Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Bacteriology

Bacteriological Profile and Antibiotic Resistance of Bacteremia in Onco-Hematology Patients at Moulay Ismail Military Hospital, Meknès

Mohammed Yassine Alami[1*], Lahmadi Khalid[2-4], Mohammed Er-rami[3-4], Lhoussaine Louzi[1-5], Mohammed Sbiti[1-4]

[1]Bacteriology Department, Moulay Ismail Military Hospital, Meknes, Morocco
[2]Serology-Immunology Department, Moulay Ismail Military Hospital, Meknes, Morocco
[3]Parasitology Department, Moulay Ismail Military Hospital, Meknes, Morocco
[4]Mohamed Ben Abdellah University, Faculty of Medicine, Pharmacy and Dentistry, Fez, Morocco
[5]Mohamed V University, Faculty of Medicine and Pharmacy, Rabat, Morocco

DOI: https://doi.org/10.36347/sjams.2025.v13i02.043 | **Received:** 17.01.2025 | **Accepted:** 22.02.2025 | **Published:** 26.02.2025

***Corresponding author:** Mohammed Yassine Alami
Bacteriology Department, Moulay Ismail Military Hospital, Meknes, Morocco

Abstract **Original Research Article**

Infection is a major cause of death in oncohematology patients. It is a diagnostic and therapeutic emergency. The diagnosis of immunocompromised infection is based first on the analysis of anamnestic data (nature of neoplasia, immunosuppressive treatment and its toxicities), clinical and radiological and especially, microbiological analyses. Blood culture remains the routine and reference examination for bacteremia detection. The objective of our study is to establish the bacteriological profile of infections in onco-hematology patients, and to evaluate the rate of resistance of isolated bacteria to antibiotics. We conducted a retrospective descriptive study spread over a period of 5 years (January 2018 - November 2022) in the bacteriology service of the Moulay Ismail military hospital of Meknes. We collected the results of blood culture isolates, carried out in patients hospitalized in the hospital's onco-hematology department, with identification and antibiogram of each germ isolated according to the standards (EUCAST/SFM). The data was analyzed using Excel version 2016. Of the 252 blood cultures performed, 77 blood cultures were positive with a positivity rate of 31% and the sex ratio (H/F) was 1.77. The most frequently encountered species are Gram negative bacilli (61%) followed by Gram positive cocci (30%). The dominant species were Escherichia coli (26%), Klebsiella pneumoniae (14%), Staphylococcus aureus (13%), and Staphylococcus with negative coagulase (7%). In Staphylococci, the resistance rate of Staphylococci to methicillin was 11% for Staphylococcus aureus and 40% for coagulase-negative Staphylococci. None of these strains exhibited resistance to the glycopeptides tested. Enterobacteria showed resistance to Amoxicillin (91%), Amoxicillin+clavulanic acid (79%), C3G (29%), quinolones (32%), and aminoglycosides (15%). Our results are analyzed and discussed with data from the national and international literature where similarities have been noted and significant differences are noted. According to our results, we can introduce a probabilistic treatment in these patients made of Cephalosporin third generation + quinolones.

Keywords: Bacteremia, Blood Culture, Sepsis, Antibiotic Resistance.

INTRODUCTION

Bacteremia are serious conditions, responsible for significant morbidity and mortality worldwide, and are among the most frequent healthcare-associated infections (HAIs). Their incidence is correlated with the increasing use of central or peripheral venous catheters. Stays in intensive care units and failure to observe basic rules of asepsis and hygiene are additional risk factors [1]. Onco-hematology patients represent a high-risk population for infection, and are a major cause of death. The occurrence of an infectious complication in a patient with a hematological malignancy or solid tumor raises complex diagnostic and therapeutic issues. Diagnosis of infection in the immunocompromised patient is based primarily on analysis of anamnestic (nature of the neoplasia, immunosuppressive treatment and its toxicities), clinical and radiological data. However, the protean aspects of the pathologies encountered and the frequent lack of specificity of clinical and radiological signs underline the importance of complementary investigations: imaging and, above all, microbiological analyses [2]. Blood culture remains the routine and reference test for detecting bacteremia. In terms of diagnostic and therapeutic urgency, it takes a long time to obtain results (from 24 hours to several days, depending on the case). As a result, an initial probabilistic antibiotic treatment must be instituted,

followed by a second course depending on the blood culture results. However, in view of ongoing changes in the epidemiological characteristics of bacteria and their resistance to antibiotics, it is becoming increasingly difficult to maintain appropriate therapeutic regimens for initial empirical treatment [3, 4]. In this work we report data collected in the bacteriology laboratory of the Moulay Ismaïl Military Hospital (HMMI) in Meknes during the period between January 2018 and December 2022, the aim of which is to establish the bacteriological profile and assess the antibiotic resistance rate of bacteria isolated on blood culture with discussion of the results in the light of literature data.

MATERIALS AND METHODS

Type, Duration and Setting of Study:

This is a retrospective study conducted in the bacteriology department of HMMI in Meknes over a 5-year period from January 2018 to December 2022.

Study Population:

The aim of our study is to establish the bacteriological profile of bacteremia in onco-hematology patients, and to assess the antibiotic resistance rate of the bacteria isolated.

Data Collection and Serological Analysis:

Information was collected from the computerized database (Excel) of blood cultures from the bacteriology department of the HMMI in Meknes. Blood samples were taken after rigorous asepsis at the time of shivering, fever or hypothermia for all patients with suspected bacteremia. The volume of blood sampled was 20 to 40ml for each patient, i.e. 1 or 2 pairs of vials. Each pair consists of one aerobic and one anaerobic vial. Samples were taken at the patient's bed, by direct venipuncture. Catheter blood sampling was only performed in cases of suspected infection of intravascular devices (IVDs), and only in parallel with direct venipuncture sampling. In our study, the blood culture bottles used were BD BACTECT bottles compatible with the automated bacterial growth identification system used in the bacteriology department of the HMMI in Meknes. As soon as possible growth is detected in a blood culture bottle, a sample is taken with a syringe fitted with a needle, after disinfection of the cap, and then subjected to Gram staining for microscopic observation. This examination is based on differences in the composition of the bacterial wall fixed on a microscope slide. The cytoplasmic components of the bacteria are stained with the Gram stain (gentian violet). When subsequently rinsed with alcohol, Gram (-) bacteria whose peptidoglycan-poor walls are permeable to alcohol are discolored. Gram (+) bacteria, on the other hand, retain their violet coloration due to the thick peptidoglycan wall surrounding them. To facilitate observation of Gram (-) bacteria, a further staining with fuchsin or safranin turns them pink or red. Microscopic observation of bacterial morphology completes this initial examination, enabling the bacteria observed to be assigned to a bacterial group. Depending on the results of the Gram reading, one or more selective or non-selective agar culture media (chocolate agar, blood agar, Chapman agar) are inoculated for isolation. Positive flasks are handled under a microbiological safety cabinet (MSC). A platinum handle is used for this purpose. This instrument is sterilized between each use. The duration of this stage depends on bacterial growth, and can take from 18 to 24 hours, during which time the agar plates are incubated at 37°C under 5-10% CO2. Bacterial identification is carried out using conventional methods based on morphological, cultural, biochemical and antigenic characteristics; chromogenic media; BD Phoenix M50 automated bacterial identification system; Api galleries.

Data Recording and Statistical Analysis: Data were analyzed using Excel software version 2016.

RESULTS

During our study period, 526 blood cultures were taken in the bacteriology laboratory from patients hospitalized in the onco-hematology department at the HMMI in Meknes. After subtraction of duplicates, 252 blood cultures were retained. During our study period, there was an increase in the number of blood cultures received by the bacteriology department of the Moulay Ismail military hospital in Meknes from onco-hematology patients during the years 2021 and 2022 compared with the years 2018 and 2019, and a significant decrease in cases during the year 2020 given the emergence of the Covid 19 pandemic. Of the blood cultures taken, 77 were positive, of which 73 were considered responsible for bacteremia and 04 contaminated. Over our study period, of the 252 patients sampled for blood cultures, 161 were male and 91 female, representing frequencies of 63.9% and 36.1% respectively. The sex ratio (M/F) was 1.77. Over our study period, of 77 patients with positive blood cultures, 26 were female and 51 male, respectively accounting for 33.8% and 66.2% of cases. The sex ratio (M/F) was 1.96.

Of the blood cultures taken, 203 came from the clinical haematology department and 49 from the oncology department, 80.6% and 19.4% of cases respectively. During our study period, 77 bacterial strains were isolated from positive blood cultures (positivity rate 31%). Gram-negative bacteria (BGN) accounted for 61% of bacteremias, while Gram-positive cocci accounted for 30%. The yeast isolation rate was 9% (Figure 1).

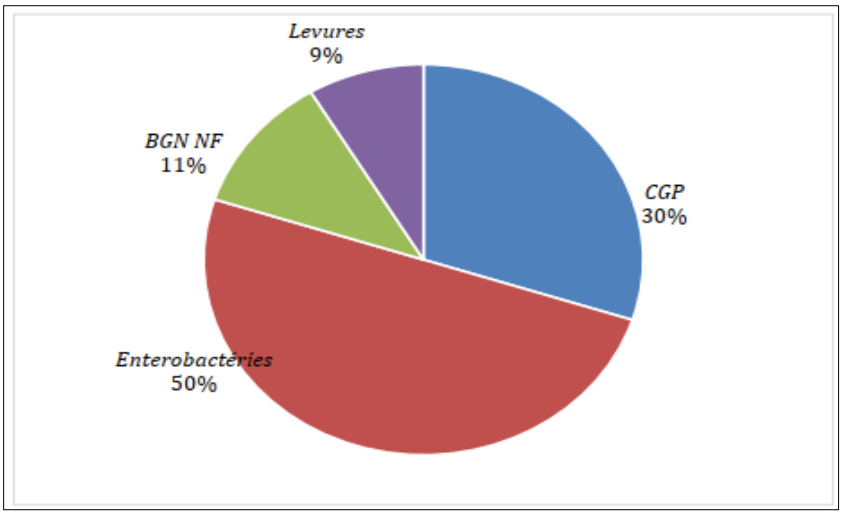

Figure 1: Main groups of bacteria isolated

We found that 61% of bacteremias were due to Gram-negative Bacilli (GNBs), mainly Enterobacteriaceae (n=35) (81.4% of GNBs and 50% of bacteremias), of which the most isolated strain was Escherichia coli, responsible for 26% of all bacteremias. Non-fermenting BGN were less frequent, with 08 isolates (18.6% of BGN and 11% of all bacteremias), of which Pseudomonas spp was the most frequent (3%). (Figure 2)

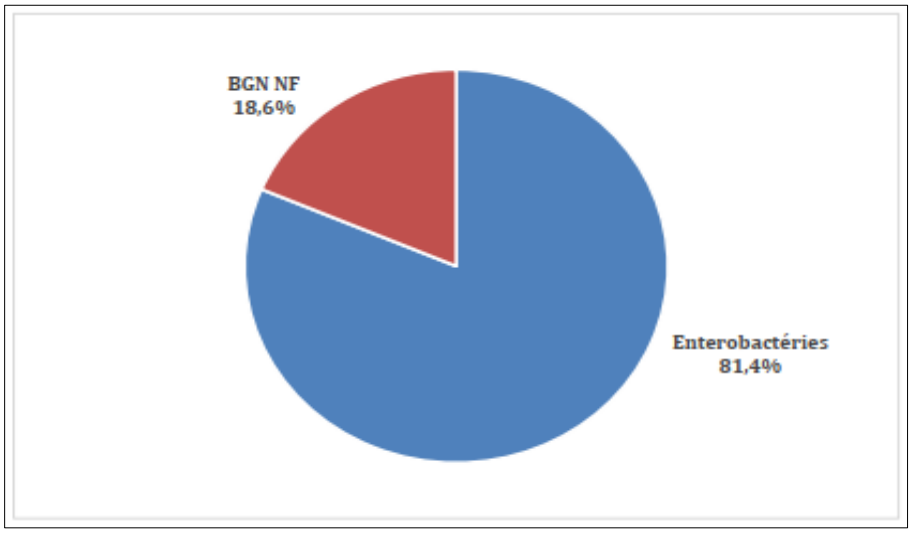

Figure 2: Distribution of Gram-negative bacteria

Staphylococci were more frequent, with 14 isolates (67% of PMCs and 20% of all bacteremias). The number of Staphylococcus aureus was 9 (43% of PGCs and 13% of all bacteremias) versus 05 isolates for Staphylococcus non aureus (24% of PGCs and 7% of all bacteremias). Streptococci (n= 3) accounted for 4% of all bacteremias and 14% of PMCs. Enterococci made up Enterococcus faecalis (n=4) were isolated in 6% of all bacteremias, representing 19% of PGC. (Figure 3)

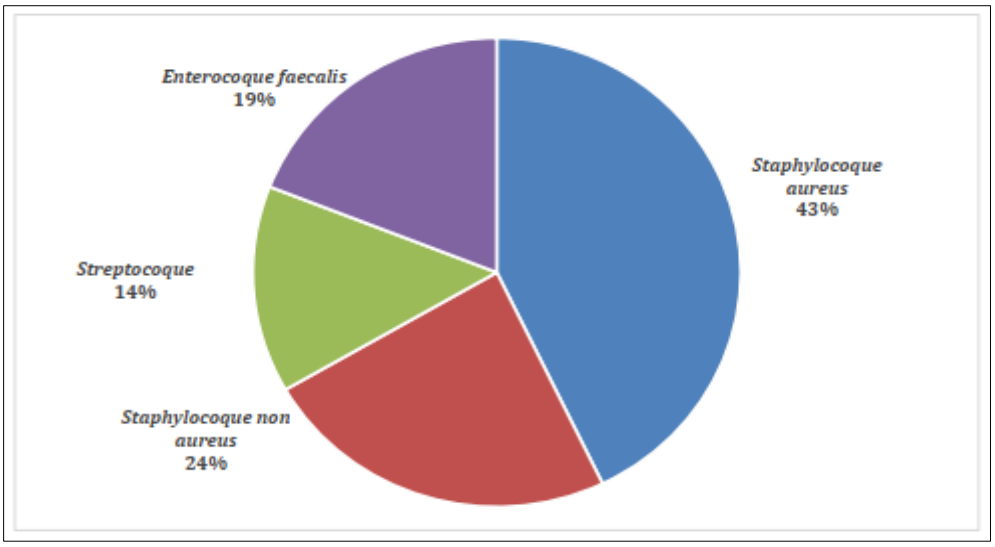

Figure 3: Distribution of Gram-positive Cocci species

Among Staphylococci, Staphylococcus aureus was the most frequent (n=9; 64%). In order of frequency, the microorganisms isolated were: Escherichia coli (26%), Klebsiella spp (16%), Staphylococcus aureus (13%), Yeast (9%), Staphylococcus non aureus (7%), Enterobacter faecalis -Enterobacter spp (6%), Streptococcus spp (4%). Other bacteria, less frequently identified, were: Stenotrophomonas maltofilia, Achromobacter indologene, Proteus mirabilis, Pantoa agglomerans, Pseudomonas spp, Alcaligene xylosoxydans, Acinetobacter baumani (Figure 4).

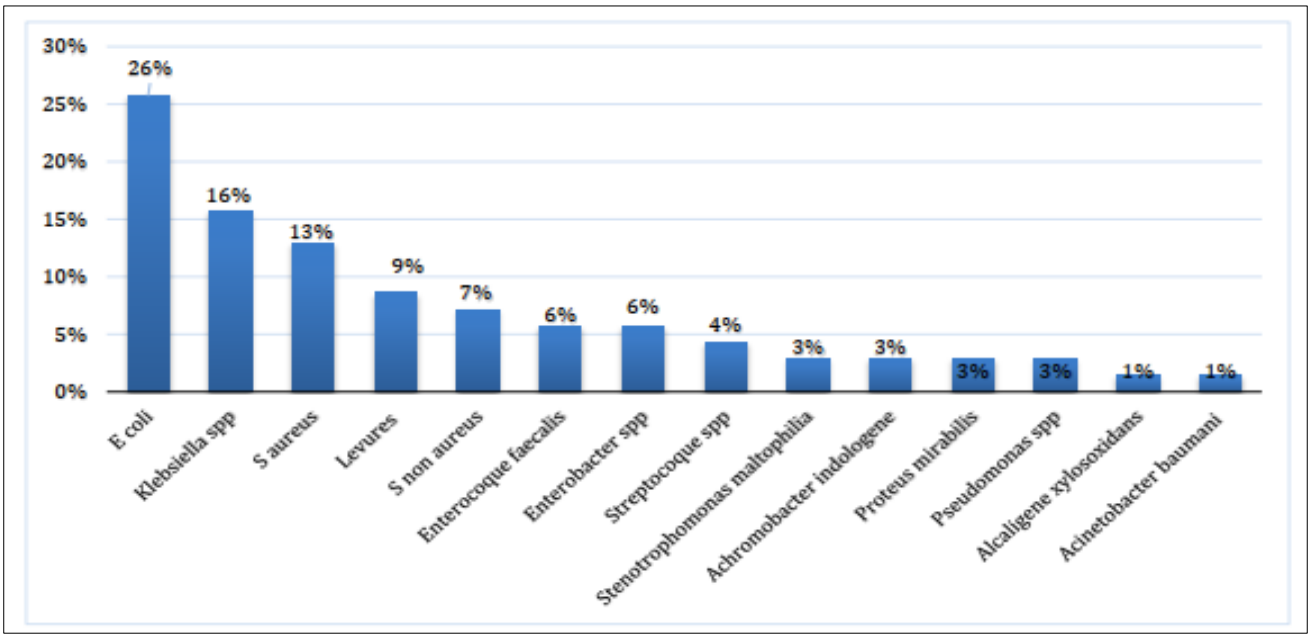

Figure 4: Frequency of microorganisms isolated

The bacteria most frequently encountered in our context showed variable patterns of resistance to beta-lactam antibiotics. The average resistance rate for Enterobacteriaceae was very high for Amoxicillin (91%), Ticarcillin (82%), Amoxicillin+Clavulanic acid (79%), Cefalexime (71%). Resistance to Ceftriaxone and Cefepime concerned 29% and 20% of Enterobacteriaceae respectively. For fluoroquinolones, the rate of resistance to Ciprofloxacin and Levofloxacin was 32% and 15% respectively of Enterobacteriaceae isolates. With regard to aminoglycosides, Enterobacteriaceae showed a resistance rate of 15% for Gentamicin and 6% for Amikacin. A low rate of resistance among Enterobacteriaceae to fosfomycin was 3%, and to imipenem 9%. The figure below shows the percentage of Enterobacteriaceae resistant to the antibiotics tested (Figure 5).

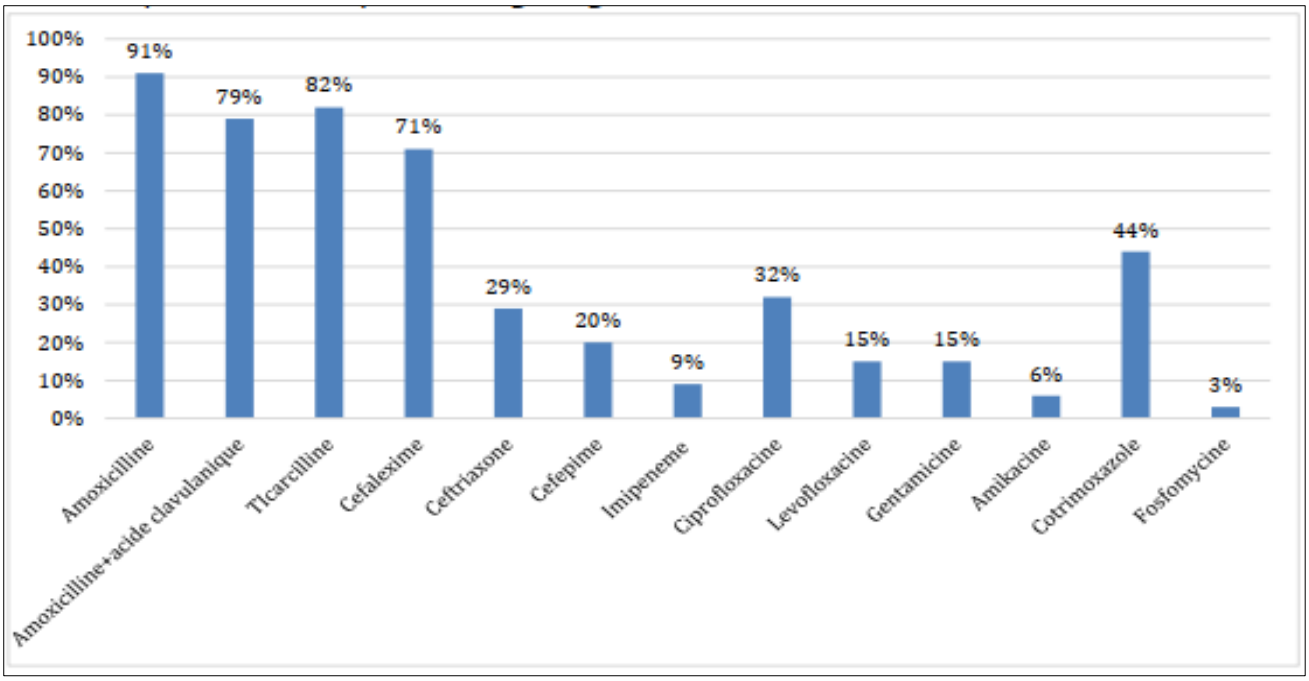

Figure 5: Resistance rates of Enterobacteriaceae to the antibiotics tested

DISCUSSION

Bacteremia is diagnosed by means of a blood culture, which consists of culturing circulating blood that is normally sterile, in order to rapidly detect and identify the infectious agent responsible. Whether blood cultures are monitored manually or automatically, two vials are usually inoculated for each sample, one aerobic and one anaerobic. Since the isolation of anaerobic bacteria in blood cultures is constantly decreasing, the appropriateness of the anaerobic vial could be discussed, except in cases of suspected gynaecological, otorhinolaryngological or colorectal infections. However, certain strains of streptococci and enterococci thrive in an anaerobic atmosphere, and many aero-anaerobic bacteria, and even strict aerobes (Pseudomonas aeruginosa in the presence of nitrates), can grow anaerobically. Finally, the main advantage is that inoculation of the anaerobic flask doubles the volume of blood cultured [5]. Blood sampling must be carried out after rigorous asepsis. Any contamination by skin or environmental germs may compromise the culture of the bacteria of interest and/or interfere with the interpretation of the result. Gloves must be worn, but beforehand, the sampler must wash his or her hands with a hydro-alcoholic solution. The sampling system generally consists of a tube with a needle at each end, one for venipuncture and the other for vial inoculation via an adapter. Venipuncture is the usual method for sampling blood cultures, as other puncture sites, such as venous or arterial catheters, increase the frequency of contamination. However, it should be borne in mind that the skin is home to a bacterial flora consisting mainly of Staphylococci and related organisms (Staphylococcus epidermidis, S. saprophytes, Micrococcus, etc.) and aerobic corynebacteria. The number of skin bacteria is estimated at between 102 and 105 per cm2, hence the importance of rigorous asepsis before sampling to avoid any risk of contamination of vials by these germs [5]. The interpretation of positive blood cultures is straightforward if the same germ is found in several samples, and if the clinic is suggestive. Moreover, when a specific pathogen (Brucella spp., Listeria spp., Salmonella spp., Haemophilus spp., Neisseria meningitidis, Streptococcus pneumoniae, HACEK group, Pasteurella spp., Campylobacter spp., Bacteroides spp. and fungal elements) is found, even from a single positive blood culture, there is no doubt as to the etiology of the infection. On the other hand, when a commensal germ is isolated from both vials of a single blood culture, or from a single vial, the bacteriologist must attempt to distinguish between contamination and true infection. This interpretation is impossible without close collaboration with the clinician, especially as the germs isolated (in some cases Staphylococcus aureus and often coagulase-negative Staphylococci, Corynebacterium spp., Bacillus spp. and Propionibacterium spp.) generally belong to the cutaneous and/or environmental flora. Consequently, a single blood culture should be banned from clinical practice, as its interpretation in the event of a positive result is very delicate. This problem is also encountered when the patient is a carrier of foreign material, catheter or prosthesis, since coagulase-negative Staphylococci, particularly Staphylococcus epidermidis, are predominantly isolated from blood cultures [5]. Negative blood cultures most often indicate a true absence of bacteria in the blood. However, when faced with a clinical context suggestive of sepsis, infective endocarditis or any other infectious syndrome, false negativity should always be considered. There are many causes of culture failure: samples taken at the wrong time, too late in the course of the illness; samples taken

under antibiotic therapy; insufficient quantity of inoculated blood; localized infection without bacteremia; microorganism impossible to culture, or non-bacterial origin. Negative blood cultures may also be due to a microorganism that is difficult to culture, where the choice of subculture conditions is inappropriate and/or the culture time too short. In fact, for certain micro-organisms with specific nutrient requirements, subcultures may be performed on different media and in an atmosphere adapted to the morphology and clinical context, notably for bacteria such as Brucella spp., Campylobacter spp., Legionella spp., Mycoplasma spp., bacteria of the HACEK group, or anaerobic bacteria [5]. Numerous studies have demonstrated the importance of blood cultures for the detection of bacteremia, such as those by Diekema DJ *et al*., and Takeshita N. *et al*., [6, 7]. According to a study carried out in Tunis 2021[8], the positivity rate of blood cultures was 7.8%. Similarly, for the study conducted at the microbiology laboratory, Hôpital d'Instruction des Armées, France 2014 [9], the positivity rate was 11.3%. However, in a Moroccan study conducted at Hôpital Militaire d'Instruction Mohammed V in Rabat, the positivity rate was 16% [10]. In our series, the positivity rate was 31%, which is higher than that reported in the three previous studies. The disparities in the literature concerning the rate of versus the number of blood cultures performed can be explained by several factors. In fact, it is standard practice in some hospitals to perform blood cultures on all patients presenting with a temperature above 38°C° or 38.3° C°. However, the literature does not support this strategy [11]. The rate of bacteremia in relation to the number of blood cultures taken may therefore be low in hospitals that take blood cultures for all febrile patients, as may the number of blood cultures taken. Shivering, on the other hand, is more predictive of bacteremia than fever, particularly severe shivering, which has a high positive likelihood value (PLV) for bacteremia (PLV=4.7) [12]. The timing of blood sampling is therefore crucial for the detection of bacteria in blood. The positivity rate can be seen to be high in studies carried out in hospitals that insist on these recommendations. The clinical context is also a major factor in predicting bacteremia. The source of infection can be used to stratify patients into those at low, medium and high risk of bacteremia. Cellulitis, for example, is at low risk (2%) compared with pyelonephritis (19%-25%), acute bacterial meningitis (53%) or septic shock (69%) [11]. However, the problem of subjectivity in the interpretation of a positive blood culture, mainly for low pathogenicity germs, certainly plays a role in the differences observed in the literature. The table below summarizes the rate of bacteremia in relation to blood cultures taken, according to different series in the literature. (Table 1)

Table 1: Rates of bacteremia versus blood cultures in different studies

Séries	Pays	Année	Taux des hémocultures positives
S. Lahmar et al[8]	Tunis	2021	7,8%
A. Bousquet et al[9]	France	2014	11,3%
W.E. Faria et al[10]	Maroc (Rabat)	2022	16%
Notre série	Maroc(Meknès)	2023	31%

The rate of Gram-negative bacteria in our study was 61%. This predominance was also reported in the Tunisian study by Lahmar *et al*., with a rate of 80%, as well as in the series by Bousquet *et al*., (France 2014) and the series by Faria *et al*., (Rabat 2022), which showed rates of 70.8% and 56% respectively. In contrast, the BGN rate in the series by El Maataoui *et al*., (Rabat 2009) was 24%. Escherichia coli was the most isolated Gram-negative bacterium in our study, occupying first place in terms of bacteremia, with an isolation rate of 26% among all bacteria identified. This result is close to the series by A. Bousquet *et al*., who found a rate of 18.7%. Lower rates were found in the series by W.E Faria *et al*., and the series by A. El Maataoui *et al*., El Maataoui *et al*., with rates of 7% and 9% respectively. The KES group represented 22% of isolates in our series. A similar rate was observed in the Faria *et al*., series, representing 25% of all bacteremias studied. On the other hand, the results were lower in the French study and the study carried out at the Mohamed V military training hospital in Rabat (2009), with rates of 14.7% and 9% respectively. The table below shows the percentage of Gram-negative bacteria in relation to the total number of bacteria detected in different studies (Table 2).

Table 2: Ratio of Gram-negative bacteria to total bacteria identified in various studies

Série	Pays	BGN	Escherichia coli	KES
S. Lahmar et al[8]	Tunis	80%	-	-
A. Bousquet et al[9]	France	70,8%	18,7%	14,7%
W.E. Faria et al[10]	Maroc (Rabat 2022)	56%	7%	25%
A. EL Maataoui et al[13]	Maroc (Rabat 2009)	24%	9%	9%
Notre série	Maroc (Meknès)	61%	26%	22%

The rate of gram-positive bacteria in our study was 30%. This rate is almost the same as that of the Moroccan study carried out at the Hôpital Militaire d'Instruction Mohamed V in Rabat (2022), which found 33% gram-positive bacteria [10]. The series by S. Lahmar *et al*., (Tunis 2021) [8], and A. Bousquet *et al*., (France 2014) [9], also found gram-positive bacteria rates of 12% and 18.5% respectively, which are lower than those reported by our study and the series by W.E Faria *et al*., [10], (Rabat 2022). Furthermore, a study carried out at the Mohamed V Military Training Hospital in Rabat (2009) [13], showed a Gram-positive bacteria rate of 60%, which is very high compared with previous series. During our study period, Staphylococcus aureus was the most frequent Gram-positive bacterium, accounting for 13% of all bacteremias. A higher rate was observed in the series by Faria *et al*., (Rabat 2022) and the series by El Maataoui *et al*., (Rabat 2009), with Staphylococcus aureus the predominant bacterium responsible for 16% of all bacteremias. In the series by Lahmar *et al*., and Bousquet *et al*., the rate of Staphylococcus aureus was lower than that reported in our series and the two series from the Hôpital Militaire d'Instruction Mohamed V de Rabat (2009, 2022), representing 6% and 4.3% respectively. Coagulase-negative Staphylococci occupied first place in terms of bacteremia in the series by Faria *et al*., (Rabat 2022) and the series by EL Maataoui *et al*., (Rabat 2009), with rates of 16% and 39% respectively. A lower rate was observed in the series by Bousquet *et al*., (France 2014), where coagulase-negative Staphylococci accounted for 6.7% of all bacteremias, while Staphylococci epidermidis represented 5.4% of all bacteremias. The table below shows the percentage of Gram-positive bacteria in relation to the total number of bacteria identified in different studies (Table 3).

Table 3: Ratio of gram-positive bacteria to total bacteria identified in various studies

Série	Pays	Gram positif	S. aureus	S. non aureus
S. Lahmar et al[8]	Tunis	14%	8%	-
A. Bousquet et al[9]	France	39%	16%	16%
W.E. Faria et al[10]	Maroc (Rabat 2022)	18,7%	4,3%	6,7%
A. EL Maataoui et al[13]	Maroc (Rabat 2009)	60%	16%	39%
Notre série	Maroc (Meknès)	30%	13%	7%

In our study, Enterobacteriaceae accounted for 50% of isolates, making them the bacterial family most frequently encountered in bacteremia. Escherichia coli, Klebsiella spp and Enterobacter spp accounted for 51%, 29% and 9% of these isolates respectively, and 26%, 15% and 6% of all bacteremias. Other Enterobacteriaceae accounted for no more than 2% of bacteremias. Analysis of the resistance profile of these Enterobacteriaceae to the antibiotics tested showed: 91% resistance to amoxicillin was observed among the Enterobacteriaceae in our study. An almost identical rate of 90% was observed in the study carried out at the Hôpital Militaire d'Instruction Mohamed V in Rabat in 2022. This rate is close to the results found in the studies carried out in Tunis in 2021 and Rabat in 2009, which each achieved a rate of 80%. A lower rate is objectified in the series of Bousquet *et al*., (France 2014) with a rate of 60%. (Table 4)

Tableau 4 : Frequency of resistance of Enterobacteria to Amoxicillin according to different studies

Série	Pays	Entérobactéries
S. Lahmar et al [8]	Tunis 2021	80%
A. Bousquet et al [9]	France 2014	60%
W.E Faria et al [10]	Rabat 2022	90%
A. El Maataoui et al [13]	Rabat 2009	80%
Notre série	HMMI de Meknès	91%

In our study, third-generation cephalosporin resistance in Enterobacteriaceae was noted in 29% of Enterobacteriaceae isolates, a rate close to that found in the study carried out in Tunis (2021), which objectified a rate of 28%. A C3G resistance rate of 4% and 10% of Enterobacteriaceae isolates, which are low compared with previous studies, were observed in the series by Bousquet *et al*., (France 2014) and the series by Faria *et al*., (Rabat 2022) respectively. In contrast, the Moroccan study carried out at the Hôpital Militaire d'Instruction Mohamed V in Rabat in 2009 showed a conservation of Enterobacteriaceae susceptibility to C3Gs. Resistance to Cefepime concerned 20% of Enterobacteriaceae isolates in our study, versus 39% in a study carried out in Rabat in 2022. In our series, 20% of Enterobacteriaceae isolates showed an ESBL profile, a result close to that found in the series by Lahmar *et al*., (Tunis 2021), who reported a rate of 16.7%. In contrast, the studies carried out in France in 2014 and Rabat in 2022 showed lower rates than the previous studies, at 2% and 4.5% respectively. Carbapenem resistance in Enterobacteriaceae concerned 9% of Enterobacteriaceae isolates, particularly Escherichia coli in our study. Comparing our results with those of Lahmar *et al*., (Tunis 2021), a lower rate of 1.5% was reported in our study. A high rate compared with our study was objectified in the study carried out at the Hôpital Militaire d'Instruction Mohamed V in Rabat in 2022, which was 31.5%. For Fluoroquinolones, our study showed a 32% resistance rate among Enterobacteriaceae isolates. This result is in line with that found in France in 2014, which showed a rate of 27%, and that found in Rabat in 2009, which showed a rate of 20%. On the other hand, a high rate of resistance to Fluoroquinolones was reported in the study carried out in Rabat in 2022, which showed a rate of 50% of Enterobacteriaceae isolates. Resistance to Amikacin in isolated Enterobacteriaceae concerned 6% of Enterobacteriaceae isolates, a rate close to that found in a study carried out in Rabat in 2022, which was 14%.

Conclusion

Neoplastic pathology and aggressive treatments are responsible for profound and prolonged immunosuppression, which increases the risk of infection in onco-hematology. Infection is a major cause of mortality and morbidity in onco-hematology patients, given their state of immunosuppression. It is a diagnostic and therapeutic emergency. They are frequent conditions, prolonging hospital stays and increasing the cost of care, and their course is generally fatal in the absence of rapid, appropriate antibiotic treatment. Blood culture remains the routine and reference test for detecting bacteremia. In view of the emergence and increase in bacterial resistance to antibiotics, it is essential to update the epidemiological profile of bacteria and evaluate their sensitivity profiles in order to rationalize initial antibiotic therapy, particularly in the case of bacteremia. Bacteremia were secondary to BGN (61%), mainly Escherichia coli (26%), CGP (30%) dominated by Staphylococci (20%) and yeasts (9%). In conclusion, this work should make it possible to adapt probabilistic antibiotic therapy for bacteremia in onco-hematology patients, and to implement a strategy for controlling the development and spread of multi-resistant bacteria. Reinforcing hygiene measures in these patients could help reduce multi-resistant bacteremia.

Bibliographical References

1. Ebongue, C. O., Mefo'o, J. N., Dongho, E. N., Moukoko, E. E., Adiogo, D., & Beyihabd, G. (2014). Profil Bactériologique et sensibilité aux antibiotiques des isolats d'hémoculture (2006–2011) à Douala, Cameroun. *Revue Malienne d'Infectiologie et de Microbiologie*, 27-39.
2. Blot, F. (2003). Pronostic des infections en oncohématologie. *Réanimation*, *12*(3), 235-247.
3. «résistance aux antimicrobiens : rapport mondial sur la surveillance (who.int)».
4. Levy, S. B., & Marshall, B. (2004). Antibacterial resistance worldwide: causes, challenges and responses. *Nature medicine*, *10*(Suppl 12), S122-S129.
5. Garnier, F., Mainardi, J. L. bactériologie médicale techniques usuelles(Missing)
6. Diekema, D. J., Hsueh, P. R., Mendes, R. E., Pfaller, M. A., Rolston, K. V., Sader, H. S., & Jones, R. N. (2019). The microbiology of bloodstream infection: 20-year trends from the SENTRY antimicrobial surveillance program. *Antimicrobial agents and chemotherapy*, *63*(7), 10-1128.
7. Takeshita, N., Kawamura, I., Kurai, H., Araoka, H., Yoneyama, A., Fujita, T., ... & Ohmagari, N. (2017). Unique characteristics of community-onset healthcare-associated bloodstream infections: a multi-centre prospective surveillance study of bloodstream infections in Japan. *Journal of Hospital Infection*, *96*(1), 29-34.

8. Lahmar, S. « profil bactériologique et sensibilité aux antibiotiques des bactéries isolées au service d'hématologie de l'hopital aziza othmana »
9. Bousquet, A., Malfuson, J. V., Sanmartin, N., Konopacki, J., MacNab, C., Souleau, B., ... & Martinaud, C. (2014). An 8-year survey of strains identified in blood cultures in a clinical haematology unit. *Clinical Microbiology and Infection*, *20*(1), O7-O12.
10. Faria, W. E. « épidémiologie des isolats d'hémocultures du service d'hématologie clinique de l'hôpital militaire d'instruction mohammed v de rabat ».
11. Sciotto, L., Abbas, M. O. H. A. M. E. D., & Serratrice, J. (2017). Détection d'une bactériémie par des hémocultures: qui en bénéficie. *Revue médicale suisse*, *13*(579), 1774-1778.
12. Coburn, B., Morris, A. M., Tomlinson, G., & Detsky, A. S. (2012). Does this adult patient with suspected bacteremia require blood cultures?. *Jama*, *308*(5), 502-511.
13. Elmaataoui, A., Elghazouani, M., Eric, N. A., Doghmi, K., Mikdame, M., Elhamzaoui, S., & Elouennass, M. (2009). Épidémiologie des isolats d'hémocultures: expérience d'un service d'hématologie clinique. *Ann Biol Clin*, *67*(3), 293-7.