Clinical outcome of patients with positive blood culture in a public university hospital: a cross-cross-set study

Desfechos clínicos de pacientes com hemocultura positiva em hospital público universitário: um estudo transversal

Resultado clínico de pacientes con hemocultivo positivo en un hospital público universitario: un estudio cruzado

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RESUMO

Objetivo: Avaliar os desfechos clínicos de pacientes sépticos com hemoculturas (HMC) positivas em um hospital universitário. Método: Trata-se de um estudo transversal com coleta de dados retrospectiva com base no banco de dados institucional do Programa Intra-Hospitalar de Combate à Sepse do Hospital terciário do Sul do Brasil e revisão de prontuários eletrônicos. A amostra foi de pacientes maiores de 18 anos com diagnóstico de sepse ou choque séptico, que não tiveram limitação terapêutica definida durante o atendimento por sepse, que internaram no hospital entre janeiro e dezembro de 2022. A análise dos dados foi por meio de variáveis quantitativas, a associação foi avaliada pelo teste qui-quadrado de Pearson e a comparação de medianas foi realizada pelo teste de Mann-Whitney, adotando nível de significância de 5%. Resultados: Entre 519 pacientes incluídos, o número de pacientes sépticos foi de 241 (46,4%) e choque séptico 277 (53,4%). Em relação a aderência da HMC foi de 174 (33,5%) com uma taxa de hemocultura positiva de 30,5% (141) e 69,5% (321) negativos. No que se refere à associação dos resultados das HMC com a administração de antibiótico, 243 pacientes iniciaram antes da coleta e a taxa de óbitos foi de 170 (32,8%). Conclusão: Constatou-se através da análise dos dados que há adesão às hemoculturas na instituição em estudo, porém o tempo de coleta ultrapassa o recomendado em até uma hora. A HMC positiva não teve relação significativa com o óbito.

Descritores: Sepse; Hemocultura; Unidades de terapia intensiva.

ABSTRACT

Objective: To evaluate the clinical outcomes of septic patients with positive blood cultures (BC) in a university hospital. Method: This study is a cross-sectional analysis utilizing retrospective data collection based on the institutional database of the Intra-Hospital Sepsis Combat Program at a tertiary hospital in southern Brazil, along with a review of electronic medical records. The sample consisted of patients aged 18 years or older who were diagnosed with sepsis or septic shock and who did not have defined therapeutic limitations during their sepsis treatment, admitted to the hospital between January and December 2022. Data analysis was conducted using quantitative variables, with associations evaluated through Pearson's chi-squared test and median comparisons performed using the Mann-Whitney test, adopting a significance level of 5%. Results: Among the 519 patients included in the study, 241 (46,4%) were diagnosed with sepsis and 277 (53,4%) with septic shock. The adherence to blood culture protocols was 174 (33,5%), with a positive blood culture rate of 30,5% (141) and 69,5% (321) negative results. Regarding the association of blood culture results with antibiotic administration, 243 patients received antibiotics prior to sample collection, and the mortality rate was 170 (32,8%). Conclusion: Data analysis revealed that there is adherence to blood culture protocols within the institution under study; however, the time taken for sample collection exceeded the recommended duration by up to one hour. Positive blood cultures did not demonstrate a significant relationship with mortality.

Descriptors: Sepsis; Blood culture; Intensive care units.

RESUMEN

Objetivo: Evaluar los resultados clínicos de pacientes sépticos con hemocultivos positivos (HMC) en un hospital universitario. Método: Se trata de un estudio transversal con recolección de datos retrospectiva basada en la base de datos institucional del Programa Intrahospitalario de Combate a la Sepsis del Hospital Terciario del Sur de Brasil y revisión de historias clínicas electrónicas. La muestra estuvo conformada por pacientes mayores de 18 años con diagnóstico de sepsis o shock séptico, que no tuvieron limitación terapéutica definida durante el tratamiento para la sepsis, que ingresaron al hospital entre enero y diciembre de 2022. El análisis de los datos fue mediante variables cuantitativas, se evaluó la asociación. mediante la prueba chi-cuadrado de Pearson y la comparación de medianas se realizó mediante la prueba de Mann-Whitney, adoptando un nivel de significancia del 5%. Resultados: Entre los 519 pacientes incluidos, el número de pacientes sépticos fue 241 (46,4%) y shock séptico 277 (53,4%). En cuanto al cumplimiento del HMC, fue de 174 (33,5%) con una tasa de hemocultivos positivos del 30,5% (141) y del 69,5% (321) negativos. En cuanto a la asociación de los resultados de HMC con la administración de antibióticos, 243 pacientes iniciaron antes de la recolección y la tasa de mortalidad fue de 170 (32,8%). Conclusión: Se encontró mediante el análisis de datos que existe adherencia a los hemocultivos en la institución en estudio, pero el tiempo de recolección supera el tiempo recomendado hasta en una hora. El HMC positivo no tuvo relación significativa con la muerte.

Descriptores: Sepsis; Hemocultivo; Unidades de cuidados intensivos.

ORIGINAL

Introduction

Sepsis is an dysregulated response of the body due to infection. The new definition of sepsis sought a more specific term and included the presence of suspected or confirmed infection. In addition to the presence of infection, there must be an increase of 2 points or more in the Sequential Organ Failure Assessment (SOFA) score. Septic shock, on the other hand, is related to persistent hypotension even after adequate volume resuscitation, with the need for vasopressors and hyperlactatemia.[1]

Globally, it is estimated that there are around 15 to 17 million sepsis patients annually, resulting in about 5 million deaths per year.[2] In Brazil, there are 400,000 cases per year, with approximately 240,000 deaths from sepsis. Since 2017, the World Health Organization has considered it a public health issue. A study conducted by the Latin American Institute of Sepsis (ILAS) found that 30% of patients admitted to Intensive Care Units (ICU) have sepsis or septic shock, with a high mortality rate (67.4%) compared to other countries such as Germany (43.4%), Australia (32.6%), and India (39%).[3]

Blood culture (HMC) is an important marker in the diagnosis of bloodstream infections and sepsis. This test can assess the presence of microorganisms in the bloodstream. The collection is performed using a peripheral and/or central blood sample from the patient, which is inoculated into bottles with specific culture media for bacteria, yeasts, and fungi, and then evaluated in the biochemistry department through an automated process. In order for the collected samples to be considered adequate, there are some recommendations from the Ministry of Health, such as hand hygiene, collection before the initiation of antibiotic therapy, correct antisepsis before collection, and proper asepsis of the bottles, as well as identification, adequate volume for each bottle, and the number of samples depending on the suspicion being investigated. [4]

The nurse is a key player in the identification of organ dysfunction, the implementation of the sepsis protocol, and the proper collection of blood cultures. Therefore, the nurse is essential in the care and management of patients with sepsis.

Method

This is a cross-sectional study with retrospective data collection based on the institutional database of the Intra-Hospital Sepsis Combat Program (PICS) of the Tertiary Hospital of Southern Brazil and a review of electronic medical records.

The research was conducted at a public, tertiary, and university hospital. It is a reference hospital for high-complexity care, with an Intensive Care Unit (ICU) consisting of 6 units, totaling 55 beds.

Septic patients were those presenting organ dysfunction related to infection, while septic shock patients were those who progressed to tissue hypoperfusion with arterial hypotension and the need for vasopressor drugs.[1]

Regarding the blood cultures (HMCs), venous or arterial blood samples were considered, collected in a specific bottle, with a volume between 8 and 10 ml, according to the standardized bottle for adults by the institution. The

technique used for HMCs is generally conventional culture and qualitative method, performed by an automated method (BACTALERT). The growth time of cultures on Agar plates is 3-4 days.[5]

The research data for each patient was obtained from the electronic system, through the selection of microbiology tests, evaluating the number of cultures requested, the number of positive cultures, and types of germs.

The sample consisted of patients over 18 years of age with a diagnosis of sepsis or septic shock who did not have defined therapeutic limitation during sepsis treatment, who were admitted to the hospital between January and December 2022, and who were consequently included in the PICS database.

Patients under 18 years old, those with a decision of therapeutic limitation within the first 24 hours of admission, or those who were re-admitted to the ICU for sepsis or septic shock during the same hospitalization were excluded from the study, as they were already included in the institutional database.

The sample size was convenience-based, as the one-year period was established for collecting all patients admitted to the hospital for sepsis as per the aforementioned definitions.

Quantitative variables were described by mean and standard deviation or median and interquartile range, depending on the variable distribution. To evaluate the normality of distribution, the Kolmogorov-Smirnov test along with asymmetry and kurtosis analysis were checked. Categorical variables were described by absolute and relative frequencies.

The association between categorical variables was evaluated using Pearson's chi-squared test. Median comparisons were made using the Mann-Whitney test. The significance level adopted was 5% ($p \leq 0.05$), and the analyses were performed in the SPSS version 28.0 software.

Data collection was performed through a review of electronic medical records and an active search for data related to positive HMCs. Descriptive data are part of the systematic and continuous collection carried out by the institution's PICS for the past 10 years.

This study was approved by the Research Ethics Committee of HCPA under CAAE number 2016-0317. Informed Consent (IC) is waived by the committee since this is an observational study with data collection only from medical records.

Results

A total of 519 patients were identified, of which 286 (55.1%) were male, with an average age of 59.8 (± 16.6) years. The most prevalent comorbidity prior to the septic episode was "other diseases," found in 432 (83.2%) patients, followed by Systemic Arterial Hypertension (SAH) and Diabetes Mellitus (DM), present in 50.9% and 32.9% of cases, respectively. Clinical causes were the leading reason for hospitalization, with 409 (78.8%) patients, and 362 (69.7%) of the infections had a community-acquired origin. The most common septic foci were pulmonary, with 178 (34.3%) cases, followed by abdominal with 128 (24.7%), urinary with 65 (12.5%), and bloodstream infections with 43 (8.3%).

Regarding triage, the most prevalent clinical signs were tachycardia in 408 (78.6%) patients, hypoxemia in 336 (64.7%), tachypnea in 315 (60.7%), hypotension in 312 (60.1%), and altered mental status in 269 (51.8%). Among

laboratory changes, leukocytosis was present in 297 (57.2%) patients, lactate alterations in 296 (57%), and creatinine changes in 237 (45.7%). The PaO2/FiO2 ratio was decreased in 284 (54.7%) patients. The average number of organ dysfunctions presented was 3.3 (± 1.5).

Regarding the scores applied to these patients, the SOFA score had an average of 7.7 (± 3.9), and the Simplified Acute Physiology Score (SAPS III) had an average of 69.0 (±17.3), demonstrating the severity of the sample. The mortality predicted by the SAPS was 51.3 (±26.7), and when adjusted for Latin America, it showed an average of 61.6 (±27.9).

The number of septic patients was 241 (46.4%), and septic shock was present in 277 (53.4%). Of these individuals, 262 (50.5%) used mechanical ventilation (MV) within the first 24 hours and stayed in the ICU for 5.3 days (2.2-12.1%). The time to organ dysfunction presentation was 1.4 hours (0.5-3.7).

Regarding lactate measurements, 416 patients (80.2%) had lactate levels assessed. Values < 2 mmol/L were found in 37.7%, and values > 4 mmol/L in 26.9%.

Table 1 – Characteristics of septic patients in a public university hospital. Porto Alegre, RS, Brazil, 2024 (n = 519).

Variables	n=519 (%)
Comorbidities – n(%)	
Neoplasia	107 (20,6)
Other immunological conditions	164 (31,6)
Diabetes Mellitus	171 (32,9)
Heart failure	105 (20,2)
Chronic kidney disease	105 (20,2)
Hypertension	264 (50,9)
Other diseases	432 (83,2)
No comorbidities	13 (2,5)
Type of hospitalization – n(%)	
Clinical	409 (78,8)
Surgical	110 (21,2)
Type of infection – n(%)	
Community-acquired	362 (69,7)
Healthcare-associated	157 (30,3)
Infectious focus – n(%)	
Pulmonary	178 (34,3)
Urinary	65 (12,5)
Abdominal	128 (24,7)
Bloodstream	43 (8,3)
Other foci	105 (20,2)
Present at triage – n(%)	
Hyperthermia	84 (16,2)
Hypothermia	89 (17,1)
Tachycardia	408 (78,6)
Tachypnea	315 (60,7)
Leukocytosis	297 (57,2)
Leukopenia	65 (12,5)
Hypotension	312 (60,1)

Creatinine alteration	237 (45,7)
Bilirubin alteration	63 (12,1)
Platelet alteration	93 (17,9)
Lactate alteration	296 (57,0)
Coagulopathy	102 (19,7)
PaO2/FiO2 ratio	284 (54,7)
Hypoxemia (SpO2)	336 (64,7)
Sensory decline	269 (51,8)
Total dysfunctions – mean ± SD	3,3 ± 1,5
SOFA score – mean ± SD	7,7 ± 3,9
SAPS III score – mean ± SD	69,0 ± 17,3
Predicted SAPS III score – mean ± SD	51,3 ± 26,7
Adjusted SAPS III score – mean ± SD	61,6 ± 27,9
Sepsis – n(%)	241 (46,4)
Septic shock – n(%)	277 (53,4)
Used mechanical ventilation in the first 24 hours – n(%)	262 (50,5)
ICU stay (days) – median (P25 – P75)	5,3 (2,2 – 12,1)
Dysfunction duration (hours) – median (P25 – P75)	1,4 (0,5 – 3,7)
Measured lactate – n(%)	416 (80,2)
< 2	157/416 (37,7)
2 a 4	147/416 (35,3)
>4	112/416 (26,9)

In Table 2, blood cultures (BC) were collected in 462 (89%) of the patients. Collection prior to sepsis occurred in 40.3% of patients, with a median time of 2.0 hours (0.6 to 6.3) for the collection after organ dysfunction. Adherence to blood culture collection was 174 (33.5%), with a positive blood culture rate of 30.5%.

Regarding antibiotic (AB) administration, 53.8% of the patients received the first dose before the blood culture collection, with an adherence to antibiotic therapy in 348 (67.1%) patients. The overall mortality rate was 170 (32.8%).

Table 2 - Variables Characterizing Blood Culture Collection, Antibiotic Administration, and Deaths. Porto Alegre, RS, Brazil, 2024

Variables	**n=519**
Blood culture collected - n/total (%)	462 (89,0)
Before sepsis	186/462 (40,3)
Time for blood culture collection (h)	2,0 (0,6 – 6,3)
Overall blood culture adherence – n(%)	174 (33,5)
Positive blood culture rate – n/total (%)	141/462 (30,5)
Administered broad-spectrum antibiotics – n(%)	
No	17 (3,3)
Yes	502 (96,7)
Administração ATB – n/total (%)	
Before blood culture	243/452 (53,8)

After blood culture	209/452 (46,2)
Overall antibiotic adherence – n(%)	348 (67,1)
Overall mortality – n (%)	170 (32,8)

Figure 1 shows the percentage of deaths in relation to the time to start antibiotic therapy. Antibiotic administration within 1 hour occurred in the majority of patients (66.1%) with a death rate of 30.3%. Mortality was higher in patients who received the first dose between 2 and 4 hours after the onset of sepsis, with 35 (6.7%) patients in this group and a death rate of 45.7%. Mortality was also higher in patients who received antibiotics more than 6 hours after the onset of organ dysfunction.

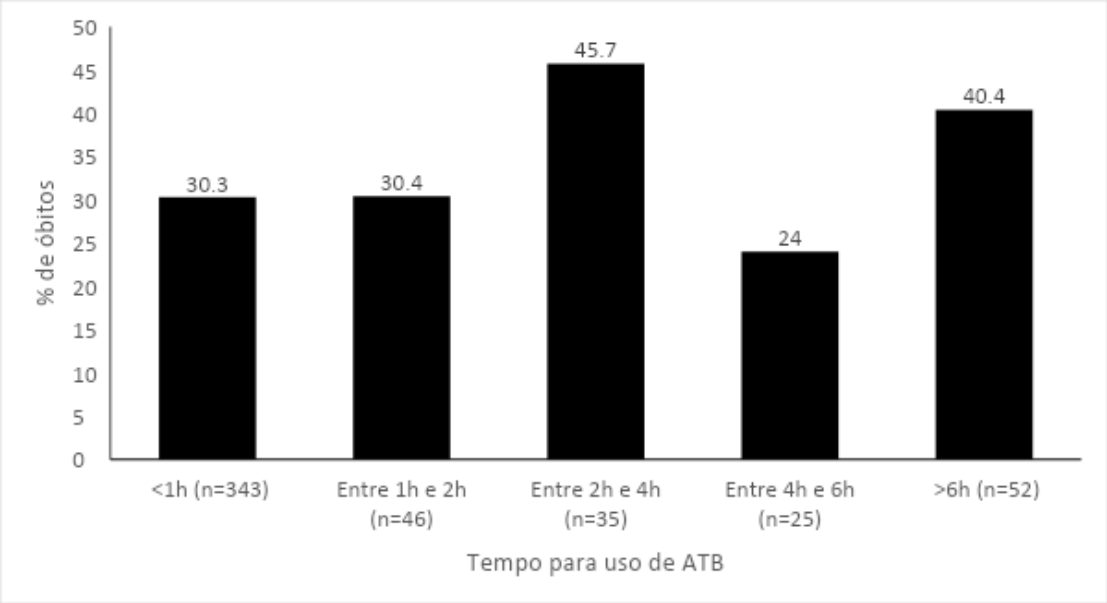

Figure 1 – Percentage of deaths according to time of antibiotic use (chi-square test; p=0.205). Porto Alegre, RS, Brazil 2024

Table 3 shows the patients who had blood cultures (HMC) requested, totaling 462 (89%) patients. Of these, 141 (30.5%) had positive results and 321 (69.5%) had negative results.

The groups with positive or negative HMC results were significantly similar in terms of hospital discharge, in-hospital mortality, time to organ dysfunction, mechanical ventilation (MV) time, ICU days, and lactate levels.

Regarding the results of the HMCs and antibiotic (ATB) administration, a difference was observed between the groups with positive and negative HMC results concerning adherence to ATB. The positivity rate was significantly higher (55.3%) in patients who received antibiotics after the blood culture compared to those who received antibiotics before the collection (44.7%).

Concerning laboratory collection, most patients had their HMC collected after developing sepsis. Among patients with positive HMC results, 53 (37.6%) had samples collected before sepsis onset, and 77 (55.5%) had samples collected afterward.

Table 3 – Associations with positive blood culture. Porto Alegre, RS, Brazil, 2024.

Variables	Positive Blood Culture n=141 (%)	Negative Blood Culture n=321 (%)	p
Outcome			0,324[a]
Discharge	87 (61,7)	221 (68,8)	
Transfer	1 (0,7)	2 (0,6)	
Death	53 (37,6)	98 (30,5)	
ICU Admission – n(%)	83 (58,9)	205 (63,9)	0,359[a]
ICU Stay (days) – median (P25 – P75)	4,7 (1,9 – 13,2)	5,8 (2,6 – 12,1)	0,663[b]
Time to Dysfunction (hours) – median (P25 – P75)	1,2 (0,5 – 2,8)	1,4 (0,5 – 3,5)	0,803[b]
Antibiotic Administration – n(%)			**0,016**[a]
Before Blood Culture	63 (44,7)	180 (57,7)	
After Blood Culture	78 (55,3)	132 (42,3)	
Used Mechanical Ventilation in First 24 hours – n(%)	66 (46,8)	167 (52,0)	0,352[a]
Antibiotic Adherence – n(%)	89 (63,1)	224 (69,8)	0,193[a]
Blood Culture Collected – n(%)			0,501[a]
Before Sepsis	53 (37,6)	133 (41,4)	
After Sepsis	88 (62,4)	188 (58,6)	
Lactate Value – n(%)			0,234[a]
< 2	49 (40,2)	99 (38,7)	
2 a 4	36 (29,5)	96 (37,5)	
> 4	37 (30,3)	61 (23,8)	

[a] Teste qui-quadrado; [b] Teste de Mann-Whitney

Discussion

The most prevalent comorbidities were hypertension (HTN) and diabetes mellitus (DM). In Vietnam, a cohort study analyzed the most common comorbidities in septic patients and showed that cardiovascular diseases (31%), DM (26.6%), and chronic neurological diseases (14.3%) were the most common.6 Another study conducted in São Paulo found that 51.2% of patients had HTN and 34.1% had DM.7 It is important to emphasize that in this article, only 2.5% of patients had no comorbidities, demonstrating the comorbid profile of patients commonly admitted to the institution. This is also reinforced by the high SOFA and SAPS scores, as seen in Thailand with scores ≥ 6 and ≥45; in Israel with scores of 7 and 51, and Italy with scores of 10 and 49.[8,9,10]

To minimize risks and provide appropriate therapy, it is essential to identify the infectious focus within the first 6 hours after diagnosis.[11,1] Pulmonary

sepsis was the predominant focus, followed by abdominal, urinary, and bloodstream infections. Studies conducted in Brasília and Vietnam demonstrated a predominance of the pulmonary focus (45.7% and 56.7%), abdominal (24.7% and 24.2%), and urinary (8.6% and 14.7%).12,13 However, in Israel, there was a predominance of urinary tract infections (23.9%), followed by bloodstream infections (20.5%) and pulmonary infections (17%).[14] The community origin in most patients is related to the profile of the tertiary hospital of the institution evaluated. Only 17.1% of infections were acquired in the ICU in an Israeli study, of which 59.3% were from the surgical ICU and 28.7% had septic shock associated.14 This percentage is much lower than the one found in the analysis, which was 53.4% of septic shock. The ILAS 2023 report shows sepsis in 21.2% and septic shock in 53.5%.[15]

According to the Surviving Sepsis Campaign (SSC), early identification and prognosis are correlated.[1] In this article, the most common clinical signs altered in sepsis triage were those that can easily be assessed at the bedside: tachycardia, hypoxemia, tachypnea, hypotension, and altered mental status. This was followed by laboratory alterations such as leukocytosis, tissue hypoperfusion markers evaluated by serum lactate levels, and worsening renal function through increased creatinine, as well as altered lung function via decreased PaO2/FiO2 ratio. These laboratory results are easily and quickly interpretable. Similar data can be found in the ILAS 2023 report,[15] highlighting the importance of professionals knowing the signs of sepsis for quick and effective action to reduce mortality. The nurse and the nursing team, as the professionals at the bedside and closest to the patient, are potentially better prepared to identify and manage the early organ dysfunctions related to sepsis and initiate the protocol.[17]

The nursing professional plays a decisive role in planning, coordinating, and implementing measures in the clinical management of sepsis, especially in the early identification of organ dysfunctions.[1] To improve the recognition and treatment of sepsis, it is important for institutions to implement a sepsis protocol, ensuring that professionals are aware of the process in addition to the clinical aspect. The nurse plays a leadership role in the team and needs to be proficient in early warning signs, guiding their team in managing and anticipating the next steps that pertain to nursing.[15]

The scores analyzed in this study were SOFA and SAPS III, with SAPS III applied to patients who were admitted to the ICU. Both the SOFA and SAPS III scores had high averages, indicating the severity of the sample and high risk of mortality. A study conducted in Mexico in emergency services showed a mean SAPS II score of 32.47 for all patients, but the mean was significantly higher in patients who died (42.08), showing the high mortality rate of septic patients.18 A study conducted in Vietnam, which used data from septic patients in 15 ICUs across 14 different hospitals in 2019, showed a median SOFA score of 7 (IQR 4.75-10). As a result of the analysis, it was described that a SOFA score greater than 8 was directly associated with an increased risk of hospital mortality, and a score above 10 was a predictor of mortality in the ICU.[13] These findings corroborate the present article, demonstrating the severity of the sample with the percentage of patients who used mechanical ventilation in the first 24 hours of sepsis/septic shock (50.2%).

Regarding lactate, which is essential for diagnosing sepsis,1 it was observed that most patients had at least one lactate serum collection, with 37.7% within normal values and only 26.9% above 4 mmol/L. Elevated lactate levels are known to increase mortality.[19]

Patients suspected of sepsis should ideally have a blood culture collected before starting broad-spectrum antibiotics (ABs) to increase the reliability of the result.1 It is recommended to collect at least two samples from different sites with an adequate blood volume between 8-10 ml, and collecting during the febrile peak increases sensitivity. However, it is not recommended to wait for the febrile peak to perform the procedure. According to ILAS, 30-50% of individuals have positive blood cultures,[5] which is confirmed in this article, where 30.5% of blood cultures were positive, potentially related to the low percentage of bloodstream infections found.

Multiple blood culture collection helps speed up the detection of microorganisms that may not be present in all samples or may be present in very low concentrations, assisting in the timely diagnosis of systemic infections and proper treatment adjustment.[5] A study conducted in Japan analyzed the practice of multiple blood culture collections, the bacteria detected, and the adjustment of ABs associated with 30-day mortality. The multiple collection occurred less frequently in patients who died and was associated with 30-day mortality. Over the years, the 30-day mortality rate decreased, with an increase in multiple blood culture collections and a reduction in ineffective empirical antibiotic use.[20]

The present study did not evaluate multiple blood culture collections but only the collection of this test and showed that 11% of sepsis patients did not have any blood cultures collected, of which 40.3% were collected before organ dysfunction. When blood cultures were collected during AB therapy without broadening the spectrum of ABs, it was considered a post-AB dose collection, potentially worsening false-negative results, thus indicating a weakness in sepsis care. Due to its difficult identification, sepsis often masks other diseases, so patients should be continuously monitored to determine whether other diagnoses are more likely, as the clinical trajectory may change during hospitalization, increasing or decreasing the probability of sepsis. Continuous monitoring of clinical signs in these patients and the potential for new blood culture collections, as well as the titration or de-escalation of ABs, is essential.[1]

The median time for blood culture collection was 2 hours, with considerable variability, indicating oscillation in collection times and potential for improvement. More than half of the sample had received ABs before blood culture collection, but adherence to proper blood culture collection before the initiation of broad-spectrum ABs was suboptimal, highlighting a weakness in this aspect of sepsis care. Guidelines recommend that blood cultures should be collected within 1 hour before sepsis diagnosis and before administering antimicrobials.1 Adherence to blood culture collection in public hospitals was 77.1%, and in private hospitals, 79.7%.[15]

Broad-spectrum ABs are one of the main recommendations for sepsis treatment, and in the study sample, 96.7% of patients were prescribed them. However, most patients were already using them before blood culture collection, and there was inadequate adherence to antimicrobial use. For adherence to be considered proper, it is necessary that administration occur within the first hour after organ dysfunction.1 When compared to public hospitals, adherence to AB

use was 82.9%, and in private hospitals, 84.3%.15 In Florida, 81.5% of patients received ABs within the first hour in a study evaluating the implementation of a "sepsis code."[21]

Regarding the timing of antibiotic therapy initiation in relation to mortality rates, it was found that mortality was 30.3% when administered before the first hour and 45.7% between the second and fourth hours. After sepsis diagnosis, early administration of antimicrobials is one of the key therapeutic pillars. If there is a delay in infectious control and diagnosis, exceeding the 6-hour recommended window, mortality increases.1 In Brasília, a study showed that early administration within 2 hours had a mortality rate of 20%, while another study in Minas Gerais showed that administering ABs within 1 hour reduced mortality by 10.33%.1,23 In South Korea, a study evaluated the impact of the timing of AB administration on hospital mortality for patients with septic shock. The administration of ABs within the first hour reduced hospital mortality. With a delay of up to 3 hours, patients showed a 35% increase in the risk of death for each hour.24 In the United States, a study found that patients who received ABs between the third and twelfth hours had a 14% higher chance of hospital death compared to those who received ABs within 3 hours.[25]

Regarding the blood culture positivity rate, a low percentage was observed, indicating a low positivity rate for the test. A study conducted in Asia on the blood culture positivity rate and the utility of blood culture collection showed that of 73.2% of cultures collected, only 17.3% were positive. Another study in the Netherlands analyzed that 2.7% of blood cultures collected from patients with suspected sepsis were positive, while another study in Sweden observed a positivity rate of 15.8%, as well as in Indonesia, where 16.3% of blood cultures were positive, corroborating the results found in the present study.[26,27,28,29]

Moreover, there was no statistical difference between patients with positive or negative blood cultures regarding death, ICU admission, ICU stay duration, time to organ dysfunction, use of mechanical ventilation (MV), adherence to antibiotics (AB), blood culture collected before or after sepsis, and lactate levels. A 2016 study at the same institution showed a low positive blood culture rate of 30%. Analyzing these data, it can be observed that despite the years passing, there was no significant change in the positivity rate.[30] There was a statistical difference between the groups with positive and negative blood cultures regarding adherence to antibiotics, with the positivity rate ideally being higher in those who received antibiotics after the blood culture collection, compared to those who received antibiotics before the culture collection. The mortality rate was around one-third of the sample, similar to what is found in the literature due to the high severity profile and a sample biased toward ICU patients. The mortality rate in public institutions in Brazil ranges from 30-70%, and the risk of developing sepsis increases due to risk factors such as age, comorbidities, timing of antimicrobial initiation, etc.[11,31] A study indicates that sepsis is the leading cause of death in non-cardiological ICUs, with 60% hospital mortality and 38.5% ICU mortality.[12]

Conclusion

Through data analysis, it was found that blood culture collection is adhered to at the institution studied, but the collection time exceeds the recommended time by up to one hour. Positive blood cultures were not significantly associated with mortality, and mortality was higher in patients who had their first dose of antibiotics administered more than 2 hours after organ dysfunction onset.

There was a statistical difference between the groups with positive and negative blood cultures regarding adherence to antibiotics, with the positivity rate being ideally higher in those who received antibiotics after the blood culture collection, compared to those who received antibiotics before the culture collection.

Proper blood culture collection is essential in the diagnosis and clinical management of sepsis, as well as timely collection for early antibiotic therapy initiation, along with the identification of potential pathogens causing the infection. The negative impact of late blood culture collection and the early administration of antibiotics before culture collection, leading to false-negative results, should be considered, as this increases the risk of complications.

Ongoing education and adherence to institutional protocols in accordance with updated guidelines can facilitate routines in managing sepsis diagnosis.

The study has limitations regarding the patient profile, as most patients were admitted to the ICU, representing a predominance of more severe cases.

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