

The evaluation of urinary tract infections in children: A study of the use of urine dipstick

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Abstract

Background and objective: The purpose of this research was to determine whether a urine dipstick may be useful for detecting urinary tract infections in kids. The purpose of this study was to evaluate the accuracy of the urine nitrite and leukocyte esterase tests in comparison to the gold standard of UTI diagnosis, which is a urine culture.

Method: Urine microscopy, urine dipstick, and urine culture were used to diagnose UTI in children aged 2-12 who presented to the emergency room or were admitted to the Department of Paediatrics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India, with symptoms consistent with UTI or fever without detectable focus. One hundred patients made up the research population. It was prospective research from the year April 2021 to May 2022, that took place in hospitals. Statistical methods were used to examine the data.

Result: Among children older than 2 years, culture-positive UTI occurred more often in girls than in boys. When contrasted to urine culture, pyuria has a higher sensitivity (up to 64.7%), specificity (up to 80.6%), positive predictive value (up to 68%), and negative predictive value (up to 78.1%). Leukocyte esterase had a sensitivity of up to 90.1%, specificity of up to 78.7%, positive predictive value of up to 73%, and a negative predictive value of up to 92.6% when contrasted to urine culture. When compared to a urine culture, nitrite has a higher sensitivity (92.5%) and specificity (92.5%) and a higher positive predictive value (87.9%) and negative predictive value (90.8%). When pitted against urine culture, the combined dipstick had a sensitivity of up to 96%, specificity of up to 80%, positive predictive value of up to 75%, and negative predictive value of up to 96%. For each of the four parameters, the chi-squared test found a p value of less than 0.001.

Conclusion: Urine microscopic examination has low sensitivity, positive predictive value, and negative predictive value, hence it should not be relied upon as a screening tool for UTIs. Due to its high sensitivity and moderate specificity, leukocyte esterase is an excellent UTI screening test. Since nitrite has high sensitivity and specificity, it is an excellent diagnostic tool for detecting UTIs. In contrast to urine culture, a combination dipstick offers high positive and negative prediction values as well as high sensitivity. While pending for urine culture results, a positive leukocyte esterase test may be relied on to diagnose a UTI, while a positive nitrite test can be used to rule out other possible causes. A positive combination dipstick test offers high sensitivity and specificity.

Keywords: Leukocyte esterase, nitrite, urine culture, microscopic analysis

Introduction

Infections of the urinary tract are among the genitourinary diseases that are seen in pediatric departments on the most regular basis. The worry of potentially life-threatening sequelae such as renal scarring, hypertension, and end-stage renal failure underscores the need of prompt and precise diagnosis as well as therapy of the condition. UTI may present with a wide variety of symptoms. The non-specific symptoms that children exhibit make it difficult to make an accurate clinical diagnosis of urinary tract infection (UTI). In light of this, the diagnostic tests play a significant part in the process of accurately identifying the condition [1, 2, 3].

The diagnostic assessment of urinary tract infections has been a developing area that has seen many progressions in the direction of noninvasive methods, which allow for a faster and more accurate diagnosis. Accurate diagnosis is not only crucial for identifying, treating, and evaluating the kid who is at risk of renal damage; it is also essential for preventing children who are not at risk of renal damage from receiving therapy that is unwarranted. Because of this, there will be less of a need for pointless interventions that incur excessive costs [4, 5, 6].

Urine samples account for a significant fraction of the overall sample pool that is analyzed in standard diagnostic labs. There is a wide variety of diagnostic equipment available, including microscopy, gram staining, automated tests, and urine culture containers. Urine culture is an expensive process that needs at least 18 hours for the development of organisms in culture media. As a consequence, getting findings might take anywhere from 24 to 48 hours following the onset of symptoms [7, 8, 9].

Methodology

Materials and Methods

The research was carried out by the Department of Paediatrics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India. Patients with a possible urinary tract infection who visited our outpatient department (OPD) or were hospitalized to our institution made up the study's population of 100 people. It was a hospital-based prospective study for the assessment of screening tests that was carried out in the year April 2021 to May 2022.

Inclusion criteria

Children between the ages of 2 and 12 who exhibit symptoms that might point to a urinary tract infection or a febrile illness Children with a focus that is not detectable.

Exclusion criteria

0-2 year olds (excluded because of decreased chances of urinary retention for four hours which is a requirement for nitrite test, difficulty in urine collection in children who are not yet toilet trained).

Results

Table 1: Profile of study population

Age	No of Cases	Percentage
3- 5 yrs	24	24
6-10 yrs	62	62
>10	14	14
Total	100	100.0

We'll discuss about 100 instances when the culture was favorable.

Of the total number of instances, 24 (or 24%) were between the ages of 3 and 5, while 62 (or 62%) were between the ages of 6 and 10, and 14 (or 14%) were older than the age of 10. The distribution's median age was 6, and its standard deviation was 2.36 years. Culture-positive individuals ranged in age from 3 to 5 years old at 24 (24%), 6 to 10 years old at 62 (62%), and 10 years or more at 14 (14%). For both culture-affirming and -denying persons, there was no discernible difference in age. ($t = 0.365$).

Sex distribution of study population

Among the 100-study population, 56 (56%) were male children and 44 (44%) were female children.

Table 2: Sex distribution of study population

Sex	Frequency	Percentage
Male	56	56
Female	44	44
Total	100	100.0

Among the study population, in males, 49 were culture positive, among the female children 35 were culture positive.

Symptomatology

One hundred percent of patients had dysuria as their primary symptom. Other symptoms included frequent urination (64%), vomiting (75%), stomach pain (69%), fever (56%) and hematuria (44%), pyuria (32%), and constipation (30%).

One hundred out of a hundred patients (100.0%) had fever. Three-and-a-half percent of the kids had fever for more than a week, eleven percent had it for a week, and two kids had it for less than a week.

Examination

Overall, 10 kids (3.8%) were found to be pale, and 10 kids (3.8%) were found to have swollen faces. Five of the kids (1.9%) had pedal oedema.

Five-hundred-three kids (43.5% of the sample) had a high fever, whereas 47 kids (56.5%) had normal temperatures. There was no abnormality in any of the 100 kids whose blood pressure was measured.

Forty-five kids (55 percent) had normal abdominal exams, whereas fifty-five percent of the kids (40 kids) had suprapubic pain. Five children (1.5%) had lumbar discomfort, and one kid (0.4%) had periumbilical tenderness.

Twenty-nine boys, or 11.1%, were found to have phimosis after normal genitourinary examinations. No cases of vulval synechia in female children were found.

Comorbidities were seen in 12 of the 100 pediatric patients. One had vesicoureteral reflux, one had hydronephrosis, four had nephrotic syndrome, three had neurogenic bladder, two had a posterior urethral valve, and four had a ureteropelvic junction blockage. Six kids, or 2.3%, had a family history of urinary tract problems.

Table 3: Comorbidities associated with study population

Associated comorbidity	No of cases	Percentage
No comorbidity	88	88
Nephrotic syndrome	3	3
Neurogenic bladder	2	2
Posterior urethral valve	3	3

Primary vesicourethral reflux	1	1
Hydroureteronephrosis	2	2
PUJ obstruction	1	1
Total	100	100.0

Urine microscopic analysis

Urea microscopic analysis revealed that pus cells were not present in 60% of samples. Thirty of the samples had no more than 5 pus cells, three had between 5 and 10, and eight (2.3%) had more than 10 pus cells.

Of the 48 people who tested culture-positive, 33 had pyuria whereas the other 15 did not. Pyuria was positive in 7 of the culture-negative group and negative in 45.

The chi-squared test's significant P value of 0.001 indicates that the relationship between the two variables is strong. The likelihood ratio (LR) was computed, and the result was 3.335, which was on the positive side. This hypothesis was strongly disproved by a negative likelihood ratio of 0.437.

Table 4: Urine microscopic analysis

PUS VS culture	Culture +	Culture -	
Pyuria +	33	7	40
Pyuria -	15	45	60
Total	48	52	100

Leukocyte esterase

Among the 100 cases, Leukocyte esterase was negative in 59 cases, positive in 41 cases. Out of this cases, in 23(51.9%) cases - 1+ colour change was noted, in 68 cases (26%)- 2+ colour change was noted, in 31 cases (11.8%) 3+ colour change was noted, in 4(1.5%) cases 4+ colour change was noted.

Table 5: Leukocyte esterase

	Culture +	Culture -	
LE +	33	9	42
LE -	15	43	58
Total	48	52	100

In 60 of the 100 instances, Leukocyte esterase was negative, whereas in 41 cases it was positive. In 23 (51.9%) of these instances, a change of one or more colors was observed; in 68 (26%), there were two or more. - In 31 of the samples (11.8%), a change of 2+ colors was seen. There was a noticeable shift in hue by 3+ levels, and in 4 instances (1.5%) there was even more noticeable shift in hue by 4+ levels.

Leukocyte esterase had up to a 90.1% sensitivity, 78.7% specificity, 73% positive predictive value, and 92.6% negative predictive value when compared to a urine culture. The significance level is at or below 0.001.

Leukocyte esterase positivity was found in 92 of 102 culture-positive cases and was absent in 10 of those with positive culture results.

Leukocyte esterase was positive in 31 of the culture-negative cases and negative in 126.

A statistically significant result was found when the chi-square test was applied: $p < 0.001$. The positive likelihood ratio was 4.23, while the negative likelihood ratio was 0.1255.

Table 6: Nitrite test

	Culture +	Culture -	
Nitrite +	35	8	43
Nitrite -	13	44	57
Total	48	52	100

Nitrite testing revealed that 62.2% of the samples were negative, whereas 98.2% were positive

Of these 99 cases, a change of one or more colors was seen in 29 (11.1%) and in 44 (16.8%). - 2 + color shifts were seen in 20 of samples (7.6%). There was a 3+ color shift seen, and in 6 instances (2.3%), a 4+ shift was seen.

Gram-negative organisms were cultured from all genuine positive cases.

Nitrite's sensitivity, specificity, positive predictive value, and negative predictive value compared to urine culture were up to 92.5%, 92.5%, 87.9%, and 90.8%, respectively.

TEST

In 35 of the 48 instances where the culture came back positive, the nitrite test came back positive, whereas in the other 13 cases it came back negative.

A nitrite test was positive in 8 of the 52 instances when cultures came back negative.

The chi-squared test's p value was significantly lower than 0.001, indicating a statistically significant relationship. The LR for the good outcome was 12, while the LR for the negative outcome was 0.107.

Combined nitrite / leukocyte esterase

Among the 100 cases, combined dipstick was positive in 67 cases and negative in 33 cases.

Table 7: Combined nitrite / leukocyte esterase

	Culture +	Culture -	
DIP +	36	31	67
DIP -	12	21	33
Total	48	52	100

When pitted against urine culture, the combined dipstick had a sensitivity of up to 96%, specificity of up to 80%, positive predictive value of up to 75%, and negative predictive value of up to 96%.

Among the culture-positive group of 48, 36 out of 12 samples were positive on the combined dipstick.

Of the 52 instances for which cultures were negative, 31 were positive on the combined dipstick and 21 were negative.

The chi-squared test p-value was significantly less than 0.001, indicating statistical significance. This resulted in a positive likelihood ratio of 4.94 and a negative likelihood ratio of 0.004.

Cultures of the patient's urine were positive in 39% of the instances and negative in 61%. Each and every one of the creatures was gram negative.

Urine culture

Urine culture was positive in 39% of cases and negative in 61% of cases. All the organisms were gram negative in nature.

Table 8: Distribution of organisms in urine culture

Urine culture	No of Cases	Percentage
No growth	62	62

E. coli	13	13
Klebsiella	8	8
Proteus	9	9
Citrobacter	3	3
Non fermentative gram neg bacilli	3	3
Pseudomonas	2	2
Total	100	100.0

Evidence of colony counted. Individuals having a colony count more than 105 of a single category of organisms were considered to have moderate bacteriuria. Those who had a colony count of 5* or higher when catheterized were also considered to have severe bacteriuria. Significant bacteriuria was defined as the isolation of any number of organisms using supra pubic aspiration. However, while supra pubic aspiration is an invasive technique, we did not use it in any of our patients.

Among the 48 culture-positive patients, 43 (43%) had a colony count >105, the threshold for serious bacteriuria.

A colony count of >104 was found in 12 of the catheterized youngsters. Only 4.6% of the population fell into this category. Ten of the kids only showed little bacterial growth in culture, hence their bacteriuria was not serious. Therefore, only 102 met the criteria for cultural positivity.

All the kids had their kidneys checked out.

Eight kids showed abnormally high values for a kidney parameter, suggesting a more serious medical problem. Two of the eight had hydronephrosis, while three had a posterior urethral valve. One instance of the 3 with hydronephrosis was caused by primary VUR, another by prenatal Hydronephrosis, and the third by a PUJ blockage. Neurogenic bladder affected 3 people. We found that the average urea level was 25.73, with a range of 8.1 to be considered statistically significant. The average creatinine level was 0.6 with a standard deviation of 0.206.

Forty-four of the children in the research (16.8%) had hematuria out of a total of 100. This test has a 67.9 percent negative predictive value, a 92.5% positive predictive value, and a sensitivity of 31.4%.

All the kids who tested positive for hematuria also had cystitis, as detected by ultrasonography.

Abdominal ultrasound was performed on all patients, and pelvic ultrasound was performed on some. Ultrasound most often detected cystitis (41) and hydronephrosis (5). Two had a preexisting condition called posterior urethral valve disease, another had Pelviureteric junction obstruction, another had antenatal hydronephrosis, and the remaining three had neurogenic bladders, which are identified by a thickened bladder greater than 2 mm and a post-void residual urine volume of more than 20 ml. Ascitis was identified in 4 patients with nephrotic syndrome.

Table 9: USG abdomen and pelvis findings in study population

USG Abdomen and Pelvis	No of cases	Percentage
Normal	68	68
Ascitis	6	6
Cystitis	16	16
Hydronephrosis	6	6
Neurogenic bladder	4	4
Total	100	100.0

Micturiting cystourethrogram

The micturition cystourethrogram was performed on roughly 5 patients who qualified. 3 youngsters were found to have aberrant results. In 2 of the kids, the prostatic urethra was

dilated and there was a linear filling defect in the region of the valves. The presence of a posterior urethral valve was suggested by these results. One youngster showed signs of grade 2 vesicoureteral reflux, characterized by reflux into the upper collecting system without ureteral dilation. Three kids showed symptoms of neurogenic bladder, including inadequate bladder emptying. Over 20 cc of pee remained after the patient empty. One youngster was diagnosed with severe hydronephrosis, or grade 4. Grade 3 VUR was suspected when a youngster was found to have a dilated renal pelvis and blunted calyceal fornices.

Table 10: Abnormal cases in micturiting cystourethrogram

MCU	No of Cases	Percentage
Normal	2	40
Abnormal	3	60
Total	5	100.0

Discussion

Of the total number of patients analyzed, 39.0% had a culture-positive UTI, whereas 61.0% did not. Our research found that urinary tract infections were more common in girls than boys. Culture positive female children formed more than half of the research population.

Gupta *et al.* conducted cross-sectional research and found that males made up 69.4 percent of the UTI population; moreover, boys were more likely to have vesicourethral reflux and renal scarring from UTIs than girls. Possible explanation: it also applied to newborns ^[9, 10, 11].

Researchers Sumit *et al.* examined the prevalence of urinary tract infections among children in northern India. In the population under study, ladies actually had a greater incidence of UTI than men did. 11.8% of women and 8.9% of men tested positive for a culture-related UTI.

UTI was shown to be more prevalent in men (60%) than in females (40%) among the study population, which comprised people of all ages with UTI-suggestive symptoms. However, the research did not categorize participants by age ^[9, 10].

According to research conducted by Sanath *et al.*, girls have higher cases of urinary tract infections (UTIs) than boys do between the ages of 3 and 5. Additionally, he found that symptomatic UTI occurs in 1-2% of boys and 3-8% of females before the age of 14.

Based on an analysis of the study population's age distribution, we found that UTI was most prevalent among participants aged 6-10 (60.78%), next those aged 0-5 (34.3%), and finally those aged >10 (18.62%).

According to the research conducted by Sumit *et al.*, the prevalence of UTI was greatest in the group of people aged >16 (30.58%), then those aged 11-15 (28.18%), then those aged 6-10 (20.58%), and lastly those aged 0-5 (20%) ^[10, 11].

Our study's findings on age distribution are similar with those of Nayak *et al.*, who found that the oldest participants were between the ages of 5 and 12, followed by those between the ages of 2 and 5, and then those less than 2 years old.

20.3% were ages 1-2, 33.3% were ages 2-3, and 46.4% were ages 5-12 in the research by Mod HK *et al.* This indicates that the peak incidence of UTI occurs between the ages of 6 and 10.

E. coli was the most prevalent culture-positive bacterium, followed by *Klebsiella*, *Proteus*, non-fermentative gram-negative bacilli, and lastly *Citrobacter*, which made up just a small fraction of the total.

According to our findings, *E. coli* is by far the most prevalent microorganism. Consistent with the findings of Palak *et al.* and A. Sharma *et al.*, our investigation yielded similar findings. When comparing our *Klebsiella* findings to those of Palak *et al.*, we found that they were similar. A large proportion of *Proteus* was found in our investigation, but no *Pseudomonas* was isolated ^[11, 12].

The results of our symptom analysis showed that dysuria was the most prevalent symptom,

followed by increased micturition frequency, prolonged vomiting, stomach discomfort, fever, hematuria, pyuria, and finally constipation.

Less than half of the patients had fever as a symptom. The vast majority of these kids had fever for less than a week, some had it for a week, and just a few had it for more than a week. Sumit Gupta *et al.* found that fever was the most prevalent symptom, followed by dysuria, burning micturition, stomach discomfort, foul urine, poor eating, and vomiting.

Research on the prevalence of urinary tract infections (UTIs) in children aged 2 months to 12 years old was conducted by Tamilarasu *et al.* Dysuria, stomach discomfort, fever, frequent micturition, vomiting, and oliguria were the symptoms, in decreasing order.

Researchers Nayak *et al.* found that fever was the most often reported symptom, followed by dysuria. Only a small percentage of the kids in our research had pale skin, and only a small percentage had puffy faces. Fewer than one percent of kids had pedal oedema. About of the kids who were sick with a high fever were under ^[13, 14].

Less than half of the kids had normal abdominal exams, and more than half of the kids had suprapubic soreness. Very few kids had lumbar discomfort.

We found that 10% of the boys we examined for genitourinary issues had phimosis. No cases of vulval synechia in female children were found. Everyone's blood pressure was OK among the kids who were checked.

One tenth of the youngsters in the research cohort had co-occurring disorders. Nephrotic syndrome, neurogenic bladder, posterior urethral valve, vesicourethral reflux, hydroureteronephrosis, and an obstructed ureteropelvic junction were the most common co-occurring disorders.

In comparing our study to previous ones, we have talked about things like sensitivity (the parameter's ability to correctly diagnose UTI), specificity (the parameter's ability to correctly rule out UTI), positive predictive value (the test, when tested positive, the likely chances that the patient has UTI), and negative predictive value (the test, when tested negative, the likely chances that the patient doesn't have UTI). It has been checked for pyuria, leucocyte esterase, nitrite, and a combination dipstick: PYURIA ^[15, 16].

AAP established criteria of 73% sensitivity and 45-98% specificity for pyuria. Our research found that pyuria's sensitivity was around 60%, which is lower than the standards set by the AAP, and that its specificity was approximately 80%, which is equivalent to the standards set by the AAP.

To evaluate the effectiveness of the urine microscope in the screening for UTI, we compared our research with four others. The results of our research demonstrate that urine microscopy has a poor sensitivity for identifying UTIs but a high specificity and negative predictive value. Our study's positive predictive value was in line with that of the vast majority of other research.

When compared to the AAP sensitivity standards for leucocyte esterase, our results were within the expected range of 83-94%. Our results are consistent with the AAP's recommended level of specificity, which ranges from 78% (64-92%).

When compared to four other research, our study's sensitivity was well above average. Our study had a high level of specificity that was on line with other research. Leukocyte esterase's positive predictive value was low, but it was comparable to that found in other research. Our research had a strong negative predictive value, which is in line with most others ^[17, 18].

The sensitivity for nitrite in our research was greater than the AAP standards of 53% (15-82%), and the specificity in our study was similar to the AAP norms of 98% (90-100%) for nitrite.

For the purpose of evaluating nitrite's diagnostic performance, we compared our research with four others. Testing the effectiveness of urine nitrite alone in UTI, Ratna Barel *et al.* showed that it is quite specific. Nearly all of the research demonstrated a specificity of 90% or above.

Similarly, our results showed that nitrite was highly specific and had a strong negative predictive value for the diagnosis of UTI. Our research indicated a high sensitivity for the

nitrite test, in contrast to that of previous studies. As with the negative predictive value, the positive predictive value was above average when compared to comparable research.

Our results are consistent with the AAP-recommended sensitivity range for the combined dipstick of 93% (90-100%). Our findings are consistent with the AAP-recommended 72% (58-91%) specificity for the combined dipstick.

In light of previous research on the efficacy of the combination dipstick in detecting UTI, we provide the results of our investigation. When compared to previous research, ours had a high sensitivity, a moderate specificity, a high negative predictive value, and a moderate positive predictive value. While most research found sensitivity between 60 to 70%, ours was much higher. The sensitivity of our analysis was unparalleled. The majority of research, like ours, had a specificity of 80% or above ^[19, 20].

Both our investigation and the studies of Ruchika *et al.* In contrast to our study's high sensitivity and specificity, the results of Nayak *et al.* and Mod Hk *et al.* reveal poor sensitivity and specificity. Both the Nayak *et al.* and Mod k *et al.* investigations had limitations, such as a lack of standardization of urine samples and a small sample size.

Microscopical analysis is less sensitive than leukocyte esterase, nitrite, and the combination dipstick. Nitrite alone has a high specificity compared to microscopic examination, leukocyte esterase, and the combination dipstick. All of the participants in our research had an ultrasound of the abdomen performed. Cystitis was the most prevalent diagnosis made by ultrasound, followed by hydronephrosis, ascitis, and finally neurogenic bladder. Consistent with our findings, Mod *et al.* found that 30% of patients with UTIs had abnormal USGs, with cystitis being the most prevalent result. Hydronephrosis was the next most frequent disorder, affecting 20% of participants. Our study's sample size for hydronephrosis is rather small, however this is likely due to the exclusion of children less than two years old. This suggests that there is room for error in finding anomalies. Medical renal illness and calculi were uncommon in the study population. No such result was found in our research ^[20, 21].

Cystitis, splenomegaly, and hydronephrosis were the most prevalent findings in a study of the clinicodemographic profile of UTI in children older than 2 years old conducted at the Government Stanley Medical College in Chennai; the remaining results were all normal. Hydronephrosis has been confirmed by this study's results. Our research found that among the kids with aberrant MCU results, one-fourth had a posterior urethral valve. Ten percent of those examined showed vesicoureteral reflux, with two percent having severe cases. Nearly a third of all bladder abnormality reports included neurogenic bladder. Ten percent of the group developed severe hydronephrosis.

Mod *et al.* found that only a small percentage of patients had aberrant MCU results, albeit they did not specify what those abnormalities were. Half of the participants in the research on UTIs at the Government Stanley Medical College had vesicoureteral reflux, while the other half had bilateral double ureters ^[21, 22].

	Our study	Sumit gupta et al.	Palak et al.	A sharma et al.
E. Coli	45.2%	27.05%	68.3%	67.5%
Klebsiella	19.8%	18.82%	21.12%	20%
Proteus	13.5%	11.76%	4.22%	10%
Pseudomonas	0%	8.23%	0.7%	

Study	Sensitivity	Specificity	PPV	NPV
Our study	63.8%	80.8%	67.5%	78.6%
Gorelick Shaw <i>et al.</i>	82%	87%	15%	
Mod hk <i>et al.</i>	63.5%	25%	70%	20%
Eric <i>et al.</i>	90.3%	91.3%	58.6%	98.6%
Nayak <i>et al.</i>	63.5%	25%	70%	19%
Hoberman <i>et al.</i>	54%	96%		

Study	Sensitivity	Specificity	PPV	NPV
Our study	92%	80.2%	74%	94.2%
Ruchika <i>et al.</i>	51.2%	92%	60.2%	88.9%
Nayak <i>et al.</i>	61%	25%	69%	19%
Mod hk <i>et al.</i>	61%	25%	69%	18.5%
Tamilarasu <i>et al.</i>	61.22%	98.8%	90.91%	92.88%

Study	Sensitivity	Specificity	PPV	NPV
Our study	86.7%	93.5%	79.6%	91.6%
Ratna baral <i>et al.</i>	69.04%	89.4%	63%	91.6%
Tamilarasu <i>et al.</i>	10.2%	100%	100%	85.03%
Mod hk <i>et al.</i>	50%	31%	66%	18.5%
Nayak <i>et al.</i>	68%	25%	71.4%	22%
Antwi s <i>et al.</i>	96.7%	58.8%	26%	99.2%
Walter ljm <i>et al.</i>	45-60%	85-98%		
Gabrielle J williams <i>et al.</i>	41-57%	96-98%		

Study	Sensitivity	Specificity	PPV	NPV
Our study	98%	82.5%	79%	97.8%
Gorelick and shaw <i>et al.</i>	73%	99%	61%	
Eric <i>et al.</i>	90.8%	93.8%	66.8%	98.7%
Ruchika <i>et al.</i>	62.2%	82.8%	45.9%	90.3%
Nayak <i>et al.</i>	68%	25%	71.4%	22%
Mod hk <i>et al.</i>	68%	25%	71.4%	22%

Conclusion

Microscopic examination of urine has a low level of sensitivity, positive predictive value, and negative predictive value. As a result, it lacks the accuracy necessary for use in UTI screening. Due to its high sensitivity and moderate specificity, leukocyte esterase is an excellent UTI screening test. Since nitrite has high sensitivity and specificity, it is an excellent diagnostic tool for detecting UTIs. In contrast to urine culture, a combined dipstick offers high positive and negative predictive values as well as high sensitivity. While waiting for urine culture results, a positive leukocyte esterase test may be relied on to diagnose a UTI, while a positive nitrite test can be used to rule out other possible causes. A positive combination dipstick test offers high sensitivity and specificity.

Funding source: None

Conflict of Interest: None

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