

“Bacteriological Analysis of Bile in T-Tube in Choledocholithotomy Patients and Its Correlation With Clinical Outcome *

Dr Nandita Doley¹, Dr Hussain Ahmed²

Dr Hosni Mobarok Choudhery³

1. Post Graduate Trainee, Department of Surgery, Gauhati Medical College and Hospital, Guwahati ; nanditadoley@gmail.com
2. Associate Professor, Department of Surgery, Gauhati Medical College, and Hospital; Guwahati ; adrussain@yahoo.in
3. Post Graduate Trainee, Department of Surgery, Gauhati Medical College and Hospital, Guwahati; hosnimobarok@gmail.com

Corresponding author : Name: Dr Hussain Ahmed, MS Surgery; Associate Professor, Department of Surgery, Gauhati Medical College and Hospital; Srimanta Sankaradeva University of Health Sciences, Assam; India – 781032

ABSTRACT

Introduction- Gallstone disease are one of the most common biliary pathology. Prevalence of gall stone is 10-14% in adult population of the eastern world. About 3-14.55% patients of cholelithiasis may be associated with the common bile duct (CBD) stones¹ Choledocholithiasis can produce a wide range of symptoms and pathology, from benign and asymptomatic to life-threatening septic shock.. Patients may be presented only with jaundice with past history of pain abdomen. CBD stones may be associated with complications like biliary pancreatitis, cholangitis or rarely hepatic abscess which may be associated with high morbidity and mortality. These complications need immediate interventions.

Materials and Methods- During the period of study from 1 st June 2021 to 31st May 2022, 50 patients who underwent open or laparoscopic CBD Exploration with T-tube insertion for Choledocholithiasis in Department of Surgery, GMCH were taken up for the purpose of study. Bacteriological study of bile culture and antibiotic testing was done for commonly used antibiotics.

Results and Observations- Our study population comprised 50 patients, 19 patients were male and 31 were female. The incidence of male and female were 38% and 62% respectively. The age incidence in the present study was found to be from 19 to 78 years, with maximum incidence being in the 49-58years (16 cases) age group followed by 59-68 years (12 cases). Bile for bacteria was found to be positive in 17(34%) cases and negative in remaining 33(66%) cases. Of the 17 cases with bile culture positive 7 cases are male and 11 cases are female. Bile culture is most commonly positive in 69-78 years age group with 87%(6/7 cases). Gram negative bacteria were most commonly isolated from the bile culture constituting 83%(16/18 Cases). *Escherichia coli* and *Klebsiella* were the most common organisms found in 16 cases (*E. coli* -11/17*Klebsiella*-5/17cases) which is 32%.*E.coli* and *Klebsiella* spp. isolated showed variable sensitivity patterns with a good response to Amikacin and Beta lactam antibiotics which are commonly used postoperatively.

Conclusion

Commonest organisms isolated were *Klebsiella* spp. and *E.coli* followed by *Acinetobacter baumannii*.. Longer hospital stay was observed in patients with positive bile culture patients as compared to patients with negative bile culture. Most organisms isolated were sensitive to Aminoglycoside (e.g.: Amikacin and Gentamicin) and B lactamase group of antibiotics. Both the groups of drugs are equally effective and available at free of cost at our hospital so they can be used as prophylactic antibiotic in pre-operative period and continued post-operatively to avoid complications arising from the bacteriological flora of the bile duct. This might be helpful in reducing the overall morbidity and hospital duration stay of the patients.

KEYWORDS- Choledocholithiasis, Bile culture

Date of Submission: 13-02-2023

Date of Acceptance: 26-02-2023

I. Introduction

Gallstone disease are one of the most common biliary pathology. Prevalence of gall stone is 10-14% in adult population of the eastern world. About 3-14.55% patients of cholelithiasis may be associated with the

common bile duct (CBD) stones¹. Common bile duct stones are of two types, first are primary stones that are formed primarily in CBD and others are migrated from gall bladder known as secondary stones. Gall stones are mentioned in Egyptian mummies dating back nearly 1,000 years before Christ².

In the present study, we attempt to study the microbiological profile of bile in choledocholithotomy patients with T-tube insertion, assess the factors that contribute to bacterial growth in bile culture, its correlation with clinical outcome of the patient and also the role of prophylactic antibiotic therapy..

The biliary infection can be caused by type ranging from aerobic gram -positive to gram negative to anaerobic organisms. Aerobics cause 94% of biliary tract infection while anaerobic causes the rest. The most common organism isolated includes E.coli, Klebsiella, Bacterium typhosum and streptococcus. Slow growing actinomycetes also found in the bile³.

Choledocholithiasis can produce a wide range of symptoms and pathology, from benign and asymptomatic to life-threatening septic shock. Patients of choledocholithiasis may be associated with constant or colicky abdominal pain which may be associated with nausea and vomiting. Patients may be presented only with jaundice with past history of pain abdomen. CBD stones may be associated with complications like biliary pancreatitis, cholangitis or rarely hepatic abscess which may be associated with high morbidity and mortality. These complications need immediate interventions. Signs and symptoms are determined by the anatomic level of biliary obstruction and the presence of infection⁴.

Ultrasound is the first line of investigation but is operator dependent. MRCP is considered to be the most accurate non-invasive diagnostic test. ERCP is another test with high accuracy but is invasive and mostly used as therapeutic modality rather than diagnostic now-a-days.

The natural history of asymptomatic CBD stone is difficult to study, since stones noted on intraoperative cholangiography traditionally undergo removal. However, recent studies indicate that up to a third of asymptomatic CBD stones will pass without intervention after cholecystectomy^{4,5}.

Closure of choledochotomy with a T-tube placement in the common bile duct with one end taken out through the abdominal wall for decompression is the traditional surgical technique following open choledocholithotomy. It is one of the most commonly used procedures used for treatment of choledocholithiasis in our current setup. The advantages of keeping a T-tube in situ are that it facilitates distal decompression of bile duct, allows postoperative contrast studies to detect retained stones and also extraction of retained stones using the T-tube tract. However, T-tube has the potential to cause complications.⁶

Understanding the most common organisms and their antibacterial susceptibility pattern would be useful in the prevention of infections, which further reduces the hospital cost, period of hospitalization, improve post-operative outcome and psychological agony of the patient.

II. Aims And Objectives

Aim: To study bacteriology of bile in T-tube in choledocholithotomy patients and its correlation with clinical outcome

Objectives:

- ☞ To evaluate the microbiological profile of bile in choledocholithotomy patients.
- ☞ To assess the factors that contributes to bacterial growth in bile culture
- ☞ To assess the clinical outcome of the patients with high bacteriological growth in bile and role of prophylactic antibiotics

III. Materials And Methods

Place of study: Department of General Surgery, Guwahati Medical College & Hospital (GMCH)

Duration of study: One year from 1st June,2021 to 31st May,2022

Type of Study: Hospital based observational study.

Study population: The study comprised of patients who underwent open or laparoscopic CBD Exploration with T-tube insertion for Choledocholithiasis in

Department of Surgery, GMCH.

Sample size: Taking 95% confidence interval with a margin of error of 10% and the sample size for the present study is taken to be 50.

Aims and objectives of the study

1. To evaluate the microbiological profile of bile in choledocholithotomy patients.
2. To assess the factors that contributes to bacterial growth in bile culture.
3. To assess the clinical outcome of patients with high bacteriological growth in bile and the role of prophylactic antibiotics

Inclusion criteria:

- Patients who underwent Open or Laparoscopic CBD Exploration with T-tube insertion for Choledocholithiasis
- Diagnosed by MRCP with CEMRI

Exclusion criteria:

- Patients not giving consent.
 - Patients with known source of sepsis
 - Associated comorbid conditions like DM, TB, Immunocompromised States and chronic illness
- Patients who had undergone endoscopic retrograde pancreaticography(ERCP) and endoscopic sphincterotomy one week before surgery.

Ethical clearance: Ethical clearance was taken before commencement of the study from the Institutional Ethics Committee (Human), Guwahati Medical College Hospital, Guwahati and written informed consent was taken..

Methodology:

Management protocol

1. Patients were selected on the basis of the inclusion and exclusion criteria as described above and after obtaining the consent from the patient or responsible attendant as per the ethical standards, they were made part of the study.
2. The patients who underwent Open and Laparoscopic CBD exploration with T- tube insertion in the Department of Surgery, GMCH are included in the study
3. Patients are to be fully evaluated clinically and investigated properly

Blood for Hemoglobin

- Total and differential WBC count, Platelet count, ESR
- Prothrombin time and INR
- Blood for liver function test, blood urea, creatinine, random blood sugar, TSH, sodium, potassium
- Blood grouping and Typing, Hbs Ag, Anti HCV, HIV 1&2
- ECG
- CXR PAV
- USG whole abdomen
- MRCP with CEMRI

The imaging studies that will be carried out include USG whole abdomen, MRCP with CEMRI, Chest X ray PA view. A detailed clinical history and physical examination carried out and recorded as per the proforma given in Annexure-A. Patients followed up during the period of the study after 2 weeks after the discharge.

4. All the patients were subjected to same pre-operative preparation which are followed in our institution, described as follows.

- Pre-operative counseling was done about the diagnosis, the prognosis associated with it, details of the operative procedure and also explained about the risks of the operation.
- Patients were kept NPO at least 6hrs prior to surgery. Pre-operative prophylactic intravenous antibiotic was given just before surgery in accordance with WHO guidelines. Ceftriaxone+ sulbactam 1.5gm IV (ANST) was the antibiotic of choice as it was available free of cost in hospital supply.

- Pre-operative shaving was done below the nipple to mid-thigh.
- **Statistical analysis:** Data were presented as frequency and percentages, bar

diagrams and pie-diagrams were drawn to represent the data. Calculation were done using Microsoft Excel-07

Sample collection

In patients undergoing open or laparoscopic CBD exploration ,bile was aspirated with a10 cc syringe from the T-Tube in immediate postoperative period and then transferred into a blood culture bottle which was then transferred to the laboratory as soon as possible. In the laboratory the specimen was evaluated to check if any organism were isolated by transferring them to culture media and allowing to incubate to see if the specimen has any positive isolate. Bacteriological study of bile culture and antibiotic testing was done for commonly used antibiotics

Culture media: Blood agar, Mac-Conkey agar and brain heart infusion agar with and without Gas-pak(anaerobiosis)

Method of culture: Bile collected intraoperatively was first examined microscopically after staining with Gram stain. Then further processing was done by inoculation of bile on culture media like MacConkey and blood agar(2sets each one for aerobic incubation and other for anaerobic incubation with Gas-pak) colonies obtained the next day were identified by conventional biochemical tests such as indole test, citrate test, urease test, triple sugar iron test, oxidase test, gram staining, and motility test.

. **Method of Culture sensitivity:** Antibiotic sensitivity test was performed on Mueller-Hinton agar with modified Kirby Bauer disc diffusion test as per CLSI guidelines.

IV. Results And Observations

A clinical study of “Bacteriological analysis of bile in T-Tube in Choledocholithotomy patients and it’s correlation with clinical outcome” has been attempted in a series of 50 cases. The results are described as follows

SEX DISTRIBUTION

In the present study of 50 patients, 19 patients were male and 31 were female. The incidence of male and female were 38% and 62% respectively.

The ratio of male: female is 1:1.6.

Table:1 Sex distribution of study cases

Sex	No.of Cases
Male	19
Female	31

There is a female preponderance with female to male ratio is 1.6:1

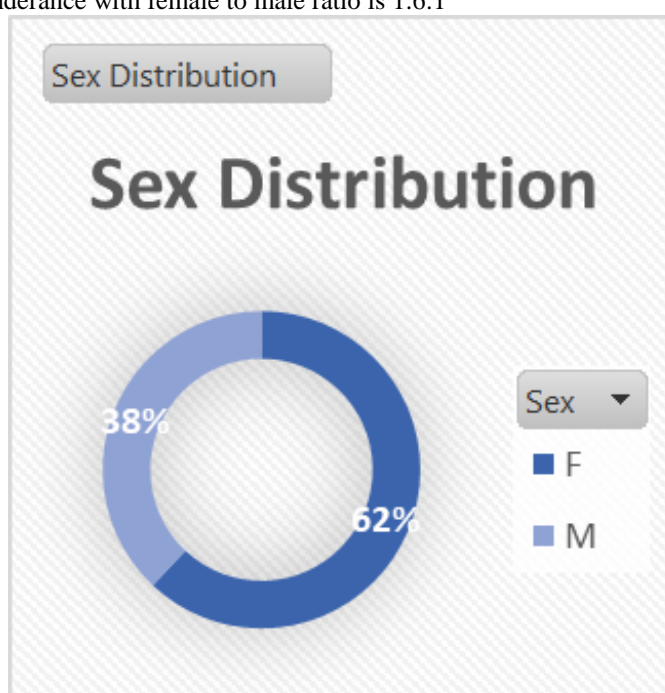


Fig. Pie diagram showing the graphical representation of the sex distribution (Table 1) of choledocholithiasis cases

AGE INCIDENCE:

The age incidence in the present study was found to be from 19 to 78 years.

Table: 2 Age distribution of study subjects

Age group in years	Total cases	Percentage (%)
19-28	4	8
29-38	6	12
39-48	10	20
49-58	16	32
59-68	12	24
69-78	2	4
TOTAL	50	

There is an increased incidence of CBS stones in the 4th and 5th Decade with the maximum incidence being in the 49-58years (16 cases) age group followed by 59-68 years (12 cases)

Table: 3 Age distribution of the CHOLEDOCHOLITHIASIS

Age group in years	Females		Males	
	Number of cases	Percentage	Number of cases	Percentage
19-28	1	3.1	3	12.6
29-38	4	12.4	2	7.2
39-48	7	21.7	3	12.6
49-58	9	27.9	7	26.6
59-68	9	27.9	3	11.4
69-78	1	3.1	1	3.8
TOTAL	31	100	19	100

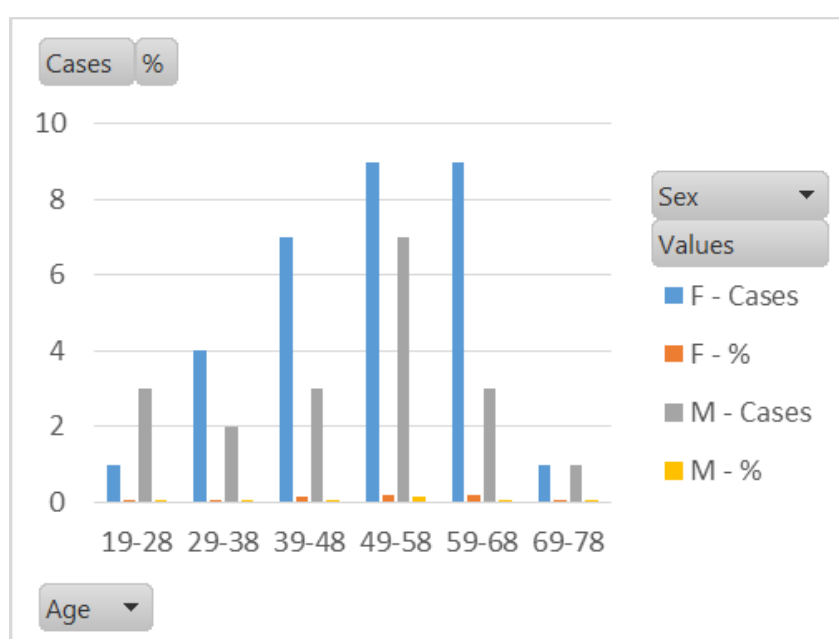


Fig.: Above bar diagram represents the age distribution (Table no.3) of Cholelithiasis cases.

Table 4 Operative Procedure done

Operative Procedure	No.of cases
Laparoscopic CBD exploration	0
Open CBD exploration	50

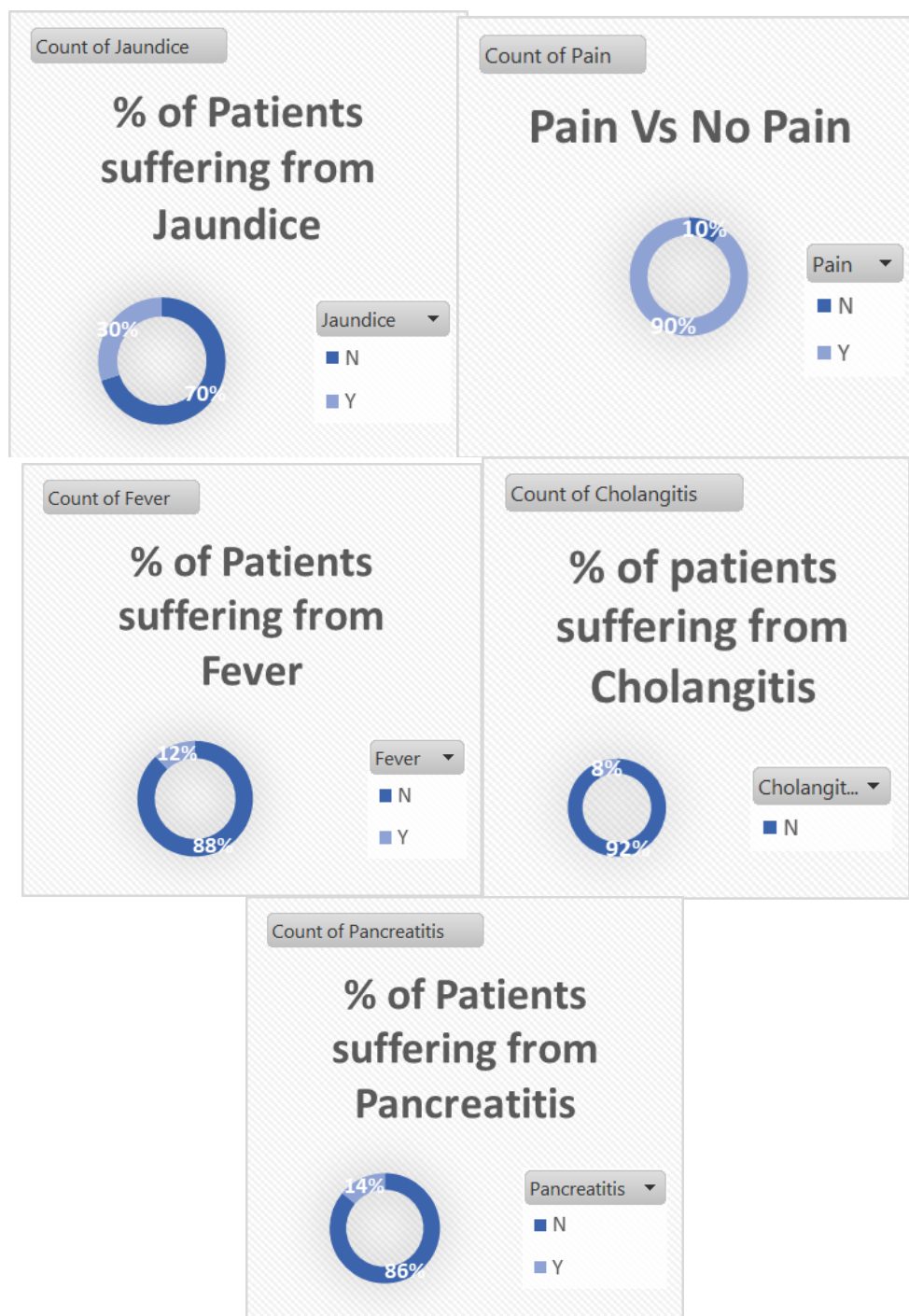
Out of 50 patients 37 underwent Open CBD exploration.

PRESENTING SYMPTOMS

5(10%) patients were asymptomatic. Pain abdomen was present in 45(90%) patients at the time of diagnosis. Jaundice was present in 35(70%) patients. Fever was present in 12(24%) patients. 4 (8%) Patients had earlier presented with cholangitis and 7(14%) of patients present with pancreatitis.

Table 5 Clinical features

Symptoms	Number of Patients	Percentage
Asymptomatic	5	10%
Pain	45	90%
Fever	6	12%
Jaundice	15	70%
Cholangitis	4	8%
Pancreatitis	7	14%



TOTAL BILIRUBIN

Out of 50 patients, 31(58%) patients had serum bilirubin levels within normal limit. 12(23%) patients had bilirubin levels between 1.1 to 2 mg/dl. 10 patients (19%) patients had clinically jaundice. Highest value obtained was 6.3mg/dl.

TOTAL BILIRUBIN(mg/dl)	NUMBER n=50	PERCENTAGE
0.6-1.1	30	60%
1.2-2	11	22%
>2	9	18%
TOTAL	50	100%

TABLE 6: Total bilirubin ranges

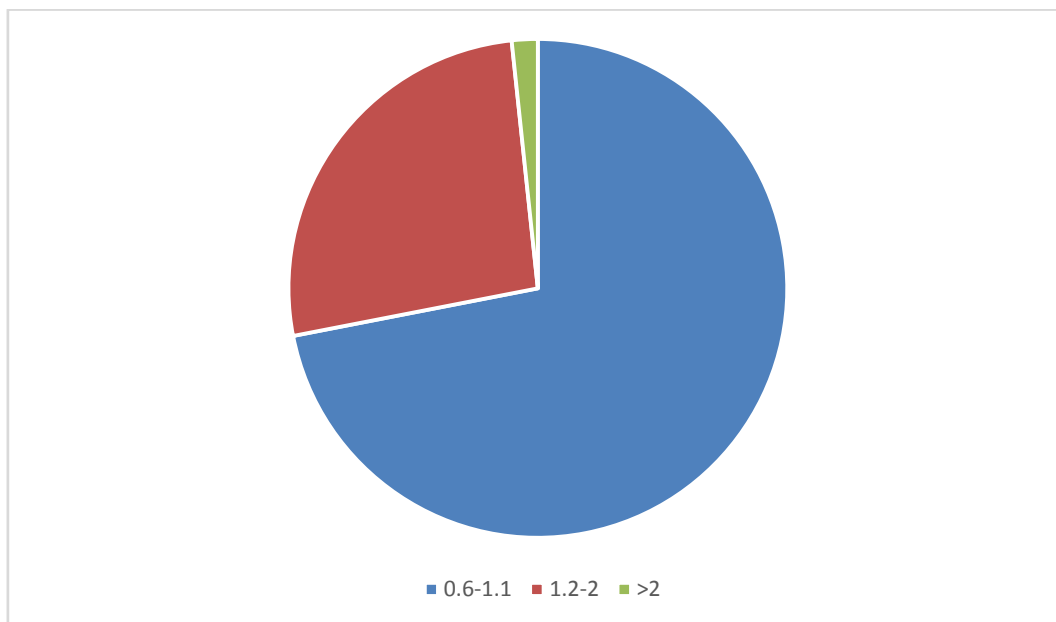


FIG-Above pie diagram represents total bilirubin ranges(Table 6)

CONJUGATED BILIRUBIN

Out of 50 patients, 10(20%) patients had conjugated bilirubin up to 0.3 mg/dl

CONJUGATED BILIRUBIN(mg/dl)	NUMBER OF PATIENTS	PERCENTAGE
Up to 0.3	10	20%
0.3-1	20	40%
1.1-3	12	24%
>3	8	16%

TABLE 7-Conjugated Bilirubin Levels

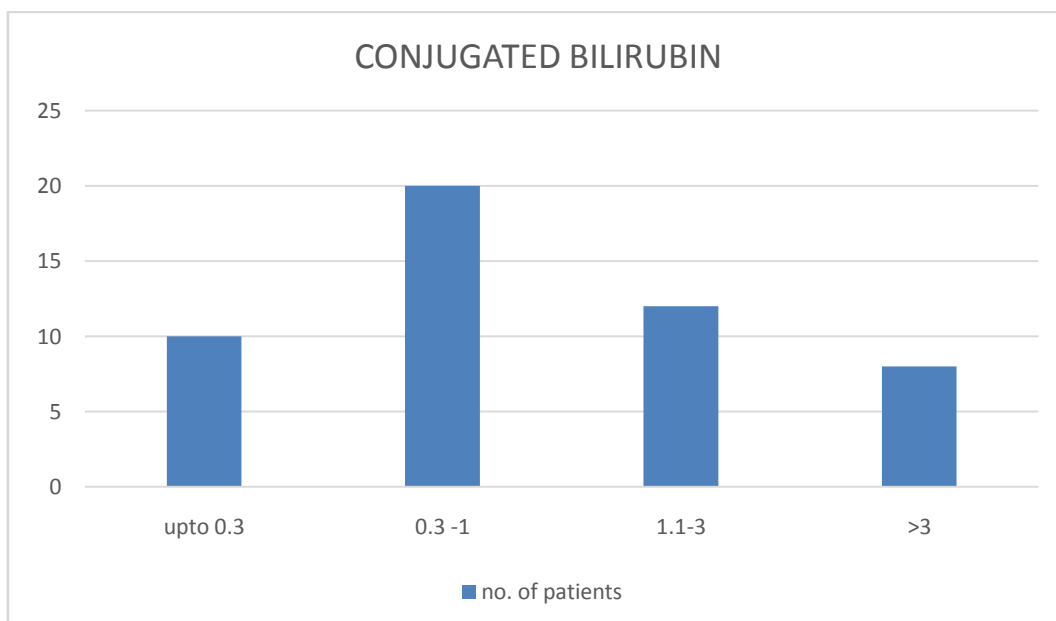


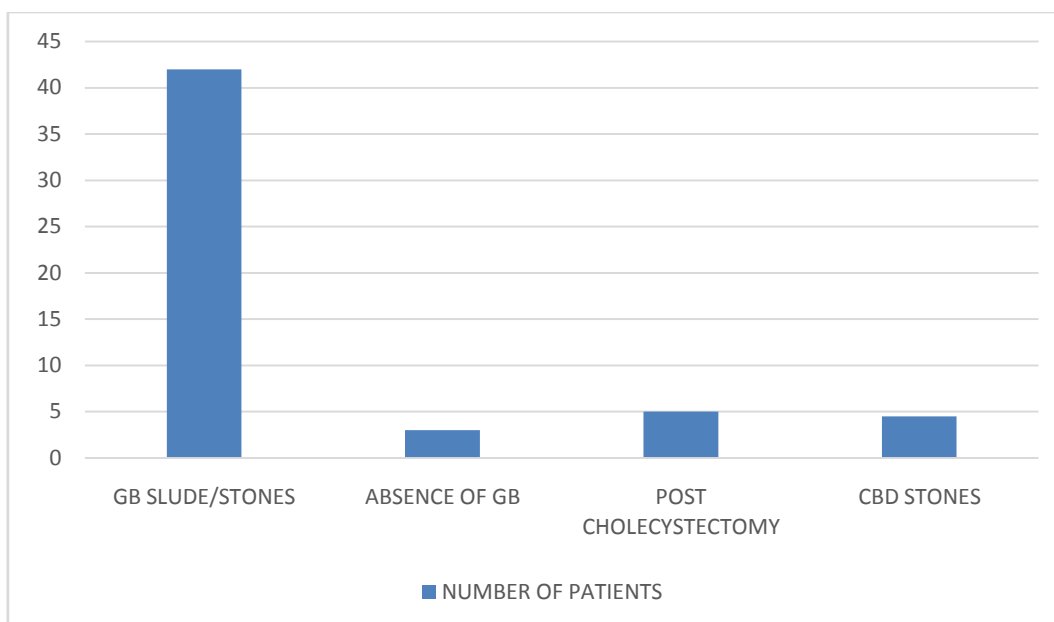
Fig-Bar diagram of conjugated bilirubin ranges(Table 7)

ULTRASONOGRAPHY OF ABDOMEN

Out of 50 patients, 42(84%) patients had gall bladder stone or sludge in USG, while 3(6%) patients did not have stone in gallbladder. In 5(10%) patients gallbladder was not visualized as cholecystectomy had been done earlier. CBD stone was not visualized in 7(14%) patients which was later confirmed by MRCP.

FINDINGS	NUMBER OF PATIENTS	PERCENTAGE
GB stones/sludge	42	84%
Absence of GB stones	3	6%
Post Cholecystectomy status	5	10%
CBD stones	43	86%

Table 8 Ultrasonography results



MRCP

MRCP was done in all the 50 patients. All patients had CBD stone in MRCP. 27(57%) patients had single stones and 23(46%) had multiple stones.

MRCP FINDING	NUMBER OF PATIENTS	PERCENTAGE (%)
GALL BLADDER STONE	42	84
POST CHOLECYSTECTOMY STATUS	5	10
ABSENCE OF GB STONE	3	6
STONE IN CBD	50	100

TABLE 9 MRCP findings

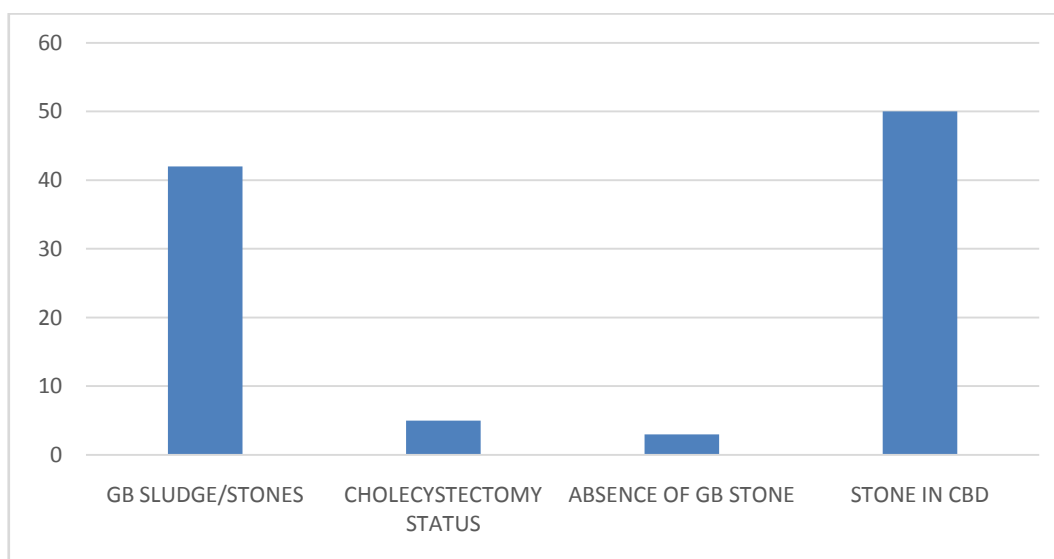


FIG- bar diagram showing frequency distribution of patients according to their MRCP Findings(table 9)

NUMBER OF STONES	NUMBER OF PATIENTS	PERCENTAGE (%)
SINGLE	27	57
MULTIPLE	23	46

Table 10 showing frequency distribution and percentage of patients according to the number of stones in their MRCP findings

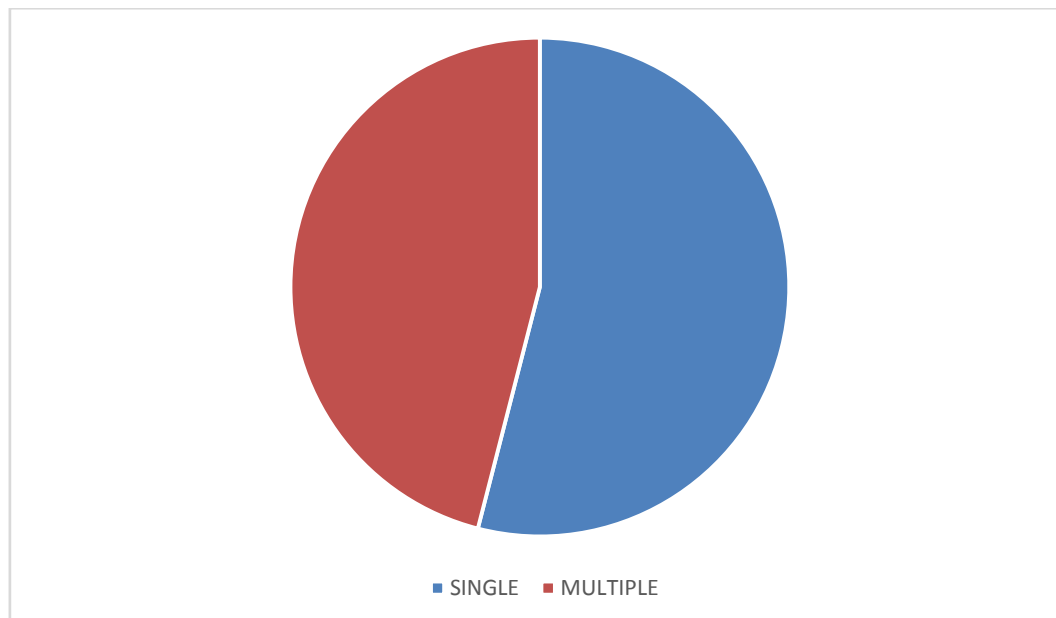


FIG- Pie diagram showing frequency distribution of patients according to the number of stones in their MRCP findings(table10)

Age group (in years)	Choledocholithiasis Cases	Bile C/S	Percentage (%)
19-28	4	0	0
29-38	6	0	0
39-48	10	2	20
49-58	16	5	31
59-68	12	8	67
69-78	2	2	20

Table11 age wise incidence of bile infection

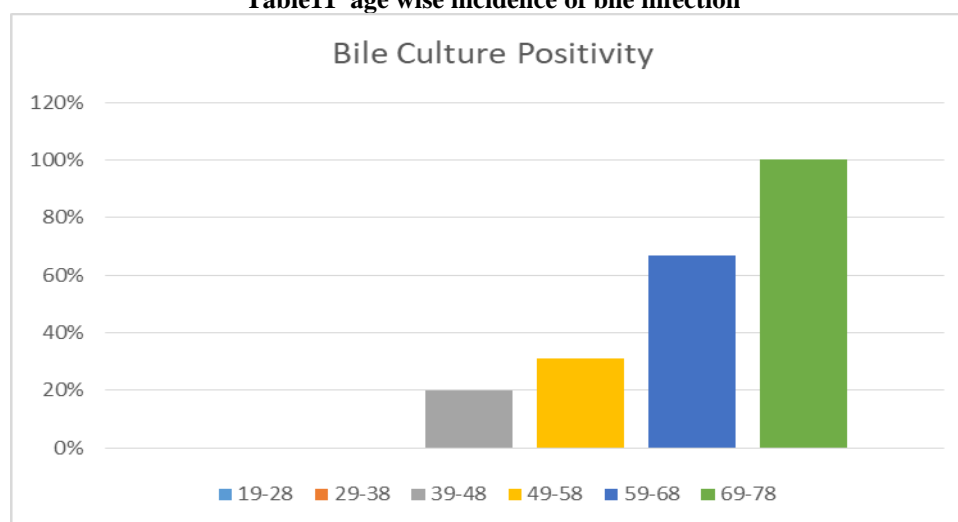


Fig. Above bar diagram represents the bile culture positivity(Table 11) in different age groups

Bile for bacteria was found to be positive in 17(34%) cases and negative in remaining 33(66%) cases. Of the 17 cases with bile culture positive 7 cases are male and 11 cases are female. Bile culture is most commonly positive in 69-78 years age group with 87%(6/7 cases).

Bile Culture Status	No.of Cases	Percentage
Gram Positive	1	17
Gram Negative	16	83

Table 12 Gram staining of the isolated organisms

Gram negative bacteria were most commonly isolated from the bile culture constituting 83%(16/18 Cases).

Bacteria isolated	Bile C/S	Percentage
Escherichia coli (E.coli)	11(64.7%)	22
Klebsiella spp.	5(29.4%)	10
Acinetobacter baumannii	1(5.8%)	2
Total	17 (100%)	34

Table 13 Common organisms isolated from bile culture

Escherichia coli and Klebsiella were the most common organisms found in 16 cases (E. coli -11/17Klebsiella-5/17cases) which is 32%.

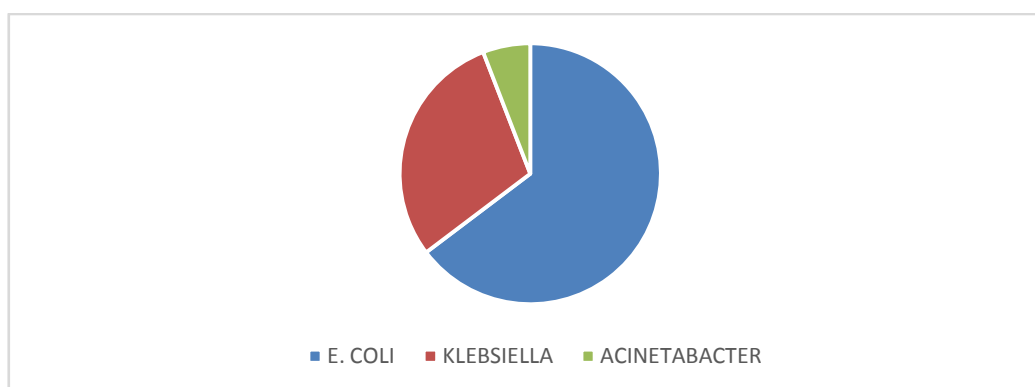


Fig.Above pie diagram represents the common organisms isolated from bile culture.(table13)

Antibiotic	Sensitive	Resistant	Intermediate sensitivity
Amikacin	5	4	2
Meropenam	6	3	2
Pipercillin +Tazobactum	6	1	4
Ciprofloxacin	3	5	3
Ceftazidime	6	3	2
Amoxyclav	3	5	3

Table14-antibiotic sensitivity for E. Coli

Antibiotic	Sensitive	Resistant	Intermediate sensitivity
Amikacin	4	1	-
Meropenam	5	-	-
Pipercillin+Tazobactum	5	-	-
Ciprofloxacin	3	1	1
Ceftazidime	3	2	-
Amoxycillin+ clavulnic acid	2	3	-

Table14-antibiotic sensitivity for Klebsiella spp

E.coli and Klebsiella spp. isolated showed variable sensitivity patterns with a good response to Amikacin and Beta lactam antibiotics which are commonly used postoperatively

Table no,13 Antibiotic sensitivity for isolated Acinetobacter baumannii

Antibiotic	Sensitive	Resistant	Intermediate sensitivity
Meropenem	-	1	-
Piperacillin + Tazobactam	1	-	-
Ciprofloxacin	1	1	-
Levofloxacin	1	-	-
Amikacin	1	-	
Minocycline	1	-	-

Acinetobacter isolated from the bile culture showed variable sensitivity patterns with a good response to Levofloxacin, Amikacin and Minocycline.

POSTOPERATIVE PERIOD COMPLICATIONS

In the post-operative period, out of the 17 patients who had their bile culture positive, 10 had fever in post-operative day 2, 6 patients had surgical site infection and 5 patients had total counts either more than 11,000 or less than 4000/ microliters and average day of discharge from hospital was 10 days Vs 6 days in patients with negative bile culture.

Complication	No.of cases	Percentage (%)
Surgical Site Infection	6	12
Fever	10	20
Total counts(>11K or <4K)	5	10

Table 14- Postoperative complications

Most common complication associated with choledocholithotomy with T- tube insertion is fever (20%).

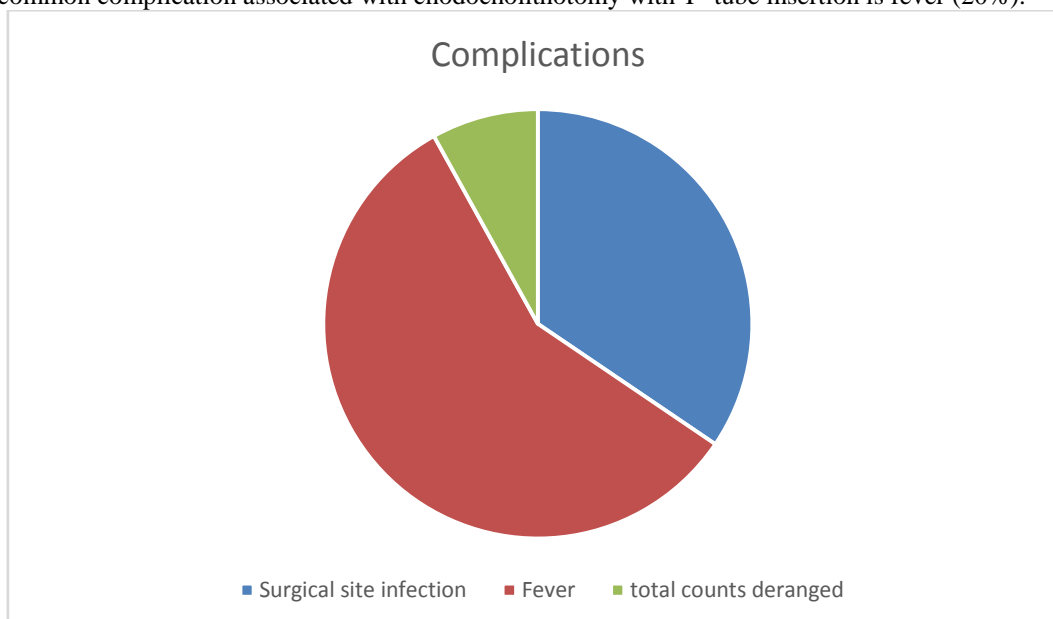


Fig.Above pie diagram is a pictorial representation of Table (14)(Complications associated with choledocholithotomy)

Table 15 Complications associated with Choledocholithotomy.

COMPLICATIONS	MALE	FEMALE
SURGICAL SITE INFECTION(SSI)	1	5
FEVER	5	5
SEPSIS(DERANGED TOTAL COUNTS)	2	3

Wound infection rate is higher in females when compared to males. Other complications mentioned above were also found more commonly in females.

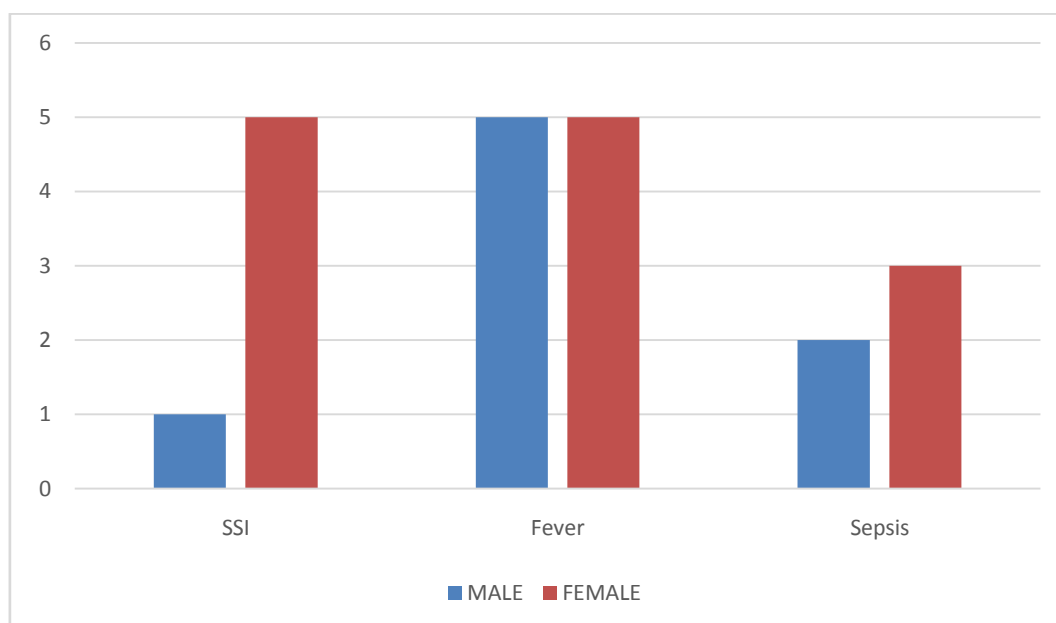


Fig. Above graph is a pictorial depiction of Table15 (Complications associated with choledocholithotomy with T-tube insertion)

V. Discussion

Common bile duct stones are one of the common medical conditions leading to surgical intervention. They occur in 3%-14.7% of all patients with cholelithiasis.⁷

Although the stones in the CBD may remain silent for long period, the development of complications can be serious. Complications like, obstructive jaundice, ascending cholangitis, acute pancreatitis all associated with serious morbidity and mortality and need immediate attention.

The present study was conducted in Guwahati Medical College and Hospital where essential infrastructure for surgical and endoscopic management of CBD stones are available.

This study was aimed to evaluate the micro biological profile of bile choledocholithotomy with T-tube patients, assess the factors that contributes to bacterial growth in bile and assess the clinical outcome of patients with high bacteriological growth in bile and the role of prophylactic antibiotics.

AGE INCIDENCE

In the present study, the mean age of patients with Choledocholithiasis disease was 58±10 years which range between 19 years to 78 years.

In a similar study by **Kaufman et al** in 1989, it was reported that the average group of patients of Choledocholithiasis was 55 years± 7 years.⁸

Barkun et al in 1994 reported that the average age was 57.5± 16.8 years in the study of 74 patients of Choledocholithiasis.⁹

Tazuma et al in 2006 reported that the mean age of patients was 67 years.¹⁰

Vidagany N et al in 2016 recorded the mean age as 63 years(ranged from 24 years to 91 years) in 160 patients.¹¹

Rai MK et al in 2017 in 23 patients of Choledocholithiasis max group was 40 years to 49 years.¹²

STUDY	TOTAL NUMBER OF CASES	AVERAGE AGE IN YEARS
Kaufman et al(1989)	63	55±7 years
Barkun et al(1994)	127	57.5±16.8 years
Prat et al(1999)	880	57.8±17 years
Tazuma et al(2006)	1384	67 years
Present study	50	58±10 years

SEX DISTRIBUTION

Choledocholithiasis is more prevalent among women. In the present study, out of 50 patients 31 were female and 19 were male and ratio is 1.6:1 . Results in this study is similar to many other studies done in the past.

Barkun et al in 1994, out of 127 patient of CBD stones 40 were male and 87 were female and the ratio was 1:2.1.⁹

Tazuma et al in 2006 reported that in his study among the patients of Choledocholithiasis in whole population of Taiwan, the ratio of male : female was 1:0.89.¹⁰

In 2007 **Yang et al** reported ratio of 1:1.28(M:F) among the patients of Choledocholithiasis in his series.¹³

Ko et al in 2013 stated that among the 215 patients of Choledocholithiasis 57 were males and 158 were females and the ratio was 1:2.7.¹⁴

Tozatti et al in 2015 reported a ratio of 1:1.61 in his study among the 47 patients of choledocholithiasis.¹⁵

Vidagany N et al in 2016 reported a ratio of 1:1.75 among the 160 patient of Choledocholithiasis.¹¹

STUDIES	TOTAL NO OF CASES	FEMALES	MALES	RATIO(Male: female)
Barkun et al 1994	127	87	40	1:2.1
Prat et al 1999	880	552	328	1:1.68
Ko et al 2013	215	158	57	1:2.7
Tozatti et al 2015	47	29	18	1:1.61
Vidagany Net al 2016	160	102	58	1:1.75
Manimaran et al 2016	115	64	51	1:1.25
Rai MK et al 2017	23	17	6	1:2.83
Present Study	50	31	19	1:1.6

SYMPTOMATOLOGY

PAIN ABDOMEN

Pain in abdomen is the predominant symptom in the present study .Among 50 cases 45 patients had pain.

Prat et al in 1999 reported that out of 880 patients of Choledocholithiasis 664 patients had pain abdomen as presenting symptom.¹⁶

Tozatti et al in his study in 2015 stated that out of 47 patients about 95.7% experienced pain with choledocholithiasis.¹⁵

In 2016 **Vidagany N et al** reported that the highest et al reported that the highest number of patients had pain abdomen as a presenting symptom. In his study, total number of patients were 160, out of which 83 had pain abdomen as a presenting symptom.¹¹

STUDY	TOTAL CASES	CASES WITH PAIN ABDOMEN	PERCENTAGE
Prat et al 1999	880	664	75.5%
Tozatti et al 2015	47	45	95.7%
Vidagany et al 2016	160	83	51.9%
Present Study	50	45	90%

JAUNDICE

. In the present series out of 50 patients 15 had jaundice. The results are similar to various studies done in the past.

Barkun et al 1994 stated that out of 127 patients of Choledocholithiasis, 42 patients had jaundice.⁹

Prat et al 1994 reported to have jaundice in 23.1% out of 880 patients of Choledocholithiasis.¹⁶

Tozatti et al in 2015 stated that out of 47 patients of choledocholithiasis 14 patients had jaundice.¹⁵

Vidyagany et al in 2016 recorded that out of 160 patient of choledocholithiasis 27 patient had jaundice in his study.¹¹

STUDY	TOTAL PATIENT	PATIENT WITH JAUNDICE	PERCENTAGE
Barkun et al 1994	127	42	33.07%
Prat et al 1994	880	203	23.1%
Tozatti et al 2015	47	14	29.78%
Vidyagany et al 2016	160	27	16.85%
Present study	50	15	30%

FEVER

In the present study out of 50 patients of Choledocholithiasis 6 (12%) had fever.

Prat et al in 1999 stated that out of 880 patients of choledocholithiasis 15.8% patients had fever.¹⁶

Tozatti et al in 2015 reported to have fever in 30% patients of Choledocholithiasis.¹⁵

Manimaran et al in 2016 stated that out of 115 patients of Choledocholithiasis 42(36.52%) patients had fever.¹⁷

STUDY	TOTAL CASES	CASES WITH FEVER	PERCENTAGE (%)
Prat et al(1999)	880	139	15.8
Tozatti et al(2015)	47	14	30
Manimaran et al(2016)	115	42	36.52
Rai MK et al(2017)	23	0	0
Present Study	50	6	12

CHOLANGITIS

Cholangitis is characterized by Charcot’s triad which consists of intermittent pain, fluctuant jaundice and fever. In the present study 4 (8%) had patients had symptoms of cholangitis..

In the similar study by **Barkun et**⁹ in 1994 stated that 15% patient had cholangitis whereas **Prat et al**¹⁶ in 1999 stated that 8.6% patients had cholangitis in the studies.

Tozatti et al in 2015 reported to have to have 9 patients who presented with symptoms of cholangitis out of 47 patients of CBD stone.¹⁵

Vidagany N et al in 2016 reported that 20 patients presented with symptoms of cholangitis out of 160 patients of Choledocholithiasis.¹¹

Manimaran at el in 2016 reported that 38 patients presented as cholangitis out of 115 patients with CBD stones¹⁷.

STUDIES	TOTAL CASE	CASES WITH CHOLANGITIS	PERCENTAGE (%)
Barkun et al 1994	127	15	11.81
Prat et al 1994	880	75	8.6
Tozatti et al 2015	47	9	19.1
Manimaran et al 2016	115	38	33.04
Vidagany N et al 2016	160	20	12.5
Present Study	50	4	8

PANCREATITIS

Some of the patients of choledocholithiasis may be presented with symptoms of biliary pancreatitis..

In the present study 7 (14%) patients had symptoms of pancreatitis out of 50 patients at some point before surgery and interval surgery was done.

Barkun et al in 1994 reported to have 12 patients presented with symptoms of biliary pancreatitis out of 127 patients in his study.⁹

Prat et al in 1999 stated that 9% patients had symptoms of biliary pancreatitis out of 880 patients in his study.¹⁶

Tozatti et al found that 6 patients had symptoms of biliary pancreatitis out of 47 patients.¹⁵

Shojaiefard et al reported that prevalence of asymptomatic CBD stones is between 5.2% and 12 %.³⁰

Costi et al reported that CBD stones may be asymptomatic (up to 50% cases) are associated with various symptoms.¹⁹

In the present study, the presence of asymptomatic patients are 43 (86%).

STUDIES	TOTAL CASES	PANCREATITIS	PERCENTAGE (%)
Barkun et al 1994	127	18	14.17
Prat et al 1994	880	79	9
Tozatti et al 2015	47	6	12.76
Manimaran et al 2016	115	6	5.21
Vidagany N et al 2016	160	12	7.5
Present Study	50	7	14

TOTAL BILIRUBIN

Out of 50 patients, 30 (60%) patients had serum bilirubin level within normal limit. 11 patients had bilirubin level between 1.2-2 mg/dl. 9 patients had clinically jaundice. Highest value obtained was 7mg%

Prat et al reported that liver and pancreatic enzymes are normal upto 54.7% of the Choledocholithiasis patients and sensitivity is 74%.¹⁶

Freitas et al reported that elevated bilirubin is an indicator of CBD stone but it is not sensitive nor specific.⁹

Costi et al reported that total bilirubin is considered the main laboratory index related to the risk of common bile duct stones and is a very strong predictor of common bile duct stones.¹⁹

MRCP

MRCP was done for the patients. All the patients had CBD stones in MRCP. 27 patients had single stone and 23 patients had multiple stones in CBD. Gall bladder was not visualized in 5 patients as cholecystectomy was done earlier, while stone in gallbladder was found in 3 patients didn’t have any stone in gallbladder.

Varghese et al in 1999 reported that MRCP diagnosed Choledocholithiasis with a sensitivity of 93%, specificity% and accuracy of 97%.¹⁶

Shojaiefard et al reported that MRCP has sensitivity of 95% and specificity of 97% for demonstrating CBD stones.³⁰

INCIDENCE OF BILE INFECTION

In present study Bile for bacteria was found to be positive in 17(34%) cases and negative in remaining 33(66%) cases. Of the 17 cases with bile culture positive 7 cases(33.33%) are male and 11 cases(66.67%) are female. Bile culture is positive most common in 58-78 years age group that is 5/17 cases(29.41%).

In **Moazeni-Bistgani, Mohammad. and Imani, Reza. (2013).**²¹⁹ study 50 of 132 (37.87%) studied patients were positive for bacteria.

In **Cristina Flores et al (2003)**, study of 23 patients with choledocholithiasis shows bile culture to be positive in 19 cases (82.6%).²³

In **Ewa Karpel et al (2011)**, study of 92 patients with choledocholithiasis shows 65(70.65%) positive bile cultures.²⁴

In **Krishna K.Singh,Dhirendra P.Singh et al (2013).**²²² study of 100 patients shows the bile culture test was positive in 20% of cases and negative in 80% cases.

In **Ashok koiral et al(2018).**²⁵ study of 100 patients bile culture was positive in 16 patients.

Table 8.2 Comparison of bile culture positivity with different studies.

Bile culture	Positive	Negative	Total no.of Cases
Present series	18 (33.33%)	36 (66.67%)	54
Moazeni-Bistgani, Mohammad. and Imani, Reza. (2013) ¹⁷⁵ series	50 (37.87%)	82 (62.13%)	132
Cristina Flores et al (2003)	19 (82.6%)	4 (17.4%)	23
Ewa Karpel et al.(2011)	65 (70.65%)	27 (29.35%)	92
Vasantrao Deshmukh et al (2018) ¹⁷⁸	36 (36%)	64 (64%)	100
Ashok koiral et al(2018) ¹⁷⁹	16 (16%)	84 (84%)	100

BILE CULTURE AND SENSITIVITY

In present study 17 cases were found to be bile culture positive out of 50 cases which is 34%. Enterobacteriaceae members were the most commonly isolated organisms. E. coli and Klebsiella were the most common organisms found in 16 cases (Klebsiella-5/17 cases; E. coli-11/17 cases) . Followed by Acinetobacter (1/17). Most of the organisms isolated were found to be sensitive to Amikacin and Beta lactamase antibiotics with variable sensitivities.

In **Moazeni-Bistgani, Mohammad. and Imani, Reza. (2013).**²³ study, 50 of 132 (37.87%) studied patients were positive for bacteria. The most common isolated organisms were Escherichia coli (13; 26%), Enterobacteriaceae (9; 18%), and Salmonella typhi (7; 14%). The most effective antibiotics were sequentially Amikacin, Ceftriaxone, and Clindamycin.

In **Shahi K S,Sanjeev Singh et al(2014).**²⁶ Bactibilia was found in 43/100 (43%) of patients. Polymicrobial flora was found in 7% of bile samples. Escherichia coli, citrobacter, Klebsiella pneumoniae and pseudomonas were the predominant organisms isolated. Amikacin, gentamicin, ceftriaxone sulbactam, piperacillin tazobactam, imipenem were among most effective in prophylactic regimen.

In **Vasantrao Deshmukh,Ramprasad Rajebhosale et al.(2018).**²⁷ study of 100 patients bacteria were isolated in 36 samples. E. coli was the most common isolate (12; 33%). Enterobacter was the second one (8; 22%). The antibiotics to which organisms were sensitive were Cefepime, Ceftriaxone, Imipenem, Amikacin, Gentamycin and Ciprofloxacin.

COMPLICATIONS

In present study, the most common complication associated with Choledocholithotomy is fever. 10 patients had fever which is 20% (10/50 cases) followed by surgical site infection(12%) and sepsis (10%) Complications like bile leak and premature dislodgement were not seen in our patients.

In **Vanessa L Wills et al 2002**²⁸ study of 274 patients with T- tube insertion done after choledocholithotomy revealed 42(15.3%) patients experiencing complications like sepsis , premature dislodgement and bile leak resulting in prolonged hospital stay.

In Deepak Naik P et al in 2019.²⁹ study of 50 patients wound site infection was in 6%(3/50 cases),bile leak in 2%(1/50 cases) and bile duct injury was in 4%(2/50 cases).

VI. Conclusion

The present study shows that bile is infected in a good number of cases with organisms is seen in 17(34%) out of 50 cases. Choledocholithiasis is common amongst middle aged patients. It is shown in the present study that CBD stones are common among females as compared to males. Pain is the most common presenting symptom among the patients of choledocholithiasis. Trans abdominal ultrasonography and MRCP were the imaging modality commonly used to detect CBD stones. MRCP is more accurate.

Commonest organisms isolated were Klebsiella spp. and E.coli followed by Acinetobacter baumannii. Fever was the most common complication seen postoperatively followed by surgical site infection. Longer hospital stay was observed in patients with positive bile culture patients as compared to patients with negative bile culture. Most organisms isolated were sensitive to Aminoglycoside (e.g.: Amikacin and Gentamicin) and B lactamase group of antibiotics. Both the groups of drugs are equally effective and available at free of cost at our hospital so they can be used as prophylactic antibiotic in pre-operative period and continued post-operatively to avoid complications arising from the bacteriological flora of the bile duct. This might be helpful in reducing the overall morbidity and hospital duration stay of the patients.

Bibliography

- [1]. Meyers WC: Jones RS. development of the liver and the biliary tract. In Textbook of liver and biliary surgery. J.B. Lippincott Company 1990:(1):1-19.
- [2]. Njeze GE. Gallstones. Nigerian Journal of Surgery. 2013;19(2):49-55.
- [3]. Maki T. Pathogenesis of calcium bilirubinate gallstone: role of E. coli, betaglucuron and coagulation by inorganic ions ,polyelectrolytes and agitation. Ann Surg. 1966;164:90-100
- [4]. Ujiki M, Hedberg HM. Current Understanding of Choledocholithiasis: Clinical Presentation and Pre operative Evaluation. Choledocholithiasis: Springer; 2018.p.31-48.
- [5]. Collins C, Maguire D, Ireland A, Fitzgerald E, O'Sullivan GC. A prospective study of common bile duct calculi in patients undergoing laparoscopic cholecystectomy: natural history of choledocholithiasis revisited. Annals of surgery.2004;239910;28.
- [6]. William J,Treacy P, Sidey P, Worthley C, Russell E.Primary duct closure versus T-tube drainage follow ing exploration of the common bile duct. Australian And New Zealand Journal of Surgery.1994;64(12):823-6
- [7]. Peng W, Sheikh Z, Paterson-Brown S, Nixon S. Role of liver function tests in predicting common bile duct stones in acute calculous cholecystitis. British journal of surgery, 2005;92(10):1241-7
- [8]. Polkowski M, Regula J, Tilszer A, Butruk E: Endoscopic ultrasound versus endoscopic retrograde cholangiography for patients with intermediate probability of bile duct stones: a randomized trial comparing two management strategies. Endoscopy. 2007, 39: 296-303
- [9]. Lee YT, Chan FKL, Leung WK, Chan HL, Wu JC, Yung MY, Ng EK, Lau JY, Sung JJ: Comparison of EUS and ERCP in the investigation with suspected biliary obstruction caused by choledocholithiasis: a randomized study. Gastrointest Endosc. 2008, 67: 660-668.
- [10]. Tazuma S. Epidemiology, pathogenesis and classification of biliary stones (common bile duct and intrahepatic). Best practice & research Clinical Gastroenterology.2006;20(6):1075-83
- [11]. Estellés Vidagany N, Domingo Del Pozo C, Peris Tomás, Díez Ares J A, Vázquez Tarragón A, Blanes Masson F. Eleven years of primary closure of common bile duct after choledochotomy for choledocholithiasis. Surg Endosc.2016 May;30(5):1975-82
- [12]. Rai MK, Kumar V. Incidence of choledocholithiasis in gallstone disease in eastern zone of India:A single centre study. Int J Med and Dent Sci 2017;6(1):1417-1420.
- [13]. Yang SH, Lee SE, Jang JY, Ryu JK, Kim YT, Yun YB et al. Clonical and epidemiological analysis of gallstone patients focused on 25 year experience of surgically treated patients. The Korean Journal of gastroeneterology=Taehan Sohwagi Hakhoe chi.2007;50(1):42-5
- [14]. Ko CW, Lee SP. Epidemiology and natural history of common bile duct stones and prediction of disease. Gastrointestinal endoscopy.2002;56(6):S165-S9.
- [15]. Maple JT, Ben-Menachem T. Anderson MA, Appalaneni V, Banerjee S, Cash BD, Fisher L, Harrison ME, Fanelli RD, Fukami N. Ikenberry SO, Jain R,Khan K, Krinsky ML, Strohmeier L, Dominitz JA, ASGE Standards of Practice Committee: The role of endoscopy in the evaluation of suspected choledocholithiasis. Gastrointest Endosc. 2010, 71: 1-9,
- [16]. Frederic Pratt BM, Beatrice Ducot, Renaud Chiche, Roberto Salimbeni Bartoli, Gilles Pelletiert. Prediction of Common Bile Duct Stones by Noninvasive tests. Annals of surgery.1999;229(3):362-8
- [17]. Dr M. Manimaran, Dr S. Chitra , Dr R. Balamurali, Dr S. Jeevan Kumar,T. P.Pugazhendhi. Choledocholithiasis:Clinical Manifestations and Associated Conditions. JMSCR.2016;4(11):14123-14127
- [18]. Shojaie A, Esmailzadeh M, Mehrabi A. Various Techniques for the Surgical treatment of common bile duct stones: a meta review. Gastroenterology research and practice.2009;2009
- [19]. Costi R. Gnocchi A, Di Mario F, Sarli L. Diagnosis and management of Choledocholithiasis in the golden age of imaging, endoscopy and laparoscopy. World journal of gastroenterology:WJG.2014;20(370):13382.
- [20]. Moss DW. Alkaline phosphatase isoenzymes. Clin Chem 1982;28-2007-2016.30
- [21]. Chen HH, Zhang WH, Wang SS et al. Twenty-two year experience with the diagnosis and treatment of intrahepatic calculi. Surg Gynecol Obstet 1984;159: 519-524.
- [22]. Freitas ML, Bell RL, Duffy AJ. Choledocholithiasis: evolving standards for diagnosis and management. World journal of gastroenterology: WJG 2006;12(20):3162-7.
- [23]. Moazeni-Bistgani M, Imani R. Bile bacteria of patients with cholelithiasis and theirs antibiogram.Acta Med Iran. 2013;51(11):779-783.
- [24]. Flores C, Maguilnik I, Hadlich E, Goldani LZ. Microbiology of choledochal bile in patients with choledocholithiasis admitted to a tertiary hospital. J Gastroenterol Hepatol. 2003 Mar;18(3):333-6.

- [25]. Abhilasha Sharma’s research works | B.P. Koirala Institute of Health Sciences, Dharān and other places.
- [26]. K S S, Singh S, Gupta R. MICROBIOLOGICAL PROFILE OF BILE IN CHOLELITHIASIS AND THEIR IMPLICATION IN CAUSING POST OPERATIVE WOUND INFECTIONS. *J Evol Med Dent Sci.* 2014 Dec 3;3(67):14478–82.
- [27]. Deshmukh V, Rajebhosale R, Mench K, Joshi M. THE STUDY OF INCIDENCE OF BILIARY INFECTION IN GALL STONE DISEASE IN A HOSPITAL. *J Evol Med Dent Sci.* 2018;7(47):5907–13.
- [28]. Wills, Vanessa⁷ Gibson, Kate & Karihaloot, Costa & Jørgensen, John.(2002).Complications of biliary T-tubes after choledochotomy.*ANZ journal of surgery.* 72.177-80.10.1046/j.
- [29]. Naik DP, Kumar HP, Harish Kumar CP. Cholelithiasis presentation and management in tertiary care hospital in South India: A clinical study. ~ 5 ~ *Int J Surg Sci.* 2019;3(3):05-08
- [30]. Shojaie A, Esmailzadeh M, Mehrabi A. Various Techniques for the Surgical treatment of common bile duct stones: a meta review. *Gastroenterology research and practice.*2009;2009

Dr Nandita Doley, et. al. “Bacteriological Analysis of Bile in T-Tube in Choledocholithotomy Patients and Its Correlation With Clinical Outcome.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 22(2), 2023, pp. 51-67.