Section: Paediatrics

Original Research Article

COMPARISON OF URINE DIPSTICK METHOD WITH URINE CULTURE FOR DETECTION OF URINARY TRACT INFECTION IN CHILDREN

Received : 27/05/2025
Received in revised form : 11/07/2025
Accepted : 01/08/2025

Keywords:
dip stick, urine culture, urinary tract infection.

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DOI: 10.47009/jamp.2025.7.4.171

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (4); 912-915

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ABSTRACT

Background: Urinary tract infection is the second most common bacterial infection in pediatric age group and its occurrence carry special significance because of its short term and long term complications leading to morbidity and mortality[1]. Urinary tract infection should be suspected in preverbal children with unexplained fever and in older children with symptoms such as dysuria, increased frequency, urgency, hesitancy, hematuria, abdominal pain, back pain or daytime incontinence and constipation[2]. But making the clinical diagnosis remains difficult in pediatric age group comparing adults because of varying presentations. **Materials and Methods:** The study was undertaken at Sri Manakula Vinayagar Medical College and Hospital, Pondicherry after obtaining ethical clearance.The proposed study was hospital based cross sectional study.1 to 12 years children presenting with symptoms suggestive of urinary tract infection who visited the pediatric OPD in SMVMCH. 2ml of urine was collected separately in the container for dipstick while the urine sample was collected for culture. Multistix 10G reagent strip Siemens, Germany was used for dipstick test. **Result:** Combined dipstick test (Nitrites and leukocyte esterase) have good sensitivity, specificity, positive prediction value and negative prediction value. **Conclusion:** we can conclude that the urine dipstick test is a good screening test in pediatric age group to detect the urinary tract infection with good overall sensitivity, specificity, positive prediction value and negative prediction value.

INTRODUCTION

Urinary tract infection is the second most common bacterial infection in pediatric age group and its occurrence carry special significance because of its short term and long term complications leading to morbidity and mortality.[1] Urinary tract infection should be suspected in preverbal children with unexplained fever and in older children with symptoms such as dysuria, increased frequency, urgency, hesitancy, hematuria, abdominal pain, back pain or daytime incontinence and constipation.[2] But making the clinical diagnosis remains difficult in pediatric age group comparing adults because of varying presentations.

Treating urinary tract infection early plays a vital role since untreated or delay in treated UTI leads to permanent renal parenchymal defects such as renal scarring and other long term consequences such as stricture ,hypertension, chronic pyelonephritis and chronic kidney disease.[3] Renal parenchymal defects are present in 3 to 15% of children within one to two years of their first diagnosed urinary tract infection.[4]

Clinical diagnosis of UTI is always challenging in pediatric age group and well equipped microbiological laboratory is essential. Urine culture remains the gold standard for the diagnosis its prerequisite remains challenging.[5] The long time delay in obtaining the results, the samples sent immediately to the microbiological laboratory and in case of practical difficulties it should be kept in refrigerator. It takes 24 to 48hours to get the result. Escherichia coli isthe most common organism causing UTI which convert nitrates to nitrites.[6] Leukocyte esterase is released from leukocytes in the infected urine.[2] Urine dipstick method which contains leukocyte esterase and nitrites are used to test the urine samples for urinary tract infection. Detection of nitrites and leukocyte esterase through dip stick may aid in early diagnosis.[1,5]

Aim

1. To assess the clinical spectrum of urinary tract infection in pediatric age group.
2. To compare the sensitivity of urine dipstick method with urine culture method.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

3. To evaluate the bacteriological spectrum in urine culture and sensitivity in suspected cases of UTI

MATERIALS AND METHODS

Setting: The present study was undertaken at Sri Manakula Vinayagar Medical College and Hospital, Pondicherry after obtaining ethical clearance.

Study Design: The proposed study was hospital based cross sectional study.

Study Participants: 1 to 12 years children presenting with symptoms suggestive of urinary tract infection who visited the pediatric OPD in SMVMCH, Pondicherry.

Study duration: 18 months (from approval of Institutional Ethics Committee)

Sample Size: The sample size was 50 based on the sensitivity of 91% from the prevalence of previous study which was calculated by m Master version 2.0 with 95% confidence interval and 8% absolute precisions

Inclusion Criteria

1 to 12 years age group children who presented with symptoms suggestive of urinary tract infection those who were coming to pediatric OPD in SMVMCH, Pondicherry

Exclusion Criteria

Patient with known urogenital anomalies.

Patient on antibiotics

Study procedure

Children with suspected UTI who consecutively presented to the pediatric OPD were assessed for eligibility, based on the conclusion and exclusion criteria as mentioned earlier after obtaining informed consent from parents. Clinical history and examination were done.

Sample collection

The urine samples were collected in two different containers under strict aseptic precautions. The urine collection methodology in our study was clean catch of midstream urinary catherisation. Before collecting the urine, genital regions were cleaned with soap and water but not by antiseptics. Forceful retraction was avoided.

The collected sample was immediately sent to the microbiology laboratory and promptly plated within 60 minutes. In case of delay in culture the samples were stored in refrigerator at the temperature of -20 degree Celsius upto 12 to 24 hours. The samples were inoculated on Cysteine Lactose Electrolyte Deficient (CLED) medium, using a 1µl calibrated loop of 28 SWG nichromewire without intermittent heating and incubated at 37ºC overnight. The following day, colonies grown were counted and were identified using standard biochemical tests. The culture positive based on the significance of the colony forming units as per standard criteria (Revised guidelines formulated by Indian Society of Pediatric Nephrology, 6($>10^5$CFU/ml in clean catch midstream urine sample, $>10^4$CFU/ml in urethral catheterization and any number of CFU/ml in a supra-pubic aspirate). Urine culture was repeated in case of suspected contamination and in situation such as when clinical suspicion of UTI was high but colony counts were normal.

A urine dipstick test may comprise up to 10 different chemical pads or reagents which react when immersed in, and then removed from a urine sample. The observation should be made by expected colour in the strip which is mentioned in the test. In this study the two parameters of leukocyte esterase and nitrites color change in the strips should be observed 2ml of urine was collected separately in the container for dipstick while the urine sample was collected for culture. Multistix 10G reagent strip Siemens, Germany was used for dipstick test. Urine dipstick strip was completely immersed in the urine within one hour of collection and removed immediately to avoid dissolving out the reagent. The strip was held horizontally to prevent possible mixing of chemicals from adjacent reagent or prevented from contaminating the hand from urine. The reagent strip was compared with the colour chart labelled on the bottle. Nitrite was considered to be as positive if the colour was changed to pink from colourless within 60 seconds. The results were graded as 0, 1+, 2+, 3+ and 4 + depending on the intensity. Except for no change in colour, others were considered as positive. Leukocyte esterase was considered as positive if there was a change in colour from white towards purple within 2minutes. Depending on intensity of colour change, the results were graded as 0, 1+, 2+, 3+ and 4+.

Diagnosis

The diagnosis of urinary tract infection was based on the urine culture positivity and presents with both specific and non-specific symptoms suspicious of UTI such as fever without focus or urinary symptoms cry or pain during micturition, frequency or urgency during micturition, vomiting, constipation, abdominal pain. The definition, classification and management was made as per Revised Statement on management of UTI published by the Indian Society of Pediatric Nephrology[23]. Simple UTI was defined as child may present with low grade fever. Dysuria, frequency or urgency and absence if symptoms of complicated UTI. Complicated UTI was stated as high grade fever >39 degree Celsius, systemic toxicity, persistent vomiting, dehydration or renal angle tenderness. Significant pyuria was defined as >10 WBC cells per mm^3 in an uncentrifuged sample or >5WBC cells per mm^3 in centrifuged sample. Urine culture was considered to be significant if$>10^5$ CFU/ml in clean catch midstream urine sample, $>10^4$CFU/ml in urethral catheterization and any number of CFU/ml in a suprapubic aspirate.[23]

The results obtained from the two parameters of Urine dipstick method such as leukocyte esterase and nitrite and the symptoms of UTI such as fever, cry or pain during micturition, frequency, urgency or

ISSN (O): 2687-5365; ISSN (P): 2753-6556

hesitancy during micturition, vomiting, abdominal pain and constipation with urine culture positive cases. The sensitivity, specificity, positive prediction value (PPV), negative prediction value (NPV) of all those parameters compared with urine culture positive cases.

The urine culture positive cases were started with antibiotic therapy and symptomatic management as per the guidelines.

Data Collection

1. Age
2. Sex
3. Symptoms:

Fever
Cry Or Pain during micturition
Frequency of micturition
Urgency of micturition
Hesitancy during micturition
Vomiting
Abdominal pain
Constipation

4. Urine dipstick method

Leukocyte esterase positive or negative
Nitrite positive or negative
Urine culture and sensitivity.

RESULTS AND DISCUSSION

Out of 35 urine culture positive cases, 18 (51.4%) were male children and 17 (48.6%) were female child. Culture negative cases were noted in 6(40%) male children and 9 (60%) female cases. It was found out the association between gender and urine culture positive were insignificant (p value = 0.46).

Out of 35 culture positive cases, 28 (80%) were lies within 1 – 4 years, 4(11.4%) were between 5 – 8 years, 3(8.6 %) were between 9 – 12 years. 15 culture negative cases, 9 (60%) were lies within 1 – 4 years, 6(40.0%) were between 5 – 8 years, 0(0.0 %) were between 9 – 12 years. It was found that the association between the age and urine culture positive cases was significant (0.05).

Out of 35 urine culture positive cases, 4(11.4%) showed symptom of hesitancy during micturition and 31(88.6%) cases showed absence of hesitancy during micturition. In total 15 Culture negative, 0(0.0%) showed urgency during micturition and 15(100%) didnot have burning micturition. It was found out the association between hesitancy during micturition and urine culture positive were insignificant (p value = 0.17).

Out of 35 urine culture positive cases, 6(17.1%) showed symptom of abdominal pain and 29 (82.9%) cases showed absence of abdominal pain. In total 15 Culture negative, 3(20.0%) showed abdominal pain and 12(80%) didnot have abdominal pain. It was found out the association between abdominal pain and urine culture positive were insignificant (p value = 0.81)

Out of 35 urine culture positive cases, 11(31.4%) showed symptom of vomiting and 24 (68.6%) cases showed absence of vomiting. In total 15 Culture negative, 1(6.7%) showed constipation and 14(93.3%) didnot have vomiting. It was found out the association between vomiting and urine culture positive were insignificant (p value = 0.06).

Out of 35 urine culture positive cases, 24(68.6%) showed positive for either nitrite or leukocyte esterase and 11(31.4%) cases were negative for either nitrite or Leukocyte esterase. In total 15 Culture negative, 3(20.0%) showed either nitrite or leukocyte esterase positive and 12(80.0%) had either nitrite or Leukocyte esterase negative. It was found out the association between either nitrite or Leukocyte esterase positive and urine culture positive were significant (p value = 0.01).

The sensitivity for combined test was 68.57%, specificity was 80.00%, the positive prediction value – 88.89% and the negative prediction value – 52.17%.

CONCLUSION

1. TCombined dipstick test (Nitrites and leukocyte esterase) have good sensitivity, specificity, positive prediction value and negative prediction value.
2. Nitrite test alone and leukocyte esterase test alone, both have good specificity and moderate sensitivity. Sensitivity is much higher to nitrite than leukocyte esterase.
3. So hereby we can conclude that the urine dipstick test is a good screening test in pediatric age group to detect the urinary tract infection with good overall sensitivity, specificity, positive prediction value and negative prediction value.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556