Asymptomatic Bacteriuria in Pre-Menopausal Patient with Type 2 Diabetes Mellitus in Bida, North Central, Nigeria


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Abstract: The studies was to investigate the prevalence of asymptomatic bacteriuria in premenopausal patients clinically diagnosed with type 2 diabetes mellitus and to determine the most prevalence isolates with the antibiotics susceptibility pattern of bacteria isolates. One hundred and twenty (120) known type 2 diabetes mellitus patients were selected randomly from patients who gave inform consent. Patient’s age was between 25-44years attending general out-patient clinic of Federal Medical Centre, Bida, Niger-state, Nigeria. Midstream urine sample was collected aseptically into sterile McCartney bottles and examined microscopically and culturally using standard laboratory techniques. Samples were cultured on Blood agar, MacConkey agar and Cysteine lactose electrolyte deficiency (CLED) media and incubated at 37°C aerobically for 24hrs. Significant bacteriuria (=10^5cfu/ml) was observed in some samples. Out of 120 patients with type 2 DM 52(43.3%) showed significant ASB. The study revealed *Escherichia coli* (46.2%) as the most prevalence uropathogens followed by *Staphylococcus aureus* (34.6%), *Staphylococcus saprophyticus* (7.7%), *Pseudomonas aeruginosa* (3.8%) and *Candida albicans* (7.7%). Large proportion of isolates were susceptible to Pefloxacin and Ceftriazone. Few isolates were susceptible to Nitrofurantoin, Nalidixic acid, Gentamycin, Erythromycin Ciprofloxacin and Cotrimoxazole. While Amoxycilin and Ampicillin were resistance to tested isolates. The study revealed that asymptomatic bacteriuria is a common problem among pre-menopausal women, this is probably due to close proximity of the vulva to the anus, sexually active and hygiene. Also, misuse of un-prescribed drugs is a major challenging resulting to multi-drugs resistance globally.

Key word: Asymptomatic Bacteriuria (ASB) · Diabetes Mellitus (DM) · Urinary Tract Infection (UTI)

INTRODUCTION

Diabetes mellitus (DM) is the most common endocrine disorder. It exhibits a variety of multi-system complications involving the blood vessels, skin, eye, kidney and the nervous system during the course of the disease process [1]. The average age of menopause varies according to geographical location. In western world, the average age of menopause is 51 years (National Institute of aging 1) [2].

In women, urinary incontinence is estimated to affect nearly 50% of middle age and older women leading to significant distress, limitations in daily functioning and poor quality of life [3,4].

According to Enzlin *et al.* [5] 18-42% women with diabetes mellitus experience reduced desire, decrease arousal and painful intercourse, this has increase sexual problems. Women with type 1 diabetes have nearly two fold greater prevalence of sexual dysfunction than women without diabetes. Diabetic women have two or three fold higher prevalence of developing asymptomatic bacteriuria and at risk of developing more serious consequences Zhanel *et al.* [6] Women with diabetes and asymptomatic bacteriuria with type 2 diabetes have an increased risk for development of symptomatic UTI (Geerlings *et al.* [7] and women with type 1 diabetes are at an increased risk of pyelonephritis and subsequent impairment of renal function Geerlings *et al.* [8].

Epidemiological studies have suggested that asymptomatic bacteriuria (ASB) and symptomatic UTIs occur more commonly in women with diabetes than in those without diabetes[9].
According to Young et al. [10], diabetes mellitus is a cosmopolitan problem; the prevalence varies according to language group, culture area, geographical location and degree of isolation.

Diabetes and urologic disease are very common health problems that markedly increase in prevalence and incidence with advancing age [11,12].

The aim of this work is to know whether Diabetes Mellitus is a predisposing factor to urinary tract infection among premenopausal women with a view to provide a guide line of clinical and laboratory methods for effective management of the disorder.

MATERIALS AND METHODS

The research was a prospective studies carried out between January – December 2010. A total of 120 urine samples were collected from known type 2 diabetes mellitus patients attending general out-patient clinic of Federal Medical Center, Bida, Niger state, North Central, Nigeria. The patients were selected randomly from cohort diabetes mellitus patients who voluntarily volunteer themselves after their consent were given. The studies had approval of ethical committee of the centre. Patient’s age was between 25-44 years, they were non-pregnant females with history of 3-6 years of diabetes mellitus therapy. There was no history of recent urinary tract infection treatment for 2-3 months before these studies.

Asymptomatic bacteriuria in patients with diabetes mellitus is the presence of a significant quantity of the bacteria in a urine specimen properly collected from a person without symptom or signs of UTI.

In women, two consecutive specimens with isolation of the same species in quantitative count of at least 10,000 colony forming units/ml (cfu/ml) [13].

Early morning urine samples were collected from patients into sterile McCartney bottle. Samples were inoculated on MacConkey agar, Blood agar and Cysteine lactose electrolyte deficiency media (CLED), using a calibrated loop to determine colony forming unit. The plate was incubated at 37°C aerobically for 24hrs, culture with colony counts =5 cfu/ml was considered as significant bacteriuria [14,15]. The organisms were identified using standard cultural, morphological and biochemical techniques Buccuna and Gibbon [16].

Antimicrobial susceptibility testing by disc diffusion method according to clinical and laboratory standard guidelines [17]. Resistance and susceptibility to antibiotics was measured by the method of Baker and Breach [18]. When the antibiotic agent was 16mm or higher, it was recorded susceptible and resistance when less than 16mm. The susceptibility plates were incubated aerobically for 12-18hrs and zone of inhibition was recorded.

Statistical analysis –SPSS version 16.0.

RESULTS

Out of one hundred and twenty (120) patients with diabetes mellitus, 52(43.3%) had significant uropathogens with ages ranged from 25-44yrs.

Table 1 showed ASB within the age variations, ASB was higher in age range 25-29yrs 2(50%) and 30-34yrs, 6(50%), followed by 40-45yrs 34(45.9%) and 35-39yrs 10(33.3%) with the lowest uropathogen. The highest percentage of uropathogen found in age groups (25-29yrs) and (30-34yrs) may be as a result of active sexual activities in this age group.

Table 2 showed the bacteria isolated in ASB and the percentage prevalence of the uropathogen. Escherichia coli (46.2%) was found to be the most prevalence uropathogen, followed by Staphylococcus aureus (34.6%), Staphylococcus saprophyticus (7.7%), Candida albicans (7.7%) and Pseudomonas aeruginosa (3.8%) being the lowest prevalence isolate.

Table 3 showed antibiotics susceptibility pattern. Escherichia coli, the highest uropathogen showed high susceptibility to Pefloxacin (83.3%), Ceftriazone (58.3%) and Gentamycin (58.3%) but least susceptible to Nalidixic acid and Cotrimoxazole which were both (25%).

Table 1: Age Distribution of Type 2 Diabetes Mellitus Patient with Asymptomatic bacteriuria (Asb).

<table>
<thead>
<tr>
<th>AGE INTERVAL</th>
<th>NUMBER TESTED</th>
<th>% WITH ASB</th>
<th>TOTAL %</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-29</td>
<td>4</td>
<td>2(50%)</td>
<td>100</td>
</tr>
<tr>
<td>30-34</td>
<td>12</td>
<td>6(50%)</td>
<td>100</td>
</tr>
<tr>
<td>35-39</td>
<td>30</td>
<td>10(33.3)</td>
<td>100</td>
</tr>
<tr>
<td>40-44</td>
<td>74</td>
<td>34(45.9%)</td>
<td>100</td>
</tr>
<tr>
<td>TOTAL</td>
<td>120</td>
<td>52</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 2: Bacteria Isolated From Urine Samples Of Patient With Type 2 Diabetes Mellitus With Asymptomatic bacteriuria (Asb).

<table>
<thead>
<tr>
<th>BACTERIA</th>
<th>NO OF OCCURRENCE</th>
<th>% OCCURRENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>24</td>
<td>46.2</td>
</tr>
<tr>
<td>S. aureus</td>
<td>18</td>
<td>34.6</td>
</tr>
<tr>
<td>S. saprophyticus</td>
<td>4</td>
<td>7.7</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>C. albicans</td>
<td>4</td>
<td>7.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>52</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3: Bacteria Isolates From Type 2 Diabetes Mellitus Patient That Was Susceptible To Different Antibiotics.

<table>
<thead>
<tr>
<th>ANTIBIOTIC</th>
<th>E. coli (N=24)</th>
<th>S. aureus (N=18)</th>
<th>S. saprophyticus (N=4)</th>
<th>P. aeruginosa (N=2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrofurantoin</td>
<td>12 (50%)</td>
<td>4 (22.2%)</td>
<td>2 (50%)</td>
<td>NA</td>
</tr>
<tr>
<td>Nalidixic Acid</td>
<td>6 (25%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>NA</td>
</tr>
<tr>
<td>Cotrimoxazole</td>
<td>6 (25%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>NA</td>
</tr>
<tr>
<td>Gentamycin</td>
<td>14 (58.3%)</td>
<td>2 (11.1%)</td>
<td>2 (50%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Ceftriazone</td>
<td>14 (58.3%)</td>
<td>8 (44.4%)</td>
<td>2 (50%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>12 (50%)</td>
<td>10 (55.6%)</td>
<td>2 (50%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>Pefloxacin</td>
<td>20 (83.3%)</td>
<td>10 (55.6%)</td>
<td>2 (50%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>NA</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>NA</td>
<td>4 (22.2%)</td>
<td>2 (50%)</td>
<td>NA</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>NA</td>
</tr>
</tbody>
</table>

An isolates with zone of inhibition =16mm is sensitive while >16mm is resistant to a particular antibiotics.
N= Total isolate of each organism.
NA- Not applicable.

*Staphylococcus aureus* second uropathogen was susceptible to Ciprofloxacin and Pefloxacin (55.6%) and least susceptible to Gentamycin (11.1%).

*S. saprophyticus* was susceptible to Nitrofurantoin, Gentamycin, Pefloxacin, Ceftriazone, Cotrimoxazole and Erythromycin by (50%) while *P. aeruginosa* was susceptible to Pefloxacin, Ciprofloxacin and Ceftriazone by (100%) but completely resistance to Gentamycin and Cotrimoxazole.

**DISCUSSION**

Out of 120 patients with type 2 diabetes mellitus 52(43.3%) shows ASB but statistically not significant (P=10.121). The 43.3% prevalence in this studies is higher than previous studies, showing 26% in Nigeria Alebiosu *et al.*[19], 19% in Bahrain (Hajeri [13] 36.15% in Nigeria Ophori *et al.*[20], 9.3% in Ethiopia Uncu *et al.* [21], 26.4% in Ghana Samuel *et al.*[22] and 31.7% (Makuyana *et al.* [23]. The contrast in prevalence in these studies may be geographical factor. The prevalence of bacteriuria among young women is strongly associated with sexual activities (Kunin *et al.*[24]. High glucose concentration in urine serves as a medium for pathogenic micro-organism to grow well in urine [7,25,26].

Stein and Funstick [27], stated that incidence of asymptomatic bacteriuria in diabetes mellitus patients are estimated from several studies to range between 7-32%

Wheat *et al.* [28], says patient with diabetes mellitus have increase risk of bacteria infection with urinary tract being the most prevalence infection site.

The population studies in this report were comparable to the number of patients in this study.

Assel *et al.* [29] says variations in percentage of ASB is attributed to factors such as geographical variation, ethnicity of the subjects and variation in screening test.

In this study, *Escherichia coli* was the highest uropathogen 24(46.2%), this is contrary to the report of Alebiosu *et al.* [19]where *Klebsiella pneumoniae* was the most common isolate from ASB. However, our result is supported by other report where *Escherichia coli* have been reported to be the major uropathogen [13, 29- 31].

Other bacteria isolated include *Staphylococcus aureus* (34.6%), *Staphylococcus saprophyticus* (7.7%), *Pseudomonas aeruginosa* (3.8%) and *Candida albicans* (7.7%).
Nicolle [32] says Escherichia coli remains common pathogen, other enterobacteriae including Klebsiella Specie, Proteus mirabilis, Citrobacter specie, Enterobacter specie, Serratia specie, may be isolated. Pseudomonas aeruginosa and Candida albicans are frequently involved and other gram positive organisms.

Stamey and Sexton [33], stated that bacteria uropathogen are likely to originate from gastrointestinal tract and ascend via the faecal-urethra route.

Result of antibiotics susceptibility showed that Ceftriazone and Pefloxacin were very susceptible against most of the isolates. Escherichia coli, been the highest uropathogen was susceptible to Pefloxacin (83.3%), Gentamycin and Ceftriazone were both (58.3%). The susceptibility to these three antibiotics may be due to their broad spectrum. Sekvi Celen et al[34], reported similar case of (90%) Ceftriazone and Quinolone susceptibility to Escherichia coli.

Few isolates were susceptible to Nitrofurantoin, Nalidixic acid, Cotrimoxazole, Erythromycin and Ciprofloxacin.

However, Amoxycilin and Ampicilin were resistance to tested isolates. This is similar to studies carried out in (1996) at Seychelles Victoria hospital [35], where Escherichia coli isolated from urine samples was (78.6%) resistance to Ampicillin and Amoxyccilin.

This is contrary to Ophori et al.[20], where Ciprofloxacin and Cotrimoxazole were effective against most isolates and Samuel et al.[22], where Nitrofurantoin, Nalidixic acid and Gentamycin were drugs of choice. The emergence of antimicrobial resistance is primarily due to excessive and often unnecessary use of antibiotics in humans and animals [36-38]. In Ethiopia, isolates from the cerebrospinal fluids (csf) as well as urinary pathogens have demonstrated multi-drug resistance [39,40].

Also, it is a known fact in African population that self medication with antibiotics led to drug resistance [41,42].

**CONCLUSION**

The high incidence of ASB of 43.3% uropathogen in this study is of public health importance. The predominant uropathogen was Escherichia coli and the level of its resistance to antibiotics is of great concern.

Therefore, authors recommend improve personal hygiene to reduce ASB that may be complicated with UTI. We recommend that culture and sensitivity should be included in the treatment of DM. Also, use of unprescribe antibiotics and their abuse is a public problem.

So, appropriate public health programs would help to resolve these challenges.

**REFERENCES**


