



A STUDY OF CHOLELITHIASIS WITH SPECIAL REFERENCE TO BILE ANALYSIS

General Surgery

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ABSTRACT

INTRODUCTION: Cholelithiasis literally means presence of stone in gall bladder. Gall stones are the most common biliary pathology and a common health problem worldwide including India. Mucous, calcium and lipids act in concert to formation of gall stones. High serum cholesterol and LDL levels are associated with gallstones.

AIM: To study bile for its pH, bile calcium level and bile cholesterol level in these patients for its correlation with formation of stone.

MATERIAL AND METHODS: This prospective study was conducted on fifty patients in the Department of Surgery, RNT Medical College Udaipur. Detailed history of the patient with special emphasis on symptoms of pain abdomen specially epigastric and right hypochondrium region was noted. Investigations like Bile pH analysis; Bile calcium and cholesterol level, USG Abdomen were assessed.

RESULTS: Out of 50 patients of cholelithiasis the female to male ratio was 3.16:1 which shows female predominance. Maximum no. of cases were in age group of 40-50 years. On USG most of patients (84%) had cholelithiasis.

CONCLUSION: Cholelithiasis was found to be more common in females and incidence was higher in younger age group. Biliary pH is alkaline in cholesterol stone while acidic in mixed and pigment stone. Biliary cholesterol level is higher in cholesterol stone compared to mixed and pigment stone. As serum cholesterol increases, biliary cholesterol also increases which shows statistically significant correlation.

KEYWORDS

Cholelithiasis, Biliary Cholesterol, Bile Calcium, Biliary pH.

INTRODUCTION

Cholelithiasis literally means presence of stone in gall bladder. Gall stones are the most common biliary pathology and a common health problem worldwide including India.

The incidence of cholelithiasis varies markedly in different geographic areas, age, sex, diet and various factors but gall stones are common in women than in men specially in fatty, forty, flatulent, fertile (multiparous) females.

The gall bladder mucous plays a regulatory role in cholelithiasis as it promotes the nucleation of stones.^[1] Mucous, calcium and lipids act in concert to formation of gall stones.^[2]

Gall bladder mucin is one of the key factors in gallstone formation however, there is little information about the diversity of mucin secretion according to stone composition.^[3]

Altered levels of various lipids work as a risk factor for developing gallstones. High serum cholesterol and LDL levels are associated with gallstones. Patients with hypertriglyceridemia usually overweight and insulin resistant are also at the risk for gallstone disease.^[4] Commonly gallstones are of three types:

1. Cholesterol stones: They comprise 10% of gallstones formed mainly by cholesterol and occur in patients with increased cholesterol levels. They are usually solitary brown/black colour, radiolucent but cast an acoustic shadow on ultrasonography. They are more likely respond to non-surgical management than pigment or mixed stones.^[5]

2. Pigment stones: They comprise 15% of gallstones are formed by the crystallisation of calcium bilirubinate, black/brown in colour. They are usually multiple, small and has a hard consistency. Brown pigment stones contains calcium bilirubinate, calcium palmitate and cholesterol. They are associated with infection in the gall bladder.^[5]

3. Mixed stones: They are commonest type of gallstones and comprise of 80-90% of gallstones. Mixed gallstones typically contain 80% cholesterol. Other common constituents are calcium carbonate, palmitate phosphate and other bile pigments because of their calcium content. They are often radiographically visible, usually multiple and small faceted and contain alternative layers of cholesterol and pigment.^[5]

AIMS AND OBJECTIVES

To study bile for its pH, bile calcium level and bile cholesterol level in

these patients for its correlation with formation of stone.

MATERIAL AND METHODS

After institutional ethical committee approval this prospective study was conducted on fifty patients in the Department of Surgery, RNT Medical College and Attached Hospital (M.B. Govt. Hospital), Udaipur.

1. Detailed history of the patient with special emphasis on symptoms of pain abdomen specially epigastric and right hypochondrium region and history of previous attacks of pain in epigastric and right hypochondrium region, fever, vomiting, jaundice and distension.
2. History of comorbid conditions including DM, HT, significant illnesses and previous symptoms.
3. General physical examination with special reference to:
 - a. Tenderness in right hypochondrium and elicitation of Murphy's sign
 - b. Presence of icterus and pallor
 - c. Itching marks
 - d. Size, consistency, mobility and tenderness of lump if any
4. Routine investigations including CBC, BT, CT, RFT, LFT, PT-INR, HIV, HBsAg, Serum urea, Serum creatinine, lipid profile blood sugar, X-ray, ECG
5. Specific investigations:

Bile analysis -pH; Bile calcium and cholesterol level USG Abdomen
6. Operative findings

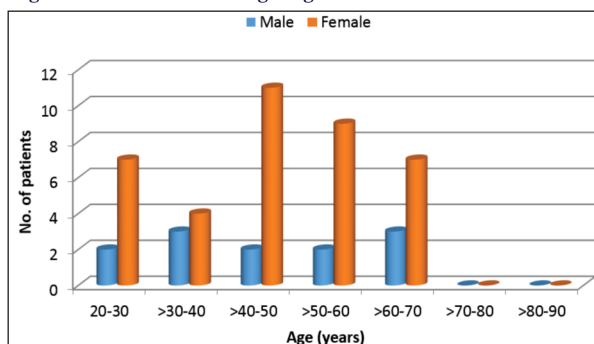
Operative gall bladder specimen of all cholecystectomy patients were sent for histological examination.

Method of collection of bile:

All patients were given an IV injection of ceftriaxone 1.0 gram in the morning on day of surgery. After opening the abdomen, and recording the findings, bile was aspirated from gall bladder at fundus in a 5 ml disposable syringe. Gall bladder was removed after ligation and cutting of the cystic artery and duct. In laparoscopic cholecystectomy after excision of gallbladder, gallbladder held with extractor was brought out up to epigastric port site and after incision on gallbladder bile was aspirated in 5 ml disposable syringe. The collected specimen of the bile was labelled and sent to a single laboratory in appropriate container. In laboratory bile special investigation like calcium level cholesterol level pH and is done. Patient demographics, like age, gender and reports of bile were recorded in a structured proforma.

RESULTS

Fig 1: Distribution according to age and sex



Out of 50 patients of cholelithiasis, 12 patients (24%) were male and 38 patients (76%) were female. The female to male ratio was 3.16:1 which shows female predominance in cholelithiasis disease. Maximum no. of cases were in age group of 40-50 years. Out of remaining cases, the age group of >50-60, >60-70, and >30-40 were in decreasing order.

Table 1. USG findings (n=50)

S.No.	USG findings	No. of patients	%
1.	Cholelithiasis	42	84
2.	Cholecystitis	9	18
3.	Shadows and echodensities in gallbladder	5	10
4.	Contracted gallbladder	2	4
5.	Hepatomegaly	3	6
6.	Splenomegaly	1	2
7.	Other findings	7	14

In our study, according to USG findings out of 50 patient, most of patients (84%) had cholelithiasis, 10% patients had shadows and echodensities in gallbladder, 18% patients had cholecystitis, 6% had hepatomegaly, 2% had splenomegaly, 4% patients had contracted gallbladder and 14% patients had other findings also like ureteric calculus, vesical calculus, epigastric mass, prostatomegaly, hydronephrosis, renal calculus, cystitis, renal cortical cyst, cervicitis.

Table 4. Bile pH (n=50)

S. No.	Type of stone	Total No. of patients	pH										P value
			5-<6		6-<7		7-<8		8-<9		>9		
			No.	%	No.	%	No.	%	No.	%	No.	%	
1.	Cholesterol	10	3	30%	1	10%	6	60%	0	0%	0	0%	0.134
2.	Mixed	35	9	25.27%	10	28.57%	8	22.85%	6	17.14%	2	5.71%	0.298
3.	Pigment	5	2	40%	1	20%	1	20%	1	20%	0	0%	0.928
	Total	50	14	28%	12	24%	15	30%	7	14%	2	4%	

In our study, formation of cholesterol stone is higher in slight alkaline Ph (60%) in between ph 7-<8 while mixed and pigment stone are more in acidic bile 54% and 60% in ph less than 7. which is statically insignificant.

Table 5. Correlation between Serum cholesterol and bile cholesterol

S No	Serum cholesterol	No. of patients	Bile cholesterol level								P value
			<100		100-<200		200-<300		>300		
			No.	%	No.	%	No.	%	No.	%	
1.	<200	40	3	7.5%	12	30%	17	42.5%	8	20%	0.02
2.	≥200	10	3	30%	1	10%	1	10%	5	50%	
	Total	50	6	12	13	26	18	36	13	26	

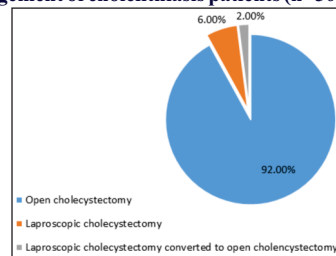
Serum cholesterol level increase correlates with biliary cholesterol increase, which is statistically significant.

DISCUSSION

The main aim of study was to study the cases of cholelithiasis with bile for its pH, bile calcium level and bile cholesterol level for its correlation with formation of stone.

In our study, out of 50 patients of cholelithiasis, 38 patients were female and 12 patients were male i.e. 76% and 24% respectively. female to male ratio was 3.16:1, the higher incidence of cholelithiasis among the female is a universal phenomena and our study also

Fig 2. Management of cholelithiasis patients (n=50)



Out of 50 patients of cholelithiasis, most of patients (92%) were managed by open cholecystectomy was done in 46 patients, Laproscopic cholecystectomy was done in 3 patients (6%) and 1 patients (2%) were managed by lap convert to open cholecystectomy.

Table 2. Bile Cholesterol level (n=50)

S. No.	Type of stone	Total no. of patients	Bile cholesterol level							
			< 100		100-<200		200-<300		>300	
			No.	%	No.	%	No.	%	No.	%
1.	Cholesterol	10	2	20%	1	10%	3	30%	4	40%
2.	Mixed	35	3	8.5%	12	34.28%	14	40%	6	17.14%
3.	Pigment	5	1	20%	3	60%	1	20%	0	0%
	Total	50	6	12%	16	32%	18	36%	10	20%

In our study, biliary cholesterol level is higher in cholesterol stone and mixed stone while lower side in pigment stone.

Table 3. Bile Calcium level (n=50)

S. No.	Type of stone	Total no. of patients	Bile calcium level				P value
			≤10		>10		
			No.	%	No.	%	
1.	Cholesterol	10	5	50%	5	50%	0.887
2.	Mixed	35	20	57.14%	15	42.85%	0.266
3.	Pigment	5	1	20%	4	80%	0.131
	Total	50	26	52%	24	48%	

In our study, it was observed that increased biliary calcium have associated with pigment stone than mixed and cholesterol stone. which is statically insignificant.

indicates the predominance of cholelithiasis in females.

A similar study conducted by P. Halgaonkar (2016)^[6] who concluded that gallstones are more prevalent in females 85(85%) as compared males 15 (15%) with male to female ratio of 1:5.6.

Rajaa N. Al-Atrakchey et al (2014)^[7] reported similar results out of 104 patients of cholelithiasis 88 were females & 16 were males, male & female ratio was 1:5.5.

In our study, there was no case of cholelithiasis below 20 years of age and maximum age of cholelithiasis patient was 70 years. The maximum incidence of cholelithiasis was in age group of 40-50 years and cholelithiasis disease was distributed decreasing order in age group of >50-60, >60-70, >30-40.

Shrestha KB et al. (2012)^[8] had similar results and showed that affected age group was 20-40 years in 120 patients of cholelithiasis. P. Halgaonkar (2016)^[6] showed that peak age of gallstone disease is 30-50 years for male and 41-50 years for females.

According to our study, pain in right hypochondrium was predominant symptom (96% cases) followed by vomiting, fever, yellow discoloration in conjunctiva & urine, and pruritis which were present in 36%, 12%, 2% & 2% respectively. Most of the patients had serum urea level & serum creatinine level within normal range, only 2 patients (4%) showed increased level of serum urea (>48 mg/dl) and 3

patients (6%) showed increased level of serum creatinine (>1.4 mg/dl). In our study, out of 50 patients, the USG findings were cholelithiasis in 42 (84%) cases, cholecystitis in 9 (18%) cases, shadowing & echodensities in gallbladder in 5 (10%) cases, contracted gallbladder in 2 (4%) cases, hepatomegaly in 3 (6%) cases, splenomegaly in 1 (2%) cases and other findings (ureteric calculus, vesical calculus, epigastric mass, prostatomegaly, hydronephrosis, renal calculus, cystitis, renal cortical cyst, cervicitis) were also present in 7 (14%) cases.

In a study conducted by Aslam et al (2013)^[9] in 454 cases of gallstones (120M + 334F), in USG, all patients 454 (100) had a finding of echogenic mass with shadowing meaning stones, most of patients had multiple stones 384 (84.5%) & few had single stone 144 (31.7%), fatty liver was present in 144 (31.7%), hepatomegaly in 92 (20.2%) and splenomegaly in 16 (3.5%) patients.

In present study, out of 30 patients, MRCP findings were cholelithiasis in 18 (60%) cases, cholelithiasis with acute cholecystitis in 1 (3.33%) cases, cholelithiasis with chronic cholecystitis in 4 (13.33%) cases, cholelithiasis with choledocholithiasis in 2 (6.66%) cases, cholelithiasis with distended gallbladder in 2 (6.66%) cases and other findings like splenomegaly, ascitis, epigastric hernia with cholelithiasis were present in 3 (10%) cases.

Out of 50 cholecystectomy, 35 patients (70%) had mixed stone 10 patients (20%) had cholesterol stone 5 patients (10%) had pigment stone, similarly Chandran P et al (2005)^[10] reported out of 200 cholecystectomy patients, 52 (25.5%) were cholesterol stone, 76 (38%) were mixed stone and 72 (32%) were pigment stone. Singh G et al (2017)^[11] in their study of 74 cholecystectomy patients, 62 (83%) were cholesterol stone and 12 (17%) were pigment stone.

In our study, formation of cholesterol stone is higher in slight alkaline pH (60%), while in between pH 7 to less than 8 (54%), mixed and pigment stone are more in acidic bile (60%) in pH <7 , which shows no significant correlation. Similar study conducted by Marteau et al (1990)^[12] observed that gallstone formation is not due to disturbances of biliary pH regulation. While Pelteris (1995)^[13] observed that acidic bile enable calcium ion to bind with pigment.

We observed, biliary cholesterol level is higher in cholesterol stone and mixed stone, while it is lower side in pigment stone. Similar to ours study by Chandran P et al (2005)^[10] observed that high biliary cholesterol is associated with formation of cholesterol and mixed stone.

We observed that increased biliary calcium is associated with pigment stone than mixed and cholesterol stone which shows statistically no significant correlation. Similar study by Singh G et al (2017)^[11] reported that increased biliary calcium level is important for co-precipitation of calcium salt of gall stone.

We observed significant correlation between serum and biliary cholesterol increase. Atamanalp SS et al (2013)^[14] observed similar results that when serum cholesterol increases biliary cholesterol level also increases which is important for formation of gallstone.

CONCLUSION

Cholelithiasis was found to be more common in females and incidence was higher in younger age group. Most common presentation was pain in right hypochondrium followed by vomiting. Lipid profile was deranged, more in female patients as compared to male patients and in one fifth of the cases, serum cholesterol and serum triglycerides were increased. In nearly half of the cases, serum HDL was decreased and serum LDL was increased.

Biliary pH is alkaline in cholesterol stone while acidic in mixed and pigment stone. Biliary cholesterol level is higher in cholesterol stone compared to mixed and pigment stone. Pigment stone have higher biliary calcium level compared to mixed and cholesterol stone. As serum cholesterol increases, biliary cholesterol also increases which shows statistically significant correlation.

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