

Harsukh Educational Charitable Society

International Journal of Community Health and Medical Research

Journal home page: www.ijchmr.com

doi: 10.21276/ijchmr

Original Research

ISSN E: 2457-0117 ISSN P: 2581-5040

Index Copernicus ICV 2018=62.61

Resistance pattern of methicillin resistant *Staphylococcus aureus* among nasal isolates of HIV infected patients.

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ABSTRACT

Background: *Staphylococcus aureus* nasal carriage plays an important role in the epidemiology and pathogenesis of infections, and this status accounts for both community-acquired and nosocomial infections. HIV-positive individuals are at higher risk of Methicillin Resistant *Staphylococcus aureus*. Knowing the Nasal carriage status of *Staphylococcus aureus* and their Antibigram will be beneficial for effective management of these patients **Material and methods :** Nasal samples from both anterior nares were obtained from the subjects using sterile moistened swabs, and the isolates were identified as *S. aureus* by the standard microbiological tests. The antibiotic susceptibility profiles were determined by the disc diffusion method according to the Clinical and Laboratory Standards Institute (CLSI) guidelines. **Results:** Of 300 samples, *Staphylococcus aureus* was isolated in 244(81.33%) patients. Prevalence rate of MRSA from the nasal carriage of HIV positive persons was 42%. Methicillin resistant strains were found to be more resistant to antibiotics in comparison to methicillin sensitive strains. **Conclusion :** Regular surveillance and monitoring of MRSA nasal carriage and antibiotic susceptibility pattern are of prime importance in controlling *S. aureus* infections especially in high risk groups like HIV-infected patients.

Keywords: HIV seropositive, MRSA, Nasal carriage, Resistance

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This article may be cited as: Dhuria N, Nagpal N Resistance pattern of methicillin resistant *Staphylococcus aureus* among nasal isolates of HIV infected patients. HECS Int J Comm Health Med Res 2019; 5(3):4-7

INTRODUCTION

Carriage of *Staphylococcus aureus* in nose plays an important role in the epidemiology and pathogenesis of infections caused by the organism.¹ HIV-infected patients have increased *Staphylococcus aureus* colonization.^{2,3} The nasal carriage of community-acquired MRSA (CA-MRSA) is associated with a much higher incidence of clinical manifestations in comparison to other *S. aureus* strains.⁴ MRSA colonization occurs in individuals who have frequent exposure to healthcare settings and in those with frequent antibiotic usage and immune suppression.^{5,6} Other factors listed as risk for MRSA in HIV infected patients are age, low CD4 count, elevated HIV viral load, duration of hospitalization, underlying disease, invasive procedures or devices, proximity to MRSA-colonized patient and underlying dermatological diseases.^{5,7} Male-to-male sexual intercourse is also a potential risk factor for community acquired MRSA (CA-MRSA).^{8,9} MRSA infections are difficult to treat because of the limited choice of therapeutic options available and due to the possibility of concomitant drug resistance of the MRSA to other antimicrobials. MRSA infections are also a challenge to patients due to increased cost of care.¹⁰ This study is

aimed to provide reports on colonization rates and antibiotic susceptibility patterns of MRSA and MSSA among HIV infected patients and concomitant drug resistance of the MRSA to antimicrobials.

MATERIAL AND METHODS

The study was conducted at department of microbiology, Government medical college, Amritsar. This study was approved by ethical committee of the GMC, Amritsar. Signed informed consent and written questionnaires concerning the demographics (sex, age, place of residence) and medical history data were obtained from all participants. A total of 300 HIV seropositive patients were screened for colonization by *Staphylococcus aureus* and Methicillin resistant *Staphylococcus aureus* by taking anterior nares swab, which were then subjected to testing by standard culture and sensitivity tests. The isolates were identified using conventional methods like Colony morphology, Gram staining, Catalase test, tube coagulase and slide coagulase test and mannitol fermentation.¹¹ All the *Staphylococcus aureus* isolates were tested for methicillin resistance by oxacillin screen agar test and ceftioxin disc diffusion test. Antibiotic susceptibilities to penicillin (10 IU), oxacillin (1 µg), ceftioxin (30 µg), cephalixin (30 µg), ciprofloxacin (5

µg), gentamicin (10 µg), erythromycin (15 µg), amikacin (30 µg) and vancomycin (30 µg) was performed on the MRSA and MSSA isolates by the disk diffusion method on Muller-Hinton agar (Merck, Germany), according to the CLSI guidelines.¹²

RESULTS

Of 300 samples, Staphylococcus aureus was isolated in 244(81.33%) patients. Most of the patients(72.33%) were in age group of 20-40 years. Males(62%) outnumbered the female

patients(38%). Maximum number of patients(89.67%) belonged to rural area.(Table 1) Prevalence rate of MRSA from the nasal carriage of HIV positive persons was observed to be 42%.(Table 2) Methicillin resistant strains were found to be more resistant to antibiotics in comparison to methicillin sensitive strains.(Table3) Of 126 MRSA strains,86 (68.25%) were multidrug resistant.They were resistant to 3 or more drugs. Only one(0.7%) MRSA strain was not resistant to any drug other than penicillin(Table 4).

TABLE 1: DEMOGRAPHIC DISTRIBUTION OF STUDY GROUP

Study patients	No of Patients	Percentage
GENDER DISTRIBUTION		
Male	186	62
Female	114	38
AGE GROUP		
Less than 20 years	8	2.6
20 to 40 years	217	72.33
More than 40 years	75	25
Total	300	100
GEOGRAPHICAL DISTRIBUTION		
Rural	269	89.67
Urban	31	10.33

TABLE 2: PREVALENCE OF STAPHYLOCOCCUS AUREUS, MSSA & MRSA

S NO	ORGANISM	NO OF STRAINS (n=300)	PERCENTAGE PREVALANCE
1	Staphylococcus aureus	244	81.33
2	MSSA	118	39.33
3	MRSA	126	42.0

MSSA- Methicillin sensitive staphylococcus aureus

MRSA- Methicillin resistant staphylococcus aureus

TABLE 3: RESISTANCE PATTERN OF MSSA AND MRSA STRAINS TO INDIVIDUAL ANTIMICROBIAL AGENTS

S.NO	ANTIBIOTIC	MSSA (TOTAL=118)		MRSA (TOTAL=126)	
		Percentage	Percentage	Percentage	Percentage
1	PENCILIN	99	83.98	126	100
2	ERYTHROMYCIN	35	29.66	107	84.92
3	CEPHALEXIN	68	57.62	104	82.54
4	CIPROFLOXACIN	56	44.44	89	70.63
5	GENTAMICIN	36	30.50	68	53.96
6	AMIKACIN	0	0	5	3.96
7	VANCOMYCIN	0	0	18	14.28

TABLE 4: DRUG RESISTANCE PATTERN OF MRSA STRAINS

No of Resistant strains (total=126)	Percentage	No. of Antimicrobials*
5	3.96	Six
12	9.52	Five
25	19.84	Four
44	34.92	Three
30	23.81	Two
9	7.14	One
1	0.7	Zero

*except penicillin, MRSA- Methicillin resistant staphylococcus aureus

Table 5: COMPARISON OF ANTIBIOTIC RESISTANCE PATTERN OF MRSA STRAINS

S No	Antibiotic	Author Name						Our study
		Chacko et al	Diwakar et al	Kalash et al	Alexander et al	Soares et al	Goyitam et al	
1	Penicillin	100%	100	100	ND	100	ND	100%
2	Erythromycin	75%	ND	63.6	83.67	68.2	50	84.92%
3	Cephalexin	ND	ND	ND	ND	ND	ND	82.54%
4	Ciprofloxacin	75	78	72.7	79.59	ND	16.7	70.63%
5	Gentamicin	ND	39	72.7	ND	ND	ND	53.96%
6	Amikacin	ND	0	ND	ND	ND	0	3.96%
7	Vancomycin	0	0	0	0	ND	ND	14.28%

DISCUSSION

First report of CA-MRSA was seen in UK among drug abusers in 1982. Since that time increased level of MRSA is being reported all over the world including India.^{13,14} HIV has been identified as an independent risk factor for determining colonization with MRSA.¹⁵ The reason for the higher colonization rates could include factors such as frequent contact with both health care and community settings and frequent exposure to antibiotics, leading to a greater likelihood of becoming colonized with resistant strains. Some authors argue that this increased susceptibility to colonization with *S. aureus* could be HIV-specific.¹⁶

In our study, *S. aureus* nasal carriage was found in 81.33 % patients, in which 42% were MRSA.

Chacko et al reported nasal carriage of Staphylococcus aureus to be 76.67% & MRSA 17.39% in HIV patients.⁷ Alexander A et al in study on MRSA in HIV positive persons showed S.aureus nasal colonization of 71.65% and MRSA nasal colonization to be 25.3%.¹⁷ Diwakar MK et al in their study confirmed 43.64% isolates as *S. aureus* and MRSA prevalence of 18.75%.¹⁸ A study done by Goyitam et al showed S.aureus prevalence of 32.5% and MRSA prevalence of 2.4%.¹⁹ Soares et al in their study showed a S.aureus prevalence of 31.4% and MRSA prevalence of 4.4%.²⁰ Neupane et al showed S.aureus prevalence of 26.66% and MRSA prevalence of 13.8%.²¹

Difference in prevalence of MRSA by different researchers may be attributed to varied geographical locations, different patient populations, sample size, sampling techniques, intermittent MRSA colonization, and prevalence of ART in the study population.^{16,22}

Maximum patients(72.33%) were males and in age group of 20-40 years and similar findings were shown by other authors.^{18,21} Maximum number of patients(89.67%) belonged to rural area.Similar findings were shown by

other authors.¹⁸ In our study MRSA was found to be more resistant than MSSA to all antimicrobials. In our study 100% MRSA strains were resistant to Penicillin. This is in accordance with the results obtained by J chacko et al,Diwakar et al, Neupane et al and Soares et al.^{7,18,20,21} Resistance to erythromycin was 84.92% and is similar to J chacko et al⁷ and Alexander A et al¹⁷ whereas Soares et al²⁰, Neupane et al²¹ and Goyitom et al¹⁹ showed resistance of 68.2%, 63.6% and 50%. Resistance to ciprofloxacin was 70.63% and is similar to study done by other authors^{7,17,18,21} whereas study done by Goyitom et al¹⁹ showed less resistance. In our study, resistance to Gentamicin was 53.96%. Neupane et al²¹ showed higher resistance (72.7%) and Diwakar et al¹⁸ showed less resistance (39%). Resistance to Amikacin and Vancomycin was 3.96% and 14.28%. None of the authors showed resistance to both antibiotics. (Table 5) The variation in antibiotic resistance pattern against MRSA nasal carriage was observed in the findings of different researchers according to the local antibiotic policies and various factors. In our study, 68.25% MRSA strains were multidrug resistant. Increasing resistance among nasal MRSA may create difficulty to manage infections and may cause more complications in HIV patients. Additionally, screening for carriage frequency and decolonization must be considered by hospital administration.

CONCLUSIONS

A higher colonization rate and increased resistance among MRSA isolates is seen in HIV seropositive patients. The accurate relationship between HIV infection and MRSA colonization has yet to be fully elucidated and further research is required. Screening of MRSA carriage status may be considered to reduce infections caused by MRSA in HIV-infected individuals.

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