URINE CULTURE CONTAMINATION: A ONE-YEAR RETROSPECTIVE STUDY AT THE TERTIARY CARE HOSPITAL

B. V. Shamsundar¹, Prashanth²

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ABSTRACT: BACKGROUND: Urine culture contamination results in significant cause of delay in treatment of patients being investigated for urinary tract Infection. Though contamination is not completely avoidable, several precautionary measures like proper patients education regarding collection of samples and proper instructions to paramedical staff regarding sample handling and transport helps in reducing the contamination. **AIM:** To determine the frequency and factors associated with urine culture contamination in samples submitted to the hospital Microbiology Laboratory. **METHOD:** Retrospective study of urine culture contamination in which data from the hospital Laboratory from January 1 to December 31 2013 were reviewed. Patients' age, gender, location and urine culture results were assessed. Contamination rates for different genders, age groups and departments were assessed and results are recorded. **RESULTS:** Over all urine contamination rate was 16.63%. Females had a contamination rate of 21.50%, which was significantly higher than the contamination rate of 9.44% in males. The Gynecology and Antenatal clinics had the highest contamination rates amongst departments with 22.5% and 21.3% respectively. Lowest contamination rates were in Emergency Unit (EPU) and intensive Care Unit (ICU) with rates of 5.9% and 9.5% respectively. The female gender was found to be the most significant predictor of higher contamination rate. **CONCLUSION:** Contamination rate of urine cultures in this study is high. Appropriate interventions need to be instituted to reduce the current urine culture contamination rate in the tertiary care hospital at Mysore.

KEYWORDS: urine specimen, Urine culture, Contamination.

INTRODUCTION: Urinary tract infection is one of the most frequent infection in both community and as well as in the hospital patients. So laboratory diagnostic methods play an important role in the detection of UTI (Urinary tract infection).

Various methods are available both rapid and conventional culture methods for the identification of urinary pathogens.

About 70-80% of the urine samples received in a clinical laboratory is found on full microscopic examination and culture examinations to be free from evidence of infection in the urinary tract.⁽¹⁾ Culture methods using various media remains as the gold standard. Using solid media helps in the appreciation of colony characteristics of the microbes and in the quantitative estimation (colony count) of the microbes.

To get the pure growth in the culture media proper collection of samples through aseptic precaution and proper and rapid transport of specimens needed.⁽²⁾ so if this procedures are not followed there is increased chance of contamination and thus difficulty in the interpretation of urine cultures.

ORIGINAL ARTICLE

Suprapubic aspiration and straight catheter technique are the best methods to avoid contamination but they are invasive. Most urine specimens in adults and children are collected using the clean-catch midstream (CCMS) technique.

Proper use of the CCMS technique results in colony counts which correlate with those of specimens collected via suprapubic aspiration.⁽³⁾

In quantitative cultures, midstream urine samples will give more than 100,000 bacteria per ml if the patient's has UTI. Counts of 10,000 bacteria or less per ml are due to contamination during voiding of urine and are of no significance unless the patient has some underlying problem. In patients who are on antibacterial or diuretic drugs and with some bacteria like *S. aureus*, even low counts may be significant. So interpretation of bacteriuria should always be with reference to the condition of the patient.⁽⁴⁾

Urine being an excellent supportive medium for growth of most bacteria must be immediately refrigerated or preserved.

For population of patients from whom colony counts of organism less than 100,000/ml, might be clinically significant plating within 2hr of collection is recommended.⁽⁵⁾ Bacterial contamination of urine often has important consequences; overuse of antibiotics, delay in instituting appropriate antibiotics, erroneous diagnosis and added cost of repeat cultures.^(2,6)

Urine culture contamination has been defined in several ways. The College of American Pathologists (CAP) has defined it as 'any urine specimen that yields >10⁵cfu/ml of two or more different organisms'.⁽²⁾ Pure culture growth of bacteria in numbers <10⁵ have been considered as contaminants in other studies.⁽⁷⁾ The rate of urine culture contamination in some studies range from 2- 37%.^(2,8,9,10,11) While possibly not being completely avoidable, rates can be reduced by instituting appropriate effective measures.

So I have taken a study in the tertiary care hospital to know the incidence of urine culture contamination so that suitable action can be taken to reduce the incidence of contamination in the urine cultures.

MATERIALS AND METHODS: The study was designed to assess the frequency of bacterial contamination of urine cultures and elucidate factors associated with urine contamination. Laboratory data for urine cultures from January 1 to December 2013 were analyzed. All culture were made on either CLED and blood agar plates or McConkey and blood agar plates and incubated for 16-24 hours.

An inoculating loop of standard dimension is used to take up a small, approximately fixed and known volume of mixed uncentrifuged urine and spread it over a plate of agar culture medium. The plate is incubated, the number of colonies counted or estimated, and this number used to calculate the number of viable bacteria per ml of urine. nichrome wire of SWG 28 is used to make a circular loop of 3.26mm internal diameter, which holds a drop of urine of 0.004ml volume.

Thus if a 0.004 ml loop full of urine yields 400 colonies the count per ml will be 10⁵ or just indicative of significant bacteriuria.⁽¹⁾ Variables analyzed were patient age, gender, location and urine culture result. Urine culture contamination as defined by CAP (College of American physician) is adopted in our laboratory. Patients with specimens not specifying age, gender or urine culture results in register were excluded from the study. Factors that could potentially be associated with higher or lower urine contamination rates were identified. Selected variables were examined

ORIGINAL ARTICLE

individually to determine if they were independently associated with urine culture contamination rate.

Sex	Total No of Specimen	Number of Contaminated	Percent contaminated
Male	180	17	9.44%
Female	265	57	21.50%
Total specimen	445	74	16.63%

TABLE 1: URINE CONTAMINATION RATES BY GENDER

P<0.0001

WARD	TOTAL SPECIMEN	NO CONTAMINATED	PERCENTAGE CONTAMINATED
EMERG	10	01	10
ICU	16	01	06.25
GYNC	100	22	22
ANC	80	17	21.25
IP	97	12	12.37
OP	142	20	14.08

TABLE 2: URINE CONTAMINATION RATE – WARD WISE

AGE	NO OF SPECIMEN	NO CONTAMINATED	PERCENTAGE CONTAMINATED
<2yr	07	62	11.29
2-60yr	59	337	16.91
>60yr	08	46	17.39

TABLE 3: URINE CONTAMINATION RATE IN DIFFERENT AGE GROUPS

P<0.01

RESULTS: A total of 2645 specimen was received in the laboratory, out of which 1545 (58.41%) met the inclusion criteria. The sample population was made up of 265(59.55%) females and 180 (40.44%) males.

Overall urine culture contamination rate was 16.63%) (72/445). Contamination rate of the female subset was 21.50% while that of the male subset was 09.44 % (Table 1).

Analysis of the age subset showed children aged less than two years had contamination rate of 11.29% while patients aged 2-60 years had a contamination rate of 16.91%. The contamination rate of patients over 60 years of age was 17.39% (Table-3)

DISCUSSION: This study was designed to study the frequency of urine culture contamination and analyze factors associated with the rates. 59.55% of the urine specimens analyzed wherefrom

ORIGINAL ARTICLE

females. This increased rate of investigating females is because of their higher risk of having urinary tract infection.^(2,12)

Overall urine culture contamination rate in the hospital for the period under study was found to be 16.63%. The literature has widely varying estimates of urine contamination^(2,8,9,10,11) this variation may be because of the different characteristics of the populations studied –(healthy males, healthy women, prepubescent females, uncircumcised males and the different criteria used for defining urine culture contamination in the various studies).

The largest study done on urine culture contamination rate, the CAP⁽²⁾ study, used the same definition of urine culture contamination as this study and has the most similar patient characteristics. Median contamination rate in the CAP study was found to be 18.1%,⁽²⁾ with laboratories in the 90th and 10th percentiles of the study having average rates of 5.7% and 36.7% relative to that study, the urine culture contamination rate in this hospital appear to be within average. Due to the differing characteristics between this study and the others, no direct comparison can conveniently be made. The finding that females have significantly more urine contamination rate than males inconsistent with previous findings,^(10,12)

Patients of different ages had slightly different contamination rates. This female dominance in urine contamination is likely due to the anatomical features of the external genitalia and its proximity to the anal region. Patients in the hospital being sent for urine culture are rarely instructed on the collection technique(personal communications); it is therefore, most likely that the contamination occurred at the time of collection as already established in previous studies.^(13,14)

Studies have shown that patients given instructions on proper collection have lower contamination rates than those who did not receive instructions ^(8,13, and 14)

Similarly urine specimens were often observed to be delayed at varying points for a total of up to four to eight hours after collection without refrigeration or preservatives before processing. Delayed processing of urine specimen for more than 2 hours post collection results in increased rate of culture contamination unless specimens have been refrigerated or kept in a preservative^(15,16)

In emergency and ICU, specimens were transported rapidly to the laboratory as against the sample obtained in other wards and outpatients where samples were kept for hours before being taken to the laboratory.

This rapid transport from Emergency ward may be one of the factors responsible for the lower contamination rate observed there, in addition to the very low number of females in this group. (Table-2).

It is concluded that the relatively high contamination rate seen in this study is unacceptable and can be reduced by giving proper instructions to patients and processing specimen within two hours of collection or stored in preservatives or refrigerated. There is need to set a benchmark contamination rate so as to enhance its use as a quality indicator in urine processing.

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REFERENCES:

1. Mackie and McCartney. Practical medical microbiology. 14 edition-1998.culture methods; 88.
2. Valenstein, P., Meier, F. Urine culture contamination: a college of American Pathologists Q-Probes study of contaminated urine cultures in 906 institutions. Arch. Pathol.Lab. Med.1998 Feb; 122: 123-9.
3. Stamm, W. E., Counts, G. W., Running, K. R. Diagnosis of coliform infection in acutely dysuric women. N. Engl. J. Med. 1982; 307: 463-8.
4. Arthi Kapil.Textbook of microbiology.9ed.2014.Methods of quantatitative culture: p 278-09.
5. Betty A. Forbes etal. Baiely and Scott's diagnostic microbiology.10Ed: 1999.Specimen transport and screening procedure; page 354.
6. Al-Orifi, F., McGillvray, D., Kramer, M. S. Urine culture from bag specimens in young children: are the risks too high? J.Pediatr. 2000 Aug; 137 (2): 221-226
7. Coulthard, M. G., Kalra, M., Lambert, J.H., Nelson, A., Smith, T., Perry, J. D. Redefining urinary tract infections by bacterial colony counts. Pediatrics 2010; 125(2): 335-341.
8. Baerheim, A., Digranes, A., Hunskaar, S. Evaluatiion of urine sampling technique: Bacterial contamination of samples from women students. Br. J. Gen. Pract. 1992; 42: 241-243.
9. Lohr, J. A., Portilla, M. G., Geuder, T. G., Dunn, M. L., Dudley, M. S. Bacterial contamination rates in voided urine collections in girls. J. Pediatr. 1989; 114: 91-93.
10. KC. Iregbu, N. Medugu, N. Abudullahi. Urine culture contamination: one year retrospective study. African j. of clinical and Exper. microbiology. 2013 may; Vol 14(2): 101-104
11. Leonas G. Bekeris, Bruce Allen Jones, Molly K. Walsh, and Elizabeth A. Wagar Comparison of Urine Culture Contamination: A College of American Pathologists Q-Probes Study of 127 Laboratories. Archives of Pathology & Laboratory Medicine: June 2008, Vol. 132, No. 6, pp. 913-917.
12. Foxman, B. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. American Journal of Medicine, 2003; 49 (2): 53-70.
13. Rebekka Lytzen, Jenny Dahl Knudsen, Steen Ladelund, Marianne Soendergaard Khinchi &Dina Cortes Impact of cleaning before obtaining midstream urine samples from children, Dan Med J 61/6 June 2014.
14. Rashmi Shrestha, Narayan Gyawali Effect of Urogenital Cleaning with Paper Soap on Bacterial Contamination Rate While Collecting midstream urine: J Lab Physicians. 2013 Jan-Jun; 5(1): 17-20.
15. Hindman, R., Tronic, B., Bartlett, R. Effect of delay on culture of urine. J. Clin. Microbiology. 1976; 4(1): 102-103.
16. Jefferson, H., Dalton, H. P., Escobar, M. R., Allison, M. J. Transportation delay and the microbiological quality of clinical specimens. Am J ClinPathol. 1975 Nov; 64(5): 689-693.

ORIGINAL ARTICLE

AUTHORS:

1. B. V. Shamsundar
2. Prashanth

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Microbiology, Mysore Medical College.
2. Post Graduate, Department of Microbiology, Mysore Medical College and Research Institute, Mysore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Shamsundar B. V,
Door No. M-16, 2nd Stage,
Kuvempunagar, Mysore,
Karnataka.
E-mail: shamsundarmysore@gmail.com

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