Detection of Methicillin-resistant *Staphylococcus aureus* Nasal and hand Carrier among health care workers at Tertiary Hospital

Abstract:

Objective: Methicillin-resistant *Staphylococcus aureus* (MRSA) is one of the main causative agents of nosocomial infections that has posed a major threat to those with compromised immune systems beside health care workers (HCWs) which may act as carriers. This study was aim to determine the carriage rates of MRSA strains among health care workers.

Methodology: Cross sectional based study, 60 nasal and hand swabs were collected from HCWs whom were enrolled in hospital and closely contact with patients. Isolation and identification of *Staphylococcus aureus* was done by culture and biochemical tests . Kirby Bauer disk diffusion method was used for antimicrobial sensitivity test.

Results: About 20 (33%) out of study population were found to be colonized by *S. aureus*. Only 4 (20%) of isolated *Staphylococcus aureus* which belong to nasal sample among HCWs, were found to be MRSA while absent at hand sample.

Conclusion: Study concluded that nasal and hand carriage of *Staphylococcus aureus* and MRSA were relatively low.

Introduction:

Staphylococcus aureus, especially methicillin-resistant *Staphylococcus aureus* (MRSA), is one of the main nosocomial pathogens associated with morbidity and mortality in both hospital and community settings [1]. The most important mode of transmission is through contaminated hands. An alternative mechanism of spread is airborne dispersal of staphylococci in association with an upper respiratory tract infection [2]. Asymptomatic carriers of *Staphylococcus aureus* may act as disseminators of the microorganism to a population susceptible to colonization. Approximately 20% of the population may be consider persistent carriers, 60% transitory carriers, and the remaining 20% do not present colonization by *Staphylococcus aureus*. The

highest rates of colonization may be found among healthcare professionals and individuals with immuno deficiency, such as those with HIV/AIDS[3]. The level of resistance to non-β-lactam antibiotic classes varies between strains that are produced by either health care-associated (HA) MRSA or community-associated (CA) MRSA [4]. MRSA colonization is predominantly present in the nose and skin of 30% people, other areas of colonization include armpit, groin, perineum, and throat [5]. MRSA carriage might be chronic or intermittent, where persons are colonized for a short time period. One form of intermittent carriage is the transient carriage, where MRSA isolated after work is gone before next day's duty, MRSA eradication is usually successful in the majority of HCWs (88%) , and successful decolonization (with mupirocin) has been shown in 94% of cases 1 week after treatment , About 5% of MRSA colonized HCWs develop clinical infections , which may progress into serious disease or have negative consequences at work [6].

Materials and Methods:

A cross-sectional hospital base study was carried out among Health care workers which were total of 60 practitioners, with male female ratio 25-35. Random sample were chosen from the staff of nurses and doctors from different units, Pharmacists, Dentists, Nutritionists, laboratory and x-ray technicians at Alragi private Hospital. Nasal and hand swabs were collected from study participants. The study excluded HCWs who do not have a direct relationship with patients and whom they refused to participate. Sample quickly transported to microbiology lab for culture, isolation and identification procedures.

Isolation and Identification of *Staphylococcus aureus* started by sample had been culture of Mannitol Salt Agar. Then after overnight, mannitol fermentation, colonial morphology, gram stain, catalase test and coagulase test were done for identification. Methicillin resistance was tested using Kirby Bauer disk diffusion method.

Table1: Distribution of health care workers according to gender and specialty

NO = 60

Category	Frequency (%)	Male (%)	Female (%)
Nurses	10(16.6%)	4(6.6%)	6(10%)
doctors	27(44.8%)	11(18.2%)	16(26.6%)
Dentists	7(11.6%)	3(5%)	4(6.6%)

Nutritionists	6(10%)	1(1.6%)	5(8.3%)
Pharmacist	4(6.6%)	2(3.3%)	2(3.3%
Lab technicians	1(1.6%)	1(1.6%)	-
X- ray technicians	5(8.3%)	3(5%)	2(3.3%)
Total	**60 (100%)**	**25(41.7%)**	**35(58.3%)**

Results:

Out of the 60 nasal swabs were examined from Health care workers, *Staphylococcus species* were detected in 45(75%) and 15(25%) were not *Staphylococcus species* of the total samples. Of these 45 positive samples, were found 20 (44%) positive to coagulase test and 25 (55%) negative to coagulase test. Among the 20 coagulase positive *Staphylococcus aureus* 4 (20%) were found to be MRSA, 16 (80%) were found to be MSSA (Table2). The overall percentage of MRSA among the health care workers was (6%).

All *Staphylococcus aureus* isolates were sensitive to Vancomycin antibiotic by Kirby Bauer disk diffusion method.

Twenty (33.3%) *Staphylococcus aureus* strains were isolated in all, of which 4 (6.6%) were MRSA. The proportion of HCWs with the nasal carriage of MRSA was higher (6.6%) than that on the hand (0%).

Table 2: Antimicrobial susceptibility test of the *Staphylococcus aureus:*

Antibiotic	**Sensitive (MSSA)**	**Intermediate**	**Resistance (MRSA)**
Oxacillin(1 µg)	16 (80%)	0	4(20%)

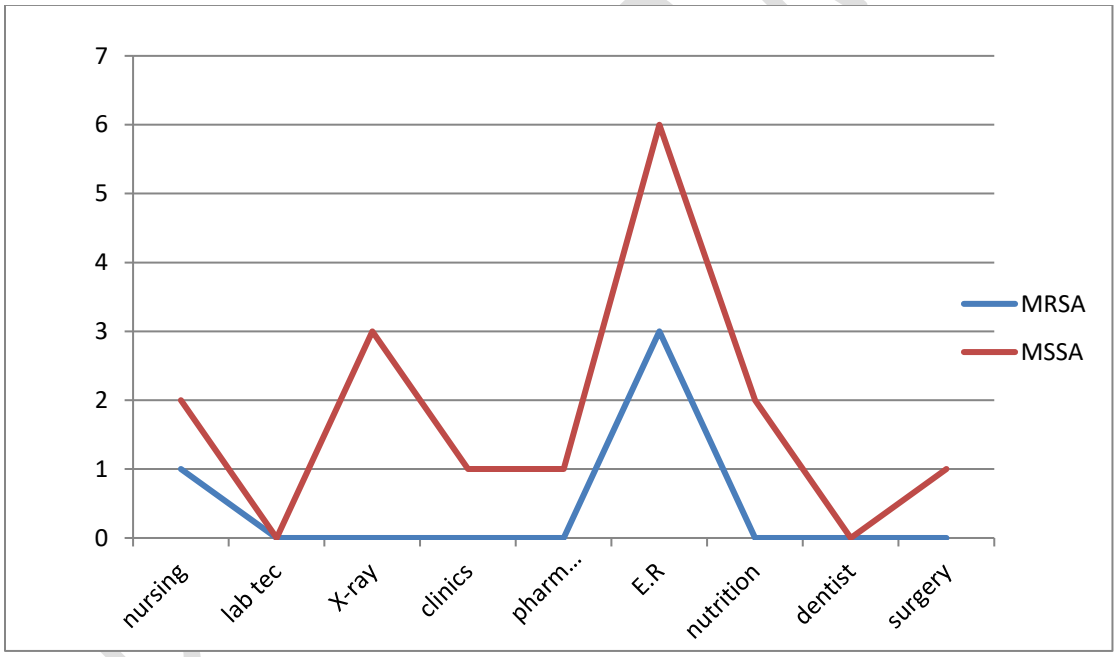
MSSA: methicillin sensitive *Staphylococcus aureus*.

MRSA: methicillin resistant *Staphylococcus aureus.*

Table 3: MRSA carriage rate:

Nasal	Hand	Category
3 (5%)	0%	Emergency room
1 (1.6%)	0%	Nurse

Figure 1: MRSA carriers :



Discussion:

This study assessed the theory of MRSA colonization among Health care workers, thus increase the possibility of its spread to hospitalized patients. In this study, 60 participants were enrolled,

the result showed that 20 (44%) *Staphylococcus aureus* were isolated, out of them 4(20%) were methicillin resistant *Staphylococcus aureus*. These results were dissimilar to study conducted in Southwestern Uganda ,Out of the 97 participants, which 13 (46.4%) were phenotypically MRSA[7]. And slightly similar to study conducted in Saudi Arabia, MRSA colonization rate was 9.04% [8]. Also it is similar to study in emergency department of Imam Reza hospital, Tabriz, Iran Out of 8 isolated *Staphylococcus aureus*, 2 cases (25%) were methicillin- resistant [9].

Forty-three percent of population from nurses encountered with *Staphylococcus aureus* present with their nasal sample, this finding is more worried because the nursing personnel are more close to admitted patients than the other HCWs.

Of 60 nasal samples with *Staphylococcus aureus*, 14.9% presented Oxacillin resistance (MRSA[10].

Swab sample from on fingertip and hand showed no growth of *Staphylococcus aureus* this result is dissimilar to that was done in referral and teaching hospital in Zambia and Kisangani where the carriage rate of *Staphylococcus aureus* was 17.1% &16.6 [11,12] respectively. The differences in carriage rate of *Staphylococcus aureus* can be attributed to variations in sampling techniques, microbiological procedures and local infection control standards.

In addition, for this study no MRSA carriage rate among healthcare workers hand swabs, the same result obtained in study from Kenya among HCWs hand swabs [13]. While different result obtained from Northern Ethiopia with MRSA carriage rate was 48.3% [14].

In this study the MRSA carrier rate on nasal swab is highly among emergency workers which may due to daily contact with incoming patients.

Conclusion and recommendations:

This study conclude that nasal carriage of *Staphylococcus aureus* and MRSA is relatively low, 20 (44%), 4 (20. %) Respectively. However, *Staphylococcus aureus* and MRSA were not detected on both fingertip and hand swab. All HCWs should be periodically educated and trained about the maintenance of personal hygiene infection control procedure and the effects of the use or rather, the misuse of antibiotics.

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