

# Demographic and Clinical Profile of Invasive Staphylococcal Infections in Children Admitted to Pediatric Intensive Care Unit: A Retrospective Study

Annayappa Venkatesh Lalitha<sup>1</sup>, Gitanjali Rebello<sup>2</sup>, Subhash Chettri<sup>3</sup>, Mounika Reddy<sup>4</sup>

## ABSTRACT

**Objective:** Staphylococcal infections are common cause of morbidity and mortality in pediatric intensive care unit (PICU). The objective of this study was to describe the clinical and microbial features, and outcome of patients with invasive staphylococcal infection.

**Materials and methods:** We conducted a retrospective chart review of the children admitted to PICU with invasive staphylococcal infections. Invasive staphylococcal infection was defined as clinical infection with isolation of *Staphylococcus aureus* from a normally sterile body site.

**Results:** A total of 50 children (1 month to 16 years) were identified with staphylococcal infections during the study period. There was male preponderance (75%) with high prevalence in school going children. Among these children, 36% (18) were coagulase-negative (CONS), which were excluded. Of the remaining, 64% (32) were coagulase-positive *Staphylococcus aureus*, 54% (27) were methicillin-resistant *Staphylococcus aureus* (MRSA), and 10% (5) were methicillin-susceptible *Staphylococcus aureus* (MSSA). Community-acquired staphylococcal infections were present in 24 children (CA-MRSA). Pneumonia with empyema was the most common 20 (62%) site of primary staphylococcal infection, followed by blood stream infection 9 (28%) and skin and soft tissue infection 3 (9%). Of the soft tissue infection, three were MRSA, with two had pyopericardium with infective endocarditis. Resistance in MSSA was found to be maximum to penicillin, erythromycin, and ciprofloxacin with no resistance with vancomycin.

**Conclusion:** There is an increase incidence of MRSA among community-acquired staphylococcal infections requiring intensive care management. A larger study on clinical profile of *Staphylococcus* infection in pediatrics is urgently needed to define the exact magnitude of the problem.

**Keywords:** Clinical profile, Drug resistance, Pediatric intensive care unit, *Staphylococcus*.

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Sir,

*Staphylococcus aureus* bacteremia continues to be a major problem related to both community-acquired (CA) and nosocomial infection.<sup>1</sup> In the community setting, *S. aureus* has a propensity to cause serious invasive infection in normal hosts as well as those with debilitating illnesses. In the hospital setting, both methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-susceptible *Staphylococcus aureus* (MSSA) are major causes of bloodstream infection.<sup>2,3</sup>

We report case series of children with invasive staphylococcal infections admitted to pediatric intensive care unit (PICU) of a tertiary care hospital of South India (January 2016 to September 2018). Since it was a retrospective record analysis, permission for the waiver of parental consent was obtained from the Institute Ethics Committee. We had 32 children with staphylococcal infections—majority was MRSA 84% (27) and only 16% (5) were MSSA isolates. All strains were Pantone-Valentine leukocidin (PVL) positive. The overall median age was 4 years (1–11 years) with mean pediatric risk of mortality (PRISM) III score of 7 (3–9). We found 12.5% children with severe acute malnutrition according to WHO growth chart. Majority (70%) were found to be anemic, while 12% had severe anemia requiring transfusion. The overall mortality was 41% (13).

In children with MRSA, 24 (88%) were CA-MRSA, while only 3 were hospital-acquired (HA-MRSA). The most common presentation was pneumonia with empyema 16 (59%). On comparison between the MSSA and MRSA groups, the median ages were found to be

<sup>1,3,4</sup>Department of Pediatric Intensive Care, St John's Medical College Hospital, Bengaluru, Karnataka, India

<sup>2</sup>Department of Pediatrics, St John's Medical College Hospital, Bengaluru, Karnataka, India

**Corresponding Author:** Annayappa Venkatesh Lalitha, Department of Pediatric Intensive Care, St John's Medical College Hospital, Bengaluru, Karnataka, India, Phone: +91 9448461673, e-mail: drlalitha03@gmail.com

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similar (MSSA 4 years/MRSA 4.5 years). The median PRISM score was 7 (4–9) in MSSA and 6.5 (0.8–2.5) in MRSA which was not statistically significant. However, 80% of the MSSA infection was empyema as compared to 59% of the MRSA group. All the children in MSSA needed ventilation support as compared to MRSA (75%). However, the duration of ventilation (median) did not differ between the groups [3 (inter quartile range (IQR) 1.5–11) MSSA, 3.5 (0–8.25) MRSA]. Likewise, the duration of hospital stay [MSSA 15 days (IQR 6–17) and MRSA 14 days (9–23)] and PICU stay [MSSA 8 days (IQR 5–12) and MRSA 10 days (5–11)] were similar in these two groups. There was no significant difference in mortality as well.

## ANTIBIOTIC SENSITIVITY

There was no resistance found to vancomycin in all strains (MSSA and MRSA) in our study. Resistance was found to be maximum to penicillin, erythromycin, and ciprofloxacin in both groups.

## DISCUSSION

Methicillin-resistant *Staphylococcus aureus* is one of the most important causes of antibiotic-resistant healthcare-associated infections worldwide.<sup>4</sup> Methicillin-resistant *Staphylococcus aureus* was initially associated with HA infections and since the 2000s with CA infections.<sup>5</sup> However, we noticed that 88% of MRSA isolates were CA. The high prevalence of MRSA infection in our PICU could be due to higher frequency of *Staphylococcus* infections which we received from the community. This was also observed in the prior study from our institute—in which they have observed that out of the 92 collected strains (both adult and children), 52.2% were MRSA, isolated from CA infections in 60.4% and HA infections in 39.6% (4).

Our study also reaffirms the high prevalence of MRSA in the community similar to other studies from India.<sup>6,7</sup> As observed in these studies, we also did not find any vancomycin-resistant isolates.<sup>8</sup> There is an urgent need for prospective studies describing the profile of *Staphylococcus* in PICU.

## AUTHORS' CONTRIBUTIONS

All the authors contributed equally for the work.

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