

Morbidity and Mortality Related to Infectious Diseases in the Roi Boudouin Paediatric Ward in Senegal

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Abstract

Introduction: Infant and child morbidity and mortality linked to infections remain a major concern in both developed and developing countries. The general objective was to determine the characteristics of hospital morbidity and mortality linked to infectious pathologies in the pediatric department of the King Baudouin hospital center in Dakar. **Methods:** This was a retrospective, descriptive and analytical study focusing on children hospitalized from January 1, 2018 to December 31, 2021 in the pediatric department of the King Baudouin hospital center in Dakar. **Results:** During the study period, 1474 children were hospitalized for an infectious pathology in the pediatric department. The sex ratio was 1.48. Children aged between one and twelve months represented 34.12%. Morbidity due to respiratory and digestive infections was 42.33% and 33.45%, respectively. Pediatric hospital mortality was 0.75% with a predominance noted in infants between 1 and 12 months (55.86%). Respiratory, digestive infections, sepsis and neurological infections were the main causes of death. Factors associated with mortality were age (1 to 12 months) with $p < 0.05$ and the presence of underlying pathologies such as sickle cell SS, heart disease and HIV infection. **Conclusion:** Reducing infant and child mortality linked to infectious diseases remains a crucial challenge to address for improving children's health. Early detection of related signs, prevention of infections, and adequate care and monitoring of infants and children can contribute to this reduction.

Keywords

Morbidity, Mortality, Infections, Children

1. Introduction

Childhood morbidity and mortality linked to infectious diseases remain a public health priority, both in developed and developing countries [1] [2] [3].

Indeed, infectious diseases, especially bacterial and parasitic, remain a public health priority. The world is still not on track to achieve the Sustainable Development Goals aimed at ending preventable deaths of newborns and children under five [4]. This requires perfect mastery of the characteristics of morbid conditions and the main causes of death.

It is in this context that we carried out a retrospective descriptive and analytical study during the period from January 1, 2018, to December 31, 2021, in the pediatric department of the Roi Baudouin hospital center in Dakar, the main objective of which was to determine the characteristics of morbidity and mortality linked to pediatric infectious pathologies. The specific objectives were to determine the epidemiological and clinical characteristics of children hospitalized for an infectious pathology, determine mortality and associated factors linked to pediatric infectious pathologies, and finally make recommendations aimed at improving the overall management of infections in children.

2. Methodology

This was a retrospective, descriptive and analytical study which took place from January 1, 2018, to December 31, 2021, in the pediatric department of the Roi Baudouin hospital center in Dakar in Guédiawaye (CHRB). It covered all children aged between 1 month and 60 months, hospitalized during the study period for an infectious pathology.

All children hospitalized during the study for an infectious pathology were included. All incomplete or lost files were excluded from the study.

The parameters studied were socio-demographic, diagnostic and progressive. We made an exhaustive collection of the medical records of all patients hospitalized during the study period.

The variables were defined as follows:

The pediatric mortality rate was defined as the number of pediatric deaths per thousand live births.

The pediatric morbidity rate was defined by the number of sick children during a determined period within an exposed population.

Certain parameters were considered as biases in the selection such as the presence of an uncontrolled chronic pathology, the delay in consultation noted in certain patients and the absence of continuous care service.

The data collected were entered into Excel then analyzed using SPSS (statistical package for social science) version 21 software. The quantitative variables were presented in the form of medians or means with their ranges. Qualitative variables were expressed as percentages. The analytical study was carried out with the Fisher test, a significance threshold was retained for a p-value (p) less than 0.05.

3. Results

3.1. Descriptive Results

3.1.1. On the Epidemiological Level

During the study period, 1474 children were hospitalized in the pediatric department for an infectious pathology out of 4457 hospitalized, *i.e.* a frequency of 33.07%.

In 2021, we noted 32.77% hospitalizations as shown in **Figure 1**.

The months of February, September and October recorded 9.84%, 14.45% and 12.28% of hospital admissions respectively (**Figure 2**).

The average age of the children was 19.90 ± 15.04 months. The sex ratio was 1.48.

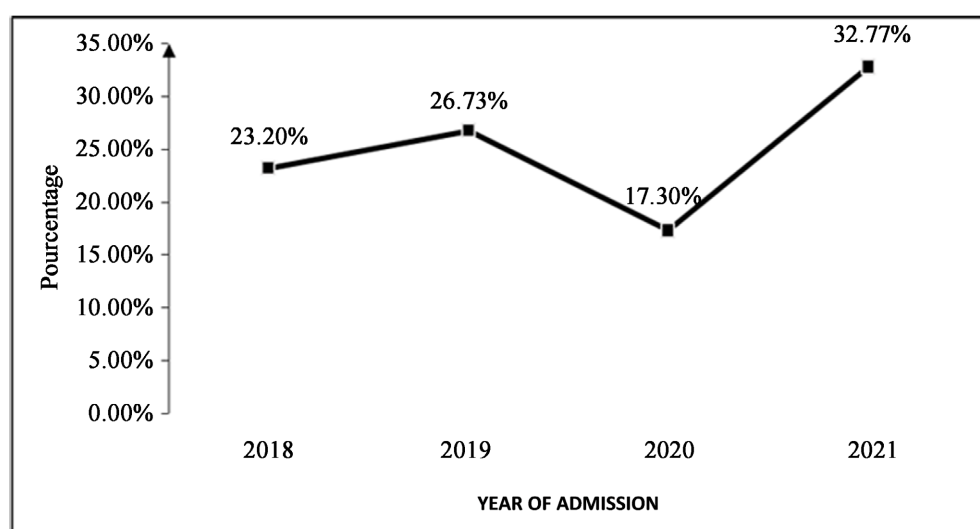


Figure 1. Distribution of children according to years of admission.

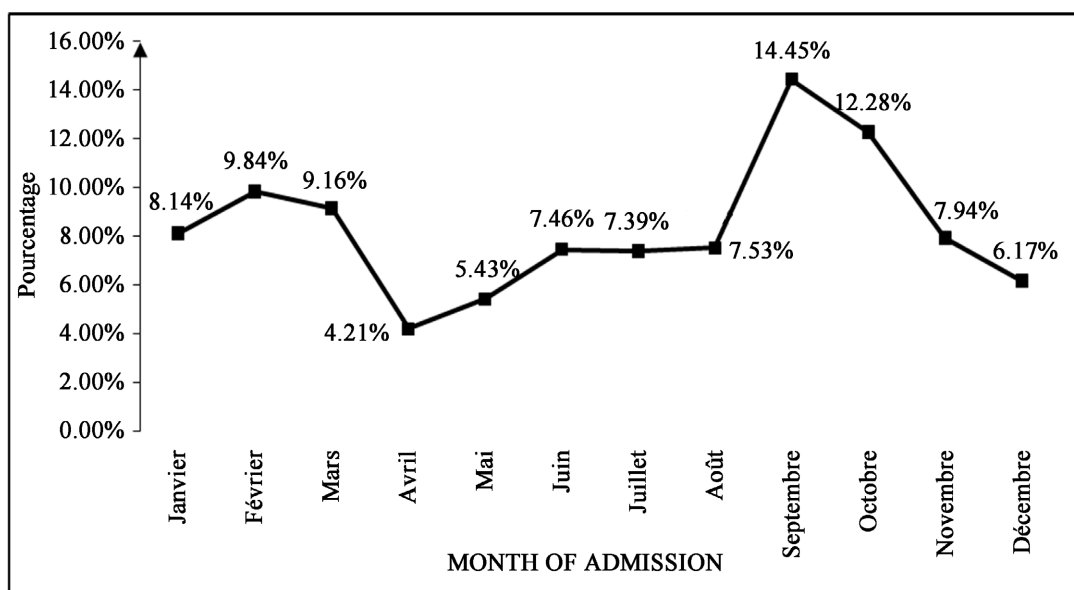


Figure 2. Distribution of children according to months of admission.

3.1.2. Clinically

Among the children, 30 had a chronic pathology. Children with sickle cell disease represented 43.33% of these. **Table 1** shows the distribution according to the chronic pathologies found.

3.2. On the Diagnostic Level

Respiratory, digestive infections and sepsis were found respectively in 42.33%, 33.51% and 12.01% as shown in **Figure 3**.

Among respiratory infections, bronchiolitis was found in 506 cases, pneumonia in 89 of cases as shown in **Figure 4**.

Table 1. Distribution of children according to chronic pathologies.

Ground	Number (n)	Percentage (%)
SS sickle cell disease	13	43.33
Heart disease	10	33.33
HIV	7	23.34
Total	30	100

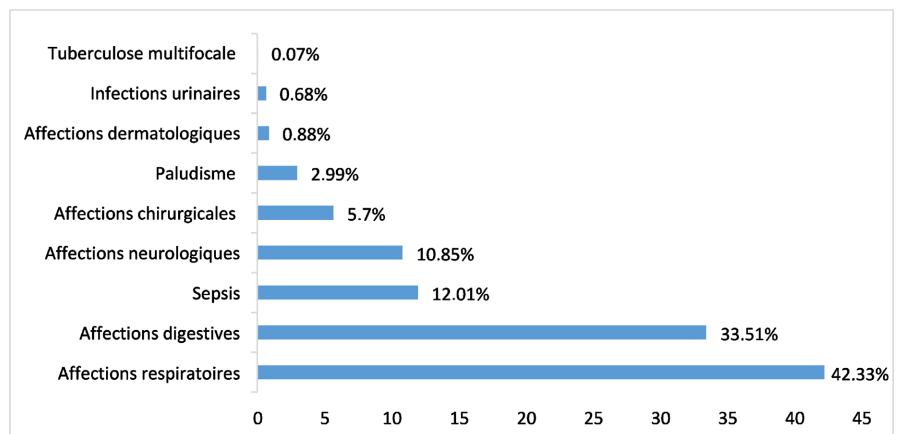


Figure 3. Distribution of children according to infectious pathologies found.

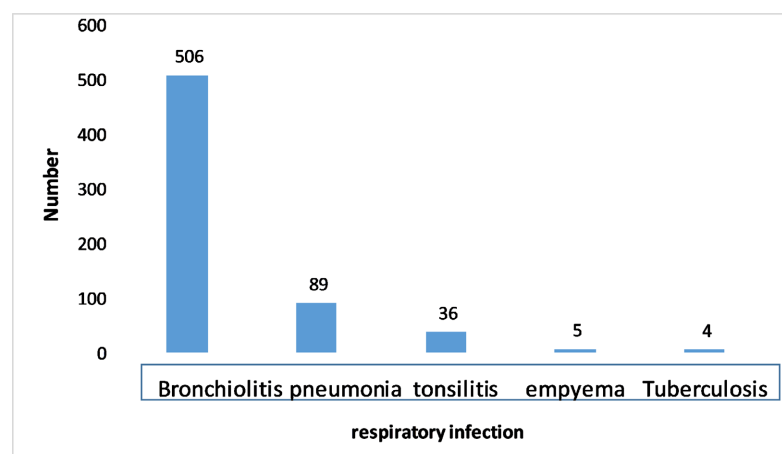


Figure 4. Distribution of children according to respiratory conditions.

Among digestive infections, acute gastroenteritis was found in 99.39%.

Among neurological infections, meningitis was found in 25%.

Among the infections whose management was surgical, tonsillar adenophlegmon was found in 39.29% and myositis in 25% as shown in **Table 2**.

Table 2. Distribution of children according to infections with surgical management.

Surgical conditions	Number (n)	Percentage (%)
Adenophlegmon	33	39.29
Myositis	21	25
Deep suppuration	13	15.48
Arthritis	9	10.71
Acute appendicitis	8	9.52
Total	84	100

3.3. On the Evolutionary Level

The evolution was favorable in 98.51% of the children. The death rate was 0.75%. The average length of hospitalization was 4 ± 2.56 days.

3.4. Analytical Results

3.4.1. Bivariate Analysis

Table 3 shows that the poor prognosis varied significantly depending on the year with a p-value (0.001).

Table 3. Distribution of children according to determinate factor of poor prognosis.

Facteurs	Poor prognosis		P-value
	yes	No	
Year of admission			0.001*
[2018 - 2019]	7	729	
[2020 - 2021]	15	723	
Age range			0.628
[1 - 30 month]	18	1125	
[30 - 60 month]	4	327	
Sex			0.953
Masculine	13	867	
Feminine	9	585	

*p-value significant (less than 0.05).

There was a statistically significant variation for non-surgical pathologies with a p-value of 0.011 (**Table 4**).

Table 4. Distribution of children according to infectious conditions.

Affection	Bad prognosis		P-value
	Yes (%)	No (%)	
Respiratory			
Yes	8 (1.3)	616 (98.7)	0.568
No	14 (1.7)	836 (98.4)	
Digestives			
Yes	5 (1)	489 (99)	0.280
No	17 (1.7)	963 (98.3)	
Neurological			0.788
Yes	2 (1.3)	158 (98.8)	
No	20 (1.5)	1294 (98.5)	
Surgical			0.011*
Yes	4 (4.8)	80 (95.2)	
No	18 (1.3)	1372 (98.7)	
Dermatological			0.655
Yes	0 (00)	13 (100)	
No	22 (1.5)	1439 (98.5)	
Urinary			0.696
Yes	0 (00)	10 (100)	
No	22(1.5)	1442 (98.5)	
Sepsis			0.422
Yes	2 (2.6)	76 (97.4)	
No	20 (1.4)	1376 (98.6)	
Malaria			0.664
Yes	1 (2.3)	43 (97.7)	
No	21 (1.5)	1409 (98.5)	

*p-value significant (less than 0.05).

3.4.2. Multivariate Analysis

At the end of the multivariate study, the factors associated with poor prognosis were:

- The year of admission: the poor prognosis was 5.4 times higher in 2021.
- Non-surgical conditions: the poor prognosis was 3.4 times higher.

4. Discussion

4.1. Limitations of the Study

This study has several limitations that must be considered when interpreting the results. This is a retrospective, single-center study, which may not reflect nation-

al-level data.

The main limitation of this study is that the service's data collection tool is certainly well designed, but it was not properly completed. Several important parameters could not be considered at times. The study population was not systematic for all the characteristics studied, ranging from certain data in the medical file to the explanation of the software. Additional examinations and definitive diagnoses could not be detected for the most part.

Added to this limitation is the context of the study period which was marked by a covid-19 pandemic which had disrupted the monitoring of some disease and access to health structures.

Despite these mentioned limitations, our study could contribute to attracting the attention of decision-makers, a change in approach from practitioners, and also the perspective of populations on infectious pathologies in children.

4.2. Prevalence

During our study period, we collected 177 cases of sepsis out of 1474 hospitalized patients, representing a hospital prevalence of 12%. This agrees with that of BA in 2006 in Dakar [1]. However, it is higher than that of Berkley in Kenya which was 5.9% [2]. In the United States, a multicenter epidemiological survey concerning all pediatric structures in seven states gave a frequency of 5.6%. While in France and Canada, studies on the importance of organic dysfunctions and score criteria had given higher frequencies on high-risk subjects in intensive care units: 17% in France [3] and 23% in Canada [4]. Certain factors could be considered as being responsible for a high incidence of sepsis in children such as poor hygiene conditions linked to poverty, low health coverage, difficulties of access and low recourse to care, unsuitable antibiotic therapy etc., frequently found in developing countries. On the other hand, in developed countries, the use of large resuscitation means could explain the low frequency of sepsis.

4.3. Age

The ages of the children varied between 1 and 60 months with an average of 19.90 ± 15.04 months. The age group [1 - 30 months] was predominant (77.5%). Ba *et al.* obtained an average age of 31.5 months, of which 75% of children were between 2 and 30 months [5]. These results were comparable with those found by Costil *et al.* who had an average age of 28 months [5]. In Canada, Proulx F. *et al.* had an average age of 35 months [4], while in France, Leclerc *et al.* had an average age of 30 months [3]. This could be explained by the vulnerability of this target with their still immature immune system and the frequency of respiratory and digestive conditions. Deaths of children under 5 years old occur in 70% of cases outside health facilities.

4.4. Sex

In our study, there was a male predominance (57.70%) with a sex ratio of 1.48.

This result is comparable to that of Sow [6] in Dakar who found the majority male (60.5%). This result is consistent with that found in the literature, particularly in the USA with a male predominance of 55% [7], in Australia 54% [8] and in France 55.5% [5]. The male predominance could be explained by a greater susceptibility of the male sex compared to the female sex noted at extreme ages of life in the face of morbid phenomena. The over-predisposition of the male sex to morbid phenomena during childhood is justified by a genetic phenomenon. Authors were able to find that the male XY genotype would be more susceptible to infections than the female XX genotype. This was explained by the fact that the X chromosome had a determining role in defense against infections [9] [10].

4.5. Ground

Among the 1474 patients, 2.04% presented with underlying pathology. In our series, sickle cell disease was the predominant cause (43.33%), followed by heart disease (33.33%) and HIV infection (23.34%). On the other hand, a study carried out by Ba showed a predominance of malnutrition (36.1%) followed by heart disease (3.3%) and sickle cell disease (1.1%) [1]. Sow also carried out a study in the same department and found a predominance of heart disease (6.6%), followed by asthma (4.4%) and sickle cell disease (2.9%) [6].

4.6. Causes of Death of Patients

The most common were respiratory conditions (42.33%), followed by digestive conditions (33.45%) and sepsis (12.01%).

4.7. Respiratory Infection

Bronchiolitis (81.09%) was predominant, followed by pneumonia (14.26%). A previous study, in the same structure on ARI, had also shown a predominance of acute bronchiolitis (38.8%) [11]. High mortality linked to ARI has also been observed in several studies [12] [13]. In Africa, numerous studies have concluded that acute bronchiolitis is the most common lower respiratory infection in infants and young children [14] [15]. In Senegal, strategies to combat ARI have been implemented in recent years. Among children under five years old, 5% had experienced symptoms of ARI in the two weeks preceding the 2019 Demographic and Continuing Health Survey interview. However, the percentage of children with signs of ARI and for whom help was not sought from a provider was 46% [16].

4.8. Digestive Infection

Acute gastroenteritis (AGE) (99.39%) was predominant among digestive conditions. This result was comparable with that of Cissé FZ who also found acute gastroenteritis as the main digestive condition (53.57%) [17]. This could be explained by the fact that the digestive tract is the preferred route for infections in children. According to the WHO, diarrhea is the second leading cause of death

among children under five years old and is responsible for 525,000 deaths per year in this age group. According to Dupont, rotavirus is the main pathogen responsible for acute gastroenteritis in children under five years of age [18]. The use of oral rehydration solutions (ORS) with reduced osmolarity and the rapid detection of states of dehydration should be perfect for healthcare personnel. The introduction of the rotavirus vaccine into the EPI must be accompanied by monitoring.

4.9. Length of Hospitalization

The average length of hospitalization was 4 ± 2.56 days. Most patients (44.97%) had a hospitalization duration of one to three days. Similar results were found in studies carried out by Sow where the average length of hospitalization was 8.2 days. The median hospitalization was 9 days [1 - 36 days]. Most of patients (46.7%) had a hospitalization duration of less than 5 days [6]. A much higher average length of hospitalization was also noted in the literature, notably in the USA with 31 days [19], in France with 29.6 days [5].

4.10. Scalable Modalities

We noted a favorable evolution in 98.51% of children with a lethality of 0.75%. This mortality was also lower in developed countries: in France 8% [20] and in the United States between 12 and 35% depending on whether the patients were respectively septic on entry or having developed sepsis during hospitalization [21]. Another study carried out in Pennsylvania revealed a mortality of 10.3% [22]. In Eastern Europe, a study carried out in Estonia revealed a mortality of 10% [23]. This low mortality rate is explained by the fact that the ROI Boudouin hospital center transfers seriously ill children to university hospitals. In our study, 44.97% of deaths occurred within the first five days of hospitalization. A study carried out in Switzerland in 2005 revealed high mortality linked to septic shock during the first 24 hours [24].

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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