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Research Article

SCREENING OF *STAPHYLOCOCCUS AUREUS* AND COAGULASE NEGATIVE STAPHYLOCOCCUS FROM URINE SAMPLES

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ABSTRACT

Objectives: The resistance profile of isolated Gram-positive organisms such as *Staphylococcus aureus* were left undone despite the increasing prevalent rate of this organism in urinary tract infections (UTI) and its role in antibiotic resistance. Therefore, the current study was carried out to identify the antibiotic resistance pattern of the *S. aureus* and coagulase negative Staphylococcus (CONS).

Methods: The study was carried out in the Department of Microbiology, Shri BM Patil Medical College, Bijapur, India over a period of 3 years from January 2010 to December 2012. Urine specimens from both outpatients and inpatients of our hospital having one or more urinary symptoms, such as burning during micturition, fever, pyuria, frequency of urine, dysuria, hematuria, flank pain, suprapubic discomfort, etc., were processed.

Results: Out of total staphylococcal isolates, 55% were *S. aureus* and 45% were CONS. Out of total isolates of Staphylococci 60.5% were from inpatient department and 39.5% were from out patient department. Linezolid (9.52%) pepercillin/tazobactam (14.3%) cefoperazone/salbactan (28.6%) showed least resistance against *S. aureus* and penicillin-G (90.5%), cloxacillin (71.4%), ciprofloxacin (71.4%) showed highest resistance against *S. aureus*. CONS isolates showed similar resistance profile, but when compared with *S. aureus*, CONS were more sensitive to the all antibiotic used.

Conclusion: This study observed that Staphylococcus is the one of the most common etiologic agent of UTI in our hospital. The drug of choice that could be considered in the treatment of UTI caused by staphylococcus in our setting are linezolid, pepercillin/tazobactam, cefoperazone/salbactan. Staphylococcus was found to be highly resistant to penicillin-G, cloxacillin, and ciprofloxacin.

Keywords: Antimicrobial resistance, Drug resistance, *Staphylococcus aureus*, Coagulase negative staphylococcus, Urinary tract infections.

INTRODUCTION

Staphylococcus aureus is one of the most important pathogens affecting humans, has acquired resistance to various antibiotics and is a leading cause of hospital and community acquired infections [1]. *S. aureus*, which was first isolated by Alexander Ogston in 1880s, is known to cause post-operative wound infections. The mortality rate of the individuals, due to *S. aureus,* infections was around 80% before the introduction of penicillin. The first penicillin resistant *S. aureus* was isolated from a clinical environment in 1942. The problem of penicillin resistance was later circumvented by the introduction of methicillin. In 1961, methicillin resistant *S. aureus* made an appearance, probably due to the acquisition of the mecA gene, leaving vancomycin as the drug of last resort to treat it [2].

Urinary tract infections (UTI) are one of the most common bacterial infections in humans both in the community and hospital setting [3]. UTI is a heterogeneous disease, which can be divided into several types of infection, such as acute, uncomplicated bacterial pyelonephritis, complicated UTI, recurrent cystitis and asymptomatic bacteriuria. The urinary tract is generally a hostile environment for bacteria and except for the distal urethra it is usually sterile. Infection results when the bacteria virulence factor overcomes the numerous host defense mechanism [4].

The common pathogens of UTI include enteric Gram-negative bacteria with *Escherichia coli* being the most predominant, coagulase negative *Staphylococcus saprophyticus* (CONS) accounting for 10-20% while *Proteus mirabilis*, *Klebsiella* and *Enterococcus* account for <5%. However, recent studies have reported the increasing prevalence of *S. aureus* in UTIs [4-9].

This changing spectrum of microorganisms involved in UTI necessitates the need for continuous and regular antimicrobial resistance surveillance in these organisms in order to guide empirical therapy in UTI. Most studies on UTI have concentrated on the antimicrobial resistance profile of Gram-negative enterobacteria, especially *E. coli* which is known to be the most prevalent UTI causative organism while the resistance profile of isolated Gram-positive organisms such as *S. aureus,* were left undone despite the increasing prevalent rate of this organism in UTI and its role in antibiotic resistance [9]. Therefore, the current study was done to identify the antibiotic resistance pattern of the *S. aureus* and CONS.

METHODS

The study was carried out in the Department of Microbiology over a period of 3 years from January 2010 to December 2012.

Ethical clearance and consent

As it was a retrospective study, ethical clearance and consent were not obtained.

Patient evaluation

Urine specimens from both outpatients and inpatients of our hospital having one or more urinary symptoms, such as burning during micturition, fever, pyuria, frequency of urine, dysuria, hematuria, flank pain, suprapubic discomfort, etc., were processed.

Inclusion criterion

Urine samples which yielded *Staphylococcus* were included in the study.

Exclusion criterion

Urine samples which did not yield *Staphylococcus* were excluded from the study. Specimens were screened by preliminary Gram's stain and then inoculated on 10% sheep blood agar and MacConkey's agar. *S. aureus* was identified by conventional techniques [10]. Antimicrobial susceptibility testing of the isolates will be performed by Kirby-Bauer disc diffusion method using following discs. Penicillin-G (10 unit); cloxacillin (30 µg); cephalexin (30 µg); cefuroxime (30 µg); tetracycline (30 µg); erythromycin (15 µg); gentamycin (10 µg); ciprofloxacin (5 µg); pefloxacin (5 µg); cefoperazone/salbactan (75 µg/30 µg) pepercillin/tazobactam (100 µg/10 µg); amoxicillin/clavulanic acid (20 µg/10 µg); azithromycin (15 µg); linezolid (15 µg). Finally, the data were recorded and analyzed at the completion of the study as per recommendations of the National Committee for Clinical Laboratory Standards [11]. *S. aureus* ATCC 29213 were used as reference strain for the standardization of antibiotic susceptibility testing.

RESULTS AND DISCUSSION

For the screening and isolation of *S. aureus,* urine samples were collected in a sterile manner and processed by the inoculation of sample on to the blood agar plate by streaking. The plates were incubated at 35°C for 24-48 hrs and the characteristic colonies on the agar plates were identified using standard established microbiological methods, which include colonial morphology, Gram's stain reaction, and biochemical characteristics. The Gram staining showed that the bacteria observed in colonies were Gram-positive cocci. The isolates differentiated by coagulase test [12].

It has been documented that *S. aureus* is one of the most widely spread human pathogens. This could be as a result of its minimal growth requirements, ability to survive long in most unfavorable environments and to find a susceptible host [4]. UTIs have been reported to be marjory caused by Gram-negative enterobacteria with *E. coli* being the most prevalent [13-15]. However, there is an increasing prevalence of *S. aureus* as a causative agent of UTIs with ever increasing rate of developing drug resistance [4,7,9,16].

Fig. 1 shows distribution of urinary Staphylococci. Out of total 38 staphylococcal isolates, 21 (55%) were *S. aureus* and 17 (45%) were CONS.

Out of total 38 isolates of Staphylococci 23 (60.5%) were from inpatient department and 15 (39.5%) were from outpatient department (Fig. 2).

Fig. 3 shows the antibiotic resistance of the staphylococcal isolates. Linezolid (9.52%) pepercillin/tazobactam (14.3%) cefoperazone/salbactan (28.6%) showed least resistance against *S. aureus* and penicillin-G (90.5%), cloxacillin (71.4%), ciprofloxacin (71.4%) showed highest resistance against *S. aureus*. CONS isolates showed similar resistance profile but when compared with *S. aureus*, CONS were more sensitive to the all antibiotic used.

CONCLUSION

The results of the current study are only limited to about 50 samples in this hospital; there we advocate a national antibiotic policy and a surveillance scheme of this organism. This study observed that Staphylococcus is the one of the commonest etiologic agent of UTI in our hospital. The drug of choice that could be considered in the treatment of UTI caused by staphylococcus in our setting are linezolid, pepercillin/tazobactam, cefoperazone/salbactan. Staphylococcus was found to be highly resistant to penicillin-G, cloxacillin, ciprofloxacin.

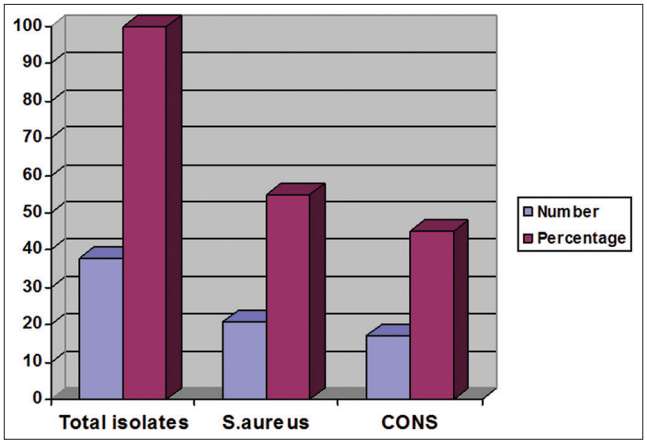

Fig. 1: Distribution of urinary Staphylococci

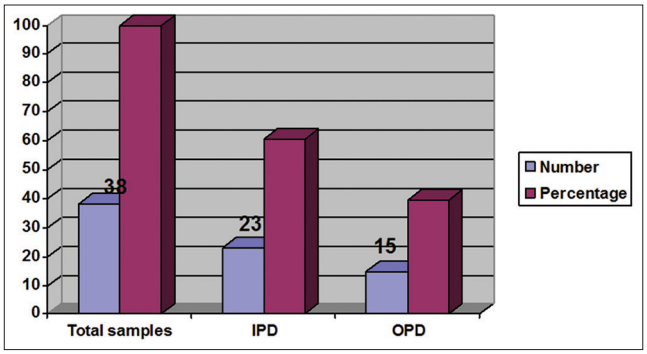

Fig. 2: Distribution of urine samples

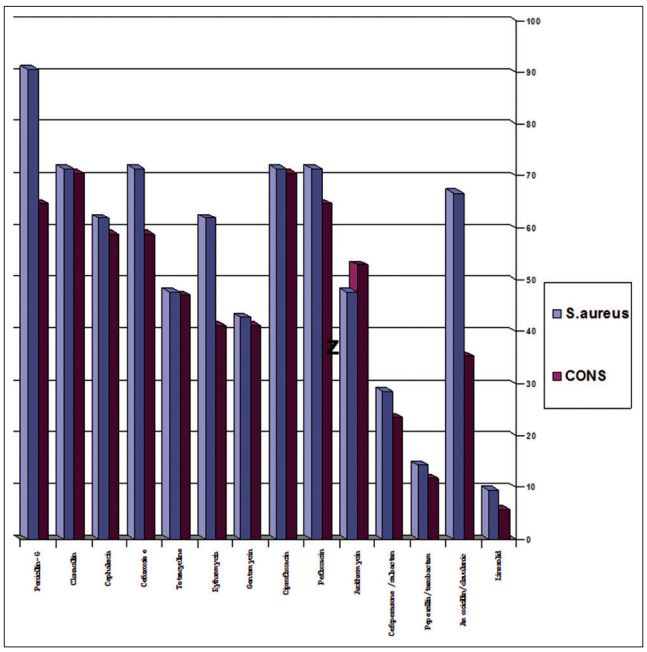

Fig. 3: Antibiotic resistant pattern of the isolates

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