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A Study on Clinical Correlation of Different Colony Counts from Urine Culture.

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ABSTRACT

Urinary tract infection (UTI) is the most common infection affecting population irrespective of the age and it accounts for approximately 40% of the hospital acquired infections. Urine cultures from patients with symptomatic UTI usually show >10⁵ CFU/mL of urine, whereas asymptomatic patients whose cultures have been contaminated usually show < 10³ CFU/mL of urine. This study aims to find out any association between low colony count and clinical symptoms so that rationale use of antibiotics can be resorted to. A retrospective study was conducted on urine cultures and correlation was done by verifying the clinical records. Among 605 samples, culture was positive with lower colony count in 104 samples (17.19%) which were further analyzed. Low colony count in urine cultures, 50.96% were from clinically not relevant cases and 45.19% were having colony count between 25,000 to 50,000 CFU/ml. Colony count of < 25,000 CFU/ml was seen more [62.8%] in clinically not relevant cases. Reporting lower colony counts from urine cultures should be always correlated well with the clinical features by the physicians before commencement of antibiotic therapy to avoid injudicious usage of antibiotics which in turn will reduce emergence of multi drug bacterial resistance.

Keywords: Urinary tract infection, low colony count, urine culture, multi drug bacterial resistance

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INTRODUCTION

Urinary tract infection (UTI) is the most common infection affecting population irrespective of the age and it accounts for approximately 40% of the hospital acquired infections [1]. Urinary tract infection (UTI) means presence of bacteria (or other microorganisms, such as yeasts) in urine with or without clinical symptoms and with or without renal disease. Treatment of urinary tract infections is based on the culture report and colony count [2].

Significant bacteriuria refers to the laboratory finding of $>10^5$ colony-forming units (CFU) of bacteria per mL of urine. Asymptomatic bacteriuria denotes significant bacteriuria ($>10^5$ CFU/mL of urine) without clinical symptoms or other abnormal findings. Urine cultures from patients with symptomatic UTI usually show $>10^5$ CFU/mL of urine, whereas asymptomatic patients whose cultures have been contaminated usually show $<10^3$ CFU/mL of urine. Colony counts less than 100,000 CFU/mL are infrequently associated with a clinically significant infection except in situations like pyelonephritis, lower urinary tract infection (urethral syndrome), prostatitis, epididymitis and fungal infection [2, 3].

Polymicrobial uropathogens in urine is usually significant especially in elderly people as they exhibit resistance to front line antibiotics which may pose an increased risk to human health.[4] Reporting lower colony counts may often result in therapeutic dilemma to the clinicians whether to treat the patient with antibiotics and inappropriate antibiotic usage may result in the development antimicrobial resistance. This study aims to find out any association between low colony count and clinical symptoms so that rationale use of antibiotics can be resorted to. This will assist in reducing antimicrobial resistance to antibiotics.

Aim and Objectives

A retrospective study was done to find out clinical correlation of lower colony counts from urine cultures.

- To find out the colony counts from mid-stream urine samples from patients attending Saveetha medical college hospital with semi quantitative method of culture.
- To correlate the clinical relevance of lower colony counts (less than 10^5 CFU/mL) in urine cultures from medical records.

MATERIALS AND METHODS

A retrospective study was conducted from 1st May 2013 to 30th June 2013 in Saveetha Medical College Hospital which is a tertiary care Hospital in South India. This study was approved by the Institutional Ethics Committee. As it was a retrospective study, informed consent was not required. Freshly voided mid stream clean catch urine samples from patients with suspected urinary tract infection were cultured by conventional method using standard loop technique in the microbiology laboratory. Culture and sensitivity was done for mid stream urine and results were analyzed. Clinical correlation was done by verifying the clinical records. Total number of samples was 605. Sample size was calculated using power analysis is "605". [Based on power - 80%, alpha - 5%, two sided test and internal prevalence rate 10.2%].

Inclusion criteria

- Samples from in patients of all age group of both sexes with suspected urinary
- tract infection
- Pregnancy without symptoms
- Diabetic patients

Exclusion criteria

- Patients on indwelling catheters
- Patients who had antibiotic therapy in the past one week

Case study form was filled up with all necessary details. [Case study form is attached separately]

Gram staining of uncentrifuged urine sample was done for microorganisms and pus cells.

Samples were inoculated using a standard loop on to Blood agar and Mac Conkey's media.

Standard loop which carries 0.04 ml of urine was used and colony count was calculated by multiplying number of colonies with 250. The culture plates were incubated at 37°C overnight. Organisms were isolated and identified by standard protocol and biochemical reactions [5]. Antimicrobial susceptibility testing was done by Kirby Bauer technique according to CLSI (Clinical and Laboratory Standards Institute) guide lines [6].

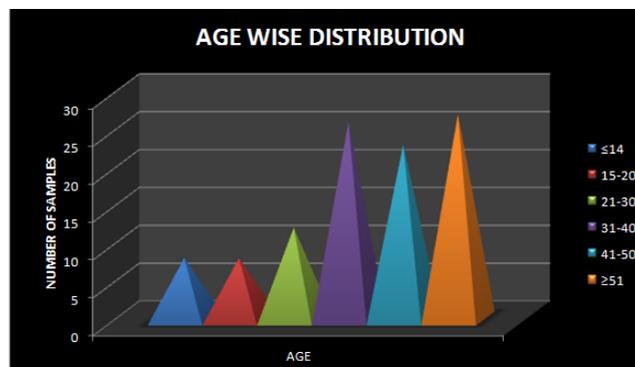
Association between colony count and clinical picture like fever, chills, dysuria and frequency of micturition were evaluated using Chi-square [X²] test and for quantitative data, student -'t'- test was used. Correlation with co-morbid conditions like diabetes mellitus and risk factors like recurrent urinary tract infection, calculi, urinary tract obstruction, and previous catheterization also were found out. The results were analyzed for various parameters like age, sex, department, colony count, clinical relevance, associated co-morbid state and organisms. The cases with lower colony count were grouped into three. First group, clinically relevant cases (more than 1 symptom pertaining to UTI). The second group, cases with doubtful relevance (symptoms other than dysuria). Third group, not relevant cases (no symptoms pertaining to UTI).

RESULTS

A total of 605 urine samples were received from patients with clinically suspected urinary tract infection and subjected to semi quantitative urine culture to find out colony count.

Among 605 samples, culture was positive with lower colony count in 104 samples (17.19%) which were further analyzed. Age wise distribution is depicted in Figure 1. The highest isolation rate 27(25.96%) was found in more than 51 years of age group, thus revealing their increased vulnerability.

Figure 1: Showing age distribution



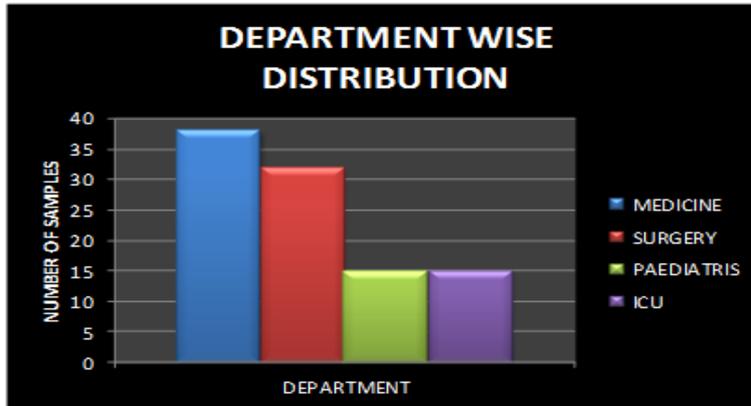
All the samples were from in-patients. Among the 104 samples, 67 samples (64%) were from females, thus showing female preponderance as shown in Figure 2.

Figure 2: Showing sex wise distribution



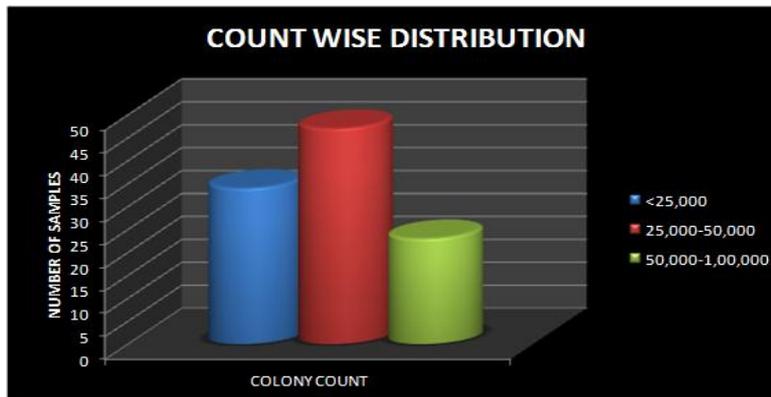
Department wise distribution of the samples is shown in Figure 3 and maximum number of samples were from Medical ward (38%).

Figure 3: Showing samples distribution from various departments



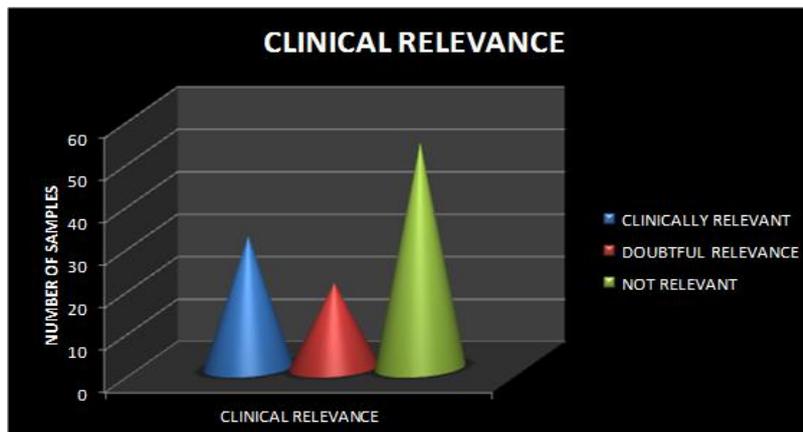
Gram stained smears of the urine samples which had lower colony counts did not show any significant number of pus cells. Of 104 samples, maximum number of samples 47 (45.19%) were having colony count between 25,000 to 50,000CFU/ml as shown in Figure 4.

Figure 4: Showing distribution of samples with colony count



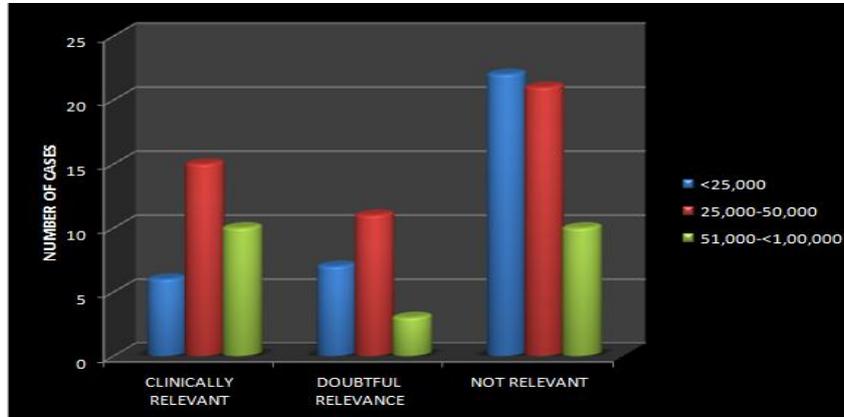
Out of 104 samples, maximum number of samples, 53 (50.96%) were from clinically not relevant cases as shown in Figure 5.

Figure 5: Showing distribution of samples with clinical relevance



More number of cases with 25,000 to 50,000 CFU/ml was seen in clinically relevant as well as doubtful relevant cases. Colony count of < 25,000 CFU/ml was seen more in clinically not relevant cases as depicted in Figure 6.

Figure 6: Showing distribution of samples with different colony counts and their clinical relevance



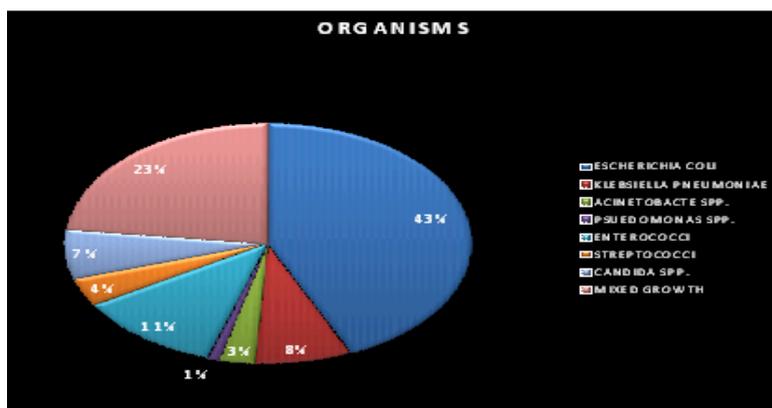
Out of 104 cases, 39 were associated with co-morbid states such as diabetes mellitus, hypertension, past history of renal calculi and recurrent attacks of UTI and uremia. The details are shown in Table 1.

Table 1: Showing details of associated co-morbid condition

CO-MORBID CONDITIONS ASSOCIATED	NUMBER OF CASES
Diabetes mellitus	13
Diabetes mellitus with Hypertension	9
Renal calculi with Hypertension	8
Renal calculi	3
Recurrent UTI	3
Uremia	3

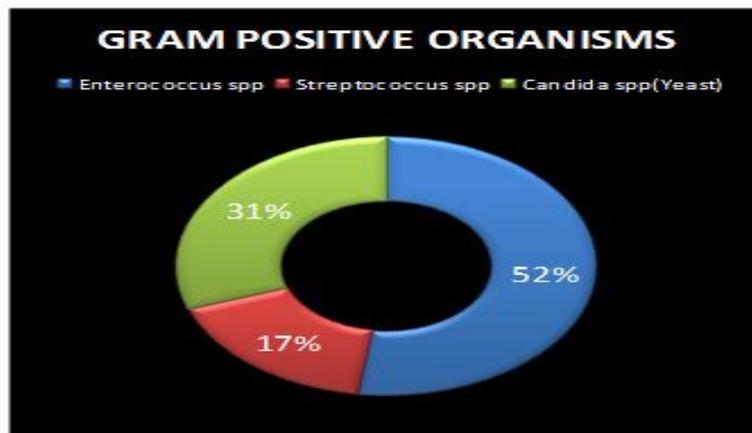
Escherichia coli (43.26%) was the predominant organism which was isolated, and mixed growth was seen in 24 samples (23%) followed by Enterococcus spp. (11.53%). The distribution of the isolates is shown in Figure 7.

Figure 7: Showing distribution of different isolates



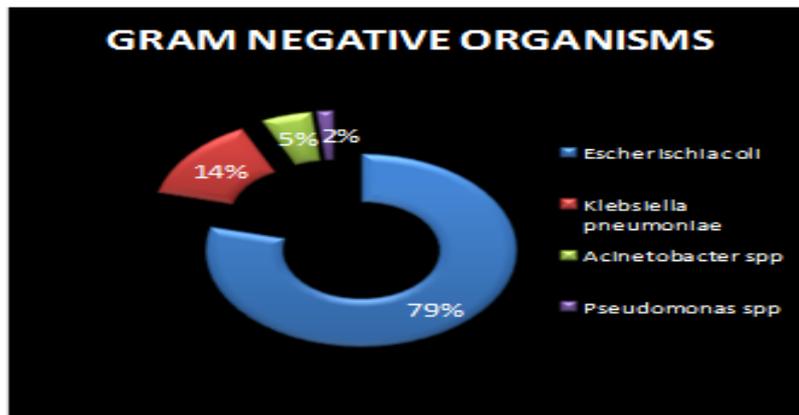
The distribution of Gram positive and Gram negative organisms are shown in Figure 8 and 9 respectively.

Figure 8: Showing distribution of different Gram positive isolates



Gram negative bacilli isolation was seen in most of the clinically relevant cases where as Gram positive cocci were mostly seen in not relevant cases.

Figure 9: Showing distribution of different Gram negative bacteria



DISCUSSION

Among 605 urine samples, culture was positive with lower colony count in 104 samples (17.19%) which were further analyzed. The highest isolation rate 27(25.96%) was found in more than 51 years of age group, thus revealing the increased vulnerability of geriatric population to UTI. High incidence of Diabetes mellitus and prostatic enlargement are common causes for UTI in elderly males whereas atrophic vaginitis and uterine prolapse are causes in elderly females [7]. In the present study, 64% samples were from females, and 36% from males which is in concordance with a study done by Ahmed et al on Urinary Tract Infections [1]. In a study conducted by F Vaezzadeh and MK Sharifi-Yazdi, approximately 38% of patients with positive urine culture did not have pyuria [8]. Gram stained smears of the urine samples which had lower colony counts did not show any significant number of pus cells in our study also which was similar to the above study. There were not many studies in the literature on clinical correlation of lower colony counts from urine culture.

A study on impact of laboratory-reported urine culture colony counts on the diagnosis and treatment of urinary tract infection for hospitalized patients found that there were no reliable markers for clinically significant UTI other than colony counts from urine culture in the population studied [3]. Out of 104 samples that yielded low colony count, maximum number of samples, 53 (50.96%) were from clinically not relevant cases and maximum number of samples 47 (45.19%) were having colony count between 25,000 to 50,000 CFU/ml. More number of cases with colony count 25,000 to 50,000 CFU/ml was seen in clinically relevant as well as doubtful relevant cases. Colony count of < 25,000 CFU/ml was seen more in clinically not relevant cases. Out of 104 cases, 39 (37.5%) were associated with co-morbid states such as diabetes mellitus, hypertension, past history of renal calculi and recurrent attacks of UTI and uremia. *Escherichia coli* (43.26%)

was the predominant organism which was isolated, and mixed growth was seen in 24 samples (23%) followed by *Enterococcus* spp. (11.53%) which is in accordance to other studies [1, 9,10].

SUMMARY

- Positive urine cultures with lower colony counts did not have pyuria.
- *Escherichia coli* (43.26%) was the commonest organism isolated in lower colony counts with clinical relevance too.
- Co-morbid states such as diabetes mellitus, hypertension, past history of renal calculi and recurrent attacks of UTI and uremia were seen in 37.5% cases.
- In this study on low colony count in urine cultures, 50.96% were from clinically not relevant cases and 45.19% were having colony count between 25,000 to 50,000CFU/ml.
- More number of cases [32.6% and 21.7% respectively] with 25,000 to 50,000 CFU/ml was seen in clinically relevant as well as doubtful relevant cases. Colony count of < 25,000 CFU/ml was seen more [62.8%] in clinically not relevant cases.

CONCLUSION

Lower colony counts from urine cultures should be always correlated well with the clinical features by the physicians before commencement of antibiotic therapy to avoid injudicious usage of antibiotics which in turn will reduce emergence of multi drug bacterial resistance.

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