

## A Prospective Study to Assess the Antibiotic Utilization in Patients Undergoing Cholecystectomy in a Tertiary Care Hospital

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### Abstract

**Background:** Development of minimally invasive laparoscopic cholecystectomy reduced surgical site infection (SSI), length of hospital stay, healthcare costs, and postoperative pain. To prevent any complication, intravenous antibiotics are preferred by most surgeons as prophylaxis. Moreover, controversy still exists regarding the effectiveness of antibiotic prophylaxis for elective laparoscopic cholecystectomy. Therefore, we performed to assess the antibiotic utilization in patients undergoing cholecystectomy in a tertiary care hospital. **Materials & Methods:** A prospective analytic study done on 100 patients those undergoing planned Cholecystectomy operation (open or laparoscopic method) in the department of general surgery at Darbhanga Medical College, Bihar, India during one year period. On post operative period, the patient bed side tickets were used to collect the data regarding antibiotics drugs prescribed with their dosage and route of administration. The patient was followed till discharge for any addition of drugs and on discharge the discharge date was noted which signified the length of drug used during the post operative period. **Results:** Majority of case were seen in 41-50 years of age groups (55%) and female preponderance (70%) in our study. The Antibiotic usage in open Cholecystectomy shows that mostly metronidazole (47%) and Cefoperazone – Sulbactam (25%) are used post operatively. The overall average duration of hospital stay was 6-7 days. Maximum number of patients with 6 days duration received metronidazole in open Cholecystectomy procedure. In Laparoscopic Cholecystectomy, the average post operative stay period is around 3-4 days. Cefoperazone sulbactam and Metronidazole combination has been given in these cases mainly. **Conclusion:** Antibiotic prophylaxis is safe and effective in reducing surgical site infections and global infections during hospitalization or after discharge, and postoperative length of hospital stay in low-risk patients undergoing elective laparoscopic cholecystectomy.

**Keywords:** Antibiotic Prophylaxis, Open Cholecystectomy, Laparoscopic Cholecystectomy, Surgical Site Infection (SSI).

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### Introduction

Laparoscopic cholecystectomy is considered gold standard method and is preferred over open cholecystectomy in the management of uncomplicated gallbladder stones and other benign gallbladder diseases. The technique of minimally invasive laparoscopic cholecystectomy has decreased the occurrence of surgical site infection (SSI), length of hospital stay, post operative pain and treatment costs[1]. In open cholecystectomy the duration of hospital stay is longer and thus it increases the burden of costs per patient.<sup>2</sup> Both laparoscopic and open Cholecystectomy operations are performed under strict aseptic conditions. To prevent any complication, intravenous antibiotics are preferred by most surgeons as prophylaxis. There is a widespread tendency of prescribing third generation cephalosporin along with metronidazole post-operatively, thereby increasing the healthcare costs among patients as majority of the drugs are not supplied from the hospitals[2].

Although antibiotic prophylaxis for elective laparoscopic cholecystectomy in low risk group is not recommended in recent guidelines on SSI from the Scottish Intercollegiate Guidelines Network and the American Society of Health-System Pharmacists, nonetheless low risk patients undergoing laparoscopic cholecystectomy are still prescribed prophylactic antibiotics in most healthcare centres[1-4].

In a developing country like India where majority of the population visiting the tertiary care hospital are from middle to low socioeconomic condition, rational prescription of drugs specially antibiotics may not only reduce the burden of cost significantly but also prevent antimicrobial resistance. The confusion still exists regarding the effectiveness of antibiotic prophylaxis for elective laparoscopic cholecystectomy. Therefore, we conducted the study on the antibiotic utilization in patients undergoing cholecystectomy in a tertiary care hospital.

### Materials & Methods

A prospective analytical study done on 100 patients those undergoing planned Cholecystectomy operation (open or laparoscopic method) in the department of general surgery at Darbhanga Medical College, Bihar, India from November 2020 to September 2021.

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**Inclusion Criteria**

- Patients undergoing planned Cholecystectomy operation (open or laparoscopic method) in the department of general surgery.
- Both male and female patients in the age group of 20 – 60 years.
- Patients willing to provide voluntary written informed consent.

**Exclusion Criteria:**

- Patients having severe systemic diseases like uncontrolled diabetes mellitus, renal failure, chronic liver disease, immune compromised patients etc.
- Patients having acute cholecystitis or any acute surgical condition.
- Patients having drug allergy.
- Patient not willing to provide voluntary written informed consent.

**Methods**

Patient admitted in the department of general surgery for Cholecystectomy (Both open and Laparoscopic) were included in the study based on the inclusion/exclusion criteria. Basic demographic data along with a short history was taken from the patient about the progress of the disease, the symptoms and any associated disease after taking voluntary written informed consent. On post operative period, the patient bed side tickets were used to collect the data regarding antibiotics drugs prescribed with their dosage and route of administration. The patient was followed till discharge for any addition of drugs and on discharge the discharge date was noted which signified the length of drug used during the post operative period.

**Statistical Techniques**

The descriptive analysis was performed using SPSS v21.0 to characterize the population parameters and study variables.

**Ethical Considerations**

The present study protocol was approved by our Institutional Ethics Committee before the commencement of the study. Additionally, prior to the collection of any information from the patients, their written voluntary informed consent was obtained. Only the data on the study variables were analyzed, and all the personal information of the patients was kept confidential.

**Results**

A total of 100 cases of Cholecystectomy (Both open and Laparoscopic) were recorded as per the inclusion and the exclusion criteria stated. Majority of cases were seen in 41-50 years of age groups (55%) and female preponderance (70%) in our study (table 1). The Antibiotic usage in open Cholecystectomy shows that mostly metronidazole (47%) and Cefoperazone – Sulbactam (25%) are used post operatively (table 2). The overall average duration of hospital stay was 6-7 days. Maximum number of patients with 6 days duration received metronidazole in open Cholecystectomy procedure. In Laparoscopic Cholecystectomy, the average post operative stay period is around 3-4 days. Cefoperazone sulbactam and Metronidazole combination has been given in these cases mainly (Table 3).

**Table 1: Age and Sex Wise Distribution Of Total Cholecystectomy Patients**

Age groups	Male	Female	Total
20-30 yrs	2 (20%)	8 (80%)	10 (10%)
31-40 yrs	5 (33.3%)	10 (66.6%)	15 (15%)
41-50 yrs	15 (27.27%)	40 (72.73%)	55 (55%)
51-60 yrs	8 (40%)	12 (60%)	20 (20%)
Total	30 (30%)	70 (70%)	100 (100%)

**Table 2: Pattern of Antibiotic Use In Total Cholecystectomy Patients (Multiple response table)**

Antibiotic used	No. of patients	Percentage
Cefoperazone-Sulbactam	25	25%
Metronidazole	47	47%
Amikacin	8	8%
Ceftriaxone	7	7%
Cefotaxime	5	5%
Ciprofloxacin & Tinidazole	3	3%
Amoxicilin & Clavulinic Acid	2	2%
Cefpodoxime	1	1%
Ciprofloxacin	1	1%
Cefixime	1	1%
Total	100	100%

**Table 3: Post Operative duration of antibiotics in Total Cholecystectomy patients (Multiple Response Table)**

Antibiotic used	No. of patients	5 days	6 days	7 days	8 days
Cefoperazone-Sulbactam	25	6	15	3	1
Metronidazole	47	10	27	7	3
Amikacin	8	1	5	2	0
Ceftriaxone	7	2	4	1	0
Cefotaxime	5	1	2	2	0
Ciprofloxacin & Tinidazole	3	1	2	0	0
Amoxicilin & Clavulinic Acid	2	1	1	0	0
Cefpodoxime	1	0	1	0	0

Ciprofloxacin	1	0	1	0	0
Cefixime	1	1	0	0	0
Total	100	23	58	15	4

### Discussion

Our study showed that among the 100 cases, 60 cases were of open Cholecystectomy (60%) and the rest 40 cases were of Laparoscopic Cholecystectomy (40%). Females showed a higher percentage of undergoing open (95%) and laparoscopic (80%) Cholecystectomy especially in the age group of 41 -50 years, which was compatible with S.M. Naser et al (2011)[2]

Anti-microbial resistance (AMR) is a major health crisis we all face today. Unnecessary use of antibiotics leads to antimicrobial resistance. Hence, the usage of antibiotics prophylactically in clean surgeries is contraindicated by the international guidelines because unwarranted use of these drugs is the main cause of development of antimicrobial resistance. AMR is commonly seen in developing countries due to its unregulated supply chains, over-the-counter availability of many broad-spectrum antibiotics, and noncompliance due to poverty[4-6]. All these factors add to the economic burden of the already weak healthcare system of the developing countries. The problem of antimicrobial resistance is compounded by another observation in our study. According to the latest Stanford Health Care (SHC) surgical antimicrobial prophylaxis guidelines, the recommended prophylactic drug in all the surgeries (except in patients with a serious beta-lactam allergy) is a first-generation cephalosporin, cefazolin.<sup>7</sup> The aim is to use a drug with a medium spectrum of activity that attacks only the suspected surgical site pathogens, thereby preventing antimicrobial resistance and the drug cefazolin meets this criterion[8]. In our study, the post operative antibiotic therapy was mainly given prophylactically to cover up for the gram positive and gram negative organisms in the hospital setup, in spite of proper aseptic measures during the operation. This finding is consistent with a previous study conducted by S. M. Naser et al (2011)[2], which reported that metronidazole was used in almost every case in a very significant percentage of 97.43%. Cefoperazone – sulbactam was also used alone and in combination with metronidazole. The usage percentage of cefoperazone –sulbactam was 30.77% in open Cholecystectomy. These findings indicate a general trend among the doctors in developing countries to prefer broad-spectrum drugs in the surgical setting, which aggravates the above-mentioned problem of antimicrobial resistance. With the routine use of broad-spectrum drugs, multidrug-resistant (MDR) bacteria develop and cause serious postoperative complications[6]. In a bid to prevent the loss of efficacy of antimicrobials, the World Health Organization (WHO) recommends rational use of antibiotics, that are used only when necessary by the front line antibiotic prescribers and dispensers[9]. This recommendation needs to be transformed into surgical practice to prevent the emergence of resistant pathogens and their spread to the community. Regarding the timing of surgical antibiotic preoperative prophylaxis, it is recommended that the first dose of the drug be administered 120 minutes before incision[10]. The timing of antibiotic administration prior to incision is crucial as a dose before 120 minutes or dose after the incision is associated with large risk of surgical site infection.

The duration of stay in open Cholecystectomy was 6-7 days whereas the duration of stay in laparoscopic Cholecystectomy was reduced to 3-4 days. This observation was in consensus with the study done by I. Gangan et al. who found out that hospital stay was reduced to 2-3 days in laparoscopic surgery[11]. Proper

prophylactic antibiotic therapy was given in both the cases. Though in our setting, we have found that open Cholecystectomy (58.2%) was performed in more occasions than laparoscopic Cholecystectomy (41.79%).

It has been rightly pointed out by Gorecki P et al. that there is an uncertainty in choosing the right antibiotics prophylactically by the surgeons to reduce the post operative complications. In the present study, similarity was seen in the usages of large number of antibiotics without any proper protocol in both open and Laparoscopic Cholecystectomy.

### Conclusion

Antibiotic prophylaxis is safe and effective in reducing surgical site infections and global infections during hospitalization or after discharge, and postoperative length of hospital stay in low-risk patients undergoing elective laparoscopic cholecystectomy.

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