Biomedical & Pharmacology Journal Vol. **5**(2), 257-260 (2012)

Diagnostic Value of Leukocyte esterase and Nitrite Tests for the Detection of Urinary TractInfection

MELODY OMRANI NAVA[1], NAZANIN MIRZAEI[2], VAHID EBRAHIMIAN[3], MEYSAM MOLAEI[4], FATEMEH TOHIDNIA[4] and MAHDI PURSAFAR[4]

[1]Faculty of Medical Sciences , Department of Infectious Disease, Tonekabon Branch, Islamic Azad University,Tonekabon, Iran.
[2]Faculty of Medical Sciences , Department of Clinical Pathology, Tonekabon Branch, Islamic Azad University,Tonekabon, Iran.
[3]Laboratory Department of Ramsar Imam Sajad Hospital,Ramsar, Iran.
[4]Faculty of Medical Sciences,Tonekabon Branch, Islamic Azad University,Tonekabon, Iran.

(Received: September 30, 2012; Accepted: November 20, 2012)

ABSTRACT

Urinary tract infection (UTI)is one of the most important diseases. The laboratory is essential in the diagnosis of UTI. The value of the nitrite and leukocyte esterase tests in detection of UTI has been proved in some studies in various countries.The goal of our study was to determine the utility of such tests in UTI in Ramsar (north of iran). This was a cross-sectional study of patients presenting to Ramsar hospital with dysuria,urgency,or urinary frequency on history, or suprapubic or costovertebral angle tenderness on examination. Patients who had taken antibiotics in the past 72 hours, had indwelling foley catheters, symptomatic vaginal discharge, immunodeficiencydisorders, or were unable to provide a reliable history were excluded. For these patients samples were sent to laboratory center of hospital in order to urine analysis (U/A) and urine culture (U/C).Then we checked leukocyte esterase and nitrite dipsticks and compared them with results of U/C.Sensitivity, specificity and predictive values were calculated. In this study, 420 patients were enrolled 68(68/420) of patients had positive U/C. When the presence of leukocyte esterase and nitrite were assessed , the sensitivity of dipstick testing for leukocyte esterase was72%, the specificity was84.7%, the positive predictive value(PPV) was47.57%,and the negative predictive value(NPV) was94%.The sensitivity, specificity,PPV and NPV were 79.4%,94.3%,72% and 96% respectively. For both of them PPV was 65.5% and NPV was 99%. Among 420 patents with suspected UTI, we determined the high specificity of dipstick testing for leukocyte esterase and nitrite. Our results suggest that a dipstick test result that is negative for both leukocyte esterase and nitrite can effectively exclude the diagnosis of UTI for patients with suspected UTI. The positive predictive value of 65.5% suggests, however, that the dipstick test is relative useful for identifying patients who meet the laboratory criteria for UTI.

Key words: Urinary tract infection, Leukocyte esterase, Nitrite, Urine culture

INTRODUCTION

Urinary tract infection (UTI) is one of the diseases that despite multiple treatment andmany antibiotics used for it, still has many mortality and Morbidity[1].Urinary tract is normally sterile and urinary tract infection occurs when the bacteria, viruses, fungi and parasites come to this system. Its consequences have many complications which most fatal of them is renal failure[2]. Bacteriuria means being bacteria in the urine which increases possibility of urine infection in the urinary tractand to prove urinary tract infection, first urine analysis (U/A) and then urine culture (U/ C) should be used. If the urine culture obtained by Clean Catch Midstream (samples collected from the middle of

urination without infection) with over 100,000 colony units per ml or with Catheterization method More than 100 colony units per ml, it is considered positive and If the patient is symptomatic, and symptoms such as dysuria, urinary frequency, suprapubic pain or CVA tenderness, and Urinary Infection is characterized[1]. Using Dipstick bands that can be quickly done on urine samples and presence of urine leukocyte esterase and nitrite tests for screening of UTI are helpful and faster than urine culture can help us in detection of UTI[3,4].Nitrite test is consistent with presence of Enterobacteriaceae (convert nitrate to nitrite in urine).Gram-negative bacteria in urine convert nitrate to nitrite. In acidic environment, nitrite in the urine reacts with Parasanilic Acid and is created diazonium salt. This salt in Combination with 1,2,3,4 tetra benzo (h) quinoline-30d produces pink color. Additionally, you can immediately test urine for leukocyte esterase, which is a combination, produced from white blood cells (WBC) destruction[5]. In this study we aimed to determine the diagnostic value of rapid tests which is commonly done on urine samples with help of urine culture (U/C) standardtest and then determine sensitivity, specificity, positive predictive value and negative predictive value of these tests.

METHODS

This study conducted prospective and observational and in the form of diagnostic study was done on all patients with a diagnosis of UTI referred to Imam Sajjad hospital of Ramsar(north of iran)during 1390-91 and urinalysis (U/A) and urine culture (U/C) was done for them. Patients, including 420 cases who as outpatient or inpatient referred to hospital, That physician when saw symptoms such as dysuria, urinary frequency, suprapubic pain or CVA tenderness, for patients requested urine analysis (U/A) and urine culture (U/C) for patientsand for urine analysis, Dipstick test was performed that in terms of Nitrite and leukocyte esterase were assessed and recorded. Then compared with urine culture, which initially requested with urine analysis (U/A). It means the urine culture results compared with Dipstick test in terms of nitrite and leukocyte esterase. Finally, specificity, sensitivity, positive predictive value and negative predictive value of this test compared with U/C gold standard test.

RESULTS

In our study, a total of 420 people were studied, 122 cases (29%) men and 298 cases (71%) were female. 51 cases (12.1%) were in age group 0-10 years, 24 cases (5.7%) inage group 20-11 years, 90 (21.4%) inage group 21-30 years, 80 (19%) inage group 31-40 years, and 175 patients (41.7%) were more than 40 years.of total taken samples, 218 cases (51.9%) were in the hospital and 202 cases (48.1%) were collected outside the hospital. in terms of method of samples collection, 378 samples (90%) were through the middle of urine, 39 samples (9.3%) through the catheter and 3 cases (0.7%) were obtained by suprapubic method.Of total number of obtained samples in terms of culture result, 68 samples (16.2%) had positive culture and 352 samples (83.8%) had negative cultures. in terms of nitrite test result, 75 cases (17.9%) had positive nitrite test and 345 cases (82.1%) had negative nitrite test. and in terms of leukocyte esterase test result, 103 cases (24.5%) had positive test result and 317 patients (75.5%) had negative test result. In Terms of the frequency

Table 1. Results of nitrite and leukocyte esterase tests compared with urine culture

		Urine Culture					
		Positive		Negative		Total	
		Number	Percent	Number	Percent	Number	Percent
Nitrite and Leukocyte esterase	Positive	38	65.5	20	34.5	58	100
	Negative	3	1	297	99	300	100
Total	41	11.4	317	88.6	358	100	

of clinical symptoms in the study population, 109 patients (25.95%) had fever, 118 cases (28.09%) had nausea, 60 (12.5%) had vomiting, 84 (17.5%) had dysuria, 104 (21.6%) had urinary frequency, 277 patients (57.7%) had abdominal pain, 94 patients (19.5%) had flank pain, 126 (26.25%) had change in urine color, 37 patients (7.7 %) had malodor of urine and 23 patients (4/5%) had other symptoms. After analyzing the data and using Fisher's Exact Test, between urine culture test and nitrite test results was statistically significant relationship (p=0.0001) . Also between Gender of studied population and nitrite test results was statistically significant relationship (p=0.035). Between the location of samples collection and nitrite test results statistically significant relationship was observed (p=0.007). Also In the study of leukocyte esterase test, statistically significant relationship with urine culture results (p=0.0001), gender (p=0.006) and method of samples collection (p0.003) was observed. After reviewing the results of this study, the sensitivity, specificity, positive predictive value and negative predictive value of leukocyte esterase test, respectively, 72%, 84.7%, 47.57% and 94% were reported. For nitrite test, sensitivity, specificity, positive predictive value and negative predictive value were 79.4%, 94.3%, 72% and 96% respectively. Considering both tape tests (Dipstick) together, positive predictive value and negative predictive value were 65.5% and 99% (Table 1).

DISCUSSION

Our results show that in comparison with Koeijers and *et al.,* research, nitrite test sensitivity in our study (79.41%) Compared to Koeijers study (47%) is very more and almost twofold. Moreover, the specificity of this test in the two studies is approximately equal (94.3% vs. 98%). Also positive predictive value (72%) and negative predictive value (95.9%) In our study are less than positive predictive value (96%) and more than negative predictive value (59%) in the study of Koeijers. Additionally, the sensitivity of leukocyte esterase test in the study (72.05%) compared to Koeijers study (78%) is almost equal. Moreover, the specificity of this test inour study is much higher than mentioned study (84.65% versus 59%)[6]. Our study results show that in comparison with Bolann and *et al*, The nitrite and leukocyte esterase test sensitivity in our study was lower than Bolann study, whereas level of their specificity in our study are more than Bolannstudy[7]. While our study results compared with Etin and et al Show that the sensitivity and specificity of this test in our study are more than sensitivity and specificity of these tests In Etin and *et al.,* study[8]. Overall, the results of this study suggest the efficacy of leukocyte esterase and nitrite tests for in detection of UTI. This study show that patients with suspected UTI,if both mentioned test are negative, with very high probability U/C is negative and UTI excluded. Additionally positive predictive value of these tests is relatively acceptable. This study showed for the nitrite and leukocyte esterase test, urine test strip diagnosis of UTI hadrelatively high and good specificity and sensitivity. Considering that doing nitrite and leukocyte esterase tests required to less than one minute and its low cost and high sensitivity and specificity, it can be used as a screening test in the emergency wards in order to prevent UTI complications leading to early diagnosis and treatment before culture results be ready.

REFERENCES

1. Stamm WE.Urinary tract infections , pyelonephritis and prostatitis. in:Face A, Breaunwald E,Kasper DL, et al, editors.Harrison's principles of internal medicine .17th ed.New York:Mc Graw Hill; 1741-1830 (2008).
2. Mandell GL ,Bennett JE ,Dolin R. Principles and practice of infectious disease. *Philadelphia*, 957-985 (2010).
3. Mc Neeley SG, Baselski VS, Ryan GM .An evaluation of two rapid bacteriuria screening procedures. obstet *Gynecol*, **69**(4): 550-3 (1987).
4. Faller MA, Koontz FP. Laboratory evaluation of leukocyte esterase and nitrite tests for the detection of bacteriuria.*J Clin Microbiol*.

21(5): 840-2 (1985).

5. Carias B, Orillaza A, Llanera F. Utility of Nitrate and Leukocyte Esterase Tests for Laboratory Detection of Urinary Tract Infection in A General Population at the Philippine Heart Center: A Prospective Study. *Philippine Journal of Microbiology and Infectious Diseases*, **35**: 3 (2006).
6. Koeijers JJ, Kessels AG .Nys S, et al. Evaluation of the nitrite and leukocyte esterase activity test for the diagnosis of acute symptomatic urinary tract infection in men. *Clin Infection Dis.* **45**(7): 894-6 (2007).
7. Bolann J, *et al.* Implication of probalitiy Analysis for Interpreting Results of leukocyte Esterase and Nitrite test strips. **35**: 8-15 (2010).
8. Etienne M,Pestel M, *et al*. Performance of the urine leukocyte esterase and nitrite dipstick test for the diagnosis of acute prostatitis. *Clinic Infect Dis*. **46**: 951-953 (2008).