

# Microbial Profile and Antibiotic Sensitivity of Bile in Patients Undergoing Laparoscopic Cholecystectomy: A Prospective Observational Study

Dr. Sachin Patel<sup>1</sup>, Dr. (Lt. Col.) Sangeeta Tiwari<sup>2</sup>, Dr. Rajesh Kumar Agarwal<sup>3</sup>

<sup>1</sup>Junior Resident, Department of General Surgery, American International Institute of Medical Sciences, Udaipur, Rajasthan, India  
Email: [sachinpateldr1\[at\]gmail.com](mailto:sachinpateldr1[at]gmail.com)

<sup>2</sup>Professor and Head, Department of General Surgery, American International Institute of Medical Sciences, Udaipur, Rajasthan, India  
Email: [sangeetabeenu\[at\]gmail.com](mailto:sangeetabeenu[at]gmail.com)

<sup>3</sup>Associate Professor, Department of General Surgery, American International Institute of Medical Sciences, Udaipur, Rajasthan, India  
Email: [doc.raj10\[at\]gmail.com](mailto:doc.raj10[at]gmail.com)

**Abstract:** *Bile, traditionally considered sterile, has been shown to harbor microorganisms in patients with gallbladder disease, particularly in acute and chronic cholecystitis.<sup>1,2</sup> The presence of bactibilia has important clinical implications, including postoperative infections and antibiotic selection. Aim: To evaluate the microbial profile and antibiotic sensitivity patterns of bile in patients undergoing laparoscopic cholecystectomy and to assess correlation with ultrasonographic findings. Materials and Methods: This prospective observational study was conducted on 100 patients undergoing laparoscopic cholecystectomy over a period of 18 months. Intraoperative bile samples were collected aseptically and sent for microbiological culture and antibiotic sensitivity testing. Clinical, radiological, and microbiological data were analyzed. Results: Bile culture positivity was observed in 40% of patients. The highest positivity was seen in acute cholecystitis (65.4%), followed by chronic cholecystitis (43.5%) and cholelithiasis (25.5%). Escherichia coli (45.8%) was the most common organism isolated, followed by Klebsiella species, Pseudomonas species, and Staphylococcus species. Gram-negative organisms showed highest sensitivity to Imipenem and Amikacin and Ceftriaxone while reduced sensitivity was observed for Ciprofloxacin. Conclusion: Bacterial colonization of bile is common in gallbladder disease. Gram-negative organisms predominate, and increasing antibiotic resistance necessitates culture-guided therapy.*

**Keywords:** Bactibilia, Laparoscopic cholecystectomy, Bile culture, Antibiotics Sensitivity, Escherichia coli, Gallbladder disease, Antimicrobial resistance

## 1. Introduction

Bile has traditionally been regarded as a sterile fluid; however, increasing evidence suggests that bacterial colonization is frequently encountered in patients with gallbladder disease.<sup>1,2</sup> The presence of bacteria in bile, referred to as bactibilia, is clinically relevant as it may contribute to postoperative infections, septic complications, and prolonged hospital stay.

Several studies have demonstrated that gram-negative enteric organisms, particularly Escherichia coli and Klebsiella species, are the most commonly isolated pathogens from bile.<sup>3-5</sup> These organisms are believed to ascend from the gastrointestinal tract or reach the biliary system via hematogenous spread.

In recent years, antimicrobial resistance has emerged as a major concern, especially in developing countries like India, where empirical antibiotic therapy is commonly practiced.<sup>6-8</sup> Knowledge of local microbial flora and antibiotic sensitivity patterns is therefore essential for appropriate perioperative management.

Ultrasonography remains the primary imaging modality in gallbladder disease. Findings such as gallbladder wall thickening and a positive sonographic Murphy's sign are

indicative of inflammation and may correlate with underlying infection.

The present study was undertaken to evaluate the microbial profile and antibiotic sensitivity patterns of bile in patients undergoing laparoscopic cholecystectomy and to correlate these findings with clinical and ultrasonographic parameters.

## 2. Materials and Methods

This prospective observational study was conducted in the Department of General Surgery at a tertiary care center over a period of 18 months.

### Inclusion Criteria

- Patients diagnosed with symptomatic gallbladder disease
- Patients undergoing laparoscopic cholecystectomy

### Exclusion Criteria

- Patients who had received antibiotics prior to surgery
- Immunocompromised patients
- Patients with complicated biliary pathology

### Procedure

All patients underwent routine preoperative evaluation. During laparoscopic cholecystectomy, bile was aspirated aseptically from the gallbladder using a sterile syringe. The

Volume 15 Issue 6, June 2026

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

[www.ijsr.net](http://www.ijsr.net)

samples were immediately sent to the microbiology laboratory for culture and antibiotic sensitivity testing.

**Microbiological Analysis**

Bile samples were cultured on appropriate media, and organisms were identified using standard microbiological techniques. Antibiotic sensitivity testing was performed using the Kirby-Bauer disk diffusion method.

**Data Collection**

The following data were recorded:

- Age and gender
- Clinical diagnosis
- Ultrasonographic findings
- Culture results
- Antibiotic sensitivity pattern

**Statistical Analysis**

Data were analyzed using appropriate statistical methods, and associations between variables were assessed.

**3. Results**

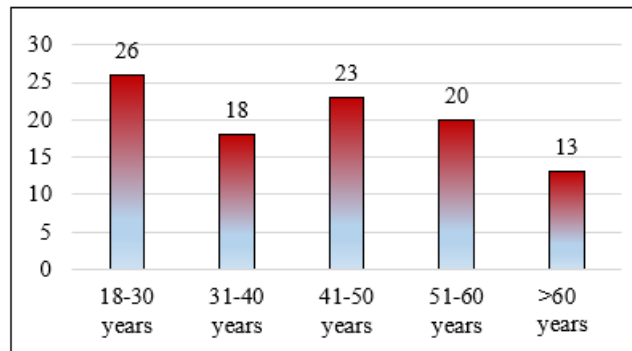
A total of 100 patients were included in the study.

Bile culture positivity was observed in 40% of patients.

**Table 1:** Distribution of patients according to Age

Age (Years)	Frequency (N)	Percentage (%)
18-30 years	26	26
31-40 years	18	18
41-50 years	23	23
51-60 years	20	20
>60 years	13	13
Total	100	100

The age of patients in the present study ranged from 18 years to more than 60 years. The highest number of patients belonged to the 18–30 years age group, accounting for 26% of the total cases. This was followed by patients aged 41–50 years (23%) and 51–60 years (20%). Patients in the 31–40 years age group constituted 18%, while those aged more than 60 years formed 13% of the study population. This indicates that cholecystitis was more commonly observed in younger and middle-aged adults in the present study.

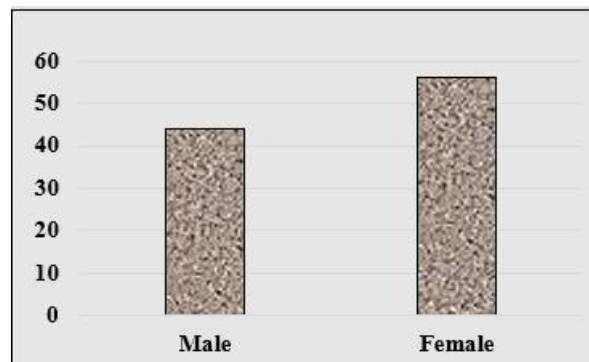


**Figure 1:** Distribution of patients according to Age

**Table 2:** Distribution of patients according to gender.

Gender	Frequency (N)	Percentage (%)
Male	44	44
Female	56	56
Total	100	100

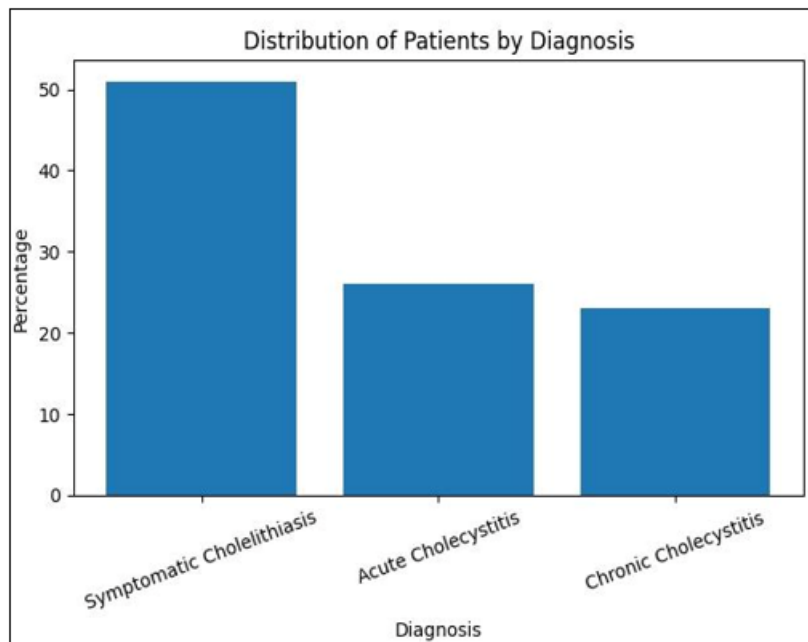
Out of the 100 patients studied, 56 were females and 44 were males, showing a female predominance (56%). The male-to-female ratio was approximately 1:1.3. This finding supports the known higher prevalence of gallbladder disease among females, attributed to hormonal factors and pregnancy-related changes.



**Figure 2:** Distribution of patients according to gender

**Table 3:** Distribution of patients by diagnosis category

Diagnosis	Frequency (N)	Percentage (%)
Symptomatic Cholelithiasis	51	51
Acute Cholecystitis	26	26
Chronic Cholecystitis	23	23
Total	100	100



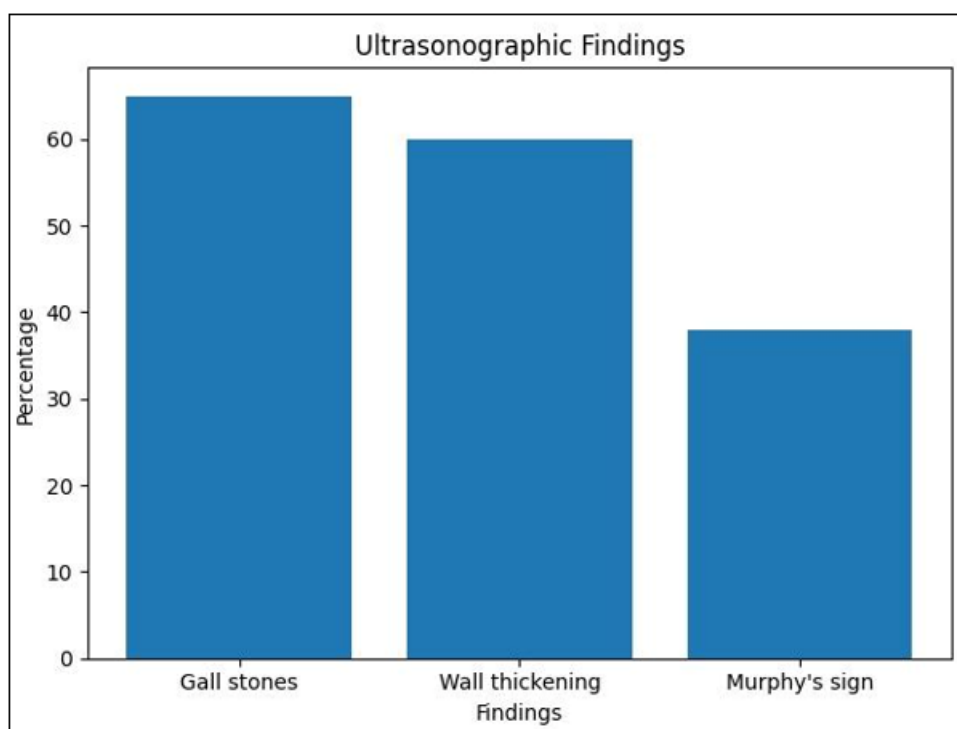
Based on clinical, radiological, and intraoperative findings, 51 patients (51%) were diagnosed with symptomatic cholelithiasis without features of acute inflammation, 26 patients (26%) had acute cholecystitis, and 23 patients (23%) had chronic cholecystitis. Symptomatic cholelithiasis was thus the most common presentation in the present study.

Ultrasonography revealed the presence of gallstones in 65% of patients, representing both single and multiple stones. Gallbladder wall thickening (>3 mm) was observed in 60% of cases and was more commonly associated with acute and chronic cholecystitis. Sonographic Murphy's sign was positive in 38% of patients, correlating strongly with acute inflammatory pathology.

**Ultrasonographic findings**

**Table 4:** Ultrasonographic Findings in study population

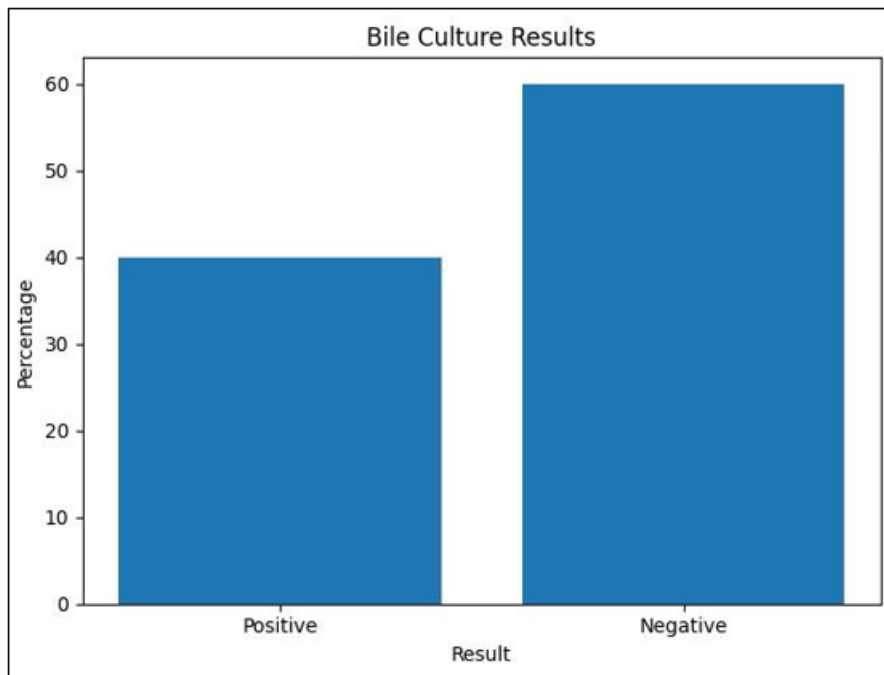
USG findings	Frequency (N)	Percentage (%)
Gall stones	65	65
Gall bladder wall thickening (>3mm)	60	60
Sonographic Murphy's sign	38	38



**Table 5:** Overall Bile Culture Positivity

Culture Result	Frequency (N)	Percentage (%)
Culture Positive	40	40
Culture Negative	60	60
Total	100	100

Overall, bile culture was positive in 40% of patients and negative in 60%. Two-fifths of the patients demonstrated bacterial growth in bile samples, indicating a substantial proportion of cases with bacterial involvement in symptomatic cholelithiasis and cholecystitis.



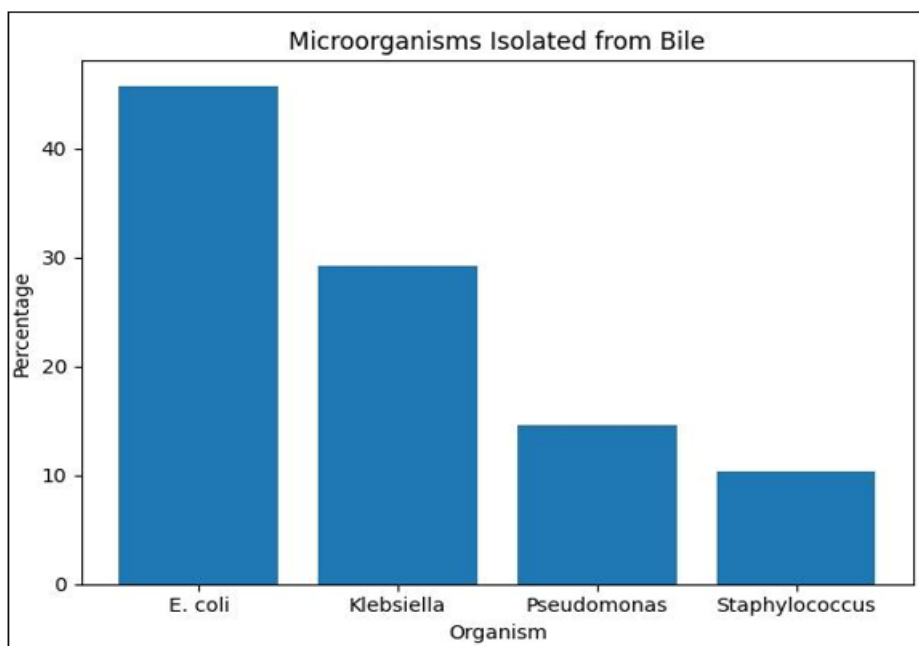
**Microbial profile**

**Microorganism Isolated from Bile**

**Table 6:** Distribution of Microorganism Isolated from Bile culture

Organism	Frequency (N)	Percentage (%)
Escherichia Coli	18	45.8
Klebsiella Sp.	12	29.2
Pseudomonas Sp.	6	14.6
Staphylococcus Sp.	4	10.4
Total	40	100

Out of the 40 bile culture–positive cases, *Escherichia coli* was the most commonly isolated organism, accounting for 18 cases (45.0% of positive cultures). This was followed by *Klebsiella* species, isolated in 12 cases (30.0%). *Pseudomonas* species were isolated in 6 cases (15.0%), while *Staphylococcus* species were isolated in 4 cases (10.0%). Overall, Gram-negative organisms constituted the majority of isolates (90%), indicating their predominant role in biliary tract infections associated with cholelithiasis and cholecystitis.

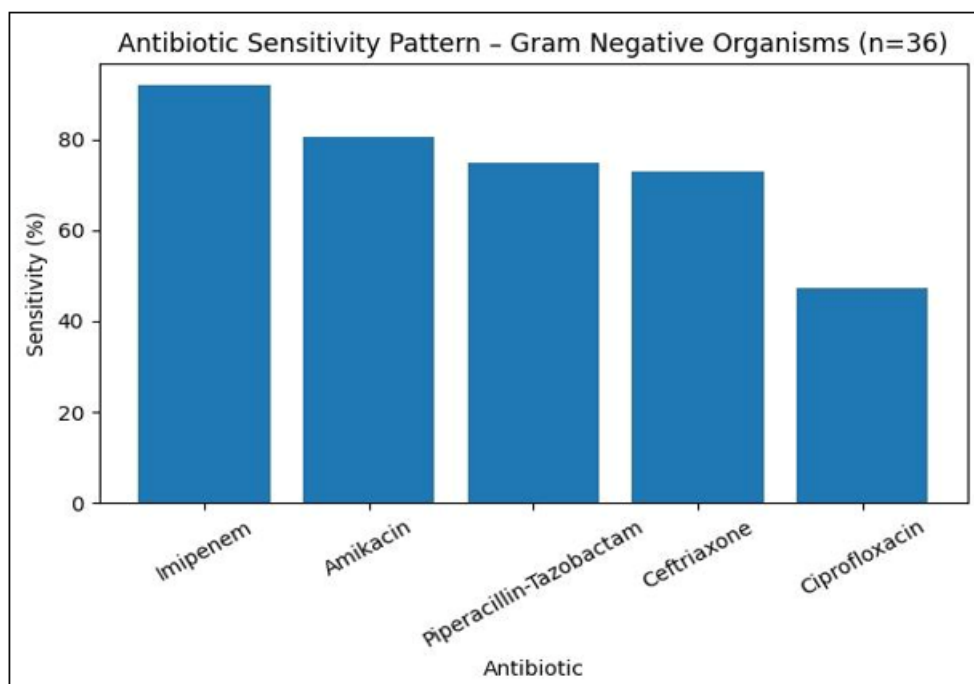


## Antibiotic Sensitivity Pattern

### Gram- negative Organisms

**Table 7:** Antibiotic Sensitivity Pattern – Gram Negative organism (n=36)

Antibiotic	Sensitivity (%)
Imipenem	92
Amikacin	80.5
Piperacillin-Tazobactam	75
Ceftriaxone	73
Ciprofloxacin	47.2



Indian studies have reported a wide range of bile culture positivity, varying from 20% to 57.9%, reflecting differences in patient selection and disease severity.<sup>6-8</sup> The findings of the present study fall within this reported range.

Gram-negative organisms were found to be the predominant isolates, with *Escherichia coli* being the most common pathogen. This is consistent with multiple studies that have highlighted the enteric origin of biliary infections.<sup>3-5,9</sup>

The antibiotic sensitivity pattern observed in this study showed high sensitivity to Imipenem and Amikacin, and good sensitivity to Ceftriaxone which is in agreement with previous studies.<sup>4,5</sup> However, reduced sensitivity to commonly used antibiotics such as Ciprofloxacin indicates increasing antimicrobial resistance, particularly in the Indian setting.<sup>7,8</sup>

Ultrasonographic findings were found to correlate with bile culture positivity, suggesting that imaging parameters may serve as useful indicators of underlying infection.

These findings emphasize the importance of routine bile culture and sensitivity testing in guiding appropriate antibiotic therapy and improving clinical outcomes.

organisms showed the highest sensitivity to Imipenem (92.0%), followed by Amikacin (80.5%) and Piperacillin-Tazobactam (75.0%). Moderate sensitivity was observed with Ceftriaxone (73.0%), while Ciprofloxacin (47.2%) showed the lowest sensitivity, indicating emerging resistance to fluoroquinolones.

## 4. Discussion

The present study demonstrates a bile culture positivity rate of 40%, which is comparable to previously reported values in both international and Indian literature.<sup>1,2,6</sup>

## 5. Conclusion

Bacterial colonization of bile is frequently observed in patients undergoing laparoscopic cholecystectomy, particularly in acute inflammatory conditions. Gram-negative organisms predominate and show variable antibiotic sensitivity, with emerging resistance to commonly used agents. These findings support the use of routine bile culture and sensitivity testing to guide targeted antibiotic therapy. Incorporating such practices may help optimize treatment outcomes and reduce postoperative complications.

## References

- [1] Ozturk-Engin D, Agalar C, Cag Y, et al. Microorganisms isolated from bile of patients undergoing cholecystectomy and their antibiotic resistance pattern: a multicenter prospective study. *Int Microbiol.* 2022;25(4):759-767.
- [2] Yun SP, Seo HI. Clinical aspects of bile culture in patients undergoing laparoscopic cholecystectomy. *Medicine (Baltimore).* 2018;97(26):e11234.
- [3] Zhang X, Wang J, Li W, et al. Microbial spectrum and drug resistance of pathogens cultured from gallbladder bile specimens. *World J Gastroenterol.* 2022;28(45):6450-6462.

- [4] Kaya M, Bestas R, Bacalan F, et al. Microbial profile and antibiotic sensitivity pattern in bile cultures from patients undergoing ERCP. *World J Gastroenterol.* 2012;18(27):3585-3589.
- [5] Zhao C, Liu S, Bai X, et al. Bile culture and antibiotic susceptibility patterns in biliary tract infections. *Evid Based Complement Alternat Med.* 2022;2022:Article ID 1234567.
- [6] Varshney VK, Sreesanth KS, Kombade SP, et al. Bacterial flora in the bile: Clinical implications and sensitivity pattern from a tertiary care centre. *Indian J Med Microbiol.* 2021;39(1):30-35.
- [7] Shankaran R, Amarasekara C. Clinical and microbiological profile of bile cultures in symptomatic cholelithiasis. *Int Surg J.* 2020.
- [8] Katyal A, Bala K, Bansal A, et al. Clinico-microbiological analysis of bactibilia in cholecystectomy patients. *Int J Res Med Sci.* 2017.
- [9] Goel S, Pandey PT, Kumar A, et al. Clinical profile and bacterial isolates from bile aspirates. *Int J Res Med Sci.* 2019.