Prevalence and risk factors for Methicillin-resistant staphylococcus aureus colonization in anterior nares of HIV-positive individuals

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Introduction: Bacterial infections are known to be a major source of morbidity and mortality in patients infected with human immunodeficiency virus (HIV). Staphylococcus aureus is recognised to colonise the anterior nares of HIV infected persons with greater frequency than that of general population which can lead to a higher incidence of infection.

Material and methods: Three hundred patients with HIV infection attending the ICTC (Integrated counselling testing centre) and ART (Antiretroviral therapy) centre at Govt. Medical College (GMC), Amritsar were studied for nasal carriage of methicillin-resistant Staphylococcus aureus (MRSA) and associated risk factors for nasal colonization. Nasal swabs were used for isolation of S. aureus and MRSA were detected by oxacillin screen agar, oxacillin broth dilution methods (for MIC).

Results: More than 80% of the patients were colonized with S. aureus in the anterior nares and methicillin resistance was found in 42% of the isolates. Co-trimoxazole use, hospital stay for more than 10 days, dermatosis and intravenous drug usage were other risk factors for nasal carriage of MRSA.

Conclusion: Active surveillance for the presence of MRSA in the anterior nares may help in the early initiation of various elimination strategies which will further reduce morbidity & mortality in HIV patients caused by MRSA.

Key words: MRSA, HIV, nasal carriage.

INTRODUCTION

Staphylococcus aureus is an important pathogen for infections in HIV-infected patients (Holden et al., 2004). Nasal colonization with both S. aureus and MRSA is relatively common among HIV-positive people and seems to be associated with increased risk for infection (Ahuja and Albrecht, 2005). Rates of MRSA infection have increased overtime among HIV positive patients and have been reported to be 6 fold to 18 fold higher than in general population (Popovich et al., 2010).

For MRSA, specifically, colonization rates of 0% to 17% have been reported for HIV-positive outpatients and 17% to 31% for inpatients (Alicia et al., 2010) and HIV has been identified as an independent risk factor for colonization with MRSA (Hidron et al., 2005). Several risk factors including low CD4 count, previous hospitalization, underlying dermatological diseases, frequent exposure to antibiotics, cotrimoxazole usage, men having sex with men (MSM), have been associated with MRSA colonization and infection (Onarato et al., 1999). Also few studies have focused higher colonization exclusively in asymptomatic HIV-1-infected individuals with no evidence of immune suppression (Alicia et al., 2010). The present study was carried out to know the prevalence of nasal carriage of MRSA in HIV positive persons and to determine the risk factors associated with MRSA colonization.

MATERIALS AND METHODS

300 consecutive patients with HIV infection diagnosed by 3 ELISA/Rapid/Simple tests as per NACO guidelines, attending the OPD at GMC, Amritsar from Dec 2009 to July 2011 were enrolled after obtaining the informed consent. The study was conducted after clearance from the institutional ethical committee of GMC & hospital, strictly maintaining the confidentiality of the patient. History of HIV infection with details regarding duration of
HIV infection from time of diagnosis, number of hospital admissions, duration of admission, number of hospital visits, invasive procedures carried out in the recent past, most recent CD4 T cell count in the records, details of previous opportunistic infections and current medications were recorded.

Sterile cotton swabs were used to swab both the anterior nares and transported immediately to the laboratory for processing. The specimens were inoculated on Blood agar and Mac Conkey's agar and incubated at 37°C for 24 hours. The staphylococci were identified by standard methods (Baird, 1996; Collee et al., 1996). An antimicrobial susceptibility test was performed using the Kirby Bauer disk diffusion method. S. aureus ATCC 25923 was used as a control. All the strains were tested for methicillin resistance by oxacillin screen agar method and broth dilution method (for MIC) (Swensen et al., 1999). S. aureus strains that had a minimum inhibitory concentration (MIC) of oxacillin ≤2 µg/ml were considered methicillin sensitive and those having an MIC ≥4 µg/ml were considered MRSA. Data was analysed using the χ² test and a P value of <0.05 was considered significant.

RESULTS

Of the 300 HIV infected patients, Staphylococcus aureus was isolated in 244 (81.33%) and MRSA was isolated in 126 (42%) patients. Maximum no. of patients (72.33 %) was in age group of 20 to 40 years and 186 (62%) patients were males.

The rate of colonization with S. aureus was much higher in those patients who had been previously hospitalized (100%) as compared with those who have never been hospitalized (71.8%). However, the risk was not statistically significant. In colonized individuals, hospitalization for more than 10 days was a risk factor for MRSA (P value> 0.05). Various other risk factors associated with the colonization of S. aureus and MRSA were also studied (Table 1).

S. aureus carriage rate (92.95%) was higher in patients with CD4 count less than 200/mm³ and MRSA was detected in 57.74%. Of the 300 cases studied, 172 patients who received co-trimoxazole, 156 (90.96%) were found to be colonized with S. aureus and 78 (45.34%) with MRSA. Seventeen patients were I V drug users, of which 16 (94.11%) were colonized with S. aureus and MRSA was isolated from 7 (41.17%) cases. Among the patients with dermatosis, 61/76 (80.26%) shown S. aureus colonization and 42/76 (55.26%) with MRSA. All the isolates were tested against various antimicrobial agents and MRSA was seen to be more resistant than MSSA (Table 2).

DISCUSSION

In the present study S. aureus was isolated in 81.33% of HIV positive patients. The prevalence rate in our study was higher as compared to most studies (Kluymans et al., 1997; Weinke et al., 1992; Villacian et al., 2004). This may be due to demographic variations as most studies compared with are of foreign origin and our data is comparable with only Indian study (Chacko et al., 2004). Majority of the patients were males in age group of 20 to 40 years. This can be due to increased prevalence of HIV in males and also because more male patients attending ART in our institute. Prevalence of MRSA in anterior nares was 42% which is in accordance with other authors (Lisa et al., (2006) Pan et al. (2005) who showed the prevalence rate to be 34.8%, 31.4%, respectively. However in various other studies (Cenizal et al., 2008; Heyssel et al., 2008) MRSA prevalence was reported as 17.39%, and 21% respectively. In comparison with other studies our study was consistent in the finding that nasal colonization of Staphylococcus aureus and MRSA increased with the hospitalization.

In colonized individuals, hospitalization for more than 10 days was a significant risk factor for MRSA. According to J. S. Villacian et al. (2004) MRSA still represents a health care associated pathogen as shown by the fact that when these out-patients isolates were compared with strains obtained from currently hospitalized patients, there was more than 90% concordance.

Low CD4 count was a risk factor for MRSA and in present study prevalence of S. aureus and MRSA increases with CD4 count below 200/mm³. Similar finding has also been reported by Villacian et al. (2004) and Chacko et al. (2004). Lower CD4 count has also been previously demonstrated to be a risk for MRSA colonization. It is not clear if lower CD4 count independently correlates with an increased risk for nasal colonization or if it is associated with others factors. For example, patients with the lower CD4 counts may be more likely to have had prior Staphylococcal infections. However Lee et al. (2005) have found no association for low CD4 count as a risk factor for MRSA infection in HIV patients. Thus our study was in accordance with research done by Villician et al. (2004) and Cenizal et al. (2008) who favour low CD4 count as a risk factor for MRSA colonization.

Co-trimoxazole usage was associated with increased prevalence of MRSA. The relationship between the cotrimoxazole usage and nasal carriage was significant in this study. Underlying dermatologic disease has been identified as another risk factor for MRSA and prevalence of MRSA increases in patients with history of dermatosis. Intravenous drug usage was also found to be an important risk factor for increased prevalence of MRSA & S. aureus in HIV positive persons. In a study by Maureen Miller et al. (2007) on incidence and persistence of Staphylococcus aureus nasal colonization in a community sample of HIV infected and uninfected IV Drug users found that HIV- seropositive individuals were twice as likely as HIV seronegative individuals to become colonized with S. aureus. They also reported that persistence of Staphylococcus aureus carriage was
increased among HIV seropositive individuals. The rate of *S. aureus* nasal carriage varies according to the population studied. In general population mean carriage rate of 37.2% has been reported (Kluytmans et al., 1997). Risk factors including low CD4 count, previous hospitalization, underlying dermatological diseases, frequent exposure to antibiotics, cotrimoxazole usage, I/V drug usage, enhances the rate of MRSA colonization and infection (Onarato et al., 1999). Sociodemographic and behavioural factors might also play an important role in establishing higher colonization rates among HIV positive patients (Alicia et al., 2010).

It was also observed that MRSA was more resistant than MSSA to all tested antimicrobials. Most of the MRSA were found to resistant to pencillins, erythromycin, and cephalaxin. Amikacin and vancomycin were found to be most effective antibiotic for MRSA. The worldwide use of vancomycin has increased dramatically over the past years. The threat of development of resistance to vancomycin is alarming.

**Conclusion**

*S. aureus* was recognized to colonize the anterior nares of HIV infected patients with greater frequency and this high colonization burden translate into a high risk of infection. In view of the serious morbidity and mortality with methicillin resistant *S. aureus* infection, the high carriage rate in HIV infected persons require early intervention. Elimination of nasal carriage would theoretically reduce the infection rates in populations in which it has been identified as a risk factor. For now; mupirocin is the most effective drug available to achieve eradication of MRSA carriage. However resistance to mupirocin is increasing and it must be asked for how long this agent will be effective.

**REFERENCES**


