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CREATING THE PROFILE OF THE PEDIATRIC PATIENT DIAGNOSED WITH LOWER RESPIRATORY TRACT INFECTIONS

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ABSTRACT

Lower respiratory tract infections (LRTIs) in pediatric patients, encompassing entities such as bronchiolitis and pneumonia, present a multifaceted clinical challenge. This study delves into the complexity of pediatric LRTIs, considering diverse pathogens, clinical manifestations, and the influence of viral epidemics. Epidemiological insights reveal a global impact, with a notable burden on mortality and morbidity, particularly in the first years of life.

The retrospective cohort study, conducted at a Children's Emergency Clinical Hospital, explores the clinical and paraclinical profile of 145 pediatric patients diagnosed with LRTIs between January 2022 and December 2022. Descriptive statistics of hospitalization days, C-reactive protein (CRP), and procalcitonin (PCT) values provide insights into the clinical-paraclinical dynamics.

Respiratory failure primarily results from viral infections, showcasing the need for targeted interventions. The study identifies Staphylococcus aureus and respiratory syncytial virus as prevalent etiological agents. Notably, antibiotic therapy, primarily cephalosporins, is employed in 86.2% of cases.

This comprehensive analysis contributes to a nuanced understanding of pediatric LRTIs, guiding personalized treatment strategies and preventive measures. The study serves as a valuable resource for clinicians and researchers, fostering advancements in pediatric respiratory care.

Keywords: respiratory tract infections, pediatrics, child health, hospitalization, epidemiology

Introduction

Lower respiratory tract infections represent a wide range of pediatric pathologies, influenced by diverse pathogens and varied clinical manifestations. These conditions, including bronchiolitis, pneumonia, and other entities, pose significant challenges in diagnosis and management, amplified by age differences and the impact of viral epidemics. Seasonal influenza epidemics are the consequence of the antigenic modification of influenza viruses. The rate of hospitalization due to severe illness is 3 per 1000 in children aged 6 to 23 months and 9 per 1000 in children under 6 months (1).

The global impact of these infections is significant, but epidemiological information is limited, with studies conducted in less representative communities and with old data. Mortality and morbidity from these infections were higher than those from other conditions, and respiratory infections are more common in the first years of life (2).

In 2002, according to the World Health Organization (WHO), respiratory infections contributed 18% to the mortality of children under five years of age, followed by diarrheal diseases (15%) and malaria (11%) (3). Furthermore, these infections not only resulted in a significant level of deaths but also caused a high rate of morbidity

among this age group. In the United Kingdom and Belgium, between 22% (4) and 26.7% (5) of all hospitalizations were attributed to respiratory infections, while between 33.5% and 59% of GP consultations in countries such as Italy they were due to respiratory viral infections (6,7).

These infections have a higher frequency in young ages compared to adulthood, with approximately 5 to 6 infections per year (8,9). The seriousness and extensive impact of these respiratory conditions on children's health is evident, highlighting the need for effective prevention and treatment strategies in this vulnerable age group.

Profiling the pediatric patient diagnosed with these infections involves a detailed exploration of factors such as etiologic agents, clinical presentation, possible complications, and therapeutic response. Understanding the complexity of these issues is essential to outline a personalized treatment plan and minimize the risk of complications. This article proposes a detailed analysis of the factors that influence the profile of the pediatric patient in the context of lower respiratory tract infections, opening new perspectives for the clinical approach and medical research in pediatrics.

Material and methods

To create this database, we selected the files of patients who presented respiratory pathology during the diagnosis at admission or discharge. This is a cohort study that was conducted retrospectively on a group of 173 children from the Children's Emergency Clinical Hospital, St. John's, Galaţi, between January 2022 and December 2022. After applying the criteria of exclusion (incomplete records in the observation sheets, such as lack of treatment, lack of etiologic agent, as well as lack of collection in all diagnostic methods), the final sample included 145 patients.

To realize the statistical elements presented and interpreted in this paper, data considered relevant were collected. Later, they were triaged according to the inclusion and exclusion criteria presented above, the information thus obtained being centralized in a database. The statistical analysis of the data was carried out within the statistical software SPSS v26, in which the variables were coded accordingly, the responses within the variables being associated with a number.

Results and discussion

Through the Pareto graph shown below, we observed the incidences of hospitalization diagnoses of pediatric patients enrolled in the study group. The dynamics of this research confirm the fact that at the level of the previously mentioned health unit, the predominance of the admission diagnosis of acute interstitial pneumonia is notable, representing 34.27% of the study group. The lowest weights are exposed in the case of tracheitis (n=1 case), respectively of bronchopneumonia with 8 cases. 12 subjects were classified under the diagnosis of acute respiratory insufficiency, in the situation where the symptomatology accused at the time of presentation could be associated with it.

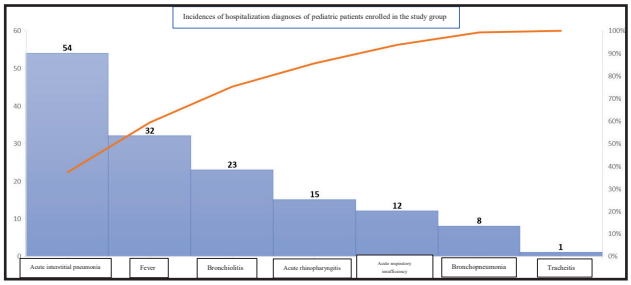


Figure 1 – Incidences of hospitalization diagnoses of pediatric patients enrolled in the study group

To draw up a clinical therapeutic profile of this category of patients as correctly as possible, it is important to expose the existing information about the distribution of these variables. In the centralizing table below, accompanied by the corresponding histograms, we presented the descriptive statistics of three scalar variables of interest: the number of hospitalization days required for the clinical-paraclinical stabilization of the subjects, respectively: values of the inflammatory parameters (at the time of recording). The obtained results were as follows:

An average number of hospitalization days of 5.35 days is noted, with an associated SD of ± 1.70 days. The variance is 2.91 days, with values between a minimum of 2 and a maximum of 10. The distribution curve describes a path with a

normal Gaussian appearance, with an amplitude dependent on the occasional maximum peak that stands out near the five days mark. The slight deviation to the left supports one of the null hypotheses that 72 hours is necessary and often sufficient to equilibrate these subjects.

After creating the frequency table, we observed that among the 145 subjects, the mean value of CRP is 1.05 mg/L, with a standard deviation of 1.06 mg/L. Also, the minimum number recorded was 0.05, while the maximum was 5 mg/L. Within this variable, the skewness is equal to 1.49. Therefore, the distribution of this study group, in terms of hospitalization days, is asymmetric and positive, strongly skewed to the left. Also, within the same frequency table, the Kurtosis index was calculated, where it recorded a value of 1.7, from which it follows that the distribution of the lot according to the CRP value, according to this index, is platykurtic, with the appearance of the so-called heavy tail appearance (monkey tail)

Following the association of descriptive statistics data on PCT values, we observed an average value (VM) of 1.32, with an SD of 1.036. The maximum detectable value is 6. According to the skewness and kurtosis statistical indicators, we observed that the distribution within the lot according to the PCT values is slightly asymmetric and positive, with the peak of the histogram curve slightly shifted to the left. The assessment of the distribution curvature was achieved using the Kurtosis index, which is of the platykurtic type.

C-reactive protein is a ring pentameric protein found in blood plasma, who's concentration increases in response to inflammation. It is an acute phase protein of hepatic origin that increases following the secretion of interleukin-6 by macrophages and T cells. We could observe that at the level of the analyzed sample respiratory failure occurs predominantly as a consequence of a viral infection, respectively of a severe inflammation of the lower respiratory tract, not as a direct consequence of the bacterial infection.

Statistics

		Number of hospitalization days	C-reactive protein	Procalcitonin
N	Valid	145	145	145
	Missing	0	0	0
Mean		5.36	1.05	1.32
Median		5.00	.50	1.00
Mode		5	1	1
Std. Deviation		1.707	1.063	1.036
Variance		2.912	1.131	1.073
Skewness		.173	1.494	1.649
Std. Error of Skewness		.201	.201	.201
Kurtosis		-.556	1.708	4.242
Std. Error of Kurtosis		.400	.400	.400
Range		8	4	6
Minimum		2	0	0
Maximum		10	5	6

Figure2 -Descriptive statistics of paraclinical investigations used and analyzed in this data set

We identified multiple etiological agents, with the highest prevalence in the case of Staphylococcus aureus (Staphilococcus aureus), 41,37% (n=60) of the subjects showing infection with this infectious agent, followed by the respiratory syncytial virus, with a prevalence of 33.79% (n=49). The prevalence for the other agents can be seen in figure 4.

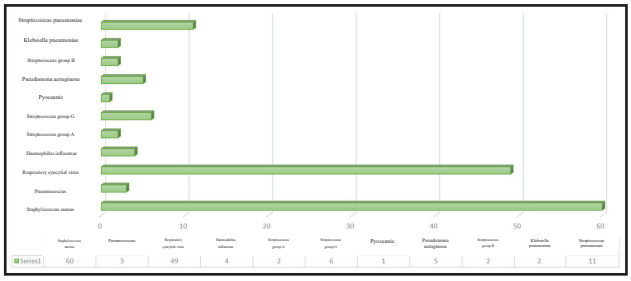


Figure 4 –Prevalence of infectious agents within the study group

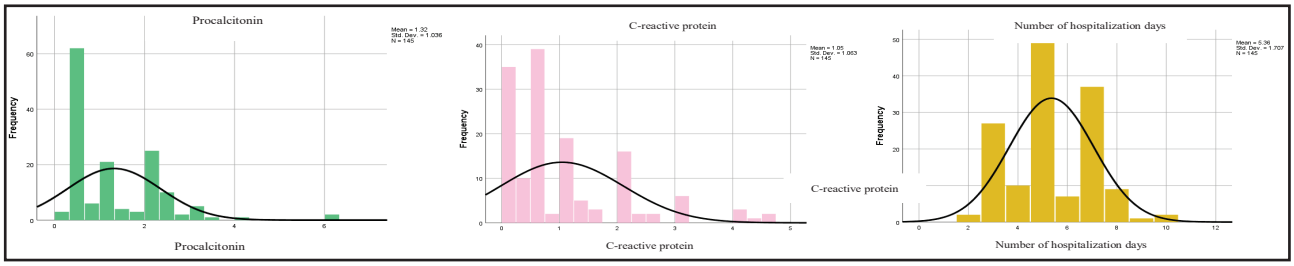


Figure 3 – Exposure of the histograms corresponding to the distributions of CRP, PCT, respectively the hospitalization days

The specialized literature provides insights into the particularities of lower respiratory tract infections in pediatric populations. Lévy 1994 points out that these infections, including croup, tracheobronchitis, bronchiolitis, and pneumonia, are common in the first years of life and are often associated with epidemics of respiratory viruses (10). Bacterial infections, either as primary agents or as superinfections, also play a significant role. Barsaoui 2001 states that bronchiolitis is a prevalent lower respiratory tract infection in hospitalized children, with viral agents, particularly respiratory syncytial virus (RSV), being frequently identified. Bacterial infections such as Haemophilus influenzae and Streptococcus pneumoniae are also present, sometimes in combination with viral infections (11). Glezen 1971 emphasizes the importance of respiratory syncytial virus, parainfluenza virus, and Mycoplasma pneumoniae as common pathogens in acute lower respiratory disease in children. (12)

Depending on the severity of the bacterial infection, as well as the resistance of the bacteria to different antibiotics, antibiotic therapy may include a single antibiotic (monotherapy) or two/three antibiotics (double/triple antibiotic therapy). Within the group analyzed, in 86.2% of the cases, antibiotic monotherapy was used, while for 13.8% of the patients, it was decided to initiate double or even triple therapy (in complicated cases). We previously stated that different antimicrobial agents were identified in this study batch. The highest rate of use was found among cephalosporins, with 44.82% (n=65) of subjects receiving this type of treatment. The second most used category of antibiotics is represented by the association between beta-lactams and beta-lactamase inhibitors, 28.27% (n=41)

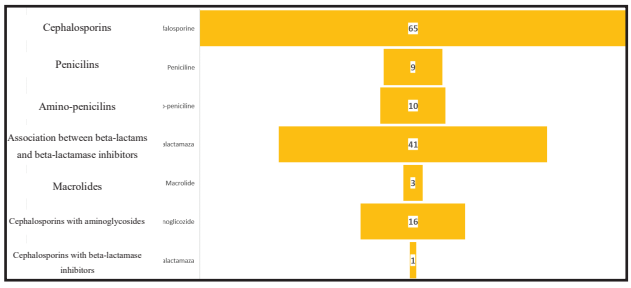


Figure 5 Graphical representation of the antibiotics used within the study group

Conclusions

Profiling a pediatric patient diagnosed with lower respiratory tract infections brings to the fore the clinical complexity and variability of these conditions. In the light of the analysis, the conclusions drawn from this theme emphasize crucial aspects:

Diversity of Pathogens: Lower respiratory tract infections in pediatric patients are influenced by a wide range of pathogens, including viruses such as RSV, rhinoviruses, influenza, and bacteria such as Streptococcus pneumoniae and Haemophilus influenzae. Understanding the diversity of pathogens is essential for proper diagnosis and treatment.

Impact of Age: The prevalence and severity of respiratory infections vary by age. Infections, such as croup, are more common in the first years of life, and this variation must be taken into account in the clinical approach.

The Role of Viral Epidemics: Epidemics of respiratory viruses influence the frequency and severity of respiratory infections in children. For example, respiratory syncytial virus (RSV) is one of the most common causes of bronchiolitis and pneumonia.

Complications and Treatment: Understanding potential complications, such as bacterial superinfections or progression to more severe conditions, is crucial for the effective management and treatment of lower respiratory tract infections in pediatric patients.

The Importance of Prevention: Preventive measures, including immunization and proper hygiene, are vital in reducing the incidence of respiratory infections among children.

In summary, the profiling of the pediatric patient diagnosed with lower respiratory tract infections requires a holistic approach, which includes the careful evaluation of pathogens, adapted to the age and individual characteristics of the patient, for effective treatment and prevention of complications.

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