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Original Research Article

Prevalence of nasal carriage of MRSA in diabetic patients attending the outpatient department

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ABSTRACT

Background: Up to 30% of the human population is asymptomatically colonized with nasal *Staphylococcus aureus*. Study was done to determine the prevalence and risk factors for MRSA colonization as nasal carrier in a population of outpatients with diabetes.
Methods: The study enrolled patients with diabetes from whom nasal swabs were obtained and were analyzed for presence of MRSA.
Results: Out of the 402 patients evaluated, 254 (63.18%) were colonized with *S. aureus* and 164 (64.56%) of them were MRSA.
Conclusions: Diabetes have more propensity for MRSA colonization than non-diabetic patients. A better understanding of the epidemiology and risk factors for nasal MRSA colonization in the persons with diabetes may have significant implications for the treatment and prevention of MRSA infections.

Keywords: MRSA colonization, Nasal carrier, *Staphylococcus aureus*

INTRODUCTION

Approximately 25-30% of the population are colonized with *Staphyococcus aureus* on the skin or in the nose of healthy people. These sites are the ecological niche from where the organism spreads to other parts of the body. Significantly increased carriage rates are seen in patients of insulin dependent diabetes mellitus, those on haemodialysis or continuous peritoneal dialysis (CAPD), intravenous drug use, *S. aureus* skin infection, liver dysfunction and with human immunodeficiency virus (HIV) infection.[1,2]

MRSA (Methicillin resistant *S. aureus*) is *S. aureus* resistant to the penicillin, dicloxacillin or other methicillin related antibiotics. Studies show that nasal MRSA carriers have a higher risk of nosocomial infection with this micro-organism. Furthermore, patients infected with MRSA have higher morbidity and mortality compared to patients infected with susceptible strains.

Present study attempts to determine the nasal carrier rate of MRSA for patients attending the diabetic clinic in IMS and SUM Hospital, determine the antibiotic susceptibility pattern for these strains as well as to determine various

risk factors associated with carriage of MRSA in diabetes patients.

METHODS

This study was carried out prospectively for a period of one year from December 2018 - November 2019 for patients attending diabetic clinic in IMS and SUM Hospital, Odisha, India. All out patients at 14 year or above age having fasting plasma glucose level ≥126 mg/dl after a period of 8 hours fasting, a plasma glucose level of more than 126 mg/dl at any time of day with history of type 2 diabetes mellitus or a 2 hour oral glucose tolerance test more than 200 mg/dl were included. The adult patients who don't fit to these criteria, children <14 years of age and all hospitalized patients were excluded from the study.

These patients were also screened for other chronic illnesses like chronic kidney disease, connective tissue disorder. Their treatment history particularly the previous use of insulin was recorded.

Two swabs moistened with sterile Nutrient broth were used to collect swabs from anterior nares from the patients. One swab was used for Gram staining and other for culture. Nutrient agar and 5% sheep blood agar were streaked, incubated for 24 hours at 37˚C.

Antimicrobial susceptibility of the isolates was done by Kirby-bauer disc diffusion method. Amikacin (30µg), piperacillin tazobactam (100/10µG), ofloxacin (5 µG), azithromycin (15µG), cotrimoxazole (1.25/23.75µG), linezolid (10 µG) and vancomycin (30 µg) discs obtained from Himedia labs were used for sensitivity testing of the isolates. *S. aureus* ATCC 25923 was used as a quality control strain for antibiotic susceptibility testing.

RESULTS

In this study, 402 patients were included for collection of nasal swabs of which 235 (58.45%) were males and 167 (41.45%) were females. All the patients were below the age of 80 year.

When the various coexisting illnesses were pondered into, 197 of these cases were either recently diagnosed or were not having any other ailments. 84 (20.9%) of these were hypertensive, while 31 (7.7%) had deranged lipid profile. Of them 30 (7.4%) cases were on antibiotics at the time of collection of the nasal swabs. Only two of the 402 patients had a recent history of hospitalization. 109 (27.1%) of the total number cases were on insulin injections.

Staphylococcus aureus was identified by colony characteristics, gram stain, catalase reaction, slide and tube coagulase tests, mannitol fermentation test. Opaque, betahaemolytic, 1-2 mm colonies and gram positive cocci on staining were subjected to further biochemical tests. Those which were catalase positive (with 3 % hydrogen peroxide), slide and tube coagulase test positive with rabbit plasma, mannitol fermenters on mannitol salt agar were designated as *S. aureus*. *S. aureus* was designated as Methicillin resistant when a zone of inhibition of ≤21 mm was obtained with cefoxitin disc (Figure 1). Among the total 402 number of cases, 254 (63.18%) samples grew *S. aureus*, out of which 164 (64.56%) were methicillin resistant.

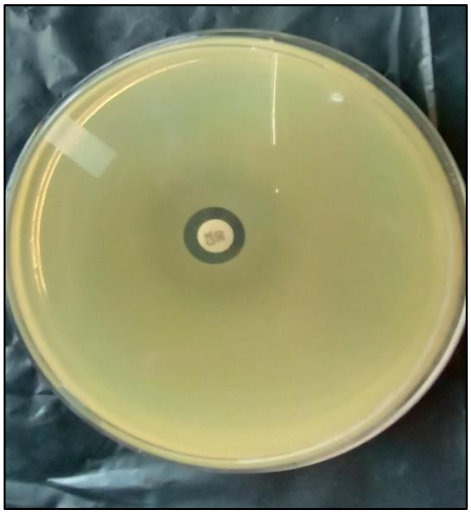

Figure 1: MRSA detection using cefoxitin disc.

Antimicrobial susceptibility of the isolates was evaluated by Kirby-bauer disc diffusion method in accordance to CLSI guidelines. The results were tabulated by using Microsoft Excel software. Of the total MRSA strains isolated, 34.75% were susceptible to amikacin, 44.27% to piperacillin tazobactam, 15.1% to ofloxacin, 27.7% to azithromycin, 29.03% to trimethoprim-sulfamethoxazole.

None of the organism was resistant to vancomycin or linezolid. Among the MSSA strains the sensitivity to amikacin, piperacillin tazobactam, ofloxacin, azithromycin and cotrimoxazole were 56.6%, 54.4%, 78.9%, 51.11% and 56.7% respectively. (Table 1).

Table 1: Comparison of sensitivity pattern of MRSA and MSSA strains to various antibiotics.

Antibiotic	% sensitivity in MRSA strains (n= 164)	% sensitivity in MSSA strains (n=90)
Amikacin	34.75%	56.6%
Piperacillin tazobactam	44.27%	54.4%
Ofloxacin	15.1%	78.9%
Azithromycin	27.7%	51.11%
Cotrimoxazole	29.03%	56.7%
Linezolid	100%	100%
Vancomycin	100%	100%

DISCUSSION

In the present study overall nasal carraige rate of *S. aureus* was 63.18%. Male carriers were outnumbered females. Higher prevalence of *S. aureus* carriage in males might be due to male students participated in sport activities more often than females which makes them more vulnerable to colonization.

Previous studies have also reported nasal S. aureus colonization rates as high as 27% - 56.6% in diabetics.[3-6] A more recent study of national health and nutrition examination survey data found a *S. aureus* colonization rate of 30.2% in patients with diabetes.7 Overall carriage of MRSA in the study was 40.8%. There is a huge difference in the epidemiology of MRSA carriage worldwide. For example, the prevalence of community-associated MRSA infection in Japan, Germany, Turkey, Taiwan, and Malta was found to be 0.94%, 1.2%, 1.2%, 1 3.8%, 1 and 8.81% 1 respectively.[8-12] This variation of nasal carriage rate of *S. aureus* in studies might be due to difference in the characteristics of the study population, quality of sampling, culturing techniques, geographical distribution, and diagnostic techniques.[13]

A previous study reported an MRSA colonization rate in diabetics as 10.2%, whereas in another study it was 19% in diabetics on hemodialysis.[14,15] Graham et al, reported a MRSA carriage rate of 2.4% (11/461) in patients with DM. Similarly, a more recent Turkish.[16]

The prevalence of *S. aureus* and MRSA colonization seems to be higher in outpatients with DM compared with those without DM. The use of insulin is the independent risk factors for MRSA colonization. An increased risk of MRSA colonization in patients with DM receiving insulin therapy was reported by Baykam et al.[17] Similarly, in that study the MRSA carriage rate increased from 3.8% to 9.1% for patients with DM using insulin.[17]

CONCLUSION

MRSA is a bacteria resistant to the commonly used beta lactam antibiotics and diabetics have a higher propensity of harbouring these in anterior nares. As people with diabetes mellitus are significantly predisposed to variety of infections including the dreaded diabetic foot, thus it is important to screen and provide them adequate anti MRSA prophylaxis. A better understanding of the epidemiology and risk factors for nasal MRSA colonization in the diabetic population may have significant implications for both empiric antimicrobial drug treatment and prevention of MRSA infections.

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