

ORIGINAL ARTICLE

Frequency of Hyponatremia in Children with Bronchiolitis

AMIR RASHID¹, MUHAMMAD WAQAS ANWAR², SAMMER SAEED³, KHAVER ALI⁴¹Associate Professor of Pediatrics PGMI/AMC/LGH^{2,4}PGR, Pediatrics LGH, Lahore³PGR, Radiology LGH, LahoreCorrespondence to Dr. Amir Rashid, Email: amirr.brain.007@gmail.com

ABSTRACT

Background: Bronchiolitis is predominant among infants and mostly caused by respiratory syncytial virus (RSV). Respiratory illnesses are related to elevated anti-diuretic hormone which in turn leads to hyponatremia (<135 mmol/L)**Aim:** To find hyponatremia frequency in bronchiolitis children.**Methods:** From December 8, 2017 to June 8, 2018, researchers from the pediatrics department of Lahore General Hospital/Post Graduate Medical Institution conducted a cross-sectional study. All 246 cases meeting inclusion criteria were taken from department of Pediatrics, Lahore General Hospital, Lahore. After taking informed consent all the basic information like age, sex and contact detail was taken. Blood sample sent to hospital laboratory to evaluate serum sodium levels to find hyponatremia as per operational definition. Data input and analysis were carried out using SPSS version 20.**Results:** With ages ranging from 2 to 24 months, the mean age was 13.29 ± 6.35 months. There were 124(50.4%) male and 122(49.6%) female cases and male to female ratio was the same. The mean Na level in all cases was 130.86 ± 6.61 mEq/L with minimum and maximum value as 115 and 145 mEq/L respectively. A total of 192(78%) cases had hyponatremia while other 54(22%) cases had normal Na+ level.**Conclusion:** According to findings of this study it was concluded that frequency of hyponatremia was too high in children with Bronchiolitis i.e. 78%. So when a child present with Bronchiolitis he must be evaluated for Na+ level, and if it is low then sodium levels should also be corrected along with the treatment of bronchiolitis.**Keywords:** Bronchiolitis, Electrolyte imbalance, Hyponatremia, ICU, treatment prognosis.

INTRODUCTION

Bronchiolitis is diagnosed clinically in those children who present with breathing difficulties, cough, poor feeding, irritability and apnea which in combination with wheeze or crackles on auscultation make the diagnosis^{1,2}. The management and evaluation varies significantly and various tests like viral isolation, blood serology, and chest radiographs often are advised with negligible outcome. Hospitalization is more likely in those with chronic lung illness, congenital heart disease, immune deficiencies, and neuromuscular problems. Moreover, preterm are more vulnerable secondary to the impaired development of the lung and immunity³. Though it is the most common lower respiratory tract infection across the world, there is no single pharmacological agent that is considered to be safe and reliable for its management⁴.

Complications include central apnea, cyanosis, dehydration, seizures, fatigue, severe respiratory failure, focal neurological abnormalities and hyponatremia. Among all of these hyponatremia is the commonest association and occurs within 6 days of symptoms onset. According to a research, hyponatremia in 23 individuals (or 22%) was identified within 2 hours of arrival. Another research found that 90% of children who came within 6 days of the onset of symptoms had hyponatremia, which occurred in 45% of newborns and was present in 84 infants (80%) at the time of admission⁵.

The rationale is to determine frequency of hyponatremia in bronchiolitis children. This study is mandatory to do as sudden drop in sodium levels can lead to significant neurologic findings with morbidity and mortality in severe cases. So through this study we can easily pick patients with low sodium levels and can manage the cases accordingly to reduce the related morbidity and mortality.

METHODS

All the patients who presented with bronchiolitis at the department of Pediatrics, Lahore General Hospital/ Post Graduate Medical Institution, Lahore from December 8, 2017 to 8, June 2018 were included in that study. Ethical review committee's approval for this study was taken. A complete physical examination involving chest auscultation, x-ray chest was done. After taking informed consent

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all the basic information like age, sex and contact detail was taken. Blood sample was taken and sent to hospital laboratory to evaluate serum sodium levels to find hyponatremia as per operational definition. Data input and analysis were carried out using SPSS version 20.

RESULTS

The minimum and maximum ages were 2 and 24 months, and the mean age was 13.29 ± 6.35 months. There were 111(45.1%) cases who were 2-12 months old and 135(54.9%) cases were 13-24 months old. There were 124(50.4%) male and 122(49.6%) female cases with almost similar male to female ratio. There were 105(42.7%) cases who had disease since < 5 days and 141(57.3%) cases had disease since ≥ 5 days. According to weight of baby there were 96(39%) cases who had low weight as per their age and 150(61%) cases had normal weight as per their age. The mean Na level in all cases was 130.86 ± 6.61 mEq/L with minimum and maximum value as 115 and 145 mEq/L (Table A) A total of 192(78%) cases had hyponatremia while other 54(22%) cases had normal Na+ level. When data was stratified for age, among 192 cases who had hyponatremia, 89(46.4%) cases were 2-12 months old and 103(53.6%) cases were 13-24 months old, the frequency of hyponatremia was statistically same in both group, p-value > 0.05 (Table B). Among cases who had hyponatremia 97(50.5%) were male and 95(49.5%) were female cases, the frequency of hyponatremia in both male and female cases was statistically same, p-value >0.05. Among cases who had hyponatremia, there were 87(45.3%) cases who had duration as <5 days and 105(54.7%) cases had duration ≥5 days, the frequency of hyponatremia was statistically same regardless of duration of disease, p-value >0.05 (Table C) Among cases who had hyponatremia, in terms of weight, there were 69 instances (35.9%) with low weight and 123 cases (64.1%) with normal weight; nevertheless, statistically, the incidence of hyponatremia was the same regardless of infant weight, p-value >0.05.

Table A: - Na+ level descriptive statistics (mEq/L)

	Na+ level mEq/L
Mean	130.86
S.D	6.61
Range	30.0
Minimum	115.00

Maximum	145.00
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Table B: - Comparison of hyponatremia with respect to age group

Age groups	Hyponatremia		Total
	Yes	No	
2-12 months	89(46.4%)	22(40.7%)	111(45.1%)
13-24 months	103(53.6%)	32(59.3%)	135(54.9%)
Total	192(100.0%)	54(100.0%)	246(100.0%)

Chi-square test result: 0.536%, p-value: 0.464%

Table C: Comparison of hyponatremia with respect to duration of disease

Duration (days)	Hyponatremia		Total
	Yes	No	
<5 days	87(45.3%)	18(33.3%)	105(42.7%)
≥5 days	105(54.7%)	36(66.7%)	141(57.3%)
Total	192(100.0%)	54(100.0%)	246(100.0%)

Chi-square test = 2.4

p-value = 0.116

DISCUSSION

Lower respiratory tract infection (LRTI), along with pneumonia, is one of the major infections in school-age children that requires hospitalisation and contributes to 30% of global mortality each year. Bronchitis, bronchiolitis, pneumonia, and empyema are all included in LRTI, which is an infection below the larynx.

The respiratory syncytial virus, which predominates in babies and is a major cause of bronchiolitis (RSV). 10-15% of the afflicted children may need critical care owing to approaching respiratory failure, and 1% of them will need hospitalisation due to dehydration, poor oral intake, or respiratory insufficiency. The main factors affecting a person's homeostasis are fluids and electrolytes, with sodium being the most significant and prevalent cation in extracellular fluid. With a 30% frequency, hyponatremia is the most typical electrolyte imbalance encountered in the intensive care unit (ICU)¹⁰. It manifests in acute inflammatory illnesses such as Kawasaki disease, febrile convulsions, respiratory tract infections, and meningitis¹¹. Antidiuretic hormone (ADH) over secretion places patients with pneumonia and bronchiolitis at a higher risk of developing hyponatremia¹². The syndrome of inappropriate antidiuretic hormone secretion (SIADH)¹³ causes hyponatremia in pediatric pneumonia.

The age range in the current study was 2 to 24 months, with a mean age of 13.29 ± 6.35 months. The male to female ratio remained the same, with 124 cases (50.4%) of males and 122 cases (49.6%) of females. To ascertain the connection between hyponatremia (serum sodium 135 mEq/L) and clinical outcomes in children ages 1 month to 2 years hospitalized to the pediatric intensive care unit (PICU) with bronchiolitis, a single-center retrospective cohort research was conducted. The findings demonstrated that only 23 individuals (22%) of the 102 children participated in the trial (n=102; age = 10.7 ± 6.7 months) had hyponatremia identified within two hours of arrival. There were significant differences between patients with and without hyponatremia in terms of length of stay in the PICU (10.63 ± 2.5 days' vs 5.82 ± 2.09 days; P = .007), noninvasive ventilator support (65% vs 24%; P = .007), ventilator time (8.41 ± 2 days' vs 4.11 ± 2 days; P = .001), and mortality (13% vs 0%; P = .011). Recently, babies between the ages of one month and 24 months were recruited for a prospective cross-sectional study employing direct potentiometer to determine the incidence of hyponatremia in infants with moderate-severe bronchiolitis. When compared to older infants, 91(57%) infants under 6 months old were found to have hyponatremia (P = 0.005)¹⁴. Hyponatremia was shown to occur more often in the current study (78% of cases).

Another research was conducted to seek for these consequences, above all. In this cohort were 233 children under the age of two who were admitted with bronchiolitis to a teaching hospital in the United Arab Emirates. According to the findings, 105 babies (45%, 95% CI 38-51) had hyponatraemia (serum sodium 135 mmol/L). Low sodium levels were present in 84 newborns (80%), with 90% of cases developing within 6 days of the illness's onset⁷. These results are remarkably identical to our statistical

findings. In order to understand the prevalence and early course of hyponatraemia (serum sodium 136 mmol l(-1)) brought on by respiratory syncytial virus (RSV) bronchiolitis in newborns admitted to critical care, a retrospective review was done. 39 of the 130 babies with confirmed RSV infection who were hospitalized were eliminated due to pre-existing risk factors for hyponatraemia, including diuretic medication (n = 14), a lack of sodium data at admission (n = 13), renal illness (n = 2), and cardiac disease (n = 10). The admission incidence for hyponatraemia was 33% (30/91) in the remaining babies (median age, 6 weeks), with 11% (10/91) showing a blood sodium level below 130 mmol l(-1). Infants who were hyponatraemic and those who had normal sodium levels were the same age (median 6 vs. 7 wk., p = 0.82). Hyponatremia incidence has decreased to 3.3% after 48 hours of diuretic and fluid restriction treatment, odds ratio 0.07 (95% confidence range 0.02-0.24, p 0.001). Four babies (4%) were admitted with hyponatraemic seizures (sodium 114-123 mmol l(-1)); three received hypotonic intravenous fluids at 100-150 ml/kg(-1) d(-1) before being transferred to critical care. All four of them responded well to fluid restriction combined with hypertonic (3%) saline, which stopped their seizures right away and allowed their blood sodium levels to return to normal over the course of 48 hours. Thus, it may be said that children arriving to critical care are more likely to have hyponatraemia and RSV bronchiolitis.

CONCLUSION

Hence, it was deduced that frequency of hyponatremia was too high in children with Bronchiolitis i.e. 78%. So when a child present with Bronchiolitis he must be evaluated for Na⁺ level, and if it is low then sodium levels should also be corrected along with treatment of bronchiolitis.

Ethical approval: The study was authorized by the Post Graduate Medical Institute's ethical review committee in Lahore, Pakistan.

Authors' contribution: AR: study design, statistical & critical analysis., MWA: data collection, statistical design, SS: manuscript writing and KA: data collection.

Conflict of interest: Nil

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