

A Study on Pregnancy-Related Bacterial Infections in the Obstetrics and Gynaecology department of a tertiary care teaching hospital

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ABSTRACT: Infection is an important, potentially preventable, and yet often overlooked cause of maternal mortality and morbidity as well as fetal and neonatal well-being. An infection that occurs during pregnancy may not only cause harm to the mother but may also affect her fetus or her partner. **Objectives** The objectives of this study were to review the pattern of different bacterial infections in pregnancy in a rural tertiary care teaching Indian hospital and to investigate the prescribing pattern of antibiotics. **Methods:** A prospective study was carried out on 450 patients, out of which 130 were enrolled after considering the inclusion and exclusion criteria and taking written consent from each volunteer for the study. A suitably designed data collection form was used to collect all the necessary information. All the collected data were analyzed using Microsoft Excel and SPSS statistical methods. **Results:** In our study, it was observed that the majority of pregnant patients were affected by a bacterial infection. 43.84% were having UTI, followed by 26.92% with Bacteriuria, and 2.30% of them were having syphilis, we also identified complications due to the presence of bacteria PROM and Preterm birth 19.23% & 7.69% respectively. **Conclusion:** The findings of the study concluded that prevalence of Bacterial infections during pregnancy is high, identified different pattern of bacterial infections during the study were UTI, Bacteriuria, and Syphilis, also identified some complications due to

bacterial infection such as PROM & Pre-term birth. The study also observed that the most commonly prescribed antibiotics were Ceftriaxone, Cefotaxime, Metronidazole.

This research has mainly focused on bacterial infections and their complications and microbiological management in pregnant women.

KEYWORDS: antibiotics, bacteriuria, complications, infections, maternal mortality, maternal morbidity, neonatal well-being, pregnant women

LIST OF ABBREVIATIONS:

CONS- coagulase-negative staphylococci
MRCONS- methicillin-resistant coagulase-negative staphylococci
GPB- gram positive bacteria
GNB- gram negative bacteria
E-COLI- Escherichia coli
UTI- urinary tract infection
PROM- premature rupture of membranes

I. INTRODUCTION:

"Infections of mothers and their babies (both in utero and ex utero) are a major global challenge."¹ Infection is an important, potentially preventable, and often overlooked cause of maternal mortality and morbidity as well as fetal and neonatal well-being.² An infection that occurs during pregnancy may not only cause harm to the

mother but may also affect her fetus (or newborn) or her partner.³ Pregnant women are at an increased risk of some infections due to the physiologic changes of pregnancy.⁴ Infections are caused by bacteria, viruses, or parasites that have invaded body tissues or have released toxins that disrupt normal functions and elicit an inflammatory response to help combat the microorganism. Infections, or the inflammatory responses to an infection, can result in adverse effects, including preterm delivery, birth defects, developmental delays, or stillbirths. Infections that are acquired in utero or during birth are a significant cause of fetal and neonatal mortality, which can contribute to early and later childhood morbidity. Several kinds of infections might harm a pregnant woman.⁵

Bacterial infection was the primary focus of our research. Bacteria are single-celled microorganisms with no nuclear membrane that are metabolically active and divide via binary fission. Bacteria appear to be simple forms of life on the surface, but they are complex and adaptive. These organisms can be found in a variety of parasitic and free-living forms.⁶ Bacterial infections, which are typically asymptomatic, are frequently misdiagnosed and neglected in antenatal care settings. Such infections, on the other hand, might severely affect pregnancy and foetal development, and untreated infections have been associated with substantial neurodevelopmental problems in offspring.⁷

Pregnancy and childbirth are linked to a number of physiological changes, both immunological and mechanical, that make the mother and newborn more susceptible to infection. Furthermore, various ailments related to pregnancy and childbirth, such as Group B streptococcal (GBS) colonization, Premature rupture of membranes (PROM), or urinary tract and wound infections, might act as the principal focus of such an infection. Infections associated with childbirth have been linked to a variety of long-term issues, including chronic pelvic pain, infertility, ectopic pregnancy, and the implications of poor mother-child bonding. Infections associated with pregnancy are also one of the leading causes of maternal and newborn death worldwide.⁸

Therefore, timely⁹ identification of pregnant women with chronic infection and prevention of potential complications caused by chronic pathogen persistence is among the priority goals in modern obstetrics.¹⁰ Management of infections in pregnant women requires an early, decisive treatment decision to prevent complications for mother and infant.

This study aimed to evaluate the pregnancy-related bacterial infections and analyze the Prescribing Pattern of Antibiotics with a high risk of chronic infection during pregnancy and the association with the presence of specific microorganisms in the genital microbiome in AH&RC.

II. MATERIALS AND METHODS

ETHICAL CONSIDERATIONS:

An experienced consultant physician and practicing clinical pharmacist were directly involved in conducting the study by utilizing their knowledge and expertise in the field at the Adichunchanagiri Hospital and Research Center. All study procedures were carried out according to the Declaration of Helsinki, and the study was approved by the institutional ethical committee (IEC/AH&RC/AC/018/2021).

PARTICIPANTS AND STUDY DESIGN

A Prospective, observational study was conducted on 450 patients out of which 130 were enrolled considering the inclusion and exclusion criteria, in the Obstetrics and gynecology unit of Adichunchanagiri hospital and research center during the period of 6 months from February 2021 to July 2021. All pregnant women with Bacterial Infection were included in the study after obtaining the written informed consent form. Pregnant women with viral Infection and those who were not willing to participate were excluded from the study.

DATA COLLECTION AND INSTRUMENTS

A specially designed suitable data collection form was used to collect the socio-demographic details. Information leaflet was prepared and circulated to all pregnant women with Bacterial infection to educate about Bacterial infection and its prevention.

STATISTICAL ANALYSIS

All the collected data were analyzed using Microsoft Excel and SPSS statistical methods. Descriptive statistics were used to summarize demographic details and source of information. Variables included in the analysis were Age, Parity, Trimester, Bacteria & Bacterial Infection. The Chi-square test was used to assess the association, among the study variables it showed that there is no statistical association among age groups ($p=0.45$) Parity($p=0.512$) and Trimester ($p=0.833$) with Bacteria show that there is a statistical association among parity ($p=0.036$) with Bacterial Infections.

III. RESULTS

A total of 130 pregnant Patients who are clinically diagnosed with Bacterial infection by physician were enrolled in the study, and their

demographic details were collected. during the data collection period.

TABLE 1. AGE DISTRIBUTION OF THE BACTERIAL INFECTED PREGNANT WOMEN

AGE GROUP	NO OF PATIENTS	PERCENTAGE (%)
18-22	37	28.5
23-26	57	43.8
27-30	31	23.8
31-34	5	3.8

Table 1 shows that among 130 pregnant women with bacterial infection, majority of them belongs to age group 23-26(43%), followed by 18 -22(28.5%),27-30(23.8%) and 31-34(3.8%). This clearly indicates that pregnant patients in age group of 23-26 are more prone to have Bacterial infections

DETAILS OF PARITY DISTRIBUTION OF BACTERIAL INFECTED PREGNANT WOMEN

TABLE 2. PARITY DISTRIBUTION

PARITY	NO OF PATIENTS	PERCENTAGE (%)
1	81	62.3
2	40	30.8
3	9	6.9

Table 2, shows that among the 130 pregnant women with bacterial infection who participated in the study, 81 (62.3%) women were from the first parity, 40 (30.8%) from the second parity, and the remaining 9 (6.9%) from the third parity.

DETAILS OF TRIMESTER DISTRIBUTION OF BACTERIAL INFECTED PREGNANT WOMEN

TABLE 3. TRIMESTER DISTRIBUTION

TRIMESTER	NO OF PATIENTS	PERCENTAGE (%)
1st Trimester	7	5.4
2nd Trimester	32	24.6
3rd Trimester	91	70

Table 3, shows that out of 130 participants majority of them 91(70%) were in third trimester, 32(24.6%) were in 2nd trimester and only 7(5.4%) were in first trimester.

DISTRIBUTION OF BACTERIA OF PREGNANT WOMEN
TABLE 4. BACTERIA DISTRIBUTION

		FREQUENCY	PERCENT
Bacteria	Gram Negative Bacteria	42	32.3
	Gram Positive Bacteria	56	43.1
	Combination of Gram Negative and Positive	32	24.6

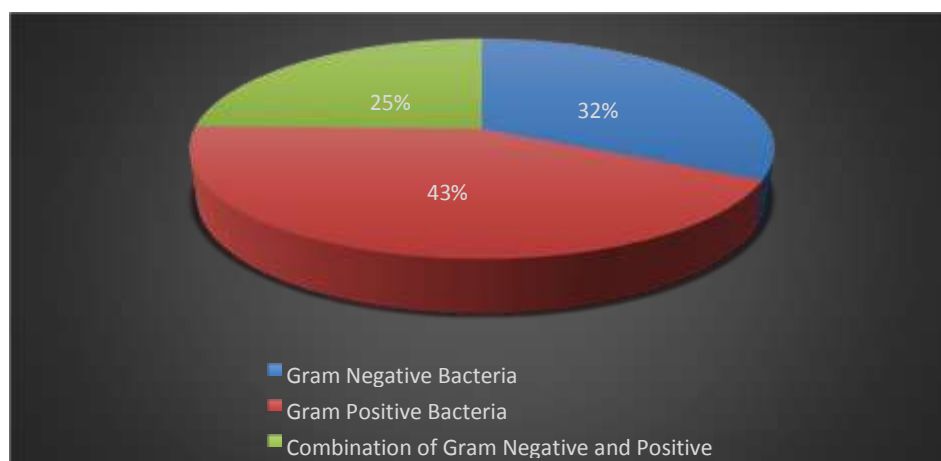


FIGURE 1. BACTERIA DISTRIBUTION

Table 4 & Figure 1, shows that out of 450 pregnant women, 130 were included, most of them were infected by Gram positive Bacteria 56(43%),

followed by Gram Negative Bacteria 42(32%) & combination of both Gram Positive & Negative Bacteria 32(24.60%).

TABLE 5. IDENTIFIED BACTERIA DURING THE STUDY

GRAM POSITIVE BACTERIA		
CONS	15	11.53
GPB	31	23.84
MICROCOCCI	2	1.53
MRCONS	4	3.07
Staphylococcus Aureus	4	3.07
Gram Negative Bacteria		
CITROBACTER KOSERI	1	0.76
E-COLI	15	11.53
Enterobacter spp	2	1.53
GNB	13	10.00
Klebsiella Spp	5	3.84
PSEUDOMONAS Spp	3	2.30

TREPONEMA PALLADUM	3	2.30
COMBINATION OF GRAM POSITIVE & NEGATIVE BACTERIA		
CONS, GNB	2	1.53
E-COLI, GPB	1	0.76
Enterobacter spp, GPB	1	0.76
ENTEROCOCCUS Spp, GNB	5	3.84
GNB, GPB	14	10.76
MICROCOCCHI, GNB,	1	0.76
MRCONS, GNB	4	3.07
PROTEUS SPP, GPC	1	0.76
PSEUDOMONAS Spp, GPB	3	2.30

Table 5, shows that different type of bacteria identified during the study.

TABLE 6. ASSOCIATION OF AGE GROUP, PARITY & TRIMESTER WITH BACTERIA

			Bacteria			Chi Square Value	P Value
			Gram Negative Bacteria	Gram Positive Bacteria	Combination of Gram Negative and Positive		
Age groups	18-22	N	15	16	6	5.76	0.45
		%	40.50%	43.20%	16.20%		
	23-26	N	19	21	17		
		%	33.30%	36.80%	29.80%		
	27-30	N	6	17	8		
		%	19.40%	54.80%	25.80%		
	31-34	N	2	2	1		
		%	40.00%	40.00%	20.00%		
Parity	1	N	30	34	17	3.28	0.512
		%	37.00%	42.00%	21.00%		
	2	N	9	18	13		
		%	22.50%	45.00%	32.50%		
	3	N	3	4	2		
		%	33.30%	44.40%	22.20%		
Trimester	1st Trimester	N	1	4	2	1.46	0.833
		%	14.30%	57.10%	28.60%		
	2nd	N	10	13	9		
		%					

	Trimester	%	31.20%	40.60%	28.10%		
	3rd Trimester	N	31	39	21		
		%	34.10%	42.90%	23.10%		

*Statistical significance set at 0.05; N: Number of samples; χ^2 value: Chi-square value

Table 6, shows that Chi-square analysis displays no statistically significant association among Bacteria with age group (P=0.45), Parity (p=0.512), and trimester (p=0.833)

TABLE 7. OBSERVED BACTERIAL INFECTION DURING THE STUDY

	NO OF PATIENTS	PERCENTAGE
UTI	57	43.84%
Bacteriuria	35	26.92%
SYPHILIS	3	2.30%

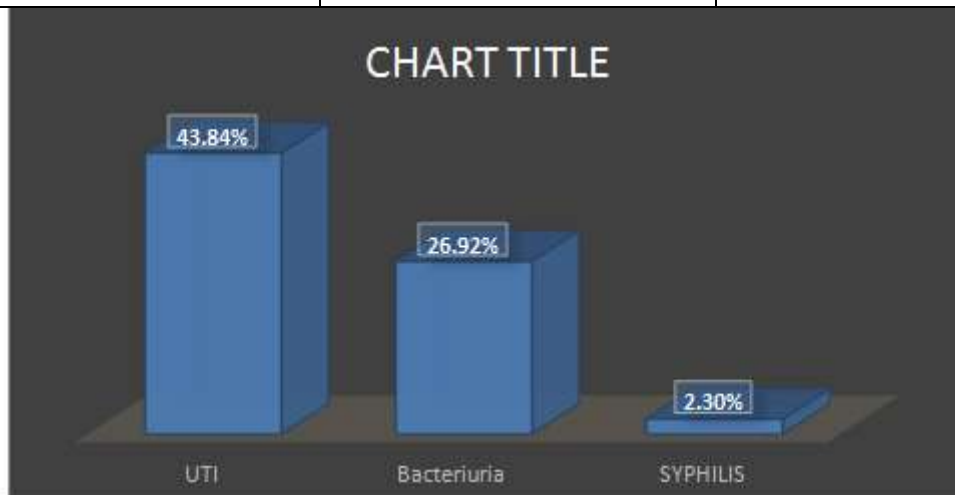


FIGURE 2. OBSERVED BACTERIAL INFECTION DURING THE STUDY

Table 7 & Figure 2, shows that out of 450 participants, 130 were bacterially infected among them 57(43.84%) women had UTI, 35(26.92%) women had Bacteriuria & 3(2.30%) women had Syphilis.

TABLE 8. COMPLICATIONS DUE TO THE PRESENCE OF BACTERIA (BACTERIAL INFECTIONS)

	NO OF PATIENTS	PERCENTAGE
PROM	25	19.23%
PRE-TERM BIRTH	10	7.69%

Table 8 shows, that out of 450 participants, 130 were bacterially infected, among them we identify 25(19.23%) women were having PROM &

10(7.69%) were having preterm birth however type of Bacterial infection was not clear.

TABLE 9. ASSOCIATION OF AGE GROUP, PARITY & TRIMESTER WITH BACTERIAL INFECTIONS

Statistical significance set at 0.05; N: Number of samples

			Bacterial Infection					P Value
			Bacteriuria	PRETERM BIRTH	PROM	Syphilis	UTI	
AGE GROUP	18-22	N	11	2	11	0	13	0.553
		%	29.70%	5.40%	29.70%	0.00%	35.10%	
	23-26	N	16	5	6	2	28	
		%	28.10%	8.80%	10.50%	3.50%	49.10%	
	27-30	N	6	3	6	1	15	
		%	19.40%	9.70%	19.40%	3.20%	48.40%	
31-34	N	2	0	2	0	1		
	%	40.00%	0.00%	40.00%	0.00%	20.00%		
PARITY	1	N	21	6	15	2	37	0.999
		%	25.90%	7.40%	18.50%	2.50%	45.70%	
	2	N	11	3	8	1	17	
		%	27.50%	7.50%	20.00%	2.50%	42.50%	
	3	N	3	1	2	0	3	
		%	33.30%	11.10%	22.20%	0.00%	33.30%	
TRIMIS TER	1st Trimester	N	4	0	1	0	2	0.487
		%	57.10%	0.00%	14.30%	0.00%	28.60%	
	2nd Trimester	N	11	3	7	0	11	
		%	34.40%	9.40%	21.90%	0.00%	34.40%	
	3rd Trimester	N	20	7	17	3	44	
		%	22.00%	7.70%	18.70%	3.30%	48.40%	

Table 9, shows that Chi-square analysis displays no statistically significant association among Bacterial infections with age group (P=0.553), Parity (P=0.999); trimester (P=0.487);

Name of Antibiotics	Frequency (%)
Ceftriaxone	109 (84.60)
Cefotaxime	35 (21.53)
Cefixime	3 (2.30)
Metronidazole	24 (18.50)
Nitrofurantoin	24 (18.50)
Penicillin G	3 (2.30)
Ceftriaxone + Sulbactam	9 (7.00)

TABLE 10. MOST COMMONLY PRESCRIBED ANTIBIOTICS

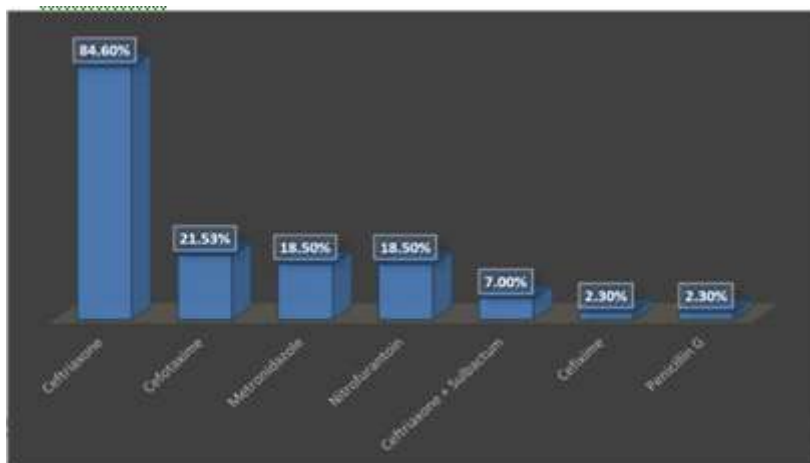


FIGURE 3. MOST COMMONLY PRESCRIBED ANTIBIOTICS

Table 10 & Figure 3, shows that Ceftriaxone 109(84.60%), Cefotaxime 35(21.53%), Metronidazole 24(18.50%), Nitrofurantoin 24(18.50%) were the most commonly prescribed antibiotics in this study.

DISTRIBUTION OF THE NUMBER OF ANTIBIOTICS PRESCRIBED TO PATIENTS

TABLE 11. NUMBER OF ANTIBIOTICS PRESCRIBED TO PATIENTS

NO OF ANTIBIOTICS PRESCRIBED	FREQUENCY	PERCENTAGE
One Antibiotic	64	49.23%
Two Antibiotics	56	43.07%
Three Antibiotics	10	7.69%

FIGURE 4: NUMBER OF ANTIBIOTICS PRESCRIBED TO PATIENTS

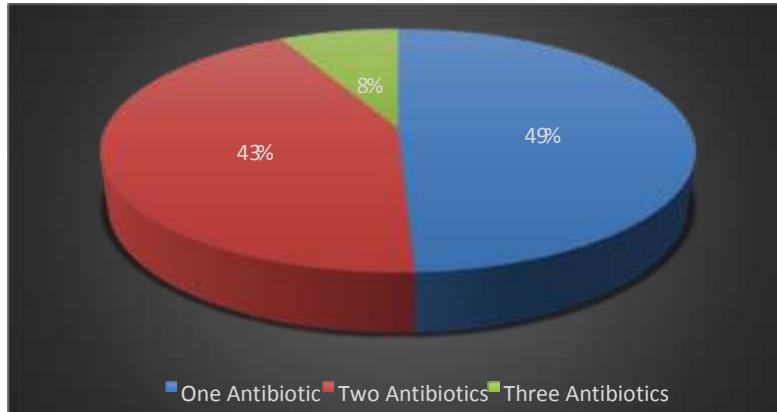


Table 11 & Figure 4, shows that among 130 participants, the percentage of patients prescribed with at least 1 antibiotic is 49%, percentage of

patients prescribed with 2 antibiotics is 43% & Percentage of patients prescribed with 3 antibiotics is 8%

TABLE 12. PERCENTAGE OF PATIENTS PRESCRIBED WITH AT LEAST 1 ANTIBIOTIC

NAME OF THE ANTIBIOTICS	FREQUENCY	PERCENTAGE
Cefotaxime	6	4.61%
Ceftriaxone	53	40.7%
ceftriaxone + Sulbactam	3	2.30%
Nitrofurantoin	2	1.53%

FIGURE 5: PERCENTAGE OF PATIENTS PRESCRIBED WITH AT LEAST 1 ANTIBIOTIC

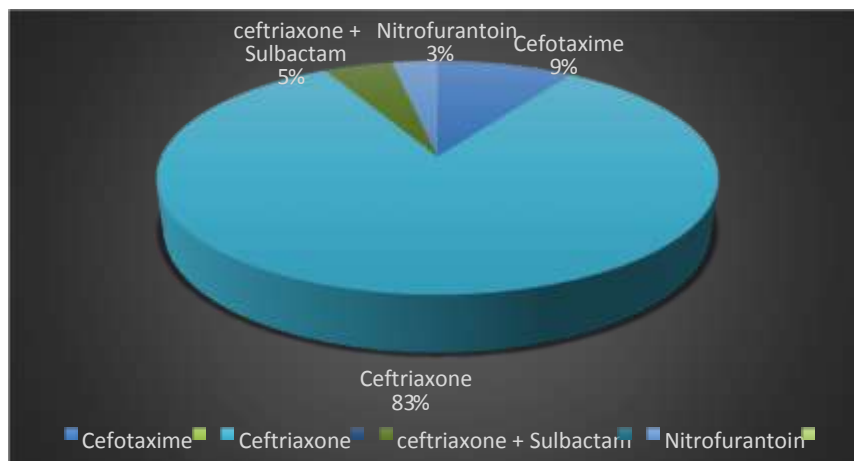


Table 12 & Figure 5, represents the percentage distribution of patients prescribed with at least 1 antibiotic

TABLE 13. PERCENTAGE OF A PATIENTS PRESCRIBED WITH AT LEAST 2 ANTIBIOTIC

NAME OF ANTIBIOTICS	FREQUENCY	PERCENTAGE (%)
Cefixime, Ceftriaxone	1	0.76
Ceftriaxone, Metronidazole	1	0.76
Cefixime, Ceftriaxone	2	1.53
ceftriaxone + Sulbactam, Cefotaxime	3	2.30
ceftriaxone + Sulbactam, Nitrofurantoin	2	1.53
Ceftriaxone, Cefotaxime	12	9.23
Ceftriaxone, Cefotaxime	2	1.53
Ceftriaxone, Nitrofurantoin	17	13.07
Metronidazole, Cefotaxime	2	1.53
Metronidazole, Ceftriaxone	11	8.46
Nitrofurantoin, Cefotaxime	2	1.53
penicillin G, Ceftriaxone	1	0.76

FIGURE 6: PERCENTAGE OF PATIENTS PRESCRIBED WITH AT LEAST 2 ANTIBIOTIC

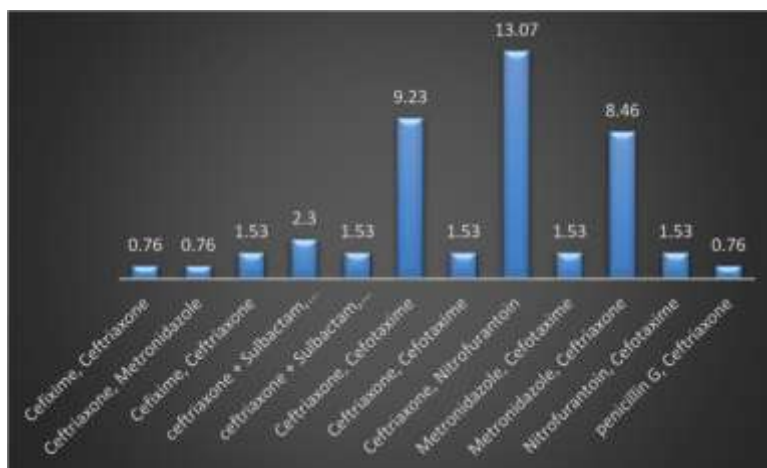


Table 13 & Figure 6, represents the percentage distribution of patients prescribed with 2 antibiotics

TABLE 14. PERCENTAGE OF A PATIENTS PRESCRIBED WITH AT LEAST 3 ANTIBIOTIC

NAME OF ANTIBIOTICS	FREQUENCY	PERCENTAGE (%)
Metronidazole, Cefotaxime, Penicillin G	1	7.69
Metronidazole, Ceftriaxone, Cefotaxime	1	7.69
Metronidazole, Ceftriaxone, Cefotaxime	6	4.61
Metronidazole, Ceftriaxone, Penicillin G	1	7.69
Nitrofurantoin, Metronidazole, ceftriaxone + Sulbactam	1	7.69

FIGURE 7. PERCENTAGE OF PATIENTS PRESCRIBED WITH AT LEAST 3 ANTIBIOTIC

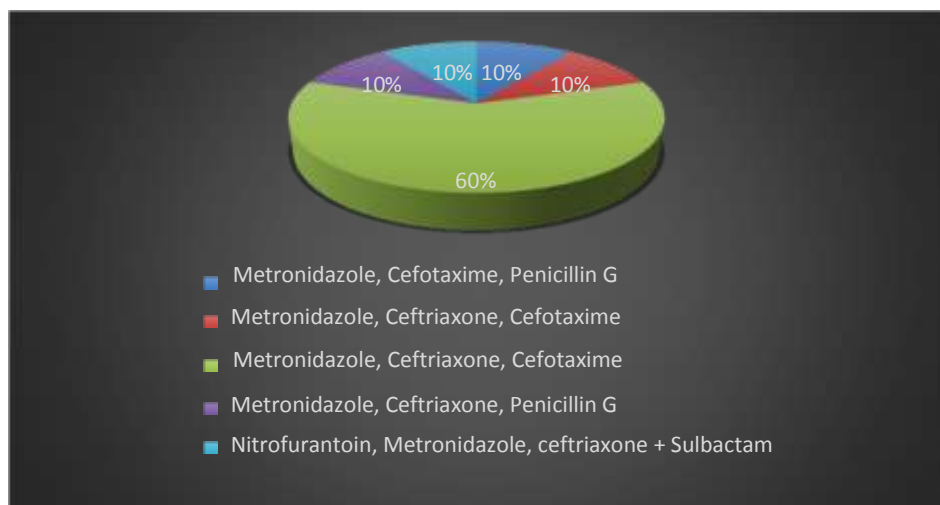


Table 14 & Figure 7, represents the percentage distribution of patients prescribed with 3 antibiotics

IV. DISCUSSION:

This current study is believed to be the first of its kind in the south Karnataka region to determine the pattern of different Bacterial Infections in Pregnancy. Women with bacterial infections appear to be at increased risk of UTI and other serious infections such as bacterial vaginosis, cervicitis, PROM, syphilis, chlamydia, etc. The primary objective of this study was to determine the various pattern of Bacterial Infections in Pregnant women and the secondary objective was to analyze the Prescribing Pattern of Antibiotic, to educate bacterial infected Pregnant Women regarding infection & its prevention, and to educate Bacterial Infected Pregnant Women to adopt healthy lifestyle modification. A.M. Al-Haddad, conducted a cross-sectional study on Urinary tract infection among pregnant women in Al-Mukalla

district, Yemen. This study aims to determine if UTI is a widespread problem among pregnant women in the Al-Mukalla district and to assess its relation with some possible risk factors such as age, duration of pregnancy, and parity. This study showed that 30% of the women suffered from UTI; Escherichia coli was the most frequently isolated organism (41.5%), and it was highly susceptible to chloramphenicol, ciprofloxacin, ceftizoxime, and amikacin. Of the variables examined, 53.7% of the infected women were in the age group 15–24 years, 48.8% were in their 3rd trimester and 75.6% had 1–3 children. Similarly, concerning our prospective study of pregnancy-related bacterial infections in the OBG department of a tertiary care teaching hospital out of 450 pregnant women, 130 were bacterially infected and it was observed that 43.84% were having UTI, followed by 26.92%

Bacteriuria, 2.30% of them were having syphilis, we also identified complications due to presence of bacteria (bacterial infection) PROM and Preterm birth 19.23% & 7.69% respectively: however, type of Bacterial infection was not clear concerning PROM & Preterm Birth. We analyzed three variables in this study such as age group, parity, and trimester. No variables show statistically significant with bacterial infections. Antibiotics are one of the foremost vital discoveries within the field of life science and are widely used against infectious agents. The utilization of Antibiotics in an inappropriate manner results in the choice of the dominance of resistant microorganisms and/or the augmented transfer of resistance genes from antibiotic-resistant to antibiotic-susceptible microorganisms. Deepak Jha et al. conducted an observational study of prescribing pattern of antibiotics in tertiary care hospitals in Bangalore, India after permission from the IEC (298-87:88). The main objective was to study the prescribing pattern of antibiotics. In this study, 300 patients were prescribed antibiotics from both outpatient and inpatient departments. Data was collected from the patient's chart and was subjected to analysis by performing descriptive statistics using Microsoft Excel software. The prescription was assessed and found the maximum number of patients belonged to the age group of 21-30 years and the proportion of male patients was more compared to the female patients. They also observed that the frequency of antibiotics was 1, 2, and 3 or > 3 prescribed to 55%, 26%, and 19% respectively. Among the whole group of antibiotics, cephalosporins were found to be prescribed for the largest number followed by Quinolone, Antifungals, Aminoglycosides, Penicillin, Antiamoebic, Macrolides, Antimalarial, and others. And they concluded that by understanding the prescribing pattern of antibiotics and the frequency of antibiotics on patient demographics, they were able to make the rational use of antibiotic agents one of the main contributions to controlling drug resistance all over the world. To overcome the risk of antibiotic resistance of microorganisms, an antibiotics policy should be carefully instituted and implemented. Further studies are needed to explore the knowledge and skills to correct the physicians' attitudes towards prescriptions. Similarly, our study observed that the most commonly prescribed antibiotics were ceftriaxone (84.60%), cefotaxime (21.53%), metronidazole (18.50%), nitrofurantoin (18.50%), ceftriaxone + sulbactam (7%), cefixime (2.30%), and penicillin G (7%). We also observed that several antibiotics prescribed to patients with

one antibiotic were about 49.23%, two antibiotics were about 43.07%, & three antibiotics were about 7.69%. We educated all the participants regarding Bacterial infections and their prevention and also, and we circulate the Patient information leaflet for better understanding.

V. CONCLUSION:

Infections are common throughout pregnancy; however, if infections are undetected or untreated, they can lead to a variety of serious complications. It's important to keep an eye out for any indications of infection during pregnancy, as well as to follow the right preventive and treatment strategies to mitigate the likelihood of complications in pregnancy. Pregnant women should be educated regarding Bacterial infections during pregnancy and their prevention. Adequate assistance should be provided to implement healthy lifestyle changes. The findings of the study concluded that the prevalence of Bacterial infections during pregnancy is high, identified different patterns of bacterial infections during the study were UTI, Bacteriuria, and Syphilis, also identified some complications due to bacterial infection such as PROM & Pre-term birth; however, type of bacterial infection is not cleared. The predominant organisms were Gram-positive and Gram-negative such as E-Coli, CONS, Pseudomonas spp., and Klebsiella. The study also observed that the most commonly prescribed antibiotics were Ceftriaxone, Cefotaxime, and Metronidazole.

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CONFLICT OF INTEREST: None declared

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