

A Prospective Observational Study on Patterns of Infections and Antimicrobial Drug Prescribing Among Pregnant Women Attending OBG Ward in a Tertiary Care Hospital in South India

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Abstract

Background: The safety of antibiotics during pregnancy depends on multiple factors, including the specific drug, gestational timing, dosage, treatment duration, and potential effects on pregnancy outcomes. While certain antibiotics, such as penicillins (amoxicillin, ampicillin) and cephalosporins (cefactor, cephalexin), are generally considered safe, individualized assessment and healthcare consultation are essential. **Aim & Objective:** To evaluate infection patterns, antimicrobial prescribing trends, and dosage forms of antibiotics used during pregnancy and delivery. **Methodology:** A prospective observational study conducted in the Obstetrics and Gynecology (OBG) department of a tertiary care teaching hospital. **Results:** Data from 188 cases were analyzed, including 95 pregnant women and 93 postpartum women. Age distribution revealed that 50% of women (94 cases) were in the 19–24 age group, while the least represented group was 31–36 years (18 cases, 9.57%). Among infections in pregnant women, urinary tract infections (UTIs) were most common (37%), followed by respiratory tract infections (RTIs) (24%). Drug categorization showed that 93% of antibiotics were from FDA Pregnancy Category B, while 5% belonged to Category D and 2% to Category C. **Conclusion:** Optimizing antibiotic prescribing patterns—considering appropriate dosage and frequency—can prevent unnecessary use, reduce drug resistance and adverse effects, and promote the safety, efficacy, and rational use of antibiotics during pregnancy.

Keywords: UTI, RTI, Pregnancy, Delivery, Antibiotics, Trimester

Introduction

Pregnancy induces physiological changes that influence drug pharmacokinetics, including alterations in gastric pH, plasma volume, hepatic metabolism, and renal clearance. While these changes may impact drug efficacy, most medications do not require dose adjustments (Anderson, 2005; Hebert et al., 2008). However, medication use during pregnancy requires careful consideration, as some drugs can cross the placenta and potentially harm fetal development. Historical cases, such as thalidomide-induced birth defects, highlight the risks associated with teratogenic drugs, though congenital abnormalities due to medications account for less than 1% of total birth defects (Brent, 2004; Briggs et al., 2017).

Pregnant women are more susceptible to infections due to immune system adaptations, including reduced T-cell and natural killer cell activity (Mor & Cardenas, 2010). Common infections include urinary tract infections (UTIs), respiratory tract infections, and bacterial vaginosis, which, if left untreated, can result in preterm birth, low birth weight, and neonatal complications (Schrag et al., 2002). Globally, nearly 25% of pregnant women receive antibiotics, accounting for 80% of all medications prescribed during pregnancy (Liu et al., 2018). While antibiotics are crucial in reducing maternal morbidity and mortality, inappropriate use contributes to antimicrobial resistance (AMR), posing significant public health concerns (Laxminarayan et al., 2013).

Peripartum infections remain a leading cause of maternal mortality, responsible for nearly 10% of maternal deaths worldwide and contributing to neonatal complications, including an estimated one million newborn deaths annually (Say et al., 2014; Blencowe et al., 2016). Risk factors such as diabetes, bacterial vaginosis, prolonged rupture of membranes, and cesarean sections further increase the likelihood of infections (WHO, 2015). Given these risks, prophylactic and therapeutic antibiotics play a key role in maternal and neonatal health, but their misuse underscores the need for evidence-based prescribing practices (CDC, 2020; ACOG, 2019).

This study aims to assess the patterns of infections and antimicrobial prescribing among pregnant women, identifying trends that can inform rational antibiotic use and improve maternal and fetal health outcomes.

Aim and Objective

The aim of this study is to evaluate the patterns of infections and antimicrobial drug prescribing among pregnant women. The primary objectives include analyzing the patterns of infections in pregnant women and assessing the utilization patterns of antibiotics during pregnancy. Additionally, the secondary objectives focus on examining the dosage forms of antibiotics used during pregnancy and delivery, as well as classifying the types of antibiotics administered during this period.

Materials and Methods

This study is designed as a prospective observational study conducted at [Hospital Name] over a period of six months. The required sample size was calculated using the formula $n = [Z^2 P(1-P)]/d^2$, where Z represents the statistic corresponding to a 95% confidence level, P is the expected prevalence (0.05), and d is the precision (0.04). Based on these values, the estimated sample size for the study is 114 participants. The inclusion criteria for this study consist of pregnant and postpartum women aged 18 years and above who have been prescribed antibiotics or received symptomatic treatment for similar conditions. However, women with septic abortions, septic shock, or pre-existing endocrinological, cardiac, nephrological, or pulmonary diseases will be excluded. Additionally, case sheets with incomplete data will not be considered for analysis. The data for this study will be obtained from patient prescriptions and case sheets. Data collection will be carried out by reviewing prescriptions and analyzing case sheets to assess the prescribing patterns of antibiotics and their utilization in pregnant women.

Result

This prospective observational study was conducted for a period of six months, considering both pregnant and delivery women. Data from 188 subjects who were administered antibiotics during pregnancy and labor were collected and analyzed. Out of the 188 subjects, 95 were in the gestational period, and 93 had undergone delivery. The majority of the study population, 94 women (50%), belonged to the age group of 19-24 years, while the minimum number, 18 women (9.57%), were in the age group of 31-36 years. The mean age of delivery women was 22.9 (± 2.97) years, and the mean age of pregnant women was 24.1 (± 3.68) years. These age distributions indicate that younger women in their early twenties were more likely to experience pregnancy and delivery, highlighting the need for targeted prenatal care and infection management strategies within this age group.

Among the 95 pregnant subjects, the majority (44 women, 46%) were in the second trimester, followed by 22 women (23%) in the third trimester. Out of the 188 study subjects, 93 were delivery women. Among them, 55 (55%) had a normal vaginal delivery, while 38 (45%) underwent a caesarean section. The study indicates that normal vaginal delivery was observed more frequently than caesarean delivery. Age and type of delivery were significantly associated ($p = 0.05$), with 64% (30) of women aged 19-24 years, 57% (21) of women aged 25-30 years having normal vaginal delivery, while 56% (5) of women aged 31-36 years had a caesarean delivery. These findings suggest that maternal age may play a role in delivery outcomes, necessitating close monitoring and appropriate medical interventions for women in higher age groups.

Out of the 95 pregnant women, the most common infections encountered were urinary tract infections (UTIs) (37%), respiratory tract infections (RTIs) (24%), gastroenteritis (20%), pyrexia (7%), candidiasis (2%), cervical cerclage (2%), and others (5%). The high prevalence of UTIs and RTIs underscores the importance of early screening and preventive measures in

prenatal care. Antimicrobial prescriptions were most frequent in the third trimester (52%), followed by the second trimester (35%) and the first trimester (13%). The most commonly prescribed antibiotics were Nitrofurantoin for UTIs, Cefotaxime for RTIs and pyrexia, Metronidazole for gastroenteritis, and Amoxicillin + Clavulanic acid for both UTIs and RTIs. The association between antibiotic use and trimester exposure was significant ($p = 0.03$). This finding emphasizes the necessity for judicious antibiotic selection and adherence to safety guidelines, particularly during critical stages of fetal development.

The study observed that 93% of the prescribed drugs belonged to FDA Category B, 5% to Category D, and 2% to Category C, indicating that most prescribed antibiotics were considered relatively safe for use in pregnancy. The majority of antibiotics in pregnant women were administered via the oral route (72%), followed by parenteral (24%) and vaginal (4%) routes. Among the 93 delivery women, the commonly prescribed antibiotic combinations were Amoxicillin + Clavulanic acid with Metronidazole (51%), Ceftriaxone/Cefpodoxime proxetil with Metronidazole (45%), and Cefperazone + Sulbactam with Metronidazole (4%). Among these, 55 women received both intravenous (IV) and oral forms of antibiotics, while 38 women received only oral antibiotics. The choice of antibiotic combinations and administration routes suggests an effort to balance efficacy and safety in managing infections during labor and postpartum recovery.

In 62% of pregnant women, the treatment duration was 5 days. In 71% of normal vaginal deliveries, the treatment duration was 5 days, while in 66% of caesarean deliveries, the treatment duration was 7 days. These findings highlight the antibiotic prescribing trends and patterns in pregnant and delivery women, providing valuable insights for optimizing antimicrobial use in maternal care. The study underscores the importance of rational antibiotic prescribing to prevent antimicrobial resistance while ensuring effective infection control in pregnant and postpartum women. Future research should focus on evaluating the long-term outcomes of antibiotic exposure during pregnancy and delivery to refine current prescribing practices further.

Table 1: Age wise distribution of data

Age	Delivery Women	Pregnant Women	Total (n = 188)
19-24	47	47	94 (50%)
25-30	37	39	76 (40.43%)
31-36	9	9	18 (9.57%)

Table 2: Distribution of subjects according to gestational age

Diagnosis	No of Pregnant Women	Percentage
UTI	35	37%
Gastroenteritis	20	21%
Pyrexia	7	7%
RTI	23	24%
Candidiasis	2	2%
Cervical cerclage	3	3%
Others	5	5%
Total	95	100%

Table 3: Distribution on type of delivery

Age	1st Trimester	2nd Trimester	3rd Trimester
19-24	16	19	12
25-30	11	18	10
31-36	2	7	0
Total (n=95)	29 (31%)	44 (46%)	22 (23%)

Table 4: Patterns of infection among pregnant women

Age	Normal Vaginal Delivery	Caesarean Delivery
19-24	30	17
25-30	21	16
31-36	4	5
Total	55 (55%)	38 (45%)

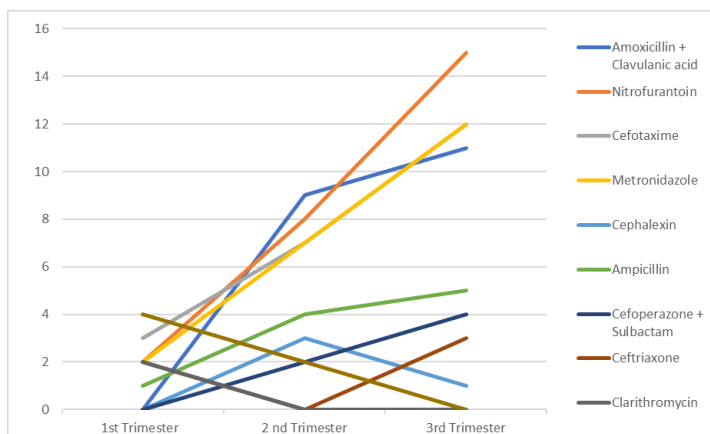


Fig 1: Antibiotic use and trimester of exposure

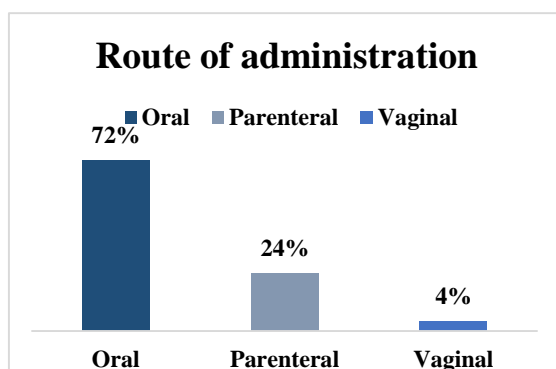
Drug	FDA Category
Amoxicillin + Clavulanic acid	B
Nitrofurantoin	B
Cefotaxime	B
Metronidazole	B
Cephalexin	B
Ampicillin	B
Cefoperazone + Sulbactam	B
Ceftriaxone	B
Clarithromycin	C
Doxycycline	D

Table 5: Prescription pattern of anti-infective drugs in the study population as per FDA category.

Drug	Group	Pregnancy Category	Normal Vaginal Delivery	Caesarean Delivery
Amoxicillin + Clavulanic acid + Metronidazole	Beta lactam	B	23	24
Cefriaxone ; Cefopodoxime proxetil +Merimidazole	Cephalosporins	B	18	24
Cefperazone + Sulbactam with Metronidazole	Cephalosporins + Beta lactam Enyme inhibitors	B	3	1

Table 6: Classification and Utilization pattern of Antibiotics in Delivery Women

Fig 2: Route of Administration of antibiotics in pregnant women



Drugs	IV and oral form	Oral Form
Amoxicillin + Clavulanic acid + Metronidazole	27	20
Ceftriaxone ; Cefopodoxime proxetil +Merimidazole	24	18
Cefperazone + Sulbactam with Metronidazole	4	0
Total	55	38

Table 7: Dosage form of Antibiotics Utilized in delivery

Duration of treatment	Pregnant women	Delivery Type	
		Normal vaginal Delivery	Caesarean Delivery
3 days	15	4	3
5 Days	59	39	25
7 Days	21	12	10

Table 8: Treatment duration of Antibiotics during Pregnancy and Delivery

Discussion

This prospective observational study analyzed the utilization patterns of antibiotics among pregnant and delivery women over six months in a tertiary care teaching hospital. The study included 188 subjects, with 95 in the gestational period and 93 in the post-delivery phase. The majority of the study population belonged to the age group of 19-24 years (50%), while the least number of subjects were in the 31-36 years group (9.57%). The mean age of pregnant women was 24.1 (3.68) years, and for delivery women, it was 22.9 (2.97) years. In terms of gestational age, 46% of pregnant women were in the second trimester, indicating a higher prevalence of infections during this period, although the highest antibiotic prescriptions occurred in the third trimester (52%). A study conducted by Begum MA et al. (2019) reported similar findings, with a higher prevalence of infections in the third trimester.

Urinary tract infections (37%) were the most commonly encountered condition, followed by respiratory tract infections (24%) and gastroenteritis (20%). This finding aligns with studies conducted in South India by Mensah KB et al. (2017) and Sunilkumar S et al. (2020), where UTIs and RTIs were identified as the most common infections requiring antimicrobial treatment. The predominant antimicrobials prescribed included Nitrofurantoin for UTIs, Cefotaxime for RTIs and pyrexia, and Metronidazole for gastroenteritis. The majority of the prescribed drugs (93%) fell under FDA Category B, ensuring a relatively safe profile for use in pregnancy. These findings are in accordance with the studies of Sunilkumar S et al. (2020) and Begum MA et al. (2019), which also reported the dominance of Category B drugs in pregnancy. Oral administration was the preferred route (72%), consistent with other studies.

Among the 93 delivery women, normal vaginal delivery (55%) was more common than caesarean delivery (45%). Antibiotic utilization patterns varied between vaginal and caesarean deliveries, with combination therapy being the standard practice. In caesarean deliveries, women received a combination of Amoxicillin + Clavulanic acid with Metronidazole (51%) or Ceftriaxone/Cefpodoxime proxetil with Metronidazole (45%) for an average duration of seven days.

The study highlights the importance of rational antibiotic prescribing in pregnancy and delivery to ensure maternal and fetal safety. The observed patterns align with existing literature, supporting the need for evidence-based guidelines in managing infections during pregnancy and postpartum care.

Conclusion

Most of the pregnant women are prescribed with medications due to the associated illnesses in circumstances where it is difficult to avoid drugs. It is safe to avoid medications during pregnancy for the sake of both mother and fetus. UTIs and RTIs were the most common among the conditions encountered and were the leading cause for antimicrobials prescription. Antimicrobials prescription was more during 3rd trimester. Majority of the antimicrobials were administered orally. Most antimicrobials prescribed were safe as they were from FDA Category B. From this study, we can conclude that perfect usage pattern of antibiotics with doses and frequency can avoid the unnecessary use, reducing the risk of drug resistance, adverse effects and side effects and therefore we can reach Safety, efficacy and Rational use of Antibiotics.

Conflict of Interest

The authors declare no conflict of interest.

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