



PREVALENCE OF URINARY TRACT INFECTION AMONG PRIMARY SCHOOL CHILDREN IN MAIDUGURI, BORNO STATE, NIGERIA

M. A. ISA*, H. Y. Ismail., I. A. Allamin., A. Shettima and A. Mustapha
Dept of Microbiology, University of Maiduguri, P. M. B. 1069, Borno State

*Corresponding Author: mustafaalhaziisa@gmail.com

Abstract

The prevalence of urinary tract infection (UTI) among children attending primary schools in Maiduguri was investigated in this study. The study was carried out between January and April 2011 among apparently healthy pupils. One hundred and twenty (120) clean-catch urine samples were obtained from the pupils using standard procedures. Microbial culture on Cystein Lactose Electrolyte Deficient (CLED) ager and subsequent Biochemical tests revealed 31.7% of the samples with significant bacterial growth ($\geq 10^5$ CFU/ml). Among the identified organisms *Escherichia coli* were more prevalent (8.3%) among the identified organisms, while *Proteus* and *Klebsiella* species were less prevalent (1.6% each). Other species that were identified include *Staphylococcus aureus* (6.7%), *Streptococcus faecalis* (4.2%), *Staphylococcus saprophyticus* (3.3%) and *Corynebacterium* species (5.8%). Urinalysis to detect haematuria as presumptive test for UTI was insignificant ($P > 0.05$). Only 2 (out of 5) samples showed bacteriuria in culture plates. Association of gender, previous history of UTI, bedwetting and presence of blood in urine related prevalence were tested, only sex was strongly associated with UTI ($p < 0.05$). The incidence of UTI in females (19.5%) was higher than males (12.5%). Therefore, government needs to increase efforts toward creating awareness among the people, for effective treatment, control and prevention of the disease.

Key words: UTI, Children, Bacteria, Urine, Culture

Introduction

Urinary Tract Infection (UTI) is a serious bacterial infection causing illness in infants, and children (Raya, 2009). It is a term generally applied to variety of clinical infections ranging from asymptomatic bacteriuria to severe kidney damage and sepsis (Tanagho and Mcaninch, 2004). Urinary tract infections (UTIs) are one of the most frequent bacterial infections in children (Moses *et al.*, 2012). UTIs have been reported to be the most commonly encountered bacterial infections that pose a health threat to infants and children (Eltigani and Amira, 2009). Several authors defined UTI, but all the definition fall along one line, that is UTI is described as significant growth of organisms of single species in the urine, accompanied with symptoms (Reddy, 2006). Significant bacteriuria is growth with colony count of $\geq 100,000$ CFU/mL of clean catch midstream urine (Brian and Sarah 2005). The

prevalence is age and gender dependent (Nadi, *et al.*, 2006). Living condition has also been recognized to play an important role (Heffner and Gorelick, 2008). Every about 150 million cases of UTI have been reported worldwide in 2001 (Stamm and Norrby, 2001). Incidence in children however is difficult to estimate, particularly because young children with UTI may only have non-specific symptoms or signs, such as fever (Nadi, *et al.*, 2006). The disease situation is commonly identified by fever, vomiting, pyuria, haematouria, pain sensation, and neonatal jaundice. Different symptoms and signs may be observed among different age groups (Reddy, 2006). In Nigeria, apart from the infections of the upper respiratory tract, UTI are the most important clinical abnormalities for which medical intervention is sought (Ejaz *et al.*, 2006). It is acquired mainly through ascending hematogenous route especially in neonates (Raya, 2009). The ascending infections are as a result of colonization of bacteria present in the gastrointestinal tract. The colonization is attributed to disturbance of normal flora by prolonged administration of antibiotics or transient organisms emerging from the environment or medical instruments such as invasive catheter. Lymphatic route of UTI is however speculated (Reddy, 2006). Risk factors associated with UTI are anatomical and physiological. Any anatomical or physiological abnormality of the urinary tract that impedes urinary flow can increase the host susceptibility (Tanagho and Mcaninch, 2004). Others may include age, race, gender, genetic and sexual activities in teenage girls and circumcision in boys. Nocturnal enuresis and some unhealthy condition have also been indicated (Heffner and Gorelick, 2008).

Similarly occurrence of UTI in adult has also been reported. Aiyegoro *et al.* (2007) showed that 36% of 301 patients (comprising children and adolescence) studied for UTI were positive. Moreover, Obiogbolu and Okonko, (2009) reported the bacteriological etiology and incidence of UTI among pregnant women in Akwa metropolis, south eastern Nigeria. Elderly individual also develop UTI due to decrease in activity of immune system (Akinduti *et al.*, 2009). Irrespective of the age, the incidence and susceptibility in females are always higher than in their male counterparts (Reddy, 2006; Akinduti *et al.*, 2009; Raya, 2009). This may be linked to the proximity of the urinary tract in females to the external environment compared to that of males. In males however, circumcised individuals show lower vulnerability than uncircumcised (Watson *et al.*, 2004). The etiology of UTI is made up of several organisms. Bacteria, viruses, protozoa and fungi are known to cause UTI. Most infections however are caused by facultative anaerobes of the enterobacteria group (Bagga and Sharma, 2000). *E coli* has been considered as a prominent urinary tract pathogen (Gafencu *et al.*, 2007; Younis *et al.*, 2010; Jombo *et al.*, 2010; Obiogbolu *et al.*, 2009). Other species include *Klebsiella*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Acinetobacter* and *Serratia* species (Jombo *et al.*, 2010; Bay and Amdeto, 2010; Akinduti *et al.*, 2008). The common gram positive species are *Staphylococcus* and Beta hemolytic *Streptococci* (Aiyegoro *et al.*, 2007). Other species like *Candida albicans* that originate from vagina or perianal skin can cause UTI in women (Reddy *et al.*, 2006).

Treatment of UTI depends on the age of the child, location of the infection, etiology of the disease, degree of illness in the child, efficacy of antibiotic and resistance profile within the community (Romolo *et al.*, 2005). The prognosis of UTI is usually favorable, but it relies on timely administration of appropriate treatment (Elder, 2004). Despite the advances in diagnosis and prophylaxis of infections, many incidence of UTI may remain unnoticed due

to mild or asymptomatic manifestation. That is why treatment of identified cases of bacteriuria in all young children is advised in addition to preventing permanent renal scarring due to reflux (Reddy, 2006).

This study aimed to identify the presence of unnoticed UTI among apparently healthy patients in among primary school children. This is with a view to providing information that is lacking or unavailable in the literature from the sampled population.

Material and Method

The study was carried out in Maiduguri Metropolis, between January and April, 2011. The study area is the capital of Borno State, northeastern Nigeria. Children that are apparently healthy and attending primary school (5- 14years) were selected for this study. Five primary schools were selected, from which a total of 120 samples were obtained. Equal numbers of samples were collected from both males and females. Pupils who participated in the study were selected at random, twenty four (24) from each primary school. The inclusion criterion was children attending primary schools only, while the exclusion criteria were children below or above primary school age and those that had recently used antibiotics.

Questionnaire

A questionnaire was used to generate some data for this study. Questionnaires were sent to parent or guardian of all the participating children. The key area addressed in the questionnaire was recent use of antibiotics, nocturnal enuresis (bedwetting) and previous history of UTI.

Sample collection

Urine samples were collected by the most recommended method of urine sampling in children above the age of three (Welsh, 2007). After collection, the clean catch mid-stream urine sample in sterile containers was transported immediately to the laboratory for analysis. Samples were stored in refrigerator at 4- 8⁰C in an event of delay (Welsh, 2007).

Urinalysis

Analysis of urine samples was conducted using multi stick of Medi- Test Combi 9[®] SGL - a form of dipstick screening technique to determine the presence of blood in urine.

Microbiological analysis

Each sample was cultured on Cystein Lactose Electrolyte Deficient (CLED) agar and Blood agar as described by Vandepitte *et al.* (2003) and Cheesbrough (2002). Incubation was carried out for 24 hours at 37⁰C. Enumeration of colonies was carried out as describe by (Olutiola *et al.*, 1991). Cultures with 10⁵ CFU/ml were considered significant (Younis *et al.*, 2010). Biochemical tests to identify individual organism were conducted from plates with positive result as described by Presscott (2002) and Cheesbrough (2002).

Statistical analysis

The data was subjected to statistical analysis using statistical package (R version 2.13.1) to determine any significant relationship between infection rates, age, gender, history of previous UTI and bedwetting. The Pearson chi- square test was employed to determine the relationships between the demographic data and clinical information with UTI and P value < 0.05 was considered significant at 95% confidence interval.

Results

Out of the 120 samples analyzed, only 38(31.7%) were positive for urine culture. Among the 38 positive samples, 23(19.2%) were females and 15(12.5%) were males as

shown in Table 1. The result of this study revealed that 60.5% of the pupils with bacteriuria are females, while the remaining 39.5% pupils are males. The presence of blood in urine yielded only 5 positive samples and bacterial culture were positive in two cases only. More so, Urinalysis to detect haematuria showed only 4.2% (n=120) cases. The information obtained from the parents or guardian revealed that 13(10.8%) pupils were found to be bedwetting and 5(4.2%) had UTI previously as shown in Table 1. All the positive cultures were shown to have at least 10^5 CFU/mL of the urine sample. Gram stain revealed distinctly gram positive and gram negative organisms. Upon biochemical tests, the organisms were identified to species level as shown in the table 2 below. The prevalence of gram positive bacteria 24(63%) were higher than gram negative bacteria 14(36.8%). *E coli* has the highest occurrence (26.3%) compared to *Proteus* or *Klebsiella* species (5.3%).

Table 1: Incidence of UTI in relation to risk factor distribution of primary school children

Risk factor	Total	Positive	Positive (%)	P- Value
Sex				
Male	60	15	25	0.014
Female	60	23	38.3	
Bedwetting				
Yes	13	5	38.5	0.809
No	107	33	30.8	
Previous history of UTI				
Yes	5	3	60	0.368
No	115	35	33.3	
Presence of blood in urine				
Yes	5	2	40	0.935
No	115	36	31.3	
Total	120	38	31.7	

Table 2: Bacterial species isolated and identified from urine culture.

Organism identified	Colony count (CFU/mL) X10 ⁵	Occurrence	Percentage (%)
<i>Staphylococcus aureus</i>	25	8	21.0
<i>Streptococcus faecalis</i>	1.3	5	13.2
<i>Staphylococcus saprophyticus</i>	17	4	10.5
<i>Corynebacterium</i> species	2.1	7	18.4
<i>E. coli</i>	2.7	10	26.3
<i>Proteus</i> species	3.2	2	5.3
<i>Klebsiella</i> species	12	2	5.3

Discussion

The prevalence rate of UTI among primary school children in Maiduguri metropolis was found to be 31.7% with significant gender difference ($p < 0.05$). The result of this study

is similar to the percentage reported by Anis *et al.*, (2008) from Hazara division in Pakistan, where 37.5% of 1000 subjects were examined. In the present study, the number of male and female subjects is the same; however, the prevalence between the two genders is significant ($P < 0.05$). This showed 2: 3 male to female ratio. This is similar with the study carried out in Egypt, where 1.7% and 2.7% males and females were positive for UTI in primary school children respectively (Eltigani and Amira, 2009).

The highest occurrence of *E coli* in the urine samples is not unprecedented. Among the 38 identified isolates, 10(26.3%) were *E coli*. Many authors have indicated the organism as the prominent uropathogen in children (Watson, 2004). In Nigeria alone, most studies on UTI revealed the predominance of *E coli* in positive urine cultures (Aiyegoro *et al.*, 2007; Okonko *et al.*, 2009 and Akinduti *et al.*, 2008). *Staphylococcus aureus* is the second most occurring organism. The organism had been reported as one of the gram positive urinary tract pathogens (Anis *et al.*, 2008). Moreover, another important pathogen observed in this study is *Corynebacterium* species. It is associated mainly with acute or chronic entrusted UTI when observed in urine (Brooks *et al.*, 2010). The least organisms that occurred in the urine samples were *Proteus* and *Klebsiella* species with 5.3% each. Although recorded in few instances, their presence is of concern. However, the microbial culture revealed only two cases with bacteriuria. Five (5) out of thirteen (13) of those pupils reported for bed wetting have significant bacteriuria. Conversely, the association between UTI and previous history of UTI was insignificant ($P > 0.05$) as shown in Table 1. Although apparently healthy subjects were involved in this study, the presence of these Uropathogen is not surprising. This is due to the fact that many UTI lack overt clinical features thus, may remain unnoticed or cause febrile illness only. However, the detected cases of Haematuria with negative cultures may be attributed to nonbacterial cause or rather noninfectious urinary tract diseases. This is obvious due to the fact that; parasites especially the Schistomes are commonly associated with consistent bloody urine (IAMAT, 2010) and obstruction of bladder leading to secondary bacterial infection (Brooks *et al.*, 2010). Therefore, due to high temperature in the area (41°C) and limited supply of potable water, the incidences may be linked to living conditions or nonbacterial causes.

Thus, it is recommended that medical practitioners intensify efforts to unravel the degree of incidence of UTI in Nigerian population, with a view to prevent serious complications that may be debilitating or lethal. This however can only be achieved with support from local, federal and non-governmental organizations. Further research is also important for the identification of other causes or factors that influence the prevalence of UTI in children.

Conclusion

This study revealed the prevalence of UTI in children attending primary school. The frequency is however alarming considering the fact that, apparently healthy subjects were used in the study rather than those with clinical manifestations. The work elucidated the danger of asymptomatic prevalence and the need for parent/ guardian to carefully monitor the health status of their children/wards. It also supported the mono microbial nature of UTI, similar to those mentioned elsewhere.

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