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PREVALENCE OF NASAL CARRIAGE OF STAPHYLOCOCCUS AUREUS AND METHICILLIN RESISTANT STAPHYLOCOCCUS IN AROUND SOUTH CHENNAI POPULATION

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ABSTRACT

To study the prevalence of the nasal carriage of staphylococcus aureus and Methicillin Resistant Staphylococcus aureus in and around Tambaram and to correlate with certain risk factors and among healthy hospital care workers. The study material consisted of 400 nasal swabs were collected from community in and around Tambaram, Chennai. 102 hospital workers were screened for nasal carriage of staphylococcus aureus and MRSA at Hindu Mission Hospital during the period of 6 months from November 2015 to April 2016. All the samples were subjected to gram staining and bacterial culture and *S. aureus* isolates were screened for MRSA prevalence using microbiological methods. All the clinical isolates are subjected to antimicrobial susceptibility testing on Mueller Hinton agar using the Kirby-Bauer disc diffusion method. *S. aureus* was the most common pathogen among the Gram-positive bacteria isolated from nasal carriage. Results: Out of 400 samples, 29% *Staphylococcus aureus* was isolated, 1.25% were found to be *Methicillin-resistant Staphylococcus aureus* (MRSA) in community and Out of 102 samples, 17.64% *Staphylococcus aureus* was isolated, 1.96% were found to be *Methicillin-resistant Staphylococcus aureus* (MRSA) in hospital workers. The number of MRSA positive individuals was only 5 out of 400. This is a low number to assess the risk factors associated with CA-MRSA. Community based study should be conducted in a larger scale in order to study the risk factors associated with the CA-MRSA status.

KEYWORDS: Staphylococcus aureus, MRSA, Nasal Swab, Community.

INTRODUCTION

Human body is rich in bacterial diversity owing to the favorable surviving conditions. Many of them bacterial residing on the surface and deep layers of the skin, in the saliva and oral mucosa and in the gastrointestinal tracts. They constitute normal flora. They prevent the transient pathogenic organisms from colonizing the skin and the mucosal surface, either by competing for nutrients or by secreting chemicals against them or by stimulating the local immune system. These resident microbes can cause skin diseases and many other diseases when there is a breach in the skin or mucous membrane or when the immunity gets suppressed. Staphyllococcus aureus is a potential pathogens and is carried in the nose and skin of healthy people. Around 30% of the population are long term carriers of staphylococcus aureus. Staphylococcus infections are most common bacterial infection. It is characteristically localized pyogenic lesions, in contrast to spreading streptococcal infections. Common staphylococcal infections are skin and soft tissue infections (SST) which include follicles, furuncle, abscesses, wound infection, carbuncle, impetigo, paronychia, cellulitis. It causes musculoskeletal infection such as osteomyelitis, arthritis, bursitis, pyomyositis. It affects respiratory system causing tonsillitis, pharyngitis, sinusitis, bronchopneumonia, ling abscess, empyema. They can also cause urinary tract infection which is uncommon.

The treatment of choice of Staphylococcus aureusnisn penicillin and many other B-lactamase drugs like oxacillin etc,. Repeated use of these drugs has resulted in the emergence of resistant strains. Methicillin Resistant Staphylococcus aureus (MRSA) is responsible for several difficult-to-treat-infection inhumans. MRSA by definition is the Staphylococcus aureus that has developed resistance to B-lactamase drugs including penicillins (Methicillin, Dicloxacillin, Oxacillin, etc.) and the cephalosporins.

MRSA was first reported in 1961 in united kingdom. It first appeared in united states in 1981 among intravenous drug users. Methycillin resistant Staphylococcus aureus has long been considered as hospital acquired pathogen.

But community acquired methicillin resistant Staphylococcus aureus (CA-MRSA) has emerged globally as a serious pathogen mainly targeting children and young adults. Dissimination of specific clones has contributed to accelerated increase in the incidence of CA-MRSA in many countries including Asian countries. Worldwide understanding of the epidermiology of CA-MRSA is incomplete and few reports are available from india. CA-MRSA is highly virulent and is genetically different from HA-MRSA. In Hindu Mission Hospital a pilot study demonstrated MRSA to be 41% of all Staphylococcus aureus among these MRSA 40% were CA-MRSA based on susceptibility to clindamycin. (Un Published). Hence the present study was aimed to detect the prevalence of MRSA in Hindu Mission Hospital and in the community served by Hindu Mission Hospital.

MATERIALS AND METHODS

Study population

For community samples people from age 10 years to 90 years were randomly screened. In order to exclude hospital acquired methcillin resistant staphylococcus aureus carriage people who were not admitted in hospital for past one year were only included for the study. Hospital care workers, including doctors who were working in intensive care units (who are in close contact with patients) and technicians who deal with the samples were screened. 400 samples were collected from community and 102 samples were collected from hospital workers (staff norse: 62 nos and operation theatre:40)

Collection of Specimens

Nasal swab were collected for detecting carrier status of staphylococcus aureus since staphylococcus sureus usually colonise in the anterior nares of the nostrils. Transport swabs procured from Hi-media were used for collecting specimens from community and hospital workers which was transported safety to the laboratory without contamination. Amies medium supplemented with charcoal was used as transport medium in the transport swab. Swabs were then rotated against the mucosa for 3 seconds. Using the same swab the step was repeated for the other nares. Cap of the transport was removed and the swab was placed into the medium. The swab was pushed firmly to ensure that it is properly inserted in to the tube.

Isolation and Identifications

The nasal swabs collected were plated onto a selective medium, mannitol salt agar (MSA). This selective and indicator medium contains mannitol (1%), sodium chloride (7.5%), with phenol red as indicator of acid production. Staphylococcus aureus which ferments mannitol produce yellow coloured colonies. Further processing included gram staining, catalase test, coagulase test and antibiotic sensitivity testing.

Antimicrobial Susceptibility Testing

All the clinical isolates are subjected to antimicrobial susceptibility testing on Mueller-Hinton agar using the Kirby-Bauer method. The procedures outlined in the fourteenth edition of Bailey and Scotts diagnostic Microbiology is followed. The following drugs and concentrations (in brackets) were used to determine the antibiogram of the strains, first line antibiotics: Cephoxitin (30µg), Co-trimaxazole (25µg), Clindamycin (2µg), Erythromycin (15 µg), Penicillin (10U), Ceforoxime (30µg) and Cephalothin (30µg). The plates were incubated at 35^0C for 18-24 hrs according to the CLSI (Clinical Laboratory Standards Institute) guidelines.

OXACILLIN DISK DIFFUSION TESTS

The entire surface of the MHA plate was covered with the required inoculum, and the plate was air dried for 15 min before the disks were laid on the surface and incubation was performed for 18 h at the required temperature. Oxacillin resistance was determined with 1g disks according to the NCCLS guidelines.

D-TEST

Inducible resistance to Clindamycin was tested by D Test as per CLSI guidelines. Clindamycin and Erythromycin discs were placed adjacent to each other, the distance from edge to edge being 211mm on a Mueller-Hinton agar. Following overnight incubation at 37°C, Flattening of Zone (D-Shaped) around Clindamycin in the area between two discs, indicated inducible Clindamycin resistance.

STATISTICAL EVALUATION

The association between colonization of staphylococcus aureus and other variables were studied by applying chi square test and the significance of the association was expressed as “p” values.

RESULT

The present study was aimed to detect the prevalence of nasal carriage of staphylococcus aureus and of Methicillin Resistant Staphylococcus aureus among the community served by Hindu Mission Hospital and to compare the same among the hospital workers. A total of 400 nasal swabs were collected from community in and around Tambaram, Chennai. 102 hospital workers were screened for nasal carriage of staphylococcus aureus and MRSA. 116 out of 400 community samples (29%) were positive for staphylococcus aureus, 213 samples (53.25%) positive for coagulase negative staphylococci (CONS) and 71 samples (17.75%) were positive for diptheriods. 5 out of 116 staphylococcus aureus (4.31%) were MRSA prevalence of 1.25% was observed among the community persons. Among 102 samples collected from hospital workers 18 samples (17.64%) were positive for Staphylococcus aureus, 83 samples (81.3%) positive for CONS, 1samples (0.9%) positive for diptheriods. 2 out of 18 staphylococcus aureus were (11.11%) were MRSA. Prevalence of MRSA was 1.96% among hospital workers. Analysis of risk factors that may be associated with carriage of staphylococcus

aureus and MRSA was attempted. When comparison was made between nasal carriage of staphylococcus aureus and number of individuals with skin infections, 29.31% (34/116) individuals with nasal carriage of staphylococcus aureus were suffering from skin infections at the time of sampling. 60% of MRSA positive individuals were presenting with skin infections. Among the 72 persons with skin infection, nasal carriage of Staphylococcus aureus was seen in 34 persons (47.22%) 3 persons (4.16%) carried MRSA in their nostrils. Out of the 102 individuals who had pets at their home, 36 individuals (35.29%) carried staphylococcus aureus and 2 individuals (1.96%) carried MRSA in their nostrils.

Table 1: Total No of Samples Processed And Screened.

Age	No of samples collected	No of S.aureus Positives	No of CONS Positives	No of diptheriods positives	No of MRSA positives
10-19	10	3 (30%)	4	3	-
20-29	51	15 (29.4%)	25	11	-
30-39	59	16 (27.1%)	33	10	-
40-49	60	17 (28.3%)	36	7	-
50-59	79	20 (25.3%)	38	21	-
60-69	81	23 (28.3%)	46	12	2 (8.6%)
70-79	52	18 (34.6%)	28	6	2 (11.1%)
80-89	8	4 (50%)	3	1	1 (25%)
TOTAL	**400**	**116 (29%)**	**213**	**71**	**5 (4.3%)**

A higher prevalence of staphylococcus aureus (34.6-50%) among age group 70-89 and among the staphylococcus aureus isolated higher prevalence of MRSA (25%) was in age group 80-89.

Table 2: Profile of Cases With Skin and Soft Tissue Infection.

Age	No of samples collected	No of samples collected with skin infections	No of S.aureus Positives	No of MRSA positives
10-19	10	2	-	-
20-29	51	9	5 (55.5%)	-
30-39	59	8	3 (37.5%)	-
40-49	60	10	4 (40%)	-
50-59	79	14	6 (42.8%)	-
60-69	81	15	7 (46.6%)	1 (14.2%)
70-79	52	11	4 (36.4%)	1 (9.0%)
80-89	8	3	2 (66.6%)	1 (33.3%)
TOTAL	400	72	34 (47.2%)	3 (8.8%)

A higher prevalence of Staphylococcus aureus (66.6%) was observed in age group 80-89 who had skin infection and the same age group had higher prevalence of MRSA (33.3%).

Table 3: Statistical Analysis of Skin Infection With Respect Tos. Aureus Nasal Carriage.

CATEGORY * GROUPS Cross tabulation						
COUNT						
		GROUPS		**TOTAL**	**CHI-SQUARE**	**P-VALUE**
		Skin infection positives	**Skin infection negative**			
CATAGORY	Nasal carriage positive	34	82	116	14.160[a]	.000
	Nasal carriage negative	38	246	284		
TOTAL		72	328	400		

Thus the association between skin infections and nasal carriage of staphylococcus aureus is highly significant statistically.

Table 4: Profile of Cases With Pets At Home.

Age	No of samples collected	No of samples collected with skin infections	No of S.aureus Positives	No of MRSA positives
10-19	10	4	1	-
20-29	51	11	5	-
30-39	59	15	6	-
40-49	60	17	7	-
50-59	79	16	5	-
60-69	81	19	5	1
70-79	52	17	3	-
80-89	8	3	2	1
TOTAL	**400**	**102**	**36**	**2**

Table 5: Statistical Analysis of Having Pets At Home With Respect To S.Aureus Nasal Carriage.

CATEGORY * GROUPS Cross tabulation						
COUNT						
		GROUPS		**TOTAL**	**CHI-SQUARE**	**P-VALUE**
		No of persons having pets	**No of persons do not having pets**			
CATAGORY	Nasal carriage positive for S.aureus	36	80	116	2.634[a]	0.105
	Nasal carriage negative for S.aureus	66	218	284		
TOTAL		102	298	400		

The association between pet animals in the house and nasal carriage of staphylococcus aureus is not statistically significant.

Table 6. Antibiotic sensitivity pattern
For community samples

ANTIBIOTICS	SENSITIVE	INTERMEDIATE	RESISTANT
Oxacillin	97 (83.6%)	11	8 (6.8%)
Cephoxitin	108 (93.1%)	3	5 (4.3%)
Penicillin	0	0	116 (100%)
Co-trimaxazole	65 (56%)	9	47 (40.5%)
Clindamycin	102 (87.9%)	5	9 (7.7%)
Erythromycin	76 (65.5%)	8	32 (27.5%)
Cephalothin	116 (100%)	0	0

For hospital samples

ANTIBIOTICS	SENSITIVE	INTERMEDIATE	RESISTANT
Oxacillin	16 (88.8%)	0	2 (11.1%)
Cephoxitin	16 (88.8%)	0	2 (11.1%)
Penicillin	0	0	18 (100%)
Co-trimaxazole	14 (77.7%)	2	2 (11.1%)
Clindamycin	17 (94.4%)	0	1 (5.5%)
Erythromycin	11 (57.7%)	4	3 (16.6%)
Cephalothin	18 (100%)	0	0

There was not much difference in sensitivity pattern in community and hospital samples.

DISCUSSION

In our study prevalence of nasal carriage of staphylococcus aureus in the community was 27.75% and the prevalence of methicillin resistant staphylococcus aureus carriage was 1.25%. similar observations were made by Lipsky BA *et al*. Lesser prevalence of MRSA (0.12%) was reported from centralItaly by Wagner FW. A very prevalence is reported from Atlanta where there had been an outbreak of infections due to CA-MRSA. Day MR, Armstrong DG observed prevalence of Staphylococcus aureus

carriage of 16.4% and prevalence of MRSA carriage of 7.3%. Among Hospital workers prevalence of Staphylococcus aureus was 17.64% and the prevalence of MRSA carriage was 1.96%. A higher prevalence was observed by Tentolouris N, Petrikkos G, Vallianou N.*et al*. We observed 72 cases with skin infection and out of this 34 (47.22%) carried staphylococcus aureus in their nostrils and 3 (4.16%) carried MRSA in their nostrils. The association between nasal carriage of staphylococcus aureus and skin infection was statistically significant (p=<.000). Similar observation was made in Los angels by Cosgrove SE *et al*, where 64% people carried MRSA who had skin and soft tissue infection. Lu Po-L, Lien-Chun Chin *et al* had reported that CA-MRSA could have been acquired from the pets. In our study 102 individuals had pets at their home. Out of which 36 (35.29%) persons carried staphylococcus aureus in their nostrils and 2 (1.96%) carried MRSA in their nostrils, but the association was not statistically significant. We observed higher prevalence of staphylococcus aureus carriage (28.36%) and prevalence of MRSA carriage (3.54%) among old age (60 years or above). Similar observation was made by TahaAB *et al* 2013 in USA. A higher prevalence of MRSA (8.28%) among old age people was also observed by Fejfarova V *et al* in USA.

CONCLUSION

In the present study the prevalence of nasal carriage of staphylococcus aureus in the community was observed as 29% and MRSA nasal carriage was observed as 1.25%. Among hospital workers the staphylococcus aureus carriage was observed as 17.64% and MRSA carriage was 1.96%. among the samples collected from 141 old age (60 or above) individuals the prevalence of S.aureus carriage was 31.91% and MRSA carriage was observed 3.54%. From our study we observed that staphylococcal colonization in hospital workers is comparatively very less screened from community. This may be because of hand washing among hospital workers. Our study showed increased in prevalence of MRSA among older age group (60 or above). The number of MRSA positive individuals was only 5 out of 400. This is a low number to assess the risk factors associated with CA-MRSA. Community based study should be conducted in a larger scale in order to study the risk factors associated with the CA-MRSA status.

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