Severity Assessment and Immediate Outcome of Hospitalized Bronchiolitis Patient in a Tertiary Care Hospital

Mumtahena Mahmuda[1*] Mohammad Imrulkayes[2] Suman Biswas[3]
Shammi Akter[4] Ilham Imam[5] MD. Saiful Islam[6]

Abstract

Background: Bronchiolitis is the most common reason for hospitalization during infancy, being a burden for the children and family and bearing huge costs for the health care system. No formal scoring system is used in our country to assess the severity of bronchiolitis. This study will contribute to create referral knowledge about bronchiolitis among the health care providers of the community.

Materials and methods: This cross-sectional observational study was carried out at the Department of the Paediatrics, Chittagong Medical College in 100 admitted patient with bronchilitis aged 1 month to 24 months. Respiratory rate, chest wall indrawing, nasal flaring, grunting, feeding ability, cyanosis and general behavior were used to measure severity. Outcome measurement parameters were duration of hospital stay, needs ICU support, needs mechanical ventilation, death and leave against medical advice.

Results: Out of 100 patients, 52 patients had mild bronchiolitis, 31 had moderate and 17% had severe bronchiolitis. The average hospital stay for patients with mild bronchiolitis was 2.48 (±1.08) days. 4.53 ((±1.15) days for moderate bronchiolitis and for severe bronchiolitis it was 7.41 ((±2.01) days. 15% of patients with severe bronchiolitis required ICU assistance and received CPAP or humidified oxygen. There was no death but 2% patient left against medical advice.

Conclusion: This study concluded that most of the bronchiolitis patients admitted with a mild disease which could be treated at home with adequate counselling and assurance of parents. This will reduce the hospital burden and the financial cost to parents. At the same time referral criteria should be strengthened to start prompt treatment of patients with severe diagnosis.

Key words: bronchiolitis; Hypoxemia; Neonates; Respiratory distress.

Introduction

Bronchiolitis is the most common acute lower respiratory tract infection in infants and hospital admission.[1] It is predominantly a viral disease and is characterized by acute inflammation, edema and necrosis of epithelial cells lining a small airway, increased mucus production and bronchospasm.[2] Respiratory syncytial virus is responsible for more than 50%-80% cases and the other agents are parainfluenza virus, adenovirus, rhinovirus and mycoplasma.[3] The incidence peaks during winter and early spring.[4]

Every year, 150 million new cases occur worldwide, 11 to 20 million cases are severe enough to require hospital admission, 7 to 13% of these cases are severe enough to require hospital admission. 95% of all cases occur in developing countries.[5] In Bangladesh, bronchiolitis is also an important cause of LRTI in children below 2 years of age and the peak age is between 2 to 6 months. The first report of bronchiolitis in an epidemic form was in the year 2000-2002, where it was found 21% of under five children attending different hospitals of Bangladesh have bronchiolitis.[6-8] As much as 2-3% of all children will be hospitalized during their first year of life. According to national guideline Bangladesh bronchiolitis is a clinical diagnosis characterized by cough and respiratory distress associated with wheeze, preceded by runny nose with or without fever in young children below 2 years of age, particularly between 2-6 months of age.[9]

1. Assistant Registrar of Paediatrics
Chittagong Medical College Hospital, Chattogram.
2. Associate Professor of Pediatric Nephrology
Chittagong Medical College, Chattogram.
3. Assistant Professor of Paediatrics
Chittagong Medical College, Chattogram.
4. Assistant Registrar of Paediatrics
Chittagong Medical College Hospital, Chattogram.
5. Registrar Neonatology of Paediatrics
Chittagong Medical College Hospital, Chattogram.
6. Resident Physician of Paediatrics
Chittagong Medical College Hospital, Chattogram.

***Correspondence:** **Dr. Mumtahena Mahmuda**
Cell : 01817 71 58 87
E-mail: mumtahena_mahmuda@yahoo.com

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Bronchiolitis is classified into mild, moderate and severe on the basis of clinical features. Severe bronchiolitis is characterized by being unable to drink or take feed, severe respiratory distress, and severe hypoxemia.[10] In a study in New Zealand, it was found that 57% of children had a mild disease, 18% moderate and 25% had a severe disease.[11] Bronchiolitis is a self-limiting disease associated with high morbidity but low mortality and 95% cases are mild. Home care is sufficient for mild cases. The main elements of treatment remain supportive care with assisted feeding, minimal handling, gentle nasal suction and oxygen therapy for patients requiring admission.[12] Other therapeutic options are nebulized salbutamol, inhalations with epinephrine, normal saline or hypertonic saline and critical management in the pediatric intensive care unit.[13,10,14] The most critical phase of the illness is the first 48-72 hours, followed by dramatic clinical improvement. The case fatality rate is below 1%.[6,3] Median duration of the hospital stay is 3 to 7 days.[6,11] Intubation and mechanical ventilation is required in 2-3% hospitalized patient and the significant predictions were low birth weight and respiratory rate ≥70 per minutes and O_2 saturation < 90% in the 1st inpatient day.[15] Death usually results from prolonged apneic spells, uncompensated acidosis or severe dehydration.[12,15]

The rate of hospitalization for all infants went up from 1 to 3% in the last 30 years.The growing number of hospital admissions is costing the health care system and reflect the high morbidity and impact on facilities.[12] Criteria for referral and admission varies between hospitals. No formal scoring system is used in our country to evaluate the severity of bronchiolitis. However, there has been no study so far to evaluate the severity of bronchiolitis. So, this study aimed to assess the severity of bronchiolitis according to guideline. This can contribute to create referral knowledge about bronchiolitis among the health workers of the community.

Materials and methods

This cross-sectional observational study was conducted in the Department of Pediatrics, Chittagong Medical College, Chattogram from September 2018 to March 2019. Approval was obtained from the Ethical Review Committee of Chittagong Medical College and informed written consent was taken from the parents of the patients.

Patients aged between 1 months to 24 months who had the first attack of wheeze or runny nose and diagnosed as bronchiolitis were enrolled in this study. Neonates, children aged less than 24 months and children with congenital heart disease or bronchopneumonia were omitted from the study.

All patients were evaluated as per pre-tested questionnaire. The parameters of severity assessment were respiratory rate for 1 min, the chest wall in drawing, nasal flaring, grunting, ability to feed, cyanosis and general behavior. All the parameters were assessed in a calm child. Then, their immediate outcome was observed. Immediate outcome means from the day of admission to discharge. Outcome measurement parameters were duration of hospital stay, needs ICU support, needs mechanical ventilation, death and leave against medical advice. The Statistical Package of Social Sciences for Windows version 20 was used to analyze all the data.

For severity assessment following parameters are used :-

Severity assessment of bronchiolitis [16, ,17]:

Parameters	Mild	Moderate	Severe
Respiratory rate	<2 month >60/min 2-12 month >50/min	>60/m	>70/m
The Chest wall in-drawing	None/Mild	Moderate	Severe
Nasal flare and or grunting	Absent	Nasal flare possible, grunting absent	Present
Feeding	Normal	Less than usual, frequently stops, quantity> half of normal	Not interested, choking, quantity < half of normal
Behavior	Normal	Irritable	Lethargic
Cyanosis	Absent	Absent	Present

Any criteria in the severe category designates that the infant is severely ill.

Results

Table I Distribution of infants by their age and sex

Variables	Total	Percentage
Age (Group)		
<6 months	50	50.0%
6-12 months	50	50.0%
Gender		
Male	69	69.0%
Female	31	31.0%

Data were expressed a frequency (Percentage) if not otherwise mentioned.

Table II Presenting features of bronchiolitis by their age group

Symptoms	<6 months (n=50)	6-12 months (n=50)	Total (n=100)	p value*
Fast breathing	48(96%)	46(92%)	94(94%)	0.678
Cough	50 (100%)	50 (100%)	100(100%)	NA
Nasal flaring	22 (44%)	15 (30%)	37 (37%)	0.147
Grunting	8(16%)	8 (16%)	16 (16%)	1.0
Respiratory Distress	47 (94%)	45 (90%)	92 (92%)	0.715
Feeding Poor	32 (64%)	29 (58%)	61 (61%)	0.539
Incessant Cry	11 (22%)	5 (10%)	16 (16%)	0.102
Lethargic	10 (20%)	9 (18%)	19 (19%)	0.799

Data were expressed a frequency (Percentage). p values were derived from the Chi-square test or Fischer's Exact test as appropriate. NA: Not applicable.

Table Ill The Severity of the chest in drawing, respiratory rate and of bronchiolitis by their age group

Signs	<6 months (n=50)	6-12 months (n=50)	Total (n=100)	p value*
Chest indrawing				
Mild	23 (46%)	29 (58%)	52 (52%)	
Moderate	19 (38%)	12 (24%)	31 (31%)	0.312
Severe	8 (16%)	9 (18%)	17 (17%)	
Respiratory rate (/min)				
Mild (50-60)	23 (46%)	33 (66%)	56 (56%)	
Moderate (61-70)	22 (44%)	10 (20%)	32 (32%)	0.037
Severe (>70)	5 (10%)	7 (14%)	12 (12%)	

Data were expressed a frequency (Percentage). p values were derived from the Chi-square test.

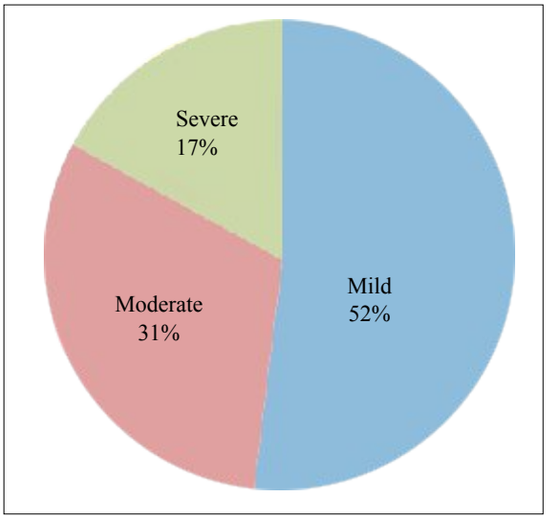

Figure 1 Clinical severity category of 100 hospitalized bronchiolitis patients

Table IV Distributions of severity criteria among infants with bronchiolitis

Parameters	Mild (n=52)	Moderate (n=31)	Severe (n=17)
Feeding	32 (69.0%)	27 (87.1%)	17 (100%)
Behavior (Lethargic)	0 (0%)	3 (9.7%)	16 (94.1%)
Grunting	0 (0%)	0 (0%)	16 (94.1%)
Nasal flare	0 (0%)	20 (64.5%)	17 (100%)
Respiratory rate (/min)	56±4	63±5	73±3

Data expressed as frequency (Percentage) or mean ± SD.

Table V In-hospital the outcome of bronchiolitis by their severity category

Signs	Number	Mild	Moderate	Severe
No complication	83	51 (61.4%)	30 (36.1%)	2 (2.4%)
Need ICU	15	0 (0%)	0(0%)	15 (100%)
LAMA	2	1 (50.0%)	1 (50.0%)	0 (0%)
LOS (Days)	Mean ± SD	2.48±1.08	4.53±1.15	7.41±2.01
	Range	0.5-4	0.5-6	2-10
	Median	2	5	7

Data expressed as frequency (Percentage) or mean ± SD. LAMA: Leave Against Medical Advice, LOS: Length of Hospital Stay.

Discussion

Here, we found the equal presentation of both age groups of ≤6 months and age group ≥6 months with the mean age of 6.44 (± 3.33) months. A study performed at SMOMCH has shown similar results, where the mean age of patients was 7.53 4.75 months.[10] All the children (100%) were within their 1st year of age. In the case of bronchiolitis, Kabir et al. have identified age group 1-6 months as having the highest occurrence of affected groups with an overall prevalence of 60%.[18] Kabir et al. KP Dawsan et al. presented maximum children within 2-12 months (71.5%).[19, 11] Bradly et al. observed that age is a relevant factor for the severity of infection, younger and older infants are the ones with more severe infections.[20] But in this study we found both age group affected equally.

The clinical features of bronchiolitis were mostly cough, runny nose (100%), respiratory distress (92%), fast breathing (94%) and poor feeding (61%). Similar findings were found by Kabir ARML et al.[7]

Clinical score is generally considered a relatively objective measure to assess the severity of illness. This study used guidelines from New Zealand for scoring. Here the parameters used were respiratory rate, chest wall in drawing, nasal flaring and or grunting, feeding behavior and cyanosis. During categorization, all the parameters were measured to classify in a group except severe classification where not all criteria needed to be met. Chest in drawing was observed by theinward movement of lower chest wall in a calm child [21]. Severe chest in drawing is deep and easily visible. Here we found 52% patient had mild, 31% had moderate and 17% had severe bronchiolitis, which was similar to the study done by KP Dawsan.[12] Mild bronchiolitis patients had a mean R/R 56±4 breaths/min whereas it was 63±5 breaths/min and 73±3 breaths /min in case of moderate and severe bronchiolitis respectively.The Voats et al found that the most important parameters to predict need of admission and emphasise seriousness of bronchiolitis are respiratory rate more than 45 breaths per minute, as well as age less than 6 months.[20] According to classification criteria used in this study, mild bronchiolitis patients should not have feeding difficulty, but this study found 69% of mild bronchiolitis patients had feeding difficulties. Kabir ARML et al. found 93% patients with feeding difficulty.[7] Most of the cases feeding was interrupted due to cough. 41.9% patients of moderate bronchiolitis had incessant cry and 94% patients of severe bronchiolitis were found lethargic. 64.5% patients with moderate bronchiolitis had grunting in comparison to 100% patients of severe bronchiolitis.

Mulholland et al. found cyanosis and crackles were two physical signs most closely related to severity. The presence of cyanosis correlated with SaO_2<90%.[22] In this study only 1% patient was found cyanosed.

Among study patients 83% patients were treated inward. Supportive therapy constituted following the Bangladeshi National guidelinewith six hourly nebulized salbutamol, Oxygen inhalation, maintenance of nutrition with I/V fluid, nasogastric tube feeding or breast feeding (As required per case) oropharyngeal suction SOS and paracetamol for fever.

Most of the patients with severe bronchiolitis needed ICU support (15%) which was in conformity with observations of Wang et al.[21] These patients were treated with humidified oxygen with the face mask and CPAP as early intervention to prevent mechanical ventilation. Four of 15 patients needed CPAP in whom SPO2 was persistently below 95% . No patient expired during study period, but 2 patients (2%) left against medical advice. In both cases, parents felt the improvement of the child. Discharge criteria based on satisfactory feeding, return of social smile and no hypoxia in room air.

In this study mean hospital stay 2.48 (± 1.08) days for mild disease, 4.53 (±1.15) days for moderate disease and 7.41(±2.01) daysfor severe disease.Rubina et al. observed the mean duration of hospitalization was 6.41 (±2.82 days)[10]. Kabir et al. observedduration of hospitalization was 4.14 (±1.79) days.[19]

Bronchiolitis is a self-limiting disease. Case fatality rate is below 1%.[6] This observation showed that the most mild bronchiolitis patient has discharged in around 3 days. So, in that case counseling to the mother regarding home care management should be the main stay of treatment. At a time, health care providers should be warned about danger signs and the strong referral system should be established.

Limitation

The sample size was small and collected from a single center.

Conclusion

From this study result it can be concluded that most of the bronchiolitis patients admitted with the mild disease which could be treated at home with adequate counselling and assurance of parents. This will reduce the hospital burden and thefinancial cost of parents.

Recommendations

Appropriate training and education for the health care providers is warranted to reduce unnecessary hospital admission and prompt referral of severe bronchiolitis patients.

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Contribution of the authors

MM- Conception, design, acquisition of data, analysis of data, manuscript writing & final approval.

MIK- Interpretation of data, critical revision & final approval.

SB- Acquisition, analysis, interpretation of data, drafting, critical revision & final approval.

SA-Acquisition of data, analysis of data, interpretation of data, drafting & final approval.

II-Acquisition of data, analysis of data, drafting & final approval.

MSI- Acquisition of data, analysis, drafting & final approval.

Disclosure

All the authors declared no competing interest.

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