

**USE OF URINE DIPSTICK TEST FOR RAPID SCREENING OF URINARY TRACT INFECTION IN CHILDREN****Anzeen Nazir Kanth<sup>1</sup>, Azhar Ajaz Khan<sup>2</sup>, Suhail Masood Khan<sup>3\*</sup>, Aymen Masood Khan<sup>4</sup> and Haider Rashid Guroo<sup>5</sup>**<sup>1</sup>Department of Paediatrics, GMC Jammu.<sup>2</sup>Department of Urology, GMC Srinagar.<sup>3</sup>Department of Urology, GMC Jammu.<sup>4</sup>Department of Neuro-Anaesthesia and Critical Care SKIMS Srinagar.<sup>5</sup>Department of Cardiology, SKIMS Srinagar.**\*Corresponding Author: Suhail Masood Khan**

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Article Received on 21/11/2021

Article Revised on 11/12/2021

Article Accepted on 31/12/2021

**ABSTRACT**

Microscopy and culture of correctly obtained urine specimens are normally used to confirm the diagnosis of UTI; however, in many resource-poor countries, this is frequently not possible due to a lack of resources and other constraints. Because UTIs can cause major problems if not detected and treated early, this study was conducted to determine the clinical significance of the Leukocyte Esterase (LE) enzyme as a diagnostic tool for screening of Urinary Tract Infections (UTIs) in resource-poor countries. The cross-sectional study included 250 asymptomatic kids (120 men and 130 females) from a tertiary care Hospital in North India. Computer-assisted random sampling methods were used to pick the subjects. Standard laboratory techniques were followed to collect, store, transport, culture, and analyse urine specimens, while leukocyte esterase (LE) dipsticks were employed as a screening tool for UTI, with results compared to culture positive findings. Significant bacteriuria was detected in 14 (5.6%) of the students, with *Escherichia coli* (42.9%), *Proteus mirabilis* (21.5%), and *Klebsiella pneumoniae* (14.5%) being the most prevalent bacteria recovered (2). In 10 of 14 verified UTIs, the leukocyte esterase dipstick test properly revealed a positive urine culture (71.4 percent). The positive and negative predictive values, respectively, were 25 and 98.1 percent. Though it has limitations in detecting UTI when compared to culture techniques, the leukocyte esterase test is nevertheless effective in places where there are no facilities or staff to do urine culture. The test is suggested for use in low-result populations, although urine culture should be performed whenever possible.

**KEYWORDS:** Children, leukocyte esterase, screening, urinary tract infection.**INTRODUCTION**

Urinary tract infection (UTI) is one of the most frequent paediatric illnesses (Bircan, 2002). The frequency of UTI ranges between 0.4 and 7.5 percent in various juvenile groups, and it has no age limit; even new-borns are vulnerable (Bircan, 2002; Eyong et al., 2009). Fever, frequent urination, dysuria, foul-smelling urine, and enuresis are among the symptoms of UTI that vary with age (Bircan, 2002; Elders, 2004). It is preferable to diagnose all instances of UTI in children as soon as possible with a simple, sensitive test in order to begin treatment as soon as possible to relieve symptoms and reduce the risk of renal scarring and other UTI consequences (Mori et al., 2007).

Urine culture with a colony count of higher than 10<sup>5</sup> cfu/ml of pure bacteria growth is the standard test for diagnosing UTI (Kass, 1962). However, because this approach involves a 24-hour incubation period or longer, it may create delays in the treatment of critically sick

infants. Urine microscopy, which looks for leucocytes and pus cells in the urine, can offer fast diagnostic information and allow treatment to begin; however, this needs inspection by experienced personnel and the use of specialist equipment, which may not be accessible in resource-poor countries.

Dipstick testing of freshly voided urine for leucocytes, which indicate the presence of white cells and may be done at home or at the bedside, is especially handy and needs less expertise than microscopy (Whiting et al., 2006). Perry et al. (1982) devised a leukocyte esterase dipstick test to demonstrate the presence of pyuria using a histochemical approach. The leukocyte esterase enzyme, which is detected in contaminated urine, is a sign for pyuria caused by neutrophils. It is based on the esterase from leukocytes cleaving an indoxyl ester included in the test pad. The released indoxyl combines with a diazonium salt to produce a violet dye with a

colour intensity proportional to the number of leukocytes in the urine (Perry *et al.*, 1982).

In most tropical and subtropical parts of the world, laboratory facilities face a variety of obstacles, ranging from a lack of or insufficient quality equipment and reagents to untrained employees, as well as operating logistics (Jombo *et al.*, 2006a, b, c). These are significant obstacles to successful healthcare delivery. Furthermore, these might result in morbidity and mortality from illnesses that could have been avoided if laboratory surveillance and screening measures had been in place (Okwara, 2004; Hageman, 2003; Cassone, 2004). Methods for resolving these issues should be promoted.

The purpose of this study was to assess the dipstick leucocyte esterase technique in the diagnosis of UTI in this community, with the goal of recommending its use in both screening and diagnosis of UTIs in resource-poor areas in order to prevent long-term UTI consequences in children (Effective Health Care, 2004; Scott, 1989).

## METHODS

### Setting

The study was carried out at a tertiary care hospital where in 250 patients were selected using computer assisted random sampling methods involving the various classes and gender. The study was carried out from June 2019 to March 2020. Structured questionnaires were administered to the parents/guardians of the recruited subjects to obtain information on: Age of pupils, history of urinary frequency, abdominal pain, bed wetting, educational status and qualifications of parents.

### Measurement of biophysical parameters

The individuals were measured anthropometrically and for blood pressure using established procedures. Pupils were weighed on a calibrated Beam balance with values corrected to the closest 0.5 kg; height was measured on a perpendicular wall with an upright metre rule; and blood pressure was taken on a standard mercury sphygmomanometer (Accoson). Clean catch midstream urine specimens were acquired from the individuals by normal voiding into sterile universal specimen containers for collection, transport, and culture (4 to 8 ml). Urine samples were collected with the help of laboratory assistants from the individual schools. Specimens were processed using conventional laboratory protocols as soon as possible after collection, or kept in the refrigerator at 4 to 8°C if processing was delayed.

Uncentrifuged, evenly mixed urine specimens were inoculated on CLED (Cysteine Lactose Electrolyte Deficient), blood agar, chocolate, and Mc-Conkey agar medium and incubated at 36.6°C overnight to identify significant bacteriuria (Scott, 1989). For anaerobe isolation, other sets of culture plates were incubated at the same temperature in a Carbon dioxide Extinction Jar. Biochemical tests, such as catalase, oxidase, sugar fermentation, motility, citrate, urease, indole, hydrogen sulphide, and gas production, were then performed on significant growths based on bacterial gramme reactions, while antimicrobial susceptibility tests were conducted using modified Kirby-diffusion Bauer's methods, where zones of inhibition were measured (Baron, 1994; Chesbrough, 2004). Those who had a positive urine culture were given the proper treatment.

### Inclusion criteria

All children under the age of 60 months were chosen by a sample technique, and their parents or caregivers gave their consent.

### Exclusion criteria

This involves children whose parents or care givers declined their involvement in the study and children 60 months and above.

## RESULTS

A total of 250 youngsters were recruited for the research, including 120 (48%) boys and 130 (52%) girls. (Table 1).

**Table 1: Age and gender distribution Children.**

Age (Months)	Males (%)	Females (%)	Total (%)
24	22 (8.8)	31 (12.4)	53 (21.2)
25-35	32(12.8)	34 (13.6)	66 (26.4)
36-47	35 (14.0)	33 (13.2)	68 (27.2)
48-59	31 (12.4)	32 (12.8)	63 (25.2)
Total	120 (48.0)	130 (52.0)	250 (100)250

Significant bacteriuria was found in 5.6 percent of the children (14 out of 250). *Escherichia coli* was the most often isolated organism (42.9 percent, or 6 of 14), followed by *Proteus mirabilis* (21.5 percent, or 3 of 14), and *Klebsiella pneumoniae* (14.3 percent, or 2 of 14), with *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Enterobacter* each accounting for 7.1 percent (Table 2).

**Table 2: Bacteria recovered from urine specimens of Children.**

Organism	Number of isolated organisms	Percentage
<i>Escherichia coli</i>	6	42.9
<i>Proteus mirabilis</i>	3	21.5
<i>Klebsiella pneumoniae</i>	2	14.3
<i>Pseudomonas aeruginosa</i>	1	7.1
<i>Enterobacter spp.</i>	1	7.1
<i>Staphylococcus aureus</i>	1	7.1
Total	14	100.0

A comparison of the activity profiles of the Leukocyte esterase dipstick method and the culture method revealed that 71.4 percent (10 out of 14) of those who were positive for significant bacteriuria by culture method were also positive by dipstick method, and 86.6 percent (206 out of 238) of those who were negative by culture method were also negative by dipstick method. As a result, the test has a negative predictive value of 98.1 percent and a low positive predictive value of 25%.

## DISCUSSION

The dipstick Leucocyte Esterase (LE) test has a sensitivity of 71.4 percent and a specificity of 86.6 percent in this investigation. The positive and negative predictive values, respectively, were 25.0 and 98.1 percent. This means that detecting pyuria alone with the dipstick LE test would result in a substantial number of false-positive and false-negative findings. Our study had a greater sensitivity than Hoberman and Wald (1994), who had a sensitivity of 52.9 percent and a positive predictive value of 82.1 percent, but their study in febrile infants less than 2 years did not provide the specificity. The explanation for this discrepancy is unknown, but it demonstrates the test's unpredictability. Wammanda *et al.* (1999) in Nigeria and Wiggelinkhuizen *et al.* (1988) in South Africa found comparable positive and negative predictive values. These disparities emphasise the need for a more accurate test, as some individuals with pyuria and a probable UTI might be missed, which could be harmful. It's worth noting that the danger of kidney damage from UTI is highest in children under the age of five; consequently, early detection and treatment are critical (Mohammed *et al.*, 2008).

Adult dipstick LE tests have been demonstrated to be both sensitive and specific in identifying pyuria, according to research (Hoberman and Wald, 1994; Mohammed *et al.*, 2008). The disparities between adult and child studies might be due to pyuria severity or the enzyme concentration of immature leukocytes, or both (Hoberman and Wald, 1994).

Another concern is whether the dipstick test may be used to select urine samples for microscopy as a screening test. Though four (28.6%) of the 14 confirmed cases of UTI tested negative according to the LE test, the high negative predictive value (98.1%) appears to be favourable in this regard. These four individuals would not have been diagnosed with UTI if a microscopic examination had not been undertaken. As a result, the dipstick LE test cannot be used only to select urine samples for microscopic analysis or bacterial culture.

Although the Leukocyte Esterase Dipstick Method appears to have limited applicability in the diagnosis of UTIs in children, we believe that the test remains a valuable fallback tool for laboratory diagnosis in a number of cities and rural communities where both laboratory personnel and facilities for appropriate diagnosis are still lacking (Akpede and Akenzua, 2001).

Because microscopy is not feasible in remote places, practitioners can rely on the LE test. The limitations of the LE dipstick test should be taken into account when determining the test's ultimate result. These factors include the time when the urine specimen was obtained during the infection, the circumstances of transport and storage, and the degree of precision with which the test was interpreted (Olowu and Oyetunji, 2003). These circumstances have a negative impact on the LE test findings. Whiting *et al.* (2006) in Bristol, UK, and Lammers *et al.* (2001) in Kalamazoo, USA, both underlined that the dipstick test, while valuable, should not be read in isolation, but rather in conjunction with culture findings wherever possible.

## CONCLUSIONS

The Leukocyte esterase dipstick technique for diagnosing UTI has a high sensitivity and specificity, but a low positive predictive value, according to the current study. As a result, the test should not be read in isolation, but rather in conjunction with culture data where possible, and is thus advised for screening purposes in populations without good laboratory facilities.

## DECLARATIONS

We hereby declare that

**Funding:** *There was no funding involved as it was an observational study.*

**Conflict of interest:** *There is no Conflict of interest.*

**Ethical approval:** *Ethical Clearance approved by the institutional ethical committee.*

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