

Study of Antibiotic Utilization Pattern and Cost of Antibiotic Therapy in Patients Undergoing Cholecystectomy in a Tertiary Care Hospital of Eastern India

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ABSTRACT

Background: Cholecystectomy, one of the most common operative procedures done in our institution. In a developing country like India, choice of antibiotics should be rational to reduce the burden of cost. There are no standard treatment guidelines to follow regarding antibiotic usage causing indiscriminate use of this antibiotic. **Methods:** An observational, prospective analytical study by collection of data without intervention was done. Ethical committee's approval was duly taken. Data were collected in the department of general surgery from the bed side tickets of the patients after taking a short history and informed consent from the patient. Cost of the therapy was calculated from CIMS (Current Index of Medical Specialities) and institutional pharmacy. **Results:** More commonly single antibiotic (190/320) prescribe followed by two antibiotic (80/320) and three antibiotic (50/320). Piperacillin + Tazobactam most commonly prescribe antibiotic as a single agent and overall. Ceftriaxone / Tazobactam + Metronidazole preferred combination when two antibiotic use at a time. Mean hospital stay 3.78 days. Average duration for prescribing of antibiotic 3.25 days. Mean cost for antibiotic in 984 INR, with a range 115-2700 INR. The average duration of stay in open Cholecystectomy was 7 days whereas the mean duration of stay in cases of laparoscopic Cholecystectomy was reduced to 3.07 days. Average antibiotic prescribing duration was 4.75 days significantly higher than Lap. Cholecystectomy (1.4 days). **Conclusion:** As there is no standard treatment protocol and antibiotic policy to follow antibiotics are used as pick and choose method due to lack of standard treatment protocol.

Keywords: Antibiotic, Cholecystectomy, Cost effectiveness, 3rd generation cephalosporins, Metronidazole.

INTRODUCTION

Antibiotics are obtained from a microorganism and fatal for another microorganism at a low concentration. Antibiotics acts either by destroying other organisms (bactericidal) or by prevent multiplication of other microorganism (bacteriostatic). Antibiotics used in surgery either to treat established infections or to prevent postoperative infections. Brief course of antibiotics given just before surgery refers as surgical antimicrobial prophylaxis. Surgical site infection (SSI) is one of the common cause of increases hospital stay. Optimal use of antibiotic prophylaxis helps to shorten hospital stay and faster return to normal daily activity after discharge from the

Hospital.^[1] The basic goals of prophylactic antimicrobial use in surgical patients are: reduction of incidence and severity of surgical site infection, use of evidence based effective antibiotics, minimum effect of antibiotic on normal bacterial flora of the patient, with acceptable adverse effects and no or minimum patient's host defences.

Surgeries are classified to four classes with increasing evidence of infection of bacterial contamination and subsequent increase chances of incidence of postoperative infections.^[2]

Clean wound: no inflammation or contamination and do not involve surgeries on an internal organ.

Clean-contaminated wounds: no evidence of infection at the time of surgery but do involve surgeries on an internal organ.

Contaminated wounds: operation with internal spilling of contents from the organ into the wound.

Dirty wound: known infection is present at the time of surgery.

Causative organism of infections in surgical patients is widely variable. So, choice of antimicrobial agents

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should protect all expected infections with knowledge of local resistance pattern and cost of drugs. First choice antibiotic for prophylaxis during surgery should be narrow spectrum and less expensive.^[3] Therefore, the current study was conducted to observe and analyse antibiotic prescribing pattern in patients undergoing cholecystectomy in tertiary care hospitals and compare them with National International guidelines.^[4,5]

Cholecystectomy is one of the commonest surgical procedures done in our institute which may be either in the laparoscopic method or in the open method.

Open Cholecystectomy require long operating time and a long post-operative stay leading to increasing the cost of treatment per patient. On the other hand Laparoscopic Cholecystectomy requires a short operating time and also a short post-operative stay. Short post operative stay period definitely reduces the post operative treatment cost. But on the other hand it require newer technique and skill.

Both operations, laparoscopic and open Cholecystectomy commonly performed under strict aseptic conditions. According to National Research Council, elective, non-traumatic cholecystectomy classified as Clean surgery.^[6] To prevent any post-operative infection, specially surgical site infection, intravenous antibiotics are used prophylactically by most surgeons.

In a developing country like India where majority of the population visiting the tertiary care hospital are from low economic condition, rational use of drugs specially antibiotics helps in reduce the burden of cost among the patient families as well as society. Rational use of antibiotics leads reduction in cost of treatment and also reduce antibiotic resistance, thus helps in increasing the community health standards.

It was an descriptive, observational study conducted in the department of surgery within 12 months period including 320 cases who underwent Cholecystectomy either laparoscopic or open, their antibiotic usage were recorded and the cost of antibiotic therapy were calculated along with the post-operative hospital stay, which is a good indicator of turnover rate of this operative procedure. Large number of cases with different presentation and complication and from different socioeconomic condition of the society justifies the setting and duration of the study.

Though this is conducted in a tertiary care hospital, there is no definite standard treatment guideline (STG) and antibiotic policy to follow, create situations where there is a chance of indiscriminate use of these antibiotic leading to extra burden to the patient families.

Aims & Objective

1. To study the antibiotics used in post operative patients of Cholecystectomy.
2. To study the cost of antibiotic therapy of these patients.

MATERIALS AND METHODS

Study Design:

Observational study by collection of data without intervention.

Type of Study: Prospective analytical study.

Study Site: IQ City Medical College, Durgapur, Department of General Surgery & Pharmacology, west Bengal.

Duration of Study: April 2018 to April 2019

Number of Subjects: 970 cases

Ethical committee Approval: The ethical committee approval was taken from the Ethical Committee, IQ City Medical college, Durgapur, West Bengal.

Inclusion Criteria:

- Patients admitted in the department of general surgery.
- Patients undergoing planned Cholecystectomy operation (open or laparoscopic method) in the department of general surgery

Exclusion Criteria:

- Patients having severe systemic diseases like uncontrolled diabetes mellitus, renal failure, chronic liver disease, immune compromised patients are excluded.
- Patients having acute cholecystitis or any acute surgical condition are excluded.

The Data Collection method:

1. Patient admitted in the department of general surgery were included in the study based on the inclusion/exclusion criteria.
2. Bed head ticket (BHT) of the hospital record (case record forms [CRFs]) were randomly collected. The relevant information was entered into the pretested preformats (containing name, age, sex, diagnosis, ongoing treatment as recorded from patients' prescription slips or CRFs) and analyzed. Analysis done by the help of SPSS and Microsoft Excels 2010

RESULTS

In current study during the study period more female (68.8%) undergo cholecystectomy than male (31.2%), on the other hand more Hindu (84.3%) than Muslim (15.6%). [Table 1]

All the uncomplicated cholelithiasis (120/320) and Cholelithiasis with Chronic Pancreatitis (10/320) underwent Lap. Cholecystectomy. Open cholecystectomy was preferred in Cholelithiasis complicated with Cholecystitis or Choledocholithiasis. [Table 2]

Most common co morbidity diabetes mellitus followed by hypertension and COPD.

More commonly single antibiotic (190/320) prescribe followed by two antibiotic (80/320) and

three antibiotic (50/320) [Figure 1]. Piperacillin + Tazobactam most commonly prescribe antibiotic as a single agent and overall. Ceftriaxone / Tazobactum + Metronidazole preferred combination when two antibiotic use at a time. Ceftriaxone /Tazobactum +Metronidazole+Amikacin and Piperacillin/Tazobactum + Metronidazole+Amikacin preferred when three agent use at a time [Table 4].

Table 1: Demographic distribution of the patient

Age	Yrs
Mean	47.12
Range	20-75
Gender	No.(%)
Male	100(31.2)
Female	220(68.8)
Body wt	Kg
Mean	63.71
Range	58-70
Religion	No(%)
Hindu	270(84.3)
Muslim	50(15.6)

Table 2: Distribution of two types of Cholecystectomy according to the diagnosis

Diagnosis	No	Open cholecystectomy	Lap. Cholecystectomy
Cholelithiasis	120	0	120
Cholelithiasis With Empyema	40	20	20
Cholelithiasis With Ch. Cholecystitis	120	110	10
Cholelithiasis (Mirizzi's syndrome)	20	10	10
Cholelithiasis with Cholecystoduodenal fistula with CBD stones (Choledocholithiasis)	10	10 (with Closure of Cholecystoduodenal Fistula)	0
Cholelithiasis with Chronic Pancreatitis	10	0	10

Table 3: Distribution of comorbidity

Co morbidity	No
COPD	10
T2DM	30
HTN	20
HTN +COPD	10

Mean hospital stay 3.78 days with a range 3 to 10days. Average duration of prescribing of antibiotic 3.25days with a range from 1 to 10 days. Mean cost for antibiotic in 984 INR, with a range 115-2700 INR [Table 5]. Only 15% antibiotic prescribe in brand name [Figure 2].

The average duration of stay in open Cholecystectomy was 7 days whereas the mean duration of stay in cases of laparoscopic Cholecystectomy was reduced to 3.07 days. Average antibiotic prescribing duration was 4.75 days with an average antibiotic 2.25 per day in case of open cholecystectomy. Average antibiotic prescribing duration was significantly lower 1.4 days with an average antibiotic 2.77 per day in case of Lap.

Cholecystectomy. Cost for antibiotic per day in Open cholecystectomy (1408.75 INR) significantly high than Lap. Cholecystectomy (892.03 INR). [Table 6]

Table 4: Distribution of antibiotic use

Single	No of prescription
Ceftriaxone	90
Meropenem	10
Piperacillin + Tazobactum	90
Two Agent	No of prescription
Ceftriaxone + Metronidazole	10
Ceftriaxone / Tazobactum + Metronidazole	40
Co-Amoxyclav + Metronidazole	10
Piperacillin / Tazobactum + Metronidazole	20
Three agent	No of prescription
Ceftriaxone /Tazobactum +Metronidazole+Amikacin	20
Piperacillin/Tazobactum + Metronidazole+Amikacin	20
Piperacillin/Tazobactum+ Metronidazole+Netilmycin	10

Table 5: Distribution of duration of hospital stay, antibiotic use and its cost

Hospital stay	No of days
Mean	3.78
Range	03-10 days
Antibiotic duration	No of days
Mean	3.25
Range	01 to 10
Cost for antibiotic	Cost per day(in INR)
Mean	985
Ranges	115-2700

Table 6: Comparative distribution of duration of hospital stay, antibiotic use and its cost between Open Cholecystectomy and Lap. Cholecystectomy.

Parameter	Open cholecystectomy	Lap. Cholecystectomy	Statistical analysis
Hospital stay(days)	7	3.07	p<0.05
Antibiotic duration(days)	4.75	1.4	p<0.05
Cost for antibiotic(INR)	1408.75	892.03	p<0.05
No of antibiotic	2.25	2.77	p>0.05

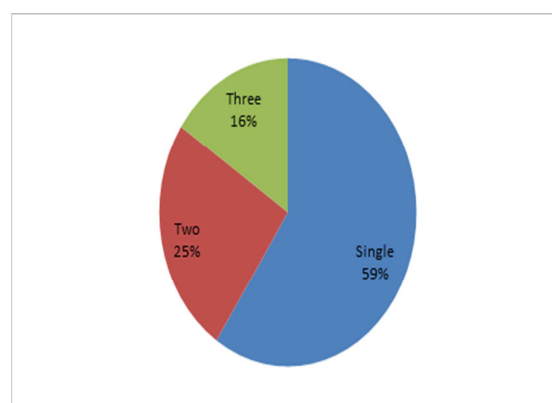


Figure 1: Distribution of no of antibiotic per prescription

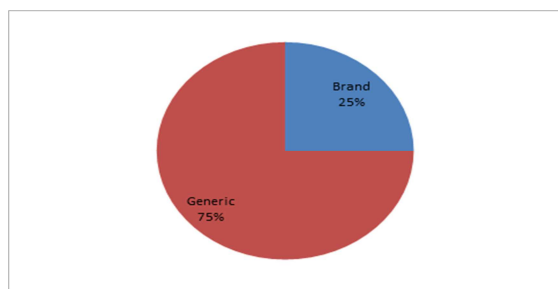


Figure 2: Distribution of antibiotic per prescribing pattern

DISCUSSION

The main objective of our study to determine the pattern of antibiotic use during open and laparoscopic Cholecystectomy and the cost of antibiotic therapy in a tertiary care hospital setup i.e. at IQ City Medical College, Durgapur, west Bengal. Sample size of the study was 320 cases.

Among the 320 cases, 150 cases were of open Cholecystectomy (46.8%) and the rest 170 cases were of Laparoscopic Cholecystectomy (53.2%). All the uncomplicated cholelithiasis (120/320) and Cholelithiasis with Chronic Pancreatitis (10/320) underwent Lap. Cholecystectomy. Open cholecystectomy was preferred in Cholelithiasis complicated with Cholecystitis or Choledocholithiasis. [Table 2]

In spite of proper aseptic measures during the operation, post-operative antibiotic therapy was mainly given prophylactically to prevent any gram positive, gram negative and anaerobic organisms.

The average duration of stay in open Cholecystectomy was 7 days whereas the mean duration of stay in cases of laparoscopic Cholecystectomy was reduced to 3.07 days. The study done by Kochhar P et al. Shows even with combination of 3 antibiotics hospital stay after open Cholecystectomy was 6 day which is similar to our study.^[7] Another study conducted by I. Gangan et al. found out that hospital stay was reduced to 2-3 days in laparoscopic surgery which was comparable to current study.^[8]

Average antibiotic prescribing duration was 4.75 days with an average antibiotic 2.25 per day in case of open cholecystectomy. Average antibiotic prescribing duration was significantly lower 1.4 days with an average antibiotic 2.77 per day in case of Lap. Cholecystectomy. Cost for antibiotic per day in Open cholecystectomy (1408.75 INR) significantly high than Lap. Cholecystectomy (892.03 INR)

In open Cholecystectomy combination of three antibiotics was preferred. 60% of all open cholecystectomy treated with three antibiotic. Most common prescribe antibiotic combination was Piperacillin/Tazobactam + Metronidazole + Amikacin. About 40% of all open cholecystectomy this antibiotic combination preferred.

In laparoscopic Cholecystectomy single antibiotic (66.7%) preferred. Among this Ceftriaxone and Piperacillin / Tazobactam combination (33.3%). All the prescribe antibiotic both used in open Cholecystectomy and laparoscopic Cholecystectomy were give through intravenous route. Previous studies conducted in India by Rehan,^[9] and Parulekar,^[10] at a tertiary care hospital shows almost half of all the patients received 3rd generation cephalosporins and duration of post-operative antibiotics for 5 to 10 days, which was inappropriate according to SIGN and ASHP guidelines. Inappropriate choice of antibiotics, use for a prolonged duration and inappropriately high frequency of prescription of antibiotics was seen in the studies conducted outside India.^[11-19] In current study Piperacillin + Tazobactam most commonly prescribe antibiotic as a single agent and overall. Ceftriaxone / Tazobactam + Metronidazole preferred combination when two antibiotic use at a time. Ceftriaxone /Tazobactam +Metronidazole+ Amikaci and Piperacillin/Tazobactam + Metronidazole + Amikacin preferred when three agent use at a time. This dissimilarity can be explained by difference in suspected organism and its susceptibility.

The study conducted by B. Palmer et al. concluded that a combination of co-amoxiclav with metronidazole was cost effective than combinations.^[20] But development of antimicrobial resistance pattern and associated comorbidity can justify the antibiotic combination preferred in current study.

Metronidazole is a antibiotic which primarily cover anaerobic spectrum. According to a study conducted by Halsall AK et al. using metronidazole was not control the infection in post-operative patients optimally. In our current study, it has been observe that metronidazole was used in high percentage. All the 130 prescription where at least two antibiotic prescribe, Metronidazole was included. This result was does not go along the previous study.^[21]

Prolonged antimicrobial treatment comes from a false belief of most of the surgeons that it provides broad and better coverage against Surgical Site Infections in overcrowding situations, like that of current study setting. Other important causes of prolonged antimicrobial usage are lack of importance and conduction of regular surveys of antimicrobial prescribing, regular pharmacovigilance, reassessment of prescribing practices, low doctor to patient ratio, low nurse to patient ratio. interdepartmental and intradepartmental consensus meetings can play important roles to reduce prolonged antimicrobial usage. The institution should have a surgical prophylaxis protocol which should be develop taking into account Surgical Site infection rates, common types of infecting organisms along with its' susceptibility. Evidence-based antibiotics use should

be the main pillar for Policies to development, formulation, adaptation, dissemination and promotion of the protocol and the policy. It must be simple, clear, and implementable. To ensure adherence with the protocol, there must be constant monitoring with periodic audit. It will ensure that clear guidelines which is protocol based, are followed. This will minimizing the development of resistance and over use, which was recommended by Agrawal,^[22] and Maria Aparecida,^[23] in their studies.

A study conducted by Gorecki P et al. correctly concluded that there is a indecision, irregularity in choosing the appropriate antibiotics prophylactically by the surgeons to reduce the post-operative infection. In the present study, we also come through the similar condition where large number of antibiotics has prescribe without any institutional protocol in both open and Laparoscopic Cholecystectomy.^[24]

CONCLUSION

Extended spectrum beta lactam antibiotic were the preferred antibiotics. It also was used in combination with aminoglycoside and metronidazole for broad and better postoperative antibiotic coverage. Current study clearly documents urgent need to develop hospital-based antibiotic guidelines for rational utilization.

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