



Etiological Frequency of MDR Bacteremia and Antibiotic Resistance: Experience of the Avicenna Hospital in Marrakech

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Abstract

This work aims to study the bacteriological profile of Multi drug resistant bacteremia, as well as the current state of their resistance to antibiotics. It is a retrospective, descriptive study, which was spread over 8 years (January 2014-December 2021), relating to hospitalized patients having a positive blood culture, confirmed at microbiological laboratory of the Avicenna Military Hospital of Marrakesh. A total of 1923 blood cultures were performed, 17% of which came back positive. 68 MDRs bacterias were isolated, which is 20% of all isolates. Enterobacteriaceae resistant to third generation cephalosporins and imipenem resistant *Acinetobacter baumannii* are the most frequently found MDRs bacterias with rates of 47% and 30% respectively. Hospital units are mainly represented by resuscitation-intensive care, followed by medical services. MDR bacteria represent a worrying problem underlining the need for the application of hygiene measures and the rational prescription of antibiotics.

Keywords: Multi drug resistant; bacteremia; Antibiogram.

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1. Introduction

Nosocomial bacteremias are serious infections, not only associated with high morbidity and mortality but also with a high cost related to care [1]. The mortality attributable to these infections varies between 14 and 38% depending on the studies and the germs [2]. Their prognosis depends on several factors, including the speed and especially the effectiveness of first-line antibiotic therapy. The emergence and growth of multidrug-resistant bacteria further complicate their management. This study aims to evaluate the place of MDR in bacteremia to better guide first-line antibiotic therapies.

2. Materials and methods

This is a descriptive retrospective study carried out in the microbiology department of the Avicenna military hospital in Marrakech over a period of 8 years (January 2014 to January 2022) on all patients hospitalized in the hospital with one or more positive blood cultures.

The bacteriological diagnosis of bacteremia was carried out by an automated system (Versa-TREK).

Bacterial identification was carried out using conventional methods and the Phoenix BD automaton. Sensitivity to antibiotics was carried out by conventional and automated methods and its interpretation according to the recommendations of CASFM/EUCAST for the current year.

The MDR bacterias selected were: enterobacteriaceae resistant to third-generation cephalosporins (ERC3G), *S. aureus* resistant to methicillin (MRSA), *P. aeruginosa* resistant to ceftazidime (PARC) and *Acinetobacter baumannii* resistant to imipenem (ABRI).

3. Results

During the study period 1923 blood cultures were performed, 73% were negative, 10% were considered contaminated and 17% (327) came back positive.

The majority of our patients with positive blood cultures were male 73%

68 MDRs were isolated: 11 MRSA, 32 ERC3G, 5 PARC AND 20 ABRI, which is 20% of all the germs isolated from blood cultures.

ERC3G was predominant 47%, followed by ABRI 30%, MRSA 16% and PARC 7%

The overall distribution of MDR according to the hospitalization services showed their predominance in the intensive care units with a rate exceeding 50% , followed by the medical services, in particular the internal medicine service and finally the surgery services.

The ERC3Gs showed resistance associated with most antibiotics, mainly aminoglycosides and fluoroquinolones. The carbapenem resistance rate was 13%. No colistin resistance was detected. Similarly, *A. baumannii* and *P.*

aeruginosa showed high rates of resistance to other families of antibiotics with the exception of colistin. As for MRSA, moderate rates of resistance to other antibiotics have been objectified with rates ranging from 30% for aminoglycosides to 12% for Fluoroquinolones. No resistance to vancomycin or pristinamycin was detected.

Table 1: Distribution of the different MDRs according to the Department

Intensive care unit	51%
Internalmedicine	37%
Cardiology	5%
Neurosurgery	3%
Orthopedics	1%
Urology	1%
General surgery	1%
Neurology	1%

Table 2: Percentages of resistance to other antibiotics

	Ciprofloxacin	Cotrimoxazole	Gentamycine	Amikacine	Colistine	VA	Pristinamycine	IMP
Enterobacteriaceae resistant to third generation cephalosporins	46%	55%	14%	4%	0%	-	-	8%
Acinetobacter Baumannii resistant to imipenm	100%	50%	100%	0%	0%	-	-	100%
Pseudomonas Aeruginosa resistant to ceftazidime	27%	-	0%	0%	0%	-	-	0%
Methicilinresistant staphylococcus aureus	12 ,5%	18%	30%	32%	-	0%	0%	-

4. Discussion

Knowledge and monitoring of MDR bacteremia play a key role in the fight against these infections. They make it possible to describe the extent of the problem and to make comparisons within and between establishments. In recent years, there has been a worldwide resurgence of MDR bacterias, observed for all bacterial species but in varying degrees. There are many risk factors for the acquisition of this resistance, in particular exaggerated prescription habits and non-compliant hygiene practices [3].

The proportion of MDR reflects the quality of care in a given hospital structure [3]. The overall MDR bacteria rate in our study was 20%, a slightly higher rate than that reported by French 15.9% [4] and Tunisian 15.3% [5] studies. These disparities are due on the one hand to staff training as well as to medical behaviors that vary from one department to another, such as the methods of fitting and maintaining invasive devices. Hand hygiene protocols are also an important factor whose adherence is not sufficiently respected. The limited number of surveillance programs for the epidemiological and microbiological profiles of bacteremia plays a crucial role in the variability of incidence rates, as well as the absence of protocols for the prevention of these infections.

Bacterial epidemiology in our study confirmed the predominance of Gram-negative bacilli over Gram-positive cocci, this is consistent with numerous studies: the ELOUANASS [6] study with a rate of 49.3%, the “reseau réa-raisin” study 51.3% [4] and the KALLEL study 73.3% [2]. Gram negative bacilli are predominated by Enterobacteriaceae, this may be due to the healthcare-related nature of bacteremia as well as the predominance of pulmonary and urinary points of entry in ventilated patients or carriers of urinary catheters in intensive care units. Our results are relatively high to those of a Tunisian study where the rate of ERC3G was 27.7% [12]. These germs are however less frequently encountered in France 11,5% [10] and in the United States 6,6% [7] thanks to the commitment of hospitals in these countries to control programs that first target these pathogens.

The non-fermenting gram negative bacilli occupy an important place in our study, especially *Acinetobacter baumannii* whose reservoir is essentially represented by the hospital environment. In our serie, all strains of *Acinetobacter baumannii* were resistant to carbapenems, whereas in a study conducted in Tunisia, this germ was only multiresistant in 50% [12] and in another study conducted in the United States, and it was involved only in 1.5% [7]. These disparities can be explained by epidemics of contamination of the environment of carrier patients [3].

Regarding ceftazidime-resistant *Pseudomonas aeruginosa*, only 5 cases were reported in our study, which corresponds to a rate of 7%, a relatively low rate compared to other MDR bacterias. A rate slightly close to 5.5% was reported in the study by FRIKH in Rabat, Morocco [8]. Other studies report significantly higher rates. The possible cause could be the combination of unsuitable hospital infrastructures, making it difficult to apply hygiene rules and the widespread consumption of antibiotics at probably sub-optimal doses [8, 9].

In our serie, 11 MRSA isolates were objectified, at a rate of 16%. This places us among countries with low prevalence of MRSA, such as Germany (5%), the Netherlands (12%) and Belgium (13%) [3]. In contrast, in France and the United States, the proportion of MRSA is 40 and 30% respectively [8, 10], all strains of *S. aureus* were sensitive to glycopeptides. New anti-staphylococcal antibiotics such as daptomycin, linezolid, tigecycline as well as ceftaroline, a new 5th generation cephalosporin active on MRSA, have enriched the therapeutic arsenal in MRSA infections [11]. These molecules represent an alternative in cases of proven resistance to glycopeptides and help prevent the development of resistant strains or reduced sensitivity to glycopeptides, by reducing the use of these molecules.

Our work is limited by a number of factors. First, it was a retrospective study with data collected from one center. Second, we analyzed a heterogeneous group of patients who may have different epidemiologic, clinical,

and behavioral characteristics. Future studies are needed. Third, the results of this study could have been affected by regional trends, established clinical practices, and local antibiotic policies.

5. Conclusion

The emergence of multi-resistant bacteria represents a worrying problem underlining the need for the application of hygiene measures and the rational prescription of antibiotics.

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