ORIGINAL ARTICLE

Hyponatremia among Adult Patients with Community Acquired Pneumonia (CAP) Admitted in a Tertiary Care Hospital

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Abstract

Introduction: *Pneumonia is a common illness affecting approximately 450 million people a year and occurring in all parts of the world. Hyponatremia is one of the most common electrolyte disturbances in patients hospitalized with pneumonia and associated with higher disease severity. The aim of the study was to see the frequency of hyponatrmia among patients with pneumonia in adults and to study the significance of this finding in the clinical course and final outcome of the disease.*

Methods: *This prospective observational study was conducted among 80 patients with the diagnosis of pneumonia in the In-Patient Department (IPD) of Pulmonology in the Enam Medical College and Hospital (EMCH) from 1st July 2018 to 30 th June 2019. All of them underwent Chest X-ray and other relevant laboratory investigations which included CBC, blood urea, serum creatinine, serum electrolytes, blood glucose, SGPT and ABG.*

Results: *Eighteen out of 80 pneumonia patients had hyponatremia. The mean p^H - PaO_2 and $PaCO_2$ among hyponatremic patients were 7.35±0.04, 54.63±6.75 and 45.58±7.74 and among normonatremic patients were 7.40±0.02, 66.67±4.17 and 37.47±3.23 respectively. The mean duration of hospital stay among hyponatremic patients was 7.15±2.92 days and among normonatraemic patients was 3.04±0.80 days. About 38.88% of hyponatremic patients with Na+ less than 130 meq/L had serum and urine osmolality 254± 6.9 and115± 8.07 respectively indicating they are having SIADH.*

Conclusion: *Hyponatremia is a common finding among pneumonia patients. These patients had more severe type of pneumonia and also needed longer duration of hospital stay. More than one third (38.88%) of hyponatremic patients had SIADH.*

Keywords: *Pneumonia, Hyponatremia, SIADH*

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Introduction:

Community Acquired Pneumonia (CAP) is pneumonia that has been acquired in a community in a patient who has not been hospitalized within 14 days prior to onset of symptoms or hospitalized less than 4 days prior to onset of symptoms.[1] It is a common acute infection in adults resulting in considerable clinical and economic impact.[2,3]

Hyponatremia is one of the most common electrolyte disturbances in patients hospitalized with pneumonia and associated with higher disease severity. The precise mechanism is unknown, Syndrome of inappropriate antidiuretic hormone secretion (SIADH) is most often implicated.[4] Patients with pneumonia often present with several factors that are associated with nonosmotic stimulation of antidiuretic hormone (ADH), most notably inûammatory cytokines such as interleukin-6,[5] stress, nausea, and hypoxemia.[6,7] Others implicate a reset osmostat, citing evidence for this mechanism in other infectious conditions, i.e., tuberculosis and malaria).[8,9] Patients with pneumonia may also have concomitant hypovolemia due to factors such as inadequate oral intake,

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systemic vasodilatation, and extra renal sodium losses from vomiting and diarrhea.[10] In contrast to SIADH, hypovolemia is a potent stimulus for appropriate ADH secretion through activation of the carotid baroreceptors. Primary disease, impaired water excretion, "inappropriate" release of vasopressin, use of hypotonic fluids, redistribution of sodium and water and several drugs may contribute to hyponatremia.[11]

In study by Mandal et al.[12] hyponatremia was found in 21% of the pediatric patients admitted with the diagnosis of pneumonia and they also found higher mortality (33%) among hyponatremic patients than normonatremic patients (2%).

Nair V et al.[13] found after their study that hyponatremia was present in 27.9% of the patients with pneumonia on admission and these patients were associated with greater risk of death and increased length of hospital stay. In a similar study by Karki L et al.[14] hyponatremia was a common occurrence at hospital admission with an incidence of 36.11%. Hyponatremia at admission was associated with longer length of hospital stay.

The aim of our study was to see the frequency of electrolyte disturbances in patients with pneumonia in adults and to study the significance of these electrolyte disturbances in the clinical course and final outcome of the disease.

Methods:

This prospective observational study was conducted in the In-Patient Department (IPD) of Pulmonology in the Enam Medical College and Hospital (EMCH) over a period of 1 year from 1st July 2018 to 30 th June 2019.

About 80 patients with the diagnosis of pneumonia on the basis of presence of consolidation both clinically and radiologically were included in the study. Samples are collected by nonprobable consecutive sampling. Patients with diarrhea, chronic kidney disease, heart Failure, chronic liver disease, malignancy, taking diuretics, oral rehydration salts, tuberculosis, HIV infection, chemical pneumonitis and interstitial pneumonitis were excluded.

Informed written consent was taken from all the patients. All of them underwent laboratory investigations which included CBC, serum electrolytes, blood urea, serum creatinine, blood glucose, SGPT and ABG. Chest-X ray was done and was reported by a radiologist. CURB-65 score was done for every patient.(CURB-65 score indicates pneumonia severity. It includes confusion, urea level more than 7 mmol/l, respiratory rate more than 30/min, systolic blood pressure less than 90 mm of Hg or diastolic blood pressure less than 60 mm of Hg and age more than 65 years, 01 point for each criteria).[15]

All the patients were followed up until discharge. Repeat Chest X-ray and serum electrolytes were done on the day of admission, when necessary and before discharge.

Data were analyzed using SPSS 16 computer program. A p value less than 0.05 considered significant.

Results:

A total of 80 patients were included in the study. Out of them 47 were male and 33 were female. The mean age of the patients was 55.56±16.17 years (Table 1).

Table-I

Age of patients

Total	80	56.55±16.17
Male	47	57.37±15.44
Female	33	56.06±17

05 out of 18 hyponatremic patients has CURB 65 score 1, 08 has score 2 and 05 patients are admitted with CURB 65 score 3-4.(Table II)

Table-II

CURB-65 score among hyponatremic patients

Score	No of patients
1	05
2	08
3-4	05

Among 80 patients of pneumonia 18 patients has hyponatremia, 11 patients has hypolalemia, 08 patients has combined hyponatremia and hypokalemia. Fifteen patients has respiratory acidosis and hypercapnia. Seventeen patients has hypoxia.(Table III)

Table-III

Electrolyte and ABG disturbances among pneumonia patients

Finding	No of patients
Hyponatremia (Na^+ <135)	18
Hypokalemia (K^+ < 3.5)	11
Combined hyponatremia and hypokalemia	08
Respiratory acidosis (p^H< 7.4)	15
Hypoxemia (PaO_2 < 60 mm of hg)	17
Hypercapnia ($PaCO_2$> 50 mm of hg)	15

05 patients has mild, 04 patients has moderate, 09 patients has severe hyponatremia (Table IV).

Table IV

Na^+ level among pneumonia cases

Mild hyponatremia (Na^+ level ≤124 mmol/l)	05
Moderate hyponatremia (Na^+ level 125-129 mmol/l)	04
Severe hyponatremia (Na^+ level ≤130 mmol/l)	09

Mean K^+, p^H, PaO_2, $PaCO_2$ among normo natremic patients were 3.55± 0.10, 7.40± 0.02, 66.67±4.17, 37.47±3.23 and the Mean K^+, p^H, PaO_2, $PaCO_2$ among hyponatremic patients were 3.35± 0.36, 7.35± 0.04, 54.63±6.75, 45.58±7.74 (Table V).

Table V

Biochemical and ABG findings among normal and hyponatremic patients

Traits	With normal Na^+	With low Na^+	p value
K^+	3.55± 0.10	3.35± 0.36	0.00
p^H	7.40± 0.02	7.35± 0.04	0.00
PaO_2	66.67±4.17	54.63±6.75	0.00
$PaCO_2$	37.47±3.23	45.58± 7.74	0.00

The duration of hospital stay among hyponatremic patients was 7.15±2.92 days and the duration of hospital stay among normonatremic patients was 3.04±0.80 days. The difference is statistically significant. (p value 0.00) (Table VI).

Table VI

Duration of hospital stay in days among normal and hyponatremic patients

Sodium Level	Duration of hospital stay	p value
Normal Na^+	3.04±0.80	0.00
Low Na^+	7.15±2.92	

Serum and urine osmolality among patients with Na^+ < 130 mmol/l were 254± 6.9 and 115± 8.07 and among patients Na^+ >130 were 286±6.63 and 87±14.22 respectively. (Table VII)

Table-VII

Serum and urine osmolality among hyponatremic patients

No of patients	Serum osmolality (mosm/l)	Urine osmolality (mosm/l)
With Na^+ < 130 (no 7)	254± 6.9	115± 8.07
With Na^+ >130 (no 11)	286±6.63	87±14.22

Discussion:

In the present study a total of 80 cases of community acquired pneumonia (CAP) were included. The mean age was 56.55±16.17 years. The mean age of male patients was 57.37±15.44 years and the mean age of female patients is 56.06±17 years. This finding is similar to that of Karki et al[14] where the mean age of all patients was 51.3 years. In a study conducted in 1996 by A M Neill[15] et al. among CAP patients the mean age was 58 years (range 18-97 years). So there is a predominance elderly patient who gets admitted to hospitals with community acquired pneumonia. In our study 47 patients were male and 33 patients were female. This finding is similar to that of A M Neill[15] et al where 55% were patients male but contradicts that of Karki et al[14] where 39% patients were male. All female cases are non smokers. Out of 47 males 07 were non smokers and 40 patients were smokers.

On the day of admission hyponatremia was found in 18(22.5%) patients, hypokalemia was found in 11 (13.75%) patients and combined hyponatremia and hypokalemia was found in 08(10%) patients. This is nearly similar to the study by Karki et al[14] who showed the incidence of hyponatremia is approximately one third (36.11%). In that study 26 out of 72 patients with community acquired pneumonia had serum sodium level less than 135 mmol/l at the time of hospital admission. Nair V et al[13] al also found the prevalence of hyponatremia, in the first hospital-obtained sample, to be 28% among CAP patients.

In this study severe hyponatremia (Na^+ less than 124 mmol/l) was present in 05 patients, moderate hyponatremia (Na 125-129 mmol/l) was present in 04 patients and mild hyponatremia (Na 130-135 mmol/l) was present in 09 patients. Seven out of eighteen hyponatremic (serum osmolality less than 135 mmol/lit) patients has serum sodium level less than 130 mmol/l, the mean serum osmolality 254± 6.9 mosm/l and the mean urinary osmolality 115 ±8.07mosm/l, indicating they had having SIADH. One

patient with serum sodium less than 130 has plasma osmolality 290 mosm/l and urinary osmolality 80 mosm/l indicating dehydration (decreased intake or increased perspiration). However 10 other hyponatremic patients have the mean serum osmolality 286±6.63mosm/l and the mean urinary osmolality 87±14.22mosm/l indicating decreased intake or increased loss by perspiration.

Thirty, forty two and eight patients were admitted with CURB-65 score 1, 2 and 3 respectively. Among the 18 patients with hyponatremia five patients were admitted with CURB-65 score 1, 08 patients has CURB-65 score 2 and 05 patients has CURB-65 score 3. Among those with combined hyponatremia and hypokalemia 01 patient has score 1, 5 patients has 2 and 2 patients has score 3. This finding indicates that those with hyponatremia have higher CURB-65 scores.

In this study, 15(18.75%) patients has p^H less than 7.4 (respiratory acidosis), 17 (21.25%) patients has hypoxaemia (PaO_2 less than 60 kPa) and 15 (18.75%) patients has hypercapnia ($PaCO_2$ more than 50 kPa). Thirteen out of 15 patients with hypercapnia has low sodium level. So it is evident from this study that those patients with type II respiratory failure ($PaO_2 < 60$ kpa and $PaCO_2 > 50$ kPa) tends to have lower sodium (Na^+) level.

The mean duration of hospital stay of patients with normal Na^+ is 3.04±0.80 days and the mean duration of hospital stay with low Na^+ was 7.15±2.92 days. This finding is statistically significant (p value < 0.05). Three patients are shifted early (day of admission) to the ICU needing mechanical ventilation. All 03 of them has CURB 65 score 3, electrolyte imbalance and respiratory acidosis. Previous studies also have shown that hyponatremia frequently accompanies hospitalization for pneumonia and is associated with adverse outcomes. Study conducted by Nair V et al[13] and Marya D Zilbergerg [16] also concluded admission sodium was an independent predictor of mortality and morbidity outcomes in terms of hospital stay, ICU admission and the need for mechanical ventilation in patients with pneumonia.

Among patients with combined sodium and potassium deficiency (a total of 8 patients) the mean duration of hospital stay was 8.5±1.38 days. Three patients were shifted to ICU on the day of admission.

Conclusion:

Hyponatremia is a common finding in patients with community acquired pneumonia(CAP) and these patients usually presents with more severe type of pneumonia. They also have longer duration of hospital stay and some of them needed ICU support. Although the precise mechanism is not known it is a common finding in CAP patients. So we advise all patients with CAP should have electrolyte measurement and their detection and early intervention may avoid adverse outcomes.

Limitations:

The number of patients was less. The study was done in a single center. So further multicentered studies with large number of patients are needed to evaluate the incidence and impact of electrolyte disorders in hospitalized pneumonia patients.

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