MRSA prevalence in a teaching hospital in Western Saudi Arabia

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ABSTRACT

Objectives: To determine the prevalence of Methicillin Resistant *Staphylococcus aureus* (MRSA) colonization in our institution.

Methods: A 5-day period prevalence study of all adult and pediatric patients. Excluded areas were the adult intensive care unit (screened on admission and weekly thereafter), the outpatient hemodialysis population (screened monthly), and newborns. Our facility is a referral/teaching hospital for the National Guard population and their dependants in Western Saudi Arabia. A total of 240 patients were screened. Nasal sampling was carried out and isolation/identification of MRSA was performed using standard microbiological methods.

Results: The total number of patients sampled was 240 and of those 10 (4%) were colonized. The 10 positives were found in 4 patient care areas; adult male medicine 5, adult male oncology 3, adult female medicine one, adult high dependency unit one. These patients care areas had 69 patients (42 males and 27 females). Ten (14%) were colonized by MRSA; 9 males (21%) and one female (3%). Statistical analysis Chi Square for discontinuous variables, "F" test for continuous variables found that one), male gender (p=0.04), 2) the presence of a long term invasive device (p=0.04), 3), length of stay (p=0.004) were predictive of MRSA colonization.

Conclusion: The overall prevalence of MRSA colonization in our hospital was low, however a sub-segment of the population identified as male, having long term invasive devices, and hospitalized more than 2 weeks, were frequently colonized. Any strategy, in our hospital, to control the spread of MRSA should include the testing of this population.

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Methicillin resistant *staphylococcus aureus (S.aureus)* (MRSA) is a pathogen of major importance in both North America and Europe. A limited number of studies in the Kingdom of Saudi Arabia[1-11] attest to its presence here. For example, Madani et al[1] in 2001 reported that approximately one third of all invasive *S.aureus* infections seen in 2 tertiary health care centers in Jeddah were due to MRSA. In January 2002 we initiated a prospective survey of MRSA colonization in our hospital's long stay population. Our institution, also in Jeddah, caters to a military population and dependants living in Western Saudi Arabia. This study involved taking nasal swabs on a regular basis from the long stay population, defined as those hospitalized more than 30 days. Those found colonized were segregated, contact precautions were instituted and decolonization was undertaken. This involved oral rifampin or topical mupirocin, used for a total of 5 days. Such a strategy, we hypothesized, would result in a decrease in the number of patients with nosocomial colonization/ infection due to MRSA, assuming: A) the therapy

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eradicated the organism; B) this group constituted a major reservoir of MRSA in our hospital. As the study progressed, despite our actions, nosocomial colonization, adjusted to patient days, remained constant. We questioned, therefore, if focusing on the long stay population only, meant there were significant numbers of other colonized patients who we were unaware of, and who were acting as a reservoir for ongoing MRSA spread. For this reason, we carried out a prevalence study throughout the hospital in October 2002. The results of this study and attendant recommendations are the basis of our report.

Methods. All inpatients, with the exception of newborns and adults in the critical care unit (screened on admission and weekly thereafter) were tested. Nasal swabs were transported immediately in Stuarts transport medium to the microbiology laboratory for testing. The primary isolation media consisted of Mueller-Hinton agar containing 6.5% Na CI and 6.0 micro gms/ml of oxacillin. Subsequent testing of all suspicious isolates included a gram stain, deoxyribonucleic acid reaction, Staph aurex test, and inhibition zone size to vancomycin using the Kirby-Bauer method as set out in the National Committee for Clinical Laboratory Standards manual (January 2002). Over a 5 day period, a total of 240 patients were tested. In addition, the following demographics were obtained: age, gender, patient location, and length of time from hospital admission to time of testing. For the four patient areas where colonization was found, a more intensive chart analysis was carried out and additional data extracted. This consisted of: co-morbid illness (es), presence of a long term invasive device (percutaneous enterogastrostomy tube, tracheostomy, arterio-venous fistula or other intravascular device, chronic indwelling urinary tract catheter), hospitalization in the preceding 12 months, antibiotic use and type in the previous 30 days. For statistical analysis the chi square for categorical variables and "F"tests for discontinuous values were applied using the statistical package for social sciences version 11.01.

Results. In the year 2002 there were 12,885 overnight admissions to our hospital. A total of 240 of these in patients were tested over 5 days in our period prevalence study. For the population tested, the average patient age was 38.2 years, 49% being males. The average length of stay (LOS) prior to screening was 28.3 days with a range of 1-1645. Ten of the total group were MRSA colonized, an overall positive rate of 4.2%. Nine of these were males, giving a male colonization rate of 7.7% compared to 0.8% for females. Those who were screen positive had an average age of 48 versus 38 years for the negative population. The LOS was similar for both populations, 32 compared with 31 days. Although the colonized groups were predominately male and older, neither difference was of significance for the total hospital population. This data is presented in **Table 1**. Methicillin resistant *S.aureus* colonization was found in only 4patient areas: adult male[5] and female medicine,[1] adult male oncology,[3] and the adult high dependency area.[1] The patient total for these areas was 69, 61% being male. A further analysis of these patients demonstrated some significant differences between the colonized and non-colonized groups. The

Table 1 - The total population of patients studied for methicillin resistant *staphylococcus aureus* (MRSA) (N=240).

Variable examined	MRSA positive	MRSA negative	*p* value
Gender			
Male	9 (7.7)	108 (92.3)	NS
Female	1 (0.8)	122 (99.2)	
Age (yrs)	48.1	37.8	NS
Length of stay (days)	31	28.1	NS

Although 90% of colonized persons were male and those colonized were approximately 10 years older than the non-colonized, these differences were not significant. The LOS of the 2 populations was quite similar.
NS - not significant

Table 2 - Wards with positive results (N=69).

Variable	MRSA positive	MRSA negative	*p* value
Male (42)	21.4	78.6	0.04
Female (27)	3.7	96.3	
Intercontinent (18)			
Yes	16.7	83.3	NS
No	13.7	86.3	
Invasive device (17)			
Yes	29.4	70.6	0.04
No	9.6	90.4	
Antibiotic in past 30 days (47)			
Yes	17	83	NS
No	4.8	95.2	
Hospitalized in the past 12 months (48)			
Yes	18.8	81.2	NS
No	4.8	95.2	
Length of stay in days (16.3)	31	12.9	0.004

In the patient areas where colonization was found (adult male and female medicine, adult male oncology, adult high dependency area) certain variables were predictive of colonization. These were male gender, the presence of a long-term invasive device and a prolonged LOS. The numbers in parenthesis are those positives for the variable in the total population of 69.
NS - not significant

MRSA positive group was significantly more likely to be male, to have a long term invasive device, and to have been hospitalized longer. These results are presented in **Table 2**.

Discussion. We have been able to identify a total of 11 publications from the KSA dealing with MRSA. (PubMed, March 2003). The largest study, by Madani,[1] reports the experience in 2 teaching hospitals in Jeddah, KSA, from January through to December 1998. Over that period, a total of 673 isolates of *S.aureus* were obtained of which 222, representing the same number of patients, were MRSA (33%). At the same time, a 30 month study from the Eastern Provinces reported 8.4% of all *S.aureus* isolates were MRSA.[2] The reason for this difference in incidence is unclear. Van Belkum et al[3] have looked at the clonal distribution of MRSA in various parts of KSA and found that a single clone accounted for 93% of all isolates examined. Therefore, it seems that any difference in the incidence of MRSA colonization/ infection in the various areas reflects host or environmental factors, and is less likely to relate to the bacteria itself. Factors which have been associated with colonization/infection in KSA and elsewhere include old age, male gender, prior hospitalization, duration of hospital stay and in some studies, antibiotic exposure.[11] Our desire to carry out a prevalence study grew from a policy initiated in January 2002 which focused on a high risk population within our hospital, the long-stay patient. All patients hospitalized more than 30 days were serially screened for MRSA colonization. This group was found on repeat testing over the year to have a prevalence which varied from 0% for pediatric patients to as high as 40% for adult males. Despite segregation, the use of contact precautions and decolonization with either rifampin or mupirocin for the positive population, our adjusted nosocomial rates remained constant at 0.4-1.6/1000 patient days, averaging 0.9/1000 patient days over 2002.

We questioned if the failure to see a decline in nosocomial MRSA rates meant that our long stay population, although a significant reservoir of the organism, were not its major source. To answer this question we carried out a period prevalence survey. Prevalence surveillance quantitates the variable of interest, at a finite point in time, in the population studied. Logistically, if such surveillance cannot be carried out within such a time frame, one may do a period prevalence study.[12] It is important that each person eligible be studied and that only one observation be made per person. Our study was carried out over 5 consecutive working days and totalled 240 patients. An overall prevalence of only 4.2%, or 10 colonized persons was found. This is of interest as 33% of all *S.aureus* isolates in our hospital in the preceding year were MRSA. This percentage overemphasizes the importance of MRSA as this number reflects isolates and not patients. Only 4 of the 10 colonized had been hospitalized for 30 days or more, therefore our usual screening policy would have missed a majority. Such an undiscovered group could serve as a source for transmission to others and might explain why targeting the long-stay population failed to reduce nosocomial MRSA colonization rates in our hospital. Despite this, we did find certain markers which will help to direct any future screening activity. These include male gender, the presence of invasive devices and admission longer than 2 weeks. Further, our study suggests we should focus, in particular, on adult male medical and oncological patients. Overnight stay in hospital in the preceding year has been an important risk factor in many studies. We found no significant association, possibly because a majority of patients in areas where MRSA colonization was found (70%) gave such a history. Similar results were seen with another reported variable, antimicrobial therapy in the month preceding. Sixty-nine percent of all patients on these wards had such a history.

In conclusion, this prevalence study in an academic institution in Jeddah demonstrated that MRSA colonization is uncommon. However certain areas, in particular those housing adult patients, often had colonized persons. In these areas MRSA colonization was associated with male gender, the presence of invasive devices and hospitalization in excess of 2 weeks. Any attempt to control the spread of MRSA within our institution will need to include such patients in our screening policy.

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