

Relationship between Enuresis and Asymptomatic Bacteriuria among Children in Ikot Ene Community, Akpabuyo, Cross River State, Nigeria

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Abstract

Background: Enuresis is the involuntary leakage of urine common in children which could sometimes be due to bladder dysfunction. This condition could occur along with other medical conditions especially urinary tract infections which a lot of times are asymptomatic.

Objective: The study was accomplished to establish the relationship between enuresis and ASB among children in Ikot Ene, a town in Cross River State's Akpabuyo Local Government Area.

Method: Sociodemographic information and history of enuresis were obtained from 400 children using a well-structured questionnaire. Urine samples were collected from the participants for microscopy and urine culture.

Results: Enuresis was found to be present in 3.5% (14/400) of the participants in this investigation while asymptomatic bacteriuria was 4.5% (18/400). Those with enuresis and asymptomatic bacteriuria were 42% (6/14) while those without enuresis but with asymptomatic bacteriuria were 3.1% (12/386). There was a statistical significant difference between asymptomatic bacteriuria and enuresis ($P < 0.00001$). *Staphylococcus aureus* with 44.4% (8/18) was the most occurring microorganism while and *Proteus mirabilis* with 11.1% (2/18) was the least occurring.

Conclusion: In the Ikot Ene Community, the prevalence of ASB among schoolchildren was 4.5 percent (18/400) while enuresis was 3.5% (14/400). There was a strong relationship between ASB and enuresis. *Staphylococcus aureus* was the most common bacteria found in patients with asymptomatic bacteriuria. It is suggested that strategies for minimizing enuresis, as well as detecting and treating ASB in children, be supported.

Keywords: Enuresis, asymptomatic bacteriuria, Ikot Ene Community

Introduction

Enuresis also referred to as urinary incontinence or bedwetting is defined as an involuntary leakage of urine which is common among children from the age of 5 years due to the ability of those under this age to control their bladders. Its incidence rises by age ^[1, 2] with 10% of children under 7-yr-old; 5% of those under 10-yr-olds with; and More than three times each week, 0.5-1 percent of adults are impacted. The majority of those afflicted are boys. ^[3-6]. "The rate of spontaneous resolution is about 15% each year" ^[5, 6] although 2-3% of children have symptoms into adulthood. "Primary enuresis is characterized by the inability to awaken from sleep in reaction to a full bladder, as well as increased nighttime urine production or reduced bladder functional capacity" ^[7]. There are other pathologies which comorbid enuresis ^[8]. "These medical conditions include asymptomatic bacteriuria (ASB), constipation, encopresis, urinary tract infection (UTI), suprapubic aches, vesicoureteral reflux, neuropsychiatric disorders, learning disabilities and learning disorders, neuropsychiatric disorders, learning disabilities and learning disorders" ^[2]. "A large proportion of 15-20% of children with secondary nocturnal enuresis have bladder infections" ^[9]. Infections of the urinary tract are especially prevalent in children with chronic illnesses and long-term consequences in all childhood age groups particularly in the tropics and subtropics ^[10-13].

Urinary tract infection in children could be asymptomatic and it is referred to as ASB. Symptomatic bacteriuria is often vague and non-specific, making diagnosis challenging ^[11, 14, 15]. While ASB was found in a small percentage of toddlers and infants, the incidence increases as age increases. Irrespective of the age. "The incidence of ASB is higher in females than in males, with *Escherichia coli* being the most prevalent bacterium in such instances" ^[16]. However, there is a challenge in identifying children with ASB due to a lack of systematic assessment of apparently healthy children using urine microscopy/culture, especially in places with low resources, which further confuses the necessity of timely intervention to prevent probable renal damage ^[18]. Urinary incontinence is an under-diagnosed and not frequently reported health challenge that increases with age ^[19]. This study was accomplished to establish the relationship between enuresis and ASB, among children in Ikot Ene, a town in Cross River State's Akpabuyo Local Government Area.

Materials and Methods

Study Area

Ikot Ene, a town in Cross River State's Akpabuyo Local Government Area, Nigeria was study place. The Local Government Area is located at longitude 4.86°N and latitude 8.33°E. With a land mass of 1241km², Akpabuyo Local

Government Area has a population of 271 395 people as at 2006 census.

Study Design

A cross-sectional study of 400 children was done in the Ikot Ene, a town in Cross River State's Akpabuyo Local Government Area, Nigeria. All the children who resided in Ikot Ene Community were included in the study. Children who did not reside in Ikot Ene Community; those who showed symptoms of UTI; those who were on specific antibiotics 2 weeks preceding sample collections; Those whose parents refused to consent were also eliminated from the study. Parents/guardians were given a questionnaire to assess sociodemographic characteristics such as age, sex, education level, and enuresis history from the participants.

Ethical Consideration

The Cross River State Health Research Ethics Committee of the Cross River State Ministry of Health in Nigeria was contacted and provided with this information. The parents of the youngsters also completed a written consent form.

Samples Collection

Participants' mid-stream urine samples were taken in the early morning, placed in a sterile, sealed universal container, tagged, and brought to the lab for examination.

Laboratory Analysis of Samples

Color, aroma, and clarity of the urine samples were analysed macroscopically in the laboratory. As detailed by Cheesbrough, the samples were studied and inspected microscopically using the 10X and 40X objectives, with the condenser iris closed sufficiently to provide adequate contrast for white blood cells, red blood cells, microbial detritus, and casts. [20].

With a sterile calibrated wire loop, the samples were cultured aerobically onto cysteine lactose electrolyte deficient (CLED) agar incubated at 37°C for 24 hours and onto chocolate agar with modification in the growth condition using Plates were assessed every 24 hours for confirmation of fastidious bacteria after being exposed to 7% carbon dioxide for five days at 37°C. "The number of colonies counted on each plate was multiplied by a factor of 100 to estimate the colony forming units (CFU) per milliliter of urine, and significant bacteriuria was taken as 10⁵CFU/ml" [21].

Bacterial identification was accomplished using a variety of techniques, including colony appearance, Gram staining, and basic biochemical procedures. Triple sugar iron, oxidase, coagulase, urease, and indole assays were among the biochemical procedures used. "To distinguish between Gram positive and Gram negative bacteria, Gram staining was utilized" [20].

Statistical Analysis

Data obtained were analyzed using Statistical Package for

Social Science (SPSS) version 20 manufactured by International Business Machines (IBM Corp, Armonk, New York). Proportion was used for categorical variables.

Results

The distribution of participants according to the occurrence of infection and their sociodemographic characteristics (Table 1) shows that the majority of the 400 participants in this study were between the ages of 9 and 12 at 37.5% (150/400); 17.5% (70/400) were between the ages of 9-12 years, 30.0% (120/400) were between the ages of 13-16 years while 15.0 percent (60/400) of the participants were between the ages of 17 and 20 years. The vast majority of the attendees were females with 61.0% (244/400) while 31.86% (128/400) were males. Most of the participants of 57.5% (230/400) were in primary classes, 32.0% (128/400) were in nursery classes while 10.5% (42/400) were in secondary classes.

Out of the 400 participants in this study, 4.5% (18/400) participants were infected. Those between the ages of 17-20 years had the most proportion of urinary infection at 10% (6/60) while those between the ages of 9-12 years had the least proportion of urinary infection at 1.3% (2/150). The rate of urinary infection occurrence in males at 3.8% (6/156) was lower than 4.9% (12/244) in females. Most infection rate was among those in secondary classes at 16.7% (7/42) while the least rate of infection was among those in nursery classes at 3.1% (4/128).

The distribution of participants according to the occurrence of enuresis and their sociodemographic characteristics (Table 2) reveals that 3.5% (14/400) of the participants presented with enuresis. All the participants with enuresis were between the ages of 5-8 years at 20.0% (14/70). The males had more occurrence of enuresis at 5.1% (8/156) than the females at 2.4% (6/244). Those in the nursery classes accounted for the most enuresis rate at 6.3% (8/128) followed by those in the primary classes at 2.6% (6/230). Those in the secondary classes did not have enuresis.

Among the participants who presented with enuresis (Table 3), 42% (6/14) of the participants with enuresis were infected while 3.1% (12/386) of those without enuresis had urinary infections. The difference between urinary infections and enuresis in this study as statistically significant ($\chi^2=49.6681$, $P<0.00001$ at $df=1$).

All the isolates in this study were Gram negative organisms except *Staphylococcus aureus* (Table 4). Their proportions were 44.4% (8/18) for *Staphylococcus aureus*, 11.1% (2/18) for *Proteus mirabilis* and 22.2% (4/18) for *Escherichia coli* (22.2%) and *Pseudomonas aeruginosa* respectively.

Table 1: Distribution of participants according to the occurrence of infection and their sociodemographic characteristics

Variables	No. (%) examined (N=400)	No. (%) with infection (n=18)	Without infection (n=382)
Age			
5-8	70 (17.5)	6 (8.6)	64 (91.4)
9-12	150 (37.5)	2 (1.3)	148 (98.7)
13-16	120 (30.0)	4 (3.3)	116 (96.7)
17-20	60 (15.0)	6 (10.0)	54 (90.0)
Gender			
Male	156 (39.0)	6 (3.8)	150 (76.2)

Female	244 (61.0)	12 (4.9)	232 (95.1)
Education status			
Nursery	128 (32.0)	4 (3.1)	118 (92.2)
Primary	230 (57.5)	7 (3.0)	223 (97.0)
Secondary	42 (10.5)	7 (16.7)	40 (95.2)

Table 2: Distribution of participants according to the occurrence of enuresis and their sociodemographic characteristics

Variables	No. examined	No. (%) with enuresis (n=14)	No. (%) without enuresis (n=386)
Age			
5-8	70 (17.5)	14 (20.0)	56 (80.0)
9-12	150 (37.5)	0 (0)	150 (100)
13-16	120 (30.0)	0 (0)	120 (100)
17-20	60 (15.0)	0 (0)	60 (100)
Gender			
Male	156 (39.0)	8 (5.1)	144 (92.3)
Female	244 (61.0)	6 (2.4)	238 (97.5)
Education status			
Nursery	128 (32.0)	8 (6.3)	120 (93.8)
Primary	230 (57.5)	6 (2.6)	224 (97.4)
Secondary	42 (10.5)	0 (0)	42 (100.0)

Table 3: Occurrence enuresis and urinary infections among the participants

Attributes	No. (%) examined	Infections	Without infections	Statistics
Enuresis				
Present	14 (3.5)	6 (42.9)	8 (57.1)	$\chi^2=49.6681,$
Absent	386 (96.5)	12 (3.1)	374 (96.9)	$P=<0.00001$ at $df=1$
Total	400	18 (4.5)	382 (95.5)	

Table 4: Occurrence of bacterial pathogens in the study population (n=18)

Bacteria	Frequency of occurrence
<i>Staphylococcus aureus</i>	8 (44.4)
<i>Escherichia coli</i>	4 (22.2)
<i>Proteus spp.</i>	2 (11.1)
<i>Pseudomonas aeruginosa</i>	4 (22.2)
Total	18

Discussion

Bacteriuria is established when species of bacteria specific for UTI colonize the urinary system. Different bacteria known to infect and cause ASB have been researched to vastly accelerate the spread of multi-drug resistant bacteria [21, 22]. The prevalence of ASB in this study was 4.5%. This was in contrast to the 4% reported among university students in Nigeria [23], 10.7% reported among children with diabetes in Iran [24], 75.2% reported among outpatients in France [25] and 6% reported among the same study group in Egypt [26]. The difference on the prevalence could have been multifactorial which include age, gender, comorbidity and the study settings.

The rate of infections of 10.0% was more among those between the ages of 17-20 years. According to Kumar [27], Due to unprotected sexual activity, mixed flora colonisation of the urinary tract may be more widespread in the teenage age range. The rate of infections among females (4.9%) in this study was higher than that of the males (3.8%). This was in

accordance with the findings from prior studies in Egypt, Nigeria and Nepal respectively [27-29]. This high rate of infections among girls in relation to boys may have been due to the nature of the female reproductive system which makes them prone to infections. Those in the secondary classes recorded the highest rate of infection. This is similar to Dada *et al* [30] study, which found that the outcomes recorded in elementary and secondary school students were much higher in secondary school students. It's possible that this was caused by sexual contacts among the participants, as well as other illnesses caused by poor cleanliness.

In this study, the prevalence of enuresis is 3.5%, which was lower than that of Alshahrani *et al.*, Linde *et al.*, Mohammadi *et al.*, Huang *et al.*, Bilal *et al.* and Alhifthy *et al.* [31-36]. Medical, psychological, socioeconomic, cultural, and racial related factors could affect the Variations in enuresis's prevalence.

Most enuresis of 20.0% in this study was predominantly among those between the ages of 5-8 years in nursery classes and had decreased as ages increased. Because the central nervous system of a child matures with age, neural pathways can better control urination, manage urine storage and outflow at night, and help in reduce the risk of enuresis [37]. This study was however inconsistent with findings of Linde *et al.* [32] who stated that enuresis did not decrease as ages increased. Boys experienced more enuresis than girls in this study. While this differed from the reports of Linde *et al.* [32] and Alhifthy *et al.*, [36] it was according to the reports of Alshahrani *et al.*, [31] Bilal *et al.* [35]. Improvements in genetic factors, parental education level, parental occupation, income and living styles could all have contributed to this [38, 39]. Infection was common among those with enuresis and was statistically significant. This was in line with the study of Iduoriyekemwen *et al.* [40] who had made a report more infections among those with enuresis though the difference between enuresis and the infection was not statistically significant.

In this study, *Staphylococcus aureus* had the highest frequency of occurrence at 44.4% (8/18). This was alike to the findings of Saud *et al.* [29] and Chime *et al.* [41] who declared that "*Staphylococcus aureus* was the most prominent uropathogen and Different as compared the statement of Popoola *et al*" [42]. WHO stated that *Staphylococcus saprophyticus* and *Escherichia coli* were the most prominent isolates from children with ASB. The frequency of *Staphylococcus aureus* in this study could be due to the fact that *Staphylococcus aureus* are commensal organisms found on the skins of every human and is capable of causing opportunistic infections [43, 44].

Conclusion

In the Ikot Ene Community, the prevalence of ASB among schoolchildren was 4.5 percent while enuresis was 3.5%. There was a high infection among those who experienced enuresis and there was a strong relationship between ASB and enuresis. *Staphylococcus aureus* was the most common bacteria found in patients with asymptomatic bacteriuria. This study therefore highlights the need for surveillance on the causes of enuresis in children as well as continuous check for

ASB and it is suggested that strategies for minimizing enuresis, as well as detecting and treating ASB in children, be supported.

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