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SHORT COMMUNICATION

Staphylococcus aureus BACTEREMIA IN A BRAZILIAN MIDWEST TEACHING HOSPITAL

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ABSTRACT

Staphylococcus aureus bacteremia is a frequent and potentially fatal condition. Resistance to methicillin is considered to be a predictive factor for mortality. The purpose of this study was to evaluate the epidemiological behaviour of *S. aureus* bacteremia in a teaching hospital. The incidence was 5.1 cases per 1,000 admissions. There was a significant improvement in the susceptibility of *S. aureus*; the incidence of methicillin-resistant *S. aureus* (MRSA) was 31.3% (95% confidence interval (CI) 24.5-39.1); whereas MRSA bacteremia a decade before had accounted for 55.0% (95% CI 45.2-64.3) of the cases. Overall mortality due to *S. aureus* bacteremia was 29.3%. MRSA bacteremia was not a risk factor for death.

KEY WORDS: Bacteremia; *Staphylococcus aureus*

RESUMO

Bacteremia por *Staphylococcus aureus* em um Hospital Escola do Centro Oeste do Brasil

Bacteremia por *Staphylococcus aureus* compreende uma infecção frequente e potencialmente grave. A resistência à meticilina representa um dos fatores aventados como preditor de letalidade. O objetivo do estudo é avaliar o perfil epidemiológico das bacteremias por *S. aureus* em hospital de ensino. Foi observada incidência de 5,1 casos de bacteremia por 1.000 admissões. A incidência de *S. aureus* meticilina resistente (MRSA) foi de 31,3% (intervalo de confiança 95% (IC) 24,5-39,1). Houve uma melhora significativa da suscetibilidade à meticilina em relação ao observado uma década antes, onde a incidência de bacteremia por MRSA era de 55,0% (IC95% 45,2-64,3). A letalidade global foi de 29,3% e bacteremia por MRSA não foi fator de risco para o óbito.

DESCRITORES: Bacteremia; *Staphylococcus aureus*.

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Bloodstream infections in critically ill patients are a common fatal condition (Paulsen et al., 2015; Tong et al 2015, Wisplinghoff et al., 2004). *Staphylococcus aureus* is responsible for approximately 20% of these infections (Wisplinghoff et al., 2004), and methicillin resistance may occur in more than 50% of the cases (Gales et al., 2009; Nabera, 2009). The emergence of methicillin-resistant *S. aureus* (MRSA) strains may influence clinical outcomes, but this issue remains controversial. Some studies have reported that MRSA bacteremia is associated with a significant increase in mortality (Cosgrove et al., 2003; Keynan & Rubinstein, 2013), but other studies observed no difference in the mortality risk between patients with MRSA and methicillin-susceptible *S. aureus* (MSSA) bacteremia (Cosgrove et al., 2005, Yilmaz et al., 2016). In a previous study performed in a Brazilian teaching hospital, 111 cases of bloodstream infection due to *S. aureus* were recorded from 2000 to 2001, representing the major microorganism found in these infections. MRSA accounted for 55% of these cases; however, there was no difference in the mortality outcome when comparing MRSA and MSSA (Guilarde et al., 2006). The purpose of this study was to evaluate *S. aureus* bacteremia in this cohort in relation to the reports of the past decade.

This investigation examined a retrospective cohort of patients presenting bacteremia due to *S. aureus*. The investigation was undertaken in a 300-bed teaching hospital (Hospital das Clinicas) associated with a state university (Federal University of Goiás, HC/UFG) in the Brazilian Mid-West. The hospital is a tertiary care institution with adult and pediatric units, clinical and surgical patients, and three intensive care units. The institution has a group of professionals working on infection control and prevention, including nurses and physicians. An active surveillance program tracks cases of nosocomial infection, and data are recorded. Cultures were requested routinely when infection was clinically suspected. Whenever bacterial growth was identified by the microbiology laboratory, the clinical data were reviewed by an infectious disease specialist. The antimicrobial susceptibility, source of bacteremia, mortality, and origin of infection were assessed. These data were reviewed from January 2010 through August 2012. The inclusion criteria were as follows: over one year of age, clinical and microbiological evidence of bloodstream infection (BSI) due to *S. aureus*, and admission to the unit during the study period. Only the first episode of *S. aureus* bacteremia per patient was considered for data analysis. Infections were classified as hospital-acquired when occurring 48 hours after hospital admission and not complications caused by infections present during admission or developed following hospital discharge but related to the previous inpatient care. BSIs were classified as primary when unrelated to any other infection focus or when associated with an intravenous catheter site infection. BSIs were classified as secondary when clinically related to an infection at another site (Garner et al.,

1988). Catheter-related BSI was defined by the isolation of the same organism from cultures of both a catheter segment and peripheral blood with no other apparent source of bacteremia. When no microbiological confirmation was available, defervescence following catheter removal was considered indirect evidence of catheter-related BSI (Pearson, 1996).

Blood cultures were processed using a VITEK 2 automated system, and positive samples were inoculated onto solid media (MacConkey agar, manitol agar and blood agar). Antimicrobial susceptibility was determined according to the recommendations of the Clinical and Laboratory Standards Institute (Clinical and Laboratory Standards Institute, 2011).

The chi-squared test or Fisher's exact test was applied to evaluate differences between proportions, and 95% confidence intervals (95%CI) were calculated. Statistical significance was defined as $p < 0.05$. The SPSS 16.0 (SPSS Inc., Chicago, IL, USA) software program was used for analysis.

The study protocol was approved by the institutional ethics Committee (CEPMHA/HC/UFG).

During the study period, the hospital provided inpatient services to 29,233patients. A total of 934 blood cultures revealed bacterial growth. Gram-positive bacteria numbered 48.6% of the cultures in 2010, 60.8% in 2011 and 58.1% in 2012. There were 5.1 cases of *S. aureus* bacteremia per 1,000 admissions, numbering 24.1% of the total episodes of bacteremia within the institution. 150 cases of *S. aureus* bacteremia were detected considering only the first sample from each patient. The major sites of infection included primary bacteremia in 114 patients (76.0%) and secondary bacteremia in 36 cases (24.0%). Among the secondary bacteremia patients, 16 cases (44.4%) were associated with respiratory infection, and 7 (19.4%) were associated with surgical site infection.

Oxacillin susceptibility was noted in most of the samples (68.7%) and 75.0% were susceptible to Ciprofloxacin. Rifampicin and Trimethoprim-Sulfamethoxazole (TMP-SMX) were active against 94.3% and 90.3% of the samples, respectively. Only 51.7% of the samples were susceptible to clindamycin. All samples were susceptible to vancomycin, tigecycline and linezolid.

Death was associated with *S. aureus* bacteremia in 29.3% of the cases (44/150) and due to other causes in 4.7% of the cases. Mortality was more common during nosocomial infection (35.8% versus 14.8%) and in patients with a secondary infection (42.4% versus 26.3%). More deaths were also observed following MRSA than MSSA infections (38.3% x 25.2%), but this difference was not statistically significant (p=0.10). Other authors have not found MRSA bacteremia connected to a significantly worse outcome compared with MSSA (Tong et al 2015). Several studies have demonstrated that MRSA bacteremia is associated with a significantly higher mortality rate compared

with MSSA bacteremia, but the higher level of mortality is thought to be due to delays in initial antimicrobial therapy (Wang 2015).

The incidence of *S. aureus* bacteremia has remained stable over the past decade at this institution. During this period, control measures have been persistently applied, even in the context of endemicity. There has been an important reduction in MRSA bacteremia, with a 55.0% incidence of MRSA over the last decade (95%CI, 45.2-64.3) (Guilarde et al., 2006) and a 31.3% incidence (95%CI, 24.5-39.1) noted in the present study (Table). Other authors have seen reductions in the incidence of MRSA through the implementation of control measures (Raineri et al., 2007).

Table. Antimicrobial susceptibility of bacteremia by *Staphylococcus aureus* in a teaching hospital, over two periods

Antimicrobial Agent	2000-2001 (n=111) Guilarde et al. 2006 Susceptibility (%)	2010-2012 (n=150) Susceptibility (%)
Oxacillin*	45.0	68.7
Ciprofloxacin	52.3	75.0
Clindamycin	46.8	51.7
Trimethoprim-Sulfamethoxazole	77.5	90.3
Vancomycin	100.0	100.0

*p< 0.01

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