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A Study on the Bacterial Profile of Urinary Tract Infection in Antenatal Cases Attending a Tertiary Care Unit

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A B S T R A C T

A descriptive study was conducted to study the bacterial profile of urinary tract infection in antenatal cases attending a tertiary care unit. The study period was for six months. Totally 246 antenatal women were screened for urinary tract infection. Of them 32 (13 %) were culture positive. *E. coli* was the most common isolate. Females of 26–30 years of age were most commonly affected, 12 cases (37.5). Urinary tract infection was more common during third trimester of pregnancy

Introduction

Urinary Tract Infection (UTI) is one of the most common type of infection in the body, accounting for about 8.1 million visits to health care providers for each year (*Urinary tract infections in adults*; national kidney and urologic diseases information clearing house, US Department of Health and Human services; Schappert *et al*., 2006). Women are especially prone to UTIs due to anatomical reasons. For women the life time risk of acquiring UTI is greater than 50 percent (Griebling, 2007). Pregnant women seem to be more prone to infections. Pregnancy causes numerous changes in the body. Hormonal and mechanical changes increase the risk of urinary stasis and vesico ureteral reflux. These changes along with an already short urethra (~ 3-4 cm) and improper hygiene due to a distended pregnant belly, increases the frequency of Urinary Tract Infections in pregnant women (Emily, 2014). Pregnant females are immuno-compromised because of the physiologic changes associated with pregnancy. These changes increase the risk of serious complications from symptomatic and asymptomatic urinary infections even in healthy pregnant women (Emily, 2014). If UTIs are untreated during pregnancy, it increases the risk by 20% to 40% for pyelonephritis, premature delivery, and fetal mortality (Nowiciki, 2002; Wing, 1998). Asymptomatic bacteriuria doubles the risk of pre-term delivery and/or low birth weight. UTIs during third trimester increase the

relative risk of mental retardation or developmental delay, as well as fetal death (Wing, 1998).

The members of the family *Enterobacteriaceae,* are the most frequent pathogens detected, causing 84.3% of the UTIs (Gales *et al*., 1998). The organisms causing UTIs during pregnancy are the same as those found in other UTI patients. *Escherichia coli* accounts for 80% - 90% infections (Hart *et al*., 1996), about 85% of community acquired UTIs, 50% of nosocomial UTIs and more than 80% of uncomplicated pyelonephritis (Bergerson, 1995).

Among *Enterobacteriaceae,* the genus *Klebsiella* accounts for 6% - 17% of all nosocomial UTIs and shows an even higher incidence in specific group of patients at risk (Bennet *et al*., 1995). *Proteus mirabilis* is a common cause of UTI in individuals with long term urinary catheters in situ or individuals with complicated UTIs.

The present study focuses on the detection and incidence of UTI among pregnant women attending the antenatal clinic of Sree Avittom Thirunal (SAT) Hospital, Thiruvananthapuram. It also focuses on the incidence, types of etiological agents, bacterial profile and their respective antibiotic susceptibility pattern.

Primary objective

To determine the bacterial profile of urinary tract infection in the urine samples of antenatal cases processed in the microbiology lab, SATH during the study period.

Secondary objectives

To speciate the common bacterial agents causing antenatal urinary tract infections.

To determine the antibiotic susceptibility pattern of the bacterial isolates.

Materials and Methods

Design of study-Descriptive study

Study period-Six months

Study settings

Clinical Microbiology laboratory, SAT Hospital, Thiruvananthapuram
Department of MLT, Govt. Medical college, Thiruvananthapuram

Study population

Antenatal cases whose urine samples have been processed in the Microbiology laboratory, SAT hospital, Thiruvananthapuram, India.

Inclusion criteria

Antenatal cases whose urine sample has been send to microbiology lab, SATH, for culture and sensitivity.

Exclusion criteria

- Improperly collected urine samples
- Fungal infections causing Urinary Tract Infection e.g. Candidiasis
- Catheterized urine sample
- Mixed Bacterial Growth

Sample size calculation

$$N = \frac{Z^2_{1-\alpha/2} \, P \, (1-P)}{d^2}$$

P = Proportion of positive cases (28.06%)
d = 20% of P
$1 - \alpha/2$ = designed confidence interval (95%)
N = 246 ($\approx$250)

Materials and Methods

A prospective study was carried out in 246 antenatal cases during the period of six months from March 2015 to September 2015. The study was conducted in the clinical microbiology laboratory in SAT Hospital, Thiruvananthapuram, Kerala. The Mid Stream Urine samples of antenatal cases sent for microbiological studies were processed

- Macroscopy: samples were checked whether it was clear, slightly turbid or turbid.
- Microscopy
  Wet film preparation
- Gram staining
- Culturing of the specimen and isolation of organism on Blood agar, Mac Conkey agar and Hichrome UTI agar
- Identification and speciation of the organism was done by conventional biochemical tests
- Antibiotic susceptibility testing was done by disc diffusion method on Mueller Hinton Agar by Stokes/ Kirby-Bauer method.

Results and Discussion

The present study was carried out in the Microbiology laboratory of Sree Avittom Thirunal Hospital (SATH), Thiruvananthapuram, during a period of six months from March 2015 to August 2015. The present study evaluates the bacterial profile of isolates obtained from urine samples of antenatal cases.

Totally 246 samples from different age groups between 18–40 years were considered for the study. Out of these a total of 32 (13 %) isolates were obtained (Table 1). This observation seems to agree with the findings of Hamdan *et al*., (2010). Similar findings were observed with the studies conducted in

Tanzania by Masinde *et al*., (2009). The use of Hichrome agar helped in detecting and identifying the organisms on the second day itself. *E. coli* gave purple coloured colonies whereas *Klebsiella pneumoniae* gave blue coloured colonies. *Staphylococcus aureus* was ivory coloured on HiChrome UTI agar. It also helped to detect mixed bacterial growth at the earliest.

Regarding the age wise distribution of bacterial isolates, the maximum number of cases was in the age group of 26 – 30 years (Table 2). Highest and lowest ages found to be infected were 39 years and 18 years respectively. These findings correlated with reports of Gonzalez and Schaeffer (1999) which showed similar result. The reason of increased prevalence in this age group may possibly be associated with high sexual activity and/or multiparity.

Escherichia coli was the most common isolate, 19 cases (59.4%) (Table 3). This correlates well with the study of Manjula *et al.,* (2013), where *E. coli* accounted for 56.9%. Second most common agent isolated in the present study was *Klebsiella pneumonia* accounting for 11 cases (34.4%).

This result is contrary to the findings of Omonigho *et al.,* (2001) who found out that *Klebsiella pneumoniae* to be more prevalent than *Escherichia coli* in antenatal cases. The least frequently isolated organism was *Staphylococcus aureus*, which accounted for about two cases (6.25%). *Staphylococcus aureus* was considered as an agent causing UTI only when it was isolated in repeat samples of clean catch midstream urine samples.

Studies by Kandaki-Olikemi *et al.,* (2009) also showed that the isolation of Gram positive organism as uropathogen was less than 10%. In the present study, trimester wise

analysis showed that the rate of infection was highest during the third trimester which accounted for 14 cases (43.8%) followed by first trimester and least frequently the second trimester (Table 4). In all the three trimesters *Escherichia coli* was found to be the major pathogen followed by *Klebsiella pneumonia* and *Staphylococcus aureus*. Highest

frequency of UTIs in third trimester may be due to the progressive obstruction of the urinary tract following and stasis of urine due to the falling forward of uterus especially in anteverted uterus. These findings correlate with studies by Theodore (2007) from Nigeria.

Table.1 Prevalence of UTI

Total samples	Bacterial isolates
246	32 (13 %)

Table.2 Age distribution of positive cases

AGE (in years)	FREQUENCY	PERCENTAGE (%)
18 – 20	3	9.4
21 – 25	9	28.1
26 – 30	12	37.5
31 – 35	5	15.6
36 – 40	3	9.4

Table.3 Bacterial profile of urinary isolates

BACTERIAL ISOLATE	FREQUENCY (Number)	PERCENTAGE (%)
Escherichia coli	19	59.4
Klebsiella pneumoniae	11	34.4
Staphylococcus aureus	2	6.25

Table.4 Positive cases in relation with gestational age

GESTATIONAL AGE (Trimesters)	FREQUENCY	PERCENTAGE (%)
1st trimester (week 1 – week 12)	11	34.4
2nd trimester (week 13 – week 27)	7	21.9
3rd trimester (week 28 – week 40)	14	43.8

Table.5 Antibiotic sensitivity pattern of bacterial isolates

ANTIBIOTICS	*Escherichia coli (n=19)*		*Klebsiella pneumoniae. (n=11)*		*Staphylococcus aureus (n=2)*	
	SENSITIVE	RESISTANT	SENSITIVE	RESISTANT	SENSITIVE	RESISTANT
Ampicillin	6	13	0	11	2	O
Gentamicin	6	13	3	8	2	0
Cephalexin	9	10	6	5	NC	NC*
Nalidixic acid	7	12	7	4	NC	NC
Norfloxacin	7	12	7	4	NC	NC
Co-trimoxazole	8	11	4	7	NC	NC
Amikacin	18	1	8	3	2	0
Ceftriaxone	10	9	6	5	NC	NC
Ciprofloxacin	7	12	8	3	NC	NC
Piperacillin/Tazobactum	17	2	10	1	NC	NC
Cefoperazone/sulbactum	17	2	11	0	NC	NC
Imipenem	19	0	11	0	NC	NC
Aztreonam	17	2	11	0	NC	NC
Nitrofurantoin	18	1	11	0	NC	NC
Novobiocin	NC	NC	NC	NC	2	0
Cefoxitin	NC	NC	NC	NC	2	0

*NC- not checked

All the Gram negative isolates were sensitive to Imipenem 19 (100%) (Table 5) followed by Nitrofurantoin 18 (96.7%), Aztreonam17 (93.3%) and Cefoperazone/Sulbactum 17 (93.3%). The common drugs used to treat UTI in antenatal cases are Ampicillin and Cephalexin, but it is noted that 13 isolates (68%) of *E. coli* were resistant to Ampicillin and 10 isolates (52%) were resistant to Cephalexin. Among the *Klebsiella pneumoniae* isolated, five isolates (46%) were resistant to Cephalexin and they are inherently resistant to Ampicillin.

Considering Gram positive isolates, they showed 100% sensitivity to Ampicillin, Cefoxitin and Aminoglycosides (Table 5).

In conclusion, UTI in pregnancy is associated with significant maternal and fetal morbidity. It is therefore recommended that routine microbiological analysis and antibiotic sensitivity test of mid stream urine samples of pregnant women be carried out so as to enhance the administration of the right drugs for treatment and prevent further complications of Urinary tract infections.

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