PUBLICAÇÃO OFICIAL DO NÚCLEO HOSPITALAR DE EPIDEMIOLOGIA DO HOSPITAL SANTA CRUZ E PROGRAMA DE PÓS GRADUAÇÃO EM PROMOÇÃO DA SAÚDE - DEPARTAMENTO DE BIOLOGIA E FARMÁCIA DA UNISC

ISSN 2238-3360

Revista de Epidemiologia e Controle de Infecção

Original Article

Epidemiological profile of sepsis in a reference hospital in Paraná

Perfil epidemiológico da sepse em um hospital de referência do Paraná
Perfil epidemiológico de la sepsis en un hospital de referencia de Paraná

Site doi:
https://doi.org/10.17058/reci.v15i4.20184

Submitted: 02/05/2025
Accepted: 05/29/2025
Available online: 01/19/2026

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ABSTRACT

Background and Objectives: To describe the clinical and epidemiological characteristics of patients who developed sepsis and/or septic shock admitted to two adult ICUs of a reference hospital in Paraná. **Methods:** This descriptive-exploratory, documentary field research used a quantitative approach, developed through the analysis of medical records of patients hospitalized in ICUs from January 2014 to December 2023. **Results:** A total of 5,423 medical records were analyzed, identifying 687 patients who developed sepsis. These patients were 56.3% male and 70.7% older adults, with 82.2% having previous comorbidities. Upon admission, 75.4% had a clinical etiology, predominantly due to respiratory pathologies (24.1%). There was a higher prevalence of septic shock (59.1%). Cases were primarily of community origin (68.1%), had a primary focus of pulmonary infection (37.6%), and resulted in death (64.6%). **Conclusion:** Sepsis is a serious public health problem and presents high morbidity and mortality rates, especially when associated with cases of septic shock. The importance of developing epidemiological studies is highlighted in order to support the construction of new protocols and public policies.

Keywords: *Sepsis. Septic Shock. Intensive Care Unit. Hospital Infection. Epidemiology.*

RESUMO

Justificativa e Objetivos: Descrever as características clínicas e epidemiológicas dos pacientes que desenvolveram sepse e/ou choque séptico internados em duas UTIs adultas de um hospital de referência do Paraná. **Métodos:** Pesquisa de campo, descritivo-exploratória, documental, retrospectivo, com abordagem quantitativa, que foi desenvolvida por meio da análise de prontuários dos pacientes hospitalizados nas UTIs no período de janeiro de 2014 a dezembro de 2023. **Resultados:** Foram analisados 5.423 prontuários, destes, 687 eram de pacientes que desenvolveram sepse, sendo 56,3% do sexo masculino, 70,7% idosos, 82,2% com comorbidades prévias, 75,4% com etiologia clínica de admissão, predominantemente por patologias respiratórias, com 24,1%. Houve uma maior prevalência de choque séptico com 59,1%, de origem comunitária (68,1%), com foco primário de infecção pulmonar (37,6%) e com desfecho de óbito (64,6%). **Conclusão:** A sepse consiste de um grave problema de saúde pública e apresenta altas taxas de morbimortalidade, principalmente quando associadas aos casos de choque séptico. Ressalta-se a importância do desenvolvimento de estudos epidemiológicos a fim de subsidiar a construção de novos protocolos de diagnóstico precoce e manejo da sepse.

Descritores: *Sepse. Choque Séptico. Unidade de Terapia Intensiva. Infecção Hospitalar. Epidemiologia.*

RESUMEN

Justificación y Objetivos: Describir las características clínicas y epidemiológicas de los pacientes que desarrollaron sepsis y/o shock séptico ingresados en dos unidades de cuidados intensivos (UCI) de adultos de un hospital de referencia de Paraná (Brasil). **Método:** Investigación de campo, descriptiva-exploratoria, documental, retrospectiva, con enfoque cuantitativo, la cual se desarrolló mediante el análisis de historias clínicas de pacientes hospitalizados en UCI en el periodo de enero de 2014 a diciembre de 2023. **Resultados:** Se analizaron 5.423 historias clínicas, de las cuales 687 trataban de pacientes que desarrollaron sepsis, el 56,3% hombres, el 70,7% ancianos, el 82,2% con comorbilidades previas, el 75,4% con etiología clínica al ingreso, predominantemente por patología respiratoria en el 24,1%. Hubo mayor prevalencia de shock séptico (59,1%), de origen comunitario (68,1%), con foco primario de infección pulmonar (37,6%) y con desenlace de muerte (64,6%). **Conclusión:** La sepsis es un grave problema de salud pública y tiene altas tasas de morbimortalidad, especialmente cuando la asocia a casos de shock séptico. Se destaca la importancia de desarrollar estudios epidemiológicos para apoyar la construcción de nuevos protocolos de diagnóstico temprano y manejo de la sepsis.

Palabras Clave: *Sepsis. Choque Séptico. Unidade de Cuidados Intensivos. Infección Hospitalaria. Epidemiología.*

INTRODUCTION

The Intensive Care Unit (ICU) is a hospital environment designed to receive critically ill or at-risk patients who require uninterrupted care from a multidisciplinary team. These patients are exposed to various invasive procedures and the administration of immunosuppressive drugs, which makes them five to ten times more susceptible to acquiring infections, which frequently progress to sepsis.[1]

According to the Society of Critical Care Medicine (SCCM) and the European Society of Intensive Care Medicine (ESICM), sepsis results from an exaggerated response of the organism to an infectious stimulus.[2]

This syndrome is characterized by an organic imbalance between the inflammatory process and anti-inflammatory actions, leading to systemic release of cytokines and chemical mediators, oxidative stress, and hemostasis-affecting mechanisms. These factors contribute to the activation of the coagulation process and complement system, leading to systemic dysfunction and even death in more serious cases, such as septic shock.[3]

Septic shock is characterized by the presence of hypotension associated with organ, cellular, and metabolic dysfunctions, and is directly related to high morbidity and mortality rates worldwide. The diagnosis of septic shock is established when vasopressors are required to maintain mean arterial pressure (MAP) >65 mmHg and serum lactate levels greater than 2 mmol/L.[4]

According to the Sepsis Prevalence Assessment Database (SPREAD) by the Latin American Sepsis Institute (LASI), at least one-third of ICU beds are occupied by patients with sepsis and/or septic shock, with an overall mortality rate of 55%. This condition accounts for between one-third and half of deaths in hospitals in the United States. In Brazil, the prevalence rate is 30%, with a mortality rate of 55%, making it the leading cause of mortality in noncardiac hospitalizations at the ICUs and the main burden to healthcare.[5]

Given this, characterizing the epidemiological profile of sepsis is crucial for directing prevention programs, as its occurrence varies by age group, sex, and location. In Brazil, a previous study found that the profile with the highest sepsis incidence is older adults aged 80 or older, male, White, with most cases concentrated in Southeastern Brazil.[2]

In light of the above, the guiding question of this study was: What are the clinical and epidemiological characteristics of patients who developed sepsis, from January 2014 to December 2023, in two ICUs of a public hospital in Southwest Paraná?

Thus, this research aimed to describe the clinical and epidemiological characteristics of patients who developed sepsis and/or septic shock admitted to two adult ICUs of a reference hospital in Paraná.

METHODS

This is a descriptive-exploratory, documentary, cross-sectional, and retrospective field research. It uses a quantitative approach and was conducted in a Reference Hospital in inland state of Paraná.

The institution has 146 active hospital beds and serves as a reference for 42 municipalities in the care of trauma; low-, medium-, and high-complexity orthopedic surgeries; vascular surgeries; intermediate- and high-risk pregnancies; pediatric surgeries; urology, and maxillofacial surgery. It has two adult ICUs, one pediatric ICU, and one neonatal ICU, and serves as an undeniable reference for the Mobile Urgent Care Service (SAMU), the Integrated Emergency Trauma Care Service (SIATE), and the Bed Management Center, serving approximately 600,000 inhabitants.

The study sample consisted of medical records of patients admitted to the two adult ICUs and diagnosed with sepsis from January 2014 to December 2023.

The inclusion criteria were medical records of patients hospitalized in the aforementioned sectors who developed sepsis and/or septic shock during the study period and who presented the variables of interest. Records that did not contain all the necessary information or indicated that the patients were affected by other diseases were excluded.

Data collection was performed using a checklist developed by the investigators that included the following variables: age, sex, comorbidities, length of stay, origin, etiology of admission, use of devices, signs and symptoms, infectious focus, isolated microorganisms, sepsis classification, origin of sepsis, and clinical outcome.

Sepsis diagnosis required two or more clinical criteria, including leukocytosis or leukopenia, a heart rate greater than 90 beats per minute (BPM), a core temperature above 38°C or below 36°C, and a respiratory rate greater than 20 respirations per minute (RPM).

Septic shock is characterized by the need for vasopressor use to maintain MAP >65 mmHg, even after adequate fluid administration, in addition to a serum lactate level greater than 2 mmol/L.[1,4] The quickSOFA (qSOFA) instrument was applied to predict sepsis severity. qSOFA is a practical and straightforward bedside tool used to assess the risk of clinical deterioration in patients with infection, such as sepsis. This instrument considers parameters such as: respiratory rate ≥ 22 RPM, systolic blood pressure ≤ 100 mmHg, and Glasgow Coma Scale < 15. Each parameter scores 1 point, ranging 0 to 3; a score of 2 or more indicates a higher risk of mortality and ICU stay for the patient.[6]

The data were analyzed using the Statistical Package for Social Sciences – 25.0 program, via descriptive frequency analyses. Furthermore, categorical variables were compared using the Chi-squared test. Univariate and multivariate analyses were performed to assess independent risk factors for mortality and sepsis classification. A p-value < 0.05 was considered statistically significant.

This study was previously sent to the research institution for the institutional consent form to be signed, and then submitted to the Ethics Committee of the Paranaense University for evaluation, and was approved under Opinion No. 6,713,924/2024. Thus, all ethical and legal principles were followed in accordance with Resolution 466/2012 of the Brazilian National Health Council.

RESULTS

This study evaluated 5,423 medical records of patients admitted to adult ICUs. Of these, 687 (12.6%) were patients who developed sepsis and/or septic shock during hospitalization. The clinical profile showed a predominance of male patients (56.3%) and older patients (70.7%), with a mean age of 66.13 ± 17.16 years. Most were hospitalized for clinical conditions (75.4%) and had previous comorbidities (82.2%), with systemic arterial hypertension (SAH) being the most prevalent (49.3%), followed by diabetes mellitus (DM) (27.8%), renal failure (19.4%), heart disease (16.7%), and chronic obstructive pulmonary disease (COPD) (13%). In some cases, patients had more than one associated comorbidity.

Regarding the length of stay, most patients remained hospitalized for up to 15 days (68.9%). As for the etiology of admission, most were due to respiratory pathologies (24.1%), followed by postoperative causes (20%) and sepsis (17%). Regarding the use of invasive devices, most patients used both invasive and therapeutic devices (Table 1).

Table 1. Clinical profile of patients with sepsis and/or septic shock admitted to adult ICUs at a hospital in Paraná. 2024.

Parameter	N (%)
Sex	
Male	387 (56.3)
Female	300 (43.7)
Age	
Young	201 (29.1)
Older adult	486 (70.7)
Comorbidities	
Yes	565 (82.2)
No	122 (17.8)
Patient	
Clinical	518 (75.4)
Surgical	146 21.3)
Trauma	23 (3.3)
Length of stay	
Up to 15 days	473 (68.9)
More than 15 days	214 (31.1)
Etiology of admission	
Respiratory pathologies	165 (24.1)
Postoperative	138 (20)
Sepsis	117 (17)
Septic shock	62 (9)
Renal/urinary pathologies	55 (8)
Neurological pathologies	49 (7.1)
Gastrointestinal/abdominal pathologies	37 (5.4)
Trauma	20 (2.9)
Cardiovascular pathologies	19 (2.8)
Other	25 (3.7)
Use of invasive devices	
Mechanical ventilation	562 (81.8)
Central line	646 (94)
Indwelling urinary catheter	676 (98.4)
Nasoenteral/nasogastric tube	579 (84.3)
Vasoactive drug	599 (87.2)
Parenteral nutrition	61 (8.9)

According to the sepsis classification criteria, 59.1% of the sample had septic shock, and most cases were community-acquired (68.1%). The primary source of infection was pulmonary (37.6%).

The qSOFA was used to predict sepsis severity. While it is not useful as a diagnostic tool for sepsis, it remains an important indicator of severity. In this study, qSOFA was calculated in 81.8% of the sample, and in most cases (33.2%), the score was 2 points, suggesting higher mortality and increased length of stay in intensive care.

Regarding clinical signs, a significant portion of patients presented with hypotension (92.6%), tachycardia (69.7%), tachypnea (43.8%), and leukocytosis (79.3%). Evaluation of clinical outcomes revealed a high mortality rate, with 64.6% of patients dying, while 35.4% were discharged from the hospital (Table 2).

Table 2. Clinical characteristics of sepsis and/or septic shock cases in patients admitted to adult ICUs at a hospital in Paraná. 2024.

Parameter	N (%)
Sepsis classification	
Sepsis	281 (40.9)
Septic shock	406 (59.1)
Sepsis origin	
Community-acquired	468 (68.1)
Nosocomial	219 (31.9)
Primary source of infection	
Pulmonary	258 (37.6)
Abdominal	140 (20.4)
Urinary tract	94 (13.7)
Cutaneous	42 (6.1)
Unspecified	118 (17.2)
Other	35 (5.0)
qSOFA performed	
Yes	562 (81.8)
No	125 (18.2)
qSOFA score	
<2*	211 (37.5)
≥ 2*	351 (62.5)

continue

Parameter	N (%)
Clinical signs of sepsis	
Hyperthermia	283 (41.2)
Tachypnea	301 (43.8)
Leukocytosis	545 (79.3)
Hypotension	636 (92.6)
Hypothermia	86 (12.5)
Tachycardia	479 (69.7)
Leukopenia	8 (1.2)
Decreased level of consciousness	233 (33.9)
Dyspnea	210 (30.6)
Hyposaturation	242 (35.2)
Bradycardia	57 (8.3)
Outcome	
Discharge	243 (35.4)
Death	444 (64.4)

Abbreviation: *qSOFA score: < 2 indicates a lower probability of poor prognosis and/or organ dysfunction; ≥ 2 indicates a higher probability of poor prognosis and/or organ dysfunction.

The data below show the statistical association between sepsis severity/classification and the use of invasive devices (Table 3).

Table 3. Frequency, percentage, and significant association of patients who progressed to septic shock (n=447), according to the use of invasive devices in patients admitted to adult ICUs at a hospital in Paraná. 2024.

Parameter	Total	N (%)	p-value
Use of invasive devices			
Indwelling urinary catheter	676	403 (59.7)*	0.001
Vasoactive drug	598	391 (65.4)*	0.000
Nasoenteral/nasogastric tube	580	373 (64.3)	0.000
Mechanical ventilation	562	374 (66.5)	0.000
Central line	645	402 (62.3)*	0.000

Abbreviation: *Significant association

A statistical association was also found between deaths related to age (stage of life), as well as clinical conditions (presence of comorbidities, sepsis classification, and use of invasive devices) (Table 4).

Table 4. Frequency, percentage, and significant association of patients with sepsis who died (n=447), according to age (stage of life) cycle and clinical conditions of patients admitted to adult ICUs at a hospital in Paraná. 2024.

Parameter	Total	N (%)	p-value
Age			
Young	201	103 (51.2)	
Older	486	344 (70.8)*	0.000
Comorbidities	565	385 (68.1)	0.001
Sepsis classification			
Sepsis	281	142 (50.5)	
Septic shock	406	305 (75.1)	0.000
Use of invasive devices			
Indwelling urinary catheter	676	444 (65.7)	0.010
Vasoactive drug	598	437 (73.1)	0.000
Nasoenteral/nasogastric tube	580	417 (71.9)	0.000
Mechanical ventilation	562	421 (74.9)	0.000
Central line	645	440 (68.2)	0.000

Abbreviation: *Significant association

DISCUSSION

Sepsis and septic shock are recognized as significant public health problems, affecting millions worldwide and associated with high mortality rates. The epidemiological profile of this syndrome may vary by region and population, making critical to characterize those affected.

When evaluating the clinical profile of patients affected by sepsis in this study, in relation to sex, the male population was found to be predominant in 56.3% of cases. This result is consistent with other Brazilian regions, as evidenced by a study conducted in the state of Tocantins, which found that males accounted for 55.0% of the cases.[7]

This data can be explained by the lifestyle and habits preferred by men, such as low adherence to and seeking of healthcare services, in addition to the everyday use of substances such as tobacco and alcohol, which, in the long term, impair the integrity and functioning of vital organs.[8]

When analyzing the age group, older adults (> 60 years) were the most affected by sepsis, representing 70.7% of cases. This number is consistent with Brazilian reality, as a nationwide study between 2010 and 2019 found that 53% of hospitalizations were among older people.[5]

It is scientifically established that the older population is naturally more susceptible to illness and, consequently, to health complications. Studies conducted in England and Wales point to factors such as immunosenescence — the decline of the immune system with age — and inflammaging — persistent, low-grade chronic inflammation — as facilitators of serious infections.[9]

Other factors, such as pre-existing comorbidities, diminished physiological reserves associated with aging, malnutrition, and even polypharmacy, are also listed.[9]

The susceptibility and frailty of older adults to the high mortality rate related to sepsis were evident in this study, which identified a significant association between older adults and the number of deaths (p=0.000), with 70.8% of total deaths related to this population.

An equally important and relevant factor in explaining the high mortality rate present in sepsis cases was the presence of comorbidities associated with hospitalized patients. This study showed that among patients affected by sepsis, 82.2% had comorbidities, which was also significantly associated with mortality, with 68.1% of patients with comorbidities dying.

Regarding relationship between sepsis and underlying comorbidities, German investigators concluded that sepsis was the exclusive and sole cause of death in only six (12%) cases. When comorbidities were present, sepsis accounted for 54 (76%) cases.[10] Thus, the presence of pre-existing comorbidities can increase case severity and worsen prognosis, since pre-existing diseases, such as DM and SAH, are associated with several physiological changes in the body.[11]

Regarding origin of hospitalized patients, those with clinical complications accounted for 75.4% of admissions. The same was observed in a private hospital in the state of Sergipe between 2016 and 2017, where

94.5% of the analyzed hospitalizations shared the same origin.[12] The severity of the admission conditions, combined with a delay in treatment initiation, can worsen the clinical picture and necessitate prolonged hospitalization.

According to data obtained on sepsis from SIH/DATASUS, the average length of hospital stay for patients varies according to the region of Brazil, being, on average, 11 days in the North region; 10.9 days in the Northeast region; 13 days in the Southeast region; 10.6 days in the South region; and 12.6 days in the Midwest region.[13] Internationally, studies show that hospital stays are longer in developed countries, such as the United States and China, than in middle- and low-income countries, a difference primarily associated with more advanced ICU care and better prognoses.[14]

This study found that most patients (68.9%) had a hospital stay of less than 15 days. This shorter length of stay can be directly attributed to early mortality, as a consequence of the severity of septic conditions.[15]

Regarding the etiology of ICU admission, this study found that respiratory pathologies were the leading cause (24.1%). These data differ from those of a study conducted in Belo Horizonte, state of Minas Gerais, which identified other traumas as the main causes.[16]

The discrepancy in the data can be explained by the study hospital's patient profile. Furthermore, the primary cause of hospitalization alone is not sufficient to justify a septic condition. However, clinical causes, especially those related to the respiratory and cardiac systems, are associated with prolonged hospital stays and the use of invasive devices, both of which contribute to infectious outcomes.[16]

Regarding use of invasive devices, in a study conducted in João Pessoa, state of Paraíba, 100% of patients diagnosed with sepsis used a central line and an indwelling urinary catheter (IUC). In comparison, 72% used mechanical ventilation (MV).[17] A similar study was conducted in Asia, where more than 70% of patients with sepsis used MV, supporting this research, which found high rates of use of invasive devices.[18]

This study also showed that sepsis related to the use of invasive devices is significantly associated with mortality, specifically the use of IUC (p=0.010) and MV and CVC (p=0.000).

The use of these devices is considered a significant risk factor for acquiring healthcare-associated infections (HAIs). Although it contributes to patient prognosis, prolonged use of these devices, coupled with inadequate protocols, insufficient hand hygiene, and incorrect procedure performance, significantly increases the risk of infection, which can subsequently progress to sepsis. Globally, one in four cases of sepsis in hospitals and one in two cases of sepsis in ICUs are the result of HAIs.[18]

Regarding sepsis classification, septic shock is prevalent in 59.1% of cases. This high rate was also found in research conducted at a trauma hospital in Belo Horizonte, where a septic shock rate of 35% was observed.[16]

This growing trend in the number of septic shock cases is directly linked to the emergence of new bacterial strains resistant to antibiotic therapy, the aging of the population due to increased life expectancy, and improvements in healthcare systems' capacity to diagnose more cases of this syndrome and its complications.[19]

Furthermore, it is proven that septic shock considerably increases the chance of death. In this study, a significant association with mortality was observed (p=0.000), as 75.1% of individuals with septic shock died, in line with a study carried out in the state of Piauí, which indicated a 90.5% mortality rate in cases of septic shock, highlighting the severity of this syndrome.[20]

Regarding origin, sepsis can be acquired in the community or in the hospital setting. Community-acquired sepsis is the one identified upon admission or within 72 hours of hospitalization.[21] In this study, it accounted for 68.1% of cases, consistent with a study conducted in Ethiopia, which also found the predominant source of infection to be community-acquired.[14]

This data may vary depending on the population and the predominant admission etiology. Furthermore, with the pandemic and social isolation measures, there was a decrease in the number of surgeries and patients hospitalized for trauma. However, many got infected with Covid-19 and became severely ill, triggering a septic condition, mostly of pulmonary origin.[21]

The respiratory tract is considered a primary site of infections and is directly related to the use of invasive devices, such as endotracheal tubes.[15] The pulmonary tract was highlighted in this study as a primary source of infection (37.6%), in accordance with the national profile, as evidenced in a study carried out in Teresina, state of Piauí, which found a rate of 44.4% of primary pulmonary focus.[20]

The large number of pulmonary infections is mainly due to the region's characteristics, which favor the infectious process and bacterial proliferation. Furthermore, the study population primarily comprised older individuals with associated comorbidities, thus presenting a higher risk of acquiring respiratory infections, as well as requiring the use of mechanical ventilation and ICU stay.[20] Moreover, although MV is important for patient prognosis, it is associated with the acquisition of ventilator-associated pneumonia (VAP) and, subsequently, with the progression to sepsis.[22]

According to the Surviving Sepsis Campaign Guidelines, hospitals and healthcare services must

include sepsis screening systems for critically ill and high-risk patients, such as SOFA or qSOFA. SOFA has high predictive validity, but it is not an easy tool to apply, as it requires laboratory tests. qSOFA, on the other hand, is faster and more practical to use at the bedside to assess the risk of clinical deterioration in patients with infections.[23]

Of the medical records analyzed, from those in which was possible to apply the qSOFA score, 51.1% presented values ≥ 2, which represents a high risk of death. In Spain, a study conducted among inpatients at a general hospital identified that 24% of the sample already presented qSOFA ≥ 2 upon admission. In this case, a significant association was observed between patients with altered qSOFA and the number of deaths, underscoring the importance of applying the score initially, but not as an isolated diagnostic method.[24]

The disparity between this study's results and those of other studies can be explained primarily by differences in the sectors analyzed, since ICUs have more complex and invasive procedures than regular wards. In view of this, it was also not possible to apply qSOFA to all medical records analyzed, as some data were incomplete.

In the analysis of sepsis-related clinical signs, hypotension (92.6%), leukocytosis (79.3%), and tachycardia (69.7%) stood out, which may be related to circulatory and inflammatory impairment. In an analysis of data from the literature, tachycardia and tachypnea were identified as the most frequent clinical signs in septic patients.

The signs and symptoms of sepsis generally affect several organ systems, as the intense release of inflammatory mediators during the septic episode results in multiple organ failures, thereby causing the classic signs observed in this study.[25]

The outcome of patients with sepsis in this study revealed a high mortality rate (64.6%), reflecting the severity and potentially lethal impact of this condition. Recent studies of sepsis mortality trends in Brazil and its regions, covering the period from 2010 to 2019, revealed an incidence rate of 51.3 deaths per 100,000 inhabitants.[5]

These results reinforce what is advocated by the World Health Organization (WHO), placing sepsis as a serious global public health problem and one of the main causes of death in ICUs, reinforcing the need for emergency measures involving infrastructure, protocols, and trained professionals who can act quickly in the face of signs of sepsis, aiming at timely rescue measures.[7]

Regarding the study's limitations, there was insufficient information, incomplete or inaccurate medical record documentation, and a lack of information on the origin or primary source of sepsis, all of which significantly affected data collection and analysis. Thus, the importance of accurately completing medical records is emphasized to improve understanding of sepsis risk factors and, consequently, to enhance prevention measures.

Furthermore, the relevance of research focused on describing the epidemiological profile of sepsis is highlighted, to assist in guiding care, fostering new investigations into the syndrome, and supporting the development of new health policies aimed at the early detection of risk factors and the implementation of early interventions, so that there is a decrease in morbidity and mortality rates.

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AUTHORS' CONTRIBUTIONS

Djúlia Raissa Seitz contributed to the bibliographic research, abstract writing, introduction, methodology, discussion, interpretation and description of results, table preparation, conclusions, review, and statistics. **Gilmar Godinho dos Santos Azevedo** contributed to the bibliographic research, abstract writing, introduction, methodology, discussion, interpretation and description of results, table preparation, conclusions, review, and statistics. **Géssica Tuani Teixeira** contributed to the bibliographic research, abstract writing, introduction, methodology, discussion, interpretation and description of results, conclusions, review, and statistics. **Franciele Nascimento Santos Zonta** contributed to project management, bibliographic research, abstract writing, methodology, discussion, interpretation and description of results, conclusions, review, and statistics. **Stefany de Oliveira** contributed to abstract writing, data collection, review, and statistics. **Allan Pantano** contributed to data collection and statistics. **Géssica Tuani Teixeira** contributed to project management, fundraising, bibliographic research, review, and statistics. **Djúlia Raissa Seitz, Gilmar Godinho dos Santos Azevedo,** and **Géssica Tuani Teixeira** contributed to project management, bibliographic research, abstract writing, introduction, methodology, discussion, interpretation and description of results, conclusions, review, and statistics.

All authors approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.

Please cite this article as: Seitz DR, Azevedo GGS, de Oliveira S, Pantano A, Teixeira GT, Zonta FNS. Perfil epidemiológico da sepse em um hospital de referência do Paraná. Rev Epidemiol Control Infect [Internet]. 19º de janeiro de 2026;15(4). Disponível em: https://seer.unisc.br/index.php/epidemiologia/article/view/20184