

## Prevalence of Klebsiella in urinary tract infection among pregnant women from South India

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### Abstract

**Introduction:** One of the frequently seen complications in pregnancy is urinary tract infection. Other complications like acute and chronic pyelonephritis, hypertension, intrauterine growth retardation occur due to UTI. Early detection and treatment of bacteria helps in the prevention of chronic urinary disease in the community and to avoid complications in pregnancy at an early stage. In view of the above an attempt was made to isolate and identify the Klebsiella pathogens from urine in suspected cases of UTI in pregnant women.

**Materials and Methods:** A total of 500 samples were investigated. The samples were collected from women attending the antenatal clinic at the Khaja Banda Nawaz Hospital, Gulbarga. A proforma was used to collect the data from the subjects of varying ages from 18 to 40 years, from varying gravida and all three trimesters were included. Sterilized urine container was used to collect urine with all aseptic precautions. Macroscopic and microscopic examination was done. Culture and biochemical reactions were done and the strains were isolated and identified.

**Results:** 52 women were found to be suffering from UTI, giving a prevalence rate of 10.4% (52/500). The incidence of organisms isolated in bacteriuric cases showed *Klebsiella* as the major isolate constituting 25%.

**Conclusion:** Urinary tract infection the most commonly seen complication in pregnancy. Both Gram-negative and Gram-positive bacteria were isolated. Klebsiella organism was isolated more commonly than other organisms in UTI in pregnant women.

**Keywords:** Urinary Tract Infection (UTI), Bacteriuria, Gram positive cocci (GPC), Gram negative bacilli (GNB).

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### Introduction

Urinary tract infection is most prevalent in women and often occurs during pregnancy<sup>1</sup>. Factors like ideal pH, temperature and constituents like glucose present in the urine predispose to bacterial growth<sup>2</sup>. Moreover during pregnancy, urethral compression at the pelvic brim by the enlarging uterus leads to stasis of urine, incomplete emptying and residual urine which are important factors that initiate the proliferation of microorganisms<sup>3</sup>. About 6-8% of pregnant women have asymptomatic bacterimia<sup>3,4</sup>. About 23-26% of these women if untreated will develop symptoms late in pregnancy<sup>5</sup>.

*Klebsiella* has been the major isolates from the urine of pregnant women in all the reported cases. The detection of bacterimia allows an approach to be made for the prevention of chronic urinary disease in the community and to avoid complications in pregnancy at an early stage<sup>4,6,7</sup>. In view of this, an attempt was made to evaluate the urinary tract infection in pregnancy and rule out all the high risk. In the present work, an effort is made to determine the clinical significance of

bacteriuria in relation to its complications with an intention to negate the untoward impact of the disease on the pregnant women and the growing fetus.

### Materials and Methods

A total of 500 urine samples were collected from women attending the antenatal clinic at KBN Hospital Gulbarga. The research study was approved by the Institutional Ethics Committee. Subjects of age group 18 to 40 years and from varying gravida and all the three trimesters were included.

- i. **Collection of Urine:** Urine was collected in sterile urine container. Midstream urine sample with complete aseptic precautions was collected.
- ii. **Examination of Urine:**
  1. **Macrosopic Examination:** Urine was observed for altered colour, presence of turbidity, deposits, etc.
  2. **Microscopic examination:** Smears was prepared and gram stained. Presence of at least one organisms per field was considered as significant (10<sup>5</sup>/ml organisms)<sup>8</sup>.

For microscopic examination of urine 10 ml of urine was transferred into conical centrifuge tube and centrifuged at 1500 rpm for 5 minutes. The supernatant was decanted, to leave sediment suspended in 1 ml volume of urine. This preparation was examined under low and high power. Several fields were searched to identify and count the number of cells, crystals and

casts. 3 or more pus cells/ high power field were considered as significant<sup>9</sup>.

#### i) **Plating of Urine Samples:**

**Standard Loop technique:** Plating was done by standard loop technique on Blood agar, Nutrient agar and MacConkey's agar.

#### **Method**

1. Flame a calibrated wire loop and allow it to cool without touching any surface.
2. Mix the urine thoroughly and remove the top of the container.
3. Insert the loop vertically into the urine to allow urine to adhere to the loop.
4. Spread the loopful of urine without flaming or re-entering urine, loop is drawn across the entire plate, crossing the 1<sup>st</sup> inoculum, which is the centre streak numerous times to produce isolated colonies.
5. Plates were incubated at 37°C for 18-24 hours. Colonies are counted on each plate. The number of colony formation units (CFUs) is multiplied by

1000 (if 0.001 ml loop is used) or by 100 (if a 0.01 ml loop is used) to determine the number of microorganisms per ml in the specimen<sup>10</sup>.

6. Fermentation of sugars like glucose, mannitol, lactose and sucrose, citrate utilization, urease production, catalase test and coagulase test were other biochemical tests used to identify the organisms.
7. The coagulase negative staphylococci were further classified into *Staph. epidermis* and *Staph. saprophyticus* with the help of Novobiocin sensitivity disc method. A zone of 22 mm or more indicated a sensitivity zone<sup>11</sup>.

#### **Results**

The present study has revealed that 52 women were found to be suffering from UTI, giving a prevalence rate of 10.4% (52/500). Prevalence of *Klebsiella* was 25% i.e. 13/52.

Table 1 shows the incidence of bacteriuria increased with age among the pregnant women.

**Table 1: Age distribution in pregnant women with bacteriuria**

Age in years	Total No. screened	Cases with bacteriuria		Cases with <i>Klebsiella</i>
		Number	Percentage	
18-20	89	7	7.86	1
21-25	203	20	9.85	5
26-30	166	16	9.64	4
31-35	38	6	15.78	2
35 and above	4	3	75.00	1
Total	500	52	10.40	13

**Table 2: Relationship of duration of pregnancy and bacteriuria**

Trimester	Total No. screened	Cases with bacteriuria	
		Number	Percentage
First trimester	55	6	10.90
Second	158	16	10.12
Third	287	30	10.45
Total	500	52	10.40

Table 2 reveals that significant bacteriuria during pregnancy has a similar incidence during all three trimesters.

**Table 3: Pyuria in bacterimic women**

No. of pus cells/ HPF	Cases with bacteriuria	Percentage
0-3	18	34.61
More than 3	34	65.38
Total	52	100.00

Based on microscopic findings, 3 or more pus cells per field were considered as significant (Table-3).

**Table 4: Gram's staining positive cases with significant bacteriuria in comparison with standard loop technique**

Technique	Cases with bacteriuria	Percentage
Standard loop technique	52	100
Gram staining	46	88.46

Table 4 shows that out of 52 cases, the Gram's staining was positive in 46 cases indicating a percentage of 88.46%. And standard loop technique was used to inoculate showing growth in all the 52 cases.

**Table 5: Number and percentage of Microorganisms isolated**

Organisms	Number	Percentage
Klebsiella	13	25.00
E.coli	12	23.07
Staph.saprophyticus	9	17.30
Staph.aureus	7	13.46
Citrobacter	3	5.76
Pseudomonas	2	3.84
Proteus	2	3.84
Staph.epidermis	2	3.84
Micrococcus	1	1.92
Enterococcus	1	1.92
Total	52	100.00

Table 5 shows the incidence of organisms isolated in bacteriuric cases. *Klebsiella* was the major isolate constituting 25%. *E. coli* was the next major isolate constituting 23.07%, *Staph. saprophyticus* accounted for 9 cases (17.3%), *Citrobacter* for 3 cases (5.76%), *Pseudomonas* and *Proteus* for 2 cases each (3.84%). Thus, Gram negative bacilli were responsible for a total of 29 cases (55.76%). *Staph. aureus* was present in a significant number of 7 cases (13.46%). *Staph. epidermis* was present in 2 cases (3.84%), *Micrococcus* was isolated in 1 case and *Enterococcus* in 1 case. Thus, the total Gram positive isolates were 23 (44.23%).

### Discussion and Conclusion

From this study, the spectrum of UTIs showed a total of 61.51% of Gram negative organisms and 38.44% of Gram positive organisms. Bacteriuria during pregnancy ranges from 3-12.8%. This variation is related to the socioeconomic status of the group of women studied which is in accordance with the observations of Turck et al and Kincaid Smith and Butler et al<sup>12,13,14</sup>. Therefore early treatment might avoid persistent bacteriuria in these women.

In this study it is evident from Table 1 & 2 the proportion of bacteriuric cases was found to increase with increasing age and increasing parity, which is in accordance with the observations of Whalley et al<sup>15</sup>.

Apart from influence of age and parity, the role of pregnancy itself in the acquisition of bacteremia must be considered. In Kass study, he has noted that material bacteriuria is usually present by the second month of gestation<sup>16</sup>. Williams GL et al found no statistically significant difference in incidence at different periods of pregnancy (3.3% before 13 weeks and 5.9% between 29-32 weeks). In the present study the incidence of bacteriuria in all 3-trimesters was not much different, being 10.9% in 1<sup>st</sup> trimester, 10.12% and 10.45% in the second and third trimesters respectively<sup>17</sup>.

In this study, Gram staining positive cases with significant bacteriuria was seen in 46 cases i.e., (88.46%) and standard loop technique has shown positive results in all 52 cases i.e., 100%. Gram positive cocci multiply slowly in the urine as compared to Gram

negative bacilli. It has been suggested by Pead et al that  $10^4$  organisms/ ml of uncentrifuged urine in cases of Gram positive cocci should be considered consistent with urinary infection instead of  $10^5$  bacteria/ ml which is appropriate for Gram negative bacilli. However, those showing  $10^4$  bacteria/ ml were repeated<sup>18</sup>.

Types of microorganisms isolated from the urine have never been constant. In this study *Klebsiella* was isolated in 25% of the bacteriuric women. Out of the other members of the coliform group, *E. coli* was isolated in 23.07% and *Citrobacter* 5.76%. Thus, the total coliform isolates constitute 55.76% (29/52).

Gram positive cocci accounted for 38.44% of the total isolates. Coagulase negative staphylococcus was isolated in a significantly high proportion. *Staph. saprophyticus* 9 cases (17.3%) and *Staph. epidermis* 2 cases (3.84%) and *Micrococcus* in 1 case (1.92%) and *Enterococcus* 1 case (1.92%).

Two strains of *Pseudomonas* were isolated and 1 case of *Enterococcus* was isolated. Controlled trials and large-scale studies are required to establish pathogenic potential of the isolates. Many studies have shown that complications during pregnancy are more common in bacteriuric women. This study has revealed the screening for bacteremia during pregnancy is an appropriate investigation and that culture was the most effective means of detecting bacteriuria.

This study will serve as a reference for researchers interested in the field of urology who may in future take up similar studies to compare and highlight with their findings over the years in combating this disease.

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