



Recovery of Children from Acute Lower Respiratory Tract Infection (Pneumonia and Bronchiolitis) : In a tertiary Care Hospital

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Key words:

Pneumonia, Bronchiolitis, Recovery.

Abstract

Backgrounds: Children are mostly the victims of pneumonia and bronchiolitis for which they are often hospitalized. Acute respiratory infection (ARI) results in 1.9 million deaths per year in developing countries (Taneja et. al 2009). It is important to know the recovery time of individual acute lower respiratory tract infection (ALRTIs) like pneumonia and bronchiolitis for better understanding the clinical feature and outcome. Knowing the length of stay (LOS) in case of ALRTI has not yet been worked out and studied well.

Objective: To determine the recovery of different clinical features Length of hospital Stay and outcome of two common LRTIs viz pneumonia and bronchiolitis.

Methods: A cross-sectional analytical study was done in department of pediatrics of Dhaka Medical College Hospital during the from October 2013 to September 2014. Cases were selected according to selection criteria. Pneumonia was diagnosed on the basis of fever, cough, breathing difficulty, and found chest indrawing, fast breathing, and bronchial breath sound or crackles on examination and consolidation or patchy opacity in chest X-ray and bronchiolitis on the basis of presence of runny nose followed by cough, breathing difficulty and wheeze on auscultation in a child below 2 yrs. Cases of pneumonia were treated with standard protocol of WHO and cases of bronchiolitis were treated with national guideline. The cases were followed up 12 hourly for 8 days using case collection sheet by monitoring 17 clinical features.

Results : There were 54 cases of pneumonia and 54 cases of bronchiolitis. Baseline selected clinical-sociodemographic parameters of both the cases were similar in terms of sociodemographic status and some clinical features. The following clinical features were similar in both groups viz. cough (100% vs 100%) breathing difficulty (100% vs 100%), feeding difficulty (92.6% vs 96.3%), chest indrawing (92.6% vs 96.3%). The dissimilar clinical features were fever (100% vs 77.8%, $p < 0.001$), runny nose (40.7% vs 100%, $p < 0.001$) sleeping difficulty (92.6% vs 77.8% $p < 0.03$) wheeze (29.6% vs 100%, $p < 0.001$) crackles (100% vs 18.5%, $p < 0.001$). Dynamics of improvement in clinical features: Significant number of cases of pneumonia did not improve from breathing difficulty (40.7%), feeding difficulty (40.7%), restlessness (16.7%), sleeping difficulty (76.9%), chest indrawing (63%), documented fever (54%) within 3 days, but more than 90% cases of bronchiolitis recovered from above mentioned clinical features. ($P < 0.001$). Social smile returned to only 68% in case of pneumonia but 100% cases of bronchiolitis ($p < 0.001$) with in 4 days.

Conclusion: This study was concluded that almost 89% cases of pneumonia and 100% cases of bronchiolitis recovered. Length of hospital stay (LOS) was 5.8 ± 2.1 days in pneumonia and LOS was 3.2 ± 0.7 in bronchiolitis. Mortality was higher in cases pneumonia (3.7%) than cases of Bronchiolitis (0.0%).

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Introduction

Acute respiratory infection (ARI) results in 1.9 million childhood deaths per year in developing countries¹. ARI are classified as upper respiratory tract infections & lower respiratory tract infections². Acute lower respiratory tract infection (ALRTI) is the leading cause of mortality & one of the common causes of morbidity in children under five years of age. In developing countries ALRTI is responsible for 19.0% of all deaths in children under five years & 8.2% of all disabilities and premature mortality as measured by disability adjusted life years (DALYS)³. The common LRTIs in children are pneumonia and bronchiolitis. The respiratory rate is a valuable clinical sign for diagnosing acute LRI in children who are coughing and breathing rapidly. The presence of lower chest wall indrawing identifies more severe disease².

Pneumonia is defined as an acute inflammation of lower respiratory tract infection associated with recently developed pulmonary shadowing. On the other hand Acute bronchiolitis is a clinical diagnosis which is characterized by runny nose followed by cough and respiratory distress in a previously healthy child⁴.

The diagnosis of bronchiolitis and its severity is rooted in the clinician's interpretation of the constellation of characteristic findings and is not dependent on any specific clinical finding or diagnostic test. Infants with acute bronchiolitis may present with a wide range of clinical symptoms and severity, from mild upper respiratory infections to impending respiratory failure⁵. A study in South Africa revealed the mean duration of illness to be 12 days, 39% of infants persist symptoms after 2 weeks, 18% continue symptoms after 3 weeks and 9% even after 4 weeks. Cough was the most common persistent symptom followed by noisy breathing and fever⁶. The recovery period for pneumonia depends on a variety of factors, the most obvious one being the immunity of affected person. The recovery period is generally 3-6 weeks. A person suffering from bacterial pneumonia takes about 1-3 days to improve after starting antibiotics treatment. However, complete recovery takes 3 weeks of time⁷

In Bangladesh, the antibiotics and bronchodilators are used for the treatment of pneumonia &

bronchiolitis respectively. But the pattern of recovery and hospital stay for the two diseases may be different. In Bangladesh no study has yet been held to determine the recovery pattern from pneumonia and bronchiolitis. This study will be conducted to demonstrate the recovery pattern of pneumonia and bronchiolitis in our patients attending Pediatrics Department of DMCH.

General objectives: To see the difference in recovery pattern of different clinical features of pneumonia and bronchiolitis following treatment, with standard treatment protocol of World Health Organization (WHO) for pneumonia and according to National Guideline for Bronchiolitis.

Specific objective: 1) To assess and compare the recovery trends of respiratory symptoms and signs. e.g. cough, breathing difficulty, feeding difficulty, nasal blockade, sleeping difficulty, return of social smile, respiratory rate, chest in drawing, nasal flaring, cyanosis, heart rate, wheeze and crackles between pneumonia and bronchiolitis. **2)** To observe the length of hospital stay between patients of pneumonia and bronchiolitis. **3)** To compare the clinical outcome between pneumonia and bronchiolitis

Methods

This study was an observational type of descriptive study. carried out in Dhaka Medical College Hospital, Dhaka, from October 2013 to September 2014. Study sample were collected from admitted Patients of the Pediatrics Department of DMCH were included in this study on the basis of following selection criteria.

Inclusion criteria i) Age 1 month to 5 years. ii) Children present with cough and/or respiratory distress and on examination either found to be suffering from pneumonia or bronchiolitis.

Exclusion criteria i) Patients who were presented with other co-morbidities. e.g. protein energy malnutrition (PEM), Cerebral Palsy, Congenital heart disease, Septicemia, Severe anaemia. Ethical approval was taken from concern authorities and written consent was taken from parents. Pneumonia was diagnosed on the basis of fever, cough, breathing difficulty, and found chest indrawing, fast breathing, and bronchial breath sound or crackles on examination and consolidation

or patchy opacity in chest X-ray and bronchiolitis on the basis of presence of runny nose followed by cough, breathing difficulty and wheeze on auscultation in a child below 2 yrs. Cases of pneumonia were treated with standard protocol of WHO and cases of bronchiolitis were treated with national guideline. Data were collected using a semi-structured questionnaire (research instrument) containing all the variables of interest.

Sampling Methods were Non probability Convenience samplings. The cases were followed up 12 hourly for 8 days using case collection sheet by monitoring 17 clinical features, sample size was 54 for pneumonia & 54 for bronchiolitis. Finally patients were discharged according to discharge criteria: No hypoxia, No breathing difficulty, No chest indrawing, No fast breathing, Satisfactory oral feeding.

Operational definitions: Bronchiolitis: Any child under two years of age, both male and female, who were hospitalized due to preceding or existing runny nose, cough or breathing difficulty, chest indrawing and wheeze on auscultation⁸.

Pneumonia: It was characterized by child presented with cough, breathing difficulty, raised respiratory rate, fever and recently developed radiological shadowing⁹.

Recovery: Remission of symptoms & signs were present on admission.

Statistical analysis:

Data were checked for consistency and edited if needed. Data were processed using SPSS (Statistical Package for Social Sciences), version 16.0. The test statistics used to analyse the data were Chi-square or Fisher's Exact Probability Test and Unpaired t-Test. The level of significance was set at 0.05 and $p < 0.05$ was considered as significant.

Results

The present study was intended to see the difference in recovery pattern from different clinical features between children with pneumonia and bronchiolitis following treatment. The findings of the study obtained are documented below:

Table I
Comparison of demographic and anthropometric characteristics between two groups

Characteristics	Groups		P-value
	Pneumonia (n = 54)	Bronchiolitis (n = 54)	
Age (months) *			0.522
<2	12(22.2)	8(14.8)	
2 – 12	28(51.9)	28(51.9)	
>12	14(25.9)	18(33.3)	
Mean \pm SD [#]	7.2 \pm 5.9	6.2 \pm 5.7	
Sex			
Male	38(70.4)	34(63.0)	0.414
Female	16(29.6)	20(37.0)	
Weight	6.0 \pm 1.8	6.8 \pm 2.6	0.082

Figures in the parentheses indicate corresponding %
* Chi-squared Test (χ^2) was done to analyze the data.
Unpaired t-Test was done to analyze the data and were presented as mean \pm SD.

**Fisher's Exact Test was done to analyze the data.

There was no significant difference between children of pneumonia and bronchiolitis in terms of age, sex, body weight.

Table II
Comparison of baseline similar clinical parameters between two groups

Clinical Parameters	Groups		P-value
	Pneumonia (n = 54)	Bronchiolitis (n = 54)	
Cough*	54(100)	54(100)	-
Breathing difficulty**	54(100)	54(100)	-
Feeding difficulty*	50(92.9)	52(96.3)	0.333
Chest indrawing**	50(92.9)	52(96.3)	0.339

Figures in the parentheses indicate corresponding %.
* Chi-squared Test (χ^2) was done to analyze the data.
**Fisher's Exact Test was done to analyze the data.

The similar clinical features of pneumonia and bronchiolitis are illustrated in table II, e.g. cough, breathing difficulty, feeding difficulty

Table III
Comparison of dissimilar baseline clinical parameters between two groups

Clinical parameters	Group		p-value
	Pneumonia (n = 54)	Bronchiolitis (n = 54)	
Fever*	54(100.0)	42(77.8)	<0.001
Runny nose*	22(40.7)	54(100)	<0.001
Sleeping difficulty*	50(92.6)	42(77.8)	<0.03
Restlessness	42(77.8)	34(63.0)	0.046
Nasal blockade	24(44.4)	12(12.2)	0.014
Cyanosis*	16(29.9)	8(14.8)	0.046%
Nasal flaring*	42(77.8)	32(59.3)	0.038
Nasal blockade	24(44.4)	12(22.2)	0.014
No social smile*	52(96.3)	46(85.1)	0.046
Inconsolable cry*	16(29.6)	4(7.4)	0.003
Documented Fever*	54(100.0)	42(77.8)	<0.001
Fast breathing**	54(100.0)	54(100.0)	-
Respiratory rate (/min)#	76± 16	66± 11	<0.001
Temperature (°F)#	101.4 ± 0.9	100.1 ± 0.8	0.301
wheeze*	16(29.6)	54(100)	<0.001
Crackles *	54(100)	10(18.5)	<0.001

Figures in the parentheses indicate corresponding %

* Chi-squared Test (χ^2) was done to analyze the data.

**Fisher's Exact Test was done to analyze the data.

Unpaired t-Test was done to analyze the data and present as mean ± SD.

The dissimilar clinical features of pneumonia and bronchiolitis are illustrated in table III. Fever was significantly more common in cases of pneumonia than cases of bronchiolitis ($p < 0.001$), while runny nose was significantly common in the latter group ($p < 0.001$). Cyanosis and nasal flaring were significantly higher in the pneumonia group compared to those in bronchiolitis group ($p = 0.046$ and $p = 0.038$ respectively). Respiratory rate was significantly higher in the former group than those in the latter group ($p < 0.001$ and $p < 0.001$ respectively). While wheeze was invariably present in children with bronchiolitis, crepitation was frequently common among children with pneumonia ($p < 0.001$ and $p < 0.001$ respectively).

After admission all of the cases of pneumonia and 96.3% of the cases of bronchiolitis received O₂ inhalation ($p = 0.339$). All of the children of pneumonia received antibiotics opposed only 7.4% of the bronchiolitis children ($p < 0.001$). No difference was found between the children of the two groups in terms of supportive treatment they received ($p = 0.339$).

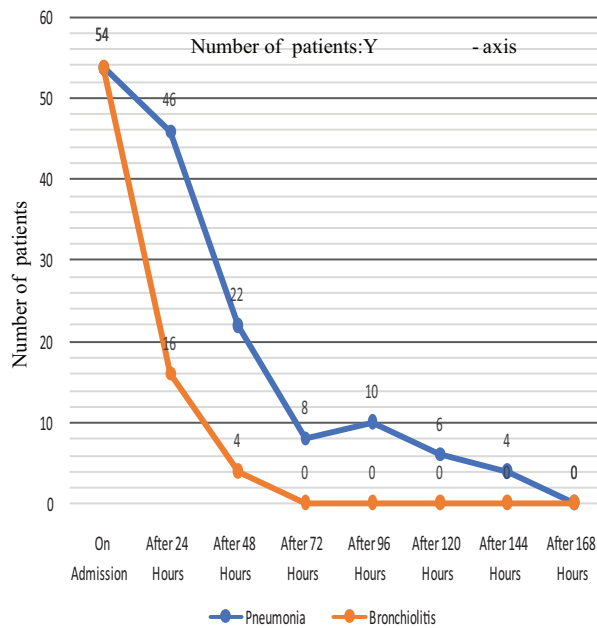
Initially all pneumonia cases treated with injectable ampicillin and gentamicin but 46.2% cases responded to this regimen but 20.3% of cases were treated with flucloxacillin along with ampicillin and gentamicin and 33.33% cases were treated with ceftriaxone instead of ampicillin and gentamicin due to clinical or radiological deterioration.

Table IV
Dynamics of improvement of different clinical features studied between two groups

Different clinical features	Percentage of children having clinical feature on admission		Proportion of children (<10%) not improved on specified days in bronchiolitis in comparison with pneumonia			P value
	Pneumonia (%)	Bronchiolitis (%)	Hospital day	Pneumonia (%)	Bronchiolitis (%)	
Cough	100	100				
Runny nose	40.7	100	Day 4	14.8	7.4	<0.001
Breathing difficulty	100	100	Day 3	40.7	7.4	<0.001
Feeding difficulty	92.6	96.3	Day 3	40.7	3.7	<0.001
Restlessness	77.8	63.0	Day 3	16.7	4.3	0.046
Sleeping difficulty	92.6	77.8	Day 2	76.9	7.4	<0.001
Nasal blockade	44.2	22.2	Day 3	14.8	7.4	0.01
Chest indrawing	92.6	96.3	Day 3	63	7.4	<0.001
Nasal flaring	77.8	59.3	Day3	18.5	0	0.001
No social smile	100	96.3	Day 4	32	0	<0.001
Inconsolable cry	29.6	7.4	Day2	23.1	3.7	0.003
Documented fever	100	77.8	Day3	54.2	0.0	<0.001
Fast breathing	100	100	Day4	40.7	3.7	<0.001
Wheeze	29.6	100	Day3	3.7	7.4	0.318
Crackles	100	18.5	Day3	77.0	0.0	<0.001

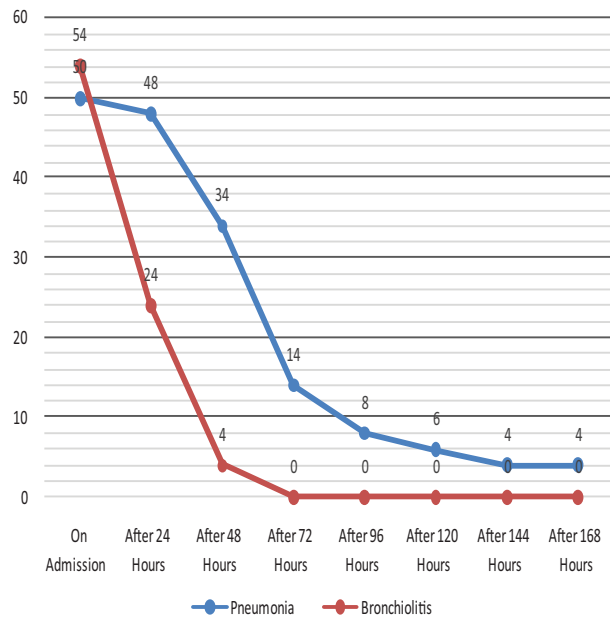
Table VIII demonstrated significant number of cases of pneumonia did not improve from breathing difficulty(40.7%), feeding difficulty(40.7%), restlessness(16.7%), sleeping difficulty(76.9%), chest indrawing (63%) and documented fever

within 3 days, but more than 90% cases of bronchiolitis recovered from above mentioned clinical features. (P<0.001). Social smile returned to only 68% in case of pneumonia but 100% cases of bronchiolitis(p<0.001) with in 4 days.



A

Number of patients:Y-axis



B

Number of patients

Figure 4 - Recovery trends of Breathing Difficulty (A) Chest Indrawing (B) Fast Breathing

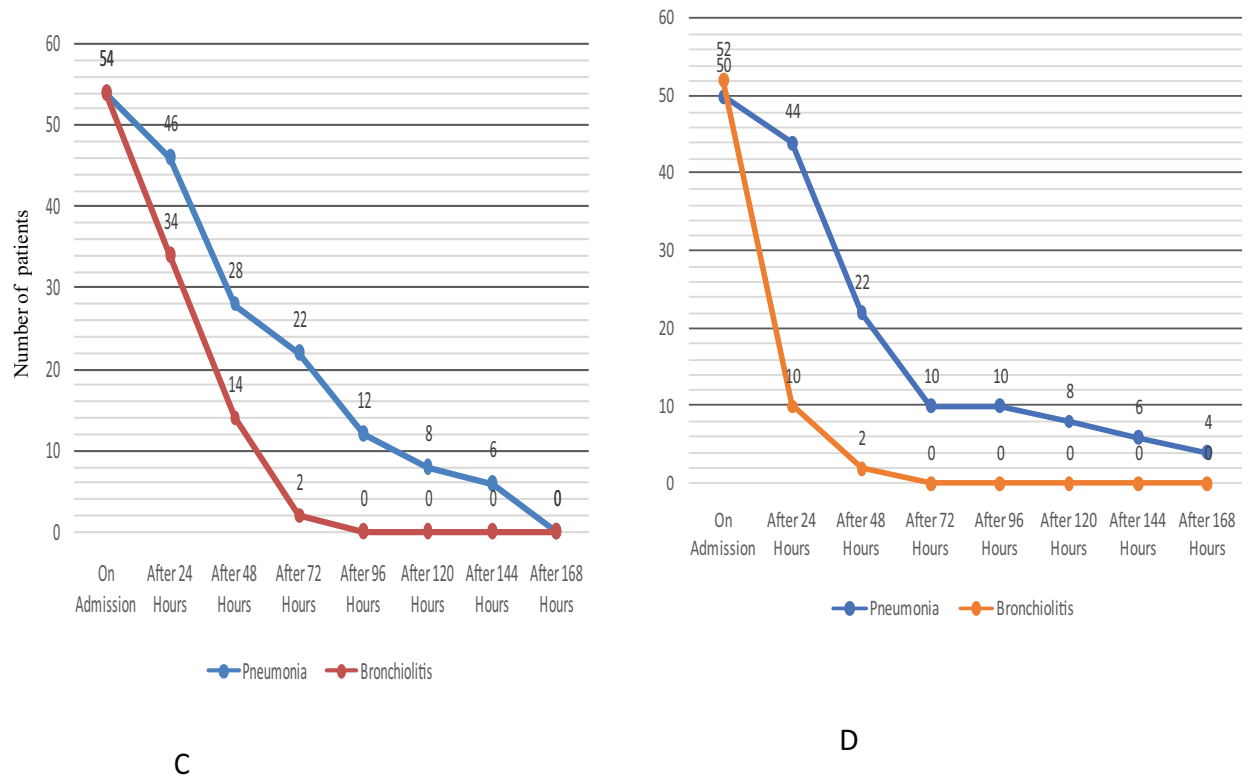
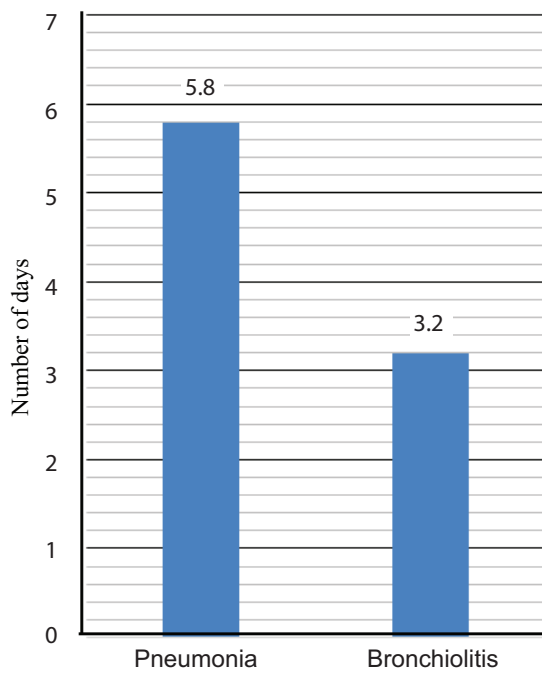


Figure 4 - Recovery trends of Breathing Difficulty (C) Feeding Difficulty(D) in Pneumonia and Bronchiolitis (ALRTIs)



*Chi-squared Test (χ^2) was done to analyze the data

Fig.: Comparison of mean Length of hospitalization between pneumonia & Bronchiolitis

Discussion

In this study the two very common and confusing acute lower respiratory tract infections (ALRTIs) of pneumonia and bronchiolitis were studied for recovery in terms of clinical features and length of hospital stay (LOS) in hospitalized children in a tertiary care setting. In our country bronchiolitis is under diagnosed (15.4%)¹⁰. Diagnosis of bronchiolitis is ensured by child under two year of age, both male and female, who were hospitalized due to preceding or existing runny nose, cough, breathing difficulty, chest indrawing and rhonchi on auscultation⁸. Pneumonia is ensured by child presented with cough, breathing difficulty, raised respiratory rate, fever and recently developed radiological shadowing⁹.

This is the first ever conducted study with two LRTIs. viz pneumonia and bronchiolitis. To determine the recovery pattern in terms of dynamics of clinical improvement and length of stay (LOS). The study is conducted for a period of 1yr in department of pediatrics at Dhaka Medical College Hospital and they were followed up 12 hrly

for 8 days with 17 clinical features and follow up conduction was done by the principle investigator herself in most of the time. Bronchiolitis is managed with supportive treatment mostly like oxygen inhalation, nutrition according to national guideline¹¹. Pneumonia cases are treated with these supportive treatment along with antibiotics according to WHO protocol¹².

There were 54 cases of pneumonia and similar number of bronchiolitis cases. However limitation was that it was a single centre with relatively small sample size.

The mode of presentation of pneumonia and bronchiolitis clinically apparently similar because of similar clinical features like cough (100% vs 100%), breathing difficulty

(100%vs 96.3%) feeding difficulty (92.6% vs 96.3%), chest indrawing (92.6%vs 96.3%) fast breathing (100% vs 100%)these findings are almost similar to a study in Bangladesh as cough (97.7%vs97.2%), respiratory distress(93.2%vs97.2%), H/O fever (100%vs94.4%) and poor feeding (88.6.%vs86%), subcostal recession (88.6vs 96.3%) palpable liver(86.4%vs85.0%) (Kabir et al. 2003).The dissimilar clinical features of this study were fever (100%vs77.8%, $p<0.001$), runny nose (40.7%vs 100%, $p<0.001$) sleeping difficulty (92.6% vs 77.8% $p<0.03$) wheeze (29.6% vs 100%, $p<0.001$) crackles(100% vs 18.5%, $p<0.001$). These findings are almost similar to earlier mentioned study where two conditons differed distinctly runny nose (22.7% vs 62.6%) recorded temperature (101.2°Fvs99°F, $p<0.001$), wheeze (22.7% vs 97.2% $p<0.001$), crackles (97.7%vs77.6%, $p<0.001$). Case fatality was higher in pneumonia (18.6%) than from bronchiolitis(4.0%) $p<0.001$ (Kabir et al. 2003).

In this study it was also observed that dynamics of improvement of clinical features between two groups. Improvement of clinical features of children of bronchiolitis was faster than clinical features of children of pneumonia. Significant number of cases of pneumonia did not improve from breathing difficulty(40.7%), feeding difficulty(40.7%), restlessness(16.7%), sleeping difficulty(76.9%), chest indrawing (63%) and documented fever within 3 days, but more than 90% cases of bronchiolitis recovered from above mentioned clinical features. ($P<0.001$). Social smile returned to only 68% in case of pneumonia but 100% cases of bronchiolitis($p<0.001$) with in 4 days.

In this study almost 89% cases of pneumonia and 100% cases of bronchiolitis were recovered. Length of hospital stay(LOS) is 5.8 ± 2.1 days in pneumonia and LOS is 3.2 ± 0.7 days in bronchiolitis that is similar(3.7 ± 1.5 days) in early mentioned study (Kabir et al. 2009). A study in abroad showed that average length of stay for pneumonia patients was 4.47 days (Average 2015). Mortality is higher (3.7%)in case of pneumonia than cases of bronchiolitis(0.0%) which is also similar to earlier mentioned study.(Kabir et al. 2003).

Conclusion

It is concluded that almost 89% children with pneumonia & 100% children with bronchiolitis recovered after providing with treatment in department of pediatrics in DMCH.Recovery of children with bronchiolitis was faster in terms of their clinical features than children with pneumonia.The average length of hospital stay was longer in pneumonia(5.8days) than in bronchiolitis (3.2days).Mortality is higher in cases of pneumonia (3.7%) than cases of bronchiolitis (0.0%).

Recommendation:

Further large-scale multicentre study is recommended to validate the findings of the present study. This study result will be helpful for counseling the parants as regards length of hospital stay in case of pneumonia and bronchiolitis.

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