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Research Article

HYPONATREMIA IN PNEUMONIA: HOSPITAL BASED CROSS SECTIONAL STUDY

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INTRODUCTION

Every year acute respiratory infections in young children are responsible for an estimate 3.9 million deaths worldwide. It is estimated that Bangladesh, India, Indonesia and Nepal together account for 40 per cent of the global Acute respiratory infection mortality. About 90 per cent of the acute respiratory infections deaths are due to pneumonia which is usually bacterial in origin. Childhood pneumonia is an important cause of morbidity in the developed world, and morbidity and mortality in the developing world. (1,2,3).The World Health Organization estimates that 156 million cases of pneumonia occur each year in children younger than five years, with nearly 20 million cases severe enough to require hospital admission(4).Among the electrolyte disorders in the hospitalized patients, hyponatremia is the most common electrolyte disorder and has been associated with increased mortality. Hyponatremia is usually defined as a serum sodium concentration of less than 135 mEq/L(3).It is established already that hyponatremia frequently accompanies pulmonary diseases, both infectious and neoplastic (6,12)With respect to pneumonia, a single-center cohort study found the incidence of hyponatremia at hospital admission among Community acquired pneumonia (CAP) patients to be 28%(8), which was associated with not only prolongation of hospitalization, but also an increase in mortality.

Water retention, fall in serum concentration of chloride and fixed base and diminished osmolality were described in lobar pneumonia way back in 1920.Since then, studies have shown an increase in plasma volume and extravascular fluid and severe hyponatremia in association with pneumonia. Further, Syndrome of Inappropriate secretion of antidiuretic hormone (SIADH) has been suggested as the likely underlying mechanism for changes in fluids and electrolytes (9,10,11). As the childhood pneumonia is important cause of mortality and morbidity in India and also hyponatremia occurs in 1/4th of CAP patients and is associated with greater disease severity and worsened disease outcome, our study was undertaken to determine the frequency of hyponatremia in pneumonia in the Assam region, in eastern part of India.(12,13,)

MATERIALS AND METHODS: This exploratory study was conducted at the Department of Pediatrics, Assam Medical College and Hospital, Dibrugarh for a period of one year from April 2012 to March 2013.It was a hospital based cross sectional study of children aged between 1-5 years admitted with a clinical diagnosis of pneumonia as per WHO criteria .The patients were included in the study after taking an informed written consent from the parents/guardians.

SELECTION OF CASES: Children with pneumonia from 1–5 year age were included while; children less than one year and more than 5 years of age were excluded from the study. Also excluded were, children with severe malnutrition, diarrhea, congestive heart failure, meningitis, nephrotic syndrome and acute glomerular nephritis.

A case of pneumonia was defined as per Acute respiratory illness control programme of Government of India. A through history and detailed examination of each child including anthropometry (weight, height according to Indian Association of Pediatrics classification) was carried out according to a predesigned proforma.

All the patients in the study group were subjected to measurement of serum sodium concentration by ion selective electrode method. Blood was collected by venipuncture into an sterile empty vial. A Serum sodium concentration of <130mEq/L was considered as hyponatremia. All the decisions regarding antimicrobials and supporting therapy were taken by the attending physician and were in no way influenced by the study.

STATISTICAL METHODS: Results on continuous measurements are presented on Mean ± SD (Min-Max)

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and results on categorical measurements are presented in Number (%). Statistical significance of the comparisons was determined by chi-square or t-test whichever appropriate. The Statistical software namely SPSS 15.0 was used for the analysis of the data.

RESULTS AND OBSERVATIONS: In the present study, out of 300 cases of pneumonia 78 (26%) cases were hyponatremic. Among them 9 (9.89%) cases were classified as pneumonia, 51 (26.84%) cases as severe pneumonia and 18 (94.74%) cases were classified as very severe pneumonia.P value is < 0.01, t-test between pneumonia (1) cases and very severe pneumonia (3) cases and between pneumonia (1) cases and severe pneumonia (2) cases.

TABLE 1: SHOWING FREQUENCY OF DISTRIBUTION OF HYPONATREMIA

SEVERITY OF PNEUMONIA	WITH HYPONATREMIA		WITHOUT HYPONATREMIA		TOTAL *(n)*
	n	*%*	*n*	*%*	
(1) Pneumonia	9	9.89	82	90.11	91
(2) Severe Pneumonia	51	26.84	139	73.16	190
(3) Very Severe Pneumonia	18	94.74	1	5.26	19
TOTAL	78	26.00	222	74.00	300

Figure 1

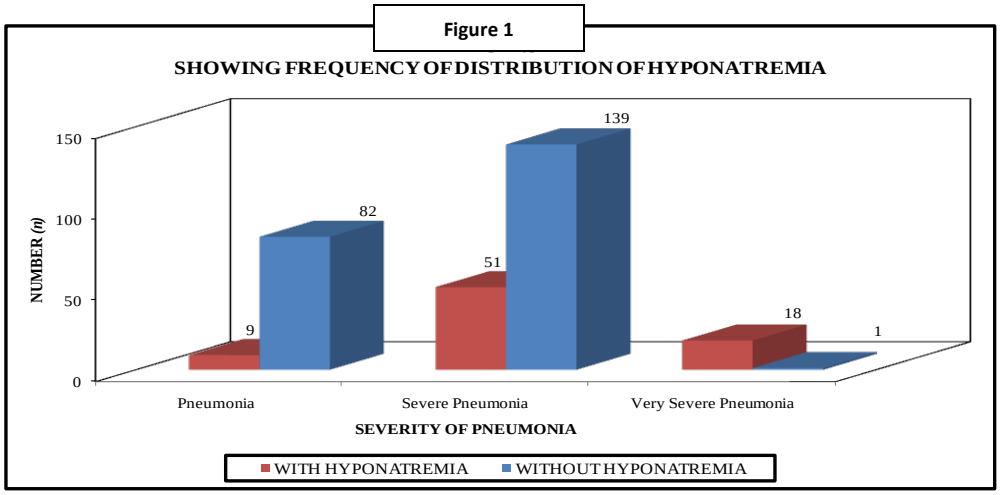


TABLE 2: TABLE SHOWING RANGE OF SERUM SODIUM IN PNEUMONIA CASES

Serum sodium (mEq/L)	Number *(n)*	Percentage *(%)*
120—125	3	1.00
126—130	75	25.00
131—135	117	39.00
135—140	105	35.00
Total	300	100.00

Figure 2

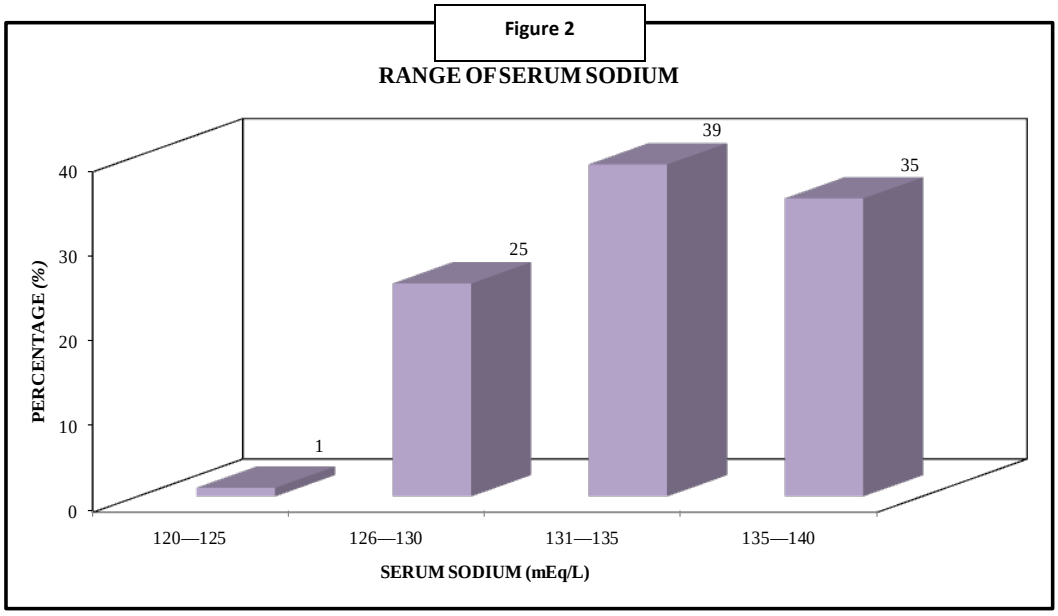
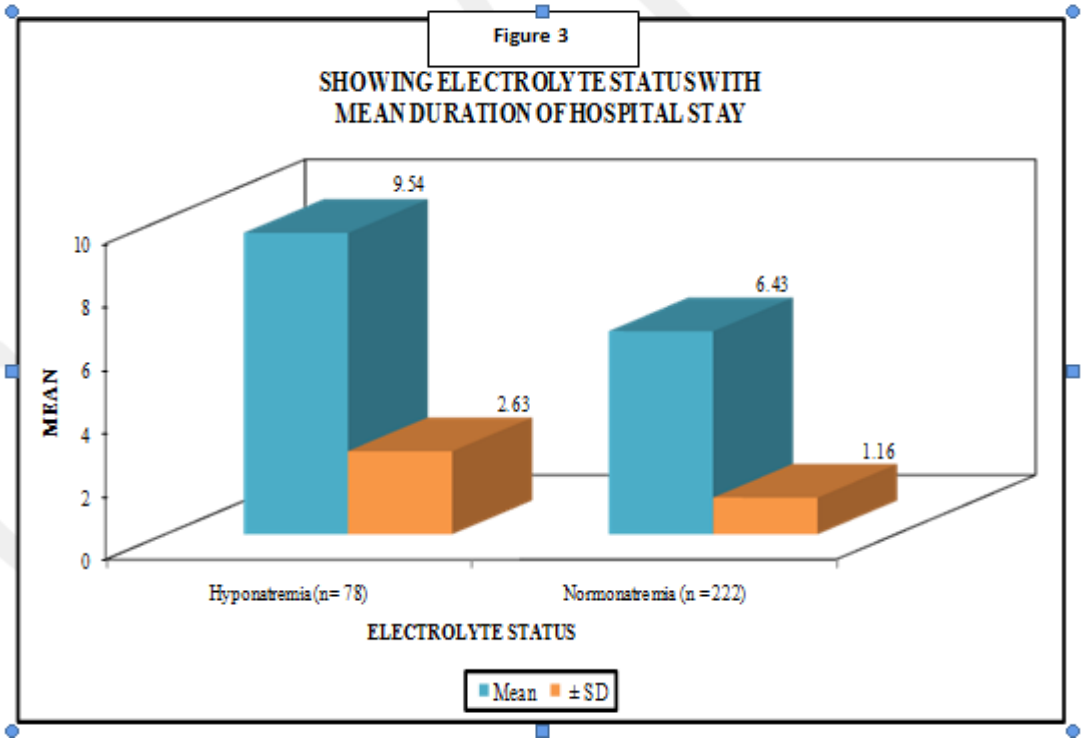


TABLE 3: TABLE SHOWING ELECTROLYTE STATUS WITH MEAN DURATION OF HOSPITAL STAY

Electrolyte status	Hospital stay (in days)		
	Mean ± SD	*Range*	*Median*
Hyponatremia (*n* = 78)	9.54± 2.63	6—18	9
Normonatremia (*n* = 222)	6.43± 1.16	4—9	6

Figure 3

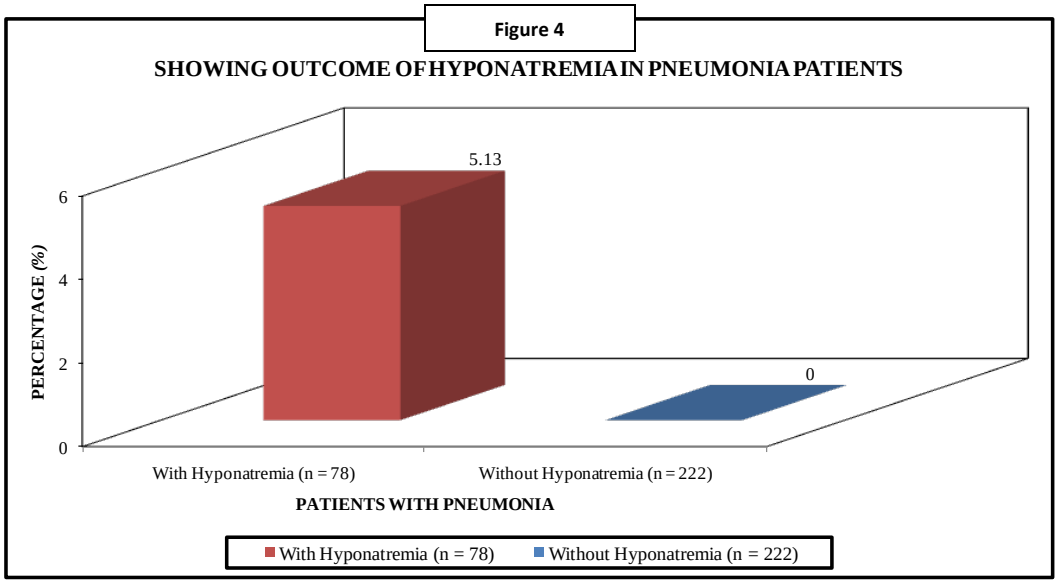


Mean duration of hospital stay of patient with hyponatremia with pneumonia is around 9.54 ± 2.63 days and those with normonatremia with pneumonia is 6.43 ± 1.16 days. P value is <0.01 which is statistically quite significant. Apparently, hyponatremia increased the hospitalization of pneumonia patients by an average 3days as compared with normonatremia.

TABLE 4: SHOWING OUTCOME OF HYPONATREMIA IN PNEUMONIA PATIENTS

Patients with pneumonia	Number of deaths *(n)*	Percentage *(%)*
With Hyponatremia (*n* = 78)	4	5.13
Without Hyponatremia (*n* = 222)	0	0.00
Total (*n* = 300)	4	1.33

Figure 4



In a total of 300 cases studied 4 patients died due to pneumonia and its complications. All of them were having very severe pneumonia with coexistent hyponatremia (5.13%) which could point out the importance of hyponatremia in increasing mortality in pneumonia.

DISCUSSION:

Pneumonia has remained a major health problem and constitutes a major portion of patients admitted in the Department of Paediatrics, Assam Medical College & Hospital, Dibrugarh. During the study period in our government medical college hospital of one year from April 2012 to March 2013, a total of 530 Assamese children suspected with pneumonia were admitted and amongst these only 300 children with pneumonia qualified to be enrolled in our pediatric pneumonia-hyponatremia study which met inclusion criteria. While our study is small in size and of short duration, our study could well be a forerunner of a pan India bigger exploratory study needed to emphasize the importance of hyponatremic events amongst pneumonia affected children.

Normal values of serum sodium ranges from 136-145 m mol/L or mEq/L.Hyponatremia is usually defined as a serum sodium concentration of less than 135 mEq/L[3].Amongst the 300 pediatric patients studied with clinically diagnosed pneumonia, we found that the sodium level estimations are quite important and they ranged nearly from 126 to 140 (99%) while only 1% had range of 120-125 mEq/L(very severe hyponatremia).25% cases among 300 had sodium range of 126 to 130 mEq/L (moderately severe hyponatremia) while another 39% had a sodium range of 131 -135 mEq/L(mild hyponatremia)

In our study, while we notice that, the overall incidence of hyponatremia in pneumonia patients (n=300) is around 26 %(78/300), a total of 222 pneumonic patients amongst 300 studied (74%) escaped the vagaries of hyponatremia. This percentage of 26% is quite high, and calls for a concerted approach. This could mean that significance of hyponatremic events is indisputable and is worth looking for. It also means that hyponatremia occurrence must warrant a full fledged treatment of the total condition. It also calls for a change in the routine attitude of the attending consultant and radical revision of standard operating procedures vis a vis sodium status among pediatric pneumonia patients. Also it mandates a

compulsory testing of children's natremic status at least 8 hourly so as to gauge the possibility of hyponatremia.Instead of dismissing the borderline hyponatremia the pediatrician is well advised to aggressively order for a 3 hourly sodium status since it does not cost much and may not increase the costs while it may indeed save a life. Also since it's possible to identify early declining trends proper anti-hyponatremia measures could well be devisable.

Amongst the very severely affected pneumonic children, nearly almost or 94.74 % total (18 out of 19) patients suffered from hyponatremic imbalance. The significance of this find while must be corroborated in further studies, we feel that this find will hold a lot of hope for the pediatric pneumonia care. This particularly high coincidence of hyponatremia with very severe pneumonia warrants our undivided attention and this fact be studied on a larger scale so as to create new guidelines about hyponatremic variety of very severe pneumonia. The remainder of 5.26% patients (only 1 patient in 19) of the very severely affected pneumonic children however didn't show overt signs of hyponatremia.

Our above find is echoed even in the severe pneumonia children's category, where we find that in a total of 190 patients with severe pneumonia nearly 51 or 26.84 % are hyponatremic and the rest of 73.16% (139/190) patients are normonatremic children. Again the importance of investigating hyponatremic children is emphasized.

Also we found that, a good ten percent of simple pneumonic children could well be suffering with concommittant hyponatremia and that ninety percent of the same category escaped low sodium levels. So even in this category investigations of sodium levels assume importance.

Our studies are also in agreement with previous studies elsewhere.

Hyponatremia with pneumonia is associated with more severe illness, increased mortality risk and extended hospital stays. Mean duration of hospital stay in patients with pneumonia with hyponatremia is 9.54 ± 2.63 when compared to pneumonia with normonatremia which is 6.43 ± 1.16 which means a good 3 days of hospitalization is preventable if a pediatrician is aware of the chance of hyponatremia.Another important finding in our Indian setting of government medical colleges at Assam is that in hyponatremic children the average duration of hospitalisation was increased by 66%.

In a total of 300 cases studied 4 patients died due to pneumonia and its complications. All of them were having very severe pneumonia with coexistent hyponatremia (5.13%) which could point out the importance of hyponatremia in increasing mortality in pneumonia.

CONCLUSIONS AND SUMMARY:

Incidence of hyponatremia in pneumonia is common and its incidence is more common in cases of very severe pneumonia .Hyponatremia is common among hospitalized patients with pneumonia and is independently associated with worsened clinical outcomes.

:Hyponatremia in pneumonia significantly affects the outcome in terms of prolonged duration of hospitalization, and increase in mortality. We conclude that regular estimation of serum electrolyte concentration and plasma and urine osmolality is necessary to guide appropriate fluid and electrolyte management of children with severe pneumonia requiring hospitalization. There is need to investigate the therapeutic benefit if any, of the fluid restriction. Future research needs to focus not only on how hyponatremia may affect children with pneumonia, but also how severity of hyponatremia impacts hospital outcomes. Further studies are necessary to evaluate the role of currently available therapies aimed at correction of hyponatremia in improving the outcomes of patients with pneumonia.

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