Epidemiological, Nutritional and Factors Associated with Infant Bronchiolitis in Hospitals: Case of the City of Lubumbashi (DR Congo)

Boniface Fievey Makam[1], Gray A. Wakamb Kanteng[1*], Stanis Okitotsho Wembonyama[1], Oscar Numbi Luboya[1.2]

[1]Department of Pediatrics, University of Lubumbashi, Lubumbashi, DR Congo
[2]Public School Health, University of Lubumbashi, Lubumbashi, DR Congo
Email: *gkanteng@yahoo.fr

Abstract

Introduction: The objective of this study is to determine the incidence of acute bronchiolitis of infants in an urban area of the Democratic Republic of Congo to establish the epidemiological, clinical and nutritional profile of affected infants. **Methodology**: A cross-sectional descriptive study was conducted in Lubumbashi (DR Congo) at three hospitals over a 2-year period from 2013 to 2014. A total of 321 acute bronchiolitis was collected in infants Less than 24 months. **Results**: A hospital incidence of 3.8% was found. Bronchiolitis occurred most from December (8.7%) until March (8.7%), and the peak was observed in February, *i.e.* 24.9% of cases, which corresponds to the great rainy season. The average age of children with was calculated 7.78 ± 6.43 months. The prevalence of underweight was 40.6% (n = 129). There was a significant association between pathology and prematurity (p = 0.00, OR = 111 [20.2 - 614.5]) with associated pathologies (p = 0.02 OR = 8 [0.9-64.5]). **Conclusion**: The incidence of bronchiolitis has declined in comparison to previous studies in the context of our study setting, but it may be regressed if targeted public health measures are taken.

1. Introduction

Bronchiolitis is an inflammation of the pulmonary bronchioles [1]. The diagnosis is clinical and is based on signs of low respiratory infection (cough, respiratory congestion, sibilant rales, crepitations), in an infant under 2 years of age, with or without respiratory discomfort (polypnea, expiratory blockage, dyspnea, Thoracic distension) [2]. It is the first of all diseases of the lower respiratory tract [2] [3] [4] [5]. The factors that favor the outbreak of the pathology are: age, season, child constitution, sex, nutrition, environment: promiscuity, smoking mother, pollution. In practice, risk factors are grouped into 5 major groups for some authors [6] [7]. Thus we have: the fragility of the child, life in collectivity, the smoking of the entourage, socio-economic conditions and urbanization.

Acute respiratory infections are the leading cause of mortality and morbidity in young children around the world. They account for about 25% of the causes of death in children under 5 years of age [5] [8] [9].

A study carried out in Tunisia during the first quarter of 1999 showed that out of a population of 1340 children admitted during the period, 10% were admitted for a respiratory problem related to bronchiolitis [9] [10] [11].

A report by the Ministry of Health published in 2011 places respiratory infections in second place of the causes of infant morbidity and third in the causes of infant mortality in the Democratic Republic of Congo [12] [13].

Numerous studies carried out in other heavens [9] [10] [14] have clearly demonstrated a relationship between the occurrence of bronchiolitis and certain risk factors. For example, a study carried out in Italy between 1999 and 2002 revealed the following observation [15]: the peak of the epidemic occurred in February, while the lowest prevalence was recorded in November [16] [17]. A high proportion of subjects had a low birth weight and most were born prematurely. For this study, gestational age, birth order, birth weight and exposure to tobacco smoke affected the prevalence and severity of the disease [13] [18] [19] [20].

Our study aims to contribute to the improvement of the management of acute bronchiolitis of the infant. Specifically, our study aims to: Determine the incidence of acute bronchiolitis in our environment, the epidemiological and clinical profile of children affected, and the nutritional status of the children concerned.

2. Methodology

2.1. Framework of Study

This work was carried out in the geographical area of the city of Lubumbashi, the second city of the DR Congo. Three hospitals have been used as a data collection site, depending on whether they organize a dedicated pediatric unit and have a high pediatric attendance rate, especially for infants under 24 months of age. Our choice has also been guided by the fact that these structures have a rationalization of care based on an expertise of doctors, specialists or accustomed to the infantile care. These are the following health facilities:

- Jason Sendwe General Referral Hospital, a University teaching hospital (tertiary level), with a mean of 1257 children admitted per year during our study

period.

- Lubumbashi University Clinics, a University teaching hospital (tertiary level), with a mean of 602 children admitted per year during our study period.
- Watoto Health Center, a private specialized pediatric clinic, with a mean of 2368 children admitted per year during our study period.

2.2. Type, Duration and Period of Study

This is a cross-sectional descriptive study carried out in three hospitals in the city of Lubumbashi. The study covers the period from 1st January 2013 to 31 December 2014, a two-year study period.

2.3. Population and Sampling

- **Target population**

Our target population is infants living in the city of Lubumbashi.

- **Sample type and size**

We conducted a sampling of convenience. A total of 321 cases of bronchiolitis were collected, as an exhaustive sample based on the inclusion and exclusion criteria described below.

- **Inclusion Criteria**

This study included infants who met the following criteria:

➢ Being a resident of Lubumbashi city town;
➢ Having a lower or equal age to 24 months;
➢ Being hospitalized for bronchiolitis in one of the designed hospitals.

The diagnosis of bronchiolitis was made on the basis of the following criteria: At an age less than or equal to 24 months, developed a cold after which the clinical examination revealed the presence of sibilant rales on auscultation, with The presence of a radiograph of the thorax suggestive of bronchiolitis (horizontalization of the dimensions, widening of the intercostal spaces, trapping of air, flattening of diaphragmatic hemi-cups).

- **Exclusion Criteria**

Excluded from this study were:

➢ All cases of dyspnea with sibilances can be explained e d by another cause that bronchiolitis (heart defects, ed foreign body intra-pulmonary, asthma infant, etc.)
➢ Outpatient bronchiolitis
➢ All cases missing evident clinical elements for the diagnosis of bronchiolitis, even if it was the chosen diagnosis by the examiner.

Thus, out of 8454 records examined, 418 records were suspected of bronchiolitis, but only 321 were selected according to the previous criteria.

2.4. Study Parameters

The following parameters were collected and were the subject of our study: Age (in months), Sex, Weight (in Kg), period of consultation, Residence area, reason for consultation, duration of hospitalization, evolution.

2.5. Data Collection

We used a documentary review based on hospital records and patient registers. The data were collected on the basis of a sheet prepared for this purpose and which enabled the recruitment of cases.

2.6. Data Processing and Analysis

The data were entered on a computer using the Epi-info 6.4 software, which generated descriptive aspects of the analysis, including frequency distributions. The Chi² or Fisher test made it possible to compare the proportions of the categorical variables. To find an association between a dependent variable and perceived risk factors, the odds ratio (OR) with 95% confidence limits ($p < 0.05$) were calculated.

For the assessment of nutritional status, the Weight for Age Z-score was calculated using the WHO ENA 2010 software. It was categorized as follows: normal Z-score between −1 and +1, Underweight with a Z-score < −1 moderately underweight with a Z-score <−2, severe underweight with a Z-score < −3.

2.7. Ethical Considerations

The essential principles related to the non-nuisance and anonymity of the patients were respected. Prior to the study, a research permit was granted by the Faculty of Medicine. Similarly, we obtained the discharge from the administration of the hospitals where the data collection was carried out.

3. Results

We collected about 321 cases of bronchiolitis out of a total of 8,454 infants admitted to hospital over a two-year study period from January 2013 to December 2014 with a frequency of 3.80% (Figure 1).

Bronchiolitis occurred most from December (8.7%) until March (8.7%), and the peak was observed in February or 24.9% of the cases. This corresponds to the great rainy season in our environment.

According to this table, children from 1 to 6 months are the most vulnerable (54.80% of the cases) followed by those of 7 to 12 months (23.00%). With a median calculated at 5 months (P25 = 2, P75 = 15). With an average calculated at 7.78 ± 6.43 months; Extremes 1 month and 24 months (Table 1).

The male sex is the most affected, that is 56% of the cases and the sex ratio was estimated at 1.26 in favor of the male sex.

The communes of Kampemba and Lubumbashi are the most affected by the pathology with 43.61% and 29.60% of cases, respectively.

The prevalence of underweight was 40.6% (n = 129), distributed as follows: 17% (n = 54) of moderate malnutrition and 23.6% (n = 75) of severe malnutrition (Table 2).

This table shows a significant association between the evolution of the pathology and the history of prematurity (p = 0.00). A preterm infant is 111 times more likely to die from bronchiolitis. A significant association was then observed
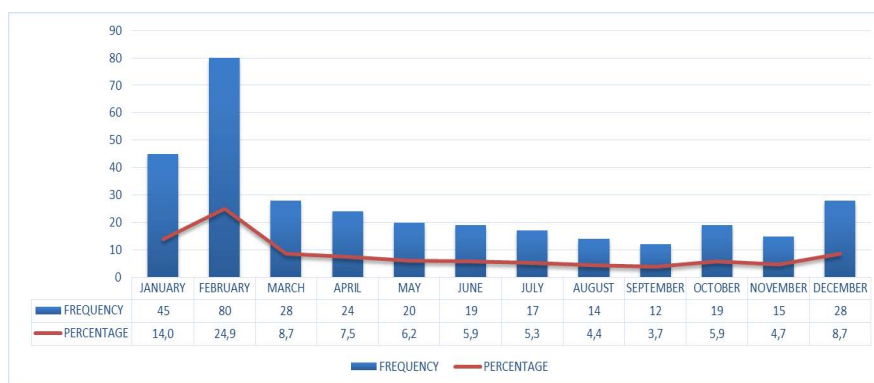
Figure 1. Distribution of cases by seasonality.

Table 1. Distribution of cases by socio-demographic parameters.

Settings	Categories	Frequency	Percentage	Other parameters
Age	1 - 6 months	176	54.80%	
	7 - 12 months	74	23.00%	Median: 5
	13 - 18 months	42	13.00%	P25 = 2, P75 = 15
	19 - 24 months	29	9.10%	
Sex	Male	180	56%	
	Female	141	44%	Sex ratio: 1.26
Residence Area	Annex Area	31	9.66%	
	Kampemba	140	43.61%	
	Lubumbashi	95	29.60%	
	Katuba	16	4.98%	
	Kenya	14	4.36%	
	Ruashi	14	4.36%	
	Kipoushi	1	0.31%	
	Kamalondo	10	3.12%	

Table 2. Distribution of cases according to the Weight for Age Z-score classification.

Nutritional status (WfA Z-score)	Frequency	Percentage
□−2Z-score ≥ WfA−3	54	17.0%
Z-score WfA < −3	75	23.6%

between the evolution of bronchiolitis and the presence of associated pathologies (p = 0.02). Thus, with the presence of associated pathologies, an infant is 8 times more likely to die (Table 3).

An age of less than 6 months is significantly associated with a shorter duration

Table 3. Distribution of cases according to the factors associated with the evolution of the pathology.

		Evolution		p	OR	IC
		Death	Healing			
Antecedent of Prematurity	Yes	7	9	0.000	111	20.2 to 614.5
	No	2	287			
Related Pathologies	Yes	8	194	0.02	8	0.9 to 64.5
	No	1	194			
		Duration of hospitalization				
		<5 days	≥5 jours			
Age	≤6mois	150	50	0.00	0.2	0.1-0.4
	>6 months	97	24			

of stay (less than 5 days) (p = 0.00, OR = 0.2 (0.1 - 0.4)). The average length of stay is 6.04 ± 6 days.

4. Discussion

This study has some limitations. First, the diagnosis of bronchiolitis was mainly based on the assessment of the physician in charge of the patient, which implies that a rare number of cases considered as bronchiolitis could have been other pathologies associated with dyspnea and sibilance. Secondly, our retrospective and multicentric study suffered from the lack of homogeneity of patient records, which differed from one hospital to another, and the lack of certain socio-demographic data, often incomplete from medical records. However, despite these limitations, the objectives of our study were reasonably achieved.

We collected about 321 cases of bronchiolitis out of a total of 8454 infants: a frequency of 3.80%. This frequency is lower than that found in 1989 by Wembonyama as an hospital incidence in Lubumbashi, which was then at 11.3% [12]. This frequency is also lower than that of Bobossi with 20.9% [11], Tall with 21.7% [21], Adonis with 14.6% [22] or Sawadogo with 11.6% [23].

This relatively low frequency is explained by the fact that we have focused on hospitalized cases, therefore potentially serious. Therefore, moderate to mild cases may have been treated on an outpatient basis and have not been collected in our series. Nevertheless, it is encouraging to note a possible improvement in hospital management in Lubumbashi when one considers the blatant difference in frequency in the above-mentioned study of 30 years ago. On the other hand, more improvement would probably be noted if public health measures, such as RSV vaccination, were initiated.

It was noted that children aged 1 to 6 months are the most vulnerable (54.80% of the cases) followed by those of 7 to 12 months (23.00%), *i.e.* a median calculated at 5 months (P25 = 2, P75 = 15), the male sex is the most affected, that is to say 56% of the cases and the sex ratio was estimated at 1.26 in favor of the male

sex. These figures are similar to most of the studies consulted, but there is no explanation for this fact [11] [12] [21] [22] [23].

For the period, bronchiolitis occurred most from December (8.7%) until March (8.7%), and the peak was observed in the month of February 24.9% of the cases that corresponds to the rainy season in our environment. Indeed, the moisture would be favorable to the spread of RSV, the main causative agent of the bronchiolitis of the infant.

Our study shows a strong association between the evolution of the pathology and the antecedent of prematurity (p = 0.00). A preterm infant is 111 times more likely to die from bronchiolitis. There is also a significant association between the evolution of bronchiolitis and the presence of associated pathologies (p = 0.02). Thus, with the presence of associated pathologies, an infant is 8 times more likely to die.

The average length of stay is 6.04 ± 6 days. An age of less than 6 months was associated with a longer stay (more than 5 days). In one study, Bogne *et al.* Found an average hospital stay of 5 days. Complications were relatively lower in the series, except for cases of bacterial superinfection. Results close to ours [16].

In relation to nutritional status, the prevalence of underweight is 40.6%. In Tshikaji in another DR Congo province, Musumbu *et al.* Have found that the histogram of Z-scores for age shows a curve deviated toward negative values, with a Z-weight-for-mean score of −1.31 ± 1.29. And in its series, 40.2% of children had good nutritional status, compared with 28.3% who were malnourished. No children were overweight [12]. Meanwhile, According to the findings of a study of *acute respiratory infections and nutritional status in children aged 0 - 5 years with in University Clinics of* Lubumbashi, Democratic Republic of Congo [18], it appears that in fact nearly 70% of children have precarious nutritional status and nutritional status, they had 41.2% of cases of ARI with proven malnutrition. This highlights the probable role of poor nutritional status that may favor the occurrence or perpetuation of bronchiolitis in infants.

5. Conclusion

This study shows that bronchiolitis constitutes a real health issue for the child, given its frequency. This highlights the importance of integrating an RSV vaccine into the vaccine schedule. Taking action on known risk factors, including prematurity and a globally deleterious state of health by the coexistence of associated pathologies, would help to reduce this frequency.

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