

# Imipenem Susceptibility Pattern of Bacterial Isolates on Pregnant Women with Urinary Tract Infection in a Tertiary Hospital

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## ABSTRACT

**Background:** Urinary Tract Infection (UTI) in pregnancy, including Asymptomatic Bacteriuria (ASB) is associated with maternal morbidity and adverse pregnancy outcomes, like preterm birth and low birth weight. In spite of an association of ASB with adverse pregnancy results, screening and treatment is not done with much strength in our country. The antibiotic susceptibility patterns differ from region to region and in different global locations and are found to vary from time to time. This study was done to evaluate the susceptibility pattern of bacterial isolates against Imipenem causing UTI in pregnant women.

**Materials and methods:** This observational study was conducted at the Department of Clinical Pathology, Bangabandhu Memorial Hospital, Chattogram During the period from January to June 2021. Urine sample from a total of 104 pregnant women was enrolled in this study. Isolation and identification of bacteria was done by conventional culture method and Imipenem susceptibility test, by Kirby-Bauer disc diffusion method.

**Results:** Among the study samples, 31(29.8%) showed positive culture result and taken as confirmed UTI. *E. coli* (45.10%) was the predominant isolated bacteria followed by *Klebsiella spp.* (25.80%). 90% bacterial isolates were found sensitive to Imipenem and rest 10% were resistant. 93% *E. coli* showed sensitivity to Imipenem, whereas *Klebsiella spp.* showed 87.5% and *Staphylococcus aureus* showed 75% sensitivity to Imipenem. Both *Enterococcus spp.* and *Pseudomonas spp.* showed 100% sensitivity to Imipenem.

**Conclusion:** Bacterial resistance against Imipenem is increasing day by day. So it should be kept as a reserve drug for severe life threatening condition.

**Key words:** Asymptomatic bacteriuria; Imipenem; UTI.

## Introduction

Women are more susceptible to Urinary Tract Infection (UTI). Further more pregnant women are at increased risk, usually beginning at 6<sup>th</sup> week and peaking during weeks 22–26, owing to the anatomical and physiological changes that occur during pregnancy. Moreover, during pregnancy there are a number of

conditions associated with an increased prevalence of UTI.<sup>1</sup> UTI is common with varying prevalence by age, sexual activity and the presence of genitourinary abnormalities. In healthy women, the prevalence of bacteriuria increases with age from about 1 percent in females with 5 to 14 years of age to more than 20 percent in women at least 80 years of age.<sup>2</sup> The prevalence is higher among individuals in lower socioeconomic classes and those with a past history of UTI.<sup>3</sup> Sickle cell traits, diabetes mellitus and grand multi-parity have been reported each is associated with two-fold increase in the rate of bacteriuria.<sup>1</sup> There is also increase in the risk of developing UTI due to catheterization, spermicidal contraceptive usage, kidney stones, tumors and urethral strictures. Similarly increase risk of UTI reported in the presence of neurological diseases, congenital/acquired anomalies of bladder, vesico-ureteric reflux and suppressed immune system.<sup>4,5</sup> UTI may present in pregnancy with symptoms of acute cystitis or pyelonephritis or may be more insidious in women with Asymptomatic Bacteriuria (ASB). UTI in pregnancy are a large and under-emphasized risk factor for pregnancy morbidity and adverse birth outcomes in Low- and Middle-Income Country (LMIC) settings.<sup>6</sup> So, they must routinely

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be screened and treated accordingly, if ASB is found to be present. But it is not a common practice in Bangladesh and screening for ASB in pregnancy is not considered as an essential part of Antenatal Care (ANC) like routine checkup for albumin and sugar in urine. In some cases, it is generally done only in the first visit of ANC.<sup>7</sup> The emerging antimicrobial resistance among uropathogens makes the management of UTI increasingly challenging. Several factors had been proved to influence this resistance - lack of hygiene, lack of compliance to dose and duration of the prescribed antibiotic, unjustified prescription writing by non medical practitioners and doctors. In addition there is easy access to over the counter medication including antibiotics especially in our part of the region.<sup>8</sup> This study was aimed to isolation and identification of bacteria causing urinary tract infection among pregnant women and to determine Imipenem susceptibility pattern of the isolated bacteria. Because continuous monitoring of upcoming resistance to antibiotics has to be addressed at regular intervals in order to modify the guidelines accordingly.

#### Materials and methods

This hospital based observational study was carried out in the Department of Clinical Pathology, BangaBandhu Memorial Hospital, Chattogram during the period of January to June 2021.

#### Inclusion criteria

- Pregnant women aged between 18 to 45 years attending in BBMH for antenatal visit were included in this research, irrespective of parity and gestational stage.

#### Exclusion criteria

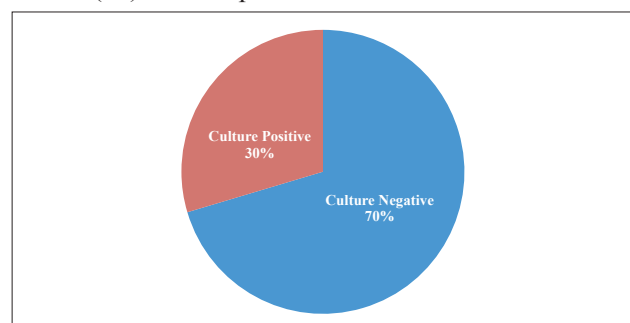
- Pregnant women, those who were not interested to participate and not accessible during data collection, under treatment with antimicrobials exempted from this study.

All the pregnant women irrespective of parity, gestation, with or without the symptoms of Urinary Tract Infection (UTI) attending antenatal clinic for regular check-up were randomly enrolled in the study. 104 pregnant women, with or without the indications of UTI were included in this consideration. After taking both verbal and written consent from the respondents, with all aseptic precautions, clean-catch midstream urine samples about 15-20 ml were collected from each pregnant women into a sterile, wide-mouthed screw-capped container by standard technique for culture and susceptibility test. After inoculating in UTI agar media by calibrated wire loop (0.01ml), identification of organisms were done as per standard laboratory

methods of identification. A specimen was considered positive for UTI if a single organism was cultured at a concentration of  $\geq 10^5$  CFU/ml in both symptomatic and asymptomatic pregnant women. Then Imipenem susceptibility pattern of the isolated bacteria were done on Muller- Hinton agar media by Kirby- Bauer disc diffusion method.

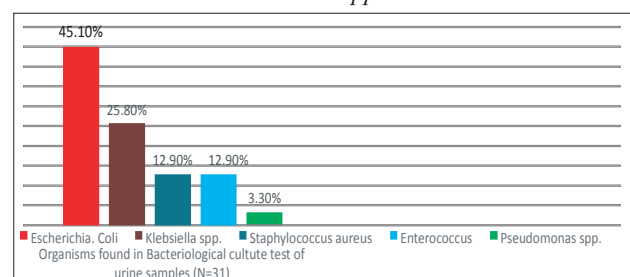
#### Results

Among the 104 urine samples from pregnant women, 29.8% (31) showed positive culture result.



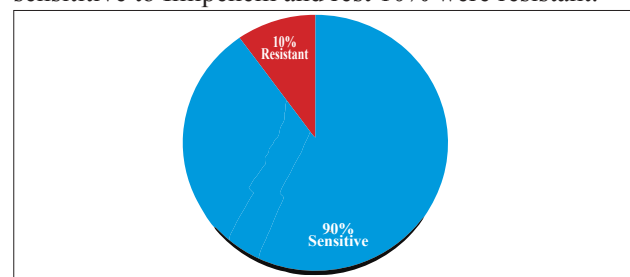
**Figure 1** Culture result of urine samples from pregnant women (n =104)

Distribution of the bacterial isolates showed *E. coli* (45.10%) was the predominant bacteria followed by *Klebsiella spp.* 25.80%, both *Staphylococcus aureus* and *Enterococcus spp.* 12.90% each and *Pseudomonas spp.* 3.30%.



**Figure 2** Distribution of bacterial isolates (n=31)

Among the total bacterial isolates, 90% were found sensitive to Imipenem and rest 10% were resistant.



**Figure 3** Susceptibility pattern of total isolated bacteria against Imipenem (n=31)

Among the isolated bacteria, *Enterococcus spp.* and *Pseudomonas spp.* showed 100% sensitivity to Imipenem, whereas, *E. coli* showed 93%, *Klebsiella spp.* 87.5% and *Staphylococcus aureus* showed 75% sensitivity to Imipenem.

**Table I** Susceptibility pattern of the different isolated bacteria against Imipenem (n=31)

Name of organisms	Number	Sensitive (%)	Resistant (%)
<i>E. coli</i>	14	13(93)	1(7)
<i>Klebsiella spp.</i>	8	7(87.5)	1(12.5)
<i>Staphylococcus aureus</i>	4	3(75)	1(25)
<i>Enterococcus spp.</i>	4	4(100)	0(0)
<i>Pseudomonas spp.</i>	1	1(100)	0(0)

### Discussion

UTIs are the second common health problems among pregnant women 'after anemia'.<sup>9</sup> Having a predilection, it is stated that nearly one woman out of three, have at least one episode of UTI requiring antimicrobial therapy by the age of 24 years and almost 50% of all women experience at least one episode of UTI during their lifetime.<sup>10</sup> A total of 104 pregnant women, with or without the symptoms of urinary tract infections (UTIs) were enrolled in this study, among which 31(29.81%) were reported as UTI after having their urine samples positive for bacteriological culture testing. A study was conducted by Salari et al. where they found the global prevalence of UTI in pregnant women was 23.9%.<sup>11</sup> That study was the first systematic review and meta-analysis of the global prevalence of UTI during pregnancy and was compiled using the most optimal secondary analysis methods among 27 eligible studies.<sup>11</sup>

In this study, the majority of the bacterial isolates were *E. coli* (45.10%), followed by *Klebsiella spp.* (25.80%), *Enterococcus spp.* and *Staphylococcus aureus* (12.90%) each and *Pseudomonas aeruginosa* was (3.30%). Similar to us, Khanum et al. also found, *E. coli* as the predominant isolated bacteria followed by *Klebsiella spp.* which was 50.4% and 20.0% respectively.<sup>7</sup> This is similar to most other studies throughout the world where *E. coli* has been consistently the predominant bacteria causing UTI among pregnant women.<sup>12</sup> The major contributing factor for isolating higher rate of *E. coli* is due to urine stasis in pregnancy which favors for *E. coli* colonization.<sup>13</sup> Traditionally, *E. coli* has been the dominant uropathogen owing to its possession of toxins, adhesins, pili and fimbriae that allow adherence to uroepithelium. These protect the bacteria from urinary clearance and allow bacterial multiplication and uroepithelial tissue invasion.<sup>14</sup>

This study revealed that *E. coli* showed the highest sensitivity to Imipenem 93%. *Klebsiella spp.* had also shown similar pattern of sensitivity only the percentages are lower, which was 87.5%. *Staphylococcus aureus* showed 75% sensitivity where both *Enterococcus spp.* and *Pseudomonas spp.* showed 100% sensitivity to Imipenem. This finding is comparable with a study

conducted by Nteziyaremye et al. where *E. coli* showed 92.3%, *Klebsiella spp.* 100%, *Enterococcus spp.* 50% and both *Staphylococcus aureus* and *Pseudomonas spp.* showed 100% sensitivity to Imipenem.<sup>15</sup> Matalka et al. showed 98.7% sensitivity of *E. coli* and 100% sensitivity of *Klebsiella spp.* to Imipenem in their study.<sup>16</sup> This variation of susceptibility pattern might be due to number of isolates studied, variation in different institutes and also geographical locations. Different studies showed resistance to antibiotics which has been developing with every new discovery of antibiotics, multiple factors are to be blamed but even in the most developed nations the problem of antibiotic resistance is present, as the pathogens have fought for their own survival, newer mutant strains had developed, thus making it more difficult to control the infection. The discovery of newer antibiotics had somewhat taken a slower pace as compared to the emerging lethal strains in the last one and a half decade, despite, of all the advanced researches which gives these pathogens an edge to our species.<sup>17,18</sup> Therefore, a very targeted treatment is necessary for a definite period in these infections to prevent antibiotic resistance as their would no longer be stronger antibiotics left to cater these infections in a few more years. Cost effectiveness of the antibiotics needed to treat these Multidrug Resistant (MD) and Extended Multidrug Resistant (EMDR) strains is another issue to be dealt with as this would prove to be very expensive.<sup>8</sup>

### Conclusion

Because indiscriminate and widespread use of antibiotics has resulted in emergence of many antibiotic-resistant organisms worldwide and become a serious health problem in hospitals and community. In fact, the situation is worst in developing countries mostly due to lack of control of antibiotic use, non-existence of legislation on antibiotic prescription. UTI in pregnancy is associated with maternal morbidity and adverse pregnancy outcomes.

### Recommendation

Antibiotic administration during pregnancy should be avoided, unless compelling medical condition. However, Imipenem must be kept in reserve for life-threatening infections.

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### Disclosure

The authors declared no competing interest.

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