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Nosocomial Infection Caused by Methicillin-Resistant *Staphylcoccus aureus* in Palestine

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ABSTRACT

This report presents the prevalence of Palestinian isolates of methicillin-resistant *Staphylococcus aureus* (MRSA) in nosocomial infections and their antibiotic resistant pattern. A total of 321 clinical isolates of *S. aureus* were identified from different patients. The prevalence of methicillin resistance among *S. aureus* isolates was 8.7% (28 isolates). Resistance rates of MRSA to other antibiotics were as follows: 82.1% resistant to erythromycin, 67.9% to clindamycin, 64.3% to gentamicin, and 32.1% to ciprofloxacin. No co-trimoxazole- and vancomycin-resistant isolates were identified in this study. The proportion of methicillin resistance was highest among *S. aureus* isolates associated with upper respiratory specimens (42.8%); the proportion of methicillin resistance was 39.3% among skin ulcer isolates, 10.7% among urinary tract infection isolates, and lowest among isolates associated with blood and prostate discharge (3.6% each).

INTRODUCTION

Methicillin resistance in *Staphylococcus aureus* is now common in many areas of the world. The frequencies of infections and outbreaks due to methicillin-resistant *S. aureus* (MRSA) have continued to increase. MRSA is often multidrug resistant and therapeutic options are limited[3–6,8,11,12] and this situation is causing increased concern. The present study aimed to obtain a snapshot of MRSA frequency in Palestine, a part of the world not previously surveyed for this type of resistance.

MATERIALS AND METHODS

Eight hundred clinical specimens were collected from October, 1997, and May, 1998, from infection sites of individual patients, and no repeat isolates were included. Most of the specimens ($n = 561$) were from Rafidya hospital, which serves five provinces (governorates) in northern Palestine (Jenin, Tulkarem, Nablus, Qalqilia, and Salfit). A small sample (239) was received from three other hospitals (Caritas Baby hospital, Bethlehem/Beit Jalla governorate, Alia hospital, Hebron governorate, and Ramallah hospital, Ramallah governorate) in southern Palestine. Isolates were identified as *S. aureus* according to colonial and microscopic morphology, positive catalase, and coagulase production by Staphytect plus tests (Oxoid).

All *S. aureus* isolates were tested for methicillin resistance in the microbiology laboratories of An-Najah National University, Palestine. The disk diffusion method outlined by the National Committee for Clinical Laboratory Standards (NCCLS)[10] was used with a 1 μg oxacillin disk (Oxoid). Zone sizes were read after incubation at 35°C for 24 hr. Isolates with zone sizes $\leq$10 mm were considered as methicillin resistant. Isolates giving a zone $\leq$10 mm were confirmed as methicillin-resistant by the ability of the isolates to grow on Mueller–Hinton agar (Oxoid) supplemented with 4% sodium chloride and 4 μg of oxacillin.[9] A standard strain of *S. aureus* (ATCC 25923) was used as a control. Methicillin-resistant isolates were tested against other antibiotics using the disk diffusion method specified by the NCCLS.[10]

RESULTS

A total of 321 isolates of *S. aureus* were identified among 800 specimens in this study. MRSA accounted for 8.7% (28 isolates) of all *S. aureus* (Table 1). The highest prevalence of MRSA isolates was seen in Alia (15%) and Rafidya (10.3%) hospitals. In contrast, the prevalence of MRSA was lowest in Caritas (2.7%) and Ramallah (0%) hospitals.

Antimicrobial-susceptibility testing of MRSA isolates indicated resistance to erythromycin (82.1% of isolates), clin-

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TABLE 1. DISTRIBUTION OF MRSA CASES IN PALESTINIAN HOSPITALS

Source	*Total number of* S. aureus *isolates*	*Number (%) of isolates that were methicillin*	
		Sensitive	*Resistant*
Rafidya Hospital	232	208 (89.7)	24 (10.3)
Caritas Hospital	37	36 (97.3)	1 (2.7)
Alia Hospital	20	17 (85.0)	3 (15.0)
Ramallah Hospital	32	32 (100)	0 (0.0)
Total	321	289 (90)	28 (8.7)

damycin (67.9%), gentamicin (64.3%), and ciprofloxacin (32.1%); no co-trimoxazole- and vancomycin-resistant isolates were identified.

Interestingly, 11 (39.3%) of the isolates were noted to be multiply resistant, *i.e.*, resistant to erythromycin and two or more of the following antibiotics: gentamicin, ciprofloxacin, and clindamycin.

The most common body sites and specimens from which MRSA was isolated were 12 upper respiratory specimens AU2 (42.8%), 11 skin ulcers (39.3%), 3 urine (10.7%), blood, and 1 prostate discharge (3.6%, each).

DISCUSSION

Hospital-acquired infections due to MRSA continue to be a major problem in many countries. It is noteworthy that the prevalence of MRSA varies from one geographic region to another and between different institutions in a given area.[4,5]

In some U.S. hospitals, MRSA already accounts for 30–50% of all nosocomial *S. aureus* isolates. The situation is comparable in many European centers: according to a recent survey,[3,5,7,8] the proportion of MRSA compared to all nosocomial *S. aureus* isolates studied was >50% in Portugal and Italy and >30% in Turkey and Greece. The methicillin-resistance rate was low (2.0%) in The Netherlands[14] and (1.8%) in Switzerland.[3,8] In the Scandinavian countries, methicillin-resistant strains still account for <1% of all nosocomial *S. aureus* isolates.[15]

The results of this study indicated that methicillin resistance has become a serious problem in Palestine, but remains relatively low compared to those that have been reported in many other countries.[3,5,7,8] Although the reduced number of tested samples from hospitals in southern Palestine limits generalizations, some differences were observed when the distributions of MRSA isolates in different hospitals in Palestine were compared. Similar observations were reported elsewhere.[4,5]

Our MRSA strains were often resistant to erythromycin, clindamycin, gentamicin, and ciprofloxacin, a finding mirrored elsewhere.[1,2,5,13] In addition, 39.3% of the isolates were noted to be multiply resistant. All our strains were sensitive to co-trimoxazole and vancomycin.

MRSA strains are responsible for many serious infections.[4,5] In the present study, the proportion of methicillin resistance was highest among *S. aureus* isolates associated with upper respiratory specimens (42.8%); the proportion of methicillin resistance was 39.3% among skin ulcers, 10.7% among urinary tract infection isolates, and was lowest among isolates associated blood and prostate discharge (3.6%, each).

In conclusion, antimicrobial resistance has clearly emerged as a serious problem with MRSA in Palestine. By analogy on the basis of experiences in other parts of the world, this problem is likely to grow in the future. Thus, more aggressive microbiological and infection control policies are necessary to prevent the further spread of these microorganisms.

TABLE 2. RESISTANCE OF MRSA ISOLATES TO VARIOUS ANTIBIOTICS

Antibiotic	*Number (%) of resistant isolates*
Erythromycin	23 (82.1)
Clindamycin	19 (67.9)
Gentamicin	18 (64.3)
Ciprofloxacin	9 (32.1)
Trimoxazole	0 (0.0)
Vancomycin	0 (0.0)

TABLE 3. DISTRIBUTION OF MRSA ISOLATES ACCORDING TO CLINICAL SPECIMENS

	Number of MRSA (%)
Upper respiratory specimens	12 (42.8)
Skin ulcers	11 (39.3)
Urine	3 (10.7)
Blood	1 (3.6)
Prostate discharge	1 (3.6)

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