

Original Research Article

Study of association between gall stone composition and bacteriological spectrum in chronic calculous cholecystitis

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ABSTRACT

Background: Chronic calculous cholecystitis is the benign disease affecting the gallbladder, frequently female population of middle age. This study was done with the objective of study the composition of gall stones, microbiological spectrum and their association in chronic calculous cholecystitis patients.

Methods: This is a prospective study done on 131 cases of chronic calculous cholecystitis admitted in the department of General Surgery (DNB), K.K. Hospital, Lucknow for cholecystectomy during January 2018 to January 2019. 31 patients were excluded from the study based on exclusion criteria. USG of abdomen was done in all 100 cases. All patients underwent either open cholecystectomy (OC) or laparoscopic cholecystectomy (LC). During cholecystectomy bile was aspirated and was sent to laboratory for culture. Gallstone retrieved from the specimen and was classified based on morphology.

Results: Out of 100 cases, 76 cases underwent LC and 24 cases were done with OC. Female dominance was seen in the study (69%). The predominant type of gall stone in present study was cholesterol (68%). The bile culture test was positive in 20% of cases. The most common isolated microorganism was *E. coli* (50%). No significant association was observed between composition/type of gall stone and isolated microorganisms in bile ($p=0.126$).

Conclusions: The result concluded that chronic calculous cholecystitis was more common in females of middle age group. Bile culture was positive in 20% cases and *E. coli* was the common organism isolated. Identification of the type of organism is crucial for early management of the disease condition.

Keywords: Gallstone, Bile culture, Chronic calculous cholecystitis

INTRODUCTION

Gallstone diseases are responsible for about 95% of biliary tract abnormalities.¹ The prevalence rate of gall bladder disorders varies between 15-25% in developing countries.² It varies between 5-10% in India.³ The rate of increase of incidence is due change in the dietary habits and life style of the individuals.⁴

The pathogenesis of cholelithiasis is multifactorial and depends on type of gallstone (cholesterol, mixed, black

pigment, or brown pigment stones). Mixed gallstone is commonly seen in many cases.¹ The common presenting symptom was biliary colic in chronic cases of cholecystitis. Many risk factors like female gender, obesity, dietary factors and diabetes play a vital role in the development of chronic calculous cholecystitis.⁴

Various studies proved that bacteria plays a significant structural and functional role in the development of pigment and cholesterol gallstones.^{6,7} Indication of the infections include isolates recovery of *E. coli*, *Klebsiella*,

Bacterium typhosum, *Streptococcus* and slow growing *Actinomyces* from the bile.⁸

Ultrasonography of abdomen is the accurate diagnostic procedure for the identification of the disease condition. The management of the disease includes non-surgical and surgical modalities. Non-surgical treatment includes dissolution of gallstones with bile salts, extracorporeal shock wave lithotripsy (ESWL) and invasive contact dissolution with organic solvents. The surgical procedures include cholecystectomy, either open or laparoscopic. Cholecystectomy is done more commonly for chronic calculous cholecystitis as compared to acute cases.⁵

The present study aims to study the composition of gall stones, microbiological spectrum and their association in chronic calculous cholecystitis patients.

METHODS

This was a cross sectional prospective study conducted in the Department of General Surgery (DNB), K.K. Hospital, Lucknow, UP. The study included 131 cases of chronic calculous cholecystitis admitted for cholecystectomy during January 2018 to January 2019. 31 patients were excluded due to various exclusion criteria. A total of 100 patients of chronic calculous were included in the study

Inclusion criteria were all USG proved chronic calculous cholecystitis cases with duration of clinical symptoms more than 3 months or incidentally detected gall stones at least 3 months back admitted for cholecystectomy, those who gave their consent to participate in present study.

Exclusion criteria were patients who were medically unfit, patients with acute cholecystitis or acute pancreatitis, carcinoma gall bladder, choledocholithiasis, with co-existence of liver disease and with recent ERCP. Patients who refused to be part of this study were also excluded.

Detailed history of demographic data, clinical presentation, complications if any, and previous treatment are recorded in a proforma. Thorough clinical examination was done in all the patients. USG of abdomen was done in all cases.

Study procedure

Patient was put in supine position on the operation table. All patients underwent either open cholecystectomy (OC) or laparoscopic cholecystectomy (LC). During operation, bile was obtained for culture from the gall bladder then stone with specimen removed and sent for microbiological analysis. Laparoscopic cholecystectomy was the procedure of choice, but open cholecystectomy also done.

For LC, 3 ml bile aspirate by 20 number spinal needle with 10 ml syringe after inserting 3 ports before starting the dissection. For OC, 3 ml bile aspirated by 20 number needle with 10 ml syringe. After taking bile sample within 2 hours it was sent for bile analysis. In cases of wound infection culture sample collected from site of wound infection. Gallstones are collected from removed gall bladder and were sent for culture and morphological analysis respectively.

The data collected was entered in Microsoft Excel. The values were presented in number and percentages. Comparative values were calculated by using Chi square test. P values less than 0.05 was considered significant statistically.

RESULTS

Total 131 patients were admitted for cholecystectomy. 31 patients were excluded due to various exclusion criteria, 100 patients of chronic calculous were included in the study. Demographic and clinical characteristics were given in Table 1.

Table 1: Demographic and clinical characteristics of patients (n=100).

Characteristics	N	Percentage (%)
Age (in years)		
11 to 20	5	5.0
21 to 30	13	13.0
31 to 40	15	15.0
41 to 50	38	38.0
51 to 60	17	17.0
61 to 70	10	10.0
71 to 80	2	2.0
Mean age (Mean±SD)	43.49±14.14	
Gender		
Male	31	31.0
Female	69	69.0
Status (BMI (kg/m²))		
Underweight (<18.5)	15	15.0
Normal (18.0 to 24.9)	68	68.0
Over weight (25 to 29.9)	17	17.0
Symptoms		
Pain in upper abdomen	65	65
Dyspepsia	50	50
Nausea/vomiting	16	16
Fever	4	4
Asymptomatic	32	32
Predisposing factors		
Hyperlipidemia	39	39
High fat diet	33	33
OCP	20	20
Sedentary life style	48	48
Co-morbidity		
Diabetes mellitus	21	21
Hypertension	8	8
Hypothyroidism	4	4
None	67	67

Majority of the cases with cholecystitis was seen in the age group between 41-50 years. Females (69%) were more affected than males (31%). Normal BMI was seen in 68% patients. Overweight was reported 17 and underweight in 15 cases. Pain in upper abdomen was the common symptom reported in 65 cases. Sedentary life style was the main predisposing factor identified for the occurrence of cholecystitis in 48% patients. Other factors involved were hyperlipidemia (39%), high fat diet (33%) and oral contraceptive pills (20%). Diabetes mellitus was the main comorbidity observed in 21% cases followed by hypertension (8%) and hypothyroidism (4%).

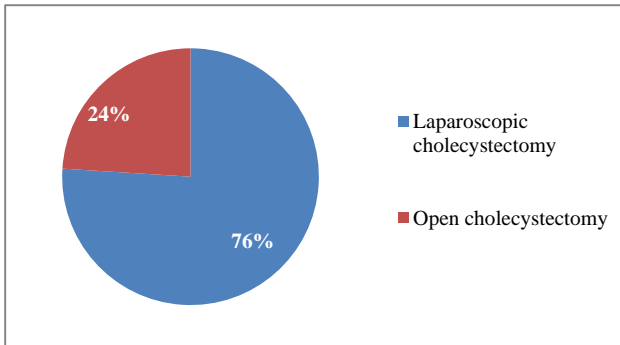


Figure 1: Type surgery done in the study participants.

Table 2: Composition/type of gall stones.

Gallstone composition	N	Percentage (%)
Cholesterol	68	68.0
Pigment	22	22.0
Mixed	10	10.0

Table 3: Result of bile culture test in study population.

Bile culture	N	Percentage (%)
Positive	20	20.0
Negative	80	80.0

In the present study, USG of abdomen confirmed the incidence of cholecystitis in all 100 cases. 24 patients underwent LC and 76 patients underwent OC (Figure 1). Cholesterol stones were noticed in the gall bladder of 68 patients. Pigmented type of stones was observed in 22 cases and mixed type was seen in 10 cases (Table 2). The bile culture test was positive in 20% of cases and negative in 80% cases (Table 3). The most common isolated organism from bile culture was *E. coli* found in 50% followed by *Klebsiella* which was present in 20% of cases (Table 4). No significant correlation was observed between composition of gallstone and isolated microorganisms from bile ($p=0.126$) (Table 5). Postoperative wound infection was seen in 14 cases (Figure 2).

Table 4: Microorganisms isolated from bile in chronic calculous cholelithiasis patients (n=20).

Microorganisms isolated	N	Percentage (%)
<i>E. coli</i>	10	50
<i>Klebsiella</i>	4	20
<i>Citrobacter</i>	2	10
<i>Enterococcus</i>	2	10
<i>Pseudomonas</i>	2	10

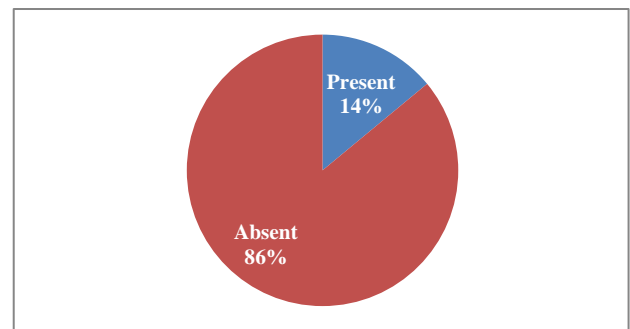


Figure 2: Postoperative wound infection in study population.

Table 5: Association between composition of gallstone and different microorganism isolated from bile in study population.

Composition of gallstones	Isolated microorganisms from bile					Total N (%)
	<i>Citrobacter</i> N (%)	<i>E. coli</i> N (%)	<i>Enterococcus</i> N (%)	<i>Klebsiella</i> N (%)	<i>Pseudomonas</i> N (%)	
Cholesterol	0 (0)	3 (30.0)	1 (50.0)	2 (50.0)	1 (50.0)	7 (35.0)
Pigment	0 (0)	6 (60.0)	0 (0)	2 (50.0)	1 (50.0)	9 (45.0)
Mixed	2 (100.0)	1 (10.0)	1 (50.0)	0 (0)	0 (0)	4 (20.0)
Total	2 (100.0)	10 (100.0)	2 (100.0)	4 (100.0)	2 (100.0)	20 (100.0)

DISCUSSION

The prevalence of cholecystitis in India varies from Southern region to Northern region. It is more common in North India (7 times) compared to South India. The difference in rate of prevalence is might be due to their food habits and life style.⁴

The incidence of cholecystitis increases with age and it is more common in females. This statement was supported by the findings of our study. In our study, majority of the patients were between 41-50 years (38%). This was in accordance with the findings of Gupta et al.¹ The increased incidence of gallstone with increase in age

is probably due to decrease of cholesterol reductase activity and increase of HMG co-A reductase activity.⁹

Female preponderance (69%) was observed in our study. Similar observation was made by Gupta et al and Lokesh et al.^{1,10} The high evidence of gallstones in females might be due to changes in female sex hormones with increase in age and due to the sedentary habits of most women in India.^{11,12}

In our study, among the type of gallstones, cholesterol type was seen in 68% cases. This was not in accordance with previous study reports of Gupta et al.¹ In their study, mixed type of gallstone was more predominant (50%) among the other types.

In our series, pain in upper abdomen was noticed in 65 cases followed by dyspepsia (50%) and nausea (16%). This was similar to the findings of Wani et al and Arora et al.^{13,14}

In this study, the bile culture findings were positive in 20% cases which are considerably lower than findings of Gupta et al.¹ In his series, the positive bile culture was noticed in 40% cases. Other studies show this positivity range from 16.4-46%.^{15,16} In our study, *E. coli* was found to be the common organism isolated from the bile culture of many patients (50%). Similar incidence was noted in previous studies.^{1,5,10} This predominant incidence of *E. coli* in bile culture might be due glucuronidase enzymatic activity of the organism in calcium bilirubinate gallstone formation.¹ In our study, no significant correlation was seen between gall stone composition and individually isolated micro-organisms from bile.

CONCLUSION

The prevalence of bile infection in the present study was 20%, in association with cholesterol type of gallstones and the most common type of bacteria isolated was *E. coli*. This culture of bile and identification of microorganism at cholecystectomy is helpful in management to the patients, hence avoids related morbidities and mortality.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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