Prevalence of Urinary Tract Infection among Age Groups in Bauchi Metropolis, Nigeria

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Abstract: Urinary Tract Infection (UTI) is a common pathogenic inflammatory, distressing and occasionally life-threatening condition that affects people of all ages and gender. The research was conducted from month of May-August, out of the 236 samples analyzed, 120(50.8%) showed significant bacteriuria. Highest infection rate, 12(29.3%) and 28(35.4%) falls at age group of 21-30 years in males and females respectively, while those of age group ≥71 years had the lowest 0(0.0%) and 1(1.3%) infection rate in both gender. This shows that age group of 21-30 years are at the peak of infection and females are at highest rate of infection.

Keywords: UTI, males and females

1. Introduction

The urinary tract comprises the kidney, ureters, bladder and urethra; it is the body’s filtering system for removing waste liquid, or urine (Ramadan, 2013). A urinary tract infection (UTIs) is defined as the presence of microbial pathogens in the urinary tract with associated symptoms. When it affects the lower urinary tract, it is known as cystitis and when it affects the upper urinary tract it is known as pyelonephritis i.e. affecting the kidney (Ramesh and Aggarwal, 2012). Urinary tract infections (UTIs) is one of the most common infectious disease in humans Mohamad et al. (2010) that occur in both community and hospital environments. They are the most common type of nosocomial infections (Sharifietal., 2013). Several different microorganisms have been known to cause urinary tract infection; these include those of normal flora of the skin, genital areas, anus and those from exogenous sources that may be contacted through bad sanitary habits especially of under wear’s (Nicolle, 2008). Some of the risk factors of UTIs include gender, sexual activity, immune system disorder, urinary tract anatomical malformations, disruption of normal flora of the genital area with antiseptics and antibiotics, urinary catheter and instrumentation (Foxman, 2003; Gould et al., 2010).

Gram negative bacteria have been found most frequently in UTIs cases by several investigators with E. coli and Klebsiellapneumoniae being the most predominant organisms (Obiogbolu et al., 2009) others include; Proteus mirabilis, E. faecalis S. saprophytics, P. aeruginosa, Serratia and Acinetobacter. According to Manikandan et al. (2011), E. coli is the most prevalent cause accounting for greater than 80-95% of bacterial UTIs and appears to be a true community pathogen

Depending on age, symptoms of UTIs include; fever, burning and painful urination, nausea, vomiting, dysuria, urgency, frequency, abdominal or lower back pain, weakness, and dark bloody, cloudy or bad smelling urine (Mandell et al., 2005). The pathogenesis of UTIs involves complex interaction between an organism, environment and the potential host (Ouno et al., 2013). For women, the lifetime risk of having a UTI is greater than 50 per cent (Kumar et al., 2012). John (2015) reported that UTIs are rare in adult males younger than 50 years but increase in incidence thereafter.

UTIs are a major cause of hospital admissions and are associated with significant morbidity and health care costs. It causes serious health problem and affecting a million of people over the world (Barisic et al., 2003).

A urinary tract infection is an old problem that continues to present new challenges due to change in the etiology of UTI and the antimicrobial susceptibility of urinary pathogens over the years (Iroha et al., 2009).

The objective is to find out the bacteria responsible for urinary tract infection and the prevalence according to gender.

2. Materials and Methods

The study area for the collection of sample include; Abubakar Tafawa Balewa University Teaching Hospital (ATBUTH), Bauchi Specialist Hospital, Primary Health Care TanshenBabiye Hospital, Bauchi State. A total of 236 midstream urine samples were obtained from males (101) and females (135) patients with symptoms of urinary tract infection between month of May-August. All urine samples were collected from each patient into a 20ml calibrated sterile screw- capped universal containers, patients were informed to provide clean catch midstream urine which gives a true representation of what is contained in the bladder. At the point of collection, samples were labeled with name, sex and age of the patients, the samples were processed immediately at the laboratory, but in cases of delay, the urine samples were refrigerated at 4°C to avoid multiplication of bacteria (Rushita et al., 2016).

Samples were observed macroscopically for colour, blood tinge and turbidity. Using a sterile wire loop, a loopful of well mixed uncentrifuged urine were aseptically inoculated onto Cysteine Lactose Electrolyte Deficient Agar by streak method with the aid of sterile wire loop. To obtain pure isolates, discrete colonies of growth isolated from the primary media were inoculated on well dried MacConkey Agar plates. The plates were incubated at 37°C overnight.
(Iraj and Nilufar, 2010), and subcultured on slants for subsequent identification.

After overnight incubation, colonies were identified based on colonial morphology and biochemical characteristics. Colonies were observed for morphological features such as size, shape, edge consistency, margin, colour, opacity and effect on media i.e. lactose or non-lactose fermenters (Ezeigbo et al., 2016). In addition to these morphological features of the colonies, motility, Gram staining reaction, and biochemical tests were used in characterizing the isolates. The identified bacterial isolates were maintained on nutrient agar slants.

Ethical clearance
This was duly obtained from the hospital management. The ethical approval was granted by West African Bioethics research programme, Abubakar Tafawa Balewa University Teaching Hospital, Ministry of Health Bauchi State Government Ethical Steering Committee.

Selection criteria
All patients both in patients and out patients with symptoms of urinary tract infection were included in the study

Sample Size Determination
Using the formula \( n = \frac{(Z)^2 \times p(1-p)}{d^2} \) (Naing et al., 2006)

Where;
- \( n \) = Desired sample size
- \( Z \) = 1.96 (The standard normal deviate, corresponds to the 95% confidence level).
- \( p \) = Prevalence based on previous studies 19% (Iregbu and Nwajiobi-Princeswell, 2013).
- \( d \) = Degree of accuracy

Therefore \( n = \frac{(1.96)^2 \times 0.19 (0.19-1)}{(0.05)^2} \)
\( n = \frac{3.8416x0.1539}{0.0025} \)
\( n = 0.59122 \)
\( n = 0.0025 \)

Sample size = 236 specimen of urine

Data Analysis
The data obtained was analyzed by Chi-square and ANOVA using Statistical Package for Social Science (SPSS) version 22.0.

3. Results and Discussion

Bacterial Isolates Obtained from Urine Sample
The Table 1 shows that, out of the 236 urine samples analyzed in the study, 120 representing (50.8%) were positive for bacteria growth. Six different uropathogens, were isolated with E. coli having the highest frequency of occurrence of 60(50.0%), followed by Klebsiella pneumoniae 28(23.3%), Staphylococcus saprophyticus 12(10.0%), Staphylococcus aureus 9(7.5%), Proteus mirabilis 9(7.5%), Pseudomonas aeruginosa had the least frequency of occurrence 2(1.7%).

Characterization of Bacterial Isolates from Urine Sample
The isolates were subjected to biochemical reactions which include catalase, coagulase, indole, urease, citrate utilization test, triple sugar iron test, motility test and gram staining reactions. Out of the isolates characterized 4 were gram negative bacteria and 2 were gram positive bacteria. (Table 2).

Age and Sex Distribution of the Patients Involved in the Study
Females within the age range of 21-30 years have the highest prevalence rate of 35.4%, followed by 31-40 years (24.1%), 41-50 years (16.5%), while above 70 years of age showed the lowest (2.5%). Among the male patients, 21-30 years showed the highest prevalence rate of 35.4%, followed by 31-40 years (29.5%), 41-50 years (21.9%), while above 70 years of age showed the lowest (2.4%) as indicated in table 3.

Table 1: Bacterial Isolates Obtained from Urine Sample (n=236)

<table>
<thead>
<tr>
<th>Organism Isolated</th>
<th>Frequency of occurrence</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>60</td>
<td>50.0</td>
</tr>
<tr>
<td>K. pneumoniae</td>
<td>28</td>
<td>23.3</td>
</tr>
<tr>
<td>S. saprophyticus</td>
<td>12</td>
<td>10.0</td>
</tr>
<tr>
<td>S. aureus</td>
<td>9</td>
<td>7.5</td>
</tr>
<tr>
<td>P. mirabilis</td>
<td>9</td>
<td>7.5</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100</td>
</tr>
</tbody>
</table>

(P< 0.05)

Table 2: Characterization of Bacterial Isolates from Urine Sample

<table>
<thead>
<tr>
<th>Colony morph Inference</th>
<th>Biochemical Reaction</th>
<th>Gram reaction</th>
<th>Catalase</th>
<th>Coagulase</th>
<th>Indole</th>
<th>Oxidase</th>
<th>TS</th>
<th>Motility</th>
<th>Urease</th>
<th>Citrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinkish shiny slightly E. coli raised lactose fermenter</td>
<td>GNR</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Whitish raised round colonies S. aureus</td>
<td>GPC</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Flat mucoid lactose K. pneumoniae colonies</td>
<td>GNR</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Tiny colonies of non P. aeruginosa lactose fermenter</td>
<td>GNR</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Swampy like colony P. Mirabilis</td>
<td>GNR</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Opaque circular colonies</td>
<td>GPC</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Key: += positive, -= negative, GPC= gram positive cocci, GNR=gram negative rod.
bacilli which are normal flora of the intestinal tract.

more than 85% of cases of UTIs are the Gram

sanitary quality. This conforms to the report of Anyamene

which are index organisms of safety, good hygiene, and

The isolated pathogens in this study mostly are coliforms

usually originate from normal microbial flora, the outer

species to be more prevalent than

findings of Omonigho

with higher frequency of occurrence than

main culprits responsible for the UTI (Hassan

study were

60(50%) in occurrence followed by

In patients with UTI (Onifade

Pseudomonas aeruginosa

(23.3%),

these study a

K.pneumoniae, S.saprophyticus, S.aureus, Proteus mirabilis,

bacteria genera were isolated and these include;

urine samples were contaminated with bacteria, of which six

K.pneumoniae

E. coli

Kliebsiella pneumoniae

Phaeura

Klebsiellapneumoniae

Phaeura

Pseudomonas aeruginosa

These findings are in accordance

in geographical locations and orientation of the people in the


the most common bacteria isolated (Table 1) were similar to

report by Kolawole et al. (2009); Obiogbolu et al., 2009;

Shanti and Kayathri, 2012, but at variance to a report by Sabrina et al. (2010) where they isolated Enterococcus

species in addition to the bacteria isolated in the present

study. The most common bacteria responsible for UTI in

these study are E. coli (50.0%), Klebsiellapneumoniae

(23.3%), Staphylococcus saprophyticus (10.0%),

Staphylococcus Phaeura (7.5%), Proteus mirabilis (7.5%),

Pseudomonas aeruginosa (1.7%).This findings is similar to

other reports which indicated that Gram negative bacteria

particularly E.colis the most implicating pathogen isolated

in patients with UTI (Onifade et al. 2005; Aiyegoro et al.

2007; Mbata, 2007). E. coli was found to be highest

60(50%) in occurrence followed by K.pneumoniae 28

(23.3%). The findings of this study is similar to another study

were E.coli and K.pneumoniae were found to be the

main culprits responsible for the UTI (Hassan et al., 2011),

but at variance to a study conducted by Kozima and Gollert

(2009) who reported Staphylococcus and Proteus species

with higher frequency of occurrence than E.coli. Also the

findings of Omonigho et al., (2001) found Klebsiella

species to be more prevalent than E.coli. These organisms

usually originate from normal microbial flora, the outer

genital and periuretheral bacterial flora usually reflect the

gut flora (Geoffrey et al., 2013).

The isolated pathogens in this study mostly are coliforms

which are index organisms of safety, good hygiene, and

sanitary quality. This conforms to the report of Anyamene

et al. (2002) that the dominant etiologic agent accounting

for more than 85% of cases of UTIs are the Gram-negative

bacilli which are normal flora of the intestinal tract.

Table 3 revealed that the incidence of bacterial pathogens

was highest among the females (35.4%) than males (29.3%).

This is in agreement with other reports which stressed that

UTI is more frequent in females than in males, during youth

and adulthood (Asinobi et al., 2003; Mbata, 2007) which

could be attributed to the proximity between the genital

tracts, urethra and anus which perhaps facilitates auto

transmission as suggested by Audu and Kudi (2004);


moist environment of the female perineum could also

favour microbial growth and bladder contamination.

Secondly, Females mostly remain indoor and have less

access to primary health care. Hence, some women do not

usually report to the hospital till their condition becomes

serious, they prefer treating themselves with homeopathic

remedies.

5. Limitation

Difficulty in educating some of the patients on urinary tract

infection

References


