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Research Article

Suspected Community Acquired Methicillin Resistant *Staphylococcus aureus* (CA-MRSA) at a Cancer Hospital in Pakistan

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Abstract: Methicillin-resistant *Staphylococcus aureus*, or MRSA, is a potentially deadly strain of Staph aureus that is resistant to several antibiotics. Previously only associated with healthcare exposure, this organism now also accounts for a growing number of infections acquired in the community without any necessary healthcare exposure. Such strains of MRSA are known as Community Acquired MRSA (CA-MRSA). CA-MRSA is distinct from its hospital-acquired counterpart and was a rare phenomenon until the past decade; now CA-MRSA is endemic in many communities and is the most common cause of skin and soft tissue infections presenting to emergency rooms and hospitals. Fortunately, its spread can be limited with good hygiene practices. This article reviews the prevalence of CA-MRSA found at a specialist hospital, the range of susceptibilities and the significance of antimicrobial substances found in urine samples.
Keywords: Community Acquired MRSA, MRSA, Antimicrobial substances, cancer, immunosuppressed

INTRODUCTION

Staphylococcus aureus has for many years been a major cause of hospital acquired infections, causing high morbidity and mortality worldwide and the proportion of MRSA has risen worldwide during the last two decades. This incidence has continued to grow at an alarming rate, particularly in less developed countries where there may be widespread use (or misuse) of antibiotics, or the ability to purchase inappropriate antibiotics without proper medical supervision [1, 2]. Certainly, this has been a growing cause for concern in Pakistan with MRSA having prevalence rates of anything from 14- 51% depending on the study [3-7]. Although previously thought to only occur in hospitalised patients, various strains of MRSA are also now known to occur in the community (CA-MRSA) and can be attributed to drug abuse, serious underlying illness, previous antimicrobial therapy or previous hospitalisation.8, 9 Some environmental factors have been implicated such as the sharing of clothing, improper care of skin trauma, direct skin-to-skin contact with an MRSA lesion, and crowded living conditions (Figure 1) [10-12].

All patients attending the Shaukat Khanum Memorial Cancer Hospital, in Lahore, Pakistan either as an out-patient or an inpatient routinely provide a urine sample for microbiological analysis. Because previous antimicrobial therapy is one cause of CA-MRSA, a simple urine-based test was used to detect evidence of antimicrobial therapy in hospital patients [13]. Of the 462 urines tested, 156 (33.7%) demonstrated the presence of anti-microbial substances (AMS), of which 50% were from patients on their first visit to the hospital (unpublished data). This does, however, fit the picture from other studies in Pakistan [14]. The decision was taken to monitor the isolates for *S.aureus* for their susceptibility patterns and to see if it was possible to identify the prevalence of MRSA within the hospital and community using medical records and to see if the presence of AMS made a difference.

METHODOLOGY

Two hundred and ninety-one isolates of *S. aureus* collected over a 2-year period were tested in the study (10 blood cultures, 25 urines, and 256 other wound and lesion sites). The isolates were identified as *S. aureus* using the Staphylase test (Oxoid Limited, UK) and confirmed by DNAse activity on a DNA plate. Any dubious results were confirmed with the API Staph (bioMérieux, UK) assay. Susceptibility testing was performed by agar diffusion using the disk method as standardised by the CLSI guidelines [15, 16]. Briefly, the test organism was inoculated onto two Mueller Hinton Sensitivity agar plates for the standard sensitivity panel and onto a quarter-plate of 5% NaCl in nutrient agar for the methicillin testing. Onto the quarter plate was added a 10-µg methicillin antibiotic disk. These quarter plates were incubated at 30 °C for 24 to 48 h [17]. Zone sizes were compared to those of a

known *S. aureus* strain sensitive to methicillin (ATCC 25923). A retrospective review of medical records was undertaken to see which samples could be classified as CA-MRSA. Isolates were considered to represent CA MRSA if (a) the patient had not presented to the hospital previously, was not currently on any treatment designated by the hospital, and was being treated as an outpatient; and/or (b) the organism had been isolated within 72 h after hospital admission.

RESULTS

Of the 291 samples tested, 3 were excluded because they were subsequently identified as *S. lugdunensis*, *S. haemolyticus*, and *S.warneri* [18, 19]. Of the remaining 288 isolates, 55 (19.1%) exhibited methicillin resistance (Table 1); 13 of these involved possible CA-MRSA. Overall, methicillin resistance was significantly more common in hospital-acquired (25%) than community-acquired (10%) infection ($p < 0.001$). The 13 suspected CA-MRSA isolates exhibited 11 different sensitivity patterns (Table 2), all were resistant to penicillin, erythromycin, and methicillin, and sensitive to fusidic acid, imipenem, vancomycin, and tetracycline. The sensitivity patterns from these suspected CA-MRSA patients were not dissimilar to those patients who were considered to have a hospital-acquired MRSA [20-22]. Rates of resistance to other antimicrobials exceeded 60%: gentamicin, 62%; ciprofloxicin, 69%; and clindamycin, 62%.

AMS was detected in 47 (37.3%) of the 126 community patients. Although AMS was more common in patients with MRSA (6/13, 46.2%) than in those with MSSA (41/113, 36.3%), the association was not statistically significant (OR = 1.51; 96% CI = 0.4738–4.782; $p = 0.5$).

Table 1: Prevalence of Methicillin Resistance (MRSA) in Hospital and Community-Acquired *S. aureus* Samples

	MSSA		**MRSA**		**Total**
	Number	**(%)**	**Number**	**(%)**	
Hospital	120	(74.1)	42	(25.1)	162
Community	113	(89.7)	13	(10.3)	126
Total	233	(80.9)	55	(19.1)	288

Table 2: Sensitivity Patterns of Suspected CA-MRSA

Sl. No.	**AMS**	**Pen**	**Ery**	**Fus**	**Gent**	**Cef**	**Meth**	**Rif**	**Imip**	**Cip**	**Clin**	**Van**	**Tet**
1	Y	R	R	S	R	R	R	R	S	R	R	S	S
2	Y	R	R	S	R	R	R	S	S	R	R	S	S
3	N	R	R	S	R	R	R	S	S	R	R	S	S
4	Y	R	R	S	R	S	R	S	S	R	S	S	S
5	N	R	R	S	R	S	R	S	S	R	S	S	S
6	N	R	R	S	R	S	R	S	S	S	R	S	S
7	N	R	R	S	R	S	R	S	S	S	R	S	S
8	Y	R	R	S	R	S	R	S	S	S	R	S	S
9	Y	R	R	S	S	R	R	S	S	R	S	S	S
10	Y	R	R	S	S	R	R	S	S	R	S	S	S
11	N	R	R	S	S	R	R	S	S	R	S	S	S
12	N	R	R	S	S	S	R	R	S	S	R	S	S
13	N	R	R	S	S	S	R	S	S	R	R	S	S

Note: AMS: Anti-Microbial Substance; Pen: Penicillin; Ery: Erythromyicin; Fus: Fusidic Acid; Gent: Gentamycin; Cef: Cefuroxime; Meth: Methicillin; Rif: Rifampicin; Imip: Imipenem; Cip: Ciprofloxacin; Clin: Clindamycin; Van: Vancomycin; Tet: Tetracycline

Fig. 1: Shanty Town-Ravi River

DISCUSSION

It is clear that although MRSA is becoming an important community pathogen in some populations, this epidemiological shift appears to have occurred over a much longer period than the appearance of penicillin resistant *S.aureus*. This small study demonstrated probable methicillin resistance in a proportion (10%) of patients with community-acquired *S. aureus* treated at this institution. The findings seem to confirm the impression that MRSA was beginning to emerge in the community. Most CA-MRSA infections involved the skin and soft tissue, which would respond quickly to wound care and outpatient oral antimicrobial therapy.

This study did have its limitations, and any conclusions must be taken in context with all available information, certainly more data would be needed to make any recommendations. These results were based on the actual finding of an MRSA from a clinical specimen but it is known that MRSA colonisation can persist for months to years with the patient remaining asymptomatic, the result being that the acquisition of the MRSA whether it occurs in hospital or in the community frequently goes unrecognised unless a clinical infection develops. Because this was a hospital-based retrospective case series, we were unable to estimate the true prevalence of CA-MRSA infection in the general population. Although medical charts were carefully reviewed, in the absence of personal interviews there is a risk of misclassifying MRSA acquisition (as hospital- or community-acquired) due to lack of a detailed history of hospital-related exposures.

A proportion of the CA-MRSA patients attending the hospital certainly demonstrated the presence of AMS, and it had been theorised that this contributes to the presence of the MRSA. Although AMS was more common in CA-MRSA than in CA-MSSA cases in this study, the association was not statistically significant.

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