Incidence of Urinary Tract Infection among Diabetic Patients in Abakaliki Metropolis

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Authors' contributions:

This work was carried out in collaboration among all authors. Authors SCK and EIO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MNA, KCO, UME and MO managed the analyses of the study. Authors MI, COU and AAA managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The investigation of urinary tract infection (UTI) among diabetic patients 15-51 years and above was assessed using 100 mid-stream urine specimen with the objective of isolating and identifying different types of bacteria and their respective frequencies among diabetic patients attending

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diabetic clinic at Alex Ekwueme Federal University Teaching Hospital, Abakaliki. A urine culture was performed combined with a full report of urine to establish the diagnosis. The result showed that the majority of bacteria in urinary tract infections were in 27-32 years of age group (71.4%) and lowest in 15-20 years age group (0%). The predominant bacteria isolates and their percentage occurrences include; *Escherichia coli* (39.13%), *Klebsiella pneumonia* (21.74%), Proteus (8.69%), *Pseudomonas aeruginosa* (8.69%), *Streptococcus* (8.69%), *Staphylococcus aureus* (6.52%), *Enterococcus faecalis* (4.25%). There was a high prevalence of the isolated organisms in female (47.7%) compared to males (36%). It follows that most predominant agent of UTI in diabetic patients in Abakaliki Metropolis is *Escherichia coli* followed by *Klebsiella pneumonia*.

1. INTRODUCTION

Urinary tract infection (UTI) in diabetic patients represents the commonest genitourinary disease in diabetic patients, and is the second commonest infection which affects them. Most urinary tract infections result from ascending infection by organism introduced through the urethra. Acute infection are common in diabetic women than males because of shorter urethra are more likelihood of its contamination [1].

Urinary tract infection can be community acquired or nosocomial, asymptomatic or symptomatic. Asymptomatic urinary tract infections represent the beginning of urinary tract disease which indicates a significant bacterial count present in the urine usually 10^5 colony forming units per ml in an individual without symptoms. Its minor symptoms include frequency voiding more than every 3 hours, nocturia awakening at night to urinate urgency that is, desire to pass urine immediately and bed wetting [1].

Urinary tract infection in diabetic patients due to conditions such as increased urinary glucose levels which creates an infection-prone environment in the urinary tract. Four groups at risk of UTI include: young girls of school age, diabetic patients more especially in women in their sexually active age, men with prostrate obstruction.

Urinary tract infections in diabetic patient are particulary important because their occurrence may be associated with some congenital abnormalities of the urinary tract or error management. If not corrected early, these may lead to recurrent infection causing damage to kidney. There has been significant progress with regard to the understanding of pathogenesis and host factors related to UTI, the diagnosis remains complicated by non-specific symptoms and difficulty in obtaining uncontaminated urine specimen. Prompt diagnosis and treatment of urinary tract infection in diabetic patient is critical especially because there is renal anomalies because delay in diagnosis can result in preventable morbidity and log-term complication associated with renal damage.

The organisms commonly associated with UTI include: *Escherichia coli*, *Streptococcus faecalis*, *Staphylococcus sapropyticus*, *Staphylococcus aureus* [2]. Less common organisms include: *Proteus mirabilis*, *Klebsiella pneumonia*, *Enterobacter spp*, *Pseudomonas aeriginosa*, *Neisseria gonorrhea*, *Enterococcus spp*, *Candida albicans*, *Trichomonas vaginalis*[2].

The study was done to determine urinary tract infection among diabetic patients in Abakaliki Metropolis.

2. MATERIALS AND METHODS

2.1 Study Area

The study was done in Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi State, Nigeria.

2.2 Sampling Technique

One hundred (100) diabetic patients attending diabetic clinic Alex AlexEkwueme Federal University Teaching Hospital, Abakaliki during the research period that showed urinary tract infection or without any symptom were recruited into the study upon obtaining informed consents. Sterile universal containers were given to the eligible diabetic patients and mid-stream clean catch urine specimens collected and carried immediately to the Microbiology Laboratory.

2.3 Gram Staining/Microscopy

Direct microscope and Gram staining preparation and examination of Gram stained smear of the

urine sample were carried out. Using a sterile Pasteur pipette, one drop of well mixed, uncentrifuged urine was placed on a clean grease-free slide. The drop was allowed to dry without spreading, heat-fixed and stained. The preparations were examined under oil immersion lens for the presence or absence of bacteria, polymophonuclear leucocytes, yeast cells and squamous epithelial cells.

2.4 Culturing Technique

All the urine samples were ascetically inoculated unto dried blood agar, MacConkey agar, Cysteine lactose electrolyte deficient (CLED) medium using the calibrated loop technique [3]. Each urine sample was mixed gently, and then tipped to a slant and with a 0.00ml standard wire loop; the surface of the urine was touched so the urine is sucked into the loop. The 0.00 ml of urine was deposited on a blood agar and half of the plate was streaked by first making a straight line down the centre, followed by close passes at right angles through the two phases. Both MacConkey agar and CLED medium plates were inoculated in the same manner. The plates were incubated for 24 hours at 37°C.

2.5 Biochemical Tests

2.5.1 Catalase test

This test is used to differentiate those bacteria that produce the enzyme catalase, such as Staphylococcus from non-catalsae producing bacteria such as Steptococci. The test was carried as follows:

Three (3) ml of freshly prepared 1% hydrogen peroxide was dispensed into a test tube. The isolate was collected with a sterile wooden stick and immesned in hydrogen peroxide solution. Active or immediate bubbling indicates a positive catalase test [4].

2.5.2 Coagulase test

The slide method was used as a greese pencil was to divide the glass slide. Drop of normal saline was placed on each of the slide using Pasteur pipette and a colony of the test organism emulsified on each of them. A drop of fresh human plasma was introduced into one of the suspension, mixed gently and clumping was checked for. If present, the organism was taken as a coagulase positive [5].

2.5.3 Oxidase test

One percent (1%) aqueous solutions of the oxidase reagent 9tetramethyl-p-phenylene diamine hydrochloride) was freshly made. A few drops of the test culture as smeared onto the filter apaer using a sterile rod. Production of purple colouration within 5-10 seconds indicated positive oxidase result [4].

3. RESULTS

Out of a total of 100 urine specimen examined, 46 showed significant growth of UTI causing organisms amounting to a prevalence of 46%.

In Table 1, 40 samples from type 1 diabetic patients were examined but 25 of samples had significant growth. In Table 2, 60 samples from type 2 diabetics were examined. But only 21 had significant growth. There was a high incident of infection in the age range of 21-25, 10(80%) followed by 26-30 years age group 4 (75%), 35-40 years age group 4 (57.14%), 45 years-above 4 (25%) but lowest in age group between 31-35 years 3 (66.7%) and 15-20 years 3 (33.3%) while in age group between 41-45 years no case of infection was recorded. But the differences in age group of distribution of patient in relation to UTI infection were statistically significant.

In Table 3, the incidence of infection was higher in females (45.7%) compared to males (36%), but there was statistical significant relationship between the sex of diabetic patients in urinary tract infection.

In Table 4, show the frequency of the various aetilogic agents of this isolated. The most frequently isolated organism was *Escherichia coli* 18 (39.13%) followed by *Klebsiella pneumonia* 10 (21.74%), *Pseudomonas aeruginosa* 4 (8.69%), *Staphylococcus* 3 (5.52%), *Sretpotococcus* 3 (6.52%), *Enterococcus faecalis* 2 (4.25%).

4. DISCUSSION

The owed results of this study showed low incidence of UTI among diabetic patients. But unlike the work done by Steven in 1989 [6] and Stamen *et al.* [7], who reported Proteus spp as next to *E. coli* in prevalence of UTI. This study agreed to the report of Behzadi et al. [8], whore ported high prevalence of *E. coli* followed by *Klebsiella pneumonia* in urinary tract infection in adults. The study showed that

Table 1. Prevalence of UTI among diabetic patients in relation to types

Type	No Examined	No with significant	% positive
Type 1	40	25	37.5%
Type 2	60	31	33.3%

Table 2.Prevalence of UTI among Type 1 diabetic patients in relation to age and gender

Type 1	Male		Female	
Age Group	No Examined	No Positive (%)	No Examined	No positive (%)
15-20	2	0(0.00%)	3	1(33.3%)
21-25	5	3(80%)	10	8(80%)
26-30	4	3(75%)	3	2(66.7%)
31-35	2	0(0.00%)	2	1(0.00%)
36-40	0	0(0.00%)	3	2(66.7%)
41-45	3	1(33.3%)	0	0(0.00%)
46-above	2	0(0.00%)	1	0(0.00%)
Total	**18**	**7(44.4%)**	**22**	**14(68.18%)**

Table 3.Prevalence of UTI among diabetic patients in relation to age and gender

Sex	No Examined	No Positive	Percentage (%)
Male	43 (43%)	16	37.2
Female	57(57%)	30	52.6
Total	**100**	**46**	**89.6**

Table 4. Distribution of the isolated etiological agents in the study population

Type of bacteria	No Isolated	Distribution (%)
Escherichia coli	18	39.13
Klebsiella pneumonia	10	21.74
Candida	1	2.17
Proteus pneumonia	4	8.69
Pseudomona spneumonia	4	8.69
Stretpococcus pneumonia	4	8.69
Staph pneumonia	3	6.52
Enterococcus faecalis	2	4.25

Klebsiella pneumonia is next to *E. coli*. The presence of *Streptococcus faecalis* shows contamination of urine by faecal commensal brought about probably due to the way most people clean up after defecation, vulval instead of the othe way around. Most urinary tract infections are caused by *Enteriobacericeae* or member of the related group and also many authours who reported that UTI adolescent age group in adult due to shortness of their urethra [9]. The fall in age group is made of teenage compared to other age groups. The increase in percentage occurrence of bacteria isolate among the age group 21-25 years could because this age group involvement in premarital sexual activities.

The second reason for increase in prevalence of bacteria isolate among the age group 27-32 years could be because this age group are involved and could be due to environmental factor. The fall in prevalence of bacteria isolate among the age group 39-44 years and above may be because they have reach their menopause and does not involve so much in indiscriminate sex activities.

The results of this study showed that symptomatic and community acquired UTI and hospital acquired UTI are common among diabetic patients and enterobacteriaea infection in diabetic patients in Abakaliki Metropolis. The predisposing factors to UTI among diabetic patients include; poor personal hygiene and low immune response.

From this study, there tends to be an increase percentage of *E. coli* in the causation of UTI

among adults followed by other members of the enterobcteriaceae and enterococcci. As in some other studies, there tends to be a shift in the proportion of aetiological agents favouring organisms like *Staphylococcus aureus* and *Klebsiella pneumonia* [10]. It has been shown in some women; perineal bacteria gain access into the urethra and causing recurrent UTI which was reported that by such women are likely to have colonization with bacteria.

5. CONCLUSION

There was a great increase in the frequency of E.coli as the aetiologic agent of UTI among diabetic patients in our environment. *Klebsiella pneumonia* as the second etiologic agent of UTI. In the same vein, there was gradual increase in the proportion of organisms such as *proteus mirabilis, Pseudomonas aeruginosa, Streptococcus enterococcus faecalis* in causing UTI in diabetic patients.

CONSENT AND ETHICAL APPROVAL

An ethical approval was obtained from the Ethics Committee of Alex AlexEkwueme Federal University Teaching Hospital, Abakaliki after submission of detailed research proposal, informed consent forms and questionnaires. As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/62847