Comparison Of Nitrate Reduction Test With Urine Culture Among The Urinary Tract Infection Suspected Patients Visiting Janamaitri Hospital

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Abstract

Urinary Tract Infection (UTI) is among the most prevalent bacterial infections, encompassing a range of clinical conditions caused by microbial invasion of the urinary tract from the renal cortex to the urethral meatus. This study aimed to evaluate the diagnostic efficacy of the nitrate reduction (nitrite) test for rapid detection of UTIs, with the goal of aiding timely treatment decisions. A total of 712 midstream urine samples collected from patients at Janamaitri Hospital were processed using standard microbiological techniques. Significant bacterial growth was observed in 189 samples (26.5%), with *Escherichia coli* (47.9%) being the predominant isolate, followed by *Klebsiella* species (7.9%). Out of all samples analyzed, 117 (16.4%) showed nitrite positivity, which was most frequent among females aged 20–30 years. When compared with culture results, the nitrite strip test demonstrated a sensitivity of 30% and specificity of 98.6%, while conventional nitrate reduction on culture media showed 51.8% sensitivity and 96.36% specificity. Microscopy for pyuria yielded a sensitivity of 76.2% and specificity of 87.58%. Among the antimicrobial agents tested, nitrofurantoin exhibited the highest efficacy against the isolates of *Enterobacteriaceae*. Although the nitrite test showed limited sensitivity, its high specificity suggests that a positive result is strongly indicative of infection. Therefore, the nitrite test, while unsuitable as a standalone screening method, may serve as a useful alternative in clinical settings lacking advanced culture facilities.

Key Words: Urinary Tract Infection, Nitrite Test, Sensitivity, Specificity

Introduction

Urinary tract infections (UTIs) are among the most frequently encountered bacterial infections worldwide and are a leading cause of outpatient visits and antibiotic prescription (L. Li et al. 2025; Stamm and Norrby 2001). Recent global estimates indicate that the lifetime risk of developing at least one UTI is very high, with women disproportionately affected compared to men(L. Li et al. 2025; Stamm and Norrby 2001). UTIs also account for a substantial proportion of healthcare-associated infections; in many settings they represent roughly one-third of all nosocomial infections, particularly in catheterized and critically ill patients (Fekadu et al. 2025; Trześniewska-Ofiara et al. 2022). During infection, bacteria multiply within the urinary tract and urine, resulting in bacteriuria that may extend to adjacent structures of the male reproductive system, including the prostate, epididymis and testes (Stamm and Norrby 2001). The burden of bacteriuria and symptomatic UTI is strongly influenced by sex and age: females show higher incidence across the lifespan, with a pronounced rise during sexually active years and in older age groups, while UTIs remain relatively uncommon in young men (Stamm and Norrby 2001). Recurrent infection is frequent in women, and a substantial proportion experience reinfection within one year of an initial episode (Stamm and Norrby 2001).

Gram-negative bacilli and enterococci are the principal enteric organisms capable of proliferating in human urine (Linhares et al. 2013). Escherichia coli remains the predominant uropathogen worldwide in both community- and hospital-acquired UTIs, followed by other Enterobacterales and staphylococci (Fekadu et al. 2025; Linhares et al. 2013; Odongo et al. 2020). Pathogens such as Pseudomonas spp., Proteus spp., Klebsiella spp. and Staphylococcus aureus are more commonly associated with healthcare-associated infections, particularly in the context of urinary catheterization and urologic or gynecologic procedures (Fekadu et al. 2025; Trześniewska-Ofiara et al. 2022). Proteus species are frequently linked with urolithiasis, whereas Staphylococcus saprophyticus is classically associated with UTIs in sexually active young women (Linhares et al. 2013). At the same time, rising antimicrobial resistance among uropathogens, especially multidrug-resistant E. coli, has been documented in multiple regions and complicates empirical therapy (Linhares et al. 2013; Odongo et al. 2020).

In low- and middle-income countries, including Nepal, the impact of UTIs is amplified by socioeconomic and health-system constraints. Limited health literacy, poor hygiene, and restricted access to preventive and diagnostic services contribute to delayed care seeking and increased infection risk (Rai 2018; Eslami et al. 2023). UTI-preventive behaviors correlate positively with education level, family income and health literacy, underscoring the vulnerability of populations with limited resources and awareness (Eslami et al. 2023) In many peripheral and resource-limited healthcare facilities, routine urine culture and antimicrobial susceptibility testing are unavailable or difficult to access, leading to reliance on empirical treatment and increasing the risk of inappropriate antibiotic use and resistance selection (Odongo et al. 2020; Rai 2018).

In this context, simple and inexpensive screening tools for UTI are of particular interest. Many uropathogens possess nitrate reductase and can reduce urinary nitrate to nitrite under suitable conditions, forming the basis of the urinary nitrite (nitrate reduction) test. This test is widely used as a rapid bedside or point-of-care method and is incorporated into standard urine dipsticks, but its diagnostic performance is characterized by high specificity and limited sensitivity because of factors such as short bladder dwell time, low bacterial counts, or infection with non–nitrate-reducing organisms (Papava et al. 2022; Sultana et al. 2024). Recent studies report nitrite test sensitivities ranging approximately from 25% to 75%, with specificities often exceeding 90%, indicating that a positive result is strongly supportive of UTI whereas a negative result does not reliably exclude infection (Papava et al. 2022; Sultana et al. 2024). Evaluation of the nitrite test in specific clinical and geographic settings, including Nepal, is therefore essential to define its appropriate role as a rapid screening or surrogate diagnostic tool where culture facilities are limited.

Methods

The patients suspected of UTI were properly instructed about the Mid-Stream Urine (MSU) collection technique to avoid contamination. The patients were given a wide necked, dry, sterile, leak proof container and were requested for 10-20ml of urine sample. The sample was processed as soon as possible.
The acceptability of the sample was evaluated before sample processing. Required information regarding the sample like proper labeling (name of the patient, age, sex, date and time of sample collection etc.) was looked for. Since only single sample from a patient was collected, routine culture was performed first followed by other microscopic observations and chemical tests.
All the samples processed were accepted ones. Rejected samples are not included in the study.

Macroscopic Observations
The samples available in the laboratory were examined macroscopically for its physical appearance and for their acceptance for further processing. The characters like color, turbidity, presence of blood, visible signs of contamination like presence of foreign body, labeling of the sample, volume of the sample etc. were observed.

Microscopic Observations
The sample was centrifuged at 5000 rpm for 10 minutes. The supernatant was discarded and the sediment was examined by wet mount preparation for WBC count.

Nitrate Reduction Test
The urine sample was inoculated into the nitrate broth and after 4 hours of incubation, 0.1 ml of test reagent was added to the test culture. Development of red color indicated presence of nitrate reducing organisms. Otherwise, a pinch of zinc dust was added to ensure presence or absence of nitrate reducing organisms in the sample.

Routine Culture
Semi quantitative culture technique was used to culture the urine specimens and to detect the presence of significant bacteriuria by standard methods. (Cheesebrough,1984). An inoculating loop of standard dimension was used to take up approximately fixed (±10% error is accepted and known volume 0.001 ml) volume of mixed uncentrifuged urine to inoculate on the surface of 5% BA and MA. Urine specimens were thoroughly mixed to ensure uniform suspension of bacteria before inoculating the agar plates. The inoculated MA and BA plates were aerobically incubated overnight at 37ºC. The culture plates were observed after 24 hours of incubation at 37ºC. The bacterial isolates in the plates were identified in case of significant growth ($\geq 10^5$ CFU/ml). The plates were re incubated for additional 24 hours if the growth was not observed or if bacterial growth was unidentifiable after 24 hours incubation or if only tiny colonies were observed. After incubation, the approximate number of colonies was counted on each plate and organisms per ml were estimated in accordance to the volume of urine inoculated previously. For example, 100 colonies on inoculating 0.001 ml of urine would correspond to 10^5 CFU/ml. The plates were discarded if growth was not observed after 48 hours of incubation. Mixed growth of contaminating organism was neglected. Blood agar was observed for hemolysis and Mac Conkey agar for lactose fermentation and lactose non fermentation. The agar plates producing homogenous colony morphology were subjected for identification. The isolates were identified by using standard microbiological technique as described in Bergeys Manual which involves morphological appearance of the colonies, staining reactions, biochemical properties and serotyping if required in special cases.

Each of the organisms was isolated in pure form before performing the biochemical and other tests.
For Gram negative organism a speck of single isolated colony from the MA plate and for Gram positive organism a speck of isolated colony from the BA plate was transferred into the nutrient broth and incubated at 37ºC for 4 hours. It was then sub cultured on nutrient agar plate and incubated at 37ºC for 24 hours. Thus obtained overnight incubated culture of organism was used to perform catalase, oxidase, other biochemical tests and antibiotic susceptibility test.

Biochemical tests

Appropriate biochemical tests were performed for the confident identification of the bacterial isolates. For that the pure colonies on the media plates were inoculated on different biochemical media. Gram positive organisms were identified primarily on the basis of their responses to gram staining, catalase, oxidase and coagulase tests. The biochemical tests used for the identification of Gram negative bacterial isolates included catalase test, oxidase test. Indole test, methyl red test, Voges Proskauer test, citrate utilization test, oxidation fermentation test, triple sugar iron agar test, motility test and gas production test.

Antibiotic Susceptibility Test

Antibiotic Susceptibility testing of the isolates was done by Kirby Bauer Disc Diffusion method as recommended by the National Committee for Clinical Laboratory Standards (NCCLS) using Mueller Hinton Agar (MHA). The isolated colony whose antibiotic susceptibility pattern is to be determined was inoculated into Nutrient Broth (NB) tube with the help of a sterile loop and incubated at 37ºC for 24 hrs. After incubation the turbidity was matched with the turbidity standard of Mc Far land no. 0.5. With the help of a sterile swab, a Mueller Hinton Agar plate was inoculated with the bacterial suspension using carpet culture technique. The plate was left for 5 minutes to let the inoculum dry. Then appropriate antibiotic discs (6mm diameter) were gently pressed into the organism carpeted plate at a distance of 15mm away from the edge of the plate and 24 mm apart from each other. After 24 hours of incubation the diameter of zone of inhibition was noted down and the result was interpreted with reference to the standard interpretative chart provided by the company.

Quality Control

Quality control was applied in all possible areas of the study. The sample was collected following aseptic techniques so as to avoid contamination. Similarly, the samples were processed maintaining aseptic conditions. The dehydrated media were prepared according to the manufacturer's instructions for preparation, sterilization and storage in order to prevent the alteration of the nutritional, selective, inhibitory and biochemical properties of media. The performance of newly prepared media was tested using control species of bacteria (i.e. known organisms giving positive and negative reactions). Whenever new batch of stain and reagents were prepared, control smears were stained first to ensure correct staining reactions. Quality of sensitivity tests was maintained by maintaining the thickness of Mueller Hinton agar at 4 mm and the pH at 7.2 – 7.4. Control stains of *E. coli* (ATCC 25922) and *S. aureus* (ATCC 25923) were used for the standardization of the Kirby Bauer test and for the correct interpretation of zone of diameter.

Purity Plate

The purity plate was used to ensure that the inoculation used for the biochemical tests was pure culture and also to see whether the biochemical tests were performed in an aseptic condition or not. The 4 hours incubated broth culture prepared for biochemical test was inoculated on the half of the nutrient agar plate just before preceding the biochemical test. The other half of the same nutrient agar plate was inoculated immediately after completing the biochemical test. The plate was incubated at 37ºC for overnight. The pure growth of same organism in both the pre and post inoculated portion of the plate is the indication of maintenance of aseptic condition throughout the experiment.

Statistical Analysis
All the data were recorded in a log book at the time of entry. The growth of any organism and its AST pattern was also noted after successive tests and incubations. These primary data from the laboratory were tabulated on various bases and all the results were entered in the worksheet of SPSS 16.0. Chi square test was used to determine significant association of dependable variables like growth etc. to different independent variables like patient status, gender etc.

Results

Growth profile

Out of 712 urine samples received, 189 (26.5%) samples showed significant growth whereas majority of the samples i.e. 523 (73.5%) showed no growth (Table 1).

Table 1: Growth Pattern of Urine Samples

Specimen	Total no. of samples	Significant Growth		No Growth	
		No.	%	No.	%
Urine	712	189	26.5	523	73.5

Bacteriological Profile

Out of 189 bacterial isolates obtained from MSU samples, 15 different species were isolated. Among the isolates E. coli (47.9%) was found to be the most predominant organism followed by *S. aureus* (7.9%), *Morganella morganii* (6.8%), *Klebsiella spp* (6.8%), *Enterobacter spp* (5.8%) and so on (Table 2).

Table 2: Bacteria Isolated from Urine Specimen

Organisms isolated	No of isolates	Total percentage (N=189)
Gram Negative Bacteria		
Morganella morganii	13	6.8
Escherichia coli	91	47.9
Enterobacter spp	11	5.8
Proteus spp	4	5.8
Citrobacter spp	3	4.2
Klebsiella spp	13	7.9
Alkaligens	7	3.7
Providencia spp	8	4.2
Pseudomonas spp	3	1.6
Gram Positive Bacteria		
Staphylococcus aureus	15	7.9
S. saprophyticus	8	4.2

Nitrite Test

A total of 712 MSU samples were processed for the study, out of which, 117 (16.4%) samples were observed to be nitrite test positive and 595 (83.6%) samples showed nitrite negativity when tested by the conventional media and only 65 (9.1%) samples positive and 647 (90.9%) negative by the stripe method (Table 3).

Table 3: Result of Nitrite Test

Nitrate Reduction Test	Total No. of Samples	Test positivity		Test Negativity	
		No.	%	No.	%
By conventional media	712	117	16.4	595	83.6
By stripe	712	65	9.1	647	90.9

Comparison between the Results of Nitrite Test and Culture

When tested by the conventional media, among 117 nitrite positive samples, bacterial growth was observed in only 98 samples whereas bacterial growth was not observed in 19 nitrite positive samples. 91 samples with nitrate negative result also showed bacterial growth in culture. Similarly, in case of nitrite test by stripe, among 65 nitrite positive samples, 58 samples showed bacterial growth in culture and 7 samples did not. 131 cases of nitrite negative samples showed obvious growth in the culture plates (Table 4).

Table 4: Comparison between the Results of Nitrite test by media and Culture

Nitrate Reduction Test	**Culture Negative**	**Culture Positive**	**Total**
By media			
Nitrite negative	504	91	595
Nitrite positive	19	98	117
By stripe			
Nitrite negative	516	131	647
Nitrite positive	7	58	65
Total	523	189	712

Distribution of Nitrite Positive Samples.
Out of 117 nitrite positive urine samples, 23 (19.7%) were from male patients and 94 (80.3%) were from female patients. The MSU samples from the age group 20–30 years showed highest nitrite positivity i.e. 46/117 (39.3%). Both in case of male and female, the age group 20-30 years accounts for highest nitrite positive cases (6% and 33.3% respectively) followed by the age group 50-60 years (4.3%) in male and 30-40 years (14.5%) in female (Table 5).

Table 5: Growth pattern among different age group and gender

Age Group (in yrs)	**Male**		**Female**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**
0-10	0	0	2	1.7	2	1.7
10-20	2	1.7	6	5.1	8	6.8
20-30	7	6.0	39	33.3	46	39.3
30-40	1	0.9	17	14.5	18	15.4
40-50	2	1.7	10	8.5	12	10.3
50-60	5	4.3	7	6.0	12	10.3
60-70	2	1.7	7	6.0	9	7.7
70<	4	3.4	6	5.1	10	8.5
Total	23	19.7	94	80.3	117	100

Sensitivity, Specificity, Positive and Negative Predictive Values of Nitrite Test and Microscopy for Pyuria
The sensitivity of nitrite test by conventional media and stripe were observed to be 51.8% and 30% with a specificity of 96.36% and 98.6% respectively. Microscopy for pyuria offered a sensitivity of 76.2% and specificity of 87.58% (Table 6).

Table 6: Sensitivity, Specificity, Positive and Negative Predictive values of Nitrite Test and Microscopy for Pyuria

S.N	**Screening Test**	**Sensitivity (%)**	**Specificity (%)**	**Predictive Values (%)**	
				Positive	**Negative**
1.	**Nitrite Test**				
a.	**By Media**	51.8	96.36	83.76	84.7
b.	**By Stripe**	30	98.6	89.23	79.8
2.	**Microscopy for Pyuria**	76.2	87.58	68.91	91.05

Antibiotic Susceptibility Pattern of Bacterial Isolates from the Urine Samples
Among all the bacteria isolated, most of the bacteria were found to be sensitive towards Nitrofurantoin (64.2%) followed by Ceftriaxone (45.3%) and were observed to be resistant towards Nalidixic Acid (45.3%) followed by Ampicillin (43.2%) (Table 7).

Table 7: Antibiotic Susceptibility Pattern of Bacterial Isolates from the Urine Samples (n=189)

Antibiotics	**Sensitive**		**Intermediate**		**Resistance**	
	No.	**%**	**No.**	**%**	**No.**	**%**

Cotrimoxazole	71	37.4	-	-	66	34.7
Nitrofurantoin	122	64.2	5	2.6	20	10.5
Ceftriaxone	86	45.3	2	1.1	41	21.6
Nalidixic Acid	57	30.0	1	0.5	86	45.3
Cefixime	56	29.5	12	6.3	76	40
Gentamicin	66	34.7	5	2.6	41	21.6
Ciprofloxacin	83	43.7	4	2.1	29	15.3
Ampicillin	2	1.1	1	0.5	82	43.2
Norfloxacin	38	20	1	0.5	12	6.3

Discussion

In the present study, 26.5% of midstream urine samples yielded significant growth, while 73.5% were culture negative, which is comparable to several reports where urine culture positivity ranged from approximately 16% to 20% among submitted samples (Shakya et al. 2021). The low growth positive rate as obtained in our study may be due to the prior use of antibiotics by the patients, infection caused by slow growing type of organisms, relative small sample size or inability of the particular organism to grow in the routine culture media used for our study.

Gram-negative bacteria accounted for 88.36% of all isolates, with Gram-positive organisms representing only 11.64%. This marked predominance of Gram-negative uropathogens is in agreement with other reports, where 80–90% of isolates from urine cultures were Gram-negative and only 10–20% were Gram-positive (Fenta et al. 2020; Serretiello et al. 2021; Alebachew et al. 2025). Among Gram-negative isolates, *E. coli* was the predominant pathogen (47.9%), followed by *Klebsiella* spp., *Morganella morganii*, *Enterobacter* spp., *Proteus* spp., *Citrobacter* spp. and *Providencia* spp. A similar predominance of *E. coli* with other Enterobacterales such as *Klebsiella*, *Proteus*, *Enterobacter*, *Citrobacter* and *Morganella* occurring at lower frequencies has been reported in multiple series of community and hospital UTI isolates (Flores-Mireles et al. 2015; Linhares et al. 2013). *E. coli* have the special virulent properties contributing to their being a major uropathogen throughout the world. *E. coli* can bind to the Glycoconjugate receptor (Gal alpha 1-4 Gal) of the uroepithelial cells of human urinary tract such that it can initiate infection itself. *E. coli* is isolated in 90% of urinary tract infections and strains are characterized by unique virulence determinant, the p pilus (Gal-Gal) (Sanyal et al. 1991). *E. coli* is the most predominant organism to colonize urethra meatus (Schaeffer and Chmiel 1983) and perineum before ascending to the bladder. *Klebsiella spp* was found to be the second predominant bacterial isolate obtained in our study, which accounted for 7.9% of the total gram negative bacterial isolates. Among *Klebsiella* isolates, there were 1.1% *Klebsiella pneumonia* and 6.8% *Klebsiella spp* which were unidentified species. The finding is in agreement with the study where *Klebsiella spp* was the second predominant bacterial isolate after *E. coli* (Costa et al. 2018).

Most of the infections are due to Enterobacteriaceae and small number due to other non –enterobacteriaceae (Semeniuk and Church 1999). Enterobacteriaceae have several factors responsible for their attachment to uroepithelium. These gram negative aerobic bacteria colonize the urogenital mucosa with adhesions, pilli, fimbriae and cause infection (Das et al. 2006). Infection is initiated when UPEC binds to the superficial epithelial cells by type 1 pilli. In addition to attatchment, the presence of type 1 pilli can lead to bacterial invasion to bladder epithelial cells. These adhesions superficially bind D-galactose D-galactose moieties on the uroepithelial cells. The prevalence of *Proteus spp* in UTI is also an important finding. It produces urease and hence results in rapid hydrolysis of urea with the liberation of ammonia. Therefore, the urine becomes alkaline promoting stone formation and acidification is virtually impossible. The rapid motility may also contribute to its invasion of the urinary tract. Formation of infectious urinary calculi is the most common complication accompanying UTI by the members of the genus *Proteus* supported by the earlier studies (X. Li et al. 2002; Torzewska et al. 2003).

Among total 712 samples processed, 117 samples i.e. 16.4% were found to be nitrite positive and the remaining 595 samples i.e. 83.6% showed nitrite negative result when tested by the conventional media. The finding of nitrite test is in agreement with a similar study done at All India Institute of Medical Sciences (AIMS) in India (Sood et al. 1999). In contrast to this, the nitrite test by stripe method, used in our study, showed only 65 (9.1%) positive cases with the remaining 647 (90.9%) being negative ones. The less number of nitrite positive cases detected by the stripe method are due to the low sensitivity of the stripes available in the market, which could not detect nitrite level in the urine below 0.001%.

Nitrite test is a widely used marker for bacterial urinary tract infection because many Enterobacterales reduce urinary nitrate to nitrite in the bladder (Moragas et al. 2026; Stadler et al. 2025; Franco and Meza 2025). This reaction requires that urine remain in the bladder for several hours (commonly cited as at least 4–6 hours), to allow sufficient time for pathogens to convert nitrate to nitrite, which explains reduced sensitivity in patients who void frequently (Moragas et al. 2026; Stadler et al. 2025; Franco and Meza 2025). When nitrite test was compared with the culture results, 98 samples were observed to give true positive results and 91 samples gave false negative results. Similarly, 504 samples were true negative and 19 were found false positive. The results of nitrite test by the conventional media did not match with that by the stripe method. The difference in the result obtained by the two methods is due to difference in sensitivity and specificity of the two separate methods. *E. coli* was observed to be the predominant bacteria showing maximum growth (58.7%) in the nitrite positive urine samples, followed by *Klebsiella spp* (9.7%) and *Morganella morganii* (8.4%). This can be interpreted as *E. coli* being most common bacteria causing UTI as well as having the ability to reduce nitrate present in urine to nitrite more efficiently followed by *Klebsiella spp*, than does any other members of enterobacteriaceae.

Out of nitrite positive samples, females account for a higher percentage of positive cases (80.3%) than do males (19.7%). The relation was also found statistically significant with P value less than 0.05. The nitrite positivity may either be due to the higher number of female patients providing the sample for our study, or due to more infections occurring in females than in males, the ratio being 30:1. The nitrite positivity is maximum in the age group 20-30 yrs both in case of males and females (6% and 33.3%) followed by the age group 30-40 years (14.5%) in females and in the age group 50-60 years (4.3%) in case of males. The sensitivity of nitrite test by conventional media and stripe methods were observed to be 51.8% and 30% with a specificity of 96.36% and 98.6% respectively. The sensitivity of nitrite test by media is in harmony with a similar study by Shaw et al., 1991, where 50% sensitivity was reported. The result was comparatively similar to other reports(Sood et al. 1999; Bachman et al. 1993). The sensitivity of nitrite test by stripe was found to be only 30%. The low sensitivity may be due to frequent bladder emptying, or high specific gravity of urine, low intake of nitrate or due to the presence of nitrate non reducing bacteria in the urine sample. But in our study, since sensitivity of nitrate reduction by conventional media is satisfactory, the low sensitivity of stripe test is because of the presence of nitrate in low concentration in the urine. The specificity of the test by both media and stripe (96.36% and 98.6% respectively) were found in agreement with the results reported by the previous studies (Bachman et al. 1993; Tincello and Richmond 1998). Due to the low sensitivity of nitrite test in our study, a negative nitrite test cannot exclude the diagnosis of UTI. However, a negative nitrite test may correctly predict the absence of UTI, in situations where the possibility is low.

The sensitivity of microscopy for pyuria was observed to be 76.2%. In comparison to the nitrite test, microscopy for pyuria showed a remarkably high sensitivity though its specificity (87.58%) was less than the nitrite test. The significant pyuria more or less suggests a case of UTI after culture. False negative results of microscopy for pyuria was also seen which may be due to the early urine infection, presence of asymptomatic UTI, patients with diabetes, enteric fever or bacterial endocarditis.

In this study, nitrofurantoin was found to be the most effective drug against all Gram negative isolates. Nitrofurantoin with few other antibiotics represents effective option for the empiric therapy of patients with uncomplicated UTI (Wagenlehner et al. 2009). Nalidixic acid was found to be the least effective drug against Gram negative isolates. Resistance to nalidixic acid was also reported by other investigators (Younis et al. 2009). Among the Gram positive isolates, Amikacin was observed to be the most effective drug, cefixime being the least effective one.

Conclusion

In conclusion, the findings of this study indicate that urinary tract infection was predominantly observed among females of 20-30 years of age and chiefly caused by Gram-negative members of the Enterobacteriaceae family, with *Escherichia coli* as the primary uropathogen followed by *Klebsiella spp*. The nitrite test, owing to its low sensitivity, cannot be relied upon as a sole screening tool for urinary tract infection. However, its high specificity makes a positive result clinically valuable, particularly in patients with nonspecific urinary symptoms, where it may justify early initiation of antibiotic therapy without resorting to more expensive diagnostic procedures. In resource-limited settings, the nitrite test can serve as a pragmatic surrogate when culture facilities are inadequate or unavailable. Microscopy for pyuria demonstrated higher sensitivity than the nitrite test and yielded a greater number of true positive cases, yet neither method alone showed sufficient sensitivity to replace conventional urine culture. A combined approach, using both pyuria microscopy and nitrite testing, may therefore provide a useful preliminary diagnostic strategy for UTI and represent a practical alternative in settings where culture-based diagnosis is not feasible.

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