

Prevalence of Asymptomatic Bacteriuria among Nursery School Children

HU OKAFOR* BA OKORO* BC IBE** AND NU NJOKU-OBI***

Summary

OKAFOR HU, OKORO BA, IBE BC and NJOKU-OBI NU. Prevalence of Asymptomatic Bacteriuria among Nursery School Children. *Nigerian Journal of Paediatrics* 1993;20: 84. A prospective study was carried out in which mid-stream urine specimens of 800 nursery school children (391 females and 409 males), aged between two and five years, were analysed. Seventeen specimens (2.1 percent) out of the 800 had significant bacteriuria on two consecutive cultures. Fifteen (88 percent) out of the 17 were from the females, while two (12 percent) were from the males (a male : female ratio of 1:7.5). This female preponderance was consistent in all age groups. The variation with sex was found to be statistically significant ($p < 0.05$). The culture results were independent of age ($p > 0.05$). Based on the present findings, it is suggested that urine for urinalysis including culture, should be obtained from nursery school children each time they have cause to visit a health care facility.

Introduction

URINARY tract infection is a common cause of morbidity¹⁻³ and mortality⁴ in the paediatric age group; its diagnosis is often missed in children due to the fact that the clinical features are seldom overt and in most cases, not referable to the urinary tract.⁴ Previous studies⁵⁻⁷ have shown that

urinary tract infections whether symptomatic or asymptomatic, are of greater significance in childhood than in adults, as most renal scars occur after such infections within the first five years of life. It has also been noted that 20 percent of children with end-stage renal disease had pyelonephritis earlier on in life.⁸

Hendrickse,⁹ in his paper on epidemiology and prevention of renal diseases in the tropics, has emphasized the importance of urinary tract infections as a cause of renal impairment in children in the tropics. The author also observed the paucity of data on the prevalence of urinary tract infections in the developing countries, including Nigeria. It is therefore, desirable to know the magnitude of the problem in our environment. Studies¹⁰⁻¹² have been undertaken on the prevalence of asymptomatic bacteriuria in other parts of the

University of Nigeria Teaching Hospital, Enugu

Department of Paediatrics

* Lecturer

** Senior Lecturer

Department of Microbiology

*** Professor

Correspondence: HU Okafor

country, but none from this part. The purpose of the present study was therefore, to document the prevalence of asymptomatic bacteriuria in pre-school children in Enugu so as to complement earlier studies carried out on this problem in the country.

Subjects and Methods

A multi-stage random sampling method was employed. Eight hundred nursery school children were randomly selected from 14 nursery schools in Enugu. The schools were selected by systematic random sampling from a constructed frame of 31 registered nursery schools in the city. The total population of the schools was 4,560. The number of children screened from each school was proportionate to the school population. The schools selected spanned all the four municipal zones in the city, thus involving all the social classes. Questionnaires were distributed to parents of the sampled children through the school teachers and information sought included age, sex, history of bedwetting and history of fever and antibiotic treatment in the preceding two weeks. Children with a history of fever, or antibiotic treatment in the preceding two weeks, were excluded from the study. Informed verbal consent was obtained from the parents.

Mid-stream urine specimens were collected by one of the authors (HUO) into universal sterile bottles containing 1.8 percent boric acid. There was no prior cleansing of the external genitalia. Samples were transported in an insulated ice-box to the microbiology laboratory, University of Nigeria Teaching Hospital (UNTH) and were analysed within two to three hours of collection. There was prior incubation of plates before culture, to rule out contamination.

A semi-quantitative method of culture was employed, using a calibrated standard loop with internal diameter of 3mm and delivering 0.003ml of urine per loopful. The loop was sterilized over a

bunsen burner flame, then immersed in the well-mixed uncentrifuged urine specimens which was then streaked unto well-dried plates of medium, consisting of cystine, lactose and electrolyte - deficient medium, using the method described by Uqurhant and Gould.¹³ The plates were incubated at 37°C for 24 hours after which, colonies were counted, using a colony counter. Bacterial colony counts $\leq 10^4$ /ml of urine, were regarded as negative; those between 10^4 and 10^5 /ml were repeated, while those $> 10^5$ ml of urine of pure bacterial growth, on two consecutive cultures, were regarded as positive. Mixed growths $\geq 10^5$ /ml were repeated, otherwise, they were regarded as contaminants. In all positive cultures, organisms were identified by their morphology and by standard methods of Collins and Lyne.¹⁴ Sensitivity tests by the disc - diffusion method of Stokes,¹⁵ were used to determine sensitivity pattern of isolates. Statistical analysis was done, using the chi-squared test and Student's 't' test.

Results

In the present study, there were 800 subjects (409 males and 391 females), aged between two and five years (Table 1).

TABLE 1

Age and Sex Distribution of 800 Children Studied for Asymptomatic Bacteriuria.

Age (Years)	No of Subjects	Sex		Percent of Total
		Male	Female	
2	59	29(49.2)	30(50.8)	7.4
3	275	142(51.6)	133(48.4)	34.4
4	242	124(51.2)	118(48.8)	30.2
5	224	114(50.9)	110(49.1)	28.0
Total	800	409(51.1)	391(48.9)	100.0

Numbers in parenthesis represent percent of total for each age

Positive urine cultures ($\geq 10^5$ colonies/ml) numbered 19 (2.4 percent) out of the 800 specimens, while there was no growth in 776 (97.0 percent) of the specimens (Table 11). Two of these positive cultures showed a mixed growth which yielded no growth on repeated culture. Thus, there were 17 (2.1 percent) urine specimens that yielded significant bacteriuria. In three specimens that yielded between 10^4 and 10^5 colonies per ml, there was no growth on repeated culture. Specimens of urine from 15 (88.2 percent) of the 17 positive cultures, were obtained from the females and only two (11.8 percent) from the males. Thus, there was a female sex predominance which occurred consistently throughout the different age groups.

TABLE 11

Bacterial Colony Counts/ml of Urine from 800 Children.

Count	No of Specimens (Males)	No of Specimens (Females)	Total No of Specimens
$< 10^4$	1	1	2
$10^4 - 10^5$	-	3	3
$\geq 10^5$	2	17	19
No growth	406	370	776
Total	409	391	800

This difference in the sexes was highly significant ($p < 0.05$). Isolated organisms from the 17 positive cultures included *Escherichia coli* (9), *Strep faecalis* (5), *Proteus sp* (1), *Micrococcus* (1), *Staph pyogenes* (1) and mixed growth (2).

Discussion

Significant bacteriuria in the present study was regarded as $> 10^5$ colonies/ml of urine, as defined by Kass¹⁶ for clean-catch specimens. Based on this definition, the prevalence of bacteriuria, in our

series after two consecutive cultures, was 2.1 percent. This finding falls within the range of data obtained from studies undertaken in developed countries,^{2,3} but lower than some of those obtained from other parts of Nigeria^{10-12,17} Similar studies, such as the present one, have been carried out in some other parts of the country, but there are only few of these that involved exclusively pre-school children. Akinkugbe, Familusi and Akinkugbe¹¹ studied children, aged between birth and 18 months, at Ibadan and obtained prevalence rates of six percent and 24 percent among urban and rural children, respectively. In another study by Akinkugbe, Akinwolere and Oyewole,¹⁷ involving children, aged between three and 12 years, the prevalence rate obtained for asymptomatic bacteriuria was 4.7 percent. At Ife, Eliegebe¹² reported a prevalence rate of five percent in children, aged between one and five years. It is noteworthy that the prevalence of asymptomatic bacteriuria in these other studies was much higher than in the present series. However, it is pertinent to note the difficulty in comparing the results from these studies, since they were conducted on children of different age groups and some of them were based on only one culture result.

It is important to note that there is a wide variation in the prevalence rates obtained from pre-school children in most parts of the world. In the United States, Cohen¹⁸ reported a prevalence of 0.4 percent in black children, aged between birth and two years and thus concluded that the prevalence of bacteriuria was lower in these children than in their white counterparts. In Brussels, Goosens *et al*¹⁹ obtained a prevalence of 2.9 percent in children, aged between three and 36 months. Here in Nigeria, Eliegebe, Eliegebe and Amusan²⁰ at Ife, reported a prevalence of five percent for asymptomatic bacteriuria among children, aged between five and 12 years. In Kaduna, Abdurrhman, Chagra-Berty and Ochoga¹⁰ reported a prevalence of one percent in children,

aged between six and 16 years. There are no satisfactory explanations for these variations. The present study has also revealed a female sex predominance for asymptomatic bacteriuria and this finding is similar to those reported from within and outside Nigeria.^{2 10 12} The usual explanation given for this female preponderance is the short female urethra which makes it easy for the vulval flora to enter the bladder.

Based on the low prevalence obtained in the present study, nation-wide screening of all pre-school children, is not advocated, but it is suggested that urine culture from pre-school children might be valuable and therefore, should be performed each time such children visit a primary health-care centre. The reason for this suggestion is because of the known fact that urinary infection, whether symptomatic or asymptomatic, has more deleterious effects on the kidneys within the first five years of life.

Acknowledgements

We wish to thank Mr Ibechior, the senior laboratory Scientist, department of Microbiology, UNTH, Enugu, for his assistance in the analysis of the specimens, Mr Nwagbo, senior medical statistician, department of Community Medicine, UNTH, Enugu, for his advice and assistance in the statistical analysis.

References

- 1 Savage DCL, Wilson MI, Mchardy M, Dewar D A E and Fee W M. Covert bacteriuria of childhood: a clinical and epidemiological study. *Arch Dis Child* 1973; **48**:8 - 20.
- 2 Kunin CM. Epidemiology and natural history of urinary tract infection in school-age children. *Pediatr Clin North Am* 1971; **18**:509 - 27.
- 3 New castle asymptomatic bacteriuria research group; asymptomatic bacteriuria in school children in Newcastle Upon-Tyne. *Arch Dis Child* 1975; **50**: 90 - 102.
- 4 Newman CG and Pryless CV. Pyelonephritis in infants and children: autopsy experience at Boston City Hospital, 1933 - 1960. *Am J Dis Child* 1962; **104**: 215 - 29.
- 5 Asscher A W, Verrier-Jones K and Harber M J. An assessment of covert urinary tract infections. In: Asscher A W and Brumfitt W, eds. *Microbial Diseases in Nephrology*. London: John Willey and Sons Limited (Publishers) 1986: 83 - 102.
- 6 Waters W E. Prevalence of symptoms of urinary tract infections in women. *Brit J Prev Soc Med* 1969; **23**:263 - 6.
- 7 Weinberg J, Anderson H J, Bergstrom T, Jacobson B, Larsen H and Lincoln K. Epidemiology of symptomatic urinary tract infection in childhood. *Acta Paediatric Scand* 1974; **1** : Supp 252.
- 8 Scharer K. Incidence and causes of chronic renal failure in childhood. In: Cameron J S, Fries D and Ogg S, eds. *Proceedings of European Dialysis and Transplant Association*. Pitman Medical (Publishers) 1971; **8**: 211 - 4.
- 9 Hendrickse R G. Epidemiology and prevention of kidney diseases in the tropics: A symposium organized by the Royal Society for Tropical Medicine and Hygiene. *Trans Roy Soc Trop Med Hyg* 1980; **74** : 8 - 16.
- 10 Abdurrahman MB, Chagra-Berty D P and Ochoga S A. Bacteriuria and other urinary abnormalities among primary school children in Kaduna. *Nig J Paediatr*. 1978; **5**: 21 - 4.
- 11 Akinkugbe F M, Familusi J B and Akinkugbe O O. Urinary tract infection in infancy and early childhood. *E Afr Med J* 1973; **50**: 514 - 20.
- 12 Eliegbe I A. Bacteriuria in some Nigerian paediatric population. *J Trop Pediatr* 1986; **32**: 69 - 71.
- 13 Uqurhant GED and Gould JC. Simplified technique of counting bacteria in urine and other fluids. *J Clin Pathol* 1965; **18**: 180.
- 14 Collins CHT and Lyne PM. *Microbiological methods*. Laboratory technical series. Butterworths 1976.
- 15 Stokes EJ. *Clinical Bacteriology*. London: Edward Arnold 1975: 203-6.
- 16 Kass EH. Asymptomatic infections of the urinary tract. *Trans Assoc Amer Phys* 1956; **69**: 56-64.
- 17 Akinkugbe FM, Akinwolere OAO and Oyewole AIM. Asymptomatic bacteriuria and other urinary ab-

- normalities in children in Ibadan. *Nig J Paediatr* 1988; **15**: 11-7.
- 18 Cohen J. Bacteriuria in black infants. *Pediatr Infect Dis J* 1987; **12**: 1141-5.
 - 19 Goosens H, Demol P, Hall M and Butzler JP. Prevalence of asymptomatic bacteriuria and comparison between different screening methods for its detection in infants. *Eur J Epidemiol* 1985; **1**: 301-4.
 - 20 Eliegbe IA, Eliegbe I and Amusan K. Screening for urinary tract infection in asymptomatic elementary school children in Ile-Ife, Nigeria. *J Trop Pediatr*; 1982; **33**: 249-52.