

ORIGINAL ARTICLE

Staphylococcus aureus infections in children in an Iranian referral pediatric Hospital

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Key words

Staphylococcus aureus • Methicillin-Resistant • Children

Summary

Introduction. *Staphylococcus aureus* is associated with various infections ranging from skin and soft tissues such as surgical site infections and abscesses to lower respiratory tracts and bloodstream. The aim of this study was to evaluate underlying condition of patients with *S. aureus* infections in an Iranian referral pediatric Hospital.

Material and methods. Information was extracted retrospectively from the medical records of patients who were diagnosed with *S. aureus* infections. Data obtained about the study subjects included basic demographics, reason for admission, culture site, length of hospital stay, and methicillin susceptibility.

Results. The underlying condition of patients with *S. aureus* infection during November 2011 and March 2013 were included in the study. The most frequent diagnosis in patients with *S.*

aureus infection was jaundice (12%), abscess (10%), cellulitis (10%), wound infection (8%), septic arthritis (7%) and seizure (5%). Wound was the most common infection sites among all subjects 34/98 (35%) followed by blood (20/98, 20%) as well as skin and soft tissue (19/98, 19%). The proportion of MRSA infections among all *S. aureus* isolates was 79% (77/98) during the study period. In addition, 58/74 (78%) met the definition of Hospital-Associated Methicillin-Resistant *S. aureus* (HA-MRSA) infections and the rest; 20/24 patients (83%), were classified as Community-Associated Methicillin-Resistant *S. aureus* (CA-MRSA).

Conclusion. In our study, the high frequency of MRSA was found not only in HA *S. aureus* but also in CA *S. aureus* isolates; therefore, the strategic goals to optimize antimicrobial use including

Introduction

Staphylococcus aureus is associated with various infections ranging from skin and soft tissues to lower respiratory tracts and bloodstream and even life-threatening infections such as endocarditis and osteomyelitis [1, 2]. There are both a rapid emergence of nosocomial *S. aureus* infection and increasing prevalence of Methicillin-Resistant *Staphylococcus aureus* (MRSA) in the hospital and community [3].

Hospitalized patients show a high frequency of *S. aureus* infections due to their weak immune system as well as frequent injections and catheterizations mainly in intensive care units (ICU) [1, 4].

The aim of this study was to evaluate underlying condition of patients with *S. aureus* infections in an Iranian referral pediatric Hospital.

Material and methods

This study was conducted at a Children medical center, an Iranian referral Hospital during November 2011 and March 2013.

Information was extracted retrospectively from the medical records of patients who were diagnosed with *S. aureus* infections. Data which was obtained about the study subjects included basic demographics, reason for admission, culture site, length of hospital stay, and methicillin susceptibility.

Hospital-Associated Methicillin-Resistant *Staphylococcus aureus* (HA-MRSA) infection was defined as occurring in a patient whose *S. aureus* isolate was cultured more than 48 h after admission, who had a history of hospitalization or residence in a long-term healthcare facility within 6 months prior to the culture date. Patients with none of the above conditions that their culture samples were obtained prior to admission or during the first 48 h of hospitalization from patient lacks the following health care-associated MRSA risk factors: hemodialysis, surgery, residence in a long-term care facility or hospitalization during the previous year, the presence of an indwelling catheter or a percutaneous device at the time of culture, or previous isolation of MRSA from the patient were classified as having Community-Associated Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA) infection [5].

Clinical isolates were identified as *S. aureus* by Gram stain, colonial morphology, catalase and coagulase test. Susceptibility to oxacillin was performed using oxacillin disk according to the performance standards of the Clinical and Laboratory Standards Institute (CLSI) [6].

Statistical analyses

The Statistical Package for the Social Sciences (Windows version 16.0; SPSS Inc, Chicago, US) was used for all analyses. Descriptive statistics were used to summarize patient variables.

Results

In this study, records of 98 *S. aureus* infected patients who were diagnosed during November 2011 and March 2013 were analysed. The mean age of the patients was 3.3 ± 2.45 years (range from 1 day to 13.8 year) and the male to female ratio was 1.2.

S. aureus isolates were frequently isolated from patients who were suffered from jaundice (12%), abscess (10%), cellulitis (10%), wound infection (8%), septic arthritis (7%) and sezeire (5%).

The most common infection sites which *S. aureus* strains were isolated were wound (34/98,35%) following by blood (20/98, 20%) and skin and soft tissue (19/98, 19%).

The proportion of MRSA infections among all *S. aureus* isolates was 79% (77/98) during the study period. In addition, 58/74 (78%) met the definition of HA-MRSA infections and the rest; 20/24 patients (83%), were classified as CA- MRSA.

Among all *S. aureus* isolates, 24 CA- *S. aureus* isolates were associated generally with the wound, skin and soft tissue infections infection. The sites of CA-MRSA and HA-MRSA infections is shown in Table I.

Discussion

The rate of MRSA has been increased considerably over the last decade [7], and are mainly associated with skin and soft tissue infections particularly abscesses and cellulitis [8].

According to our results, the high frequency of MRSA was found not only in HA- *S. aureus* isolates but also in CA- *S. aureus* isolates. CA-MRSA strains appear to have rapidly disseminated among the general population and affect patients with and without exposure to the health care environment.

The frequency of MRSA infections among all *S. aureus* isolates in this study was more than other studies [5, 9-12]. Huang et al. reported that 42% of the *S. aureus* isolates were MRSA (55.1% HA-MRSA and 44.9% CA-MRSA) [5]. Aminet al. reported that CA-MRSA infections represented 31.5% of CA- *S. aureus* infections, while HA-MRSA accounted for 52.6% of HA- *S. aureus* infections [9].

The rapid emergence of MRSA in the recent years might be due to the increasing consumption of antibiotics, long time of hospitalization, failures of hospital hygiene and even selective and mobile genetic elements [3, 13-16]. Soriano et al. has been reported a 1.8 fold increase in MRSA isolation in patients who were prescribed more than 2 antibiotics in the last 180 days [17].

In our study, *S. aureus* isolates were commonly associated with wound, bloodstream and skin, and soft tissue infections. Caini et al. reported that more than 50% of all reported HA-MRSA isolates belonged to surgical site as well as skin and soft tissues in Hungarian patients during 2005-2010 [18].

In our study, the frequency of MRSA causing bloodstream infections was 60% (12/20). In the previous studies which were conducted in our hospital, the rates of MRSA was 60% and 79% during 1996–2000 [19] and 2001-2005 [20], respectively.

In this study, the rate of wounds MRSA isolates was higher than other reports (26/34, 76%) [2, 21]. In Wolk et al. [2] and Borgundvaag et al. studies [21], the prevalence of wound MRSA isolates was 30% and 32%, respectively. Skin and soft tissue consider as one other common infection sites [19] that was found in 25% of patients. This rate was less than Huang et al. reports [5]. Drug resistance has continued to emerge particularly in intensive care units (ICUs) [14, 15]. In this study, a high frequency of MRSA was found in Pediatric Intensive Care Unit (PICU) and Neonatal Intensive Care Unit (NICU) (80% and 77%, respectively). Minimizing the antibiotic pressure and duration of empiric therapy as well as hand hygiene is essential for controlling the emergence of these resistant strains in the hospitals [22, 23].

Tab. I. Sites of CA-MRSA and HA-MRSA infections

| | | wound | Bloodstream | Skin and soft tissue | eye | Respiratory tract | Other* | total |
|---------|---|-------|-------------|----------------------|-----|-------------------|--------|-------|
| CA-MRSA | n | 6 | 2 | 6 | 4 | 0 | 2 | 20 |
| | % | 33 | 13 | 25 | 21 | 0 | 8 | 100 |
| HA-MRSA | n | 20 | 12 | 9 | 7 | 8 | 2 | 58 |
| | % | 35 | 23 | 18 | 11 | 11 | 3 | 100 |

* Includes urine tract and bone marrow aspiration

CA: Community-Associated

HA: Hospital-Associated

Moreover, identifying of the important factors contributing to acquisition and transmission of *S. aureus* infection as well as antibiotic stewardship programs should imply in our hospital.

The spread of MRSA is usually occurring by transient carriage on the hands of health care workers. In our hospital due to high rate of MRSA isolates, improvement in the adherence of health care workers to hand-hygiene guidelines should perform. In addition, aseptic technique such as waterless antiseptic hand rubs, use of sterile gowns and gloves must be practiced. In addition,

series of appropriate guidelines for antimicrobial use and a chart audit should be developed.

In conclusion, in our study, the high frequency of MRSA was found not only in HA *S. aureus* but also in CA *S. aureus* isolates; therefore, the strategic goals to optimize antimicrobial use including optimizing choice and duration of empiric therapy, monitoring and providing feedback regarding antibiotic resistance, prevention of antimicrobial resistant transmission as well as basic infection control policies and procedures are recommended.

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