

## Original Articles

### Serum Sodium Level in Children Suffering from Acute Bronchiolitis Admitted in a Tertiary Care Hospital

SHAMIMA SHARMIN SHOVA<sup>1</sup>, A.F.M. SALIM<sup>2</sup>, MAHBUB MUTANABBI<sup>3</sup>

#### Abstract

**Background:** Acute bronchiolitis is a clinical syndrome produced by inflammation of the terminal bronchioles. It usually occurs in association with viral respiratory tract infection. Children with bronchiolitis are at risk of developing hyponatraemia. The objective of this study is to find out any change of serum Na<sup>+</sup> values in bronchiolitis.

**Methodology:** A cross sectional observational study was done during January to June 2015 among the children between age of 2 months to 2 years admitted in the pediatric ward of Institute of Child Health & Shishu Sasthya Foundation Hospital, Dhaka, who were diagnosed as acute bronchiolitis. Data were collected by interviewing, physical examination and laboratory investigations and recorded through a proforma. Data were processed and analyzed using computer software SPSS.

**Results:** A total of 50 cases suffering from bronchiolitis were studied. Among them only 5 (10.0%) cases had hyponatraemia considered as group I and rest 45 (90.0%) patients had normonatraemia considered as group II. The mean age was found to be 10.8±5.3 months and 8.91±5.8 months in group I and group II respectively. Male was found 4 (80.0%) in group I and 27(60.0%) in group II. Mean respiratory rate was found to be 50.0±1.4 per min in group I and 54.18±3.9 per min in group II, which was significantly higher in normonatraemia group. Seizure, requirement for mechanical ventilation and mortality were not found in any child suffering from acute bronchiolitis.

**Conclusion:** These results indicate that normonatraemia was predominant and hyponatraemia was found only 10% cases and all were in mild degree. The clinical outcome of all the hyponatraemia cases was good and they were not associated with any complications.

**Keywords:** Bronchiolitis, Serum Sodium, hyponatraemia

#### Introduction:

Bronchiolitis is the leading cause of lower respiratory tract infection (LRTI) in infants<sup>1,2</sup>. The incidence of bronchiolitis has been shown to be as high as 11 per cases per 100 children per year<sup>3,4</sup>. Respiratory syncytial virus (RSV) is the most common cause of bronchiolitis in infants and young children<sup>5</sup>.

It is now known that the syndrome of inappropriate anti diuretic hormone secretion (SIADH) occurs frequently in several pulmonary conditions including bronchiolitis which may lead to hyponatraemia.<sup>6-15</sup> Normally ADH is secreted by the pituitary gland in response to high plasma osmolality. However, in various clinical condition including fever, hypoxia, hypercarbia, pain nonosmotic stimulation of ADH secretion can lead to hyponatraemia. In bronchiolitis the stimulus of ADH release is likely to be nonosmotic in nature; in particular, lung hyperinflation and pulmonary infiltrates may stimulate ADH secretion by causing a false perception of hypovolemia by intrathoracic receptors.<sup>8</sup> Therefore, if IV fluid is administered, judicious and careful calculation of the

1. Registrar, Department of Paediatrics, Apollo Hospitals, Dhaka

2. Professor, Department of Paediatrics, Dr. MR Khan Shishu Hospital and ICH, Mirpur, Dhaka

3. Associate Professor, Department of Paediatrics, BSMMU, Dhaka

**Correspondence:** Dr. Shamima Sharmin Shova, 463/1,5-A; Eureka Shantineer, South Kafrul, Dhaka Cantonment, Dhaka, Telephone no: +8801873412999, E-mail: shoovaa@gmail.com

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fluid intake is advised to reverse hypervolemia in bronchiolitis.<sup>9</sup>

Serum Na<sup>+</sup> changes in bronchiolitis is not extensively studied in our country and this study was undertaken to determine hyponatraemia as a complication of bronchiolitis.

### Materials and Methods

This was a cross-sectional observational study carried out in Institute of Child health & Shishu Sasthya foundation Hospital, Dhaka from January 2015 to June 2015 on children with acute bronchiolitis. Inclusion criteria were children age 2 months to 2 years, both sexes, attack of wheeze and/or runny nose followed by respiratory distress with or without fever and wheeze on auscultation. Exclusion criteria were children age <2 months & >2 yrs of both sexes, congenital heart disease, pneumonia, pulmonary tuberculosis, acute gastroenteritis. Data was collected by interview, physical examinations and laboratory investigations. These were recorded by using a structured questionnaire. Just after admission, before giving treatment blood samples were collected and sent to laboratory to measure serum Na<sup>+</sup> level. According to serum Na<sup>+</sup> level the study cases were grouped as group I (Hyponatremia: <135 mmol/L) and group II (Normonatremia: 135-145 mmol/L). Complete blood count and chest x-ray were also done as routine investigation. During hospital stay of the study cases, daily follow up had been done to see the outcome like seizure, mortality, requirement for mechanical ventilation and duration of hospital stay. Statistical analyses was carried out by using the Statistical Package for Social Sciences version 16.0 for Windows (SPSS Inc., Chicago, Illinois, USA). A P-value <0.05 was considered statistically significant. Consent was obtained after explanation about the study in Bengali from all respondents.

### Results

This cross-sectional observational study was carried out during January 2015 to June 2015 on 54 patients. Among these 54 patients, 4 patients were excluded from the study group. Among those excluded, 3 cases were associated with acute gastroenteritis and 1 cases had pneumonia. Finally 50 patients were included in the study. Among them only 5 (10.0%) cases had hyponatraemia (serum Na<sup>+</sup> level <135 meq/l) considered as group I and rest 45 (90.0%) patients had normonatremia considered as group II (Table-II). All the cases of hyponatraemia were of mild degree. The mean age was found to be 10.8±5.3

months and 8.91±5.8 months in group I and group II respectively (Table-III). Male was found 4(80.0%) in group I and 27(60.0%) in group II (Table-IV). Running nose, respiratory distress, poor feeding, cough and fever were the common presenting complaints in both groups. All (100.0%) patients had wheeze in both groups (Table-V). Mean respiratory rate was found to be 50.0±1.4 per min in group I and 54.18±3.9 per min in group II, which was significantly higher in normonatremia group and other physical examinations were almost similar between two groups (Table-VI). Seizure, requirement for mechanical ventilation and mortality were not found in any child suffering from acute bronchiolitis. The mean duration of hospital stay was 5.6±0.3 days (range 5 – 7 days) in group I and 5.9±0.6 days (range 5 – 7 days) in group II. The difference was not statistically significant (p>0.05) between two groups.

**Table-I**  
*Age distribution*

Age(Month)	No. of Patients (n)	Percentage(%)
<6	20	40
6-12	15	30
12-18	13	26
>18	2	4

**Table-II**  
*Distribution of the study patients by serum Na<sup>+</sup> level (n=50)*

Serum Na <sup>+</sup> (mmol/l)	No. of Patients	Percentage
Group I(<135)	5	10%
Group II(135-145); normal	45	90%

**Table-III**  
*Distribution of the study patients by age (n=50)*

Age (Month)	Group I(n=5)		Group II(n=45)		P-value
	N	%	N	%	
<6	0	0.0	20	44.4	
6-12	3	60.0	12	26.7	
12-18	2	40.0	11	24.4	
>18	0	0.0	2	4.4	
Mean±SD	10.8 ±5.3		8.91 ±5.8		0.489 <sup>ns</sup>
Range (min-max)	(7-18.0)		(2-24.0)		

ns=not significant

P value reached from chi square test

**Table-IV***Distribution of the study patients by sex (n=50)*

Sex	Group I(n=5)		Group II(n=45)		P-value
	n	%	N	%	
Male	4	80.0	27	60.0	0.362 <sup>ns</sup>
Female	1	20.0	18	40.0	

ns=not significant

P value reached from chi square test

**Table-V***Distribution of the study patients by presenting complaints (n=50)*

Presenting complaints	Group I(n=5)		Group II(n=45)		P-value
	n	%	N	%	
Running nose	5	100.0	45	100.0	-
Respiratory distress	4	80.0	41	91.3	0.423 <sup>ns</sup>
Poor feeding	3	60.0	31	68.9	0.518 <sup>ns</sup>
Fever	2	40.0	26	57.8	0.384 <sup>ns</sup>
Cough	2	40.0	25	55.6	0.422 <sup>ns</sup>

ns=not significant

P value reached from chi square test

**Table-VI***Distribution of the study patients by physical examinations (n=50)*

Physical examinations	Group I(n=5)		Group II(n=45)		P-value
	N	%	N	%	
Wheeze					
Yes	5	100.0	45	100.0	-
No	0	0.0	0	0.0	
RR per min					
Mean±SD	50.0	±1.4	54.18	±3.9	<sup>a</sup> 0.024 <sup>s</sup>
Range (min-max)	(48	-52.0)	(48	-62.0)	
Chest indrawing					
Yes	4	80.0	42	93.3	<sup>b</sup> 0.353 <sup>ns</sup>
No	1	20.0	3	6.7	
Crepitations					
Yes	2	40.0	30	66.7	<sup>b</sup> 0.241 <sup>ns</sup>
No	3	60.0	15	33.3	

s=significant; ns=not significant

<sup>a</sup>P value reached from unpaired t-test<sup>b</sup>P value reached from chi square test**Discussion**

This cross-sectional observational study was carried out with an aim to see the clinical profile of bronchiolitis patients having hyponatraemia and to determine the proportion of hyponatraemia in children with bronchiolitis.

A total of 50 cases suffering from bronchiolitis were studied. Among them only 5(10.0%) cases had hyponatraemia (serum Na<sup>+</sup> level <135 meq/l) considered as group I and rest 45(90.0%) patients had normonatraemia as group II. All the cases of hyponatraemia were of mild degree. The mean age was found to be 10.8±5.3 months and 8.91±5.8 months in group I and group II respectively. Running nose, respiratory distress, poor feeding, cough and fever were the common presenting complaints in both groups. All (100.0%) patients were found to have wheeze in both groups. Mean respiratory rate was found to be 50.0±1.4 per min in group I and 54.18±3.9 per min in group II, which was significantly higher in normonatraemia group and other physical examinations were almost similar between two groups. Mean serum Na<sup>+</sup> was found to be 134±0.0 mmol/L in group I and 139.58±3.0 mmol/L in group II. Seizure, requirement for mechanical ventilation and mortality were not found in any child suffering from acute bronchiolitis. The mean duration of hospital stay was 5.6±0.3 days (range 5 – 7 days) in group I and 5.9±0.6 days (range 5 – 7 days) in group II. The difference was not statistically significant (p>0.5) between two groups.

Hyponatraemia in children affected by bronchiolitis is associated with seizures and potential severe complications.<sup>19</sup> In another study, hyponatraemia has been associated with lengthy hospital stays and death.<sup>16</sup> Preventing hyponatraemia may potentially contribute for shorter stays and early hospital discharge. Luu et al.<sup>17</sup> found normonatremia in 75.65% and hyponatremia in 24.35%, out of which mild hyponatremia was in 19.82%, moderate hyponatremia in 3.13% and severe hyponatremia was in 1.4%. These data do not correspond with the findings of the present study, may be due to higher number of sample size, where they under taken 105 children with RSV bronchiolitis and study duration more than two years and also retrospective analysis of their observation. Moreover in our study all hyponatraemia in children was of mild variety.

Most (60.0%) of the present study patient's age belonged to 6-12 months in group I (hyponatraemia

group) and 44.4% age belonged to <6 months in group II (normonatremia group). The mean age was found  $10.8 \pm 5.3$  months varied from 7 – 18 months and  $8.91 \pm 5.8$  months varied from 2 – 24 months in group I and group II respectively, which were almost alike between two groups. Similarly, Luu et al.<sup>17</sup> showed the mean age was  $11.2 \pm 7$  months in hyponatremia group and  $10.6 \pm 6.6$  months in normonatremia group. The difference was not statistically significant ( $p > 0.05$ ) between two groups.

In USA, a study done by Seifert et al.<sup>18</sup> found 62.8% male in hyponatremic group and 50.0% in normonatremic group. Female was found 37.2% and 50.0% in hyponatremic and normonatremic group respectively. In our study it was observed that male was found 4(80.0%) in group I and 27(60.0%) in group II. There was one (20.0%) female in group I and 18(40.0%) in group II, which indicates that male predominant in acute bronchiolitis. However, the difference was not statistically significant ( $p > 0.05$ ) between two groups.

Four (80.0%) patients had respiratory distress in group I and 41(91.3%) in group II. Three (60.0%) patients had poor feeding in group I and 31(68.9%) in group II. Two (40.0%) patients had fever in group I and 26(57.8%) in group II. Two (40.0%) patients had cough in group I and 25(55.6%) in group II. Presenting complaints difference was not statistically significant ( $p > 0.05$ ) between two groups.

The mean body temperature at admission ( $^{\circ}\text{C}$ ) was found  $38.8 \pm 1.0$  in hyponatremia group and  $38.0 \pm 0.9$  in normonatremia group. The difference was statistically significant ( $p < 0.05$ ) between two groups.

Seizure, mortality and requirement for mechanical ventilation were not found in any children suffering from acute bronchiolitis. In Luu et al.<sup>17</sup> study observed seizures were 4.0% in hyponatremia group and 6.0% in normonatremia group. Mortality was found in 13.0% hyponatremia group and not found in normonatremia group.

### Conclusion

This cross sectional observational study was carried out with an aim to find out the association between serum  $\text{Na}^+$  level changes in children suffering from acute bronchiolitis and clinical features. Normonatremia was predominant in this study. Hyponatremia was found only 10.0% and all were mild hyponatremia in children with acute bronchiolitis.

Age of majority of the hyponatremia group belonged to 6 – 12 months and there was male predominance.

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