

# MICROORGANISMS RESPONSIBLE FOR URINARY TRACT INFECTIONS IN DIABETES MELLITUS PATIENTS AND THEIR RESPONSE TO ANTIBIOTICS

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## ABSTRACT

**Objective:** To determine the frequency of urinary tract infection (UTI) in diabetes mellitus patients. **Methodology:** This was a cross sectional study, conducted from October to December 2017 at department of Microbiology, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan. A total of 200 samples of urine, were collected from outdoor patient department of diagnosed diabetic patients and were inoculated on a CLED agar. These cultures plates were placed in incubator at 35–37 °C in aerobic environment. Positive cultures having growth were identified by their colony characteristics, appearance and confirmed by biochemical tests. Pure culture was obtained and inoculated on Nutrient agar plate and discs of amoxicillin clavulanic acid (20µg: 10µg), ciprofloxacin (5µg), imipenem (10 µg), piperacillin tazobactam (10µg) and gentamicin (10µg) were applied. Plates were examined to read the zones of inhibition according to CLSI. Data was analyzed by using SPSS Version 20. **Results:** Uropathogens were isolated from 200 urine samples. Escherichia coli was the most frequent isolate (52%), followed by Klebsiella species (17%), Proteus species (8%), Pseudomonas aeruginosa (6%) and Staphylococcus species (17%). Gram positive bacteria were highly sensitive to imipenem, Sulzone (Cefoperazone/Sulbactam). Gram negative bacteria were sensitive to imipenem, sulzone, Fosfomycin, ceftriaxone, Ciprofloxacin and resistant to amoxicillin clavulanic acid, nitrofurantoin, piperacillin tazobactam and gentamicin. **Conclusion:** DM patients are prone to Urinary Tract Infection and should carefully be treated after culture and sensitivity, as rational use of antibiotics make it difficult to treat. Microbial Drug Resistance against uropathogens is a major problem and this problem should be properly evaluated.

**Keywords:** Diabetes mellitus, CLSI, Drug resistance, Disc diffusion method

## INTRODUCTION

Diabetes mellitus (DM) is a disorder characterized by increased level of blood glucose, due to defects in insulin secretion or insulin action or both. The blood glucose level for diabetes mellitus patients range from 90 to 120mg/dl (5-7mmol/l) in fasting and should be less than 10 mmol/L (180 mg/dl) after meals according to the American Diabetes Association.<sup>1</sup> Long standing hyper glycemia in DM patients have many lethal effects on different organs especially on eyes, nerves and kidneys.<sup>2</sup> Studies show that urinary tract infection in DM patients is four times higher than non diabetic patients as glucose makes urine fertile for pathogens.<sup>3</sup>

Usually normal host defense mechanisms prevent entry and persistence of microorganism within the urinary tract. Urine is a good nutrient and it is best medium for most pathogens. The growth rate of bacteria in urine is further stimulated by increase urine glucose.<sup>4</sup> UTIs may exist as asymptomatic bacteriuria, uncomplicated or complicated urinary tract infection in women or men.<sup>5</sup> Females are more prone to UTIs due to short urethra, pregnancy and sexual activity. In pregnancy most females develops gestational diabetes which leads to UTIs. Canadian and Danish studies shows diabetes were mostly hospitalized with urinary

tract infections.<sup>6</sup> The Objective of current study is to assess the type of microorganisms and their antimicrobial susceptibility.

## METHODOLOGY

This cross sectional study was conducted in the microbiology section of Pathology department to Sheikh Zayed Medical College/Hospital, Rahim Yar Khan. It took six months to complete this study, from October 2017 to December 2017. A total of 200 samples of urine were collected from diabetic patients visiting diabetic OPD.

### Sample collection, handling and transport

After making sure that patient didn't take any antibiotics, and using wide mouth leak proof container, mid stream urine samples (10-20 ml) were collected from non-catheterized patients. The labeled containers were delivered to the laboratory within one hour for microscopy. Those patients having more than 5/HPF leukocyte in urine were selected for urine culture.

### Urine culture

CLED agar (OXOID) plates were used to culture, after inoculation culture plates were placed in incubator at 35–37 °C. Positive culture having growth were identified by their characteristics

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colony appearance and different positive biochemical reactions.

#### Antibiotic sensitivity

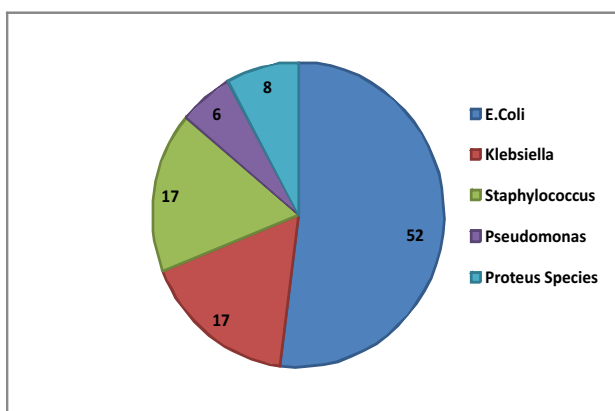
The antibiotic sensitivity of all clinical isolates was done by using oxoid sensitivity discs by disc diffusion method. A loopful growth of bacteria is used to form a homogenous suspension and compared with the McFarland standard 0.5 in order to standardize the inoculum. A cotton swab which is sterilized was then used to distribute the bacteria evenly over the entire surface of Muller Hinton agar (Oxoid).

The inoculated culture plates were left at room temperature to dry for 3-5 minutes. With the aid of sterile needle disks of Imipenem (10 ug) Cefexime (5ug) and other below mention drugs were placed on the surface of Muller Hinton agar (Oxoid). After 24 hrs incubation (35-37c) plates were seen to measure the zones of inhibition and results were read according to CLSI 2010 guide line. Data was entered and analyzed by using SPSS version 20.

## RESULTS

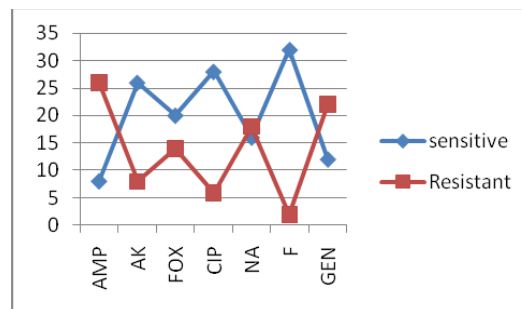
A total of 200 urine samples of diabetic patients were collected. Out of these 72 samples have growth and 128 samples have not growth. The isolated organisms from these 72 samples are were; E. coli (52%), Klebsiella (16.6%), P. aeruginosa (5.5%) Proteus spp. and (8.3%) S. aureus (16.6%) as shown in Figure I.

**Figure I: Percentage of different microorganisms isolated from urine samples**



The Gram positive cocci S. aureus was highly sensitive to Amikacin, Ciprofloxacin and nitrofurintine. This microorganism was resistant to Ampicillin, Cefoxitin, Nalidic acid and Gentacine. (Figure II)

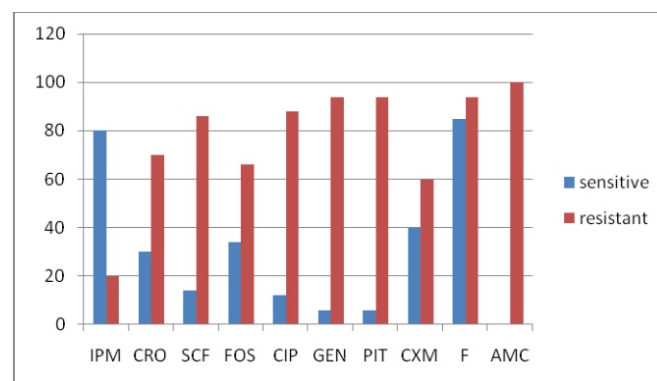
**Figure II: Antimicrobial susceptibility pattern of Gram positive cocci.**



AMP:ampicillin,AK:Amkacine,FOX:Cefoxitin,CI: Ciprofloxacin,NA:Nalidic acid; F: Nitrofurintine, GEN: Gentacine.

Gram negative bacteria (E.coli, klebsiella proteus and pseudomonas) were sensitive to imipenem, sulzone, Fosfomycin, ceftriaxone, Ciprofloxacin and resistant to amoxicillin clavulanic acid, nitrofurantoin, piprracillin tazobactam and gentamicin as shown in Figure III.

**Figure III:**



#### Antibiotics

IPM: Imipenem; CRO: Ceftriaxone; SCF: Cefoparazone -Tazobectam; FOS: Fosfomycine; CIP: Ciprofloxacin; GEN: Gentamycine; PIT:Pipracillin-Tazobectam; CXM: Cefuroxime; F: Nitrofurantain; AMC: Amoxicilline-Clavulanic acid.

## DISCUSSION

UTI is one of the commonest microbial infections seeking treatment in hospitals. UTI is predominantly a disease of the female due to a short urethra and proximity to the anus. The majority of studies showed predominance of UTI in female over male.<sup>7,8</sup> In this study, from 200 samples E.coli was most common (52%) followed by klebsiella (17%), staphylococcus spp. (17%), Proteus spp (8%), and

*Pseudomonas aeruginosa* (6%). A study conducted by Bonadio et al. showed that 54.7% of UTIs were caused by *E. coli*.<sup>9</sup> and our findings are in accordance with these mentioned studies.<sup>7,8,9</sup>

Goswami et al, similarly found that *E. coli* was the mostly isolated pathogen (64.3%).<sup>10,11</sup> Similar findings were observed by Ramana and Chaudhary.<sup>12</sup> Bapat et al, found that *E. coli* was the most commonly isolated organism (64.3%), followed by *Staphylococcus aureus* (21.4%), and *Klebsiella pneumoniae* (14.3%).<sup>11,12</sup> Lloyds et al, have shown that *Enterococci* spp. accounted for 35% of urinary tract isolates.<sup>13</sup> The presence of UTI among the diabetic mellitus patients was found to be 54.76%, such higher prevalence were also observed by Saleem & Daniel.<sup>13,14</sup> Geerling et al, have reported prevalence of 26% of UTI in India, and this is contrary to our findings. Different studies in the general population showed that the causative agents of Urinary Tract Infections belonged mainly to Gram negative enteric rods.<sup>15</sup> In the present study, *E. coli* was the most common isolate (31.7%).<sup>16,17</sup>

Manaa et al, reported 30% prevalence of *E. coli*.<sup>18</sup> The second most common bacteria was *CoNeg. staphylococci* (22%).<sup>20</sup> The other common isolates were *Klebsiella* (14.6%). This is also in contrast with previous studies conducted in Ethiopia and India.<sup>21,22</sup> In the present study most of the Gram negatives clinical isolates (59.6%) were susceptible to drug i.e. amoxicillin-clavulanic acid. This is in disparity to 70% susceptibility observed to the same drug in a previous study from Ethiopia.<sup>23</sup> low susceptibility to this drug in the this study may be due to self-medication and indiscriminate use like any other antibiotics.

## CONCLUSION

Diabetes mellitus patients are prone to UTIs and should carefully be treated after culture and sensitivity, as rational use of antibiotics make it difficult to treat. *E. coli* most common bacteria isolated following by *S. Aureus*. Gram-ve bacteria were highly resistant Amoxicillin clavulanic acid and piperacillin Tarobactam while gram positive was highly resistant to Ampicillin and Gentamicine.

## Conflict of interest

There is no conflict of interest among all authors.

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