

## ***The Influence of Instruction about the Method of Urine Collection and Storage on the Prevalence of Urinary Tract Infection***

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### **Summary**

**Anochic IC, Nkanginieme KEO, Eke FU. The Influence of Instruction about the Method of Urine Collection and Storage on the Prevalence of Urinary Tract Infection. Nigerian Journal of Paediatrics 2001; 28:39.** A study of 66 children, including 46 (69.7 per cent) females and aged between four weeks and 15 years with significant bacteriuria was undertaken over a four-month period to determine the effects of instructions received about the methods of urine collection and storage on the prevalence of urinary tract infection. The commonest clinical presentation was fever (65.2 per cent). Only 23 (35.1 per cent) of the patients had specific symptoms suggestive of urinary tract infection (UTI). The method of urine collection was explained to 68.2 per cent of the patients and/or their relations. This instruction was given mostly by the attending physicians (80.0 per cent). Despite the explanation, 14 (21.2 per cent) of the patients collected the urine samples wrongly and 48 (72.7 per cent) stored the samples longer than one hour. Significant bacteriuria was more prevalent in 72.7 per cent of patients who submitted their urine samples to the laboratory later than one hour after collection. There is a need for health care workers to effectively educate patients and/or their relations on the proper methods of urine collection and storage in order to reduce the frequency of making a false diagnosis of UTI with its consequent financial wastage.

### **Introduction**

URINARY tract infection (UTI) is a preventable cause of morbidity and mortality in the paediatric age group.<sup>1-5</sup> The infection is often asymptomatic or the symptoms may be so mild that insufficient attention is paid to the illness.<sup>4</sup> The prevalence rate of asymptomatic bacteriuria in Sweden was reported as being between one and three per cent from the neonatal period to school age.<sup>1</sup> In Saudi Arabia, the rate of 5.3 per cent was reported<sup>6</sup> while in Nigeria, Okafor *et al*,<sup>7</sup> found the prevalence rate of 2.1 per cent in Enugu. Akinkugbe *et al*,<sup>8</sup> reported prevalence rate of 24 per cent and six per cent among rural and urban children, respectively. Morton and Lawande<sup>9</sup> in Zaria reported a 0.4 per cent prevalence rate of symptomatic bacteriuria while Omer and El-Haj<sup>6</sup> reported a rate of 26.7 per cent in Saudi Arabia. Female sex preponderance for symptomatic

and asymptomatic bacteriuria after the age of two years has been reported from within and outside Nigeria.<sup>4,6,7</sup>

The diagnosis of UTI is based on the finding of significant bacteriuria, which is influenced by the methods of urine collection.<sup>1-4</sup> Accurate diagnosis requires careful collection of urine samples in sterile bottles, with appropriate storage and transportation to the laboratory within 30 minutes to one hour after collection.<sup>2,4,6</sup> This is important in order to ensure early antibiotic treatment and subsequent follow up of the patients. Urinary tract infections can be over-diagnosed due to contamination of urine samples during urine collection and prolonged storage without refrigeration consequent upon lack or inadequate instructions by health care workers. This will result in economic waste from unnecessary and often expensive investigations and treatment. This study was undertaken to explore the presenting complaints, the level of instruction received by patients and/or their relatives and their effects on the method of collection and storage of urine specimens in patients with significant bacteriuria

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### **Patients and Methods**

The study was carried out at the University of Port Harcourt Teaching Hospital (UPTH) between October 1999 and January 2000. The patients were consecutive children

**Table I**  
*Age and Sex Distribution of the Subjects*

Age (yrs)	Male	Female	Total	Per cent of Total	P value
>1-12 months	9(45.0)	11(55.0)	20	30.3	>0.05
>1-5 years	7(35.0)	13(65.0)	20	30.3	>0.1
>5-15 years	4(15.4)	22(84.6)	26	39.4	<0.05
Total	20(30.3)	46(69.7)	66	100.0	

Figures in parentheses represent percentages of total for each age group

aged between four weeks and 15 years that attended the paediatric clinic of UPTH in whom there was significant bacteriuria and whose parents gave consent for the study. All the urine samples were analysed in the UPTH microbiology laboratory, and the only criterion for selection was significant bacteriuria of  $10^5$  colonies/ml of a single organism isolated on culture.

A structured questionnaire was used to collect the data, and was administered by one of the authors (ICA) who completed the questionnaires except in older patients ( $\geq 10$  years) who were supervised while they filled theirs. The information obtained from the parents, guardians or older patients included age, sex, presenting complaints, methods

of urine collection, duration and places of urine storage, if instructions were given (i.e. to clean the external genitalia, collect urine midstream, store in the refrigerator and then submit to the laboratory within one hour), source of instruction and the organism(s) cultured from the urine.

The data were analysed using the chi-square test where appropriate and a probability level of  $p < 0.05$  was taken as significant

## Results

There were 66 patients (20 males and 46 females) aged two weeks to 15 years who attended UPTH during the study period with significant bacteriuria of a single organism. Female predominance was observed in all the age groups but this was only statistically significant after five years of age (Table I). The symptoms on presentation included fever (65.2 per cent), abdominal pain (27.3 per cent), dysuria (7.6 per cent), facial and leg swelling (4.5 per cent), urinary incontinence (4.5 per cent) and failure to thrive (3.0 per cent). Eight (12.1 per cent) patients had more than one symptom at presentation.

The methods of urine collection are shown in Table II. No urine specimen was obtained by suprapubic tap or urethral catheterization. Fourteen (21.2 per cent) patients collected the urine specimens wrongly (from chamber-pot or as early stream specimens). Table III shows that only 18 (27.3 per cent) patients submitted the urine samples within

**Table II**  
*Methods of Urine Collection According to the Age Groups*

Method	>1-12 Months	>1-5 Years	>5-15 Years	Total
Midstream	-	6	23	29
Clean catch	16	7	-	23
Chamber-pot or bag specimen	-	3	1	4
Early stream	4	4	2	10
Total	20	20	26	66

**Table III**  
*Duration and Places of Urine Storage*

Duration of Storage	Place of Storage					Total
	None	Table	Handbag	Vehicle	Refrigerator	
$\leq$ One hour	14	4	-	-	-	18
> One hour	-	19	20	9	-	48
Total	14	23	20	9	-	66

None = Not stored

**Table IV**  
*Relationship between Instructions and Methods of Urine Collection and Duration of Storage*

Method	Received Instruction		Total (Per cent)	$X^2$	P value
	Yes (n=45)	No (n=21)			
Urine collection					
Correct	37	15	52(78.8)	1.75	>0.1
Wrong	8	6	14(21.2)		
Duration of urine storage					
<1 hour	13	5	18(27.3)	0.35	>0.1
≥1 hour	32	16	48(72.7)		

**Table V**  
*Relationship between Duration of Urine Storage and Presence and Types of Organism on Culture*

Duration of Storage	Kl	Col	SA	E.coli	Ps	Pr	Total
≤ 1 hour	6	5	3	3	1	-	18
>1 hour	17	9	10	10	1	1	48
Total	23	14	13	13	2	1	66

SA = *Staphylococcus aureus*

Ps = *Pseudomonas aeruginosa*

E.coli = *Escherichia coli*

Pr = *Proteus mirabilis*

Kl = *Klebsiella aerogenes*

Col = *Coliforms*

one hour of collection. None of the urine specimens was stored in the refrigerator. Forty-five (68.2 per cent) patients admitted being instructed on the proper method of urine collection, storage and transportation to the laboratory within one hour; doctors (80 per cent), nurses (4.4 per cent) and laboratory technician (15.6 per cent) gave such instructions. Twenty-one (31.8 per cent) patients and/or their relations did not receive previous instructions. Although there was no significant relationship between instructions given and the method of urine collection as well as the duration of urine storage, bacteriuria was higher in patients who stored their urine samples longer than one hour (Table IV).

The commonest organism isolated was *Klebsiella aerogenes* in 33 per cent of the patients (Table V).

## Discussion

The present study has shown a female preponderance for asymptomatic bacteriuria. This was significant after the age of five years. This finding is similar to those reported from within and outside Nigeria.<sup>4,6,7</sup> It is usually thought to be due to the short female urethra, which makes it easy for organisms from the vulva to enter the bladder. Morton and Lawande<sup>9</sup> noted that up to the age of three years, males were more affected than females. However, Okoro and Okafor<sup>10</sup> did not observe any sex difference in patients with symptomatic urinary tract infections.

The symptoms noted in the majority of our patients were not referable to the renal system. The commonest clinical presentation was fever, which was reported in 43 (65.2 per cent) of the cases. Only eight (12.1 per cent) of the children had symptoms specific for urinary tract infections; such symptoms were dysuria in 7.6 per cent and urinary incontinence in 4.5 per cent of cases. The present finding contrasts with a previous report by Okoro and Okafor,<sup>10</sup> who observed dysuria and pyuria in 43 per cent and 71 per cent of their cases, respectively. Similarly, Morton and Lawande<sup>9</sup> in Zaria, found UTI in 10 per cent of children with fever, 22 per cent of those with diarrhoea and 43 per cent of those with dysuria. It is therefore suggested that UTI should be suspected and investigated accordingly, in any child that presents with a history of non-specific fever, even in the absence of symptoms referable to the renal system.

About 32 per cent of the patients and/or their attendants failed to receive adequate instructions in respect of proper urine collection, storage (refrigeration) and rapid transportation of samples within one hour to the laboratory. This has contributed to the high proportion (21.2 per cent) that collected urine samples from unsterile containers (chamber-pot) or from early rather than mid stream clean catch of urine flow. The chances of growing contaminants in

cultures of such collections are high. There was delay in the transportation of urine samples to the laboratory in 72.7 per cent of patients; these samples were submitted later than one hour after collection. This practice is known to increase the multiplication of the organisms in the urine, resulting in false diagnosis of urinary tract infection. This over-diagnosis of UTI may account for the high prevalence rate of 68.9 per cent reported from Port Harcourt in a previous study.<sup>11</sup>

The instructions given by the doctors and nurses to 45 (68.2 per cent) patients did not positively influence the method of urine collection and storage. This may indicate that the instructions were not detailed enough for the patients and/or relations to comprehend, hence eight (17.8 per cent) and 32 (71.1 per cent) patients who claimed to have received instructions collected urine samples wrongly and stored the samples for more than one hour, respectively.

The commonest organism detected in the present study was *Klebsiella* spp. (33 per cent). Similarly, in the Arabian Gulf, *Klebsiella* spp. (29 per cent) and *Pseudomonas* spp. (6.2 per cent) were the commonest organisms isolated in the paediatric age group.<sup>12</sup> However, in rural Nigerian children, Akinkugbe *et al.*,<sup>8</sup> found *Staphylococcus aureus* (4.7 per cent) as the commonest organism in the urine specimens of asymptomatic subjects. This was similar to that reported by Omer and El-Haj.<sup>6</sup> Other studies from within and outside Nigeria have reported that *Escherichia coli* was the commonest cause of UTI in symptomatic patients.<sup>6-8,13,14</sup> *E. coli*, *S. aureus* and coliforms were each reported in 13 (19.7 per cent) patients in the present study.

With the uncertainty of electricity power supply in Nigeria and the low socio-economic status of most people, refrigeration is not always possible. There is a need for health care workers to be well informed about how to educate older patients or relations, on the accurate methods of

collecting urine specimens to be examined for bacteria, and also about transporting such specimens to the laboratory within one hour of collection.

## References

1. Rudolph AM, Hoffman JIE, Rudolph CD. Rudolph's Paediatrics; Prentice Hall International 1996: 1388-92.
2. Campbell AGM, McIntosh N. Forfar and Arneil's Textbook of Paediatrics. Churchill Livingstone 1994; 1031-46.
3. Aikhionbare HA. Epidemiology of childhood renal diseases in Africa. *Nig J Med* 1998; **7**: 97-100.
4. Eke FU, Eke N. Urinary tract infections. In: Azubuike JC, Nkanginieme KEO, eds. Paediatrics and Child Health in a Tropical Region. Owerri: African Educational Services, 1999: 326-9.
5. Mitchell K. Urinary tract infection in catheterised patients. *Postgrad Doc (Africa)* 1993; **15**: 29-31.
6. Omer EE, El-Haj AI. Urinary tract infections in school children in Saudi Arabia. *Med Dig* 1992; **18**: 3-7.
7. Okafor HU, Okoro BA, Ibe BC, Njoku-Obi NU. Prevalence of asymptomatic bacteriuria among nursery school children. *Nig J Paediatr* 1993; **20**: 84-8.
8. Akinkugbe FM, Familusi JB, Akinkugbe OO. Urinary tract infection in infancy and early childhood. *East Afr Med J* 1973; **50**: 514-20.
9. Morton RE, Lawande R. Frequency and clinical features of urinary tract infection in paediatric outpatients in Nigeria. *Ann Trop Paediatr* 1982; **2**: 113-7.
10. Okoro BA, Okafor HU. Pattern of childhood renal disorders in Enugu. *Nig J Paediatr* 1999; **26**: 14-8.
11. Eke FU, Eke NN. Renal disorders in children. A Nigerian study. *Paediat Nephrol* 1994; **8**: 383-6.
12. Elhag KM, Chugh TD. Bacteriuria in the Arabian Gulf. *Arab J Med* 1982; **1**: 5-10.
13. Okafor HU, Okoro BA. Urinary tract infection in children. The Enugu experience. *Nig Med Pract* 1993; **25**: 71-5.
14. Wemabu SN, Obi JO. Bacteriological profiles in childhood urinary tract infection in Benin City, Nigeria. *J Trop Pediatr* 1983; **29**: 85-6.