

Acute Infant Bronchiolitis at the University Hospital of Bouaké (Côte d'Ivoire) about 404 Cases

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Abstract

Background: Acute bronchiolitis is a common cause of morbidity and mortality that is not well studied in Côte d'Ivoire. The objective of the study was to describe the main epidemiological, diagnostic, therapeutic and evolutionary aspects of this condition for the improvement of prognosis

Methods: This was a retrospective, descriptive and analytical study conducted in the paediatric ward of the Bouaké University Hospital from January 2016 to December 2018. Included were all infants from 1 to 24 months hospitalized for acute bronchiolitis diagnosed on clinical and/or radiological grounds. The variables studied were epidemiological, diagnostic, therapeutic and evolutionary aspects. The analysis was descriptive and analytical. The Chi 2 test or the exact Fisher test was used to compare proportions to the significant threshold <5%.

Results: 15,695 admissions recorded, including 404 cases (232 males, 172 females) of bronchiolitis or 2.6%. The age was less than 6 months in 62% and 50.7% of admissions recorded between July and October. Promiscuity, exposure to wood smoke and the notion of family asthma were noted in 79.2%, 73% and 17.3% of cases respectively. The triad dyspnea-fever-cold accounted for 84.8% of the general and functional signs recorded. Pulmonary auscultation revealed an anomaly in 83.4% represented by bronchial rales in 72%. X-ray of the chest face incidence revealed chest distension in 74.3%. The main associated diseases were bacterial superinfection (36%), malaria (7.42%) and heart disease (4.45%). The trend was favourable in 86.1%. Lethality was 6.7%. The risk factors for death were age 6 months or less ($p=0.003$) and the existence of an associated pathology ($p<0.001$).

Conclusion: Bronchiolitis is a frequent viral infection that progresses favourably in the majority of cases under symptomatic treatment. It is potentially fatal in infants under 6 months of age with an associated pathology. Well-coded care, as well as improved technical support and capacity building for health workers, will improve their prognosis.

Keywords: acute bronchiolitis, infection, infant, Bouaké.

INTRODUCTION

Acute bronchiolitis is a seasonal epidemic respiratory viral infection in infants from one month to two years of age. It results from inflammation of the bronchioles caused in 60 to 90% by the Syncytial Respiratory Virus[1]. Other viruses such as Adenovirus, para influenzae, influenzae and rhinovirus may also

be responsible for this disease. The diagnosis of bronchiolitis is essentially clinical and management is based solely on symptomatic medical means. There is no vaccine or specific treatment. Acute bronchiolitis is a common cause of infant morbidity and mortality in both developed and underdeveloped countries. In France, it is estimated that 460,000 infants, or

30% of this age group, are affected annually by this infection. In this country, the maximum frequency is between 2 and 8 months. The epidemic begins in mid-October, peaks in December and ends in winter[2]. In an American study that looked for RSV in children under 5 years of age consulting paediatric emergency departments for respiratory infection, the virus was found in 18% of children[3]. This study estimated the annual rate of hospitalizations related to RSV at 3 per 1000 children under 5 years of age and 17 per 1000 children under 6 months of age. Progress has been made in the fight against acute infant bronchiolitis in developed countries. In these countries, there has been a significant decrease in the number of infant deaths from acute bronchiolitis over the past decade. In contrast, in developing countries, the number of deaths due to acute respiratory infection with RSV was estimated in 2005 at between 65,000 and 197,000[4]. In Africa, particularly in Morocco and the Democratic Republic of Congo, acute bronchiolitis accounted for 24.4% and 12.4% of paediatric hospitalizations respectively. This ranked this disease as the 2nd leading cause of child hospitalization in these countries [5, 6]. In Côte d'Ivoire, the national incidence of bronchiolitis is unknown and data on this condition are limited to hospital series. Yeboua[7, 8] at the Bouaké University Hospital reported in a communication to the 11th Ivorian Days of Pediatrics in 2013 that bronchiolitis accounted for 1% of hospitalizations, 17.8% of causes of acute low respiratory infection and 7% lethality at the Bouaké University Hospital. At Yopougon University Hospital, Nagoanand al.[9] by analyzing the chest radiographs of 165 infants aged 1 to 24 months with acute lung disease reported 29.7% of bronchopneumonia attributed to bronchiolitis. These various Ivorian studies insufficiently described the main epidemiological, diagnostic and therapeutic aspects of this frequent condition of the child in Côte d'Ivoire. It seemed appropriate to us to carry out this work, the objective of which was to describe the epidemiological, diagnostic, therapeutic and evolutionary aspects of acute infant bronchiolitis, an important cause of child hospitalization in Côte d'Ivoire.

METHODS

This is a retrospective study with a descriptive and analytical aim carried out in the paediatrics department of the Bouaké University Hospital from January 2016 to December 2018. The paediatrics service is the only tertiary level service located in the interior of the

country 347 km from Abidjan, the economic capital of Côte d'Ivoire. This service has a semi-intensive emergency unit for all urgent cases. This unit has eight beds, a single vacuum cleaner, four oxygen cylinders and two nebulizers. The medical and paramedical team of this unit included an assistant head of clinic, a hospital intern, four physicians enrolled in the Diploma of Special Studies in Paediatrics, a doctoral candidate in medicine, medical students, three nurses, nine caregivers, two hospital officers. The reception and visit of children in paediatric emergencies was provided by two doctors during the day, assisted in their work by two nurses, two orderlies and a hospital services officer. Duty and on-call duty was also provided by two physicians, medical students, a nurse, a caregiver and a hospital services officer. The study population consisted of all infants aged 1 to 24 months admitted to the unit during the study period for respiratory difficulties. On admission, all patients had a complete clinical examination after nasopharyngeal clearance, oxygen therapy and stabilization of major vital functions if necessary. The paraclinical check-up included at least one chest X-ray. The other additional examinations were based on the clinical picture. Management included positioning the infant in the dorsal proclive, rhinopharyngeal clearance, oxygen therapy, meal splitting, and hydroelectrolytic and energy intake. Nebulization with salbutamol and corticosteroid therapy were administered in moderate and severe cases. Antibiotic therapy was associated with suspicion of bacterial superinfection. Respiratory physiotherapy was not practiced in the department. Treatment monitoring was essentially clinical. All information about the child and his or her family, the care provided and the progress under treatment were recorded in the patient's medical file. Included in the study were infants aged 1 to 24 months with an operable medical record hospitalized for acute bronchiolitis based on the following clinical and radiological arguments: (i) clinical arguments: fever, cough, cold, respiratory difficulty with polypnea type, cyanosis, signs of respiratory control (nose flapping, intercostal pulling, xiphoid funnel, whining), wheezing or rales. (ii) radiological arguments: thoracic distension, flattening of diaphragmatic domes, widening of intercostal spaces, horizontalization of ribs, pulmonary hyperclarity or bilateral hilar overload. Infants aged 1 to 24 months admitted for acute bronchiolitis and died on arrival without medical records or hospitalized for acute bronchiolitis with inoperable medical records were

not included in the study. Data collection was carried out with a survey sheet providing information on epidemiological, clinical, therapeutic and evolutionary aspects. The sampling was exhaustive and the sample consisted of all cases that met the inclusion criteria. The variables studied included: (i) the socio-demographic characteristics of the infant (gender, age, place of residence), ascendants (age, education level, occupation, concept of asthma). The parent’s level of education was described as low if he or she was illiterate or had primary education), siblings (number and medical history), promiscuity, passive smoking, air pollution, family asthma; ii) diagnosis : (iii) management and evolution: symptomatic means and treatment of associated pathologies, discharge modalities, duration of hospital stay, factors associated with death. For the study to be carried out, the prior authorization of the Medical and Scientific Director of the Bouaké University Hospital was required. Patient confidentiality was respected by assigning an anonymity number to the data collection form. The data were entered and analyzed using the Epi-Info 7 computer software. The quantitative variables were expressed as means with the standard deviation. Qualitative variables were expressed as proportions. The comparison of the qualitative variables was made with the Chi 2 or Chi 2 test with Yates correction

RESULTS

Epidemiological Aspects

During the study period, 15,695 patients were enrolled. Of these, there were 844 cases of low acute respiratory infections (ARI), including 404 cases of acute infant bronchiolitis. Acute bronchiolitis accounted for 47.86% of low ARFs and 2.6% of admissions. Acute bronchiolitis involved 232 boys and 172 girls, for a sex ratio of 1.35. The average age was 7.16 months (extreme 1 month and 24 months) and the age group from 1 to 6 months accounted for 62% of cases. The infant’s feeding pattern was predominantly breastfeeding in 55% of cases. There was a history of family asthma in 17.3% of children. The notion of promiscuity, exposure to wood smoke, exposure to cigarette smoke and exposure to animal hair were found in infants in 79.2%, 73%, 29.2% and 14.8% respectively. The peak frequency of acute bronchiolitis was in October with 66 cases or 16.34%. The mother was a housewife in 58% of cases and the father a merchant in 74.8% of cases. The father and mother were illiterate in 70 and 79.4% of cases respectively. The main socio-demographic characteristics of the child and parents are presented in Table I.

Table I. Main socio-demographic characteristics of children and their parents

Socio-demographic characteristics	Number	Percentage
Gender		
Male	232	57
Female	172	43
Age groups		
0-6	250	62
7-11	65	16
12-24	89	22
Place of residence		
Bouaké	362	90
Out of Bouaké	42	10
Trophicstatus at birth		
Eutrophic	195	67.7
Hypotrophic	85	29.5
Hypertrophic ou macrosomia	8	2.8
Feeding method		
preponderant breast-feeding	222	55.0
Exclusive breast-feeding	67	16.6
Mixed breast-feeding	60	14.8
Formula feeding	31	7.6
Not specified	24	6.0

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Father's level of education		
Illiterate	283	70.0
Primary school	50	12.4
Secondary school	28	8.4
Superior	37	9.2
Mother's level education		
Illiterate	321	79.4
Primary school	20	5.0
Secondary school	28	6.9
Superior	35	8.7
History of family asthma		
Yes	70	17.3
No	334	82.7
Notion of promiscuity		
Yes	320	79.2
No	84	20.8
Notion of exposure to cigarette smoke		
Yes	118	29.2
No	286	70.8
Notion of exposure to wood smoke		
Yes	295	73.0
No	109	27.0
Notion of exposure to animal hairs		
Yes	60	14.8
No	344	85.2

Diagnostic Aspects

The reason for consultation was respiratory difficulty in 86.6% of cases. The triad of dyspnea, fever and colds accounted for 84.8% of all general and functional signs recorded. Signs of respiratory control were present in 84.4% of cases dominated by intercostal pulling (89.4%) and nose flapping (84%). Abnormal

pulmonary auscultation in 83.4% revealed bronchial rales in 72% of cases. Pulmonary radiography performed in 339 children revealed chest distension and alveolar opacity in 74.2% and 6% respectively. The two main diseases associated with bronchiolitis were probable bacterial superinfection (36.4%) and malaria (9.2%). The main clinical and paraclinical characteristics of infants are presented in Table II.

Table II. Main clinical and paraclinical characteristics

Characteristics	Number	Percentage
Reason for admission (n=404)		
Respiratory difficulty	350	86.6
Cold	32	8.0
Coughing	22	5.4
General and functional signs (n=404)		
Dyspnea	404	100.0
Fever	262	64.8
Cold	248	61.4
Coughing	64	15.8
Vomiting	64	15.8
Diarrhea	36	8.9
Signs of respiratory distress (n=404)		
Yes	341	84.4
No	172	15.6

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Abnormalities on pulmonary auscultation (n=404)		
Bronchial rails	242	60.0
Crackling rails	86	21.3
Under crackling rails	9	2.2
Radiographic abnormalities(n=404)		
Chest distension	300	74.2
Alveolar opacity	24	6.0
Associated pathologies (n=404)		
Probable bacterial superinfection	147	36.4
Malaria	37	9.2
Congenital heart disease	18	4.4

Therapeutic and evolutionary aspects

Rhinopharyngeal clearance with saline, oxygen, corticosteroids and bronchodilators accounted for 76.5% of the total treatment undertaken (Table III). The average length of hospitalization was 4.16 days

(extreme 1 and 16 days). The trend was favourable in 86.1% of cases. Age less than 6 months ($p=0.003$) and the existence of an associated pathology ($p<0.001$) were significantly associated with infant death (Table IV).

Table III. Main therapeutic means

Therapeutic means	Number (n/N)	Percentage
Physiological serum for nasal lavage	347/404	85.9
Oxygen	323/404	80.0
Corticosteroids	279/404	69.0
Nébulization of salbutamol	265/404	65.6
Antibiotics	254/404	63.0
Antipyretics	141/404	8.8

Table IV. Varied uni analysis of risk factors for death by bronchiolitis

	Yes n(%)	No n (%)	Khi 2	P
Gender				
Male	13(6)	203 (94)	1.06	0.31
Female	14 (9)	145 (91)		
Age (month)				
≤ 6	25 (11)	207 (94)	10	0.003*
> 6	2 (1)	141 (99)		
Passive smoking				
Yes	9 (8)	101 (92)	0.22	0.66
No	18 (7)	247 (93)		
Promiscuity				
Yes	14 (7)	197(93)	0.23	0.68
No	13 (8)	151(92)		
Exposure to wood smoke				
Yes	20 (7)	253 (93)	0.02	1
No	7 (7)	95 (93)		
Family Atopy				
Yes	5 (7)	63 (93)	0.003	1
No	22 (8)	285 (92)		
Exposure to animal hair				
Yes	4 (7)	52 (93)	0.000	1
No	23 (7)	296 (93)		

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History of prematurity				
Yes	10 (27)	92 (73)	1.42	0.26
No	17 (6)	256 (94)		
Signs of respiratory distress				
Yes	24 (7.1)	317 (92.9)	0.55	1
No	4 (6.4)	59 (93.6)		
Associated diseases				
Yes	25 (12.4)	177(87.6)	0.000	<0.001*
No	3(2)	199(98)		

* Significant P at threshold < 5%

DISCUSSION

The objective of this descriptive and analytical retrospective study is to describe the main epidemiological, diagnostic, therapeutic and evolutionary aspects of acute infant bronchiolitis in the paediatric ward at Bouaké University Hospital. The study shows a hospital prevalence of 2.6%. Acute bronchiolitis affects nearly two thirds of all cases in infants under 6 months of age without a predominance of sex. The peak frequency is in October (16.3%) and 50.7% are recorded between July and October. Promiscuity, exposure to wood smoke and the notion of family asthma were noted in 79.2%, 73.0% and 17.3% of cases respectively. The triad dyspnea-fever-cold represents 84.8% of all general and functional signs recorded. Pulmonary auscultation reveals an anomaly in 83.4% represented by bronchial rails in 72%. X-ray of the chest face incidence reveals chest distension in 74.3% of cases. The main diseases associated with bronchiolitis are bacterial superinfection (36.4%), malaria (9.2%) and heart disease (4.4%). The trend is favourable in 86.1%. Lethality is 6.7%. The risk factors associated with death are age 6 months or less ($p=0.003$) and the existence of an associated pathology ($p<0.001$). Difficulties constituting limitations of the study were encountered. These are the socio-demographic, diagnostic, therapeutic and evolutionary data missing in some files due to the retrospective nature of the study. To this must be added the inadequacy of diagnostic methods, which makes it impossible to document the virus responsible for bronchiolitis and the suspected germs of superinfection. These difficulties represent potential biases that may underestimate or overestimate the results. Despite the methodological limitation, the work raises the following points for discussion.

At the Epidemiological Level

The hospital prevalence of bronchiolitis is 2.6% in the paediatric ward of Bouaké University Hospital. This rate is close to the 2 to 3% reported in 2007 by Andrew and al[10] in the United Kingdom. Doumbia and al.[11] in Mali and Bobossian and al.[12] in Bangui reported lower rates of 1.05% and 1.6% respectively. The paediatric ward at Bouaké University Hospital is the only referral hospital in the Gbêkê region and receives the majority of infants in respiratory distress. That could explain our high rate. The peak frequency is in October (16.3%) and half of the cases recorded between July and October (50.7%). This period corresponds to a period of heavy rainfall in Bouaké. The rainy season period was also reported by Bogne and al.[13] in Cameroon. Doumbia and al.[11] reported the months of September to December corresponding to the beginning of the dry season. In France, on the other hand, bronchiolitis was observed mainly between October and January, corresponding to late autumn and early winter[2]. For Hamzé and al.[14] the bronchiolitis epidemic in developing countries is seasonal and climate-dependent, unlike in developed countries where it occurs at the lowest temperatures and unrelated to the rainy season. In the study, bronchiolitis mainly affects infants under 6 months of age without gender difference. Doumbia and al.[11] also reported that the 1-6month age group was predominant. These results could be explained by the fact that parents bring their infants to a consultation, especially when they are young, because at this age the signs of bronchial obstruction are more important because of the smaller sizes at these ages. In the study, the notion of family asthma was present in 17.33% of cases. Although this parameter was not reported in all cases, this rate is close to the 16% reported by

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Doumbia and al. [11]. A higher rate of family asthma, 35.2%, has been reported in Senegal by Seckand al. [15]. The study revealed a passive smoking rate of 29.20% of cases. This rate is below the 38.2% reported in Mali by Diamoutene[16]. While the link between bronchiolitis and asthma is still much debated, the link between bronchiolitis and passive smoking is well established[17].

At the Diagnostic Level

The main reason for admission is respiratory difficulty (86.64%). This sign was also noted by Seck et al[15] and Doumbia et al[11] in proportions of 90.8% and 87% respectively. Respiratory difficulty is the consequence of bronchial obstruction caused by hypersecretion of mucus during inflammation in bronchiolitis. This is a sign of seriousness that worries parents and motivates consultation. This probably explains why this sign is the main circumstance for the discovery of this condition in the study. Fever is present in nearly 25% of the infants in the study. In the infant population studied by Gueddariand al.[18] in Morocco, fever was the primary reason for consultation. Fever is also a sign that worries parents, but it is not necessarily a sign of severity. A high fever should raise concerns about bacterial superinfection and justify the need for paraclinical examinations to refute or confirm the hypothesis. On physical examination, 84.40% of infants show signs of respiratory control. Zariat[19] reported a rate of 70% in its study. When pulmonary auscultation is abnormal, 83.4% of cases, it reveals bronchial rails in 72% of cases. The prevalence of bronchial rails on auscultation has already been reported by Bogneand al.[13] in Cameroon. Chest X-ray reveals chest distension in 74.3%. Doumbia and al.[11] in Mali and Seckand al. [15] in Senegal also reported a predominance of this thoracic distension in 71% and 87% of cases respectively. Chest distension is an indirect sign of bronchial obstruction resulting from inflammation and hypersecretion in the bronchioles and alveoli. Some authors describe that chest radiography is of no interest during typical bronchiolitis without signs of severity [20, 21]. Bronchiolitis is a viral infection that can be superinfected. In the study, bronchiolitis is associated with probable bacterial superinfection

in 36% of cases. The germ of superinfection could not be detected either in the blood culture or in the bronchial secretions samples due to the insufficiency of the technical platform. Routine testing for signs of bacterial infection in bronchiolitis such as neutrophil polynuclear hyperleukocytosis and C Reactive Protein testing is of no interest except in cases of suspected super infection[19, 22].

Therapeutic and Evolutionary Aspects

The management of acute bronchiolitis in infants is essentially symptomatic. In the study, nasopharyngeal clearance (NC) was performed in 85.9% of infants. The realization of nasopharyngeal clearance has been reported by Doumbia and al.[11] in Mali and Seckand al.[15] in Senegal in proportions of 100% and 48% respectively. While the management of acute bronchiolitis has been the subject of much controversy, the place of NC is no longer in dispute and must be systematic in the therapeutic arsenal. Oxygen therapy is instituted in 80% of cases. In the study 69% of infants received corticosteroids and 65.6% of salbutamol for nebulization. According to the literature, 99% of Swiss paediatricians use salbutamol, 80% of Canadian paediatricians prescribes a bronchodilator to treat bronchiolitis[20, 22, 23]. French studies have shown that bronchodilators still appear in 40 to 60% of prescriptions during bronchiolitis[23, 24]. Salbutamol nebulization was systematically performed in Mali according to the study by Doumbia and al. [11]. The benefit of corticosteroids and bronchodilators in the management of bronchiolitis is assessed differently according to the studies[20, 23, 25, 26]. The low efficacy of bronchodilators could be explained by the pathophysiology of bronchiolitis, where obstruction is mechanical and bronchospasm plays only a minor role, unlike asthma[20, 27]. In this work, antibiotic therapy is instituted in 63% of cases. Several studies show the uselessness of antibiotics in bronchiolitis in the absence of superinfection [16, 20, 21]. In the studies of Seckand al.[15] and Doumbia and al[11] respectively 71% and 85% of patients had received antibiotic therapy and in the study of Bobossiand al. [12] all patients had received antibiotic therapy. The inadequacy of the technical platform in microbiology and the practitioner's fear of missing a bacterial

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infection detrimental to the infant's prognosis certainly explain this over-prescription of antibiotics reported in the study and those of the other authors. Respiratory physiotherapy is not performed in the study due to the lack of a trained physiotherapist in the emergency unit. In the literature, the role of respiratory physiotherapy in the management of acute bronchiolitis is variously appreciated. While some authors support systematic physiotherapy [28, 29, 30, 31], others recommend that its use be rationalized [32, 33, 34, 35]. The average length of hospitalization is 4 days with extremes of 1 day and 16 days. 10.9% of infants have a hospital stay of more than 7 days. In the study by Bobossian *al.* [12] the average hospitalization time was 8 days. In India, for previously healthy infants, the average length of hospitalization is 3 to 4 days [36]. The evolution is marked by healing in 86.13% of cases. Bogue *al.* [13] and Doumbia *al.* [11] in their studies reported a cure in 99% and 98% of cases respectively. Lethality is high in this work (6.7%). Factors significantly associated with death are the age of the infant under 6 months ($p=0.003$) and the existence of an associated pathology ($p<0.001$). Lower mortality rates were found in Cameroon by Bogue *al.* [13] in 1.1%, in Senegal by Seck *al.* [15] in 1.6% and in Mali by Doumbia *al.* [11] in 1.8% of cases.

CONCLUSION

Acute bronchiolitis in infants is common in pediatrics at Bouaké University Hospital. It most often concerns infants under 6 months of age regardless of gender, with low socio-economic conditions and exposure to wood and tobacco smoke. Lethality is high with a rate of 6.7%. The factors significantly associated with death are the age of the infant under 6 months and the existence of an associated pathology. Well-coded management, improved technical support, capacity building for health personnel and public awareness of acute bronchiolitis will improve the prognosis.

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