A STUDY ON NASAL CARRIAGE OF MRSA AND ITS ANTIMICROBIAL SUSCEPTIBILITY PATTERN IN HEALTHY INDIVIDUALS AND HOSPITALISED PATIENTS.

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ABSTRACT: BACKGROUND: Staphylococcus aureus is an important pathogen in hospital associated infections as well as in community acquired infections. About 20-40% of healthy persons carry Staphylococci in the nose. Most dreadly strains of S.aureus are Methicillin resistant S.aureus (MRSA) strains. Till recent times these MRSA strains were restricted to hospitals only as Health care associated MRSA (HA-MRSA). But now these strains have also emerged in community, called as Community associated MRSA (CA-MRSA).

AIM: 1. To study the nasal carriage rate of, Staphylococcus aureus in community and in hospital setting in adult males and it’s Antimicrobial susceptibility pattern.
2. To compare the nasal carriage rate of HA-MRSA with that of CA-MRSA and their Antimicrobial susceptibility patterns. MATERIAL AND METHODS: Nasal swabs were collected from anterior nares of control group (100 healthy adult males with no risk factors for acquisition of HA-MRSA) and study group (100 patients) from June 2011- August 2011. Samples were inoculated on Mannitol Salt Agar and incubated at 37°C for 24-48hrs. Yellow colonies were considered as Staphylococcus aureus and after confirmation, they were subjected to antimicrobial susceptibility test by Modified Kirby-Bauer disc diffusion test. RESULTS: Nasal carriage rate of Staphylococcus aureus and MRSA was 14% & 4% in healthy individuals and 27% & 11% in patients, with significant p value. Community associated S.aureus and CA-MRSA were more susceptible to antimicrobials than Hospital associated S.aureus and HA-MRSA. All hospital strains and 85.78% community strains were resistant to penicillin. All strains were more susceptible to Amikacin and ciprofloxacin and least susceptible to co-trimoxazole. CONCLUSIONS: Nasal carriage rate of MRSA was higher in hospitalized patients than in general population. Resistance pattern was more in hospital strains.

KEY WORDS: Nasal carriage, CA-MRSA, HA-MRSA, Antimicrobial susceptibility pattern.

INTRODUCTION: Staphylococcus aureus is an important pathogen in hospital associated infections as well as in community acquired infections. About 20-40% of healthy persons carry Staphylococci in the nose. Most dreadly strains of S.aureus are Methicillin resistant S.aureus (MRSA) strains. Till recent times these MRSA strains were restricted to hospitals only as Health care associated MRSA (HA-MRSA). But now these strains have also emerged in community, called as Community associated MRSA (CA-MRSA). The known risk factors for CA-MRSA are...
antibiotic use in the past 3 months, hospitalization during past 12 months, diagnosis of skin and soft tissue infections (SSTIs) at admission [1], chronic illness, IV drug use, and close contact with health care personnel[2].

Although several studies were conducted on the nasal carriage of S.aureus in school going children or in students and most of the Indian studies were on the prevalence of CA-MRSA but not on HA-MRSA. Hence we made an attempt to study nasal carriage rate of community associated and health care associated S.aureus and MRSA in adult males.

AIM:
1. To study the nasal carriage rate of Staphylococcus aureus, in community and in hospital setting in adult males and its Antimicrobial susceptibility pattern.
2. To compare the nasal carriage rate of HA-MRSA with that of CA-MRSA and their Antimicrobial susceptibility patterns.

MATERIAL AND METHODS:
Nasal swabs were collected from anterior nares from both control group and study group from June 2011- August 2011 after taking informed written consent. Institutional ethics committee approval was taken. Statistical analysis was done using Chi-Square method.

CONTROL GROUP: Comprised 100 healthy individuals in the age group of 20-40 yrs, who were not on antibiotics in the past 3 months, not hospitalized in the past 1yr and not having respiratory infections or skin and soft tissue infections at the time of study.

STUDY GROUP: Comprised post operative patients who were admitted to hospital for more than 1wk duration, without any ENT problem and were negative for nasal carriage of S.aureus at the time of admission.
A single sterile moistened swab was inserted into anterior nares and was rotated gently to collect nasal flora.

PROCESSING OF SAMPLE: Samples were inoculated on Mannitol salt agar (MSA), incubated at 37°C for 24-48 hrs. Processing was done by using standard methods [3]. Yellow colored colonies were considered as Staphylococcus and S.aureus was identified by positive, tube coagulase test and Voges Proskauer test and then subjected to antimicrobial susceptibility test by Modified Kirby-Bauer disc diffusion test using the following antibiotic discs – oxacillin (1μg), Penicillin (10u), Cotrimoxazole (trimethoprim-sulfamethoxazole: 1.25/23.75μg), Vancomycin (30μg), Ciprofloxacin (5μg), Gentamycin (30μg), Doxycyclin (30μg), Roxythromycin (30μg), Amoxycillin (Amoxycillin + Clavulenic acid: 20/10μg) and Cefotaxime (30μg) discs on Mueller Hinton agar. Next day susceptibility was determined by measuring diameter of zone of inhibition according to CLSI guide lines. Quality control was ensured by comparing the results with that of Staphylococcus aureus ATCC 25923 strain.

RESULTS: 14 persons (14%) in control group and 27 patients (27%) in study group were positive for nasal carriage of S.aureus. 4 of the 14 strains of S.aureus from control group (28.57%) and 11 of the 27 strains from patients were MRSA (40.74%) as shown in Table 1 and the values were statistically significant.
All strains isolated from patients showed resistance to penicillin. 100% of community associated S.aureus (CA-SA) isolates and 96.29% of health care associated S.aureus (HA-SA) isolates were susceptible to Vancomycin. Least susceptibility was found to Cotrimoxazole. Antimicrobial susceptibility pattern of S.aureus and MRSA from both groups was shown in Table 2 &3.

**DISCUSSION:** Many bacteria are transmitted from one person to another through hands. A person with S.aureus carriage in the anterior nares may rub his nose, pick up Staphylococci on the hands and spread the bacteria to other parts of the body or to other person, where infection results. The normal resident microbial flora is harmless, but if introduced into foreign locations, they may produce disease [4]. Nasal carriage of S.aureus acts as endogenous reservoir for clinical infections in the colonized persons, but also act as a source of cross colonization for others [5].

In the present study nasal carriage of S.aureus was 14% in control group and among them 28.57% were MRSA. In the test group it was 27% and among them 40.74% were MRSA. MRSA nasal carriage was 4% and 11% in control group & test group respectively. In an unpublished study (2002) from the same author nasal carriage rate of S.aureus was 11.5% in burns patients at the time of admission and all strains were methicillin sensitive. It showed increase in the nasal carriage rate and development of resistance to methicillin over the years. Most of the Indian studies were on the prevalence of CA-MRSA but not on HA-MRSA. To the best of our Knowledge, our study was first of this kind in our area.

Nasal carriage of S.aureus in healthy adults was 14% in our study, 22.5% in the study of Goud R et al [6] and 46.1% in Dev Jyothi Majumdar et al study [7] and 6.3% in Pathak's study [5]. Rajendra Goud N et al [8] found it was 48.43% in the age group of 13-16 yrs. The above studies were from India. Nasal carriage was 29% in 2wks-21 yrs age group in a study by Nakamura [9], 29% in students by Bischoff et al [10], 31.5% in 20-64yrs age group in AG Mainous III et al study [11], 40.8% in 18-27 yrs age group in Karina A Prates study [12] and 18% in healthy volunteers by Nicola Best [13]. The above findings suggested that there was a wide variation (14-52.3%) in the nasal carriage of S.aureus among different age groups and in different geographical regions.

MRSA carriage rate in healthy adults also had wide range – 26.6% (Dev Jyothi Majumdar), 9.9% (Goud R), 0.84% (AG Mainous III) , 0.3%( Munckhof) [14], 2.4% (Karina A Prates), 0.2% (Nicola Best) and 4% (Present study) suggested higher rates in India than in other countries. CA-MRSA nasal carriage rate in the present study is lower than that from other areas in India.

Nasal carriage rate of HA-SA was 27% and HA-MRSA was 11% in the present study. No Indian studies were available in this regard. HA-MRSA carriage rate was 7.3% in Al Hidron et al study [1] and 0.7% in Munckhof study [14] again shows the higher rate in India than in other countries.

In the present study 100% strains of CASA & CA-MRSA, as in some studies [2,8,12], 96.29% strains of HASA and 90.9% strains of HA-MRSA were susceptible to vancomycin, where as it was 56% in one study [15]. In an unpublished study (2002) from the same institute all MRSA strains were vancomycin sensitive, suggested development of vancomycin resistance in the sensitive strains, stresses the importance of adhering to hospital antibiotic policy. Indiscriminate use of antibiotics leads to development of resistance by selective pressure. Extensive use of penicillin for any infection especially in rural India results in the development
of almost total resistance to penicillin. Similarly indiscriminate use of vancomycin may result in the development of vancomycin resistance in future. Hence the need of the hour is to take containment measures by strict implementation of antibiotic policy.

Least susceptibility was seen to co-trimoxazole, as in some studies [5,15]. Susceptibility of CA-S.aureus to amikacin, roxithromycin, ciprofloxacin, cefotaxime, doxycycline and amoxyclav was 78.57%, 57.14%, 64.28%, 78.57%, 64.28% and 57.14% respectively. Where as for HA-S.aureus it was 62.96%, 44.44%, 44.44%, 62.96%, 55.55% and 48.14% to the above drugs.

The antimicrobial susceptibility pattern of CA-MRSA varied widely among different studies. In the present study CA-MRSA strains were more resistant than CA-SA strains. HA-MRSA strains showed still more resistance. The susceptibility rate of HA-MRSA to amikacin, roxithromycin, ciprofloxacin, cefotaxime, doxycycline and amoxyclav was 36.36%, 36.36%, 27.27%, 54.54%, 45.45% and 36.36% respectively. From the above findings it was clearly evident that hospital strains were more resistant to antimicrobials than community strains. Unless we take measurements, microbes will develop 100% resistance to these antibiotics also as in case of penicillin.

CONCLUSIONS: 1. Nasal carriage rate of S.aureus and MRSA was higher in hospitalized patients than in healthy individuals.
2. Health care associated S.aureus and MRSA strains showed more resistance to antimicrobials than CA-SA and CA-MRSA.

Table 1 showing S.aureus and MRSA isolates from anterior nares of healthy individuals and patients

<table>
<thead>
<tr>
<th>Group</th>
<th>Total No. of cases</th>
<th>S.aureus*</th>
<th>%</th>
<th>MRSA**</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>100</td>
<td>14</td>
<td>14%</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>Test</td>
<td>100</td>
<td>27</td>
<td>27%</td>
<td>11</td>
<td>11%</td>
</tr>
</tbody>
</table>

*p value significant (< 0.05)
** p value significant (< 0.05)

Table 2 showing antimicrobial sensitivity pattern of S.aureus isolated from both groups in percentage

<table>
<thead>
<tr>
<th>Group</th>
<th>P</th>
<th>V</th>
<th>OX</th>
<th>CO</th>
<th>Ak</th>
<th>Ro</th>
<th>Cf</th>
<th>CTX</th>
<th>Do</th>
<th>AMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>14.21</td>
<td>100</td>
<td>71.42</td>
<td>21.42</td>
<td>78.57</td>
<td>57.14</td>
<td>64.28</td>
<td>78.57</td>
<td>64.28</td>
<td>57.14</td>
</tr>
<tr>
<td>Study</td>
<td>0</td>
<td>96.29</td>
<td>59.25</td>
<td>18.51</td>
<td>62.96</td>
<td>44.44</td>
<td>44.44</td>
<td>62.96</td>
<td>55.55</td>
<td>48.14</td>
</tr>
</tbody>
</table>

Table 3 showing antimicrobial sensitivity pattern of CA-MRSA and HA-MRSA in percentage

<table>
<thead>
<tr>
<th>Group</th>
<th>V</th>
<th>CO</th>
<th>AK</th>
<th>RO</th>
<th>Cf</th>
<th>CTX</th>
<th>DO</th>
<th>AMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA-MRSA</td>
<td>100</td>
<td>25</td>
<td>75</td>
<td>75</td>
<td>50</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>HA-MRSA</td>
<td>90.9</td>
<td>18.18</td>
<td>36.36</td>
<td>36.36</td>
<td>27.27</td>
<td>54.54</td>
<td>45.45</td>
<td>36.36</td>
</tr>
</tbody>
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REFERENCES:


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