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Staphylococcus aureus bacteremia in a tertiary care hospital in India

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ABSTRACT

Background: Staphylococcus aureus bacteremia (SAB) carries significant mortality and is increasingly caused by methicillin resistant *Staphylococcus aureus* (MRSA).
Materials and methods: We conducted a prospective observational study of 70 patients with SAB, between April 2014 and March 2015. Clinical and laboratory parameters of patients with MSSA and MRSA bacteremia were compared. Factors associated with poor outcome were analyzed.
Results: 70 patients ((51 MSSA, 19 MRSA) with SAB constituted 7.56% of all bacteremias. Diabetes mellitus, chronic kidney disease, immunosuppressant usage and congestive heart failure were the most common co-morbid conditions. 5.71% of patients had infective endocarditis. Cefazolin and vancomycin were the commonest agents used for definitive therapy of MSSA and MRSA SAB respectively. There was no difference in co-morbidities, persistent bacteremia (pBact) or inappropriate antibiotic therapy between patients with MSSA and MRSA bacteremia. Severe sepsis and pBact were associated with a poor outcome.
Conclusion: SAB is a serious infection that carries a mortality of almost 25%, especially if patients present with severe sepsis or pBact. MSSA and MRSA bacteremia had similar features and outcome. Transesophageal echocardiography, detection and drainage of abscesses and appropriate parenteral antibiotics for a minimum of two weeks are recommended to avoid pBact and ensure a favorable outcome.

1. Introduction

Bacteremia caused by the gram positive coccus *Staphylococcus aureus*(SAB) is increasingly common both in community and hospital settings, accounts for 12.4% of all bacteremias [1] and is associated with mortality rates of 15–60% [2]. Presentation can be with severe sepsis or septic shock: skin and soft tissue infection, pneumonia, intravascular catheter infection and bone and joint infection are the most important sources of bacteremia [3]. Methicillin resistant *S. aureus* (MRSA) strains account for as much as 70%–80% of nosocomial SAB and may carry a poorer prognosis [4,5]. Treatment of SAB requires 2–4 weeks of appropriate parenteral antibiotics [6].

Relatively few Indian studies are available describing the epidemiology, clinical features and outcome of SAB [3,7,8,9]. Though guidelines for SAB exist in the west, [10] similar empiric and definitive management guidelines have not been clearly defined in India. We therefore attempted to analyze clinical features and treatment outcome of SAB at a tertiary care hospital in southern India.

2. Materials and methods

This was a prospective observational cohort study from April 2014 to March 2015, with a subsequent 3 month follow up, in 700 bed multi-speciality tertiary care referral hospital. Hospitalized patients ≥ 18 years old from whom two or more sets of blood cultures grew *Staphylococcus aureus* were included. Details of patient demographics, clinical characteristics, risk factors, course of illness, treatment and outcome were analysed. The source of SAB was determined based on clinical findings and isolation of *S. aureus* from anatomical sites.

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2.1. Definitions

SAB was defined as community acquired if blood culture was drawn before or < 48 h after admission or hospital acquired if blood culture was done > 48 h after admission [11]. Persistent bacteremia was defined as a positive blood culture 72 or more hours after starting an appropriate anti-staphylococcal antibiotic [10,12,13]. Systemic inflammatory response syndrome (SIRS) and severe sepsis were defined based on standard guidelines [14]. Inappropriate empirical antibiotic therapy was defined as receipt of antibiotic(s) within the first 48 h after blood culture draw that did not match the in vitro susceptibilities of the *S. aureus* isolate [15]. Diagnosis of IE was based on modified Duke criteria [16].

2.2. Statistical analysis

Comparision of continuous variables were done by independent sample 't' test. Comparison of non-normal continuous variables was done by Mann-Whitney test. Comparison of categorical variables was done by Chi Square test or Fisher's exact test. Data analysis was performed using SPSS software version 16.0. A p-value <0.05 was considered to be statistically significant.

The study was presented to and cleared by the institutional ethics committee before commencement.

3. Results

Among 926 positive blood stream infections between April 2014 and March 2015, 70 patients grew *Staphylococcus aureus*, leading to a prevalence of SAB of 7.56%. Of the 70 patients, 51 patients (72.9%) had MSSA while 19 patients (27.1%) had MRSA with a prevalence of 5.51% and 2.05% respectively. The age of the patients ranged from 23 to 82 with 88.6% aged above 40 years. 45 (64.3%) were males and 25 (35.7%) were females. The mean age for MSSA was 55 years (range 23–82 years) and for MRSA was 58 years (range 34–77 years). 60% patients had been hospitalized in the one year preceding the present admission with 45.7% being hospitalized in the preceding month.

The most common co-morbidity observed in our study was diabetes mellitus (DM) in 43 patients (61.4%), followed by immunosuppressant use (13%), chronic kidney disease (15%) and cirrhosis of liver (10%). Malignancy was observed in 2 patients (one had non-Hodgkins lymphoma and another had Sezary syndrome). One patient had a past history of culture negative infective endocarditis. No patients had a history of HIV infection or injecting drug use. 53 of 70 patients (75.7%) overall and 16 of 19 MRSA bacteremia patients (84.2%) had at least one of three main risk factors i.e diabetes mellitus, chronic kidney disease and liver cirrhosis (Table 1).

Thirty days mortality among patients with persistent bacteremia (p = 0.002) and severe sepsis (p = 0.041) was significantly higher than those without these characteristics. Mortality among those patients with inappropriate empirical antibiotic usage (p = 0.161), embolism (p = 1.000) and hospital acquired bacteremia (p = 0.673) were not statistically significant from those without (Table 2).

Table 2
Mortality in patients with persistent bacteremia, severe sepsis, inappropriate antibiotic use,embolism and hospital acquired bacteremia.

Variables	Present	Absent	p value
Persistent bacteremia	22 (31.4%)	48 (68.6%)	
30 day mortality	10 (45.5%)	6 (12.5%)	0.002
Severe sepsis	46 (65.7%)	24 (34.3%)	
30 day mortality	14 (30.4%)	2 (8.3%)	0.041
Inappropriate empirical antibiotic usage	37 (52.9%)	33 (47.1%)	
30 day mortality	6 (16.2%)	10(30.3%)	0.161
Embolism	2 (2.9%)	68(97.1%)	
30 day mortality	0	16 (23.5%)	1.000
Hospital acquired bacteremia	9 (12.9%)	61(87.1%)	
30 day mortality	1 (11.1%)	15 (24.6%)	0.673

Table 1
Study variables (comorbidities, source bacteremia, laboratory and clinical parameters) Ilio-psoas abscess-5, Intramuscular (other sites)-2, Prostatic abscess-2, Epidural abscess-1 Liver abscess-1, Splenic abscess-1, Renal abscess-1.

Study variables	All SAB	MSSA bacteremia N (%)	MRSA bacteremia N (%)	p value
Gender				0.317
Male	45 (64.3%)	31 (60.8%)	14 (73.7%)	
Female	25 (35.7%)	20 (39.2%)	05 (26.3%)	
Co-morbidities				
Diabetes mellitus	43 (61.4%)	28 (54.9%)	15 (78.9%)	0.098
Immunosuppressant use	13 (18.6%)	10 (19.6%)	03 (15.8%)	1.000
Chronic kidney disease	15 (21.4%)	12 (23.5%)	03 (15.8%)	0.744
Heart failure	13 (18.6%)	09 (17.6%)	04 (21.1%)	0.739
Cirrhosis of liver	10 (14.3%)	07 (13.7%)	03 (15.8%)	1.000
Malignancy	02 (2.9%)	02 (3.9%)	00	1.000
Prior infective endocarditis	01 (1.4%)	01 (1.96%)	00	1.000
Source of Bacteremia[a]				
Skin and soft tissue	32 (45.71%)	24 (47.06%)	8 (42.11%)	0.711
Central line	05 (7.14%)	4 (7.84%)	1 (5.26%)	1.000
Pulmonary infiltrate	04 (5.71%)	4 (7.84%)	0	0.568
Abscess	13 (18.6%)	10 (19.61%)	3 (15.79%)	1.000
Bacteriuria	07 (10%)	4 (7.84%)	3 (15.79%)	0.379
Septic arthritis	01 (1.43%)	1 (1.96%)	0	1.000
Unknown source	12 (17.1%)	8 (15.7%)	4 (21.1%)	0.723
Laboratory parameters (Mean ± Standard deviation)				
WBC	13821.86±8440.3	13643 ± 9232	14300 ± 5996	0.359
Serum Glucose	188 ± 120.3	180.22 ± 108.96	208.89 ± 148.05	0.501
Albumin	3.1 ± 0.67	3.16 ± 0.66	3.17 ± 0.71	0.995
Creatinine	2.36±3.13	2.52 ± 3.56	1.93 ± 1.47	0.436
Clinical parameters				
Severe sepsis	46 (65.7%)	33 (64.7%)	13 (68.4%)	0.771
Inappropriate empirical antibiotic usage	37 (52.6%)	25 (49.0%)	12 (63.2%)	0.292
Persistent bacteremia	22 (31.4%)	13 (25.5%)	09 (47.4%)	0.080
Embolism	02 (2.9%)	02 (3.9%)	00	1.000
Hospital acquired bacteremia	09 (12.6%)	05 (9.8%)	04 (21.1%)	0.211

[a] Some of the patients had more than one source for bacteremia.

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