

## Study of relationship between anemia and urinary tract infection in pregnant women

Shobha Bembalagi\* and Mitul P. Sojitra

Department of Obstetrics and Gynaecology, Karnataka Institute of Medical sciences, P. B. Road, Vidyanagar, Hubballi-580022, Karnataka, India

**Abstract:** *Background:* Pregnancy is a state of decreased immunity. Physiological changes occurring in the pregnancy make women susceptible to urinary tract infection (UTI), more so in anemic pregnant women. The global prevalence of bacteriuria in pregnancy ranges from 4% to 23% in various studies. Maternal anemia has been associated with both asymptomatic bacteriuria and pyelonephritis. *Materials and Method:* This cross sectional study was conducted to determine the relationship of UTI with anemia in pregnant women attending antenatal clinic in tertiary centre, KIMS Hubli. A total of 100 pregnant women were enrolled in this study. The sample was divided into two study groups cases and controls. The cases group had Hb level of <10 gm% and control group had Hb level  $\geq$  10gm%. Hemoglobin estimation was done by sahli's method. Anemia was classified accordingly. UTI was diagnosed using mid stream urine (MSU) culture, using  $>10^5$  colony forming unit per millilitre as significant level of bacteriuria. *Result:* The overall prevalence was found to be 26%. There was a high prevalence of UTI of about 40% in anemic pregnant women (whose Hb was <10 gm %) as compared to 12% in non anemic pregnant women (whose Hb was 10 gm %). The mean blood Hb was significantly lower in UTI case (8.2%). There was high prevalence in 21-25yrs age group and also in 2nd trimester (75%). Multiparity is associated with increased UTI in pregnancy. E.coli was most frequently isolated pathogen (61%). *Conclusion:* We can conclude that there is an association between UTI and anemia of different causes during pregnancy. There was a high risk of having anemia amongst the complicated pregnancy with UTI in association with their parity, age and gestational age.

**Keywords:** Bacteriuria, Pyelonephritis, Amaemia, Hemoglobin.

### Introduction

Urinary tract infections (UTI) which are caused by the presence and growth of microorganisms in the urinary tract are perhaps the single commonest bacterial infections of mankind [1] and in pregnancy, it may involve the lower urinary tract or the bladder [2]. UTI has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards [3]. Anatomically UTI can be classified into lower urinary tract infection involving the bladder and urethra and upper urinary tract infection involving the kidney, pelvis, and ureter. The majority of the UTI occur due to ascending infection [4-5].

Three common clinical manifestations of UTIs in pregnancy are: asymptomatic bacteriuria, acute cystitis and acute pyelonephritis [6]. UTI is defined as the presence of at least 100,000 organisms per milliliter of urine in an asymptomatic patient or as more than 100

organisms/mL of urine with accompanying pyuria ( $> 5$  WBCs/mL) in a symptomatic patient. Particularly in asymptomatic patients, diagnosis of UTI should be supported by a positive culture for auto pathogen [7]. Untreated asymptomatic bacteriuria is a risk factor for acute cystitis (40%) and pyelonephritis (25-30%) in pregnancy. These cases account for 70% of all cases of symptomatic UTI among unscreened pregnant women [7]. Symptomatic and asymptomatic bacteriuria have been reported among 17.9% and 13.0% pregnant women, respectively.

Pregnancy increases the risk of UTI. At around 6th week of pregnancy, due to the physiological changes of pregnancy the ureters begin to dilate. This is also known as "hydronephrosis of pregnancy", which peaks at 22-26 weeks and continues to persist until delivery, returning to normal within several weeks after delivery in most women. Both

progesterone and estrogen levels increase during pregnancy and these will lead to decreased ureteral and bladder tone. Dilatation of renal pelvis along with the elongation and dilatation of the ureters above the pelvic brim occurs due to compression of ureters by gravid uterus. Increased plasma volume during pregnancy leads to decrease urine concentration and increased bladder volume. The combination of all these factors leads to urinary stasis and uretero-vesical reflux [4]. In addition glycosuria and aminoaciduria provide an excellent culture medium for bacteria in areas of urinary stasis. Additionally, the apparent reduction in immunity of pregnant women appears to encourage the growth of both commensal and non-commensal microorganisms [5].

Female gender itself is a risk factor because of short urethra, its proximity to vagina and anus and inability of women to empty their bladder completely. High incidence is seen in lower socioeconomic group. Sexual activity and certain contraceptive methods are also said to increase the risk. The anatomical relationship of female's urethra and the vagina makes it liable to trauma during sexual intercourse as well as bacteria been massaged up the urethra into the bladder during pregnancy/ childbirth [8]. Abnormalities of urinary tract or stones, diabetes mellitus, sickle cell traits, immunosuppression and past history of UTI, low socioeconomic status tend to increase the risk [9].

The global prevalence of bacteriuria in pregnancy ranges from 4% to 23% in various studies. Maternal anemia has been associated with both asymptomatic bacteriuria and pyelonephritis. Urinary tract infection during pregnancy contributes significantly to maternal and perinatal morbidity. Abortion, low birth weight, maternal anemia, hypertension, preterm labour, and chronic pyelonephritis are related to urinary tract infection during pregnancy. E. coli remains the predominant organism implicated in urinary tract infection in pregnancy, though recent reports show changes in pattern of the infection.

Recent studies in Nigeria show an increasing involvement of Klebsiella Spp, Staphylococcus aureus, Proteus spp., and Pseudomonas spp in urinary tract infection in pregnancy. Studies have also shown that treatment of bacteriuria during

pregnancy reduces the incidence of these complications and lowers the long-term risk of sequelae following asymptomatic bacteriuria.

### Material and Methods

*Study design:* This hospital based cross sectional study was conducted in a tertiary centre, KIMS Hubli between October 2015 and December 2015. This was a case control study conducted to determine the relationship of UTI with anemia in pregnant women.

*Study Population:* 100 pregnant women attending antenatal clinic were randomly recruited into the study.

*Data collection:* Antenatal women who presented at the antenatal clinics of the above mentioned hospital during the study period were randomly recruited into the study. Verbal informed consent was obtained from each women before the commencement of the research. Socio- demographic data such as age, parity and duration of gestation were collected from the pregnant women using standard questionnaires and kept confidential during the research. Hemoglobin estimation was done by Sahli's method.

Early morning clean-catch midstream urine was collected from each pregnant women into a wide-mouthed sterile screw capped container. Urine was cultured on to a Blood agar & a MacConkey agar plate using the standard loop technique. After overnight incubation at 37<sup>0</sup> C for 24 hours, colony counts yielding bacterial growth of >10<sup>5</sup> /ml was taken as being significant in both symptomatic and asymptomatic pregnant women. Centrifuged urine deposit was examined microscopically at high magnification for pus cells, red blood cells, epithelial cells, casts, crystals, yeast-like cells. Pus cells 5/HPF were also considered significant for infection.

*Data analysis:* Data was computed to extract relevant descriptive statistics for each parameter. Data was analysed using statistical software SPSS version 19.0 at a significance level, p=0.05.

**Results**

**Table-1: Frequency distribution of study groups by age, parity and gestational age**

Age in years	Cases	Controls
16-20	4	5
21-25	22	20
26-30	16	17
31-35	7	6
36-40	1	2
<b>Parity</b>		
Nullipara	16	14
1-2	24	25
3-4	10	11
<b>Gestational Age (trimester of pregnancy)</b>		
First	5	6
Second	15	16
Third	30	28
<b>Total</b>	<b>50</b>	<b>50</b>

**Table-2: Case control difference in mean blood Hb concentration**

Blood Hb concentration (gm/dl)	Cases n=50	Controls N=50
Range	6.4-9.9	10-12.
Mean	8.2	11.2

**Table-3: Prevalence of UTI (urine culture positivity) among two study groups**

	Cases (n=50) Hb<10gm%	Controls (n=50) Hb>=10 gm%
No positive	20	6
% positive	40%	12%

**Table-4: Case-control difference in prevalence of UTI in relation to the age, parity and Gestational age**

Age groups	Cases			Controls		
	No examined	No positive	% positive	No examined	No positive	% positive
16-20	4	1	5%	5	0	0%
21-25	22	10	50%	20	3	50%
26-30	16	5	25%	17	2	33.3%
31-35	7	3	5%	6	1	16.66%
36-40	1	1	5%	2	0	0%
<b>Parity</b>						
Nullipara	16	4	20%	14	1	16.6%
1-2	24	8	40%	25	2	33.3%
3-4	10	8	40%	11	3	50%
<b>Gestational age</b>						
First	5	2	10%	6	1	16.6%
Second	15	3	15%	16	1	16.6%
Third	30	15	75%	28	4	66.6%

**Table-5: Percentage of isolation of various significant pathogen in urine of pregnant women**

Pathogen	No isolated	Percentage%
E.coli	16	61
Klebsiella	4	15
Enterobacter	3	12
Proteus	2	8
Pseudomonas	1	4

**Discussion**

The highest incidence is seen in age group 20-25 years followed by 26-30 years. The aforementioned age groups having the highest was also observed in previous studies. 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 [10]. Sexual activity and certain contraceptive methods are also said to increase the risk and women are mostly sexually active at this age. The report of this study is also similar to that of Leigh and Onuh et al, who also found the similar age group has highest incidence in developing urinary tract infection in pregnancy. In this study, the frequency of urinary tract infection was higher in the third trimester compared to the first and second trimester. This is in agreement with Leigh, who reported an increased frequency of urinary tract infection in the third trimester compared to the first and second trimester of pregnancy.

In this study, twenty six urine samples gave significant growth amounting to 26.0% prevalence, which is nearly similar to Akinloye et al [11] who reported a prevalence of 21.7%. This study does not agree with that of Onuh and colleagues who reported 32.7%, a bit higher to the present study. There was a high prevalence of UTI of about 40% in anemic pregnant women (whose Hb was <10gm%) as compared to 12% in non anemic pregnant women (whose hb was  $\geq 10$ gm%). The mean blood significantly lower in UTI case (8.2%). These findings agreed with study done in Erbil in 2013 which revealed significant association between anemia and UTI and also agreed with study done in Mexico 2009 which stated that significant association present between UTI and anemia. National centre of Health statistics in United states supported this association between anemia and UTI through research published in 2004. Study done in Baghdad found that maternal anemia is associated with UTI during pregnancy.

## Conclusion

The physiological changes of pregnancy predispose women to UTI. This happens more so in anemic pregnant women. We can conclude that there is an association between UTI and anemia of different causes during pregnancy. There was a high risk of having anemia amongst the complicated pregnancy with UTI in association with their parity, age and gestational age.

All pregnant women should be screened for UTI with a urine culture, treated with antibiotics if the culture is positive and then retested for cure. The goal of early diagnosis and treatment of UTI during pregnancy is to prevent complications with all the added benefits to the mother and the fetus.

Awareness creation and nutritional education are recommended to prevent anemia in pregnancy. Nutritional counseling on consumption of iron rich foods and iron/folate supplementation are recommended to prevent anemia in pregnant women. It is recommended to redistribute the health services according to the needs of the population, to train clinical providers to deliver services up to the standards of the guidelines, to increase the awareness of ASHA worker regarding the diagnosis and referral system of anemia cases, to increase the utilization of family planning services and iron supplementation in reproductive age.

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\*All correspondences to: Dr. Shobha Bembalagi, Professor and HOD, Department of Obstetrics and Gynaecology, Karnataka Institute of Medical sciences, P.B. Road, Vidyanagar, Hubballi-580022, Karnataka, India. Email: subhasvb@gmail.com