

Staphylococcal Nasal Carriage among Health Care Personnel at Tertiary Care Hospital, Jaipur, India

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Abstract: Staphylococcus aureus is the most common cause of suppurative lesions. It commonly resides in anterior nares as colonizer where it is transmitted from health care workers to the patients. A prospective study was done to determine the frequency of staphylococcal nasal carriage and their antibiogram. Nasal Swabs from health care workers were cultured on Blood agar and mannitol salt agar. Staphylococci was identified by colony characteristics, catalase and coagulase test. Antibiogram was determined against the different group of antibiotics according to CLSI guidelines. 51% staphylococcal nasal carries among health care workers was seen. Methicillin resistant strains were predominantly isolated. All the isolated strains were sensitive to mupirocin, vancomycin and linezolid. High erythromycin and clindamycin resistant was seen. High staphylococcal nasal carriage among health care workers necessitates for immediate decolonization. Mupirocin should be used topically to decolonize the staphylococci from anterior nares.

Keywords: Nasal carriage, Staphylococcus aureus, mupirocin, MRSA, Colonisation.

1. INTRODUCTION

Staphylococci, the gram positive microbes are the most common cause of community acquired as well as nosocomial infections resulting localised as well as systemic suppurative lesions.[1],[2] Being ubiquitous in nature, Staphylococcus aureus also resides in humans as commensal. Anterior nares are the most frequent site of colonization. Extranasal sites also colonized by Staphylococci especially axilla, vagina and intestinal tract.[3] About 20-40% of healthy persons are staphylococcal carrier.[4] These carriages predispose for the hospital acquired infection especially the surgical site infections.[5] Microbe is directly transmitted by health care personal to the patients where these microbes produce clinical manifestations. Knowledge of such staphylococcal nasal carriage is important as elimination of the colonized Staphylococci by using appropriate antibiotics reduces the incidence of nosocomial infections.[6],[7] Against this background, a prospective study was designed to determine the Staphylococcal nasal carriage and its antibiogram at tertiary care centre so that health care workers can be decolonized for patients welfare.

2. MATERIALS AND METHODS

Present study was carried out in Department of Microbiology, NIMS medical College and Hospital, Jaipur, Rajasthan during the period of January 2015 to June 2015. The relevant data and history of health care personnel were recorded. Anterior nares swabs with the help of cotton swabs, (Himedia) moistened in sterile normal saline were collected from the health care workers including specialists, physicians, postgraduate students, staff nurses and sanitary staff. Nasal swab were inoculated on blood agar and mannitol salt agar and incubated aerobically at 37⁰C overnight. Staphylococcus genus and species identification was done by proper protocol. Antibiogram of the isolated Staphylococci was determined according to CLSI guidelines. Both low level as well as high level mupirocin resistance was determined by using 5 & 200µg disc. Methicillin resistance was determined by cefoxitin 30µg where zone of inhibition <22mm was considered as MRSA.[8]

3. OBSERVATIONS AND RESULTS

Total 100 nasal swabs were collected from the health care personnel. Among them 57% participants belong to age group of 20-40 years followed by age group >40 yrs. A total 51 Staphylococci including 44 S.aureus were isolated. Among these 44, 31 were MRSA. Among 7 CoNS, 5 were MRCoNS. Most of the methicillin resistant staphylococci (n=23) were isolated from 20-40 yrs age group. ^{Table 1} Most of these MRS strains were isolated from the nursing staff followed by doctors. ^{Table 2} All the isolates were sensitive to mupirocin 5µg & 200µg, vancomycin 30µg and linezolid 30µg. 82.35% (42/51) isolates were sensitive to levofloxacin 5µg followed by cotrimoxazole (70.6%), clindamycin 2µg (56.8%) and erythromycin 15µg (0.06%). ^{Table 3} In comparison to MRSA, MRCoNS strains were more resistant to erythromycin and clindamycin. Whereas MRCoNS strains in comparison to MRSA were more susceptible to cotrimoxazole and levofloxacin. For linezolid, vancomycin and mupirocin, no difference in sensitivity was observed in between MRSA & MRCoNS.

Table 1: Distribution of isolated Staphylococcal strains according to age

Age in years	S.aureus		CoNS		Total
	MRSA	MSSA	MRCoNS	MSCoNS	
<20 years	4	1	2	0	7
20-40 years	21	10	2	2	35
>40 years	6	2	1	9	9
Total	31	13	5	2	51

Table2: Distribution of isolated Staphylococcal strains according to occupation

Occupation	S.aureus		CoNS		Total
	MRSA	MSSA	MRCoNS	MSCoNS	
Doctor	7	2	1	0	10
Resident	3	2	1	1	7
PG Student	1	0	0	1	2
Nursing Staff	11	5	3	0	19
Receptionist	6	3	0	0	9
Guard	2	0	0	0	2
Sweeper	0	1	0	0	1
Lab Technician	1	0	0	0	1
Total	31	13	5	2	51

Table 3: Antibigram of isolated Staphylococcal strains

Antibiotic		MRSA (n=31)	MSSA (n=13)	MRCoNS (n=5)	MSCoNS (n=2)
Penicillin1 µg	Sensitive	0	0	0	0
	Resistant	31	13	5	2
Erythromycin 15 µg	Sensitive	2	1	0	0
	Resistant	29	12	5	2
Cotrimoxazole 25+1.25 µg	Sensitive	17	13	4	2
	Resistant	14	0	1	0
Clindamycin 2 µg	Sensitive	21	7	1	0
	Resistant	10	6	4	2
Vancomycin 30 µg	Sensitive	31	13	5	2
	Resistant	0	0	0	0
Linezolid 30 µg	Sensitive	31	13	5	2
	Resistant	0	0	0	0
Levofloxacin 5 µg	Sensitive	23	13	4	2
	Resistant	8	0	1	0
Mupirocin 5& 200µg	Sensitive	31	13	5	2
	Resistant	0	0	0	0

4. DISCUSSION

Staphylococci are one of the most important causes of nosocomial infections. Most of these infections are transmitted directly from the health care personnel to the patient. Commensal behavior of staphylococci in the anterior nares of health care workers predisposes for its transmission either directly or indirectly. Eradication of staphylococci from the anterior nares reduces the chances of nosocomial infection that necessitate the screening of nasal carriage at the time of joining.

Carriage rate of staphylococci in the anterior nares varies in different parts of the world. Compared to developed countries, a higher carriage rate is observed in developing countries. This difference may be attributed to frequent surveillance as well as proper hygiene in developed countries. In our study, 51% staphylococcal nasal carriage among health care personnel was observed with a higher (86.27%) methicillin-resistant staphylococci carriage. Most of the isolates were *Staphylococcus aureus*. Most of this carriage was seen among the 20-40 years age group which is highly active in health care settings. Although prevalence of the health care workers harboring the staphylococci varies but the higher carriage rate was observed in the nursing staff (19/41) followed by the treating doctors (12/35) that governs the alarming state that admitted patients are highly vulnerable to get nosocomial infection if proper universal precautions are not followed. Similar higher staphylococcal nasal carriage (52.3%) has been reported by Shiv Shekhar et al.[9]

In this study, higher (60.7%) *Staphylococcus aureus* nasal carriage was observed in contrast to N Akhtar who reported lower (18.2%) *Staphylococcus aureus* nasal carriage rate in health care persons.[10]

The higher carriage rate among active health care workers predisposes for direct transmission to the patients. Being anterior nares carriage, they are easily transmitted by coughing, sneezing, even through the hands. In patients, these microbes colonize and infect resulting surgical sites as well as respiratory infection.

Different groups of antibiotics are used to eliminate these colonized microbes.[11] In our study, antibiogram against isolated strains were also noted. Most of the isolated strains were resistant to erythromycin (94%) and clindamycin (44%). Higher resistant rates denote the overuse of erythromycin in upper respiratory tract infections. Higher clindamycin resistance may be due to overuse in prophylaxis of anaerobic infection. Now a days, clindamycin is also used topically in staphylococcal infections as well as in acne where sensitized flora is eliminated leaving behind the resistant flora. In our study, 17.6% staphylococcal strains showed levofloxacin resistance.

In our study, all the isolated strains were mupirocin sensitive even at the low level in contrast to the Gadepalli et al; who reported the 5% & 2% *S.aureus* resistant to high level and low level mupirocin resistance respectively.[12] Similar higher high level mupirocin resistant 2% & 28% MRSA and MRCoNS strains respectively has been reported by Oommem et al.[13] similarly Kaur et al; have reported the higher mupirocin resistant rate of 1.43% and 3.57% in MRSA and MRCoNS respectively.[14]

Although mupirocin resistance was not seen in our study but few mupirocin resistant has been reported from other parts of India. At present, although as nil mupirocin resistance problem in our area, it may create problem in future if there is emergence of mupirocin resistance strains. It will be difficult to decolonize such strains.

5. CONCLUSION

Higher staphylococcal nasal carriage in health care workers creates a problem to control the nosocomial infections. Frequent screening as well as proper surveillance is required to eliminate the carriage rate by using appropriate antibiotics. Mupirocin can be used topically to eliminate the carriage state. Proper antibiotic selection is needed for prevention of nosocomial infections.

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