

Role of Pathological Organisms in Gallstone Disease

ABSTRACT

Background Gallstone disease is the commonest disease in India. Patients present with pain abdomen and nausea and vomiting. This study deals with etiology, pathogenesis including the role of bacteria in the formation of gallstones. It also deals with role of bacteria in different type of gallstones. By knowing the bacteriological etiology it will help in prevention as well as better treatment of gallstone disease in the features.

Materials and Methods Sixty patients with gallstone disease who underwent cholecystectomy in Hi-Tech Medical College and Hospital during October 2013 to September 2015 were studied. Data related to the objectives of the study were collected.

Results Majority of patients with gallstone disease were women aged from 41 to 50 years. Male to female ratio was 1:3. Most of the patients had mixed gallstones (31 cases) followed by pigment stones (19 cases) and cholesterol stones (10 cases) in the gallbladder. Bile culture was positive in 18 cases. Highest proportion of bile culture positivity was found in pigment gallstones i.e. 8 out of 19 cases. *Escherichia coli* was the most common organism isolated from the bile culture.

Conclusion We conclude that gallstone disease is common in women aged 41–50 years. Infection plays a major role in the formation of pigment gallstones. The role of bacteria in cholesterol gallstone and mixed gallstone formation is found to meager. Mixed gallstones are the most common stones found in this geographical area.

KEYWORDS cholesterol gallstone, pigment gallstone, mixed gallstone, bile culture

INTRODUCTION

Gallstone disease is one of the common surgical conditions requiring surgery. Gallstone disease is often thought to be a major affliction in modern society. The incidence varies widely across geographical regions. The pathogenesis of gallstones is multi factorial. It varies according to the type of gallstones. Primarily gallstones can be divided into two major groups—(1) pure gallstones and (2) mixed and combined gallstones. In many cases, bacteria can be cultured from gall bladder bile. Infective factor seems to be a major cause of formation of gallstones. Moynihan's aphorism that "gall stone is a tomb stone erected in the memory of the organism with in it" is true today¹. Septic complications reported from stones and concretions lost in the peritoneal cavity following laparoscopic cholecystectomy reflect the infective potential of gallstones. Evidence in favour of infection includes isolation of *E. coli*, *Bacterium typhosum*, *Streptococcus* from the gall bladder bile. Slow growing actinomyces also have been recovered from the bile. Brown pigment gallstones occur as a result of infection. Bacteria are found within the calcium bilirubinate and protein matrix of brown pigment gallstones.

AIMS AND OBJECTIVES

1. To know the bacteriology of bile in gall bladder.
2. To know the incidence of gallstone formation in infected bile.
3. To study the role of infection in different type of gallstones formation.

METHODOLOGY

Patients admitted in Hi-Tech Medical College and Hospital with the diagnosis of gallstone disease for cholecystectomy were taken for this observational study from October 2013 to September 2015.

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Bile was aspirated from the gallbladder of the patient who underwent open cholecystectomy using a sterile syringe (10 ml). In case of laparoscopic cholecystectomy, bile was collected by an aspirator. The bile sample was put in sterile bottle and transferred to laboratory. In the laboratory, the bile samples were cultured both aerobically and anaerobically for 48 hours. Gallstones were removed from gallbladder after the specimen was taken out by open cholecystectomy or laparoscopic cholecystectomy.

The stones were divided into three groups depending upon their colour and morphology.

- Pale yellow and whitish stones - cholesterol stones
- Black and dark brown - pigment stones
- Brownish yellow or greenish with laminated features - mixed stones

RESULTS

In the present study, 60 cases with acute calculous cholecystitis and chronic calculous cholecystitis were observed. Majority of cases in the present study were in the age group of 41 to 50 years. The female to male ratio is 3:1. All the patients in the present study presented with pain abdomen (right hypochondriac pain) i.e. all 60 cases. Nausea/vomiting was seen in 54 cases and fever in 32 cases. Ultrasound abdomen revealed acute calculous cholecystitis in 14 cases and chronic calculous cholecystitis in 46 cases. Out of 60 patients, laparoscopic cholecystectomy was performed in 57 cases, however in 3 cases it was converted to open cholecystectomy.

In the present study, mixed stones were reported in 31 cases followed by pigment stones in 19 cases whereas cholesterol stones were found in only 10 cases. Out of 60 cases reported in the present study, bile culture was positive in 18 cases including 15 female and 3 male patients.

In the present study, 8 out of 31 cases of mixed stones had positive bile culture and majority of pigment stones i.e. 8 out of 19 cases had positive bile culture. Similarly, in two cases of cholesterol stones, bile culture

was found to be positive. The proportion of bile culture positivity is highest in pigment stones. The most common organisms isolated from bile culture was *E. coli* (6). The other organisms were klebsiella, staphylococcus, streptococcus, bacteroid, pseudomonas, acinetobacter and proteus.

DISCUSSION

We also try to explore infection of bile and its association with different type of gallstones formation (mixed, pigment, cholesterol). We have compared our study with other studies done previously. The most commonly involved age group for gallstone disease was 41–50 years of age followed by 31–40 years of age with female predominance (Table 1). Most number of cases are seen in female due to increased VLDL in female and hormonal factors resulting in biliary stasis. This finding is in concordance with Jaraari et al.² of Libya and Chandran et al.³ of India and differ from others.

In the present study, mixed stones were the most common stones found comprising 51.67% followed by pigment stones (31.67%) and cholesterol stones (16.67%). This finding is comparable with the finding of Chandran et al.³ of India and Pradhan et al.⁷ of Nepal.

But in a study by Saadeldin et al.⁸ and Jaraari et al.², pigment stones were the most common stones observed. In a study by Jarrari et al., pigment stones were the commonest finding (39%) followed by mixed stones (34%) and cholesterol stones (17%).

In majority of publications, 25% to 50% patients undergoing biliary surgery were found to harbour bacteria in bile. In the present study, 18 out of 60 patients were found to be bile culture positive (30%). This finding is similar to the findings of Irfan Sattar et al.⁹ [study of Pakistan (36%)] and Al Harbi et al.¹⁰ (25%) but lower than the incidence observed by Csendes et al.¹¹ study (46%).

In the present study, 8 out of 19 pigment stones were observed to have infected bile. However, 8 out of 31 cases of mixed stones had positive bile culture. This

Table 1 Types of gallstones and positive bile culture in different age group and sex.

Age	M	F	Mixed		Pigment		Cholesterol		Bile C/S	
			M	F	M	F	M	F	M	F
<20	1	0	1	0	0	0	0	0	0	0
21–30	1	8	1	3	0	3 (2)	0	2	0	2 (2)
31–40	2	15	0	9 (2)	0	5 (3)	2	1 (1)	0	6 (6)
41–50	5	14	3 (1)	7 (1)	2 (1)	5 (4)	0	2	2 (2)	5 (5)
51–60	4	6	2	3 (1)	2	1 (1)	0	2	0	2 (2)
61–70	2	2	1	1	1 (1)	0	0	1	1 (1)	0
Total	15	45	8	23	5	14	2	8	15	45
			(1)	(4)	(2)	(10)		(1)	(3)	(15)

() means positive bile culture.

Table 2 Common microorganisms isolated from bile culture.

Microorganisms	Total number
<i>E. coli</i>	6
<i>Klebsiella</i>	4
<i>Staphylococcus</i>	2
<i>Streptococcus</i>	1
<i>Bacteroid</i>	2
<i>Pseudomonas</i>	1
<i>Acinetobacter</i>	1
<i>Proteus</i>	1

proportion was least in case of cholesterol stones i.e. only 2 cases out of 10 cases harbour bacteria.

This finding is similar to finding of Kaufmann series¹² where maximum percentage of bile infection was found in pigment stones.

E. coli (30%) was found to be the commonest organism followed by *Klebsiella* (22%) in the present study (table 2). This finding is similar to the finding of Ballal et al.¹³ of KMC Manipal, Irfan Sattar et al.⁹ of Pakistan, Darko et al.¹⁴ of Ghana & Al Harbi et al.¹⁵ studies. However, *Klebsiella pneumoniae* was the commonest organism observed in a study reported by Sabir.

The bacteria producing β -glucuronidase phospholipase (β Gphl) enzyme degrades the bile and causes pigment stone formation. Pigment stones contain calcium palmitate, calcium bilirubinate and conjugated bilirubin which are associated with bile infection. Bacteria in bile produce glycocalyx which help in bacterial adherence and precipitation of bilirubin pigment which acts as nidus for gallstone formation. All our observations in the present study are comparable with other studies.

CONCLUSION

From our observations we conclude that cholelithiasis is common in women who presents with right hypochondrial pain and nausea, vomiting. Mixed stones are the most common type of gallstones found in this

geographical area. Bile infection plays major role in the formation of pigment gallstones. *E. coli* is the most common organism causing bile infection.

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