Outcomes of infradosed antimicrobials patients with bacteremia in the emergency department

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Background and importance

Bacteremia is a major cause of sepsis and is associated with high morbidity and mortality. Suboptimal antibiotic dosing in the bacteraemic population has previously been associated with poorer outcomes in the Emergency departments (ED).

Aim and objectives

This study has been designed to analyse clinical outcomes in patients with bacteraemia when receiving suboptimal antibiotic dosing (SAD).

Materials and methods

Observational, retrospective cohort study performed in a third-level hospital in Spain. The population studied included patients admitted in an ED with positive blood cultures for true pathogenic microorganisms (November 2021 to June 2022). SAD was defined according to Stanford Severe Sepsis and Septic Shock Antibiotic Guide (2020), except for ceftriaxone, in which we used the recommendation of *Aaron J. Heffernan et al, 2020* (2g/24h). Data were collected on demographics, microorganisms responsible for the infection, focus of infection, antibiotics and doses used and outcomes in terms of 30-day mortality.

Results

A total of 442 patients with bacteremia caused by a microorganism susceptible to the antibiotic prescribed in the ED were evaluated (Mean age: 73±15 years, 54% male), being 54 (12%) considered as SAD. From these patients, 24 infections (44%) were caused by *E.coli*, being the main focus the urinary tract (n=29, 54%). The most frequently SAD treatments were beta-lactams (n=35, 65%), followed by carbapenems (n=17, 32%), vancomycin (n=8, 15%) and aminoglycosides (n=5, 9%). Among beta-lactams, ceftriaxone was prescribed in SAD (1g/24h) in 8 patients (22%); within carbapenems, meropenem was usually prescribed (without loading dose) adjusted to kidney impairment in the moment of admission. Patients who received SAD presented a higher 30-mortality than those who received an appropriate dosing (22% vs 7%; p=0.001).

Demographic characteristics	Control group	SAD group
n	389 pacients	54 pacients
Age	73 ±15 years	69 ±17 years
Sex	210 female (54%)	30 female (56%)

Outcomes	Control group n=389	DAS group n=54	Statistical significance
Microorganism			
E.coli	182 (47%)	21 (40%)	**p=0,653**
Klebsiella pneumoniae	35 (9%)	8 (15%)	**p=0,704**
Staphylococcus aureus	19 (5%)	4 (7%)	**p=0,904**
Pseudomonas aeruginosa	18 (4%)	2 (4%)	**p=1,000**
Poteus mirabilis	9 (2%)	4 (7%)	**p=0,729**
Source of infection			
Urinary	175 (45%)	30 (56%)	**p=0,416**
Abdominal	78 (20%)	8 (15%)	**p=0,807**
Skin and soft tissue	39 (10%)	12 (22%)	**p=0,406**
Respiratory	15 (4%)	3 (5%)	**p=0,947**
Antimicrobial agent			
Beta-lactamics	233 (60%)	34 (63%)	**p=0,808**
Carbapenems	97 (25%)	17 (33%)	**p=0,604**
Vancomicine	47 (12%)	8 (15%)	**p=0,124**
Quinolones	19 (5%)	3 (7%)	**p=0,584**
Aminoglycosides	16 (4%)	2 (4%)	**p=1,000**
30 day mortality	**27 (7%)**	**12 (23%)**	**p=0,001**

Conclusion and relevance

SAD in bacteraemic patients in the ED is 12%, being associated with higher risk of mortality. Beta-lactams and carbapenems are the most prescribed antibiotics in bacteraemia to cover Gram negative spectrum. A possible explanation for SAD in the ED might be that antibiotics are adjusted according to renal function in the moment of admission. We don't recommend adjusting doses of antibiotics during the first 24-48h of treatment in order to reduce the risk of SAD.