REME • Rev Min Enferm. 2022;26:e-1426
DOI: 10.35699/2316-9389.2022.38662

RESEARCH

HOSPITAL MORBIDITY OF CHILDREN UNDER FIVE YEARS OLD IN A BRAZILIAN BORDER MUNICIPALITY

MORBIDADE HOSPITALAR DE CRIANÇAS MENORES DE CINCO ANOS EM UM MUNICÍPIO BRASILEIRO DE FRONTEIRA

MORBILIDAD HOSPITALARIA DE NIÑOS MENORES DE CINCO AÑOS EN UN MUNICIPIO DE FRONTEIRA BRASILEÑO

Ana Caroline Souza[1]
Helder Ferreira[1]
Ana Paula Contiero[2]
Rosane Meire Munhak Silva[2]
Adriana Zilly[2]
Maria Cândida de Carvalho Furtado[3]
Rosangela Pimenta Ferrari[4]

[1]Universidade Estadual do Oeste do Paraná - UNIOESTE, Curso de Graduação em Enfermagem. Foz do Iguaçu, PR - Brazil.
[2]UNIOESTE, Mestrado em Saúde Pública em Região de Fronteira. Foz do Iguaçu, PR - Brazil.
[3]Universidade de São Paulo - USP, Escola de Enfermagem de Ribeirão Preto. Ribeirão Preto, SP - Brazil.
[4]Universidade Estadual de Londrina - UEL, Curso de Graduação em Enfermagem. Londrina, PR - Brazil.

Corresponding Author: Ana Paula Contiero
E-mail: ana_contiero@hotmail.com

Authors' contributions:
Conceptualization: Ana P. Contiero, Maria C. C. Furtado; ***Data Collection:*** Ana C. Souza, Ana P. Contiero; ***Funding Acquisition:*** Maria C. C. Furtado; ***Investigation:*** Ana P. Contiero; ***Methodology:*** Helder Ferreira, Ana P. Contiero, Adriana Zilly, Rosangela P. Ferrari; ***Project Management:*** Ana P. Contiero, Maria C. C. Furtado; ***Resources Management:*** Ana P. Contiero; ***Statistical Analysis:*** Helder Ferreira, Ana P. Contiero; ***Supervision:*** Ana P. Contiero, Adriana Zilly, Maria C. C. Furtado; ***Validation:*** Helder Ferreira, Ana P. Contiero, Rosane M. M. Silva, Maria C. C. Furtado, Adriana Zilly, Rosangela P. Ferrari; ***Visualization:*** Ana C. Souza, Ana P. Contiero, Rosane M. M. Silva, Maria C. C. Furtado, Rosangela P. Ferrari; ***Writing - Original Draft Preparation:*** Ana C. Souza, Ana P. Contiero; ***Writing - Review and Editing:*** Ana C. Souza, Helder Ferreira, Ana P. Contiero, Rosane M. M. Silva, Adriana Zilly, Maria C. C. Furtado, Rosangela P. Ferrari.

Funding: *Parque Tecnológico Itaipu* - PTI.

Submitted on: 02/23/2021
Approved on: 12/15/2021

Editors in charge:
Bruna Figueiredo Manzo
Tânia Couto Machado Chianca

ABSTRACT

Objective: to describe the causes of hospitalization of children under five years old and the factors associated with avoidable hospitalizations in a Brazilian municipality of the triple border. **Method:** a cross-sectional study of hospital morbidity, with data collection in medical records, conducted at the public hospital of reference for pediatric care in a municipality of the triple border between Brazil, *Paraguai* and *Argentina*, from May 2017 to April 2018. The hospitalizations were classified as avoidable and non-avoidable. The independent variables were as follows: medical diagnosis; gender; age; hospitalization period; outcome and country of residence. The ratios of non-adjusted prevalence and adjusted by the log-binomial regression model were estimated to verify the association between the dependent variable, avoidable hospitalizations, and the independent variables. **Results:** there were 758 hospitalizations, 45.1% of which were considered avoidable. The main causes of hospitalization were diseases of the respiratory system (42.8%), the group of undefined causes (13.8%) and infectious and parasitic diseases (10%). The avoidable hospitalizations were associated with the age group of less than one year old, with longer hospitalization time and with the "discharge to home" outcome. **Conclusion:** the avoidable hospitalizations were responsible for almost half of the hospitalizations, mostly due to respiratory diseases, being associated with less than one year old, longer hospitalization time and better outcome. These findings suggest the need to strengthen the Primary Health Care actions through adequate financial investment to reduce unnecessary hospitalizations.

Keywords: Hospitalization; Primary Health Care; Child Health; Border Health.

RESUMO

Objetivo: *descrever as causas de hospitalização de crianças menores de cinco anos e os fatores associados às internações evitáveis em município brasileiro de tríplice fronteira.* ***Método:*** *estudo transversal, de morbidade hospitalar, com coleta de dados em prontuários, no hospital público de referência para atendimento pediátrico em município de tríplice fronteira entre Brasil, Paraguai e Argentina, no período de maio de 2017 a abril de 2018. As hospitalizações foram classificadas em evitáveis e não evitáveis. As variáveis independentes foram: diagnóstico médico; sexo; idade; período de internação; desfecho e país de residência. Foram estimadas as razões de prevalência bruta e ajustada pelo modelo de regressão log-binomial para verificar a associação entre a variável dependente, internações evitáveis e as variáveis independentes.* ***Resultados:*** *ocorreram 758 hospitalizações, sendo 45,1% consideradas evitáveis. As principais causas de internação foram as doenças do aparelho respiratório (42,8%), o grupo de causas indefinidas (13,8%) e as doenças infecciosas e parasitárias (10%). As hospitalizações evitáveis estiveram associadas à faixa etária menor de um ano, mais tempo de internação e com o desfecho "alta para casa".* ***Conclusão:*** *as internações evitáveis foram responsáveis por quase metade das hospitalizações, em sua maioria por doenças do aparelho respiratório, sendo associadas a menores de um ano, mais tempo de hospitalização e melhor desfecho. Esses achados sugerem a necessidade de fortalecer as ações da atenção primária à saúde por meio de adequado investimento financeiro para reduzir as hospitalizações desnecessárias.*

Palavras-chave: *Hospitalização; Atenção Primária à Saúde; Saúde da Criança; Saúde na Fronteira.*

RESUMEN

Objetivo: *describir las causas de hospitalización de niños menores de cinco años y los factores asociados a hospitalizaciones evitables en una ciudad brasileña de la triple frontera.* ***Método:*** *estudio transversal de morbilidad hospitalaria, con recolección de datos de historias clínicas, en un hospital público de referencia para la atención pediátrica en una ciudad de la triple frontera entre Brasil, Paraguay y Argentina, de mayo de 2017 a abril de 2018. Las hospitalizaciones fueron clasificadas en evitable y no evitable. Las variables independientes fueron: diagnóstico médico; sexo; edad; período de hospitalización; resultado y país de residencia. Las razones de prevalencia brutas y ajustadas se estimaron mediante el modelo de regresión log-binomial para verificar la asociación entre la variable dependiente, las hospitalizaciones evitables y las variables independientes.* ***Resultados:*** *hubo 758 hospitalizaciones, de las cuales el 45,1% se consideraron evitables. Las principales causas de hospitalización fueron las enfermedades del aparato respiratorio (42,8%), el grupo de causas indefinidas (13,8%) y las enfermedades infecciosas y parasitarias (10%). Las hospitalizaciones evitables se asociaron con tener menos de un año, estar más tiempo hospitalizado y con el resultado "alta domiciliaria".* ***Conclusión:*** *las hospitalizaciones evitables representaron casi la mitad de las hospitalizaciones, en su mayoría por enfermedades respiratorias, estando asociadas a menores de un año, mayor estancia hospitalaria y mejor evolución. Estos hallazgos sugieren la necesidad de fortalecer las acciones de atención primaria de salud a través de una adecuada inversión financiera para reducir las hospitalizaciones innecesarias.*

Palabras clave: *Hospitalización; Atención Primaria de Salud; Salud del Niño; Salud Fronteriza.*

How to cite this article:
Souza AC, Ferreira H, Contiero AP, Silva RMM, Zilly A, Furtado MCC, Ferrari RP. Hospital morbidity of children under five years old in a Brazilian border municipality. REME - Rev Min Enferm. 2022[cited _____ ___ __];26:e-1426. Available from: _____ DOI: 10.35699/2316-9389.2022.38662

INTRODUCTION

Brazil has shown an improvement in the children's health indicators, especially in the reduction of infant mortality and pediatric hospitalization rates. Such advances result from investments in public policies for the promotion of children's health, such as: monitoring of growth and development; encouragement to breastfeed; immunization programs and control of infectious diseases associated with coping with the social determinants; and improvement in the socioeconomic conditions of the population.[1]

However, most infant deaths are considered avoidable or reducible. It is estimated that, among children under five years old, more than half of the deaths are due to avoidable and treatable diseases through simple and accessible interventions. In this sense, the country is a signatory to the Sustainable Development Goals (SDGs), which aim to eradicate avoidable deaths of children under five years old and reduce mortality to at least 25 per 1,000 live births by 2030.[2]

There are still high hospitalization rates for children, and the main causes of illness and hospitalization in children under five years old are respiratory diseases such as pneumonia and asthma, infectious and parasitic diseases, with emphasis on gastroenteritis and urinary tract infections (UTIs) and diseases of the neonatal period.[3,4]

It is noted that most of these hospitalizations are avoidable, being called Hospitalizations due to Conditions Sensitive to Primary Care (HCSPCs), as timely and quality outpatient care could solve most of the child's health problems, avoiding this outcome.[5] A number of Brazilian studies have reported different prevalence values of HCSPCs in children under five years old, varying from 20% in the South to 60% in the Northeast region.[3,4,6]

Although the high rates of HCSPCs may indicate failures in access, resoluteness and performance of Primary Health Care (PHC), it is necessary to analyze this indicator with caution, as other factors may contribute to the occurrence of these hospitalizations, such as: the sociodemographic determinants; the way in which services are organized; the funding of the health system; and the lack of qualified human resources in PHC.[7]

A prospective microsimulation study that analyzed the impact of fiscal austerity measures, establishing a limit on health expenditures and, consequently, greater underfunding of the PHC actions, verified an increase in infant mortality by up to 8.6%, in addition to the increase of 124,000 avoidable hospitalizations by 2030.[8]

Knowing these hospitalizations better becomes an opportunity to identify problems in the health services and reorient the actions, in addition to being able to lead to behaviors that enable a reduction of the health expenditures, as hospitalization represents a much higher expense when compared to primary care, which offers a package of low-cost interventions for the main diseases.[9]

In addition to the costs for the health system, hospitalization is a stressful and traumatic event for the child, due to the change of routine and environment, which can cause harms to growth and development, as well as problems for mental health, such as: aggressiveness; sleep disorders; anguish; lack of affect; lack of receptivity to the treatment; and other behaviors that corroborate non-adherence to the treatment modalities, consequently increasing the number of hospitalization days.[10]

Therefore, it becomes necessary to identify the profile of the hospitalizations of children in order to help discover the existing gaps in their causes, mainly in the border region, as it is an area with a large flow of people belonging to different ethnicities, cultures and sociodemographic conditions. On the triple border between Brazil, Paraguay and Argentina, there is an inter-country movement of foreigners seeking care in Brazil due to fragmentation and difficulty accessing health services in the neighboring countries, as well as to the characteristics of the Unified Health System (*Sistema Único de Saúde*, SUS), which offers universal access to health regardless of nationality and country of residence, which, in a way, reflects the health indicators in this region.[11,12]

This cross-border mobility can influence both the risk for the onset of diseases, especially among children, and further impact on the scarcity of resources and infrastructure for health care in the PHC scope.[11] Thus, the objective of this study was to describe the causes of hospitalization of children under five years old and the factors associated with avoidable hospitalizations in a Brazilian municipality of the triple border.

METHODOLOGY

This is a cross-sectional study of hospital morbidity, carried out at the public hospital of reference for pediatric hospitalization by the SUS, in Foz do Iguaçu, a municipality located in the western region of the state of Paraná, on the triple border with Paraguay and Argentina, one of the busiest borders in Latin America, due to the intense flow of people. It is a city with an estimated population of 258,532 inhabitants, of which 19,790 (7.7%) are in the age group selected for the study.[13]

All the hospitalizations of children from zero to five years old that occurred between May 2017 and April 2018 were included. The period of one year was adopted so as

not to incur in seasonality bias. Data collection was performed by a Nursing student and a PhD student from two public teaching universities previously trained by the responsible researcher. An instrument was elaborated by the research team, comprised by experts in the area of children's health for data extraction in the electronic medical records and Hospital Admission Authorization (HAA) for immediately after the child's discharge.

The structured instrument contained the following variables: age; gender; hospitalization time; causes of the hospitalizations; outcome; readmission; avoidable hospitalization; country of residence and address. For application of the instrument, two pilot tests were first carried out. Although all the information necessary for the research was available in the electronic medical records, without missing data, there were some inconsistencies regarding the home address of the patients, who were registered with the same address of the hospital institution.

The hospitalizations were classified as avoidable (HCSPCs) and non-avoidable according to the medical diagnosis of the 10th Review of the International Classification of Diseases (ICD-10). The hospitalizations were classified as avoidable when the medical diagnosis was HCSPC, according to the Official Brazilian List of the Ministry of Health,[3] and when the hospitalization time exceeded 24 hours. The other hospitalizations were considered non-avoidable, as well as those of children younger than two months old with a diagnosis of pneumonia or bronchiolitis as a result of the express recommendation of hospitalization in this age group, due to the risk of complications.[14]

After double entry into *Excel* spreadsheets, the data were validated and a descriptive analysis of the hospitalizations was performed, calculating absolute and relative frequencies, estimating the proportional admissions for the following variables: gender (male and female), age group (< one year old and from one to four years old), hospitalization time, outcome (discharge to home and hospital transfer), and occurrence of readmission during the data collection period.

The rates of HCSPCs were calculated for groups of children under one year old and between one and four years old, dividing the number of HCSPCs, in each of these age groups, by the number of children in the same age group living in Foz do Iguaçu, according to the data obtained from the Paraná Institute of Economic and Social Development (*Instituto Paranaense de Desenvolvimento Econômico e Social*, IPARDES),[13] multiplying the result by 1,000.

The dependent variable of the study was HCSPC. The non-adjusted and adjusted prevalence ratios were estimated, with their respective 95% confidence intervals (95%-CI), by the log-binomial regression model for the independent variables of gender, age group, hospitalization time, outcome and readmission, in order to verify which ones were associated with the HCSPC outcome. The analyses were implemented using the SAS program, version 9.4, and the R program, version 3.5.3.

This research is a clipping of the PhD thesis entitled: Hospital admissions of children due to conditions sensitive to primary care in the border region. It was approved by the Research Ethics Committee of the Ribeirão Preto Nursing School of the University of São Paulo with Certificate of Presentation for Ethical Appreciation (*Certificado de Apresentação para Apreciação Ética*, CAAE) No. 64907717.6.0000.5393 and Opinion No. 2,005,981.

RESULTS

During the study period, there were 758 hospitalizations of children aged from zero to five years old, 423 (55.8%) males and 335 (44.2%) females, 459 (60.6%) aged between one and four years old for and 299 (39.4%) under one year old. As hospitalization outcomes, 721 (95.1%) children were discharged from the hospital, followed by 37 (4.9%) who needed to be transferred to another hospital due to deterioration of the clinical condition, as the researched institution did not have pediatric intensive care beds.

Three quarters of the children were admitted only once. The mean was 1.18 hospitalizations (SD=0.61) and the number of hospitalization days varied from zero to 62, with a median hospital stay of 4.3 days. All were registered as residents in Brazil; however, in the home address field, in nearly 1/4 of the medical records the address registered was the same as that of the hospital institution.

Of these hospitalizations, 342 (45.1%) are considered avoidable because they are HCSPCs; and, when compared to other causes of hospitalization, they differ significantly in terms of the age, hospitalization time and outcome of the hospitalization variables (Table 1). The rate of HCSPCs for children under one year old was 40.14 per 1,000 inhabitants, while for children aged from one to four it was 11.47 per 1,000.

As illustrated in Table 1, there was a higher prevalence of avoidable hospitalizations for children under one year old, with predominance of the "improved discharge" to home outcome, when compared to other causes of hospitalization, which presented more complications and required hospital transfers. However, the median number of hospitalization days was significantly higher for HCSPCs.

Table 1 - Distribution of the pediatric hospitalizations of children under five years old (n=758) according to the gender, age, hospitalization time, outcome and readmission variables. *Foz do Iguaçu*, PR, Brazil, 2017-2018

Variables	HCSPC*			95% CI			95% CI	
	No	Yes	Non-adjusted PR	LL	UL	Adjusted PR	LL	UL
Gender								
Male	231 (54.61)	192 (45.39)	0.988	0.868	1.125			
Female	185 (55.22)	150 (44.78)	1	1	1			
Age (years old)								
< 1	138 (46.15)	161 (53.85)	0.762	0.660	0.879	0.779	0.676	0.898
1 - 4	278 (60.57)	181 (39.43)	1	1	1	1	1	1
Length of stay (days) ** **Outcome**	2 (0; 62)	4 (1; 22)	0.955	0.929	0.983	0.961	0.935	0.988
Hospital discharge	332 (46.0)	389 (54.0)	1	1	1	1	1	1
Transfer	27 (72.97)	10 (27.03)	0.741	0.603	0.912	0.751	0.629	0.896
Readmission								
No	361 (56.06)	283 (43.94)	1	1	1			
Yes	55 (48.25)	59 (51.75)	1.162	0.949	1.422			

*Hospitalization due to Conditions Sensitive to Primary Care
**Median, minimum and maximum values.

According to the ICD-10 diagnostic chapters (Table 2), almost half of the hospitalizations were due to diseases of the respiratory system; nearly 1/4 by the group symptoms, signs and abnormal findings, and infectious and parasitic diseases were the third most frequent group that motivated hospitalizations in general.

Among the avoidable hospitalizations, the most frequent HCSPC diagnoses are shown in Table 3. Bronchitis and pneumonia accounted for more than half of the causes of avoidable hospitalizations (217=63.4%). Bronchitis predominated in male children and in those under one year old, with a higher proportion of readmission cases among the HCSPCs.

However, children hospitalized due to epilepsy presented a higher median of hospitalization days. For the children aged from one to four years old, pneumonia was more prevalent, especially for females.

DISCUSSION

The HCSPCs were responsible for almost half of the pediatric hospitalizations, and the diseases of the respiratory system were the most frequent cause of hospitalization. The occurrence of HCSPCs was shown to be high, especially when compared to other research studies in the southern region of the country, which found a proportion of HCSPCs of up to 23.3% among children of the same age group.[4] Equally high prevalence values were reported in the Brazilian Southeast and Northeast regions.[15,16]

High HCSPC rates may reflect the effectiveness of PHC, as it offers several programs and actions of low technological density, especially surveillance of children's health, for presenting priority due to their biological vulnerability and susceptibility to illness, which renders unjustifiable the high hospitalization rates, considering that PHC has the ability to avoid this outcome.[3,4]

However, it is necessary to consider the challenges faced by PHC, which range from the improvement in the physical structure in basic health units (BHUs), increased funding of the health actions and more integration with other care levels to training of professionals to work in the SUS. Thus, it becomes evident that it is necessary to strengthen PHC in Brazil, through investment in resources, as it has historically received less financial contribution than the secondary and tertiary levels.[17]

It should also be noted that, since 2016, the Brazilian health system has undergone transformations due to the implementation of fiscal austerity measures and cuts in health expenditures, changes in primary care policy, and changes in the PHC funding modality. This context of economic and political crisis can result in precariousness of the services and is a threat to the implementation of a universal, comprehensive and integral PHC, which may be reflected in the worsening of the population's health indicators.[18]

The HCSPCs were more prevalent among children under one year old, which can be explained by immunological immaturity and by specific conditions related to development, resulting in vulnerability and propensity to

Table 2 - Distribution of the pediatric hospitalizations of children under five years old according to the ICD-10 diagnostic chapters. *Foz do Iguaçu*, PR, Brazil, 2017-2018 (n=758)

	HCSPC*		
ICD-10 Diagnostic Chapters	**No (n=416)**	**Yes (n=342)**	**Total (n=758)**
I. Infectious and parasitic diseases	44 (10.6)	32 (9.4)	76 (10.0)
II. Neoplasms	2 (0.5)	0 (0)	2 (0.3)
III. Diseases of the blood and hematopoietic organs	16 (3.8)	1 (0.3)	17 (2.2)
IV. Endocrine, nutritional and metabolic diseases	4 (1.0)	4 (1.2)	8 (1.1)
V. Mental and behavioral disorders	4 (1.0)	0 (0)	4 (0.5)
VI. Nervous system disorders	12 (2.9)	20 (5.8)	32 (4.2)
VII. Diseases of the ear and mastoid apophysis	2 (0.5)	2 (0.6)	4 (0.5)
VIII. Diseases of the circulatory system	5 (1.2)	2 (0.6)	7 (0.9)
IX. Diseases of the respiratory system	94 (22.5)	231 (67.5)	325 (42.9)
XI. Diseases of the digestive system	45 (10.8)	0 (0)	45 (5.9)
XII. Skin and subcutaneous tissue disorders	14 (3.4)	18 (5.2)	32 (4.2)
XIV. Diseases of the genitourinary system	5 (1.2)	32 (9.4)	37 (4.9)
XVI. Some conditions in the perinatal period	4 (1.0)	0 (0)	4 (0.5)
XVII. Congenital malformations and anomalies	3 (0.7)	0 (0)	3 (0.4)
XVIII. Symptoms, signs and abnormal findings	105 (25.2)	0 (0)	105 (13.9)
XIX. Injuries - poisonings and external causes	55 (13.2)	0 (0)	55 (7.3)
XXI. Contacts with health services	2 (0.5)	0 (0)	2 (0.3)

*Hospitalization due to Conditions Sensitive to Primary Care.

Table 3 - Distribution of the hospitalization diagnoses by sensitive condition according to gender, age, outcome, readmission and hospitalization time. Foz do Iguaçu, PR, Brazil, 2017-2018 (n=342)

	Medical Diagnosis					
	Bronchitis (n=151)	**Pneumonia (n=66)**	**ICU** (n=32)**	**Gastroenteritis (n=28)**	**Epilepsy (n=20)**	**Other HCSPCs*** (n=45)**
Gender		Pneumonia				
Male	97 (50.52)	35 (18.23)	7 (3.65)	16 (8.33)	12 (6.25)	25 (13.02)
Female	54 (36)	31 (20.67)	25 (16.67)	12 (8)	8 (5.33)	20 (13.33)
Age (years old)		Epilepsy				
< 1	84 (52.17)	18 (11.18)	18 (11.18)	12 (7.50)	11 (6.83)	18 (11.18)
1 - 4	67 (37.02)	48 (26.52)	14 (7.73)	16 (8.84)	9 (4.97)	27 (14.92)
Outcome						
Discharge	149 (44.87)	63 (18.98)	32 (9.63)	28 (8.43)	18 (5.42)	42 (12.66)
Transfer	2 (20)	3 (30)	0 (0)	0 (0)	2 (20)	3 (30)
Readmission						
No	125 (44.17)	50 (17.67)	29 (10.25)	25 (8.83)	14 (4.95)	40 (14.13)
Yes	26 (44.07)	16 (27.12)	3 (5.08)	3 (5.08)	6 (10.18)	5 (8.47)
Hospitalization days*	3 (1; 18)	4 (2; 22)	4 (1; 11)	4 (2; 10)	5 (2; 10)	5 (2; 21)

*Median, minimum and maximum values.
**UTI - Urinary Tract Infection.
***Hospitalizations due to Conditions Sensitive to Primary Care.

illness,[2,4] as well as by the interruption of breastfeeding and the beginning of the activities in the Municipal Centers of Childhood Education (*Centros Municipais de Educação Infantil* CMEIs) and schools, which expose them to conditions that favor the risk factors for the main health problems inherent to the age.[4]

Among the causes of HCSPCs, the bronchitis, pneumonia, UTI, gastroenteritis and epilepsy diagnoses stood out in order of frequency. These findings reinforce a systematic review that analyzed the causes of HCSPCs in Brazilian children under five years old,[3] with the exception of epilepsy, which was only mentioned among the five most frequent causes of HCSPCs in the state of São Paulo.[19] In the respiratory diseases, more frequently for the bronchitis and pneumonia diagnoses, it should be noted that these morbidities varied according to gender and age group.

Acute bronchitis prevailed in children under one year old and male, similarly to other studies.[20] In this age group, children are more susceptible to developing more severe respiratory conditions, due to immunological immaturity and anatomical characteristics. Although its occurrence is acknowledgedly more frequent in males, its mechanism is not yet well recognized, and there may be a genetic component that predisposes boys to a high risk of bronchitis.[21]

Pneumonia, the second most frequent cause of hospitalization, was more prevalent in the group of children aged from one to four years old, converging with other findings, which also evidenced a higher incidence in the same age period.[14] However, it is worth noting that these clinical conditions could be avoided, as PHC has preventive measures, such as immunization, and provides care and medication treatment for these diseases.[3,14]

Diseases of the genitourinary system and infectious and parasitic diseases were the second most prevalent diagnostic group of HCSPCs, with emphasis on the UTI and gastroenteritis diagnoses. In this study, UTIs affected more female children under one year old, corroborating the results that also verified an increasing increase in the number of UTIs in this age group.[3]

UTIs are common in childhood, and hygiene habits and the anatomical structure of the genitals are factors that favor onset of this disease.[5] However, the signs and symptoms characteristic of this morbidity can be identified early in time and, thus, timely treatment by the PHC can be implemented. The health team has the responsibility of instructing on the correct hygiene of the children's genitals, adequate water intake, and, for children under one year old, breast milk is a protective factor against UTIs.[3,4]

Gastroenteritis prevailed in male children aged between one and four years old, in line with other studies, which identified an increase in the number of cases in this age group.[5] Gastroenteritis is considered a public health problem, being a parasitic infection of common involvement among children throughout Brazil, related to the sanitation conditions and to deficient education, which favor onset of the disease[3]. However, PHC has resources for diagnosis and treatment initiation with low complexity therapies, which involve oral rehydration and anti-parasite treatment, in addition to provision of the human rotavirus vaccine, which will prevent development of the disease.[3,22]

Among the causes of non-avoidable hospitalizations, the diagnostic chapters of symptoms, abnormal signs and findings, respiratory diseases and hospitalizations due to external causes stood out in order of frequency. The diagnostic chapter of symptoms, signs and abnormal findings of clinical and laboratory examinations, not elsewhere classified, stood out due to the R00 - R99 diagnosis of unknown and unspecified causes of morbidity. It consists of clinical cases that do not present a more accurate diagnosis, even after performing several laboratory and imaging tests, and may be signs or symptoms with transient characteristics, without definite causes.[23]

This result draws the attention since, in nearly 1/4 of the hospitalizations, the children were discharged from the hospital without identifying the cause of hospitalization, thus underestimating the number of HCSPCs. The external causes, the third most frequent group of hospitalization among non-avoidable causes, in this study represented by injuries resulting from trauma, fractures, burns and accidents with venomous animals, are a public health problem, with an endemic character in Brazil, as the reduction in the number of deaths and injuries by this morbidity group occurs slowly, impacting on the health services and on the families' lives. The prevention actions for the adoption of measures that promote child safety can be worked on in PHC, taking into account the risk factors, vulnerability and development stage for each child.[7]

Although the data presented have revealed that children hospitalized due to CSPCs had a better outcome than those with non-avoidable causes, receiving, to a greater extent, discharge to home, the median number of hospitalization days was higher, especially in the epilepsy-related cases. Epilepsy is characterized as a chronic neurological disease, being considered as an important risk factor for child development, increasing by two to three times the probability of sudden death, which can explain the reason for longer hospitalization times when compared to hospitalizations due to other causes.[24]

The occurrence of readmission was higher in the HCSPCs. These readmissions can increase the psychological problems triggered during hospitalization, and

it is common for the child to present some psychosocial problem according to the number of readmissions,[11] also reflecting the increase in health expenditures.[21]

According to a study conducted in a municipality from the Brazilian South region that monitored a cohort of births, the hospitalizations favored the onset of behavioral problems, mainly when related to children under five years old with more hospitalization days.[10] The chance for mental health problems was higher among children hospitalized up to 48 months of life, which reinforces the importance of preventing potentially avoidable hospitalizations.[10]

No children living in other countries were identified in the consultation of the medical records. However, a common practice was verified in the municipality: in 25% of the hospitalizations, the children's home address was the same as that of the hospital institution. This occurs when no proof of address is delivered at hospital admission, a situation that may have happened due to the family's insecurity regarding the right to use the Brazilian health service, causing some people to conceal their true origin, which makes it difficult to identify the true demand for care by foreigners.[25]

Lack of knowledge about the real number of foreigners who use the health services in Brazil can exert an impact on access, quality and funding of the health services. Nevertheless, the expenses with hospitalizations consume a large part of the resources that could be used in PHC funding, with a significant potential for the development of health promotion actions and prevention of the most frequent health problems of the population.[7,22]

A weakened children's health care system, that is, without public funding in promotion and prevention actions, can contribute to the increase in the hospitalization rates and complications resulting from it, directly impacting on infant morbidity and mortality in these regions.

The findings of this study were limited to investigating the information available in medical records, and it is not possible to estimate the risk of HCSPCs, as well as to address the issues related to the families' sociodemographic conditions and the use of primary services, both factors recognized as with potential to influence the children's health indicators, with the possibility of contributing to the occurrence of hospitalizations. Nor was it possible to identify the demand of foreigners who make use of the health service in Brazil, as this information was not available in the hospital records.

CONCLUSION

This study found that the hospitalizations considered avoidable accounted for almost half of the hospitalizations recorded. The main cause of hospitalization among children under five years old were respiratory diseases, with bronchitis and pneumonia being the most frequent, followed by UTIs, gastroenteritis and epilepsy.

The avoidable hospitalizations were associated with age less than one year old, with a higher median of hospitalization days and with the discharge to home outcome. Among the non-avoidable hospitalizations, the main cause was hospitalizations due to symptoms, signs and abnormal findings of clinical and laboratory examinations not elsewhere classified due to the diagnosis of unknown and unspecified morbidity causes.

This information is important to support the actions of prevention and promotion of children's health in PHC, through adequate financial investment, as most care programs are directed to this age group, showing that there are gaps in the service, which are not able to prevent hospitalizations, thus generating additional costs to the health system, in addition to harms to both the child and the family facing a hospitalization.

When also considering the context of the triple border region, with circulation of children from other countries and who can consume the health services of the municipality that was the field of this research, it is necessary to implement a mechanism that allows mapping this demand, as there is no official record of the number of foreign children treated in the pediatric reference hospital. Thus, constant articulation between the managers from the three countries is recommended, so that investment in joint actions is a priority in the public agendas for the health care in this population.

REFERENCES

1. Leal MC, Szwarcwald CL, Almeida PVB, Aquino EML, Barreto ML, Barros F, *et al*. Saúde reprodutiva, materna, neonatal e infantil nos 30 anos do Sistema Único de Saúde (SUS). Ciênc Saúde Colet. 2018[cited 2019 Oct 19];23(6):1915-28. Available from: https://www.scielo.br /pdf/csc/v23n6/1413-8123-csc-23-06-1915.pdf

2. UNICEF. Levels & Trends in Child Mortality. Report 2019[cited 2020 Mar 5]. Available from: https://data.unicef.org/resources/levels-and-trends-in-child-mortality/

3. Pedraza DF, Araújo EMN. Internações das crianças brasileiras menores de cinco anos: revisão sistemática da literatura. Epidemiol Serv Saúde. 2017[cited 2019 Oct 19];26(1):169-82. Available from: https://www.scielo.br/pdf/ress/v26n1/2237-9622-ress-26-01-00169.pdf

4. Prezotto KH, Lentsck MH, Aidar T, Fertonani HP, Mathias TAF. Hospitalizações de crianças por condições evitáveis no Estado do Paraná: causas e tendência. Acta Paul Enferm. 2017[cited 2019 Oct 19];30(3):254-61. Available from: https://www.scielo.br/pdf/ape/v30n3/1982-0194-ape-30-03-0254.pdf

5. Rocha JVM, Nunes C, Santana R. Avoidable hospitalizations in Brazil and Portugal: Identifying and comparing critical areas through spatial analysis. PLoS ONE. 2019[cited 2019 Oct 19];14(7):e0219262.

Available from:https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0219262

6. Pinto Junior EP, Aquino R, Medina MG, Silva MGC. Efeito da Estratégia Saúde da Família nas internações por condições sensíveis à atenção primária em menores de um ano na Bahia, Brasil. Cad Saúde Pública. 2018[cited 2019 Oct 21];34(2):e00133816. Available from: https://www.scielo.br/pdf/csp/v34n2/1678-4464-csp-34-02-e00133816.pdf

7. Morimoto T, Dias da Costa JS. Análise descritiva dos gastos com internações por condições sensíveis à atenção primária. Cad Saúde Colet. 2019[cited 2020 Jan 10];27(3):295-300. Available from: https://www.scielo.br/pdf/cadsc/v27n3/1414462-Xcadsc-1414-462-X2019-00030344.pdf

8. Rasella D, Basu S, Hone T, Paes-Sousa R, Ocke-Reis CO, Millett C, *et al*. Child morbidity and mortality associated with alternative policy responses to the economic crisis in Brazil: a nationwide microssimulation study. Plos Medice. 2018[cited 2021 Sept 06];15(5):e1002570. Available from: https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002570

9. Pinto F, Giovanella L. Do Programa a Estratégia Saúde da Família: expansão do acesso e redução das internações por condições sensíveis a atenção Básica (ICSAB). Ciênc Saúde Colet. 2018[cited 2019 Oct 20];23(6):1093-13. Available from: https://www.scielo.br/pdf/csc/v23n6/1413-8123-csc-23-06-1903.pdf

10. Silva VLS, França GVA, Munhoz TN, Santos IS, Barros AJD, Barros FC, *et al*. Hospitalização nos primeiros anos de vida e desenvolvimento de transtornos psiquiátricos aos 6 e 11 anos: estudo de coorte de nascimentos no Brasil. Cad Saúde Pública. 2018[cited 2019 Nov 2];34(5):e00064517. Available from: https://www.scielo.br/pdf/csp/v34n5/1678-4464-csp-34-05-e00064517.pdf

11. Levino A, Carvalho EF. Análise comparativa dos sistemas de saúde da tríplice fronteira: Brasil/Colômbia/Peru. Rev Panam Salud Publica. 2011[cited 2019 Nov 4];30(5):490-500. Available from: https://scielosp.org/article /ssm/content/raw/?resource_ssm_path=/media/as-sets/rpsp/v30n5/v30n5a13.pdf

12. Souza S, Duim E, Nampo FK. Determinants of neonatal mortality in the largest international border of Brazil: a case-control study. BMC Public Health. 2019[cited 2019 Dec 15];19:1304. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7638

13. Instituto Paranaense de Desenvolvimento Social e Econômico. Caderno Estatístico do Município de Foz do Iguaçu: IPARDES; 2020[cited 2020 Mar 5]. Available from: http://www.ipardes.gov.br/cadernos/MontaCadPdf1.php?Municipio=85850&btOk=ok

14. Vieira ILV, Kupek E. Impacto da vacina pneumocócica na redução das internações hospitalares por pneumonia em crianças menores de 5 anos, em Santa Catarina, 2006 a 2014. Epidemiol Serv Saúde. 2018[cited 2019 Dec 15];27(4):e2017378. Available from: https://www.scielo.br/scielo.php?pid=S223796222018-000400307&script=sci_abstract&tlng=pt

15. Ferrer APS, Grisi SJFE. Avaliação do acesso à atenção primária à saúde de crianças e adolescentes hospitalizados devido a condições evitáveis. Rev Assoc Med Bras. 2016[cited 2019 Dec 19];62(6):513-23. Available from: https://www.scielo.br/pdf/ramb/v62n6/0104-4230-ramb-62-6-0513.pdf

16. Araújo EMND, Costa GMC, Pedraza DF. Internações por condições sensíveis à atenção primária em crianças menores de cinco anos: estudo transversal. São Paulo Med J. 2017[cited 2019 Nov 10];135(3):270-6. Available from:https://www.scielo.br/pdf/sp-mj/v135n3/1806-9460-spmj-135-03-00270.pdf

17. Fausto MCR, Rizzoto MLF, Giovanella L, Seidl H, Bousquat A, Almeida PF, *et al*. O futuro da Atenção Primária à Saúde no Brasil. Saúde Debate. 2018[cited 2021 Sept 06];42(suppl):12-7. Available from: https://www.scielo.br/j/sdeb/a/bSpRGvzf54nJ4pQjMy7PY3r/?lang=pt

18. Seta MH, Ocké-Reis CO, Ramos ALP. Programa Previne Brasil: o ápice das ameaças à Atenção Primária à Saúde? Ciênc Saúde Colet. 2021[cited 2021 Sept 6];26(suppl 2). Available from: https://doi.org/10.1590/1413-81232021269.2.01072020

19. Ferreira JBB, Borges MJG, Santos LL, Forster AC. Internações hospitalares por condições sensíveis ao atendimento ambulatorial em uma região de saúde do Estado de São Paulo, Brasil, 2008-2010. Epidemiol Serv Saúde. 2014[cited 2019 Nov 10];23(1):45-56. Available from: http://scielo.iec.gov.br /scielo.php?script=sci_arttext&pid=S1679-49742014000100005

20. Mendes-da-Silva A, Gonçalves-Pinho M, Freitas A, Azevedo I. Trends in hospitalization for acute bronchiolitis in Portugal: 2000–2015. Pulmonology. 2019[cited 2019 Nov 15];25(3):154-61. Available from: https://www.sciencedirect.com/science/article/pii/S253104371-8300783

21. Bont L, Checchia PA, Fauroux B, Figueras-Aloy J, Manzoni P, Paes B, *et al*. Defining the Epidemiology and Burden of Severe Respiratory Syncytial Virus Infection Among Infants and Children in Western Countries. Infect Dis Ther. 2016[cited 2019 Nov 15];5(3):271-98. Available from: https://link.springer.com/article/10.1007/s40121-016-0123-0

22. Souza DK, Peixoto SV. Estudo descritivo sobre a evolução dos gastos com internações hospitalares por condições sensíveis à atenção primária no Brasil, 2000-2013. Epidemiol Serv Saúde. 2017[cited 2019 Nov 20];26(2):285-94. Available from: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S2237-96222017000200285

23. Balieiro PCS, Silva LCF, Sampaio VS, Monte EX, Pereira EMSP, Queiroz LAF, *et al*. Fatores associados à mortalidade por causas inespecíficas e mal definidas no Estado do Amazonas Brasil, de 2006 a 2012. Ciênc Saúde Colet. 2020[cited 2021 Sept 06];25(1):339-52. Available from: https://doi.org/10.1590/1413-81232020251.27182017

24. Rodrigues-Bastos RM, Campos EMS, Ribeiro LC, Firmino RUR, Bustamante-Teixeira MT. Internações por condições sensíveis à atenção primária em município do sudeste do Brasil. Rev Assoc Med Bras. 2013[cited 209 Nov 15];59(2):120-7. Available from: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-42302013000200010

25. Zaslavsky R, Goulart BNG, Ziegelmann PK. Cross-Border healthcare and prognosis of HIV infection in the triple border Brazil-Paraguai-Argentina. Cad Saúde Pública. 2019[cited 2019 Dec 10];35(9):e00184918. Available from: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2019001105004