

Original Research

Analysis of microbiological profile and antibiotic susceptibility pattern of Gram-positive isolates: An observational study

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ABSTRACT:

Background: The present study was conducted for assessing the microbiological profile and antibiotic susceptibility pattern of Gram-positive isolates. **Materials & method:** A total of 500 patient samples were evaluated in the present study. Among these tested samples, gram positive isolates were identified and separately analysed. The patient samples were processed using standard laboratory techniques and were further cultured overnight on Columbia sheep blood agar (CBA) (BioMérieux, France) and on MacConkey's agar (HIMedia, India). Further, organism identification and antibiotic susceptibility test was done using the automated system. The antibiotic susceptibility testing was reported. **Results:** Out of 186 staphylococcus aureus positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 85, 77, 67, 84 and 71 cases respectively. Out of 101 Enterococcus positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 39, 25, 24, 20 and 38 cases respectively. Out of 53 CONS positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 30, 28, 32, 19 and 35 cases respectively. Out of 42 Streptococcus spp. positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 29, 24, 26, 21 and 25 cases respectively. **Conclusion:** Continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity is necessary to decrease the potential risks of complications by early institution of appropriate systemic and topical antibiotic alongside mastoid exploration.

Key words: Gram Positive, Microbiological, Antibiotic

Received: 17-01- 2019

Accepted: 24-02-2019

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This article may be cited as: Chinubhai GM, Bargade MB. Analysis of microbiological profile and antibiotic susceptibility pattern of Gram-positive isolates: An observational study. J Adv Med Dent Scie Res 2019;7(3):220-222.

INTRODUCTION

Nosocomial infections are those infections which are acquired during hospitalization. The acquisition and severity of such infections depend on the characteristics of microorganisms and the rate of contamination of hospital environment. Hospital surfaces and frequently used medical equipment are contaminated by a variety of pathogenic microorganisms. Contamination of patient serving hospital environment increases the risk of healthcare-associated infections.^{1,2}

The hospital environment can be contaminated with bacterial pathogens such as Staphylococcus aureus, Enterococcus, Streptococcus, Acinetobacter, Escherichia coli, Salmonella, Shigella, Klebsiella, Proteus, and Pseudomonas spp. Environmental surfaces in healthcare centers act as a reservoir for

bacteria and can as well serve as vectors of the bacterial pathogens. The acquisition of nosocomial pathogens by a patient and the resultant development of infection depends on a multifaceted interplay between the environment, a pathogen, and a susceptible host. Contamination of rooms of unaffected patients is due to viability of organisms shed by previous occupants. But it could also be due to horizontal transmission from healthcare workers, visitors, or asymptomatic carriers as well as dissemination of the organisms through air flow or other means.³⁻⁵

The incidence of hospital-associated infections due to emerging antimicrobial resistant organisms is also increasing leading to higher morbidity and mortality. Many ordinary surfaces such as side table/bench, floors, carpets, wall, and many other areas in the

hospital environment may not be adequately decontaminated and can become reservoirs of pathogens. Commonly used disinfection techniques are sometimes incapable of eradicating fomites reservoirs of nosocomial pathogens such as methicillin-resistant *Staphylococcus aureus*.⁵⁻⁷ Hence; the present study was conducted for assessing the microbiological profile and antibiotic susceptibility pattern of Gram-positive isolates.

MATERIALS & METHODS

The present study was conducted for assessing the microbiological profile and antibiotic susceptibility pattern of Gram-positive isolates. A total of 500 patient samples were evaluated in the present study. Among these tested samples, gram positive isolates were identified and separately analysed. The patient samples were processed using standard laboratory techniques and were further cultured overnight on Columbia sheep blood agar (CBA) (BioMérieux, France) and on MacConkey's agar (Himedia, India). Further, organism identification and antibiotic susceptibility test was done using the automated system. The antibiotic susceptibility testing was reported. All the results were recorded and analysed

using SPSS software. Chi-square test was used for evaluation of level of significance.

RESULTS

Out of 500 patient samples which were evaluated, gram positive pathogens were identified in 311 specimens. Among these gram-positive specimens, the predominant isolate identified was *Staphylococcus aureus*, followed by *Enterococcus* spp, CONS (Coagulase negative staphylococcus) and *Streptococcus* spp., found to be present in 186, 101, 53 and 42 specimens respectively. Out of 186 *Staphylococcus aureus* positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 85, 77, 67, 84 and 71 cases respectively. Out of 101 *Enterococcus* positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 39, 25, 24, 20 and 38 cases respectively. Out of 53 CONS positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 30, 28, 32, 19 and 35 cases respectively. Out of 42 *Streptococcus* spp. positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 29, 24, 26, 21 and 25 cases respectively.

Table 1: Microbiological profile

Gram positive isolate	Number of specimens	Percentage
<i>Staphylococcus aureus</i>	186	37.2
<i>Enterococcus</i> spp.	101	20.2
CONS	53	10.6
<i>Streptococcus</i> spp.	42	8.4
Overall	311	62.2

Table 2: Antibiotic susceptibility profile

Antibiotic	<i>Staphylococcus aureus</i>		<i>Enterococcus</i> spp.		CONS		<i>Streptococcus</i> spp.	
	Susceptibility	Resistance	Susceptibility	Resistance	Susceptibility	Resistance	Susceptibility	Resistance
Ciprofloxacin	101	85	62	39	23	30	13	29
Erythromycin	109	77	76	25	25	28	18	24
Clindamycin	119	67	77	24	21	32	16	26
Linezolid	102	84	81	20	34	19	21	21
Vancomycin	115	71	63	38	18	35	17	25

DISCUSSION

Bacteraemia and fungaemia are one of the cause for high mortality rate. Septicaemia may be a transient, self limited phenomenon without clinical consequences, it frequently reflects the presence of serious infection. It has been confirmed by culture that is associated with clinical manifestation and systemic response. It is often associated with hospitalization, insertion of foreign bodies such as catheters into blood vessels, and other predisposing factors like ICU, lapses in handwashing, and non-adherence to infection control practices of medical staff. Genitourinary tract, intraabdominal foci and respiratory tract are the common sources of blood stream infections. Organism isolated from blood culture vary according to geographical distribution and development of multidrug resistant organism is of great concern as they prolong hospital stay. Increase cost of treatment and can be a cause of high

mortality.⁸⁻¹⁰ Hence; the present study was conducted for assessing the microbiological profile and antibiotic susceptibility pattern of Gram-positive isolates.

Out of 500 patient samples which were evaluated, gram positive pathogens were identified in 311 specimens. Among these gram-positive specimens, the predominant isolate identified was *Staphylococcus aureus*, followed by *Enterococcus* spp, CONS (Coagulase negative staphylococcus) and *Streptococcus* spp., found to be present in 186, 101, 53 and 42 specimens respectively. Out of 186 *Staphylococcus aureus* positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 85, 77, 67, 84 and 71 cases respectively. Madanaa J et al defined the microbiology of atticranial type of chronic otitis media and the antibiotic sensitivity pattern, thereby reducing the potential risks of complications.²²³ children with atticranial type

CSOM consisting of 126 males and 97 females with an age range of 1–14 years were assessed. Patients with persistent otorrhea for more than 3 months with atticointral type of chronic otitis media were selected. Gram negative organisms accounted 58% of total isolates and gram positive organisms constituted 22% isolates. *Candida albicans* and methicillin resistant *S. aureus* were identified in 4% and 2% of isolates, respectively. 100% of *Pseudomonas* isolates showed susceptibility to ceftazidime and a high sensitivity (92% of isolates) to ciprofloxacin and 88% isolates were sensitive to amikacin. 100% of *P. mirabilis* isolated from inoculates showed sensitivity to ceftazidime and ciprofloxacin. It also showed 87–97% sensitivity to ceftriaxone, amikacin and ampicillin. All (100%) of the *Staphylococcus* isolates were sensitive to vancomycin and 84–86% were sensitive to ciprofloxacin and erythromycin. In general, gram negative organisms showed increased sensitivity to ceftazidime, ciprofloxacin and amikacin, while gram positive organisms to vancomycin, erythromycin and ciprofloxacin.¹⁰

Out of 101 *Enterococcus* positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 39, 25, 24, 20 and 38 cases respectively. Out of 53 CONS positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 30, 28, 32, 19 and 35 cases respectively. Out of 42 *Streptococcus* spp. positive cases, ciprofloxacin, linezolid and vancomycin resistance was seen in 29, 24, 26, 21 and 25 cases respectively. Agrawal SK et al determined the microbiological profile and antibiotic susceptibility patterns of organisms isolated from SSTIs in our hospital. They studied 4551 consecutive pus samples collected from both inpatients and outpatients. Of the 1997 bacterial isolates, 772 (38.65%) were gram-positive cocci and 1225 (61.34%) gram-negative bacilli. Extended-spectrum beta-lactamase (ESBL) production was observed in 819 (66.85%) isolates, and it was highest in *Escherichia coli* (44.08%). Resistance to methicillin was detected in 24.18% of *Staphylococcus aureus* isolates and 13.94% CoNS. High proportion 71.64% of isolates exhibited HLRG. High rates of ESBL production (66.85%) and methicillin resistance were noted, which is comparable to previous studies from India. More than half (71.64%) of the enterococcal isolates were HLRG, with the implication that the combination of beta-lactam plus aminoglycoside will not be active against them.¹¹⁻¹⁴

CONCLUSION

Continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity is necessary to decrease the potential risks of complications by early institution of appropriate systemic and topical antibiotic alongside mastoid exploration.

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