 41 - 60 years⁽⁵⁾; 46 - 50 years², 30 - 40 years⁽⁸⁾ of age whereas, Lodha *et al.*⁽⁴⁾ and Fukami *et al.* reported mean age 70.8 years⁽⁹⁾.

In this study, acute cholecystitis was observed in 80% (32/40) females and 20% Male (8/40) (Table 1 and Fig 2)

patients. In sex - wise distribution, the female predominance was seen with a female to male ratio of 4: 1 and a greater number of females in the age group (20 - 35) years. Many studies have reported that females are more commonly affected by AC than males. In this study, it was found that higher incidence was found in females than males. Similar findings were found by Agrusa and Nielsen⁽¹²⁾. In our study female to male ratio was observed as 4: 1 in contrast to that of Daniel and Eggleton, Bhansali and Sangma who reported 3: 1, 1.5: 1 and 2.6: 1 male to female ratio respectively^(10, 11, 5). This may be due to a greater number of females reporting for AC than males. On the basis of the marital status, 97.50% (39/40) patients were married and only 2.50% (1/40) unmarried. The findings are in correlation with Sangma *et al.*⁽⁵⁾.

The nature of the diet consumption also leads to variation in AC cases. In the present study, 55% (22/40) patients consumed vegetarian food and 45% (18/40) non - vegetarian die (Table1). The highest incidence of AC in vegetarians may be due to low protein and high carbohydrate in vegetarian diet. The study by Bansal *et al.* and Sangma *et al.* is not in correlation with our study^{13, 5} they reported higher incidence in non - vegetarians. However, Maskey *et al.* reported higher incidence in Nepal where people consume more fat and protein in diet^(1,4).

Table 1: Distribution of acute cholecystitis in relation to various demographic factors such as age, sex, gender and diet

Age (Years)	No. of patient (N=40)	%age
20 - 35	23	57.5
36 - 50	7	17.5
51 - 65	8	20
66 - 80	2	5
>80	0	0
Gender		
Male	8	20
Female	32	80
Transgender	0	0
Marital status		
Married	39	97.5
Unmarried	1	2.5
Diet		
Vegetarian	22	55
Mixed or Non - vegetarian	18	45

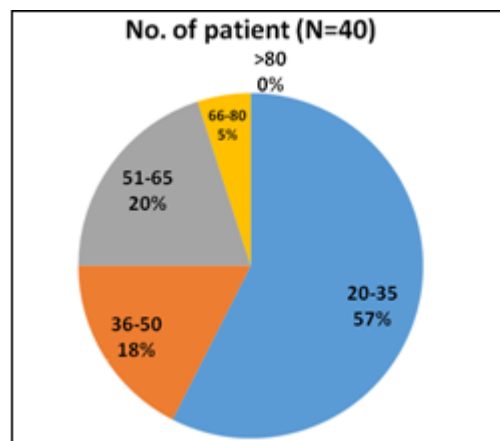


Figure 1: Diagram showing the distribution of cholecystitis in different age group

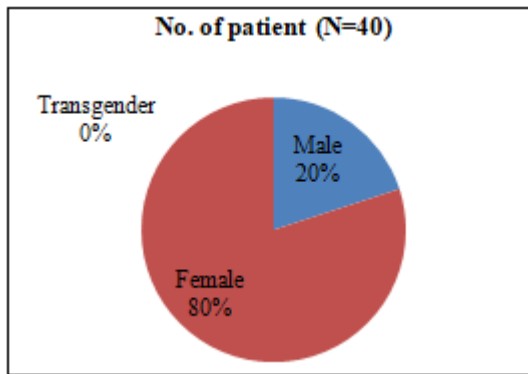


Figure 2: Diagram showing the distribution of cholecystitis in different sex.

Clinical Signs and Symptoms:

In the present study, 97.50% (39/40) patients presented with pain in epigastric region or hypochondrium followed by vomiting 70% (28/40), loss of appetite 65% (26/40), referred pain in shoulder and in the back 60% (24/40), nausea 52.5% (21/40), fever 15% (6/40), jaundice and itching in 5% (2/40) cases respectively (Table 2). On physical examination tenderness in right hypochondrium was reported in 62.50% (25/40) patients with signs of acute cholecystitis followed by

dyspepsia 65% (26/40), positive Murphy’s sign 30% (12/40), palpable gall bladder 22.5% (9/40) and palpable enlarged liver in 5% (2/40) respectively (Table 2). Icterus was reported in 5% (2/40) patients having calculi in neck of gall bladder. In the present study, pain in epigastric region or hypochondrium was present almost in all the cases which is in correlation with Lodha *et al*, Sangma *et al*, Mohandhas *et al* and Ganey *et al* (4, 5, 2), however, tenderness in the hypochondrium is not in correlation with this study, as in the present, is 65% (26/40). The Jaundice reported in this study is in correlation with Lodha *et al* and sangma *et al* (4, 5). Vomiting was reported in 70% cases which is in correlation with Sangma *et al* (5), whereas, Mohandhas *et al* observed only in 24% cases (2). The Palpable gall bladder was observed in 22.5% (9/40) patients in the present study. Whereas, Sangma *et al* reported in 15% cases (5) and Kune *et al* in 40% cases which is not in correlation with the present study (15). The palpable liver was reported in 5% cases in the present study, whereas Sangma *et al* in 1% cases which is not in consistent with this study (5). Fever was reported in 15% (6/40) cases whereas, Sangma *et al* reported in 94% patients, which is not inconsistent with the present study.

Table 2: Clinical presentation in acute Cholecystitis

Symptoms	Hypertension	Pain in Epigastric region/ hypochondrium	Nausea	Constipation	Vomiting	Loss of Appetite	Fever	Jaundice	Itching
No	6	39	21	0	28	26	6	2	2
%age	15	97.50	52.50	0	70	65	15	5	5
Signs	Referred pain in shoulder and in the back	Tenderness in right hypochondrium	palpable gall bladder	Palpable enlarged Liver	Icterus	Murphy's sign	Dyspepsia	-	-
No of patients (N=40)	24	25	9	2	2	12	26	-	-
%age	60	62.50	22.5	5	5	30	65		

Diagnostic Investigations:

Various investigation specific or nonspecific were conducted, such as Complete Blood Count, Clotting Time Bleeding Time, ECG, viral markers HIV, HCV, Routine urine examination, Abdominal Ultrasonography and ERCP in patients with acute cholecystitis (Table 3 and 4). In the present study, 7.5% (3/40) female patients aged 25 - 30 years of age with signs of acute cholecystitis revealed anemia and in remaining patient’s hemoglobin ranged from 11 - 15 gm/dl. Lodha *et al* reported anemia in 56.60% cases (4), which is not in correlation with the present study. Neutrophilic Leukocytosis of $12 \times 10^3/\text{ul}$ was observed in 27.50% (11 /40) cases without fever. Sangma *et al*, Nathaniel *et al*, Roslyn and Zinner and Lodha *et al* reported leukocytosis in a greater number of cases (5, 15, 16). However, the findings were not consistent with the present study. Leukocytosis was reported in acalculous cholecystitis which may be associated with inflammation of gall bladder wall and infection, but in 72.50% (29/40) showed leukocyte count within the normal range.

On evaluating liver function tests, 22.5% (9/40) had deranged serum glutamate - pyruvate transaminase (SGPT) with 37.5% (15/40) had deranged serum glutamic oxaloacetic transaminase (SGOT). About 2.5% (2/40) patients had hyperbilirubinemia, and 10% (4/40) had

increases alkaline phosphatase (ALP). Lipase and amylase were found to be raised in only 5% (2/40) and 2.5% (1/40) cases in the present study. A total of 7.5% (3/40) patients were found to be suffering from diabetes. Total serum protein ranged from 4 - 8.1g/dl and was within normal range in all the patients.

Table 3: Hematological alterations associated with Acute cholecystitis

Parameter	Value	No of patient (N=40)	%age
Haemoglobin (gm/dl)	<9	3	7.5
	9.1 - 11	10	20
	11.1 - 13	20	50
	13.1 - 15	6	15
	>15.1	1	2.5
Total leucocyte count ($\times 10^3/\text{ul}$)	<4	2	5
	4.1 - 7	12	30
	7.1 - 10	15	37.5
	10.1 - 13	6	15
	>13	5	12.5
BT/minute	2 - 4	2.05 - 3.12	
CT/minute	3 - 7	4.0 - 7.1	
ECG	Normal	40	100
HIV	Nonreactive	40	100
HCV	Nonreactive	40	100
Routine Urine	Normal	40	100

Table 4: Biochemical alterations associated with Acute cholecystitis

Parameter	No of Patient (N=40)	%age	Parameter	No of Patient (N=40)	%age
Random Blood sugar (mg/dl)			Alkaline phosphatase (IU/L) (ALP)		
<80	6	15	<100	5	12.5
81 - 100	23	57.5	101 - 150	11	27.5
101 - 120	6	15	151 - 200	7	17.5
121 - 140	2	5	201 - 250	8	20
>140	3	7.5	251 - 300	2	5
			>301	2	5
SGOT (IU/L)			SGPT (IU/L)		
<20	10	25	<20	15	37.5
21 - 30	15	37.5	21 - 35	11	27.5
31 - 40	6	15	36 - 55	5	12.5
>41	9	22.5	>56	9	22.5
Blood Urea mg/dl			Total serum Bilirubin g/dl		
<15	2	5	0.2 - 0.8	23	57.5
15.1 - 25	20	50	0.81 - 1.5	16	40
25.1 - 35	13	32.5	1.6 - 2.5	1	2.5
35.1 - 45	4	10	>2.6	0	0
>45	1	2.5			
Total Serum protein g/dl			Creatinine mg/dl		
<4	0	0	<0.5	2	5
4.1 - 6	3	7.5	0.51 - 0.89	27	67.5
6.1 - 8	35	87.5	0.91 - 1.1	6	15
>8.1	2	5	>1.1	5	12.5
Amylase (IU/L)			Lipase (IU/L)		
<40	0	0	<1	0	
41 - 140	1	2.5	1.1 - 160	1	2.5
>141	1	2.5	>161	0	

Kidney function tests were also conducted which revealed creatinine in normal range 0.5 - 1.1mg/dl in all the patient serum blood urea was higher in 12.50% (5/40) cases of acute cholecystitis (Table 4). The present study is not in consistent with a study conducted by Lodha *et al*, Sangma *et al* and Nathaniel *et al* (4, 5, 16). A total of 2.5% patients had hyperbilirubinemia, whereas 17.5% patients were diagnosed with stone in the common bile duct. Raised level of SGOT,

SGPT and ALP was found to be in the higher range, however, it did not alter our treatment plan. Diabetes was reported in 7.5% cases, which causes diabetic neuropathy leading to decreased mobility of the gall bladder and increased fasting volume of the gall bladder compared to non - diabetic patients. Thus, it may contribute to bile stasis and gallstone formation.



Figure 3: Ultrasound findings in patient of Acute cholecystitis having multiple stones in lumen of gall bladder

To diagnose cholecystitis, in addition to the history, clinical examination and blood investigation, radiological investigations are needed. The abdominal ultrasonography reports of 40 patients revealed calculi in the neck of gall bladder in 17.5% (7/40) cases, in 82.5% (33/40) in the lumen of gall bladder with the size of calculi ranging from 5.7 - 18mm and 2 - 19 mm in the neck and lumen of

gallbladder respectively. Multiple stones were observed in 72.5% (29/40) patients and the remaining 27.5% (11/40) had solitary stones (Fig.3). Further, 45% (13/40) cases showed thickened gall bladder wall and 32.5% (13/40) with pericholecystic edema. In two patients, ERCP was conducted which revealed dilated common bile duct with 9 - 10mm stone. (Table 5) Ultrasonography of abdomen

revealed calculi in 40 patients but postoperative confirmation revealed calculus cholecystitis in 38 patients with accuracy of 95%. (Table 6) Sangma *et al* and Bansal *et al* observed similar type of findings⁽¹³⁾. The 95% accuracy rate of ultrasonography in acute cholecystitis was also

reported by Kenneth, which is in correlation with our study⁽¹⁸⁾. Sangma *et al* reported stones in the gallbladder in 86.2% cases and 13.8 % had stones in bile duct. They reported multiple stones in 82.98% and solitary in 17.02% patients⁽⁵⁾.

Table 5: Abdominal Ultrasonography in cholecystitis

Test	Abdominal Ultrasonography						ERCP	
Observations	Calculi in neck of gall bladder (Common bile duct)	Calculi in lumen of Gall Bladder	Multiple stone	solitary stone	Gall bladder wall Thickened	Pericholecystic Edema	Stone (mm)	Dilated (CBD) mm
No of patients	7	33	29	11	18	13	10	2
Size (mm)	5.7 - 18	02 - 19						
%age	17.5	82.5	72.5	27.5	45	32.5		5

Table 6: Post - Operative comparison of calculous and acalculous cholecystitis

Parameter	Acalculous cholecystitis	Calculous Cholecystitis	Calculi in			No. of calculi	
			Gall Bladder	Neck	Both neck and gall bladder lumen	Single	Multiple
No of patients	2	38	37	7	5	11	27
%age	5	95	90	17.5	12.5	27.5	67.5

In the present study, all the patients with cholelithiasis had undergone laparoscopic cholecystectomy and majority of the patients had no postoperative complications as the utmost care was taken during surgery. The post - operative findings revealed calculus cholecystitis in 95% (38/40) patients and acalculous cholecystitis in 5% (2/40) cases. Calculi was found in 90% cases in gall bladder, 17.5% in neck of gall bladder and 12.5%, both in Neck and lumen of gall bladder. Majority of patients 67.50% had multiple stones and 27.50% cases had single stone. (Table 6) Two acalculous cholelithiasis patients had small amount of sludge in the lumen of gall bladder and wall of gall bladder was severely inflamed. The study revealed that ultrasonography was able to detect acute cholecystitis associated with stone in 95% of cases however, other diagnostic methods must be explored before surgery.

hepatomegaly in 20% (8/40) cases, respectively. Mucocele was observed in 20% (8/40) and in 5% (2/40) pancreatitis was detected. (Table7). Sangma *et al* reported mucocele of gall bladder in 6% of cases and which is in consistent with our study, but distention of gall bladder with pus and stones was reported in 3% patients, which does not correlate with our study⁽⁵⁾. Seven patient had multiple or solitary stone in the neck of gall bladder. As reported by other workers obstruction of the cystic duct by stones may be the major factor to pathological changes of acute calculus cholecystitis⁽¹⁶⁾. In the present study, 95% patients revealed acute calculus cholecystitis which is in correlation with other studies^(16, 4, 2). The occurrence of acute acalculous cholecystitis was observed in 5% cases which is in correlation with other studies^(16, 5, 19).

Table 7: Post - Operative findings in acute Cholecystitis

Findings	No of patients	%age
Adhesions of Gall bladder	16	40
Dilatation of Bile duct	7	17.50
Distention of Gall bladder	24	60
Mucocele Pancreatitis	8	20
Hepatomegaly	2	5
Rupture of gall bladder	8	20
Lymphadenopathy	0	0
Polyps of Gall Bladder	0	0
Tumor/ Malignancy	0	0

In the present study, 40% (16/40) of the cases revealed minor adhesions of gall bladder with omentum, dilatation of bile duct 17.50% (7/40), distention 60% (24/40) and

Final diagnosis of cholecystitis was made after receiving histopathology report, in the present study 80% (32/40) cases were diagnosed as acute calculous cholecystitis, 15% (6/40) chronic calculous cholecystitis and 5% (2/40) acute acalculous cholecystitis respectively (Table 8). However, by ultrasonographically 100% cases were diagnosed as calculus cholecystitis. There was 20% downgrading by histopathological diagnosis. Similar findings have been reported by Sangma *et al*, Rains and Ritchie^(5, 19). One case with follicular cholecystitis with cholelithiasis was also reported. No malignancy was reported in any case. Thus, the histopathological examination of surgically removed gall bladder examination plays important role in the final diagnosis of gallstone diseases.

Table 8: Final diagnosis by histopathology

Findings	Acute calculus Cholecystitis	Chronic calculus Cholecystitis	Acute acalculous Cholecystitis	Chronic acalculous Cholecystitis	Type of tumor	
					Benign Tumor	Malignant Tumor
No of patients	32	6	2	0	0	0
%age	80	15	5	0	0	0

5. Conclusion

The Cholelithiasis one of the commonest causes of acute cholecystitis. In the present study, it is concluded that the

incidence of acute cholecystitis is associated with cholelithiasis and is more in females aged 20 - 35 years of age consuming vegetarian diet. The most important clinical symptom and signs are pain in the epigastric region with

tenderness in right hypochondrium and vomiting. Fever is not a consistent symptom in acute cholecystitis except in cases of acalculous cholecystitis. Leukocytosis is not associated with cholelithiasis. Biochemical alteration in acute calculous cholecystitis is not an important indicator for diagnosis. Ultrasonography is an important diagnostic test for cholelithiasis. Histopathology of gall bladder must be done to rule out malignancy and for final diagnosis. Further studies need to be undertaken to study the association of more demographic factors with acute cholecystitis.

Conflict of interest statement

The authors declare no conflicts of interest.

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Informed Consent:

Informed consent was obtained from all the patients for the publication of their data and any image.

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