



THE EFFECTS OF URINARY TRACT INFECTION ON ANTIOXIDANT STATUS AMONG PREGANANT WOMEN

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ABSTRACT

Background - The aim of the study was to investigate the etiology of UTI and its antibiotic profile in pregnant women; and to assess the excretion of urinary malondialdehyde (MDA) and antioxidants like superoxide dismutase(SOD) levels in pregnant women with UTI and to compare them with healthy pregnant women without UTI and also to investigate if antioxidant enzymes and MDA differed in each trimester. **Methods** - This is a cross sectional study carried out between November 2015 to April 2016 at K.S.Hegde Charitable Hospital, Deralakatte. The study included 100 pregnant women reporting to OBG &Gynecology OPD with complaints of UTI as well as healthy pregnant women without UTI symptoms. Biochemical analysis and microbiological culture of urine was done. **Results** - Out of 100 samples 86 samples had no growth and 14 samples were positive for urinary pathogen. The prevalence of UTI infection in relation to age showed- individuals of age group 26-30 years had highest incidence of infection. Among the significant urinary isolate E.coli had highest prevalence. In the study there was significant variation between MDA,SOD values between pregnant women with UTI and healthy pregnant women. Trimester wise there was significant variation in MDA between 1st and 3rd trimester and SOD levels between 2nd and 3rd trimester which suggests that gestational period plays a major role in aggravation of UTI among pregnant women. **Conclusion** - Pregnancy causes oxidative stress from first to third trimester and UTI may aggravate the oxidative stress during pregnancy. Screening with urine culture during pregnancy and treatment of asymptomatic bacteruria may provide modest reduction in pyelonephritis among women and may reduce number of preterm and low-birth weight infant. Increasing antibiotic resistance trends in UTI patients indicates that it is imperative to rationalize the use of antimicrobials to limit antibiotic resistance.

KEYWORDS: Asymptomatic bacteruria, Urinary tract infection, Pregnant women.

INTRODUCTION

UTI is the common bacterial infection during pregnancy, and can associated with serious obstetric complications. UTI has been reported among 20% women during pregnancy and it is the commonest cause of admission in obstetrical wards.^[1] It is estimated that one in three of women of child bearing age will have UTI.^[2] UTI's are characterized by the presence of infectious organisms in genitourinary tract which cannot be explained by contamination. UTI is the second most common medical complication of pregnancy.^[3] The etiological agents are *Escherichia coli*, *Staphylococcus saprophyticus*, *Group B streptococci*, *Pseudomonas spp*, *Klebsiella spp*, *Candida spp* etc. *E.coli* being the predominant organism implicated in pregnancy. Pregnancy increases risk of UTI. Increased progesterone and estrogen levels in pregnancy causes decreased ureter and bladder tone hence resulting in urinary stasis as well as media for bacterial growth.^[4] Apparent decrease in immunity of pregnant women will enhance the growth of commensal

and non- commensal microorganism.^[5] Physiological increase in plasma volume during pregnancy decreases urinary concentration and upto 70 % pregnant women will develop glycosuria thus encouraging growth of bacteria in urine.^[6,7]

Pregnancy itself is a stressful condition and also because of mitochondria-rich placenta, that favors oxidative stress.^[8] Increased formation of reactive oxygen species and/or decreased antioxidant defense can be defined as oxidative stress, which is widely recognized as important feature of many diseases such as diabetes mellitus, cancer or renal failure. Superoxide dismutase (SOD), Catalase (CAT) are some of the important antioxidants which protect the cell from oxidative stress.^[9] Important marker of oxidative stress is lipid peroxidation which is marked by excretion of products like Malondialdehyde (MDA) in urine. UTI during pregnancy can significantly contributes to maternal and perinatal morbidity and mortality^[10] like abortion, small birth size, maternal

anaemia, hypertension, preterm labour, chr. pyelonephritis.^[10,11] Studies also shown that treatment of bacteruria during pregnancy decreases the incidence of these complications^[12] and lower the long term risk of sequelae following asymptomatic bacteruria.^[13]

AIMS

The present aim of the study is to investigate the etiology of UTI and its antibiotic profile in pregnant women; and to assess the excretion of urinary malondialdehyde (MDA) and antioxidants like superoxide dismutase (SOD) levels in pregnant women with UTI and to compare them with healthy pregnant women without UTI and also to investigate if antioxidant enzymes and MDA differed in each trimester.

OBJECTIVES

1. To study the microbiological etiology of UTI and its antibiotic profile among pregnant women.
2. To assess the association of urinary malondialdehyde and superoxide dismutase among pregnant women with UTI and compare them with a healthy pregnant women without UTI.
3. Age wise prevalence of UTI, trimester wise prevalence of UTI among pregnant women.
4. Variation of MDA, SOD and catalase levels between trimester among healthy pregnant women and pregnant women without UTI.

MATERIALS AND METHODS

Study design - Cross sectional study.

Study setting – K.S.Hegde Charitable Hospital, Deralakatte (tertiary care hospital, OPD).

Study population – 100 pregnant women reporting to OBG and Gynecology department of K.S.Hegde Charitable Hospital.

Study sample size: Pre-tested and pre-structured questionnaire were used for the study

Inclusion criteria

1. Patients diagnosed for UTI in their pregnant period with symptoms of it i.e., dysuria, frequency, urgency, abdominal pain, with or without fever.
2. Healthy pregnant women without symptoms of UTI.

Exclusion criteria

1. Subjects with other symptomatic disease like chronic illnesses such as hypertension, diabetes mellitus.
2. Subjects receiving antibiotic therapy.
3. Subjects on antioxidant supplementation and who are not willing to participate.

Microbiological methods

Diagnosis of UTI will be done based on the culture, and considered positive when there is a single pathogen isolated on culture.

UTI will be confirmed or excluded based on the number of colony forming unit (CFU) on culture media. Only one isolate (>10 CFU/m L) will be accepted. (Kass concept of significant bacteruria.^[15])

Sample-Clean catch midstream urine.

Method of collection – Clean voided midstream urine will be collected in a wide mouthed sterile bottle.

A. Microbiological analysis

1. Culture- MacConkey agar and Blood agar and incubated overnight at 37°C aerobically.
2. Identification of isolate will be done by standard bacteriological methods.
3. Antimicrobial susceptibility test according to the clinical and laboratory standard institute (CLSI) recommendation.
4. Antibiotic sensitivity will be tested for ampicillin, gentamicin, cefotaxime, nitrofurantoin, etc using disc diffusion using CLSI interpretive criteria.

B. Biochemical Methods

1. Estimation of MDA by BUEGE method^[16]
2. Estimation of SOD by NBT reduction method^[17]
3. Estimation of catalase^[18]

Statistical analysis - Students-T-test, Mann Whitney U test and Kruskal wallis test were used for the analysis of data using SPSS (Statistical package for social science) version 16.

RESULTS

Gold standard for detection of bacteruria is pregnancy is urine culture. Out of 100 samples 86 samples had no growth and 14 samples were positive for urinary pathogen. The prevalence of UTI infection in relation to age showed- individuals of age group 26-30 years had highest incidence of infection (50%) followed by age group 21-25 (28.5%), 30-35 years(21.4%). While age group 18-20 years had lowest incidence of infection (7.14%). There was higher rate of UTI infection in 3rd trimester (50%) compared to 2nd trimester(28.57%) and 1st trimester(21.4%). Among the significant urinary isolate E.coli had highest prevalence (71.42%) followed by Klebsiella (28.5%).

Statistics showing oxidant-antioxidants correlation between UTI presence/absence in pregnant women

1. Kruskal wallis test for trimester variation of MDA, catalase and SOD values between pregnant women

MDA	Catalase	SOD
0.01	0.04	0.005

The above table shows that there is a significant (<0.05) trimester variation of all biochemical parametres between pregnant women.

2. Mann Whitney Test for biochemical parameters among pregnant women with UTI and healthy pregnant women

MDA	Catalase	SOD
0.001	0.982	0.03

The p value of MDA and SOD are <0.05 , hence there is a significant variation in these values between pregnant women with UTI and healthy pregnant women.

3. Kruskal wallis test results between the trimesters

Status of pregnancy	MDA	Catalase	SOD
UTI positive	0.064	0.141	0.055
UTI negative	0.007	0.012	0.007

The above table shows that in pregnant women with UTI there is no significant variation of MDA, catalase, SOD between the trimesters. And in healthy pregnant women there is significant variation (<0.05) of MDA, SOD, catalase between the trimesters.

4. Trimester wise variation of biochemical analysis between healthy pregnant women

Sr. No	Trimester	MDA	Catalase	SOD
1	1 and 2	0.057NS	0.057NS	0.057NS
2	1 and 3	0.017Sig	0.017Sig	0.017Sig
3	2 and 3	0.024Sig	0.073NS	0.024Sig

Note: $p < 0.05$ was considered the level of significance. NS=Non-significant, Sig= Significant

The above table shows that there is significant variation in MDA, catalase, SOD levels between trimester 1 and 3 among healthy pregnant women.

And also significant variation in MDA, SOD levels between trimester 2 and 3.

ANTIBIOTIC PATTERN AMONG UTI POSITIVES

Antimicrobial	E.coli (10)	Klebsiella spp (4)
Amikacin	60	75
Azetreonam	40	75
Cefotaxime	40	50
Cefoxitin	30	50
Cefuroxime	70	50
Chloramphenicol	60	50
Ciprofloxacin	60	75
Cotrimoxazole	60	75
Ertapenem	30	20
Gentamicin	40	50
Imipenem	30	25
Piperacillin tazobactam	30	25
Tigercyclin	0	0

The table depicts the percentage of organism resistant to the particular antibiotic used.

DISCUSSION

Studies^[14] have shown the relationship between the pregnant women with UTI infection, and associated oxidative stress which is marked by several urinary markers like MDA, SOD, Catalase. In the present study relationship between Urinary MDA and antioxidant enzymes associated with pregnant women with UTI and healthy pregnant women were assessed. It is observed that UTI in pregnancy which will further aggregate the oxidative stress among pregnant women and can result in complications. The study showed that predominant pathogen involved in UTI among pregnant women was *E.coli* with isolation rate of 71.42% which supports the findings reported in Yemen, 41.5%^[19], Sudan, 42.4%.^[20] *E.coli* being the common microorganism in vaginal and rectal area. Poor personal hygiene and functional changes in pregnancy increases the risk of acquiring UTI from *E.coli*. The bacterial distribution according to the trimester were 1st trimester 2 isolates of *E.coli* and 1 *Klebsiella*, 2nd trimester 3 isolates of *E.coli* and *Klebsiella* and in 3rd trimester 5 isolates of *E.coli* and 2 *Klebsiella*. The incidence of UTI was highest among age group 26-30 years which may be due to multiparity, contraceptive methods and sexual activity etc, but there are other studies which disagree with age wise prevalence and also findings of Onuh et al^[21] reported that there was no relationship between parity and risk of UTI. The antimicrobial sensitivity reports had shown that the isolates were sensitive to Tigercyclin (100%) higher resistant to amikacin, chloramphenicol, ciprofloxacin, cotrimoxazole have been noted which suggests the indiscriminate, common use of these drugs and or due to incorrect use of drugs during empiric therapy. The study showed that MDA and antioxidant levels in pregnant women with UTI was higher than healthy pregnant women. In view of trimester wise healthy pregnant women showed increase in all 3 entities from first trimester to third trimester in response to oxidative stress. But in pregnant women with UTI increase in MDA levels from 1st to 3rd trimester but catalase and SOD levels decreased from 2nd to 3rd trimester which had suggested that UTI further aggregates the oxidative stress.

CONCLUSION

Pregnancy causes oxidative stress from first to third trimester and UTI may aggravate the oxidative stress during pregnancy. Screening with urine culture during pregnancy and treatment of asymptomatic bacteriuria may provide modest reduction in pyelonephritis among women and may reduce number of preterm and low-birth weight infant. Increasing antibiotic resistance trends in UTI patients indicates that it is imperative to rationalize the use of antimicrobials to limit antibiotic resistance.

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