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A Study on Community - Acquired Methicillin Resistant Staphylococcus Aureus Infections in Coimbatore Children

KEYWORDS: Staphylococcus aureus; Community-acquired; Methicillin-resistant; Children

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ABSTRACT

Introduction

Community acquired Methicillin-resistant Staphylococcus aureus (CA-MRSA) isolates are increasingly reported in many countries. Local epidemiological data are sparse.

Objective

To determine the frequency, clinical features, antibiotic sensitivity and outcome of infections caused by Community acquired Methicillin-resistant Staphylococcus aureus among children in a territory care teaching hospital, Coimbatore (south India)

Material and methods

Children(less than 15 years) with infections meeting the criteria of community-acquired were included. Demographic and clinical data were collected. Antibiotic susceptibilities were determined in the microbiology laboratory.

Results

The prevalence of CA-MRSA was around 35% among MRSA isolates. Skin and subcutaneous infections were the most common site (74%). All isolates were 100% sensitive to Vancomycin, Linezolid and Doxycycline. Drugs with poor sensitivity (< 5%) were Cefazolin, Penicillin, Ampicillin and Ceftriaxone. All cases except one recovered completely.

Conclusion

CA-MRSA isolates accounted for a high percentage of infections among Staphylococcus aureus in children. Community surveillance of these infections is essential to decide the appropriate empiric antibiotic treatment.

Introduction

Infections caused by Staphylococcus aureus, especially methicillin-resistant S. aureus (MRSA), are emerging as a major public health issue[1]. Methicillin-resistance of Staphylococcus aureus infections is reported to be a nosocomial origin[2]. Recent reports suggest that the epidemiology of MRSA is changing and community acquired methicillin resistance(CA-MRSA) is on the rise[3]. The risk factors for acquisition of MRSA are intensive care unit stay, prolonged hospitalization, severe chronic illness, invasive procedures, indwelling devices and long term antibiotics therapy[4,5]. The first case of community acquired methicillin resistant (CA-MRSA) in children was reported in 1988[6]. The emergence of MRSA as a cause of infection in the community in patients who have never been hospitalized and who have no other known risk factors for MRSA infection is a significant concern. Recent studies from India also confirmed the prevalence of CA- MRSA[7,8,9]. In this context we conducted a study on community acquired methicillin resistance in Staphylococcal aureus infections in Coimbatore children.

MATERIALS AND METHODS

This Indian council of medical research (ICMR) - STS funded study was conducted in Department pediatrics , PSGIMS&R, Coimbatore. The Institutional Human Ethics Committee has approved the study protocol and written informed consent was obtained. All children aged less than 15 years with any culture (pus or blood) positive for MRSA is included for analysis. MRSA identification and antimicrobial drug susceptibility was done in department of microbiology (NABH accredited laboratory) at PSG hospitals. The probable reasons for the methicillin resistance were analyzed clinically. Data extracted from the case records included demographics, Information on close contacts, infection type, culture site, antibiotic susceptibility, treatment, interventions, outcome and presence of risk factors for methicillin resistance. The duration of study period was one year (2011).

The infection is considered community acquired MRSA if the patient met all the following criteria.

1. The sample for culture is obtained during an outpatient visit or within 48 hrs of hospitalization.
2. The subject had no history within the past year of known risk factors for MRSA, including hospital admission, current intravenous drug use, surgery, dialysis, an indwelling catheter, or a percutaneous medical device.

Culture method

The samples were streaked on Blood and Mac-conkey agar. The plates were read after an incubation of 24 hours at 37 degree Celsius. The colonies suspected to be staphylococcus were subjected to catalase test, tube coagulase, mannitol fermentation, bacitracin and furazolidone sensitivity. Antibiotic susceptibility is tested on Muller Hinton agar by making lawn culture. The antibiotics tested were Cefoxitin, Erythromycin, Clindamycin, Co-trimoxole, Ciprofloxacin, Vancomycin, Linezolid, Gentamicin, Doxycycline, Rifampicin, Furazolidone, Novobiocin and Penicillin. All Staphylococcus species are catalase positive, furazolidone sensitive and bacitracin resistant. Those that are tube coagulase positive and mannitol positive are considered as S.aureus. The S.aureus those are resistant to Cefoxitin in zone size less than 22mm are considered as MRSA in this study.

Descriptive statistics were used in this study.

Results

Patient characteristics: During the one year period 290 cultures were positive for staphylococcus aureus including colonization. Of the 290 cultures, 140 isolates were MRSA infections. Among the 140 cases, 50 were identified as CA-

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MRSA and included for final analysis. The remaining 90 cases had one or more risk factors for methicillin resistance. There were 32 boys and 18 girls (sex ratio: 1.78:1) in the final study group. The median age was 3.6 years. All children were from Coimbatore region and they had no identifiable risk factors for methicillin resistance. About the sites of isolation, 20 isolates from pus, 21 from blood and in 9 cases staphylococcus aureus was isolated from both.

Clinical presentation: Localized Skin infections were the most common sites of infection, accounting for 74% (37/50) of CA-MRSA infections. Septic arthritis (4/50) and lung infections (4/50) were involved in 16 % of cases. Scalded skin syndrome in 3 (6%) cases. Osteomyelitis and toxic shock syndrome contributed each case(2%). The other non specific symptoms observed were fever (26/50),vomiting (8/50),diarrhoea (7/50) and septic shock in one case.

Antimicrobial susceptibility: all isolates were 100% sensitive to Vancomycin, Linezolid and Doxycycline (Table-1). The drugs such as Rifampin, Ciprofloxacin, Cephalothin and Clindamycin had sensitivity around 80-90% of the tested isolates. The sensitivity rate was around 55-65 % for the following drugs Co-trimoxazole, Cloxacillin, Gentamycin and Erythromycin. Drugs had poor sensitivity were Cefazolin, Penicillin, Ampicillin and Ceftriaxone.

Outcome: All but one patient recovered without any major complications. The one patient who had toxic shock syndrome died of multi-organ dysfunction syndrome. Patients with skin and soft tissue infections were treated with topical mupiroicin and oral cloxacillin and erythromycin. Those who had systemic infections were treated with either vancomycin or linezolid.

Discussion

Our study revealed CA- MRSA infections in previously healthy children without known risk factors for MRSA infection in a territory care hospital in south India. In this study among the MRSA isolates 35% of cases were community acquired as those case did not have any risk factors for nosocomial spread. The overall prevalence among all Staphylococcus aureus infections was 17 % in children. MRSA is now endemic in many parts of India. The incidence of MRSA varies from 25 per cent in western part of India to 50 per cent in South India[10]. CA-MRSA has been increasingly reported from India[11]. Clinically, CA-MRSA usually causes skin and soft tissue infection, often with abscess and furuncle formation. However, it can cause serious life-threatening conditions, which in addition to necrotizing pneumonia include necrotizing fasciitis, joint infections bloodstream infection, and septic shock[12,13]. CA-MRSA may arise in either of 2 ways: hospital strains may be carried into the community, where they then spread person to person, or community MRSA may arise de novo when the methicillin-resistance gene complex is acquired by a methicillin-susceptible strain [14]. CA-MRSA strains were recognized as a novel pathogen that is genetically different from healthcare-associated MRSA with regard to genetic resistance determinants [14]. The genetic resistance determinants are mobile staphylococcal cassette chromosome mec type IV, and certain virulence factors, such as the Panton-Valentine leukocidin. Panton-Valentine leukocidin-positive S. aureus strains have been associated with severe SSTIs and pulmonary infections [15]. In this study we have done only risk factors analysis for Methicillin resistance. We could not do molecular analysis of MRSA isolates to determine their genotypes due to various reasons. In our study all the isolates were 100% sensitive for Vancomycin, Linezolid and Doxycycline as with earlier studies[16,17]. Strains of MRSA circulating in the community generally are susceptible to a number of non beta-lactam antimicrobial agents, although resistance patterns may vary temporally and geographically[17]. Antibiotic choice is more crucial for management of these infections and should be guided by the prevalence rate and its antibiotic susceptibility profile in the community[17,18].

Conclusion

In Coimbatore city , MRSA was prevalent among pathogens of community acquired infections in children, In areas with high prevalence of methicillin resistance, even community-acquired, a glycopeptide-containing regimen should be started as initial empirical antibiotic therapy.

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Table -1: depicts antibiotic sensitivity

Drug	Sensitive	Resistant	Total cases tested	Percentage of sensitivity
Cefazolin	0	1	1	0%
Penicillin	4	46	50	0.08%
Ampicillin	1	4	5	20%
Ceftriaxone	1	1	2	50%
Co-trimoxazole	29	21	50	58.00%
Cloxacillin	23	15	38	60.53%
Gentamycin	33	17	50	66.00%
Erythromycin	28	14	42	67%
Rifampin	4	1	5	80.00%
Ciprofloxacin	44	6	50	88.00%
Cephalothin	35	9	44	88.63%
Clindamycin	39	5	44	88.63%
Doxycycline	50	0	50	100%
Levofloxacin	5	0	5	100%
Linezolid	50	0	50	100%
Vancomycin	50	0	50	100%

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