



INFECTION RELATED TO HEALTH CARE AND SEPSIS IN HOSPITALIZATION IN PEDIATRICS¹

Yngrid Fernandes Silva*
Mauren Teresa Grubisch Mendes Tacla**
Dayanne Cristina Zanfrille da Costa***
Gilselena Kerbauy****
Patrícia Basso Squarça Mendes*****

ABSTRACT

Introduction: cross-infections are obstacles in the treatment of hospitalized children, as they are more frequently, and may be a triggering factor for complications in the treatment of hospitalized children. **Objective:** to investigate the frequency of healthcare-related infections and sepsis in hospitalized children. **Method:** this is a prospective and descriptive quantitative study. The data collection took place from July to December 2015, using 173 physical and electronic patient records. The data were analyzed using *Microsoft Office Excel®* and descriptive analysis. **Results:** a high prevalence of cross-infections was identified with 31% (n=54), having pneumonia as the main cause, and out of these 55% have progressed to sepsis (n=32). **Conclusion:** the findings allow an insight into the severity of the occurrence of infections in hospitalized children, highlighting the need for training the health team for early recognition for reducing infection rates within health services, and improving the quality of assistance offered to the pediatric population.

Keywords: Cross-infection. Sepsis.Child. Pediatrics.

INTRODUCTION

Cross-infections (CIs) are considered a worldwide public health problem. They're characterized as infections acquired during the care process in any environment or health institution. Therefore, they represent a threat to these services, impacting the increase in hospitalization time, morbidity and mortality and care costs⁽¹⁻²⁾.

A study promoted by the World Health Organization (WHO) shows a prevalence of 15.5 infections per 100 patients in developing countries against 7.6 infections per 100 patients in developed countries⁽²⁾. Given this panorama, the challenge that Brazil and other developing countries face in preventing damage to healthcare is evident⁽³⁾.

With regard to the pediatrics (the age group from 0 to 12 years old), infections appear more frequently, being a triggering factor for complications in the treatment of hospitalized

children. The extreme age of children also favors the development of these infections, as well as congenital or acquired immune-deficiencies, haemato-oncological diseases, transplants and, consequently, the use of immunosuppressants, corticosteroids and infections by the Human Immunodeficiency Virus (HIV)⁽⁴⁾.

According to the National Health Surveillance Agency (*Agência Nacional de Vigilância Sanitária*- ANVISA), infections in Pediatric Intensive Care Units (PICU) range from 3 to 27%, with an overall average rate of 14 infections per 1,000 patients/day, with infections of bloodstream, pneumonias and urinary tract infections. On the other hand, in pediatric wards, cross-infections depend on the type of service offered, with higher rates for those who have children's surgery and cancer care. In general, in this sector, the most frequent infections are pneumonia, bloodstream infections, skin infections, oral cavity and soft tissue infections⁽⁵⁾.

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*Nurse. Senior Nurse at the Hospital do Coração de Londrina. ORCID: 0000-00032251-2026. Email: ygridfer.silva@hotmail.com

**PhD in Public Health Nursing, Child Health sub-area, at Ribeirão Preto College of Nursing - University of São Paulo (USP)
Associate Professor at the Department of Nursing at UEL. ORCID: 0000-0001-8928-3366 / Email: maurentacla@gmail.com

***Licensed Nurse from the University of São Paulo. Resident in Child Health by the UEL Nursing Residence. ORCID: 0000-0003-3171-6311 / Email: dayanne.costa@alumni.usp.br

****Doctor in Microbiology. Adjunct Professor at the Department of Nursing at the State University of Londrina (UEL). ORCID: 0000-0002-1737-4282 / Email: gilselena@hotmail.com

*****Master in Nursing. Coordinator Nurse of the Pediatric Unit of the University Hospital of the State University of Londrina. ORCID: 0000-0003-2216-5431. Email: patriciasquarça@gmail.com

Another global health problem that affects different age groups, especially for children, is sepsis⁽⁶⁾. It is estimated, globally, 22 cases of child sepsis per 100,000 children, and an annual mortality in this population ranging from 4% to 50%, most of which is related to refractory septic shock or multiple organ dysfunction, making it one of the 10 major causes of death⁽⁷⁾.

Sepsis can be defined as a fatal multi-organ failure resulting from a deregulated body response to an infectious process⁽⁸⁾. However, according to the Latin American Institute of Sepsis (*Instituto Latino Americano de Sepse - ILAS*), with regard to the pediatric population, until 2005, there was no agreement regarding the definitions of sepsis due to the particularities of childhood. From that date onwards, members of the International Pediatric Sepsis Consensus Conference (IPSCC) have published definitions to the pediatric age group that were based on the concepts of sepsis for the adult population, on the definitions of pediatric sepsis from several authors, and on the organ dysfunction scores used in adults and children⁽⁶⁾.

In 2020, with the aim of promoting even more specific recommendations for childhood sepsis and confirming the commitment established in 2016, a compilation of guidelines was published based on a systematic review, prepared by expert panels of the Society of Critical Care Medicine (SCCM) and European Society of Intensive Care Medicine (ESICM). In this document, sepsis is defined as a severe infection that causes the child to present clinical signs, such as tachypnea, tachycardia and fever, but also signs of perfusion impairment in specific organs⁽⁷⁾.

Despite these great advances, sepsis has been one of the main causes of death in children, both in underdeveloped and developing countries⁽⁹⁾. Thus, it directly impacts the recovery of pediatric patients, since its manifestations in more severe forms can reach a high rate of morbidity and mortality due to several factors that range from poor vaccination coverage to the lack of preparation and adoption of updated protocols by institutions hospitals⁽⁸⁾.

Given the relevance of the topic and its impact on mortality in the adult population and especially the pediatric population in this study, the need to investigate the frequency of cross-

infections and the development of sepsis in hospitalized children was identified, in search of improvements in the care provided, awakening an analysis of the institutional daily life for the infection index.

METHOD

It is a prospective and descriptive quantitative study, and a part of the matrix research project entitled "*Colonization and decolonization by multi-resistant microorganisms in the hospitalized mother-child binomial: a prospective study*", funded by the National Council for Scientific and Technological Development (*Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq*), which enabled a series of analysis, as this study is one of the aspects analyzed.

The research was carried out in a public university hospital of high complexity in southern Brazil, in units with pediatric beds, comprising the Pediatric Intensive Care Unit (PICU), Pediatric Emergency Department (PED) and Pediatric Emergency Room (PER).

All units are characterized by general care for children aged 0 to 12 years old (ECA, 1990), in the various specialties that need tertiary care. Bed layout is organized as follows: PICU with 5 beds; PED with 20 beds; and PER, 17 beds.

This study included children (0 to 12 years old) hospitalized in one of the units described above, with at least 24 hours of hospitalization. All patients with shorter hospital stays were excluded from the sample, as well as companions and/or guardians who did not accept to participate in this research, totaling 173 children, without losses.

Clinical and epidemiological data were collected from July to December 2015, through physical and electronic medical records, with the aid of a previously structured instrument that analyzed the following variables: sociodemographic data of the companion and child identification, such as gender and age. Hospitalization period, main diagnosis, according to ICD 10 (International Classification of Diseases), development of cross-infections, evolution to sepsis, invasive procedures, surgeries, antimicrobial therapy, microbiological cultures, sensitivity profile of microorganisms

and clinical outcome (hospital discharge) were also obtained, transfer or death).

Clinical and epidemiological information were entered into spreadsheets prepared in *Microsoft Office Excel®* 2013, enabling their tabulation and subsequent descriptive analysis. The results were grouped into tables and graphs and discussed based on the literature on the subject.

The study was submitted to the Ethics Committee on Research Involving Human Beings of the institution, under opinion 1.440.289, CAAE: 15415413.4.0000, according to Resolution nº 466 of 2012. For all participants who agreed to participate in the research, the Free and Informed Consent was presented, with subsequent request for signature in two copies.

RESULTS

Out of the 173 children, there was a predominance of males (55%) over females (45%). The age ranged between 1 and 12 years old, with emphasis on children aged 1 to 5 years

old (40%), with length of stay that ranged from 1 to 71 days, with an average of 21 days. The main reasons for hospitalization were digestive system diseases (26%), followed by external causes (20.8%), respiratory (15.6%) and neurological (10.4%) diseases. The most frequent invasive procedures were central venous catheterization, urinary catheterization and mechanical ventilation, distributed in 72 (41.6%) children. As for the performance of surgeries, 59 (34.1%) children underwent some type, with gastrointestinal (47.5%) and orthopedic (25.4%) being more frequent. The outcome of the studied population was as follows: 97.6% (n=169) were discharged, 1.73% (n=3) died and 0.5% (n=1) transferred to another service.

During the study period, 54 children (31%) developed cross-infections, totaling 58 infections, considering that some patients had more than one infection, pneumonia (41%) being the most frequent (Figure 1). The hospitalization time of these children who developed cross-infections ranged from 3 to 68 days.

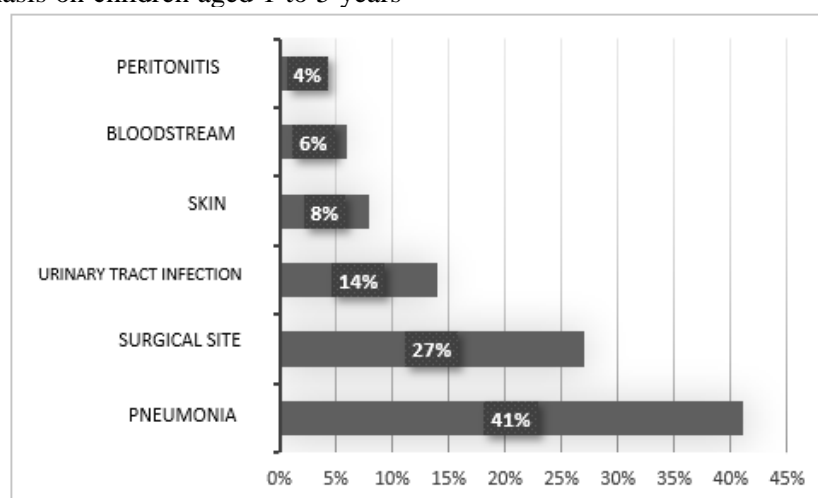


Figure 1. Characterization of CIs developed by children admitted to a university hospital in northern Paraná, from July to December 2015.

Source: Research data.

In this research, 32 patients (55%) developed sepsis and, in their entirety, underwent some invasive procedure or surgery, indicating the severity of children with CIs. The length of stay for these patients ranged from 8 to 68 days. If we consider the total number of patients (n=173),

18.4% had this condition. Among the causes identified for its development, 48% were triggered by pneumonia, 32% by surgical site infection (SSI), 10% by bloodstream infection, 7% by peritonitis and 3% by urinary tract infection (Figure 2).

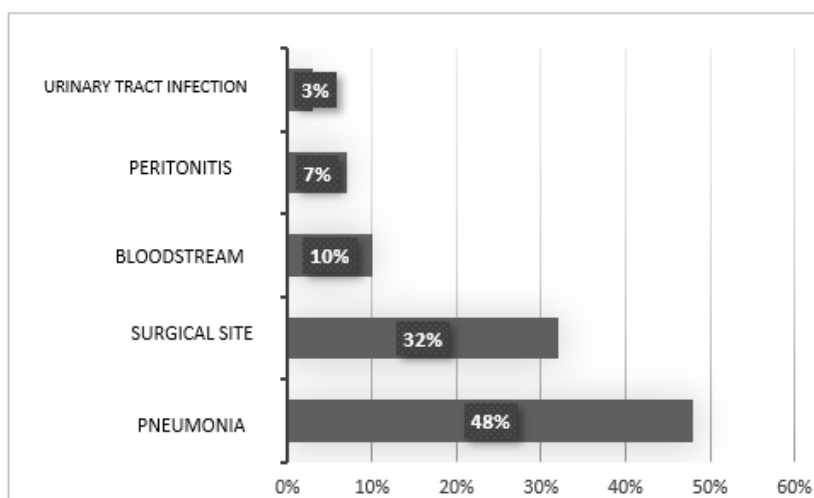


Figure 2. Sepsis outbreaks in children admitted to a university hospital in northern Paraná, from July to December 2015.

Source: Research data.

DISCUSSION

The results of this survey have demonstrated the predominance of male children aged between 1 and 5 years old, and this finding is similar to results from a study carried out in a Pediatric Intensive Care Unit (PICU) in Northeastern Brazil, in a tertiary hospital. This study evaluated the epidemiological profile of children with CIs, also obtaining a prevalence of males (59.5%) among patients⁽¹⁰⁾.

When studying children between 0 and 5 years old admitted to a hospital also located in southern Brazil, a research showed an average hospital stay of four days. The authors claim that this period is adequate, since antimicrobials have a peak of action within 72 hours, with improvement in the clinical condition. The average mentioned above is well below the results of the present research (average of 21 days of hospitalization), which can be partially attributed to the fact that the location of this study is a tertiary level hospital, which handles complex/severe cases referenced and that require a longer hospital stay, such as external causes, respiratory and neurological diseases⁽¹¹⁾.

The hospitalization of the studied population was mostly due to digestive system diseases (26%), differing from the literature, which shows respiratory diseases as the main cause of hospitalization in children⁽¹²⁻¹³⁾.

Among the results already highlighted, most children who developed CI had pneumonia as the most frequent cause. A systematic review study corroborates this finding, as it identified pneumonia as one of the main childhood morbidities. Thus, it is noteworthy that 40% of all hospitalizations in children under five years old result from respiratory tract infections⁽¹²⁾.

Surgical site infection (SSI) ranked second in this study. The National Health Surveillance Agency (ANVISA) reports that, in general, SSI occurs in the postoperative period around 3 to 20%, that is, a value similar to that found, meeting the value of 2.9 % of SSI in a similar study⁽¹⁴⁾.

Again, a hypothesis for this finding may be due to the fact that the hospital, the setting for this study, has a Pediatric Surgery service that performs complex surgeries and receives children transferred from other services. These patients often arrive in serious condition and in poor general condition, in addition to often requiring prolonged hospitalization.

The development of sepsis found in the studied population that presented some CI (18.4%) was similar to that obtained by another author, in a research on the etiology and prognostic factors of sepsis in children and adolescents in the PICU of a municipal hospital in the Southeast of the country, who identified a diagnosis of sepsis in 14.9% of the studied

patients⁽¹⁵⁾.

Children have immaturity of the immune system and, with the increase in hospital stay, 68 days in the case of sepsis and CI, in this study, the breaking of the barrier promoted by invasive care procedures facilitate the invasion of the organism by pathogenic agents⁽¹⁶⁾. The children studied were submitted to a large number of these procedures, as well as to the use of drugs, especially antimicrobials, thus reflecting a greater probability of developing CI and sepsis.

In this context, considering CIs and sepsis as high-risk conditions in pediatric care, surveillance and early diagnosis by health professionals during their care process are necessary⁽⁸⁾. It is worth noting that nurses have a fundamental role in the control and prevention of hospital infections, but they still have difficulties in identifying these signs of infection, in order to promote interventions at an opportune time⁽¹⁷⁻¹⁸⁾.

The training of nurses and other members of the health team, based on the prevention of CIs and sepsis, is crucial for improving the quality of care in pediatrics, as well as for reducing hospitalization costs and reducing its impact on worldwide mortality⁽¹⁸⁾.

CONCLUSION

In this survey, its performance in a tertiary-level university hospital was considered as a limitation, since it receives children with aggravated health conditions and who might have already developed some type of CI at the origin, which culminated in sepsis during their period of hospitalization within the research setting.

The study evidenced the severity of the development of cross-infection and sepsis, as well as their impact on the child's health. Thus, it is necessary to verify the procedures associated with the prevention of CIs in the hospital environment and to reflect on the care practices, and the training of professionals involved in care, especially nurses.

The development of efforts should be focused on teaching mechanisms to combat CIs and sepsis, for example, the creation of a package of measures that provides a broad view of the pathophysiology, risk factors, rapid diagnosis and the impact of complications on the health of the child. In this way, there will be care with greater quality and effectiveness, thus avoiding worse outcomes for pediatric patients.

INFECÇÃO RELACIONADA À ASSISTÊNCIA À SAÚDE E SEPSE NA HOSPITALIZAÇÃO EM PEDIATRIA

RESUMO

Introdução: as infecções em pediatria são entraves no tratamento da criança hospitalizada, pois surgem com maior frequência, sendo um fator desencadeante de complicações no tratamento da criança hospitalizada. **Objetivo:** investigar a frequência das infecções relacionadas à assistência à saúde e sepse em crianças hospitalizadas. **Método:** trata-se de um estudo quantitativo prospectivo e descritivo. A coleta de dados ocorreu de julho a dezembro de 2015, por meio de 173 prontuários físicos e eletrônicos dos pacientes. Os dados foram analisados via Microsoft Office Excel® e análise descritiva. **Resultados:** identificou-se uma alta prevalência de infecções relacionadas à assistência à saúde com 31% (n= 54), tendo como principal causa a pneumonia, e destas 55% evoluíram para sepse (n=32). **Conclusão:** os achados permitem uma visão sobre a gravidade da ocorrência de infecções em crianças hospitalizadas, destacando a necessidade de capacitação da equipe de saúde para o reconhecimento precoce, com vistas à diminuição dos índices de infecção dentro dos serviços de saúde e melhoria na qualidade da assistência ofertada à população pediátrica.

Palavras-chave: Infecção Hospitalar. Sepse. Criança. Pediatria.

INFECCIÓN RELACIONADA CON LA ATENCIÓN A LA SALUD Y SEPSIS EN HOSPITALIZACIÓN EN PEDIATRÍA

RESUMEN

Introducción: las infecciones en pediatría son obstáculos en el tratamiento del niño hospitalizado, pues surgen con mayor frecuencia, siendo un factor desencadenante de complicaciones en el tratamiento del niño hospitalizado. **Objetivo:** investigar la frecuencia de las infecciones relacionadas con la atención a la salud y sepsis en niños hospitalizados. **Método:** se trata de un estudio cuantitativo prospectivo y descriptivo. La recolección de datos tuvo lugar de julio a diciembre de 2015, a través de 173 registros médicos, físicos y electrónicos, de los pacientes. Los datos fueron analizados vía Microsoft Office Excel® y análisis descriptivo. **Resultados:** se identificó una alta prevalencia de infecciones relacionadas con la atención a la salud con 31% (n=54), teniendo como principal causa la neumonía, y de estas 55% evolucionaron para sepsis (n=32). **Conclusión:** los

hallazgos permiten una visión sobre la gravedad de la ocurrencia de infecciones en niños hospitalizados, destacando la necesidad de capacitación del equipo de salud para el reconocimiento precoz, con vistas a reducir los índices de infección dentro de los servicios sanitarios y mejorar la calidad de la atención ofrecida a la población pediátrica.

Palabras clave: Infección Hospitalaria. Sepsis. Niño. Pediatría.

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Corresponding author: Dayanne Cristina Zanfrille da Costa. Rua Góias, nº 1347, Apto. 302. CEP: 86020410, Londrina – Paraná; Brasil. Email: dayanne.costa@alumni.usp.br

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