College Hospital and Dhaka Shishu Hospital during July 2010 to June 2011.

Study population: The study was carried out among the 02-24 months old infants who were admitted in the selected hospitals with acute bronchiolitis and pneumonia.

Case definitions:

(A) Bronchiolitis: child below 2 years of age with fast breathing, wheeze, coryza and radiological evidence of bronchiolitis e.g hyperinflation of chest. (National ABC guideline, 2005, Asthma association, Bangladesh)

(B) Pneumonia: child below 2 years of age with cough, fast breathing, lower chest wall indrawing, fever, coarse crackles on auscultation and radiological evidence of pneumonia like consolidation or perihilar infiltrate (Pocket Book Of Hospital Care For Children: guideline for the management of common illness with limited resources: WHO 2005:71) .

In both of the pneumonia and bronchiolitis groups' features of hypoxia like nasal flaring, grunting, head nodding were noted.

Selection of cases:

Inclusion criteria: Any child from two months to two years of age with meeting the case definition of pneumonia or bronchiolitis irrespective of sex and nutritional status were enrolled in the study.

Exclusion criteria: Patients having congenital heart diseases or other congenital anomalies, suffering from chronic illness like TB, thalassemia, malabsorption syndrome were excluded from the study.

Sample size and sampling: The samples are selected purposively based on the inclusion and exclusion criteria form Dhaka Medical College Hospital and Dhaka Shishu Hospital during July 2010 to June 2011. A total of 100 cases were selected initially in the pneumonia group. 45 of them were excluded because of having no radiological evidence of pneumonia and five were excluded because of having associated congenital heart diseases. 85 cases were selected in bronchiolitis group but 35 of them were excluded because of having no radiological evidence. Finally 50 patients were enrolled in each group.

Data collection: After enrolment, thorough clinical assessment was done using a pretested semi structured questionnaire. As a part of anthropometric measures weight, length, Occipito Frontal Circumference (OFC) and Mid Upper Arm Circumference (MUAC) were noted. Naked weight was measured using an electronic scale that stands a maximum weight 15 Kg with 100gm precision. The measurement of length was done in infantometer from the top of the head to the heels with the child lying on a wood slab with a fixed piece on one side and a movable one on the other side (top of the head on the fixed part). MUAC and OFC were measured by a measuring tape with a precision of 1 mm. MUAC was measured among children of more than 6 months of age. We measured weight in Kilogram, Length and OFC in Centimeter and MUAC in Millimeter.

Classification of nutritional status: To assess the nutritional status z scores of weight for age, weight for length, length for age, MUAC and OFC were calculated. Normal range was defined as +2 to -1 z scores, mild poor status as -1 to -2 z scores, moderate poor status as -2 to -3 z scores and severe poor status as <-3 z score[8,9].

Statistical analysis: Calculated Z values were determined for each group for comparison between pneumonia and bronchiolitis cases. Z values > 1.96 were considered as significant (Z values > 1.96 equivalent to $p < 0.05$).

Ethical consideration: The ethics and research committee of Dhaka Medical College Hospital approved the study and was carried out.

Results:

In this study, among the data of 100 cases (50 in pneumonia and 50 in bronchiolitis group) male outnumbered female (58% in pneumonia and 68% in bronchiolitis groups). Children of 2-6 months age group were predominant (Table I). Fever, cough, respiratory distress and chest indrawing were present in 100% patients of pneumonia group. On the other hand, respiratory distress and wheeze were present in 100% patients of bronchiolitis group. Features of hypoxia like flaring of ala nasae, head nodding, grunting and cyanosis were more frequent among the children of pneumonia group than their bronchiolitis counterparts (Table II). Among the pneumonia cases, perihilar infiltrate on the chest x ray was the predominant finding (42%) followed by lobar consolidation (36%) and bilateral patchy opacity (22%). On the other hand hyperinflation (46%) was predominant among the bronchiolitis cases followed by both hyperlucency and hyperinflation (22%) (Table III). Children with microcephaly (OFC<-3SD), severe underweight (weight for age <-3 SD), and MUAC <115 were significantly more in pneumonia cases than their bronchiolitis counterparts (Table IV). Number of mild to severely wasted and stunted children were also more in pneumonia group than their bronchiolitis counterparts, though the differences were not statistically significant (Table IV).

Table-I

Age and sex distribution of pneumonia and bronchiolitis patients

Characteristics		Pneumonia n=50	Bronchiolitis n=50
Age (in months)			
	2-6	25 (50%)	31(62%)
	6-12	14 (28%)	14 (28%)
	12-24	11 (22%)	5 (10%)
Sex			
	Male	29 (58%)	34 (68%)
	Female	21 (42%)	16 (32%)

Table-II

Clinical features of pneumonia and bronchiolitis patients.

Clinical features	Pneumonian=50 (%)	Bronchiolitisn=50 (%)
Fever	50 (100)	32 (64)
Cough	50 (100)	42 (84)
Respiratory distress	50 (100)	50 (100)
Chest indrawing	50 (100)	35 (70)
Wheeze	10(20)	50 (100)
Flaring of ala nasae	20 (40)	12 (24)
Head nodding	13 (26)	03 (06)
Grunting	08 (16)	05 (10)
Cyanosis	06 (12)	02 (04)

Table-III

Radiological features of pneumonia and bronchiolitis patients

Group of patients	Radiological features	No. of patients (%)
Pneumonia	Perihilar infiltrate	21 (42%)
	Bilateral patchy opacity	11 (22%)
	Lobar consolidation	18 (36%)
Bronchiolitis	Hyperinflation	23 (46%)
	Hyperlucency	9 (18%)
	Both hyperlucency and hyperinflation	11(22%)
	Hyperinflation and streaky density	6 (12%)

Table-IV

Comparison of anthropometric measures of Pneumonia and Bronchiolitis patients

Anthropometry	Standard Deviation	Pneumonia n (%)	Bronchiolitis n (%)	Calculated Z value	p
Occipito Frontal Circumference	+2 to -1	06(12%)	06 (12%)	0	1.00
	-1 to -2	15 (30%)	23 (46%)	1.67	0.09
	-2 to -3	14 (28%)	15 (30%)	0.22	0.08
	<-3	15 (30%0)	06 (12%)	2.26	0.03
Weight/Age(under nutrition)	+2 to -1	06(12%)	09 (18%)	0.843	0.4
	-1 to -2	09(18%)	12 (24%)	0.73	0.4
	-2 to -3	10(20%)	14(28%)	0.94	0.3
	<-3	25(50%)	15 (30%)	2.08	0.04
Weight/Length (wasting)	+2 to -1	08 (16%	16 (32%)	1.9	0.06
	-1 to -2	12 (24%)	16(32%)	0.89	0.4
	-2 to -3	15 (30%)	10 (20%)	1.25	0.2
	<-3	15 (30%)	08 (16%)	1.68	0.09
Mid upper arm circumference	≥ 115	15 (60%)	17 (89.8%)	4.14	0.03
	<115	10 (40%)	02 (10.2%)	4.14	0.03
Length/Age(stunting)	+2 to -1	08(16%)	12 (24%)	1.005	0,3
	-1 to -2	20 (40%)	24 (48%)	0.8	0.4
	-2 to -3	12 (24%)	06 (12%)	1.5	0.1
	<-3	10 (20%)	08 (16%)	0.52	0.6

Discussion:

The most important observation of this study is the frequent association of microcephaly (OFC<-3SD), severe underweight (weight for age <-3 SD), and MUAC <115 with children having pneumonia compared to the children with bronchiolitis. Although, children with pneumonia proportionately more likely to be wasted and stunted compared to those with bronchiolitis, the difference was not significant and this might be due to small sample.

Common age group of pneumonia and bronchiolitis cases were 2-6 month of age. Several studies showed same findings that the younger age group is more vulnerable to lower respiratory tract infection[10,11]. There is a male predominance in both pneumonia (58%) and bronchiolitis (68%) groups. ARI as a whole affects males more frequently than females throughout the world[12,13]. This may be due to genetic factors or cultural practice of seeking medical care frequently for males than females, considering males more precious[14,15].

It is known that poor nutrition is one of the causes of microcephaly[16]. In this study under nutrition and wasting is more prevalent in pneumonia group and consistently microcephaly is also significantly more in pneumonia group in comparison to bronchiolitis group ($p<0.05$).

In a study conducted in Bangladesh to investigate the host risk factors in the outcome of severe pneumonia, the findings were consistent. Similar type of another study conducted on ARI in Bangladesh also had consistent observation[17]. On the other hand, one study on nutritional status of bronchiolitis patient showed that only 7.5% had severe under nutrition, 72% had good nutritional status[18]. And these are almost consistent with the observation of our study population with bronchiolitis.

A number of previous studies were conducted to evaluate the nutritional status of children with pneumonia and bronchiolitis. Most of those studies assessed only one or two components of nutritional

anthropometry. But our study is unique in the context of assessing most of the components of nutritional anthropometry (such as weight for age, weight for length, length for age, OFC and MUAC) of children having pneumonia and bronchiolitis patients of same demographic characteristics. Thus, on the basis of all the evaluated parameters our main observation was that the children with pneumonia more often had poor nutritional status compared to the children having bronchiolitis. The observation is understandable but very important. Children with poor nutritional status are immune-compromised due to depressed cell mediated and humoral immune responses and often more susceptible to severe bacterial infection[19]. Bacterial infection in children more likely to be associated with pneumonia compared to bronchiolitis[20]. Moreover, children with poor nutritional status more likely to be associated with bacterial pneumonia[21,22]. This explains our observation of association of pneumonia with poor nutritional status compared to bronchiolitis.

There were limitations in the study. The study was performed over small sample of children and selected the samples purposively. The selection bias could not be ruled out. But the study included all the children meeting the case definition and inclusion and exclusion criteria. As it was a cross sectional study, the findings did not determine the temporal relationship between the nutritional status and pneumonia and bronchiolitis.

Conclusion:

In conclusion, the results of our data suggest that children with low MUAC, severe under nutrition and microcephaly were more prone to have pneumonia compared to bronchiolitis. Overall nutritional status was poor in pneumonia cases in comparison to bronchiolitis cases.

Recommendation:

Multicenter case control study with large sample size may be conducted to determine more precise relationship between the nutritional status and pneumonia and bronchiolitis.

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