ETIOLOGY AND PREVALENCE OF URINARY TRACT INFECTIONS AMONG PREGNANT WOMEN IN A TERTIARY CARE HOSPITAL IN KOTA REGION

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Abstract

Background: UTI's are more common during pregnancy because of changes in the urinary tract and has been reported among 20% of the pregnant women with significant reason for hospital admission. It has several adverse outcomes not only on the mother but also on the fetus like chronic renal failure, pyelonephritis, preeclampsia, anemia, fetal mortality and premature delivery.

Patients and methods: The aim of this study was to determine the prevalence and etiology of UTI among 120 pregnant women attending the ANC of GMC Kotaduring the study period from January 2017 to June 2017. UTI was diagnosed by growth of at least 10^5 CFU/ml of a urinary tract pathogen in a culture of a midstream urine sample. The isolated bacteria were identified by biochemical tests.

Results: Of the 120 urine samples examined in this study, 34 (28.33%) were found to contain significant bacteriuria. Of the variables examined, Highest prevalence was observed in 21-25 years age group (50%), multipara (44.11%), and in 3rd trimester (55.88%). The bacterial pathogens isolated were most commonly *Escherichia coli* (55.88%), *Klebsiella sps* (20.6%), *Pseudomonas sps* (8.82%), *Proteus sps* (5.88%), *Enterobacter sps* (5.88%), *Enterococcus sps* (2.94%).

Conclusion: The prevalence rate of urinary tract infection (UTI) during pregnancy is high. So it is important to do routine screening of all pregnant women for significant bacteriuria to reduce the complications on both maternal and fetal health. The study also recommends health education on personal sanitary hygiene.

Introduction:

Urinary tract infections (UTI) are mainly caused by the presence and growth of microorganisms in the urinary tract. Incidence of UTI is comparatively higher in women than men, 40% to 50% of whom will suffer at least one clinical episode during their lifetime [1].

Increased incidence of UTI during pregnancy is due to the morphological and the physiological changes that take place in the genitourinary tract during pregnancy. The uterus anatomically lies directly on top of the bladder. As the uterus grows, its increased weight can block the urinary drainage from the bladder, causing an infection. Hormonal and mechanical changes can promote urinary stasis and vesicoureteral reflux. These changes, along with an already short urethra (approximately 3-4 cm in females) and difficulty with perennial hygiene due to a distended pregnant belly, causes UTIs among the most common bacterial infections during

pregnancy. UTI has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards.[2]

Pregnant women with UTI are more likely to develop serious obstetric complications, including hypertensive diseases of pregnancy, intrauterine growth restriction, anemia, chronic renal failure, prematurity and preterm delivery, and low birth weight babies.[3-4]. Thus An early detection and treatment of UTI may be of considerable importance not only to forestall acute pyelonephritis and chronic renal failure in the mother but also to reduce prematurity and fetal mortality in the offspring.

Materials and methods

Study area and population

The study was conducted on 120 samples of pregnant females with different gestational age attending the ANC of Govt Medical College, Kota Rajasthan during

the study period. The samples were collected from January 2017 to June 2017.

Inclusion and exclusion criteria—Pregnant women ages 18 years to 40 years with varying gravid a from all three trimesters were included in this study. All non-pregnant women, women suffering from STD's and the pregnant women who took any antibiotics during the last two weeks were excluded from the study as antibiotics have hinderd the bacterial load. The sample was not considered as valid if sample collection was improper.

Ethical considerations

The study was started after getting approval from the institutional ethical committee. Participants were explained about the study and informed and written consent was obtained from each study participants.

Freshly voided midstream urine sample were collected in a sterile wide mouth container. All the urine samples were processed within twohour after the collection for aerobic bacterial culture. If delayed, samples were refrigerated and processed within 4 - 6 hours.

All chemicals required for culture media and reagents were procured from HiMedia laboratories Pvt Ltd., Mumbai.

Microscopic StudyCentrifuged urine deposit was examined microscopically at high magnification. Screening criteria was based on microscopic findings of >10 pus cells /hpf,which is confirmed by urine culture.

Isolation and Identification of Uropathogens

Semiquantitative urine culture using a calibrated loop was used to isolate bacterial pathogens onMacConkey agar and Blood agar plates. According to the recommendations of Kass [5] in distinguishing infection from contamination, colony counts yielding single bacterial species from urine sampleat a concentration of of $\geq 10^5$ / mL was taken as being significant in both symptomatic and asymptomatic pregnant women

Only a single positive culture per patient was included in the analysis.The plates were incubated at 37°C for 24 hrs and extended to 48 hrs in culture (growth) negative cases. Further, the isolates were identified by cultural, morphological and biochemical tests. The method used in the identification and characterisation of isolated bacteria included Gram staining, motility test and biochemical tests like, TSI

and IMViC according to Cheesbrough [6]. Isolated and characterized uropathogens were then preserved in semi solid nutrient agar media.

RESULTS

Of the 120 urine samples examined in this study, 34(28.33%) were found to contain significant bacteriuria.(Figure 1). Urine microscopy revealed >10 pus cells/high power (40×) field.

Graph 1:

The prevalence of infection in relation to age are shown in [Table 1], individuals of age group 21 - 25 years had the highest incidence of infection 16/30 (50%) followed by age group 26 - 30 years 13/42 (30.95%), 31 - 35 years 03/25 (12%) and 18 - 20 years 01/10 (10%). While the age group 36 - 40 years had the lowest incidence of infection 01/13 (7.69%). (Table 1).

Table 1: Incidence of UTI in relation to age distribution in pregnant women

Age group (years)	Number tested	Number positive (%)
18-20	10	1 (10%)
21-25	30	16 (50%)
26-30	42	13 (30.95%)
31-35	25	3 (12%)
36-40	13	1 (7.69%)
Total	120	34

Based on parity (number of pregnancy), women in their 3rd and above pregnancy had a greater number of UTI (44.11%), followed by second pregnancy (32.35%) and the lowest incidence of UTI (23.52%) was seen in the first pregnancy (Table 2).

Table 2: Incidence of UTI by parity (no: of pregnancy).

No: of Parity	No: tested	No: positive (%)
First pregnancy	38	8 (23.52%)
Second pregnancy	29	11 (32.35%)
Third pregnancy and above	53	15(44.11%)
Total	120	34 (28.33%)

While, the incidence of UTI by trimester as shown in Table 4, women in their 3rd and 2nd trimester had a greater number of UTI cases having an incidence of 55.88% and 35.29% respectively than in the first trimester (8.82%).

Table 4: Incidence of UTI by trimester period.

Trimester period	No. tested	No. positive (%)
I trimester (1st 3 months)	12	3(8.82%)
II trimester (2nd 3 months)	45	12 (35.29%)
III trimester (3rd 3 months)	53	19 (55.88%)
Total	120	34

Among 34 bacterial isolates obtained from 120 urine samples, majority of the isolates (97%) were Gram negative bacteria which included *Escherichia coli* (55.88%), *Klebsiella* spp (20.6%), *Pseudomonas* spp (8.82%), *Proteus* spp (5.88%), *Enterobacter* spp (5.88%), and *Enterococcus* spp (2.94%) as shown in Table 5.

Table 5: Frequency of bacteria isolated from pregnant women with UTI.

Isolates	No: of positive samples (%)
<i>Escherichia coli</i>	19 (55.88%)
<i>Klebsiella</i> species	7 (20.6%)
<i>Pseudomonas</i> species	3 (8.82%)
<i>Proteus</i> species	2 (5.88%)
<i>Enterobacter</i>	2 (5.88%)
<i>Enterococcus</i> species	1 (2.94%)

Discussion:

Since UTI is frequently associated with maternal and fetal complications, it is necessary to have an estimate of its burden in pregnant women. The present study was focused on the prevalence of urinary tract infection in pregnant women. The overall prevalence of significant bacteriuria among 120 pregnant females during the study period was 28.33% (34/120). This is comparable to the prevalence of urinary tract infection reported in Bihar (28%)⁷ and Andhra Pradesh (35%)⁸ but lower than study done in Karnataka (46.5%)¹⁰ while higher than study done in Kerala (13.5%)⁹. The dissimilarity may be

due to the difference in the environmental, geographical and social nature of the population.

In this study, the frequency of urinary tract infection was higher in the third trimester compared to the first and second trimester. This finding is in agreement with Yasmin T *et al*⁷ and Ranjan *et al*⁸ who reported an increased frequency of urinary tract infection in third trimester. The increased incidence during third trimester may relate to progressive mechanical obstruction of urinary tract due to gravid uterus on the ureters causing stasis of urine flow and vesicoureteral reflux. It is also attributed to the hormonal and immunological changes during pregnancy.

Multiparity has an increased risk factor of developing bacteriuria among pregnant women. Yasmin T *et al*⁷ and Sharma JB *et al* (10) had similar observation. This may be related to laxity of uterine muscles which results in increased risk of urinary incontinence with multiparity. In multi gravida, the incidence was almost twice when compared to that in the primi gravida.

The highest incidence is seen in 21 - 25 years age group (50%) followed by 26 - 30 years age group (30.95%). The reason could be due to the fact that many women within this age group are likely to have had many children before the present pregnancy and it has been reported that multiparity is a risk factor for acquiring bacteriuria in pregnancy.^(7,15) Women in this age group are mostly sexually active at this age and certain contraceptive methods are also said to increase the risk¹⁶. The report of this study is also similar to that of Yasmin T and Manjula N. G. *et al* who also found the similar age group has highest incidence in developing urinary tract infection in pregnancy.

The uropathogens identified in this study are similar to other studies.^{9,11} The *E. coli* is the most common pathogen isolated with a rate of 55.88% similar to studies done by Srinath MP *et al* (53.8%)⁹ Manjula N.G. *et al*. (56.89%)¹² and Ranjan *et al* (50%)⁸. *E. coli* being an endogenous flora of the colon, usually colonize the periurethral area and vaginal introitus. Pregnancy may make difficulty to maintain personal hygiene due to anatomical and functional changes in them. This results in ascend to upper urinary tract by receptor mediated ascending process. [14] This can increase the chance of *E. coli* infection during pregnancy. The second commonest uropathogen isolated in our study was *Klebsiella*

species (20.6%), The other organism isolated include *Pseudomonas* species, *Proteus*, *Enterobacter*, *Enterococcus* species, and with a percentage of 8.82%, 5.88%, 5.88%, 2.94% respectively. This is comparable to most of the other studies.⁷

Our results agree with reports from research workers in other part of country, with minor differences, which could be due to differences in the environment, social habits of the community, the standard of personnel hygiene and differences in health care.

Conclusion:

In this study, the prevalence rate of UTI during pregnancy is 28.33%. The physiological changes of pregnancy predispose women to UTI, so does other factors such as age, sexual activity, trimester, multiparity. All pregnant women should be screened for UTI with a urine culture, treated with antibiotics and if the culture is positive and then retested for cure. If left untreated; 20% - 30% of cases may will lead to acute pyelonephritis. This can result in low birth weight infants, premature delivery and occasionally stillbirth, so it is a serious threat for both the mother and foetus. Therefore, careful monitoring of the UTI among pregnant women becomes necessary.

Bibliography:

1. D. Leigh "Urinary Tract Infections," In: G. R. Smith and S. F. Easma Charles, Eds., Topley and Wilson's Principles of Bacteriology, Virology and Immunity, Butler and Tanler Ltd., Frome and London, 1990, pp. 197-214.
2. Schneeberger C, Kazemier BM, Geerlings SE. Asymptomatic bacteriuria and urinary tract infections in special patient groups: women with diabetes mellitus and pregnant women. Current opinion in infectious diseases. 2014;27(1):108-14.
3. Smaill F, Vazquez JC. Antibiotics for asymptomatic bacteriuria in pregnancy. Cochrane Database Syst Rev 2007;(2):CD000490.
4. Sheiner E, Mazor-Drey E, Levy A. Asymptomatic bacteriuria during pregnancy. J MaternFetal Neonatal Med 2009;22:423-7
5. Giron, C. Rioux, C. Brun-Buisson and B. Lobel, "Infection Committee of the French Association of Urology. The Postoperative Bacteriuria Score: A New Way to Predict Nosocomial Infection after Prostate Surgery," Infection Control and Hospital Epidemiology, Vol. 27, No. 8, 2006, pp. 847-854. doi:10.1086/506398
6. M. Cheesbrough, "Medical Laboratories Manual for Tropical Countries," Butterworth-Heinemann, Cambridge, 2002
7. Yasmin T, Sarwar MY, Sen A. Prevalence of urinary tract infection in pregnant women in Katihar district, Bihar. J. Evolution Med. Dent. Sci. 2018;7(03):372-375, DOI: 10.14260/jemds/2018/82.
8. Ranjan et al.: UTI prevalence in pregnant women and complications in neonates
9. Srinath MP et al. Int J Community Med Public Health. 2018 Aug;5(8):3298-3303
10. Sharma JB, Aggarwal S, Singhal S, et al. Prevalence of urinary incontinence and other urological problems during pregnancy: a questionnaire based study. Arch GynecolObstet 2009;279(6):845-51.
11. FasaluRahiman OM, Balasubramanian T, Pawan Kumar, Ashif CM, Shejina M. Prevalence of Urinary Tract Infections and Its Etiological Agents among Pregnant Women in Malabar Region of Kerala. Int J Pharm Sci Rev Res. 2015;34(2):202-9.
12. Cura C, Ozen M, Kara AA, Alkan G, Cetin ES. Health care-associated infection surveillance in a tertiary neonatal intensive care unit: A prospective clinical study after moving to a new building. Am J Infection Control. 2016;44(1):80-4.
13. Manjula N. G. et al Incidence of Urinary Tract Infections and Its Aetiological Agents among Pregnant Women in Karnataka Region Advances in Microbiology, 2013, 3, 473-478
14. B. Nowicki, "In Vitro Models for the Study of Uropathogens," In: H. L.T. Mobley and J. W. Warren, Eds., Urinary Tract Infection: Molecular Pathogenesis to Clinical Management, ASM Press, Washington DC, 1996, pp. 3-29
15. Nath G, Choudary M, Prakash J, Pandey LK, Singh TB, Prakash J. UTI during pregnancy and fetal outcome. Indian J Med Microbiol. 1996;14(3):15860.
16. Bandyopadhyay S, Thakur JS, Ray P, et al. High prevalence of bacteriuria in pregnancy and its screening methods in North India. J Indian Med Assoc 2005;103(5):259-62, 266.