REVIEW ARTICLE
AFRICAN JOURNAL OF CLINICAL AND EXPERIMENTAL MICROBIOLOGY MAY 2013 ISBN 1595-689X VOL 14(2) 2013
AJCEM/21317 -http://www.ajol.info/journals/ajcem

AFR. J. CLN. EXPER. MICROBIOL 14(2): 101-104 http://dx.doi.org/10.4314/ajcem.v14i2.10

URINE CULTURE CONTAMINATION: A ONE-YEAR RETROSPECTIVE STUDY AT THE NATIONAL HOSPITAL, ABUJA

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ABSTRACT

Background: Urine culture contamination is a significant cause of delay in treatment of patients being investigated for urinary tract infection. Though contamination is not completely avoidable, several measures have been proven to decrease contamination rates. There are few studies detailing urine contamination rates in laboratories in Nigeria.

Aim: To determine the frequency and factors associated with urine culture contamination in samples submitted to the Medical Microbiology Laboratory in National Hospital Abuja (NHA).

Method: Retrospective study of urine culture contamination in which data from Medical Microbiology Laboratory from January 1 to December 31 2012 at National Hospital Abuja were reviewed. Patients' age, gender, location and urine culture result were assessed. Contamination rates for different genders, age groups and departments were assessed and results presented in simple averages and percentages.

Results: Overall contamination rate was 13.1%. Females had a contamination rate of 16.9%, which was significantly higher than the contamination rate of 6.8% in males. The Gynaecology and Antenatal clinics had the highest contamination rates amongst departments with 22.5% and 21.3% respectively. Lowest contamination rates were in Emergency Paediatric 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 unacceptably high. Appropriate interventions need to be instituted to reduce the current urine culture contamination rate in National Hospital Abuja.

Key Words: Urine, Contamination, National Hospital, Abuja.

INTRODUCTION

Contamination of urine cultures results from poor collection technique and or prolonged time from collection to processing (1). Suprapubic aspiration and straight catheter technique are the best methods to avoid contamination but they are invasive (2). 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). Bacterial contamination of urine often has important consequences; overuse of antibiotics, delay in instituting appropriate antibiotics, erroneous diagnosis and added cost of repeat cultures (1,4).

Urine culture contamination has been defined in several ways. The College of American Pathologists (CAP) has defined it as 'any urine specimen that yields $>10^5$cfu/ml of two or more different organisms' (1). Pure culture growth of bacteria in numbers $<10^5$ have been considered as contaminants in other studies (5,6). The rate of urine culture contamination in some studies range from 2- 37% (1, 7, 8, 9).While possibly not being completely avoidable, rates can be reduced by instituting appropriate effective measures. This study was carried out to determine the baseline contamination rate in NHA to guide appropriate intervention measures.

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 2012 were analyzed using Microsoft Excel. All culture were made on either CLED and blood agar plates or McConkey and blood agar plates and incubated in air for 16-24 hours in air. Variables analyzed were patient age, gender, location and urine culture result. Urine culture contamination as defined by CAP is adopted is 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 individually to determine if they were independently associated with urine culture contamination rate.

RESULTS

A total of 4448 specimen were received in the laboratory, out of which 2631 (59.2%) met the inclusion criteria. The sample population was made up of 1593 (60.6%) females and1038 (39.5%) males.

Overall urine culture contamination rate was 13.1% (345/2631). Contamination rate of the female subset was 16.9% while that of the male subset was 6.7% (Table 1).

TABLE 1: URINE CONTAMINATION RATES BYGENDER

	Total No of Specimen	Number of Contaminated	Percent contaminated
Male	**1037**	**70**	**6.6**
Female	**1593**	**269**	**16.9**
Total specimen	**2631**	**345**	**13.1**

P<0.0001

Analysis of the age subset showed children aged less than two years had contamination rate of 10.5% while patients aged 2-60 years had a contamination rate of 12.9%. The contamination rate of patients over 60 years of age was 11.1%. (Table 2)

TABLE 2: URINE CONTAMINATION RATE BY SITE

	Total Specimen	Number Contaminated	Percent contaminated
EPU	**255**	**15**	**5.8**
ICU	**21**	**2**	**9.5**
GYNAE	**178**	**40**	**22.5**
ANTENATAL	**150**	**32**	**21.3**
INPATIENT	**1346**	**179**	**13.3**
OUTPATIENT	**1285**	**161**	**12.5**

The EPU and ICU had contamination rates of 5.5% and 9.5% respectively. Contamination rates of specimen from the Gynaecology and Antenatal subsets were 22.5% and 21.3% respectively. The adult emergency department had a contamination rate of 13.8%. The rate for inpatients was 13.3% while that of outpatients was. 12.5%. (Table 3)

TABLE 3: URINE CONTAMINATION RATE IN DIFFERENT AGE GROUPS

Age	Number of Contaminated Specimen (n)	Total Specimen (N)	Percent contaminated
<2yr	**12**	**114**	**10.5**
2-60yr	**306**	**2374**	**12.9**
>60yr	**12**	**117**	**11.1**

P<0.01

DISCUSSION

This study was designed to elucidate the frequency of urine culture contamination and analyze factors associated with the rates.

Majority (60.0) of the urine specimens analyzed were from females. This increased rate of investigating females is because of their higher risk of having urinary tract infection (1, 10).

Overall urine culture contamination rate in NHA for the period under study was found to be 13.1%. The literature has widely varying estimates of urine contamination (1, 7, 8, 9); 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 (1) 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% (1), with laboratories in the 90th and 10th percentiles of the study having average rates of 5.7% and 36.7% respectively. Thus, relative to that study, the urine culture contamination rate in NHA may 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 is consistent with previous findings (1, 5, 6, 10).

Patients of different ages had slightly different contamination rates; the trend towards higher contamination rates was seen in groups with a higher proportion of females. Although contamination rates differed markedly for different departments, the higher contamination rates were seen in sections with higher female population. This female dominance in urine contamination is likely due to the anatomical features of the external genitalia and its proximity to the perianal 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 contaminations occurred at the time of collection as already established in previous studies (1,11). Studies have shown that patients given instructions on proper collection have lower contamination rates than those who did not receive instructions (6, 7, 8).

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 (1, 11, 12, 13).In EPU, specimens were transported rapidly to the laboratory as against what obtains in other wards and outpatients where samples were kept for hours before being taken to the laboratory. This rapid transport from EPU 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.

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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