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Research Article

Incidence of Urinary Tract Infections and determination of their susceptibility to antibiotics among Pregnant Women

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Abstract

Urinary tract infections (UTIs) are the second most common infections in community practise. Prevalence of UTI is an extremely in females than males, 40% to 50% of whom will suffer at least one clinical episode during their lifetime. This study therefore focuses on the detection and incidence of UTI among pregnant women. It also aimed to isolate and identify the organisms that causing UTI among pregnant women, and determined their susceptibility patterns to commonly used antimicrobial agents. A total of one hundred (100) midstream urine sample were collected from pregnant women at the aged ranges from 16 to 40 years attending to Sri Vijaya Hospital at Mehdipatnam , Hyderabad city India between June 2015 and December 2015. Early morning clean-catch midstream urine was collected from each pregnant woman into a wide-mouthed sterile screw capped container. With a calibrated micro-loop, 0.001 ml. of urine was cultured on to a Blood agar, MacConkey agar, EMB agar , Nutrient agar and Muller Hinton Agar plates. After overnight incubation at 37º C for 24 hours, A total of Thirty nine (39%) out of 100 patients had urinary tract infection . The bacterial isolates were identified based on colony morphology characteristics, Gram stain reaction and biochemical tests. the commonest isolated organism was S. aureus (43.53%), followed by E.coli (35.89 %), Klebsiella pneumonia (10.25%), Pseudomonas aeruginosa (7.69%) and lowest incidence of the isolates was Proteus spp (2.56%). More than 97% of the isolates were resistance to ampicillin (97.3%), followed by Netillin (84.2%), in other hand the most effective antibiotic was Amikacin which show (5.2%) of the isolates resistance, followed by the resistance of isolates to Cefotaxime and Gentamicin were each (21%).

Keywords: *Bacterial agents, UTI, Antimicrobial susceptibility, Pregnant women, Urine culture.*

1. Introduction

UTI is the most common bacterial infection, accounting for 25 % of all infections. UTI can occur in any populations and age groups however, infection is most common in females in reproductive age (Karki A *et al*, 2004). Urinary tract infections (UTIs) are the second most common infections in community practise. Prevalence of UTI is an extremely in females than males, 40% to 50% of whom will suffer at least one clinical episode during their lifetime (G. R. Smith *et al*, 1990). Bacterial infections of urinary tract are most commonly observed in general practice being responsible for considerable morbidity (Ledinham *et al*, 1996). According to Foxman, acute urinary tract infection is very common entity that affects almost half of women in the united states of America (Foxman,B 2002). There are approximately 150 million urinary tract infections per year worldwide and cost the global economy in excess of 6 billion US dollars (Stamm *et al*, 2001). A limited and predictable spectrum of organisms is responsible urinary tract infections.

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UTI is a heterogeneous disease, which can be divided into several types of infections such as acute, complicated UTI, uncomplicated bacterial pyelonephritis, asymptomatic bacteriuria and recurrent cystitis. Acute UTI is one of the most common bacterial infections among women presenting to primary care (Akortha EE *et al*, 2008).

The increase risk factor for UTI in women may be due to absence of prostatic secretions, short urethra, easy contamination of urinary tract with faecal flora and pregnancy (A. M. Awaness *et al*, 2000). Dilation of Ureteral occur in an estimated 90% of pregnant women, which will persist until delivery (J. E. Delzell *et al*, 2000). And it may contribute to increased ureterovesical reflux and urinary stasis. moreover, the physiological increase of the volume of plasma during pregnancy decreases the concentration of urine and up to 70% of pregnant women develop glycosuria, which is considered to encourage bacterial growth in the urine (J. E. Delzell *et al*, 2000; T. F. Patterson *et al*, 1987). Women with a history of UTIs are at high risk of having a UTI during pregnancy and other risk factors for UTIs during pregnancy include individual hygiene,

lower socio economic status, increased parity or age, sickle cell trait and anaemia, and lack of prenatal care. Diabetes mellitus and the functional urinary tract abnormalities can also increase susceptibility to UTIs during pregnancy (B. Nowiciki, 2002).

Acute pyelonephritis may lead to adverse outcomes for the mother and the baby , such as low birth weight infants, premature delivery, hypertension, renal failure, preeclampsia and fetal death (Hill *et al*, 2005).

Only single bacterial species causing more than 95% of urinary tract infections. *E. coli* is the most incidence uropathogen in acute infection (Jellheden B *et al*, 1996; Ronald A, 2002).

Staphylococci, Klebsiella, Enterobacter, Pseudomonas, Proteus, and *Enterococci species* are more often isolated from patients, whereas there is a greater preponderance of *E. coli* in an outpatient population (Bronsema DA *et al*, 1993). Anaerobic organisms are rarely pathogens in the urinary tract (Jacobs LG, 1996). *Staphylococci saprophyticus* tends to cause infection in young women of a sexually active age (Schneider PF *et al*, 1996). Coagulase Negative *Staphylococci* are a common cause of urinary tract infection in some reports (Mandell GL *et al*, 2005).

UTIs are often treated with different broad spectrum antibiotics when one with a narrow spectrum of activity may be appropriate because of concerns about infection with resistant organisms. Fluoroquinolones are preferred as initial agents for empiric therapy of UTI in area where resistance is likely to be of concern (Schaeffer AJ, 2002; Biswas D *et al*, 2006). This is because they have high bacteriological and clinical cure rates, as well as low rates of resistance, among most common Uropathogen (Schaeffer AJ, 2002; Goldstein FW, 2000). The extensive uses of antimicrobial agents have invariably resulted in the development of antibiotic resistance, which, in recent years, has become a major problem worldwide (Kumar MS *et al*, 2006).

The Infectious Diseases Society of America also recommends that physicians obtain information on local resistance spectrum of organisms cause urinary tract infections and that ongoing surveillance be conducted to monitor changes in susceptibility of uropathogens (Warren *et al*, 1999).

This study therefore focuses on the detection and incidence of UTI among pregnant women. It also aimed to isolate and identify the organisms that causing UTI among pregnant women, and determined their susceptibility patterns to commonly used antimicrobial agents.

2. Material and methods

A total of one hundred (100) midstream urine sample were collected from pregnant women at the aged ranges from 16 to 40 years attending to Sri Vijaya Hospital at Mehdipatnam , Hyderabad city India between June 2015 and December 2015. The urine samples were obtained by informed consent of the pregnant women used for this study and the permission to that effect was obtained from the Ethical Committee of the hospital. Data such as duration of gestation and age were obtained from the pregnant women. Early morning clean-catch midstream urine was collected from each pregnant woman into a wide-mouthed sterile screw capped container.

With a calibrated micro-loop, 0.001 ml. of urine was cultured on to a Blood agar, MacConkey agar, EMB agar, Nutrient agar and Muller Hinton Agar plates. After overnight incubation at 37º C for 24 hours, colony counts a bacterial growth of ≥105 / ml was taken as being significant in both symptomatic and asymptomatic pregnant women.

Antibiotic susceptibility of an isolated species were tested for their susceptibility to some antibiotics (Ampicillin, Ciprofloxacin, Cefotaxime, Ofloxacin, Cotrimoxazole , Nitrofurantoin, Amikacin, Gentamicin and Norfloxacin) (Hi-Media Lab, India) by modified disc-agar diffusion technique (Kirby-Bauer method) (Collee, 1996).

3. Results

In this study, cultures that showed ≥ 10^5 bacterial colonies per ml of urine were identified to have significant growth. A total of Thirty nine (39%) out of 100 patients had urinary tract infection (figure 1). The bacterial isolates were identified based on colony morphology characteristics, Gram stain reaction and biochemical tests.

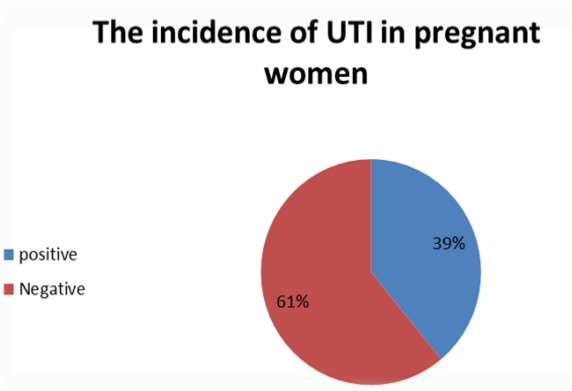


Figure 1: The incidence of UTI in pregnant women

Table 1, shows the incidence of UTIs in relation to age of the subjects. A higher percentage of pregnant women [16 (41.02%)] with UTIs were found within the age brackets of 21 - 25 years, followed by age groups 26 - 30 years which shows [14(35.89%)], 31 - 35 years having a total of [5 (12.82%)] and lastly the age between 16-20 and 36-40 years having the same incidence [2 (5.12%)] . (Table 1).

Table 1 Prevalence of urinary tract infection in pregnant women in relation to an age

Positive %	No positive	No examined	Age groups (years)
5.12%	2	7	16 – 20
41.02%	16	37	21 – 25
35.89%	14	36	26 – 30
12.82%	5	15	31 – 35
5.12%	2	5	36 – 40
100%	**39**	**100**	**Total**

The incidence of UTI by trimester as shown in Table 2, There was higher rate of infection in the second trimester (58.97%) compared to third trimester (28.20%) and first trimester (12.82%). (Table2)

Table 2 Prevalence of urinary tract infection in pregnant women in relation to gestational age

Gestational age(weeks)	Number Examined	Number Positive	Positive%
1 – 12	25	5	12.82%
13 – 25	34	23	58.97%
26 – 40	41	11	28.20%
Total	100	39	100%

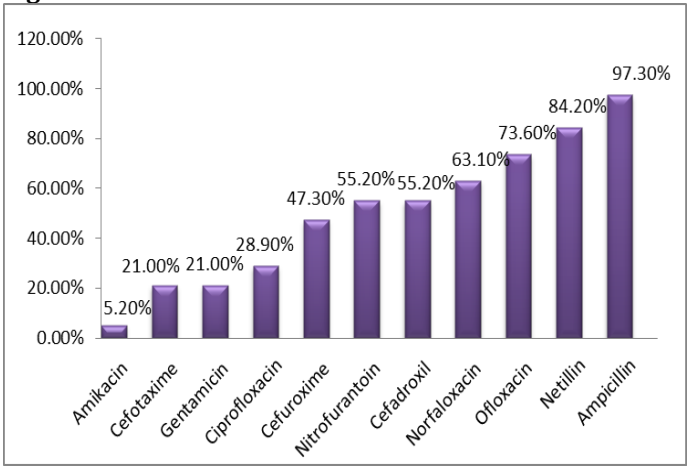
Among 39 bacterial isolates obtained from 100 urine samples, majority of the isolates (56.41%) were Gram negative bacteria which included the commonest isolated organism *S. aureus* in 17 patients (43.53%), followed by *E.coli* in 14 patients (35.89 %), *Klebsiella pneumonia* in 4 cases (10.25%), *Pseudomonas aeruginosa* found in 3 cases (7.69%) and lowest incidence of the isolates bacteria is *Proteus spp* which have seen in one patient (2.56%). (Table 3).

Table 3 Percentage of Isolation of various significant pathogens in urine of pregnant women

Pathogens	Number isolated	Percentage (%)
Staphylococci	17	43.53%
Escherichia coli	14	35.89%
Klebsiella spp	4	10.25%
Pseudomonas argenosa	3	7.69%
Proteus spp	1	2.56%
Total	39	100.00%

Antimicrobial susceptibility results in our study are shown in table 4, More than 97% of the isolates were resistance to ampicillin (97.3%), [E.coli, klebsiella and pseudomonas were (100%) while staphylococcus arouse was (94.1%)]. then followed by Netillin (84.2%) which shows [(100%), (88.2%), (78.5%), (75%) *to pseudomonas, staphylococcus, E.coli, klebsiella* respectively]. in other hand the most effective antibiotic was Amikacin which show (5.2%) of the isolates resistance [*staphylococcus arouse, klebsiella* and *pseudomonas* were (0%) while *E.coli* was (14.2%)]. followed by the resistance of isolates to Cefotaxime and Gentamicin were each (21%). **(Table 4, Figure 2).**

Figure 2. The resistance of isolate bacteria to antibiotic



4. Discussion

In this study the incidence of UTI in pregnant women was 39% this was found concordant with 39.69% observed in Edo State in Nigeria (Oladeinde *et al.,* 2011), and it was nearly agreement with other study conducted by (Chitra *et al.,* 2007) 40.4% from India. However this was lower than 47.5% in Nigeria by (okonko *et al.,* 2008), 76.29% in India by (Latika *et al.,* 2015). This study was in high rate compared to that in other countries which reported 35.2% in Saudi Arabia by (Nawal Salim ., 2011), 21% in Tanzania by (Sabrina J. Moyo *et. al.,*2010). This high incidence highlights the size of the serious problem which necessitates a rapid interference specially UTI is incriminated in different adverse outcomes of pregnancy.

The incidence of UTI in relation to age distribution shows that the pregnant women in the range of 21 - 25 years has highest incidence (41.02%) followed by (35.89%) in the age range 26 - 30, this may be because of women in the reproductive age groups have a high incidence of UTI and similarly the prevalence rate of symptomatic UTI is high in sexually active young women.

In this study the prevalence rate UTI in relation to the trimester of pregnancy was higher in the second trimester (58.9%) compared to the first (12.8%) and third (28.2%) trimesters. this is in agreement with the study by (Sudha B K *et al*., 2013) and (Onuh *et al*., 2006). however this study disagree with (okonko *et al*., 2009), this difference may be because of either the vesicoureteral reflux and change in urine stasis or decrease in urinary oestrogens and progesterone in the different trimester of pregnancy.

Table 4 The resistance of isolate bacteria to antibiotic

Antimicrobial agent	*Staph arouse* (N=17)	*E.coli (n=14)*	*Klebsiella spp* (n=4)	*Pseudomonas spp* (n=3)	*Total No (%)*
Amikacin (AK)	0 (0%)	2 (14.2%)	0 (0%)	0 (0%)	**2 (5.2%)**
Cefotaxime (CTX)	3 (17.6%)	4 (28.5%)	1 (25%)	0 (0%)	**8 (21%)**
Gentamicin (GEN)	5 (29.4%)	1 (7.1%)	1 (25%)	1 (33.3%)	**8 (21%)**
Ciprofloxacin(CIP)	4 (23.5%)	5 (35.7%)	0(0%)	2 (66.6%)	**11 (28.9%)**
Cefuroxime (CXM)	8 (47%)	7 (50%)	1 (25%)	2 (66.6%)	**18 (47.3%)**
Nitrofurantoin (NIT)	9 (52.9%)	9 (64.2%)	2 (50%)	1 (33.3%)	**21 (55.2%)**
Cefadroxil (CFR)	9 (52.9%)	8 (57.1%)	2 (50%)	2 (66.6%)	**21 (55.2%)**
Norfaloxacin (NX)	12 (70.5%)	9 (64.2%)	2 (50%)	1 (33.3%)	**24 (63.1%)**
Ofloxacin (OF)	13 (76.4%)	10 (71.4%)	3 (75%)	2 (66.6%)	**28 (73.6%)**
Netillin (NET)	15 (88.2%)	11 (78.5%)	3 (75%)	3 (100%)	**32 (84.2%)**
Ampicillin (AM)	16 (94.1%)	14 (100%)	4 (100%)	3 (100%)	**37 (97.3%)**

The predominant isolate bacterium was *Staphylococcus aureus* accounting for 43.53% followed by *E. coli* 35.89 % this was similar to previous studies in saudi arabia by (Nawal Salim ., 2011), and in Bayelsa State Nigeria (Pondei *et al*., 2012). however this study is disagree with other reports in different countries which found *E.coli* the most isolates causing UTI in pregnant women (Kahlmeter, 2003,Oluremi, 2011 and Shazia *et al*., 2011). The similarities and differences between our study and other studies result from host factors and different environmental conditions and practices such as socio economic standards, education programmes, health care, and hygiene practices in each country.

According to our results the most effective antibiotic was Amikacin which show (5.2%) of the isolates resistance [*staphylococcus arouse, klebsiella* and *pseudomonas* were (0%) while *E.coli* was (14.2%)]. followed by the resistance of isolates to Cefotaxime and Gentamicin were each (21%),This results are agree with the results reported by (Astal *et al* 2002, McIsaac *et al*., 2004, Kebira *et al*.,2009 and Mohammad MT *et al*., 2010), However more than 97% of the isolates were resistance to ampicillin (97.3%), [*E.coli, klebsiella* and *pseudomonas* were (100%) while *staphylococcus arouse* was (94.1%)] These findings agree with findings from previous studies (Schieve *et al* 1994 and Bashir MF *et al*., 2008).

Conclusion

This study revealed 39% incidence of UTI among pregnant women. This is worrisome because UTI in pregnancy may have serious consequences for both the mother and the child. The most predominant organisms were Streptococcus arouses and Escherichia coli, and significant bacteriuria in pregnant women and high level of antibiotic resistance was observed.

This suggests a need for continuous monitoring to organisms causing urinary tract infection in all pregnant women, and testing its resistance to the different antimicrobial agents before antibiotic prescription in order to ensure adequate treatment of urinary tract infection.

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