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*Full Length Research Paper*

# Urinary Tract Infections (UTIs) Associated with Diabetic Patients in the Federal Medical Center owerri, Nigeria.

**Chukwuocha U.M.[1], Emerole C.O.[1], Njokuobi T.N. [2], and Nwawume I.C.[3]**

1. Department of Public Health Technology, Federal University of Technology, Owerri, Nigeria.
2. Department of Microbiology, Imo State University, Owerri, Nigeria.
3. Department of Optometry, Federal University of Technology, Owerri, Nigeria.

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**The risk of urinary tract bacterial infection in diabetic patients attending the Federal Medical Centre Owerri was assessed to aid in identifying significant bacterial ailments in diabetics for prompt treatment. Urine cultures of a total of 100 subjects were carried out. About 50 of these were known diabetics attending diabetic clinic while the other 50 were normal, non-diabetic controls. The mean isolates from diabetics (4.0±3.7) was significantly higher than that of the controls (3.2±2.8) at P<0.05. Mean isolates from diabetic females (2.2±4.8) and males (1.8±3.5) respectively were higher (though not significantly) those of their corresponding control (1.8±3.5 and 1.4±2.7). Out of the 50 diabetics, 20 (40%) had urinary tract bacterial infection compared to the 50 non-diabetics in which 16 (325) had urinary tract bacterial infection. There was a rising incidence of UTI in female diabetics (55%) compared to male diabetics (45%). Analysis of the results showed a prevalence of urinary tract bacterial infections in diabetic subjects.**

**Keywords:** Urinary, Bacteria, Patients, Diabetics

## INTRODUCTION

Human urine can support bacterial growth due to its favourable chemical composition (Acharya and Jadav, 1980). Urinary tract infections (UTI) have been a very major problem in the tropics. It is a common problem seen in community practice as well as in hospitals. Upper UTI and loin pain is more serious than lower tract infections and requires appropriate antimicrobial therapy (Foxman, 2002). Infections of the urinary tract (UTI) are common causes of morbidity and mortality.

*Corresponding Author E-mail: chukwuochauchem@yahoo.com; +2348034712957

Several literatures on UTI conclude that these infections leave their mark from cradle to the grave and are responsible for many complications such as premature babies, hypertension and renal failure.

A study carried out by Acharya and Jadav, (1980) showed that 3.4% of their sample population had asymptomatic bacteriuria in a randomized outpatient diabetic population. Asymptomatic bacteriuria is established if the diagnostic methods used do not detect presence of pus cells in urine, but the culture of same urine shows at least $10^5$ colony forming units (cfu) per milliliter of urine in subject without clinical symptoms of bacteriuria (Goswami *et al,* 2001). While

symptomatic bacteriuria is the isolation of at least, $10^4$ cfu/ml in subject already presenting with the clinical symptoms of bacteriuria. Studies are limited, but many experts believe that asymptomatic bacteriuria in diabetics should be treated because of the frequency and severity of upper urinary tract infections in these patients. Recent studies suggest that as few as $10^2$ cfu/ml is considered significantly in the presence of concomitant pyuria in young, sexually-active women with the acute urethral syndrome (dysuria, frequency and urgency) (Stamm, 1982). True urinary infections associated with fewer than $10^6$ cfu/ml may occur in infants and children, in males and in persons who are catheterized. Also in those who were recently treated with antimicrobial agents, those who drink large amount of fluids, those who have symptoms and concomitant pyuria and those who have obstruction in the urinary tract, or have pyelonephritis acquired from hematogenous spread(Goswami *et al,* 2001). The incidence of bacteriuria is 2-4 times higher in diabetics (Horcajada *et al,* 1999). They are also more likely to have severe complications, such as papillary necrosis, emphysematous pyelonephritis and perinephric abscess.

Patients with diabetes have a 10-fold increased risk of UTI when compared to non-diabetics (Goswani *et al,* 2001) and diabetics have a longer hospitalization than non-diabetics (Moreno *et al*, 1999). Diabetics are more prone to UTIs and to upper UTI (Geerlings, 2008). The reason for this predisposition is not completely understood, but the most important is likely to be bladder dysfunction caused by diabetic neuropathy. In diabetic women, there is higher incidence of bacteriuria and of asymptomatic kidney infection. UTIs are more common in women than men. Females are more commonly affected with UTI than males and are about thirty times more common among females than males (Geerlings, 2008). UTIs occur in females throughout life and tend to increase with age ( Raz and Stamm, 1992). Silent infection occur about 1% for each ten years of life. They can suddenly become symptomatic and produce considerable discomfort particularly among women prone to repeated infections and during the last three months of pregnancy ( Raz and Stamm, 1992). About half of adult women report that they have had a UTI at some time during their life. They are important complications when a midstream urine culture yields 10,000,000 organisms or more with the commoner organisms being *Escherichia coli , Klesiella sp, Proteus mirabilis, Enterobacter, Citrobacter* and *Pseudomonas.* These organisms originate mainly from endogenous colonic flora. Pyuria itself is a poor indication of infection (Acharya and Jodav,1980).

Diabetics as a whole suffer more UTIs than non-diabetics (Foxman, 2002). This increase is confined largely to those patients with long- standing diseases and neuropathic bladder dysfunction. Young diabetics are not at risk of UTIs (Souhami and Moxham, 1994).This study is aimed at assessing the prevalence of significant bacteriuria in diabetics at the Federal Medical Centre, Owerri.

## MATERIALS AND METHODS

### Selection of Subjects

Fifty known diabetics attending the federal medical centre Owerri ,Imo State were randomly selected for this study. Fifty control subjects used were those who have never been diagnosed with the condition.

### Specimen Collection

Patients were given sterile wide-mouth universal containers into which a clean catch (midstream urine) of about 10 – 20 ml urine was collected on the morning of test. Urine samples were stored at 2 – $8^0$C in the refrigerator until culture time (Cheesbrough, 2000).

### Inoculation of Media

Culture media (nutrient agar, MaConkey agar No 1, and CLED medium) obtained from Fluka Biochemika, Germany were prepared according to standard procedures (Cheesbrough, 2000). The culture media were dried over the incubator and allowed to cool. Using the Hooto and Stamm(1997) filter paper method of urine culture, a sterile filter paper (12mm X 6mm) was dipped into the well-mixed urine before centrifugation, drained at the side of the container and culture made in duplicate on each of the CLED, MacConkey and blood agar plates. The plates were then incubated at $37^0$C for 24 – 48hours.

### Characterization of Bacterial Isolates

Plates were observed under the microscope for bacterial growth after 24 – 48 hours. Colonies greater than 30 (or $10^4$ colony forming units per millimeter) were considered significant. Biochemical tests including coagulase test, oxidase test, indole, Grams staining as elucidated by Cheesbrough(2000) were carried out on the colonies to ascertain organisms isolated.

**Table 1: Prevalence of Bacteruria in Diabetics compared to Non-Diabetics**

| | Diabetics | | Non-Diabetics | |
|---|---|---|---|---|
| | No | (%) | No | (%) |
| Number with bacteriuria | 20 | (40) | 16 | (32) |
| Number without bacteriuria | 30 | (60) | 34 | (68) |
| **Total** | **50** | **(100)** | **50** | **(100)** |

**Table 2: Bacteria Isolates Distribution of Diabetic and Non-Diabetic Subject**

| Organisms | Diabetics | | Non-Diabetics | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 1. *E.coli* | 5 | 4 | 4 | 5 |
| 2. *Proteus spp* | 2 | 2 | 1 | 1 |
| 3. *S. aureus* | 1 | 2 | 1 | 2 |
| 4. *Pseudomonas spp* | 1 | 2 | 1 | - |
| 5. *Klebsiella spp* | - | 1 | - | 1 |
| | 9 | 11 | 7 | 9 |
| **Total** | **20** | | **16** | |

## RESULTS

The study assessed the presence of bacteria in urines of diabetic patients. There were 27 males and 23 females who were diabetics, and 25 males and 25 females who were non-diabetics. These were age-matched. Out of the 50 diabetics who participated, 20 (40%) had bacteriuria while 16 (32%) of the 50 non-diabetics had bacteriuria. In both patients and controls, more female than males had bacteriuria; also duration of diabetes determines the intensity of the infection. In those who have had diabetes for longer periods and who are poor managed, the infection was more intense than in those who have just been diagnosed of the disease or those who are well-managed. Diabetics on antibiotics had more intense UTI when compared to those who were not. This is because of the resistance posed by the medication, thereby exposing them to more serious infections.

Table 1 shows the prevalence of bacteriuria in diabetics compared to the control. 40% of diabetics showed significant bacteriuria while only 32% of control showed significant bacteriuria.

Table 2 shows bacteria isolates distribution of diabetics and controls. *E. coli* (isolated in 5 male and 4 female diabetics) had the highest distribution while Klebsiella spp (isolated only in 1 female diabetic) had the least distribution. Table 3 shows the percentage distribution of isolates in diabetics and controls. E. coli again had the highest percentage distribution (45%) and (56%) for diabetics and controls, respectively; while klebsiella spp had the least percentage distribution (5%) and (6%) respectively for diabetics and controls. These values are statistically significant at $P<0.05$.

Table 4 shows bacteria isolates and sex distribution in diabetics and controls. Mean isolates for both male and female diabetics was 4.0±3.7 and for controls 3.2± 2.8.Table 5 shows the age distribution and corresponding percentages of bacteria isolates in diabetics and controls; the highest percentage (45%) occurs in diabetics between ages 61 – 70 years, while the least (5%) occurs in those between 21 -30 years.

## DISCUSSION

**Table 3:** Percentage Distribution of Bacterial Isolates in Diabetic and Non-Diabetic Subjects

| Organisms | Diabetics | | Non-Diabetics | |
|---|---|---|---|---|
| | No. of isolate | % of sample | No. of isolate | % of sample |
| 1. *E.coli* | 9 | 45 | 9 | 56 |
| 2. *Proteus spp* | 4 | 20 | 2 | 13 |
| 3. *S. aureus* | 3 | 15 | 4 | 19 |
| 4. *Pseudomonas spp* | 3 | 15 | 1 | 6 |
| 5. *Klebsiella spp* | 1 | 5 | 1 | 6 |
| **Total** | **20** | **100** | **16** | **100** |

*P < 0.05 (statistically significant)*

**Table 4:** Bacterial Isolates and Sex Distribution in Diabetics and Controls

| Gender | Diabetics( Mean Bacteria Isolates) | Non Diabetics( Mean Bacteria Isolates) | Total |
|---|---|---|---|
| **Female** | **23(**2.2±4.8) | **25(**1.8±3.5**)** | **48** |
| **Male** | **27(**1.8±3.5**)** | **25(**1.4±2.7**)** | **52** |
| **Total** | **50(**4.0±3.7**)** | **50(**3.2±2.8 **)** | **100** |

Mean Isolates for Male and Female Diabetics=4.0±3.7; Controls= 3.2±2.8; $X^2$= 0.160; $X^2$0.05=3.841; df=1; *P>0.05*; Not significant

**TABLE 5:** Age Distribution of Bacterial Isolates in Diabetics and Controls

| Age | Diabetics(No of isolates ) | Non-Diabetics (No of isolates ) | Total |
|---|---|---|---|
| 21 – 30 | 1 | 5 | 6 |
| 31 – 40 | 3 | - | 3 |
| 41 – 50 | 2 | 3 | 5 |
| 51 – 60 | 4 | 4 | 8 |
| 61 – 70 | 9 | 2 | 11 |
| 71 and above | 1 | 2 | 3 |
| **TOTAL** | **20** | **16** | 36 |

$X^2$=10.322; $X^2$0.05=11.070; df=5; ***P>0.05***; Not Significant

Urinary tract bacteria pathogens were isolated more in diabetics than in non-diabetics in the present study. This agrees with the findings of Horcajada *et al* (1999) that the incidence of bacteriuria is higher in diabetics; and with that of Geerlings (2008) that diabetics are more prone to UTIs. This is because diabetes affects many systems that protects against infection in general, and against UTI specifically (Goswami *et al,* 2001). Poor circulation in diabetes reduces the ability of infection-fighting white blood cells to get where they are needed, and even when they do, they are less able to ingest the offending bacteria and kill them than normal white blood cells. It may also be due to bladder dysfunction caused by diabetic neuropathy which allows urine to remain in static pools for long periods of time, providing luxurious ponds for bacteria to grow in (Acharya and Jadav, 1980).

Higher incidence of bacteriuria was also recorded in female diabetics (55%) than in female non-diabetic and the male diabetics (45%) respectively. This corroborates the reports of Raz and Stamm (1992) that females are more commonly affected with UTI than

males and with that of Geerlings, Stolk and Camp (2001) that woman with *Diabetes mellitus* are about 2-3 times more likely to have bacteria in their bladders than women without D.M. *E.coli* was the most commonly isolated organism (45%) followed by *Proteus* (20%) and *Staphylococcus aureus* (15%). *E.coli* is a normal intestinal flora found in humans and is therefore expected to be more prevalent in urinary tract of immunologically suppressed patients. Age appeared to play a role in the prevalence of bacteria pathogens among diabetics as those between 61 and 70 years of age had more isolates. This can be derived from the fact that people in this age group are more prone to diabetes and therefore their urine provide better conducive conditions for bacteria to thrive(Goswami *et al.,* 2001). There seems to be an increased risk of the infection spreading upwards into the kidneys in diabetic patients especially in those whose condition has lasted for long periods of time and in those poorly managed for the condition.

## CONCLUSION

This study confirms that diabetes predisposes humans to the risk of urinary tract infections due to the changes in bladder function and in circulation. Diabetics infected with UTIs should therefore be promptly treated with the proper antibiotics to prevent development of kidney damage or more serious infections. However further studies with large sample size is highly recommended to authenticate the findings from this study.

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