USE OF ANTIMICROBIAL PROPHYLAXIS FOR OBSTETRIC AND GYNECOLOGICAL SURGERIES AND SENSITIVITY PATTERN OF INFECTIVE ORGANISMS

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ABSTRACT

**Title:** “Use of antimicrobial prophylaxis for obstetric and gynaecological surgeries and sensitivity pattern of infective organisms.”

**Objective:** To study the effectiveness of various antimicrobial agents used to prevent and treat post surgical infection along with the current trend of prescribing patterns, the rate of wound infection and sensitivity pattern of causative organisms.

**Materials and Method:** All the patients admitted in the department of Obstetrics and Gynaecology and scheduled for surgical procedure and received surgical prophylaxis were reviewed daily. Details of antimicrobial agents given for treatment were noted in case record form. Patients who showed signs of infection were identified and rate of infection was calculated. Culture and sensitivity was done in these patients and details of antimicrobial agents given for treatment were noted.

**Result:** Total 209 patients were included in study, out of which 158 were from obstetrics and 51 were from gynaecology department. Cefotaxime was the most commonly given antimicrobial agent to the obstetrics [72.78%] and gynaecology [98.03%] patients 30 minutes prior to the surgery. Combinations of Cefotaxime, Metronidazole and Gentamicin [obstetrics – 79.74% and gynaecology – 96.07%] were commonly given parenterally followed by combination of Cefixime and Metronidazole [obstetrics- 89.87% and gynaecology – 68.62%] orally to all the patients during postoperative stay.0.63% [1 out of 158] of obstetric and 1.96% [1 out of 51] of gynaecology patient developed infection. The overall rate of infection was 0.95 %. E.coli was the common organism found in both groups which was found to be sensitive to Amikacin. Amoxicillin- clavulenic acid (oral) and Amikacin (iv) were given for treatment to patients who developed wound infection in
obstetric [0.63%] and gynaecological [1.96%] patients after culture sensitivity report. **Conclusion:** Combination of cephalosporin, aminoglycoside and nitroimidazole groups were effective for prevention and treatment of surgical site infection of obstetrics and gynaecological surgeries.

**Key words:** Antimicrobial agents, Surgical prophylaxis, Surgical site infection.

**INTRODUCTION**

Antimicrobial agents are medicines used to treat infections caused by bacteria, fungi, parasites, and viruses. The discovery of antimicrobials is one of the most important advances in health in human history, decreasing suffering from disease and saving lives. The use and misuse of antimicrobials in human medicine and animal husbandry over the past 70 years have increased the number and types of microorganisms resistant to these medicines, causing deaths, greater suffering and disability and higher health-care costs.

Surgical antimicrobial prophylaxis (AMP) refers to a very brief course of an antimicrobial agent initiated just before an operation begins. AMP is not an attempt to sterilize tissues, but a critically timed adjunct used to reduce the microbial burden of intraoperative contamination to a level that cannot overwhelm host defences. Intravenous infusion is the mode of AMP delivery used most often in modern surgical practice. Surgical site infection is a type of healthcare-associated infection in which a wound infection occurs after an invasive (surgical) procedure. Surgical site infections have been shown to compose up to 20% of all of healthcare-associated infections. At least 5% of patients undergoing a surgical procedure develop a surgical site infection.

Surgical site infections are a common complication of obstetric and gynaecological surgeries; up to 10% of gynaecological patients undergoing an operative procedure will develop a surgical site infection. In surgeries with high rates of post-operative infection, antibiotic prophylaxis (using an antibiotic with an appropriate microbiological spectrum and administered in a timely manner) can play a major role in improving outcomes. So main objective of the study was to check the effectiveness of various antimicrobial agents for prevention and treatment of post-surgical infection along with the current trend of prescribing patterns, the rate of wound infection and sensitivity pattern of causative organisms.
MATERIALS AND METHODS
This was a record based, observational, prospective study conducted at the Indoor patient department of Obstetrics and Gynaecology, P.D.U. Govt. Medical College and Rasulkhan Zanana Hospital, Rajkot, Gujarat. Approval from Departmental Screening Committee of Department of Pharmacology and Institutional Ethics Committee of P.D.U. Govt. Medical College, Rajkot was taken before the conduct of the study. The study was conducted from March 2012 to May 2013

Selection criteria of patients

Inclusion Criteria

- All patients who are scheduled for surgical procedure with no previous injury or infection in the area being operated.

Exclusion Criteria

- Patient with history of allergy to any antimicrobial agents.
- Patient with chronic renal disease.
- Patient who has any preoperative infectious disease at the time of admission.
- Patient receiving any antimicrobials more than 24 hours prior to surgery.
- Patient has any other procedure requiring spinal or general anaesthesia occurred within 24 hours prior to surgical procedure during this hospital stay.

Method of collection of data

Patients selected on the basis of inclusion and exclusion criteria before the enrolment into the study as participant. Informed consent was obtained from patients. A suitable case record form was designed to collect the all necessary and relevant information. All the patients scheduled for surgical procedure received surgical prophylaxis were reviewed daily. Details of antimicrobial agents like dose, dosage form, route of administration, frequency of administration and duration were noted in case record form till their discharge.

Daily wound inspection was done during postoperative days till patient was discharged and then on day 15 and day 30 postoperative days to assess the clinical outcome. Wound assessment was done by ASEPSIS wound scoring method. Patients who showed signs of infection were noted and culture sensitivity was done in these patients.
Data analysis
Recorded data were analyzed as under:

1. Patient details
Patient details were analyzed to study the following parameter:
   - Age distribution
   - Distribution of Patients according to gravidity and parity

2. Analysis of antimicrobial agents used
Various antimicrobials were analyzed to study the following parameters:
   - Average number of antimicrobials used per patient.
   - Common antimicrobials prescribed as prophylaxis preoperatively, intraoperatively, and postoperatively.
   - Average duration of antimicrobial prophylaxis.
   - Frequency of use of antimicrobials
     Antimicrobials prescribed were grouped according to their class and frequency of each class was found out.
   - Use of antimicrobials single versus combination.
     Percentage of patients administered antimicrobial combination was calculated during their postoperative stay and at the time of discharge.
   - Route of administration of antimicrobials
     Frequency of use of parental and oral antimicrobials was calculated during their hospital stay.
   - Any change in Antimicrobials therapy: Escalation, Descalation or change of antimicrobial.

3. Analysis of wound
   - Percentage of patient developed infection were analyzed by ASEPSIS wound scoring methods.
     Culture and sensitivity testing done in patient developing infection and following parameters were assessed.
     1. Most common organism isolated.
     2. Antimicrobial sensitivity pattern of most common isolated organism found in the study.
     3. Change in the therapy following the results of culture sensitivity test and whether the change correlated with the antimicrobials sensitivity pattern.
4. WHO core indicators

- Frequency of antimicrobial prescribed by Generic versus Brand name.
- Antimicrobial prescribed from Essential Medicines list.
- Average number of drugs per patient

RESULT AND DISCUSSION

After initial enrolment of 158 patients from obstetric and 54 patients from gynaecology department, 158 and 51 patients from obstetrics and gynaecology department respectively were included for final analysis. 3 patients from gynaecology department were excluded due to drug allergy and infectious disease.

Most common age group in our study was 21-30 years [79.74%] for obstetric patients and 31-40 years [29.41%] for gynaecological patients. Liabsuetrakul et al showed common age group of 30-34 years for obstetric patients in his study, while Oliphant SS et al found most common age group of 40-69 years for gynaecological patients. [7, 8]

Mean gravidity was 1.89±1.11 and mean parity was 0.72±0.97 for obstetric patients. For gynaecological patients, mean gravidity and mean parity were 2.94±1.51 and 2.62±1.56 respectively. Gocmen et al found mean gravidity of 2.5±1.2 and mean parity of 2.2±1.0 in his study for obstetric patients. [9] In study done by Ecker et al, mean gravidity and mean parity were 1.9±0.1 and 1.4±0.1 respectively for gynaecological patients. [10]

According to the ASHP Therapeutic Guidelines on Antimicrobial Prophylaxis in Surgery, the optimal time for administration of preoperative doses is within 60 minutes before surgical incision. For all patients, intraoperative redosing is needed to ensure adequate serum and tissue concentrations of the antimicrobial if the duration of the procedure exceeds two half-lives of the drug or there is excessive blood loss during the procedure. The recommended antimicrobial agents for prophylaxis of cesarean delivery are Cefazolin and Clindamycin + Aminoglycoside for the patients with β-lactam allergy. For patients undergoing hysterectomy(vaginal or abdominal), the recommended antimicrobial agents for prophylaxis are Cefazolin, Cefotetan, Cefoxitin, Ampicillin-Sulbactam while in patients having β-lactam allergy, the recommended antimicrobial agents are Clindamycin or Vancomycin + Aminoglycoside or Aztreonam or Fluoroquinolone. [11]
Our study showed that the most commonly prescribed antibiotic 24 hours prior to surgery was Ampiciilin [16.45%] followed by Cefotaxime [5.69%] in case of obstetric patients and Doxycycline [29.41%] followed by Ampicillin [7.84%] in case of gynaecology patients. Goswami et al found that Ampicillin and Cefotaxime were commonly prescribed antimicrobial agents along with other antimicrobials.

Cefotaxime was the most commonly given to the obstetrics [72.78%] and gynaecology [98.03%] patients 30 minutes prior to the surgery. Similar studies have shown that Cefotaxime was effective as a prophylaxis to prevent infection.[Kamaliya et al, Campillo et al] Administration within 30–60 minutes of surgery is optimal; this maximizes tissue and blood antibiotic concentrations at surgical sites.

Average numbers of antibiotic used were 4 for both obstetrics and gynaecology patients. In all patients undergoing surgeries in obstetrics and gynaecology department, antimicrobial agents were initially given by parenteral route followed by oral route postoperatively until the patient had been discharged. Combinations of Cefotaxime, Metronidazole and Gentamicin [obstetrics – 79.74% and gynaecology – 96.07%] were commonly given parenterally [Table I] followed by combination of Cefixime and Metronidazole [obstetrics- 89.87% and gynaecology – 68.62%] orally to all the patients during postoperative stay [Table II].

Table I: Antimicrobial Given By Parenteral Route

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Cefotaxime,Metronidazole,Gentamicin</td>
<td>126 [79.74%]</td>
<td>49 [96.07%]</td>
</tr>
<tr>
<td>Ceftriaxone,Metronidazole,Gentamicin</td>
<td>17 [10.75%]</td>
<td>0</td>
</tr>
<tr>
<td>Ceftriaxone,Metronidazole,Gentamicin, Cefotaxime</td>
<td>8 [5.06%]</td>
<td>0</td>
</tr>
<tr>
<td>Ceftriaxone,Metronidazole,Amikacin</td>
<td>3 [1.89%]</td>
<td>1 [1.96%]</td>
</tr>
<tr>
<td>Ampicillin,Metronidazole,Gentamicin</td>
<td>3 [1.89%]</td>
<td>0</td>
</tr>
<tr>
<td>Cefotaxime,Metronidazole,Amikacin</td>
<td>1 [0.63%]</td>
<td>0</td>
</tr>
<tr>
<td>Cefotaxime,Metronidazole</td>
<td>0</td>
<td>1 [1.96%]</td>
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Table II: Antimicrobials Given By Oral Route

<table>
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<tr>
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<tbody>
<tr>
<td>Cefixime, Metronidazole [oral]</td>
<td>142 [89.87%]</td>
<td>35 [68.62%]</td>
</tr>
<tr>
<td>Ciprofloxacin, Metronidazole [oral]</td>
<td>6 [3.97%]</td>
<td>1 [1.96%]</td>
</tr>
<tr>
<td>Cefixime [oral]</td>
<td>4 [2.53%]</td>
<td>11 [21.56%]</td>
</tr>
<tr>
<td>Cefixime, Metronidazole, Azithromycin [oral]</td>
<td>2 [1.26%]</td>
<td>0</td>
</tr>
<tr>
<td>Ampicillin, Metronidazole [oral]</td>
<td>1 [0.63%]</td>
<td>1 [1.96%]</td>
</tr>
<tr>
<td>Ciprofloxacin, Metronidazole, Cefixime [oral]</td>
<td>1 [0.63%]</td>
<td>0</td>
</tr>
<tr>
<td>Doxycycline + Metronidazole [oral]</td>
<td>0</td>
<td>1 [1.96%]</td>
</tr>
<tr>
<td>Amoxycillin + Metronidazole [oral]</td>
<td>0</td>
<td>1 [1.96%]</td>
</tr>
<tr>
<td>Metronidazole [oral]</td>
<td>0</td>
<td>1 [1.96%]</td>
</tr>
<tr>
<td>Directly change of treatment after culture sensitivity report</td>
<td>1 [0.63%]</td>
<td>0</td>
</tr>
<tr>
<td>Not given</td>
<td>1 [0.63%]</td>
<td>0</td>
</tr>
</tbody>
</table>

In our study, Cephalosporins, Aminoglycosides and Nitroimidazoles were the commonly prescribed antimicrobial groups in obstetric as well as gynaecological patients. Single antimicrobial agent was commonly prescribed preoperatively and half an hour before surgery while combined antimicrobial agents were commonly prescribed postoperatively. These antimicrobial agents were given in varying combinations. In study done by Goswami et al in Gujarat, all the patients had received two to four antibiotics in varying combinations. Most commonly used combinations were: Beta lactum antibiotics (crystalline penicillin / ampicillin / cefotaxime) ± cloxacillin / aminoglycosides (gentamicin, amikacin) / metronidazole and fluroquinolone (ciprofloxacin) ± cloxacillin / aminoglycosides (gentamicin, amikacin) / metronidazole. Heethal et al has shown that the most frequently used combinations were third generation cephalosporins like Cefotaxime or Ceftriaxone with Metronidazole and Gentamicin was added in case of three drug combinations.

According to an Advisory Statement from the National Surgical Infection Prevention Project regarding antimicrobial prophylaxis for surgery, it was found that resistance developed in patients who were continued with antibiotics for 4 days postoperatively as compared to patients who received only three perioperative doses. The antimicrobial agents were given...
7-8 days during postoperative stay in our study. In study done by Anand et al in Jamnager, antimicrobial drugs were given for 5 days. So prolonged use may lead to development of resistance and increase duration of hospital stay which may in turn lead to increased cost to the patients.

In an intervention review done by Smaill FM and Gyte GML, it was found that use of antimicrobial prophylaxis in women undergoing caesarean section substantially reduced the incidence of wound infections. In our study, oral route was preferred preoperatively for antimicrobial agents and parenteral route for half an hour before surgery, while oral as well as parenteral route during postoperative phase. Heethal et al showed that antimicrobial agents were administered intravenously for the first four postoperative days followed by oral formulations. Preoperatively, antimicrobial agents were not prescribed to obstetric patients but given 1 to 4 hours before surgery in gynaecological patients. In our study, 0.63% [1 out of 158] of obstetric and 1.96% [1 out of 51] of gynaecology patient developed infection. The overall rate of infection was 0.95% in this study. The rate of infection was 25% in study done by Guaschino et al for obstetrics patients while the rate of infection was 12.17% in study done by Kamat et al. Anand et al found 3.6% of overall rate of infection in her study. Rate of infection is significantly less in our study.

E.coli was the common organism found in both groups which was found to be sensitive to Amikacin, Piperaciiln- Tazobactam and Co-trimoxazole while resistant to Cefepime, Piperacillin and Teicoplanin. Similarly, Heethal et al showed in their study that E.coli was most commonly found organism which was sensitive to Amikacin while resistant to Cefotaxime, Ceftriaxone and Gentamicin. The predominance of Gram negative bacilli in surgical site infection (SSI) in this study is similar to that of Mofikoya et al. In most cases of SSI, the organism is usually patient’s endogenous flora. These groups of organisms tend to be endemic in hospital environment by being easily transferred from object to object and they also tend to be resistant to common antiseptics, often difficult to eradicate in the long term. This does not agree with the work of Jonathan et al who reported S. aureus as the predominant isolate. Enterobacteriaceae are increasingly playing a greater role in the many hospital acquired infections.
In our study, all the antimicrobial agents were prescribed by generic name which was appreciable. In study done by Shah et al in Jamnagar, antimicrobial agents prescribed generic name was 61.28%. In our study, 13 out of 14 antimicrobial were included from WHO Essential Medicine List [April 2013 18th ed.] and 12 out of 14 were from National List of Essential Medicine 2011 [3rd list]. In our study, average number of drugs per patient was 54.39 for obstetric patients and 46.49 for gynaecology patients.

CONCLUSION

Ampicillin (oral) and Doxycycline (oral) were the most commonly prescribed antimicrobial agents preoperatively in obstetrics and gynaecological patients respectively. Cefotaxime (iv) was the most commonly given antimicrobial agent half an hour before surgery in all patients. Combination of Cefotaxime, Metronidazole and Gentamicin was commonly given by parenteral route followed by combination of Cefixime and Metronidazole by oral route in obstetric and gynaecological patients during postoperative stay. Postoperative prophylaxis was given for 7-8 days in majority of patients. Only 1 out of 158 of obstetric (0.63%) and 1 out of 51 of gynaecology (1.96%) patient developed infection which was caused by E.coli and it was found to be sensitive to Amikacin in culture sensitivity report. Amoxicillin-clavulanic acid (oral) and Amikacin (iv) were given to patients who developed wound infection in obstetric [0.63%] and gynaecological [1.96%] patients after culture sensitivity report.

REFERENCES

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