Original Research Article

Bronchiolitis epidemic: experience of the mother and child teaching hospital of Tsaralalàna Madagascar

Andrianina Harivelvo Ranivoson*, Ny Ando Andrianina Rabevazaha, Elsa Haganaiain Rakotojoelimary, Mathias Bemena, Ymelda Ramiharijafy, Annick Lalaina Robinson

Department of Pediatrics, University Hospital for Mother and Child, Tsaralalàna, Antananarivo, Madagascar

Received: 09 October 2019
Revised: 30 October 2019
Accepted: 04 November 2019

*Correspondence:
Dr. Andrianina Harivelvo Ranivoson,
E-mail: andrianina.rani@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: An increase in the number of children hospitalized for bronchiolitis has been observed on February to April over the past 5 years. This study aimed to describe the bronchiolitis characteristic during the 2019 epidemic as well as its management at the Tsaralalàna Teaching Hospital.

Methods: This is a 3 months retrospective descriptive study, from February to April 2019, including all children diagnosed with bronchiolitis.

Results: Bronchiolitis was diagnosed in 1704 children (40.1%) and 425(29.4%) were hospitalized. Severe bronchiolitis was found in 212 children (49.9%) which were aged under 3 months in 46.7%. Secondary bacterial infection was noted in 359 children (84.5%) and cardiac failure in 145 children (34.1%). Hypertonic saline 3% was prescribed at 76.4% of children.

Conclusions: Younger infant under 3 months were the most frequently admitted in hospitalization. Severe or complicated bronchiolitis are predominant. Using a pediatric plan adapted to bronchiolitis epidemic may improve care of children.

Keywords: Bronchiolitis, Children, Epidemic, Heart failure, Hypertonic saline

INTRODUCTION

Acute bronchiolitis is the most common lower respiratory tract infection in infants and the leading cause of hospitalization in this group of patients.1 Respiratory Syncytial Virus (RSV) is the common cause of bronchiolitis during epidemic period.2

A substantial proportion of children will experience at least one episode of bronchiolitis, and as much as 2-3% of all children will be hospitalized with bronchiolitis during their first year of life.3,6 In tropical and semitropical climates, with arms temperatures and seasonal rainfall, bronchiolitis occurs throughout the year usually with outbreak during the rainy season.7

In Antananarivo, an increase in the number of children hospitalized for bronchiolitis has been observed on February to April over the past 5 years. Especially during the four first months of 2019, hospitalization for bronchiolitis was found to be more important.

So, Authors carried out this study whose objectives are to describe the bronchiolitis characteristics during the 2019 epidemic as well as its management at the Tsaralalàna Teaching Hospital.
METHODS

This is a retrospective descriptive study, at the Mother and Child Teaching Hospital of Tsaralalana, Antananarivo. This was a hospital seen at the downtown of Antananarivo, capital of Madagascar. It had a capacity of 52 beds and 45 simultaneous oxygen therapies. The period of study was 3 months, the 01 February of 2019 to the 30 April of 2019.

All children aged 1 day to 2 years old diagnosed with bronchiolitis and hospitalized during this period were included. Children who presented bronchiolitis and treated in ambulatory are excluded.

Variables study were characteristics of children (age, antecedent of bronchiolitis, prematurity, smoking exposition, congenital heart disease) clinical feature (stage of bronchiolitis, complications) and treatment (nebulization, steroids, antibiotics) and the outcome. Wang score was used to determine the severity of this pathology. Bronchiolitis was severe if Wang score was greater than or equal to 8; moderate if it was between 4 and 7 and without severity if less than 4.

The data were analyzed with epi-info 7. Chi square test was used to determine the association between the age and variable study. p value <0.05 were considered significant.

RESULTS

A total of 4242 visits at triage and emergency department were identified during these 3 months. Bronchiolitis was diagnosed in 1704 children (40.1%) and 425 (29.4%) were hospitalized. Sex ratio was 1.03. The average of age was 4.4 months (±3.6). The peak of incidence was the week 9 to week 12 (25 February to 24 March 2019) (Figure 1).

![Figure 1: Distribution of bronchiolitis according to epidemiological week.](image)

Nearly than half of children, 198(46.6%) were under 3 months of age and 89.9% under 12 months. Six children had died (1.4%). Severe bronchiolitis with Wang score more than 8 was found in 212 children (49.9%) which were aged under 3 months in 46.7%.

Secondary bacterial infection was noted in 359 children (84.5%) and cardiac failure in 145 children (34.1%) (Table 1).

| Characteristics | Number (n) (%) |
|-----------------|---------------|
| Age distribution |               |
| < 1 month       | 71 (16.7)     |
| 1-2 months      | 127 (29.9)    |
| 3-5 months      | 97 (22.8)     |
| 6-8 months      | 58 (13.6)     |
| 9-11 months     | 30 (7)        |
| 12-24 months    | 43 (10.1)     |
| Antecedent      |               |
| Smoking exposition | 60 (14.1) |
| Bronchiolitis   | 38 (8.9)      |
| Prematurity     | 33 (7.7)      |
| Congenital heart disease | 17 (4) |
| Stage of bronchiolitis |          |
| Severe          | 212 (49.9)   |
| Moderate        | 200 (47)     |
| Without severity| 13 (30.6)    |
| Complications   |               |
| Secondary bacterial infection | 359 (84.5) |
| Heart failure   | 145 (34.1)   |
| Pneumothorax    | 2 (0.5)      |
| Treatment       |               |
| Hypertonic saline 3% | 312 (76.4) |
| Hypertonic saline 3%-epinephrine | 73 (17.2) |
| Salbutamol      | 35 (8.2)     |
| Epinephrine     | 3 (0.7)      |
| Steroids        | 135 (31.7)   |
| Antibiotics     | 359 (84.5)   |
| Days of hospitalization |          |
| 1-3 days        | 83 (19.5)    |
| 4-6 days        | 190 (44.7)   |
| 7-9 days        | 96 (22.6)    |
| 10 days or more | 56 (13.2)    |

Nebulization of hypertonic saline 3% was administered to 76.4% of children, 135(31.7%) received steroids and 359 (84.5%) antibiotics.

The average length of hospitalization was 6.4 days (±2.8) with extreme of 1 to 29 days (Table 1).

Association between heart failure and age was found (p=0.04) and between days of hospitalization and age (p<0.001) (Table 2).

DISCUSSION

Many studies from the USA, Europe and Africa show increasing rates of bronchiolitis.\textsuperscript{8-10} In this study, the most
affected age group is infants under 3 months of age (46.6%). At Yaoundé - Cameroon, peak of incidence was between 2 and 4 months. In Puerto Rico, subgroup analyses showed that the 3.1 to 6 months age group had the highest percentage of bronchiolitis hospitalizations (20% SD 9%). This difference may be explained by systematic hospitalization of patients under 6 weeks of age in this present study. Prior studies have identified risk factors associated with hospitalization for bronchiolitis, including prematurity, younger age, environmental factors and co-morbidities.

Severe bronchiolitis was found in 49.9% vs 9% at Yaoundé. It may be explained by the youngest age of this population. Secondary bacterial infection was seen in 84.5% patients vs 11% at Yaoundé. This could be due to the fragility of the terrain (age, nutritional status, immunity), but also to a possible particular virulence of the virus. Antibiotic use is twice as high as in Lebanon.

Association between group of age and severity of bronchiolitis has been seen in this study as well as found by Praznik at Slovania. Chronological younger age and the use of antibiotics were associated with severe bronchiolitis defined as hospitalization longer than 1 day.

Complications like encephalitis and myocarditis have been described as rare. However, heart failure chart suggesting myocarditis or cardiac decompensation of congenital heart disease was seen in 34.1% of children. Significant association between group of age and heart failure was found in this study (p<0.001). The first report on detection of RSV in the myocardium in patients with bronchiolitis was in an infant with combined immunodeficiency; the virus was cultured from myocardium. More recently RSV was again detected in the myocardium by PCR in a patient with myocarditis. Right ventricular decompensation due to pulmonary hypertension is a possible cause for myocardial damage, cardiac troponin elevation and systolic hypotension. Pulmonary disease is associated with pulmonary hypertension in bronchiolitis. The routine uses of multiple management modalities including bronchodilators, antibiotics and corticosteroids have not demonstrated better efficacy and should be avoided.

In this study, average days of hospitalization was 6.4 days (±2.8). The median length of hospitalization in a large study including children below 12 months was only one day. In a Norwegian study the mean length of hospitalization was 80 hours. This result was similar of the days of stay found by Bogne at Yaoundé-Cameroun 5 days and the 5.4 days by Dagan et al. In front of the length of days hospitalization, and to improve quality of care of children hospitalized to bronchiolitis, an organizational infrastructure plan adapted to bronchiolitis epidemic resulted in a significant decrease in the average hospital length of stay.

CONCLUSION

Bronchiolitis epidemics are responsible of important visits at emergency room and hospitalization. Younger infant under 3 months were the most frequently admitted in hospitalization. Severe or complicated bronchiolitis are predominant. Use of multiple management modalities such as antibiotics, steroids were already seen. Using a pediatric plan adapted to bronchiolitis epidemics may improve care of children. Furthermore, larger studies focused on factors of severity and virus involved characteristics should be conducted.

ACKNOWLEDGEMENTS

Authors would like to thank all the staff in the Tsaralalana Hospital.
REFERENCES

1. American Academy of Pediatrics. Subcommittee on Diagnosis and Management of Bronchiolitis. Diagnosis and management of bronchiolitis. Pediatr. 2006;118:1774-93.
2. Fuger M, Timsit S, Chérion G. Bronchiolite del lattante. EMC-Urgenze. 2019 Aug 1;23(3):1-8.
3. Nagakumar P, Doull I. Current therapy for bronchiolitis. Arch Dis Child. 2012;97:827-30.
4. Zorc JJ, Hall CB. Bronchiolitis: recent evidence on diagnosis and management. Pediatr. 2010 Feb 1;125(2):342-9.
5. Ralston SL, Lieberthal AS, Meissner HC, Alverson BK, Baley JE, Gadomski AM, et al. Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis. Pediatr. 2014;134(5):1474-502.
6. Stockman LJ, Curns AT, Anderson LJ, Fischer-Langley G. Respiratory syncytial virus-associated hospitalizations among infants and young children in the United States, 1997-2006. Pediatr Infe Dis J. 2012 Jan 1;31(1):5-9.
7. Piedimonte G, Perez MK. Respiratory syncytial virus infection and bronchiolitis. Pediatr Rev. 2014 Dec;35(12):519.
8. Øymar K, Skjerven HO, Mikelsen IB. Acute bronchiolitis in infants, a review. Scandina J Trauma, Resus Emerg Med. 2014 Dec;22(1):23.
9. Cangiano G, Nenna R, Frassanito A, Evangelisti M, Nicolai A, Scagnolari C, et al. Bronchiolitis: analysis of 10 consecutive epidemic seasons. Pediatr Pulmonol. 2016 Dec;51(12):1330-5.
10. Bogne JB, Chiabi A, Yatchet Tchata D, Nguefack S, Mah E, Tchokoteu PF et al. Acute bronchiolitis in infants less than 24 months of age in Yaoundé. A review of 290 cases. Health Sci Dis. 2013;14(4).
11. Rivera-Sepulveda A, Garcia-Rivera EJ. Epidemiology of bronchiolitis: a description of emergency department visits and hospitalizations in Puerto Rico, 2010-2014. Trop Med Health. 2017 Dec;45(1):24.
12. Bradley JP, Bacharier LB, Bonfiglio J, Schechtman KB, Strunk R, Storch G, et al. Severity of respiratory syncytial virus bronchiolitis is affected by cigarette smoke exposure and atopy. Pediatr. 2005 Jan 1;115(1):e7-14.
13. Mecklin M, Heikkilä P, Korppi M. Low age, low birthweight and congenital heart disease are risk factors for intensive care in infants with bronchiolitis. Acta Paediatrica. 2017 Dec;106(12):2004-10.
14. Shahnaz A, Parker RA, Wills S, Russell RR. Assessing efficient patient care: should length of stay be calculated independently of local admission rates?. Arch Dis Child. 2013 Dec 1;98(12):951-4.
15. Lanari M, Prinelli F, Adorni F, Di Santo S, Vandini S, Silvestri M, et al. Risk factors for bronchiolitis hospitalization during the first year of life in a multicenter Italian birth cohort. Ital J Pediatr. 2015;41:40.
16. Weber MW, Mulholland EK, Mulholland EK, Greenwood BM. Respiratory syncytial virus infection in tropical and developing countries. Trop Med Inte Health. 1998 Apr;3(4):268-80.
17. Naja Z, Fayad D, Khafaja S, Chamseddine S, Dbaibo G, Hanna-Wakim R. Bronchiolitis Admissions in a Lebanese Tertiary Medical Center: A 10 Years’ Experience. Fron Pediatr. 2019;7.
18. Praznik A, Vinsék N, Prodan A, Erčuľ V, Pokorn M, Mrvić T, et al. Risk factors for bronchiolitis severity: A retrospective review of patients admitted to the university hospital from central region of Slovenia. Infl. Other Resp. Vir. 2018 Nov;12(6):765-71.
19. Fishaut M, Tubergen D, McIntosh K. Cellular response to respiratory viruses with particular reference to children with disorders of cell-mediated immunity. J Pediatr. 1980 Feb 1;96(2):179-86.
20. Bowles NE, Ni J, Kearney DL, Pauschinger M, Schultheiss HP, McCarthy R, et al. Detection of viruses in myocardial tissues by polymerase chain reaction: evidence of adenovirus as a common cause of myocarditis in children and adults. J Am Coll of Cardiol. 2003 Aug 6;42(3):466-72.
21. Sreeram N, Watson JG, Hunter S: Cardiovascular effects of acute bronchiolitis. Acta Paediatr Scand. 1991;80:133-6.
22. Meissner HC. Viral bronchiolitis in children. N Engl J Med. 2016;374:1793-4.
23. Lavilledieu D, Abassi H, Mercier G, Guiraud M, Du Chaffaut G, Milesi C, et al. Implementation of an organizational infrastructure paediatric plan adapted to bronchiolitis epidemics. J Infe Pub Health. 2019 Aug 2.
24. Dagan R, Landau DA, Haikin HA, Tal AS. Hospitalization of Jewish and Bedouin infants in southern Israel for bronchiolitis caused by respiratory syncytial virus. Pediatr Inf Dis J. 1993 May;12(5):381-6.

Cite this article as: Ranivoson AH, Rabe vazaha NAA, Rakotojoelimarina EH, Bemena M, Ramiharijafy Y, Robinson AL. Bronchiolitis epidemic: experience of the mother and child teaching hospital of Tsalalalana Madagascar. Int J Res Med Sci 2019;7:xxx-xx.