

Antibiogram of Isolates from Cubital Fossa and Web Spaces of Hands of Hospitalized Patients

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Abstract

Background: Human beings harbor a wide array of microorganisms both on and in their bodies. The normal flora depends on the area of the body, the clothing one wears, occupation, and environment. This normal flora can be replaced by multiple antibiotic resistant bacteria in hospitalized patients.

Objective: To study the antibiogram of the aerobic isolates from the cubital fossa and web spaces of hands of hospitalized patients.

Materials and Methods: About 200 swabs were collected from 50 inpatients from various wards after taking consent. The swabs were processed in the microbiology laboratory by standard protocol. The isolates were identified by a set of standard biochemical reactions. The antibiotic susceptibility was done by Kirby-Bauer's disc diffusion method laid by Clinical and Laboratory Standards Institute (CLSI) guidelines.

Results: Out of 50 patients, 80% were male and 20% were female. 23 patients had a history of previous hospital stay. 18 patients were diabetic. Out of 200 swabs, 94 showed growth (47%). 43 swabs (45.7%) from cubital fossa showed growth, whereas 51 swabs (54.2%) from finger web spaces showed growth. Methicillin-resistant coagulase-negative staphylococci (MRCoNS) were the predominant bacteria isolated (94.5%). They were found to be sensitive to linezolid (90%), doxycycline (80%), and aminoglycosides (77%). One each of *Escherichia coli*, *Enterococci*, and *Proteus* species was isolated.

Conclusion: In our hospital, the hospitalized patients from various wards were found to harbor MRCoNS in cubital fossa and web spaces of hands. Such colonization can persist after hospital discharge and can serve as a reservoir. Thus, patient education activities such as hand washing and bathing regimens are required to minimize skin colonization by resistant bacteria.

Key words: Coagulase-negative staphylococci, Cubital fossa, Methicillin resistance, Web spaces

INTRODUCTION

Human beings harbor a diverse group of microbial population on their skin and mucous membrane called normal flora. The normal flora depends on the area of the body, the clothing one wears, occupation, and environment. These microorganisms can be divided into two categories, namely, resident or transient. The resident flora consists of microorganisms that are life-long members of the body's

normal microbial community. Resident flora is less likely to be associated with infections but may cause infections on non-intact skin and in sterile body cavities.¹

The transient flora consists of microorganisms that inhabit the skin or mucous membranes temporarily for hours, days, or weeks. It is usually derived from the environment and does not establish itself permanently on the surface. As long as the resident flora is intact, transient microorganisms assume little significance. However, if the resident flora is disturbed, transient flora may colonize, proliferate, and produce disease.²

In hospitals, patients may acquire multiple antibiotic resistant bacteria from the healthcare workers and hospital environment replacing the normal indigenous microbiota.

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This study was conducted to know the antibiogram of the aerobic isolates from the cubital fossa and web spaces of hands of hospitalized patients.

MATERIALS AND METHODS

Study Population

About 200 swabs were collected from cubital fossa and web spaces of hands of 50 inpatients from various wards after taking consent.

Sampling Technique

The cubital fossa and web spaces of hands were sampled because these are moist areas that are known to harbor relatively large numbers of bacteria. Sterile cotton-tipped swabs were pre-moistened with sterile normal saline. The cubital fossa and web spaces of both the hands were swabbed in circular motions for 20 times: 10 times in each direction.

Sample Processing

The swabs were inoculated onto 5% sheep blood agar and MacConkey's agar, and the plates were incubated aerobically at 37°C for 72 h. The isolates were identified by Gram's staining and a set of standard biochemical reactions.

Antimicrobial Susceptibility Testing

The Kirby-Bauer's disc diffusion method laid by CLSI guidelines was used to test the antimicrobial susceptibilities of organisms isolated.

- Gram-positive isolates were tested against amoxicillin-clavulanic acid, cotrimoxazole, ceftazidime, doxycycline, clindamycin, linezolid, ciprofloxacin, and amikacin.
- Gram-negative isolates were tested against ampicillin-sulbactam, piperacillin-tazobactam, ceftazidime, ceftazidime-clavulanic acid, ciprofloxacin, amikacin, and imipenem.

RESULTS

Out of 50 patients, 40 (80%) were male and 10 (20%) were female. 23 patients had a history of previous hospital stay. 18 patients were diabetic (Figures 1-5).

Out of 200 swabs, 94 showed growth (47%). 43 swabs (45.7%) from cubital fossa showed growth, whereas 51 swabs (54.2%) from finger web spaces showed growth (Figure 6).

Coagulase-negative staphylococci (CoNS) were the predominant bacteria isolated (96.8%). Methicillin resistance was seen in 94.5% of the CoNS isolates. They were found to be sensitive to linezolid (90%), doxycycline (80%), and aminoglycosides (77%).

One each of *Enterococci*, *Escherichia coli*, and *Proteus* species was isolated (Figure 7).

DISCUSSION

The term normal flora encompasses microorganisms that are frequently found in various body sites in normal,

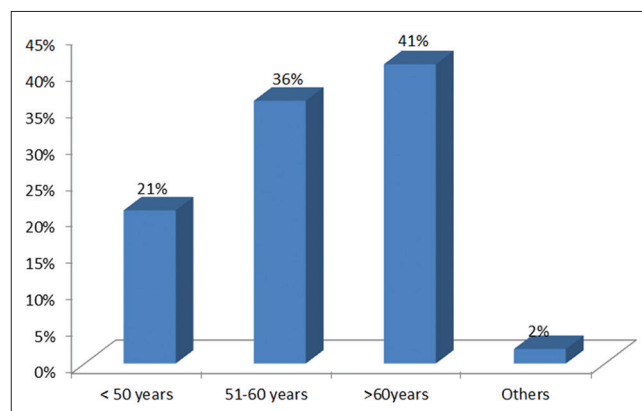


Figure 1: Age distribution

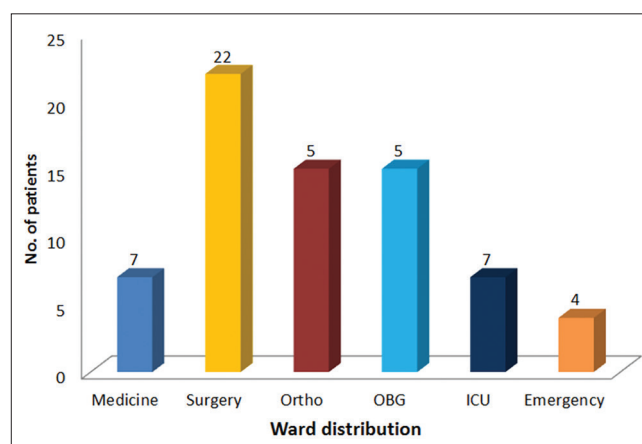


Figure 2: Ward distribution

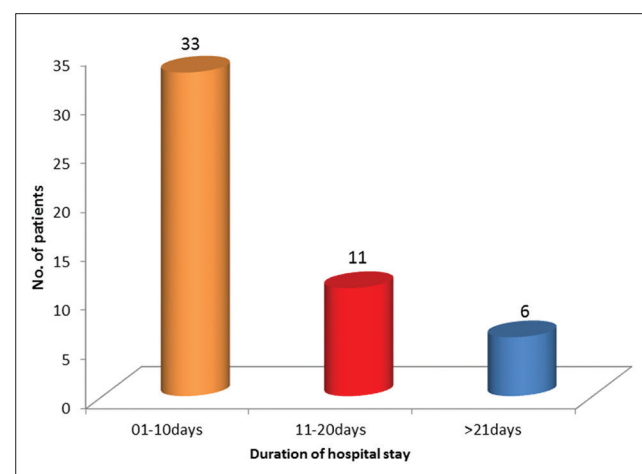


Figure 3: Duration of hospital stay

healthy individuals. The type of flora and as well the number varies in different body sites, different age groups, gender, and physiologic states. Environmental factors such as occupation, clothing, and antibiotic usage may also modulate colonization by the skin microbiota.

The predominant resident microorganism of the skin is *Staphylococcus epidermidis*.¹ Other resident bacteria include *Staphylococcus hominis* and other CoNS, followed by coryneform bacteria (*Propionibacteria*, *Corynebacteria*, *Dermobacteria*, and *Micrococci*).¹

Table 1: Antibiotic susceptibility pattern of CoNS

Antibiotic	Sensitivity %
Amoxicillin/clavulanic acid	16
Co-trimoxazole	16
Doxycycline	80
Linezolid	90
Clindamycin	55
Ciprofloxacin	22
Amikacin	77

CoNS: Coagulase-negative staphylococci

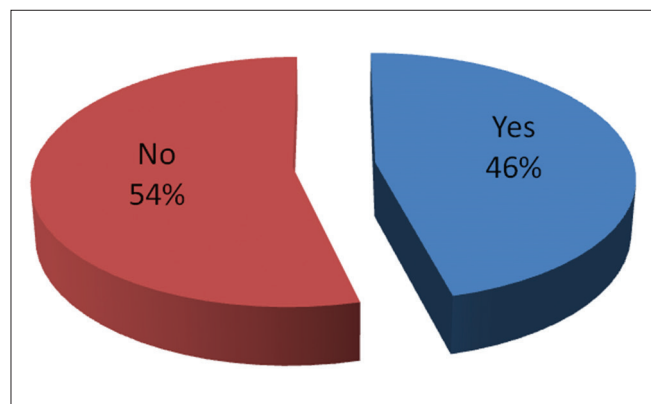


Figure 4: H/O previous hospital stay

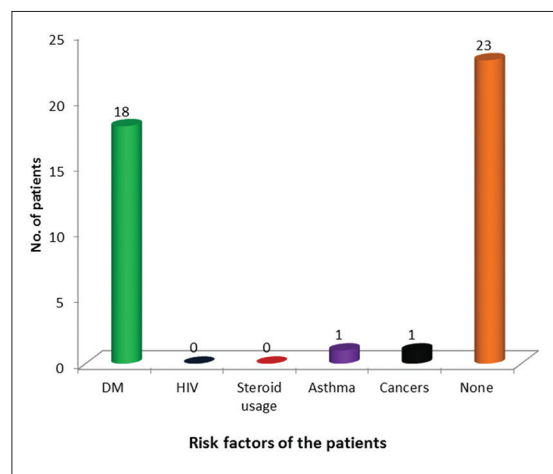


Figure 5: Risk factors

In hospitals, patients often acquire transient microorganisms during direct contact with healthcare workers, other patients, and contaminated environmental surfaces adjacent to the patient. The rate of transmission of transient flora depends on the species present, the number of microorganisms on the surface and the skin moisture.² Further, it has been observed that multiple antimicrobial resistance of the skin flora in hospitalized patients is very common.

The risk of colonization by multi-resistant bacteria in hospitals is associated with use of antimicrobials, advanced age, prolonged hospitalization, exposure to invasive medical devices, severe underlying medical condition and immunosuppression.^{3,4}

In the present study, diabetes was the most significant risk factor observed. 36% of patients were diabetic. CoNS were the predominant organism isolated. This is similar

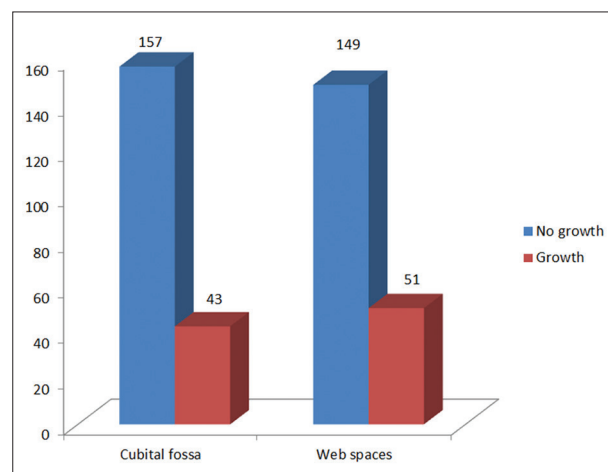


Figure 6: Number of swabs showing growth from cubital fossa and web spaces

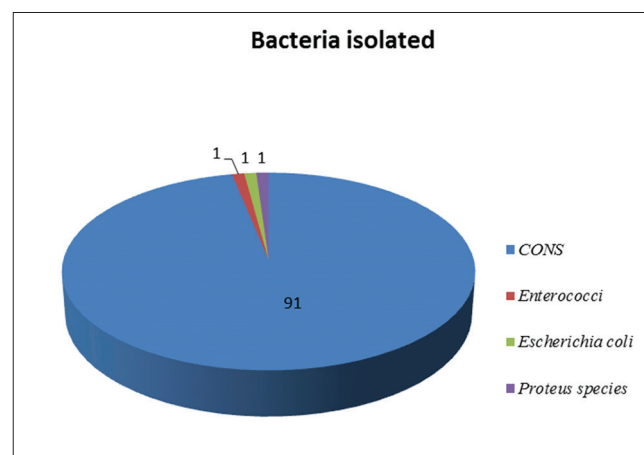


Figure 7: Isolates from cubital fossa and web spaces

to another study, in which *S. epidermidis* was commonly isolated from the skin of diabetic subjects.⁵

In the present study, CoNS were the predominant bacteria isolated (96.8%) from the cubital fossa and web spaces of hands of the hospitalized patients of various wards and methicillin-resistant coagulase-negative staphylococci (MRCoNS) was seen in 94.5% of the isolates. They were found to be sensitive to linezolid (90%), doxycycline (80%), and aminoglycosides (77%) (Table 1). This is higher when compared to a study conducted by Larson *et al.*, in which CoNS were isolated from 56.3% of toe web spaces of patients, and methicillin resistance was seen in 44.3%.³

Resistance to antibiotics was seen more in the methicillin-resistant isolates compared with those that were methicillin sensitive. This is similar to a study conducted by Koksall *et al.* and Jain *et al.*, in which the resistance to antibiotics was found to be extremely high in the methicillin-resistant strains compared to those that were susceptible to methicillin.^{6,7}

Furthermore, in 23 patients who had history of previous hospital stay, CoNS were the predominant bacteria isolated.

CoNS, which were previously regarded as innocuous commensal microorganisms on the human skin and mucous membranes, have now emerged as predominant pathogens in hospital-acquired infections. They are by far the most common cause of bacteremia related to indwelling devices. Other important infections due to CoNS include central nervous system shunt infections, native or prosthetic valve endocarditis, urinary tract infections, surgical wound infections, osteomyelitis, peritonitis in patients with continuous ambulatory peritoneal dialysis, and endophthalmitis.⁸

The increasing resistance of CoNS to antimicrobial drugs is not a less problem. Antibiotic therapy inhibits the normal, sensitive bacterial flora of the body and thereby provides an environment that facilitates colonization by antibiotic-resistant bacteria.⁹ After exposure to multiple antibiotics, surgical prophylaxis, indiscriminate use of antibiotics, patients become colonized with multi-drug resistant strains of CoNS species.

Multiple antibiotic resistance is characteristic of hospital strains of CoNS.¹⁰ This is due to the fact that resistance plasmids are transferrable between different strains of CoNS and also between them and *Staphylococcus aureus*.¹¹ Such flora serves as a reservoir for transmission of resistant strains to the hospital environment, other staff, patients, and household contacts.

We educated all the patients who participated in the study about hand hygiene measures. There was a significant decrease in the number of swabs showing growth collected after washing of hands with soap.

Limitations

The limitation of the present study is that the sample size was small. Another limitation is that we did not include other risk factors. Future studies should be done with large sample size and other risk factors to know the prevalence and changing trends of antibiogram of MRCoNS.

CONCLUSION

CoNS have long been regarded as non-pathogenic, but their important role as pathogens is increasing. There is a significant increase in the multidrug resistant bacteria colonizing hospitalized patients due to the capability of these bacteria to adapt rapidly to antibiotic stress. Furthermore, such colonization can persist even after hospital discharge. Colonized patients who are readmitted to wards can serve as a reservoir for further spread of multi-resistant organisms in hospitals and thus have become a major concern to the medical community. Patient education activities such as hand washing and bathing regimens are required to minimize skin colonization by resistant bacteria.

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