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### ASSESSMENT OF LEUKOCYTE ESTERASE DIPSTICK TEST IN DIAGNOSIS OF CHILDHOOD URINARY TRACT INFECTION

\*ADELEKE, S.I\*, \*ASANI, M.O. and \*\* NWOKEDI, E. E. \*BAYERO UNIVERSITY, DEPARTMENTS OF PAEDIATRICS, AND \*\*MICROBIOLOGY & PARASITOLOGY, KANO

**CORRESPONDENCE:** DR. S.I. ADELEKE. Dept. of Pediatrics, Aminu Kano Teaching Hospital, Kano. . E- mail: [adelekesolo@yahoo.com](mailto:adelekesolo@yahoo.com)

#### ABSTRACT

This is a prospective study of urinary tract infection in 65 children (38 males and 27 females, M: F ratio 1: 0.7). Urine samples were evaluated by culture, microscopy and leukocyte esterase dipstick test. Positive urine culture, with significant bacteriuria was found in 19(29.2%). Urine microscopy for leukocyturia identified positive urine culture in 6 of the 19 samples, giving a sensitivity of 43.1%. leukocyte esterase distick test correctly identified 14 of 19 urine samples with culture proven UTI (74% sensitivity). The positive and negative predictive values were 37.1% and 87.2% respectively.

The leukocyte esterase dipstick test was found to be better than leukocyturia in detecting UTI. in conclusion, leukocyte esterase is sensitive in detecting UTI, easy to perform, requires less time and does not need a highly trained personnel for the test.

**Key words:** *Urinary Tract, leukocyte esterase, Infection.*

#### INTRODUCTION

Urinary Tract Infection (UTI) is a common childhood infection, the presentation of which is often non-specific in infant and young children. (1,2,3) et al. Feature such as dysuria, frequency and urgency which in adults are characteristics of UTI, are not characteristic features of early childhood. Prompt detection and treatment of urinary tract infection is especially important in children because the developing kidney is more prone than the adult kidney to formation of

renal scars and later to development of chronic renal failure following delayed or improper treatment of the infection (4,5)

The general laboratory diagnosis of clinical UTI is usually confirmed by microscopy and culture of well collected and promptly processed sample of urine. There might be many challenges in collecting proper urine samples in children especially in the developing world. Reliable screening tests for UTI will facilitate early diagnosis and treatment of

patients with positive urine samples while the negative samples identified early will reduce unnecessary urinalysis.

Leukocyte esterase is an enzyme from neutrophil not normally found in urine and is a marker of pyuria (6). A dipstick is available that tests for their marker.

This study was undertaken to evaluate the use of test strip leukocyte esterase as a rapid screening method in the diagnosis of urinary tract infection among children suspected of UTI in Kano.

#### **PATIENTS AND METHODS**

The subjects consisted of 65 consecutive children presenting with features suggestive of urinary infection among the patients attending the paediatric unit of Aminu Kano Teaching Hospital, Kano. Midstream urine specimens were collected into sterile containers by clean catch method in the older children, while collection in infants was by means of sterile urine bag attached to the perineum after cleaning with 1% chlorhexidine.

The urine samples were taken to the laboratory within one hour of collection and were processed immediately. Five millimeters (5mm) of loopful of the samples were seeded (inoculated) on to blood agar (for total colony count) and Mac Conkey agar (for differential count). The culture media were incubated at 37°C for 18-24 hours. A

colony count of  $>10^5$  organisms /ml of voided urine was taken as significant. Ten millimeters of the urine was centrifuged for five minutes, the supernatant fluid was then decanted and the remaining contents were shaken and two drops were placed on a slide covered with a cover slip and examined under light microscopy for leukocytes, using a high power objective. Significant leukocyturia was defined as  $> 10^5$  cells per high power field.

Screening urine for leukocyte esterase was done by using multistix 10 SG (Bayer) test strip according to the manufacturer's instruction. The performance of the leukocyte esterase in detecting or otherwise of UTI, was statistically expressed in terms of sensitivity, positive predictive and negative predictive values.

The Chi-square ( $\chi^2$ ) test was used to compare the results of leukocyte esterase tests with significant leukocyturia in patients with culture proven UTI. A P-value of  $< 0.5$  was regarded as significant.

#### **RESULTS**

Sixty-five consecutive children (38 males and 27 females giving M: F ratio of 1: 0.7). They were aged 4 days to 12 years. Thirty three (50.8%) of the 65 were aged two years and below; 29

(76.3%) of the 38 males were uncircumcised. The commonest symptoms seen in these patients were fever; dysuria and abdominal pain.

Positive urine culture with significant bacteriuria was found in 19 samples (29.2%) *Escherichia coli* was the predominant organism isolated. (Table II), urine microscopy for leukocyturia was significant in 19 urine samples, giving a sensitivity of 43.1 percent; the specificity was 79.7 percent while the positive predictive value was 41.1

percent. The leukocyte esterase dipstick test was positive in 31 (47.6%) of the urine samples.

Table III shows the performance characteristic of leukocyte esterase dipstick test in detecting urinary tract infection. The positive and negative predictive values were 37.1% and 87.2 percent, respectively. False positive leukocyte esterase dipstick test was observed to be common among the females 9(37%) of 27 had a false positive leukocyte

**TABLE I: AGE AND SEX DISTRIBUTION OF THE 65 CHILDREN STUDIED.**

<u>Age (months)</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>	<u>%</u>
< 1	3	0	3	4.6
1 -12	7	3	10	15.4.
13 - 24	15	5	20	30.8.
25 - 36	6	4	10	15.4.
37 - 48	0	2	2	3.0
49 - 60	2	1	3	4.6
>/ 61	5	12	17	26.2
<b>Total</b>	<b>38</b>	<b>27</b>	<b>65</b>	<b>100.</b>

**TABLE II: MICRO-ORGANISMS ISOLATED FROM THE 19 URINE SAMPLES.**

<u>Micro-organisms</u>	<u>No. of urine samples.</u>	<u>Percent of Total</u>
<i>Escherichia coli</i>	11	57.9.
<i>Klebsiella</i>	4	21.1
<i>Protens</i>	2	11.0
<i>Pseudomonas</i>	2	11.0
	<b>19.</b>	<b>100.</b>

**Table III: LEUKOCYTE ESTERASE DIPSTICK TEST COMPARED TO URINE CULTURE.**

Leukocyte esterase Test	Colonies		Total
	>/ 10 <sup>5</sup> Im	< 10 <sup>5</sup> Im	
Positive	15	22	37
Negative	4	24	28
	19	46	65

esterase dipstick tests, compared to 25.6% among males. False positive leukocyte esterase dipstick test was higher in uncircumcised (82%) than the circumcised (19%).

The performance of leukocyte esterase dipstick test was compared to that of significant leukocyturia among patient with culture proven UTI. The results showed the leukocyte esterase dipstick test was positive in 15 (78.9) of the 19 with culture proven UTI in contrast to only 6 (31.5) of the 19 who had significant leukocyturia in association with culture proven UTI. This difference was significant ( $\chi^2 = 64$ ,  $df = 1$ ,  $p < 0.02$ ). Leukocyte esterase dipstick test was therefore, better than leukocyturia in detecting UTI.

**DISCUSSION**

The sensitivity of leukocyte esterase dipstick test for detecting UTI with significant bacteriuria in symptomatic patients in this study was 79%. This finding is similar to those reported by others who used similar criteria for significant bacteriuria (Gold smith et al

1990; Perry et al 1982; Wanamanda et al 1999). The specificities ranging from 78 to 96 percent reported by Gold smith et al (7) and Perry et al (8) were higher than the 41.1 percent obtained in the study. It is also lower than the 59.4% in a similar study by Wammanda et al (9). The reason for the differences may be due to the number of patients studied. There were 65 patients in this study while the number of patients studied by the workers cited above except Wammanda et al (9), ranged from 800 to over one thousand patients.

The low positive predictive value of 37.1 percent and high negative value of 37.1 percent obtained in this study are similar to the studies done elsewhere. Wiggelinkhuzien et al (8) from South Africa reported figures of 42.3 percent and 98.2 percent, while Le Jeune et al (10), reported figures of 42.3 percent and 97.6 percent respectively, while Wammanda et al (9), in Zaria reported 36.6 percent and 86.4 percent. The high negative predictive value is essential requirement of leukocyte esterase dipstick on screening test for urinary

tract infection. A negative predictive value is the likelihood that a subject with a negative test does not have the disease (UTI) tested for.

A false positive leukocyte esterase test was common in female patients than males this has been observed by earlier workers also. (6) It has however been speculated that this difference in false positive rates between the sexes could be due to increased contamination of urine samples in the females by vaginal secretions. The study has also shown that leukocyte dipstick test is more sensitive than significant leukocyturia in detecting culture proven urinary tract infection. Infection of the urinary tract remains a significant problem in most Paediatric populations. The dipstick test of leukocyte esterase is a reasonable and rapid screening test which does not require highly trained personnel for diagnosis of urinary tract infections.

#### REFERENCES

1. Ross JH, Kay R, (1999). Paediatric Urinary Tract infection and reflex. *Am Fam Phys*. 1999; B 59: 1472 - 1474
2. Morton R, Lawande R. Frequency and Clinical features of urinary tract infection in Paediatrics out - patient in Nigeria. *West Afri J Med* 1982; 2; 113 - 117.
3. Adeleke SI, Asani MO, Belonwu RO, Ihesiulor G. U. (2005). Urinary tract pathogens and antimicrobial sensitivity patterns in childhood urinary tract infection, Kano Nigeria *Annals Nig. Med* 2005; 1: 2: 14 - 16.
4. Abdurrahman MB, Amirkik M, Shamran JO (1992). Urinary tract infection in children is still mis managed problem. *Emirate Med J* 1992: 10: 13 - 18.
5. Lebowitz RL, Coldony AH. Urinary tract infection in children. *Crit Rev Clin Radiol Nucl Med* 2000; 10: 4; 1045 - 1052.
6. Wiggelinkhuize, J. Mathen B, Hanalo DH. *S Afri Med J* 1988; 74; 22 - 24.
7. Goldsmith BM, Campos JM, urine dipstick microscopy and culture for the detection of bacteriuria in children *clin paedtr* 1990: 29: 2114 - 2118.
8. Perry JL, Mathew JS, Seesver DF. Evaluation of leukocyte esterase activity as a rapid screening technique for bacteriuria. *J clin Microbial* 1982: 15; 852 - 854.
9. Wammanda RD, Aikhion bare HA, Ogala WN. Evaluation of leukocyte esterase dipstick test in the diagnosis of urinary tract infection in Children. *Nig. J Pediatr* 2002: 26: 21 - 24
10. Le Jeune B, Balon R, Grullars B, Mayeax (1991) evaluation of screening test detecting urinary tract infections in newborns and infants. *J Clin Pathol* 1991. 44; 1029 - 1031.