



Research article

Pattern of antimicrobial use in caesarean section in a tertiary care hospital in rural south India

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ABSTRACT

Use of antimicrobials in caesarean section has become an accepted practice to minimize the incidence of post operative complications. Not many studies are available in India regarding the use of antimicrobial in caesarean section, hence this study. The study aims at finding the pattern of use of antimicrobial prophylaxis in caesarean section and also the frequency of post operative morbidity. This study is a retrospective case series analysis which included seventy five patients undergoing caesarean section admitted to the obstetrics and gynaecology department of Sri R.L.Jalappa hospital and research centre. Relevant information on each patient was collected according to the proforma designed for the study. Antimicrobial used, their dose dosage schedule were recorded. Investigations like pus, blood and urine culture and sensitivity was recorded for patients with post operative complications. Change of antimicrobial following culture sensitivity report was noted. In our analysis, most of the patients came from low socioeconomic status. We observed the use of third generation cephalosporin like ceftriaxone or cefotaxime and metronidazole in most of the patients. Two drugs or three drug combinations were used which commonly included third generation cephalosporin and metronidazole with gentamicin being added in three drug combinations. Thirty patients had post operative complications which included wound infection, urinary tract infection and fever. *E. coli* were the common organism isolated which was resistant to third generation cephalosporin and sensitive to amikacin. In conclusion, periodic surveillance of antimicrobial prophylaxis is essential to detect the emergence of antibiotic resistance.

Key words: Antimicrobials, Cesarean section, Urinary tract infection, Wound infection, South India.

1. INTRODUCTION

Infectious morbidity is the most common complication following caesarean section with reported rates ranging from 18% to 83%. [1]. Women undergoing caesarean delivery have significant incidence of many infectious complications, including fever, wound infection, endometritis, bacteraemia, urinary tract infection and pelvic abscess [2]. Although there are a number of well developed risk factors for infectious complications after caesarean delivery these complications still occur in patients without risk factors [2].

A major challenge for obstetricians dealing with parturient has been the potential occurrence of serious infections during the post partum period. The incidence of infection is of even greater concern for those patients who undergo a caesarean section [3]. Because of these issues, early attempts to decrease the incidence of infections with prophylactic antimicrobials were discovered. The overall aim of using prophylactic antimicrobials in caesarean section is to prevent post operative infection of the surgical site and reduce post operative morbidity and mortality.

The aim of this study is to find the use of antibiotic pattern in caesarean section and to study the frequency of post operative morbidity and mortality. It is believed that this study would help to develop an antibiotic policy and to decrease the development of antibiotic resistance as well as post operative mortality and morbidity for our hospital.

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Table 1

Socioeconomic status and haemoglobin percentage

Socioeconomic status (%)*	Haemoglobin (Hb %) Mean±SD	Statistical results when compared between Hb% of different socioeconomic groups
Lower 30 (40%)	8.2±0.80g%	Lower+upper middle - P<0.0001
Lower middle 22 (29.3%)	9.2±1.44g%	Lower middle+upper middle - P<0.001
Upper middle 23 (30.7%)	10.2±1.60g%	Lower+lower middle - P<0.001

*Socioeconomic status (rupees per annum): Lower - Up to 20,000 INR; Lower middle - 20,001 to 40,000 INR; Upper middle - 40,000 to 62,000 INR

Table 2

Combination of drugs used with duration of treatment and hospital stay

Drug combinations	No of patients	Post operative administration in days (mean±SD)	Duration of stay in days (mean±SD)
Cefotaxime+metronidazole	26 (35%)	8.3±0.9	11.6±2.6
Ceftriaxone+metronidazole	19 (25.3%)	9.2±1.8	16.9±10.1
Ampicillin-cloxacillin+metronidazole+gentamicin	13 (17.2%)	8.0±2.5	12.6±2.8
Ceftriaxone+metronidazole+gentamicin	7 (9.3%)	9.8±1.6	15.8±5.9
Cefotaxime+metronidazole+gentamicin	6 (8%)	10.1±1.4	17.0±6.5
Cefotaxime+tindazole	1 (1.3%)	7.0±0	13.0±0
Cefotaxime+gentamicin	1 (1.3%)	12.0±0	11.0±0
Ceftriaxone+ornidazole	1 (1.3%)	8.0±0	20.0±0
Ampicillin+metronidazole	1 (1.3%)	9.0±0	18.0±0

2. MATERIALS AND METHODS

The study was conducted by the department of Pharmacology and Obstetrics and Gynaecology at Sri R.L.Jalappa hospital and research centre attached to Sri Devaraj Urs Medical College, Kolar, which is situated in a rural area in south India.

This is a retrospective study based on case series analysis conducted from July 2003 to December 2003, constituting a sample size of 75. Ethical clearance was taken from the institutional ethical committee. Relevant data was collected on a proforma which was prepared according to the protocol designed for the study. The data included name and age of the patients, socioeconomic status, date of admission and discharge, diagnosis and type of surgery performed (elective or emergency). It also included details of the use of antimicrobial such as choice of antimicrobial, dose, dosage schedule, route of administration and also any change in the antimicrobial following culture and sensitivity. Post operative complications and investigations like pus culture, urine culture, blood culture and antimicrobial sensitivity relevant to the post operative complications were also recorded.

The data was analyzed using descriptive statistics. The results were expressed as mean±SD; unpaired *t* test was employed for comparison between the means as a measure of significance. P value ≤ 0.001 and ≤ 0.0001 was considered highly significant.

3. RESULTS

The study had a sample size of seventy five. The mean age of the patients was 25.2±4.7 years. Sixty eight patients (90.7%) underwent emergency caesarean section and 7 patients (9.3%) underwent elective surgery. Cephalopelvic

disproportion was the common indication i.e. 20 cases (26.6%) followed by fetal distress i.e. 17 cases (22.6%).

Thirty patients (40%) belonged to low socioeconomic status followed by 22 patients (29.3%) to lower middle and 23 (30.7%) to upper middle. The mean haemoglobin (Hb %) value of all patients was 9.3±5g%. This implies that most patients were anemic owing to their socioeconomic status. Statistically significant results were obtained when the Hb% were compared between patients of different socioeconomic groups (Table 1).

Analysis of usage of antimicrobials suggest that most of the patients received two drug combinations accounting to 49 cases (65.3%) followed by three drug combination i.e. 26 cases (35%) (Table 2). Cefotaxime with metronidazole was the frequently used combination which constituted 26 cases (35%) followed by ceftriaxone with metronidazole i.e., 19 cases (25.3%). None of the patients received antibiotics preoperatively or intraoperatively. All received post operatively in the range of 5-9 days.

Patients with post operative infection had longer duration of hospital stay i.e., 17.36±8.53 than ones without post operative infections i.e., 12.1±2.94. The difference in stay duration between patients with and without post operative infection was found to be statistically significant (P value<0.0001).

Thirty patients out of 75 had postoperative complications (Fig. 1). Postoperative complications such as wound infection and fever were seen commonly in patients who underwent cesarean section for premature rupture of membranes. Urinary tract infection (UTI) was common in case of fetal distress due to prolonged labor.

The organisms isolated from wound infection and UTI are shown in Fig. 2 and 3 respectively. Patients with fever did not show any growth in blood culture. Seventeen cases (57%)

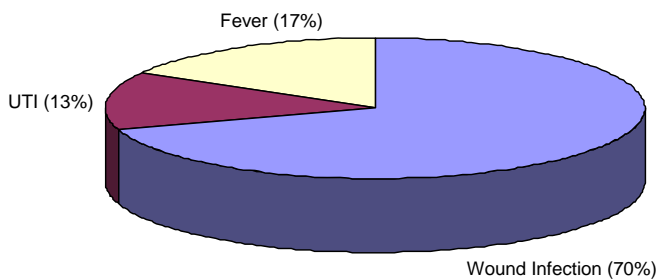


Fig.1. Post operative complications in cesarean section

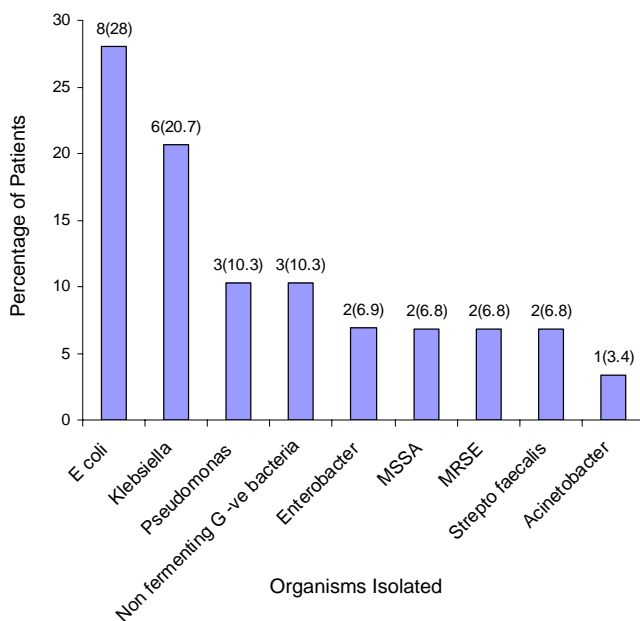


Fig.2. Organisms isolated in wound infection

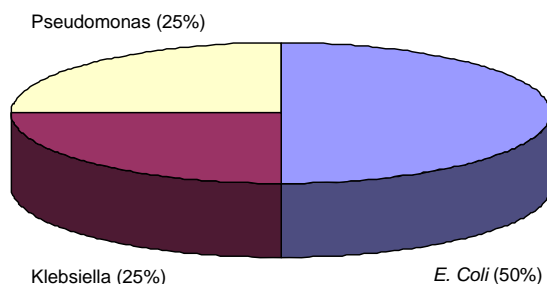


Fig.3. Organisms isolated in urinary tract infection

had unimicrobial infections and eight (26.6%) cases had polymicrobial infections. Most of the organisms isolated from wound infection and UTI were gram-negative organisms. In case of wound infection they were resistant to ceftriaxone and sensitive to amikacin. In UTI they were resistant to ceftriaxone and ciprofloxacin and sensitive to amikacin. Gram positive organisms isolated were MSSA (methicillin sensitive *Staphylococcus aureus*), MRSE

(methicillin resistant *Staphylococcus epidermidis*) and *Streptococcus faecalis* which were sensitive to cefotaxime and ciprofloxacin respectively. Following the culture sensitivity report patients were given amikacin in the dose 15mg/kg body wt twice daily i.v. for a period of 7 days and 6 days for wound infection and UTI respectively. Fluoroquinolones, third generation cephalosporins, amoxycillin+clavulanic acid were used in some cases.

4. DISCUSSION

In our study most of the patients were from low socioeconomic status, the reason being that the hospital was situated in a rural area. Studies have shown that patients undergoing cesarean section have a 10% to 85% risk of postoperative infections depending on socioeconomic status [4]. Our study showed that most of the patients who developed postoperative complications in cesarean section were of low socioeconomic status which was in concurrence with the other studies. Increase in postoperative complications in these patients can be due to poor nutritional status.

The mean age of patients who underwent caesarean section was 25.2 ± 4.7 years. The mean Hb% of these patients was 9.3g%. This shows that most of the patients were anaemic. Anaemia is one of the risk factors for postoperative complications [5]. The cause for anaemia could be attributed to the low socioeconomic status.

Most of the cases were of emergency, because trial labor was tried before taking any patient for surgery, unless there was an absolute indication. Elective cesarean section patients presented with less post operative complications i.e. one out of seven, whereas in case of emergency cesarean section 29 of 68 presented with post operative complications. Patients with premature rupture of membranes as an indication for cesarean section presented with postoperative complications. This could be due to entry of the vaginal flora to the site of incision. A study conducted on patients undergoing cesarean section also showed premature rupture of membranes as one of the risk factor for the development of post operative infections [5]. There are similar studies which demonstrated that women in labor prior to the procedure are at more risk for post operative complications than those who are not in labor at the time of cesarean section [6].

In surgical practice, there is considerable variation in the timing of prophylactic administration of antimicrobials. Classen *et al* [7] have shown that timing of antibiotic administration was critical in preventing post operative wound infections. We observed that prophylactic antimicrobials were often not administered at optimal time preoperatively to ensure their presence in effective concentration throughout the operative period. Guidelines published by "surgical infection prevention guideline writer's workshop" have suggested that antimicrobials should be administered 60 min before the surgical incision and discontinued within 24 hours after the end of surgery [8].

None of the patients received preoperative or intraoperative antimicrobials. Thus therapeutic concentration of the drug may not have been achieved during the operative period. This could have led postoperative complications. All the patients received antimicrobials intravenously for the first four postoperative days. This is to achieve high and quick plasma concentration of the drug during the period at which the risk of bacterial contamination is maximum. Patients were then changed to oral formulations for better compliance and cost effectiveness.

Most post surgical infections are due to patient's own organism. The choice of antibiotics should be guided by the knowledge of organisms causing infections within the institution and their susceptibility pattern. In our hospital, the choice of antimicrobial for prophylaxis was appropriate for the expected pathogens and their antimicrobial susceptibility. However, ceftazolin could have been used as it has long $t_{1/2}$, good tissue penetration and it is cheaper than cefotaxime or ceftriaxone. The duration of stay and duration of drug administration was the same irrespective of the number of drugs used in the combination. Therefore only two drug combinations if preferred could have decreased the cost for the patient.

Short term administration of antimicrobials i.e. three peri operative doses is as effective as long term administration in surgical prophylaxis [9]. In a report describing emergence of resistance to antimicrobials, it was found that resistance developed in patients who were continued with antimicrobials for 4 days postoperatively as compared to patients who received only three peri operative doses [9]. This showed that shorter course of prophylactic antimicrobials decreased the emergence of antimicrobial resistance. Patients were administered antimicrobials for a period of 5-9 days postoperatively. Such prolonged administration may increase cost, which includes acquisition cost and costs for treating post operative infections related to prophylactic failures due to development of resistance. Increased duration of stay in the hospital can also lead to nosocomial infections which further increases morbidity and mortality.

Clarke *et al* [10] reported that post operative complications added 8 days to the duration of hospitalization. Our study also suggests that patients with post operative complications were hospitalized for longer duration around 12-16 days as compared to those without complications. In those instances in which patients presented with postoperative complications and failed to improve with antimicrobials, culture sensitivity was done and antimicrobials to which the organism was susceptible was administered.

E. coli are a commensal of the normal vaginal flora. It was the most common organism isolated in wound infection and urinary tract infections. Our study shows that *E. coli* has not only developed resistance to ampicillin but also to third generation cephalosporins like cefotaxime and ceftriaxone. This could be because of prolonged administration of

cephalosporins which could have led to emergence of resistant strains of *E. coli*. [11]. Isolation of bacteria that are not present in the genital tract such as pseudomonas, which are found in the hospital environment and MRSE and acinetobacter found in the skin shows the iatrogenic aetiology of wound infection these can be reduced by decreasing the duration of hospital stay and by practicing more strict aseptic measures. Studies have shown that MRSA colonization is increased if the hospital stay of the patients is prolonged [12].

Fever was seen in 6.7% of patients and no organisms were isolated in blood culture. The first spike in temperature appeared on the third postoperative day and subsided by the sixth day. Fever may occur after any surgical procedure and cesarean section may not necessarily be a marker of infection [13].

Most of the gram-negative organisms isolated in wound infection and UTI were resistant to ceftazolin and sensitive to amikacin. Gram positive organisms like MSSA, MRSE and *Streptococcus faecalis* were sensitive to cefotaxime and ciprofloxacin respectively. In some instances patients on prophylactic course of gentamicin developed complications and the organism was resistant to gentamicin. Therefore gentamicin was discontinued and amikacin was given twice daily for a period of 7 days.

Obstetricians should utilize antimicrobial regimens that are clinically effective and cost effective. Whenever possible, single agent rather than combination therapy should be used if clinical efficacy and safety can be demonstrated. It should be noted that use of prophylactic antimicrobials should not replace proper pre and intra operative preparation, meticulous surgical handling of tissues and meticulous haemostasis. It is probably of greater importance than prophylactic antimicrobials in reducing post operative infectious morbidity.

5. CONCLUSIONS

In all hospitals there is a need for careful periodic surveillance of pattern of antimicrobial used to detect the emergence of drug resistant strains of bacteria because it caters to the needs of the local population. Antimicrobials are crucial weapons and should be used as trump cards rather than be thrown away as an opening gambit.

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