Original Research Paper

Volume-8 | Issue-11 | November-2018 | PRINT ISSN No 2249-555X

Medicine

ACCURACY OF URINE DIPSTICK TEST TO DIAGNOSTIC SYMPTOMATIC NOSOCOMIAL URINARY TRACT INFECTION AND RESISTANCE PATTERN OF NOSOCOMIAL UTI IN HAJI ADAM MALIK GENERAL HOSPITAL MEDAN

Citra Abdi Negara	Division of Tropical and Infectious Diseases Department of Internal Medicine Medical Faculty, University of Sumatera Utara/ Adam Malik Hospital, Jl. Bunga Lau Medan Indonesia
Fransciscus Ginting*	Division of Tropical and Infectious Diseases Department of Internal Medicine Medical Faculty, University of Sumatera Utara/ Adam Malik Hospital, Jl. Bunga Lau Medan Indonesia*Corresponding Author
Rina Yunita	Division of Tropical and Infectious Diseases Department of Internal Medicine Medical Faculty, University of Sumatera Utara/ Adam Malik Hospital, Jl. Bunga Lau Medan Indonesia
Putri Eyanoer	Division of Tropical and Infectious Diseases Department of Internal Medicine Medical Faculty, University of Sumatera Utara/ Adam Malik Hospital, Jl. Bunga Lau Medan Indonesia

ABSTRACT **Background :** Urinary tract infections (UTI) is one of the most common nosocomial infections and many of these infections are associated with microorganisms that are resistant to antimicrobial. Currently, urine culture considered to be a gold standard to diagnose UTI. The usage of urine dipstick as a screening tool for patients suspected with symptomatic nosocomial UTI has been used widely but performance characteristic of dipstick is still questionable. To determine accuration of dipstick urine test compared with urine culture for diagnosis of symptomatic nosocomial UTI as a gold standard, identify etiological microorganisms and antimicrobial drug resistance rate in bacterial pathogens causing symptomatic nosocomial UTI. **Method** : The study design is diagnostic test with standard reference urine culture that involved 151 patients with signs and symptoms of nosocomial UTI. **Result** : From 151 samples, 75 male (49.66%) and 76 female (50.33%). The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of dipstick urine test in diagnosing symptomatic nosocomial UTI was found to be 89.28%, 56.71%, 72.11% and 80.85% respectively. A total 91 isolates (60.26%) were successfully isolated from urine samples with highest prevalence of Escherichia coli 35 isolate (38.48%) followed by Enterococcus spp. 18 isolate (19.76%), Klebsiella pneumonia 13 isolates (14.28%), Pseudomonas aeruginosa 7 isolate (7.69%), Acinetobacter baumanii 4 isolate (4.39%) dan others 14 isolate (15.3%). Antimicrobial empiric for symptomatic nosocomial UTI with level of resistance under 20% are amikacin and fosfomycin. **Conclusion:** The urine dipstick test can to be useful as a screening test to role-out symptomatic nosocomial UTI and can reduce the need urine culture and avoid the prescription of ineffective antimicrobial. The most germ cause symptomatic nosocomial UTI is Escherichia coli. The empirical therapy with favourable sensitivity for all bacterial pathogens only amikacin and fosfomycin.

KEYWORDS : Dipstick urine, negative predictive value, symptomatic nosocomial UTI, antimikroba resistance.

1. INTRODUCTION

Nosocomial infections or hospital-acquired infections are defined as infections acquired during treatment at hospitals identified at least 48-72 hours after being treated in health institutions.1,2 Nosocomial infections cause morbidity, mortality and increased health costs. Urinary tract infection (UTI) is the most common cause of nosocomial infections2,3 and accounts for 35% - 50% of all nosocomial infections 4-7 and are often associated with the use of urinary catheters in 80% of cases.[7,8]

Nosocomial UTI can be symptomatic and asymptomatic.9 Asymptomatic nosocomial UTIs are more common (> 75%) with the prevalence of asymptomatic bacteriuria between 15% - 50% in patients without urine catheters, and almost 100% in patients with urine catheters.10 There are many examinations available for diagnosing nosocomial UTIs including wet mount microscopy, gram staining, dipstick and automated assays, but the gold standard for the diagnosis of UTI is that there are clinical symptoms plus positive urine culture. Urine culture is a costly microbiology laboratory procedure, requires experts and a long time of 3-5 days to get results, making it difficult for developing countries.11 Ideally an examination must be cheap, requires fast time and with reliable accuracy.[12,13]

Urine dipstick examination (dip dye method) is a qualitative examination method that assesses specific gravity, PH, urobilinogen, glucose, ketone, blood, leukocyte esterase (LE), and nitrite.12 Urine dipstick testing has been routinely used in many countries for initial investigations / screening or screening of UTIs and has advantages such as inexpensive, fast, and easy testing, especially in small laboratories that do not have culture facilities.12,13 This study assessed the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of urine dipstick test so that not all patients with nosocomial UTI suspicion were urine culture and given antimicrobials so as to reduce financing. , reduce the risk of AMR in patients suspected of nosocomial UTI.

2. METHOD

This study is an analytical study, cross sectional, population based study with a diagnostic test design on 150 samples taken with a proportional to population size technique, where each sample was then taken by consecutive sampling technique which corresponds to both symptomatic nosocomial UTIs associated with urinary catheter use or those who did not use a urine catheter based on the UTI criteria from CDC in 2012. The inclusion criteria in this study were male and female patients aged over 18 years, patients treated ≥48 hours later showed symptoms and signs of UTI that were not present with or without a urine catheter, and the patient was willing to take part in the study and proved by signing informed consent with exclusion criteria were patients with reduced consciousness and patients who entered the Haji Adam Malik General Hospital with a diagnosis of UTI.

Examination carried out with the urine dipstick method is a urine examination using sticks made specifically to detect glucose, protein, bilirubin, urobilinogen, PH, specific gravity, blood, ketones, leukocytes and nitrites by dipping sticks into urine fluid quickly (one second), then pull the stick and clean the stick on the edge of the tube to remove excess urine. Examination is read visually, wait 60 seconds for leukocyte and nitrite examination then compare the color reaction of the stick with the color on the label with positive results when the color changes to purple for leukocytes (+1, +2, and +3) and becomes pink for nitrite. Negatively expressed when there is no color change.

The urine culture method is the breeding of microorganisms from the urine material where the growing germs will be identified by testing

their sensitivity to antimicrobials. urine homogenisation was done by shaking the urine slowly evenly, then the urine was taken 10 µl using a disposable calibration loop and then deposited to make MC conkey and blood agar evenly. Then incubated at 36-370C for 18-24 hours.

Data will be analyzed descriptively to see the frequency distribution of research subjects based on characteristics. Then it will be continued with inferential analysis, namely data analysis to determine the value of sensitivity, specificity, PPV, NPV, and accuracy by using a 2x2 table.

3. RESULT

This study was conducted during May 2018 to July 2018 and was followed by 630 patients who were screened, but only 151 people (23.96%) met the inclusion criteria. Of the 151 patients there were 75 people (49.66%) men and 76 people (50.33%) women with a mean age of 50.25 years (range 18 years - 86.2 years). Based on the treatment room, patients treated in non-surgical wards were as many as 83 people (55%) and surgical rooms 68 people (45%). A total of 88 people (58.3%) used a urine catheter and 63 people (41.7%) did not use a urine catheter. Based on urine dipstick examination, there were 104 positive urine dipsticks (69%) and 47 (31%) negative urine dipstick with culture results found in 84 patients (55.6%) and no germ growth on 67 patients (44.4%). In patients using a urine catheter there were 72 positive patients (85.22%) with positive urine cultures found in 53 patients (73.61%) consisting of Escherichia coli 23 (43.39%) isolates, Klebsiella pneumonia 10 (18.86%) isolates, Enterococcus spp. 8 (15.09%) isolates, Pseudomonas aeruginosa 3 (5.66%), Pseudomonas putida 3 (5.66%) isolates, Burkholderia cepacia 2 (3.77%) isolates, Acinetobacter baumanii 1 (1.88%) isolates and other 8 (15.09%) isolates. Whereas 16 patients (18.18%) with positive urine catheter with negative urine dipstick were found in 3 patients (18.75%) consisting of Enterococcus spp. 2 (66.66%) isolates and Acinetobacter baumanii 1 (33.33%) isolates. Patients who did not use a urine catheter found 32 positive urine dipstics (50.79%) with positive urine culture as many as 22 patients (68.75%) consisting of Escherichia coli 10 (45.45%) isolates, Enterococcus spp. 6 (27.27%) isolates, Klebsiella pneumonia 3 (13.63%) isolates, Pseudomonas aeruginosa 3 (13.63%), Burkholderia cepacia 1 (4.54%) isolates and Acinetobacter baumanii 1 (4.54%) isolates. Whereas in patients who did not use a urine catheter a negative urine dipstick was found as many as 31 patients (49.20%) with positive urine culture found in 6 patients (19.35%) consisting of Escherichia coli 2 (33.33%) isolates, Enterococcus spp. 2 (33.33%), Pseudomona aeruginosa and Acinetobacter baumanii each of 1 (16.66%) isolates. Malignancy (malignancy) is the underlying disease of at most 33 people (21.8%) followed by neurological abnormalities 21 people (13.9%), trauma 21 people (13.9%), infectious diseases not UTI 20 people (13.2%), nephrology 19 people (12.5%), gastroenteroal hepatology abnormalities 10 people (6.6%), hematologic abnormalities 9 people (5.9%), obstetrics and geriatrics 5 people (3.3%), immunology and cardiology 3 people each (1.9%) and endocrine disorders 2 people (1.3%). (Table 1).

Table 1. Frequency distribution based on the characteristic of patients

Characteristic	Frequency	
	n	%
Sex		
Male	75	49.7
Female	76	50.3
Age (year)	50.25 ± 15.79	
Chateter		
Using	88	58.3
Not using	63	41.7
Ward		
Surgery	68	45
Non-Surgery	83	55
Dipstik		
Positif	104	69
Negatif	47	31
Urine Culture		
Positif	84	55.6
Negatif	67	44.4
Underlying disease		
Malignancy	33	21.8
Neurology	21	13.9
Trauma	21	13.9
Infection – non UTI	20	13.2
Nefrology	19	12.5
Gastroenterohepatology	10	6.6
Hematology	9	5.9
Obstetry	5	3.3
Geriatry	5	3.3
Imunology	3	1.9
Cardiology	3	1.9
Endocrine	2	1.3

The results of sensitivity, specificity, PPV and NPV from urine dipstick examination compared to urine culture showed a high sensitivity value of 89.28% and low specificity of 56.71% and PPV value of 72.11% and NPV of 80.85%, this indicates that urine dipstick has diagnostic tests with high sensitivity.The results of this study showed that antimicrobials with a sensitivity level above 80% against E. coli were seen in amikacin (96.87%), ertapenem and meropenem (87.5%), fosfomycin (84%) and tiglecyclin (100%). While the sensitivity level below 20% is seen in ampicillin / sulbactam (18.18%), aztreonam (6.66%), cephalosporins and floroquinolone groups. The level of antimicrobial sensitivity to Enterococcus spp. above 80% seen in amoxicillin / clavunamat acid (100%), benzylpenicillin (100%), imipenem (100%), linezolid (100%), nitrofurantoin (100%), tiglecyclin (100%), fosfomycin (93.75%) and vancomycin (88.88%). Whereas for antimicrobial Klebsiella pneumonia with a sensitivity level above 80% are amikacin (90%), fosfomycin (88.88%) and meropenem (80%), for Pseudomonas aeruginosa and Acinetobacter baumanii are amikacin 85.71% and 100% respectively (Figure 1).

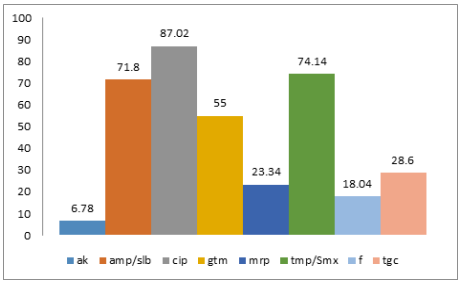

Figure 1. Antimicrobial resistance of nosocomial symptomatic UTI. Ak: Amikacin; amp/slb: Ampicillin/Sulbactam; cip: ciprofloxaxin; gtm: Gentamycin; Mrp: Meropenem; Tmp/Smx: Trimetroprim Sulfamethozaxole; F: Fosfomycin; Tgc: Tigecyclin

From 151 samples of patients with nosocomial UTI, we found 91 isolates (55.6%). There were 35 Escherichia coli isolates (38.48%), 18 Enterococcus spp isolates. (19.78%), 13 isolates of Klebsiella pneumonia (14.28%), 7 isolates of Pseudomonas aeruginosa (7.69%), 4 isolates of Acinetobacter baumanii (4.39%) and other bacteria 14 isolates (15.3%). (Table 2).

Table 2. Pathogen microorganism in nosocomial UTI

Mikroorganisme	Jumlah	%
E. coli	35	38.48
Enterococcus spp.	18	19.78
Klebsiella pneumonia	13	14.28
Pseudomonas aeruginosa	7	7.69
Acinetobacter baumanii	4	4.39
Pseudomonas putida	3	3.29
Burkholderia cepacia	3	3.29
Serratia marcescens	1	1.09
Cryptococcus laurenti	1	1.09
Proteus mirabilis	1	1.09
Cupriavidus pauculus	1	1.09
Kocuria kristinae	1	1.09
Stenotrophomonas maltophilia	1	1.09
Citrobacter freundii	1	1.09
Providencia stuartii	1	1.09
Total	91	100

4. DISCUSSION

Our research shows that out of 630 screened patients, 151 (23.96%) patients with nosocomial UTI symptoms and signs were found in positive urine dipstick results in 104 (69%) patients and 75 (49.6%) positive urine urine patients. . This result is in line with research conducted by Najeeb et al. in 2015 showed that 300 nosocomial UTI suspects were found to have positive urine dipstick 154 (51.3%) patients, of which 136 (45.3%) patients were positive urine culture.11 Another study conducted by Ginting et al. in Haji Adam Malik General Hospital Medan showed that out of 983 patients with symptoms and signs of nosocomial UTI there was a positive urine dipstick 715 (72.73%) and positive urine culture as many as 374 (38.04%) patients.[14]

Research conducted by Angpaoa et al. reported sensitivity, specificity, PPV and NPV of urine dipstick tests were 95.2%, 82.3%, 81.2% and 95.5% respectively15 while Najeeb et al. showed different values of sensitivity, specificity, PPV and NPV of 75.79%, 68.9%, 66.88% and 77.44%. Taneja et al. also showed sensitivity values and urine dipstick NPV of 79.6 and 90.9%.14 In patients with UTI the Ginting community had previously reported that NPV patients with dipstick tests in patients suspected of community UTI were 93%.16 This is in line with this study the results of urine dipstick and urine culture as gold standard were compared to see the accuracy of urine dipstick, with a sensitivity, specificity, PPV and NPV of urine dipstick of 89.28%, 56.71%, 72.11% and 80.85% respectively also higher than the research conducted by Duanngai and Najeeb. With a high NPV value (80.85%) then patients with signs and symptoms of nosocomial UTI with negative urine dipstick test results do not need to check urine culture and antimicrobial administration, otherwise if the urine dipstick test is positive then further examination is necessary in the form of urine culture to confirm the diagnosis.

The main cause of UTI in this study was Escherichia coli (38.48%) followed by Enterococcus spp. (19.78%), Klebsiella pneumonia (14.28%), Pseudomonas aeruginosa (7.69%), Acinetobacter baumanii (4.39%) and other microorganisms (15.3%). This result is the same as the research conducted by Latour et al. in 19 European countries showed that Escherichia Coli (34.4%) and Enterococcus spp. (10.2%) is the most common microorganism as a cause of nosocomial UTI (Latour et al. 2014). Likewise, research conducted by Mambatta et al. in 2015 in India showed Escherichia coli (62.8%) as the most common cause of nosocomial UTI followed by Enterococcus spp. (14.1%) and Klebsiella pneumonia (6.7%).[12]

Data obtained from this study showed that resistance levels were found in third and fourth generation cephalosporins 90%, against ciprofloxacin 70-87.5%, ofloxacin 75-100% and norfloxacin 75-100%. This figure is higher than the average resistance rates of ciprofloxacin, levofloxacin and cephalosporins against uropathogen causing nosocomial UTIs in Asia Pacific countries in the period 2004-2013.17,18 This is in line with research by SENTRY in North America in 1998 which showed that Escherichia coli had high resistance to ampicillin 42.2% and trimethropim / sulfamethoxazole (TMP / SMX) 23.3% and low resistance to fluoroquinolones <4%, imipenem 0% and aminoglycosides <3% while against Klebsiella spp. cephalosporin generation three figures <5% resistance, 0% imipenem, 4.8% piperacillin / tazobactam, <5% aminoglycosides and <8% fluoroquinolones, resistance to Enterococcus spp. still low on ampicillin 16.6%, amoxicillin / clavunamat acid 16.6%, imipenem 16.6%, nitrofurantoin 11.9% and vancomycin 5.2%.18 Data from the European Study Group on Nosocomial Infection (ESGNI-003) in 29 European countries in 1999 showed the rate of Escherichia coli resistance to TMP / SMX 28%, ampicillin 55% was very high while against ciprofloxacin 9%, gentamicin 5.8%, amikacin 19 %, ceftazidime 13%, cefepime 13.2%, and imipenem 9.7% are still quite good.19 Research conducted by the Antimicrobial Resistance Trends (SMART) Monitoring Study in Asia Pacific countries during 2010-2013 showed antimicrobials with resistance rates below 20% only in imipenem, ertapenem and amikacin.20 Another study conducted by Sukumaran and Kumar in India in 2017 showed high rates of antimicrobial resistance to Escherichia coli found in ampicillin (91.1%), ciprofloxacin (66.4%), cotrimoxazole (58.8%), cefepime (70.1%) and gentamycin (35.1%). Data in Indonesia reported by Sugianli and Ginting show resistance levels below 20% found in amikacin, fosfomycin, meropenem, and tiglecyclin.14

The high number of resistance to cephalosporins and floroquinolones has been predicted previously because these antimicrobials have been used for a long time in Medan Haji Adam Malik Hospital. According to the Infectious Disease Society of American (IDSA) guidelines for empirical antibiotic administration should be based on local resistance patterns, so that as empirical symptomatic nosocomial UTI therapy in Haji Adam Malik General Hospital Medan is amikacin and fosfomycin because it has a broad scope to fight microorganisms that cause symptomatic nosocomial UTI.

5. CONCLUSION

In conclusion, this study reports that the sensitivity of urine dipstick in diagnosing symptomatic nosocomial UTI is 89.28%, specificity is 56.71%, PPV is 72.11% and NPV is 80.87%. urine and antimicrobial administration before screening. The most common microorganisms causing symptomatic nosocomial UTI are E. coli, followed by Enterococcus spp. and Klebsiella pneumonia. Amikacin and fosfomycin as the preferred antimicrobials for symptomatic nosocomial UTI in Haji Adam Malik General Hospital Medan because the resistance level is below 20%.

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