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"A STUDY ON PATIENTS WITH HYPONATREMIA AND THEIR OUTCOMES IN ADMITTED PATIENTS OF HAMIDIA HOSPITAL, BHOPAL(M.P.)"

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ABSTRACT

Background -. Hyponatremia, defined as a serum sodium concentration ([Na+]) <135 mEq/L. It is not a disease but rather a pathophysiologic process indicating disturbed water homeostasis. Hyponatremia should be further classified to provide directions for diagnosis and treatment. It is the predominant electrolyte abnormality with an incidence rate of approximately 22%. and leading cause of morbidity and mortality with scarce data in Indian settings. Hence a study on patients with hyponatremia in admitted patients of Hamidia Hospital, Bhopal (M.P.) was undertaken to determine the etiological factors, clinical manifestations and outcomes.

Material & Methods – The present study was undertaken among hyponatraemic patients admitted in Gandhi Medical College and Hamidia Hospital, Bhopal. Participants /patients giving the consent was included and subjected to a detailed history, physical examinations and relevant clinical investigations. All the data analysis was performed using appropriate statistical software (Epi Info Version-6).

Results

the incidence of hyponatremia was more prevalent in the age groups of 51-60 years (27.55). Most common complaint of patients with hyponatremia in present study was Breathlessness with facial puffiness & decreased urine output (25%) followed by altered mental status (21.9%). majority had general condition below average (63.1%), 30.6% had poor condition whereas only 6.3% had average general conditions

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Conclusion -There is an increasing tendency for it to occur with increasing age, hypertension, diabetes mellitus and use of drugs (diuretics). Nausea, vomiting and drowsiness are the commonest symptoms. Mortality is high and acts as a poor prognostic marker of primary disease

Keywords – Hyponatremia, Sodium, Electrolyte

INTRODUCTION

Hyponatremia, defined as a serum sodium concentration ([Na+]) <135 mEq/L, is the most common electrolyte abnormality observed in clinical practice and occurs in up to 30% of the hospitalised patients in its mild form (serum [Na+] 130-135 mEq/L).[1,2] It is well-known that acute severe hyponatremia may have severe neurological consequences because of cerebral oedema, and it can be lethal if not diagnosed and effectively treated.[3]

The syndrome of inappropriate antidiuresis (SIAD), the use of diuretics, polydipsia, adrenal insufficiency, hypovolemia, heart failure, and liver cirrhosis are the most frequent causes of hyponatremia (the latter two are frequently referred to as "hypervolemic hyponatremia" collectively). [4] Various medications (such as hydrochlorothiazide), gastrointestinal loss, corticosteroid withdrawal, hypothyroidism, and the syndrome of improper antidiuretic hormone secretion are a few of the additional reasons of hyponatremia (SIADH).[5]

Acute or chronic hyponatremia are also possible. Acute hyponatremia is characterised by the onset of symptoms in <48 h. Patients with acute hyponatremia develop neurologic symptoms resulting from cerebral oedema induced by water movement into the brain. These may include seizures, impaired mental status or coma and death. Hyponatremia developing over > 48 h is considered chronic. The serum sodium concentration is usually above 120 meq/L. The incidence of hyponatremia in hospital-admitted patients, as quoted in various studies, varies between 12 and 14%, with severe symptomatic hyponatremias being 12%. [6-8] The identification of risk factors associated with the development of symptomatic hyponatremia is important in determining preventive strategies.[9]

Chronic hyponatremia does not cause significant brain swelling, but correction should not exceed 8 mEq/l/day to prevent osmotic demyelination. Correction in high-risk individuals shouldn't go over 4-6 mEq/l/day. Desmopressin management of undesired urinary water losses can prevent the accidental overcorrection of hyponatremia. Although it is known that even moderate chronic hyponatremia is linked to higher mortality, attention deficit, gait instability, osteoporosis, and fractures, it is unclear whether treating mild hyponatremia will lead to better results. [10].

In terms of diagnosis, the first step is to distinguish between hypotonic and nonhypotonic hyponatremia. Based on urine osmolality, urine sodium level, and volume status, hypotonic hyponatremia is further distinguished from other types of hyponatremias. Recent findings, such as plasma copeptin levels and fractional uric acid excretion, may help to further refine the diagnostic strategy. [4]

For acute or symptomatic hyponatremia, recommendations state that hypertonic saline (usually 3% NaCl) should be used. Loop diuretics may be used with hypertonic saline in patients with hypervolemic hyponatremia. Reducing free water intake and/or enhancing renal free water excretion are the mainstays of treatment for persistent hyponatremia. When treating chronic hyponatremia, fluid restriction (1 L/d) is

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frequently the cornerstone of the treatment. 500 ml of fluid per day is advised for patients whose ratio is more than one (showing concentrated urine), however this is challenging to follow. Treatment with loop diuretics, urea, vasopressin receptor antagonists (or "vaptans"), or demeclocycline can do this. [4] Data on prevalence and clinical profile of hyponatremia are scarce, to say the least, from this part of the Indian subcontinent. Hence, we took up this hospital-based, observational descriptive study as an attempt to evaluate the clinical profile of hyponatremia in medically ill patients in our setting.

MATERIAL AND METHODS

Study Type: Prospective Hospital based Observational Study

Study Centre: Department of Medicine Gandhi Medical College, & associated Hospitals (Hamidia Hospital) Bhopal.

Study Duration: January 2021 to May 2022

Study Subjects: Patients with hyponatremia in admitted patients of Hamidia Hospital, Bhopal (M.P.)

Sample Size: 160

Methodology

After approval of the study protocol by the Institutional Ethics Committee, written consent taken. The study was done in Department of Medicine, Gandhi medical collage & Hamidia hospital Bhopal to investigate the etiological factors, clinical manifestations and outcome in hyponatraemic patients. 160 patients aged 18 years and above giving consent were enrolled for the study and was subjected to a detailed history, physical examinations and relevant clinical investigations.

Investigation

- Sr. Na+
- Sr. K+
- CBS
- LFT
- RFT
- ECG

Statistical analysis:

All the data analysis was performed using appropriate statistical software (Epi Info Version-6). Frequency distribution and cross tabulation was used to prepare the tables. Continuous variables were presented as mean ± SD, and categorical variables were presented as absolute numbers and percentage. Data was checked for normality

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before statistical analysis. Descriptive analysis was performed to obtain general characteristic of the study population. Categorical variables were analysed using either the chi square test or Fisher's exact test. $P<0.05$ was considered statistically significant.

RESULTS

Table 1: Distribution of patients with hyponatremia according to their age groups

Age group in years	Frequency	Percent
≤20	4	2.5
21-30	16	10.0
31-40	23	14.4
41-50	36	22.5
51-60	44	27.5
61-70	29	18.1
>70	8	5.0
Total	160	100.0

Incidence of hyponatremia was more prevalent in the age groups of 51-60 years (27.55) followed by 41-50 years (22.55). Mean age of patients with hyponatremia was 49.94±14.82 years.

Table 2: Distribution of patients with hyponatremia according to their gender

Gender	Frequency	Percent
Female	57	35.6
Male	103	64.4
Total	160	100.0

Incidence of hyponatremia in present study was more among males (64.45) than females (35.6%).

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Table 3: Distribution of patients with hyponatremia according to their presenting complaints

Presenting complaint	Frequency	Percent
Abdomen pain	11	6.9
Vomiting	22	13.8
Fever	19	11.9
Abdominal distended	10	6.3
Abnormal body movement	4	2.5
Agitation	3	1.9
Altered mental status	35	21.9
Breathlessness with facial puffiness & decreased urine output	40	25.0
Headache	5	3.1
Hemiparesis	18	11.3
Blood in stool	1	0.6
Body swelling	9	5.6
Tingling in feet	1	0.6
Difficulty in swallowing	1	0.6
Burning micturition	1	0.6
Chest pain	2	1.3
Diarrhoea	13	8.1
Decrease urine output	7	4.4
Dizziness	1	0.6
Hypertension	2	1.3
Seizure disorder	1	0.6
Shortness of breath	7	4.4
Yellowish discoloration of sclera	1	0.6

Most common complaint of patients with hyponatremia in present study was Breathlessness with facial puffiness & decreased urine output (25%) followed by altered mental status (21.9%), vomiting (13.8%), fever (11.9%) and Hemiparesis (11.3). Abdomen pain (6.9%), Abdominal distended (6.3%) and Diarrhoea (8.1%0 were the other common complains made by patients with hyponatremia.

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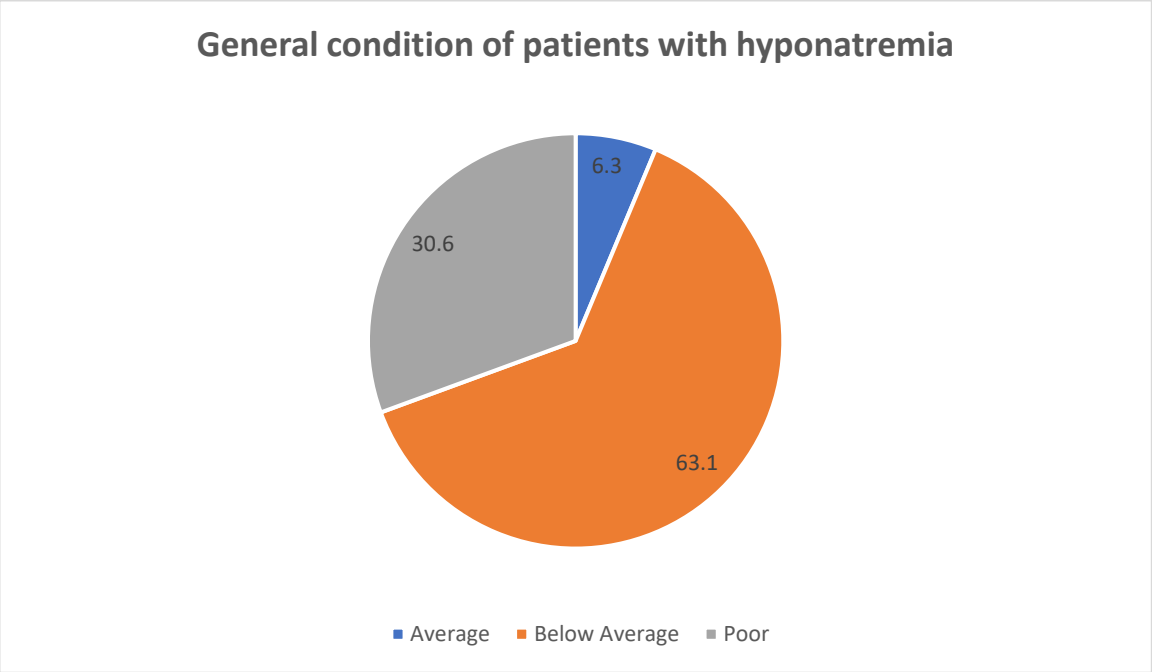
Figure 1 - Distribution of patients with hyponatremia according to their general condition



On analysing the general condition of patients with hyponatremia it was revealed that majority had general condition below average (63.1%), 30.6% had poor condition whereas only 6.3% had average general conditions.

Table 4: Distribution of patients with hyponatremia according to their general characteristics

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Mean**	**SD**
Total duration of stay in hospital (Days)	160	1	15	6.51	1.939
Pulse Rate	160	60	134	94.23	13.21
SBP	160	80	1140	129.18	84.12
DBP	160	50	110	78.09	11.62
HB	160	5.9	13.8	9.912	1.84
TLC	160	2700	18000	9308.36	3116.87

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Platelets	160	.67	3.90	2.17	0.71
Urea	160	10	167	49.59	33.08
Creatinine	144	.23	11.40	2.11	2.03
HBa1C	112	2.7	12.0	6.071	1.75
RBS	142	56	591	175.20	76.12
T.Bilirubin	147	.20	5.80	0.88	0.90
Sr. Magnesium	77	.41	2.28	1.28	0.42
Sr. Sodium	160	108.0	131.3	123.73	4.04
Sr. Potassium	160	2.4	5.8	3.942	0.66
Total Cholesterol	134	80	445	160.03	55.15
Triglycerides	147	18	554	173.35	65.89

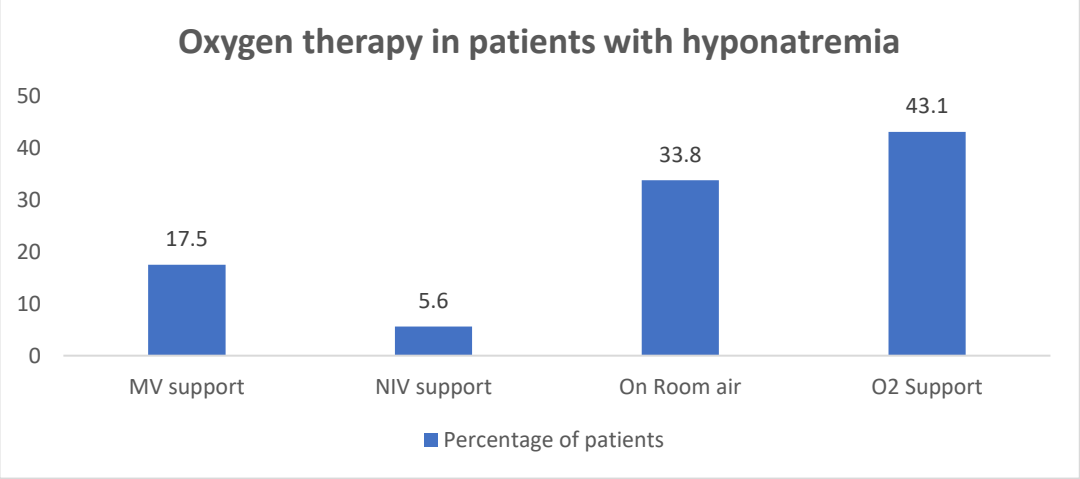
Mean total duration of stay in hospital (Days), Pulse Rate, SBP, DBP, HB, TLC,

Platelets, Urea, Creatinine, HBa1C, RBS, T. Bilirubin, Sr. Magnesium, Sr. Sodium,

Sr. Potassium, Total Cholesterol and Triglycerides was 6.51±1.939, 94.23±13.21,

129.18±84.12, 78.09±11.62, 9.912±1.84, 9308.36±3116.87, 2.17±0.71, 49.59±33.08, 2.11±2.03, 6.071±1.75, 175.20±76.12, 0.88±0.90, 1.28±0.42, 123.73±4.04, 3.942±0.66, 160.03±55.15 and 173.35±65.89 respectively.

Figure 2 - Distribution of patients with hyponatremia according to oxygen therapy



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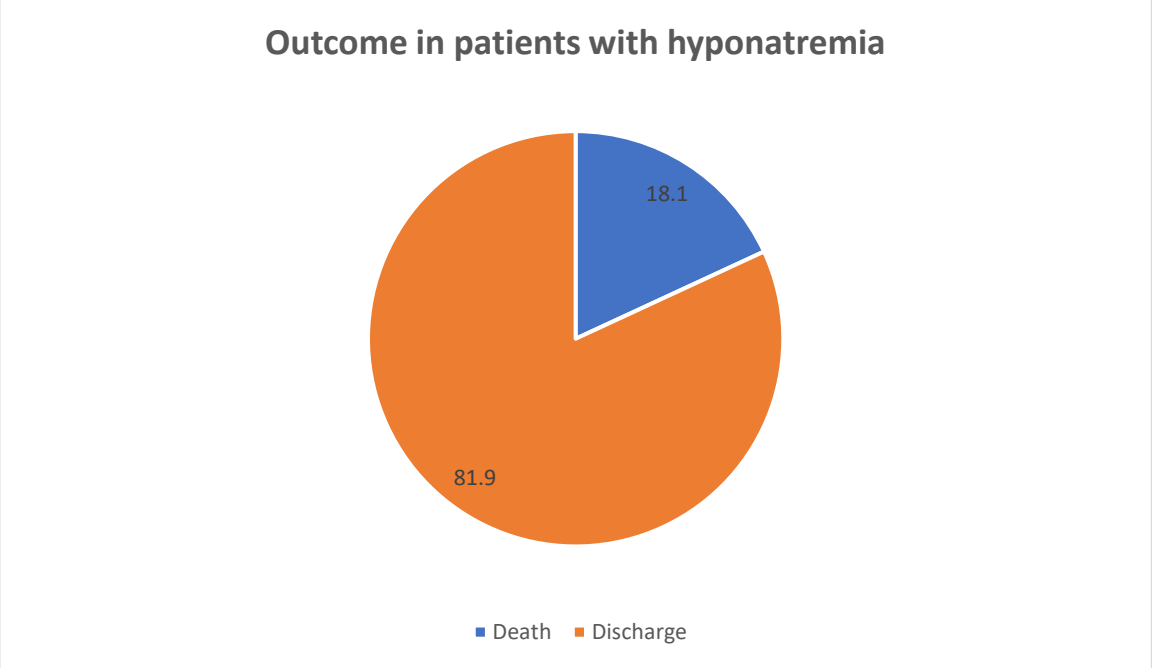
Out of 160 patients with hyponatremia, 28 (17.5%0 were on MV support, 9 (5.6%) were on NIV support and 69 (43.1%) were on oxygen support. There were 54 (43.1%) patients who were on room air in present study.

Figure 3: Distribution of patients with hyponatremia according to their outcome



Mortality rate in patients with hyponatremia in present study was 18.1%.

Table 5: Comparing outcome of patients with degree of hyponatremia

Hyponatremia	Outcome		Total	P value
	Death	Discharge		
Mild	0 (0)	4 (3.1)	4 (2.5)	<0.001
Moderate	12 (41.4)	101 (77.1)	113 (70.6)	
Severe	17 (58.6)	9 (6.9)	26 (16.3)	
Total	29 (100)	131 (100)	160 (100)	

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A significant association was obtained between outcome and severity of hyponatremia was observed in present study as revealed by the significant p value of <0.001 (Chi Square test). Death was more common in patients with severe hyponatremia (58.6%) followed by those with moderate hyponatremia (41.4%). None of the patients with mild hyponatremia had mortality in present study.

DISCUSSION

This study was undertaken on patients with hyponatremia in admitted patients of hamidia hospital, Bhopal (MP) to study the clinical manifestations, etiological factors, various outcomes as well as the treatment modalities associated with hyponatremia.

A total of 160 patients were recruited in the present study. Incidence of hyponatremia was more prevalent in the age groups of 51-60 years (27.55) followed by 41-50 years (22.55). There were 10% patients with age 21-30 years, 14.4% with 31-40 years, 18.1% with 61-70 years. There were 2.5% patients who were younger than 20 years whereas 5% patients were older than 70 years. Mean age of patients with hyponatremia was 49.94±14.82 years. Sood N et al (2020) reported that in their study the patients' age ranged from 20 to 95 years with a mean age of 62.25 ± 17.77 years.[11] Sixty patients (57%) aged more than 60 years and 46 (43%) patients' age was below 60 years. Baji PP et al (2015) [12] reported that the patients were between 28 to 89 years. 63% of the patients belong to the age group of 50 to 69 years; the mean age was 59.4 years. The youngest patient was 28 years and the oldest was 89 years of age. 76% patients were above 50 years and only 24% patients were below 50. This was statistically significant.

We observed that the incidence of hyponatremia in present study was more among males (64.45) than females (35.6%). Baji PP et al (2015) [12] reported that there was no statistically significant difference in the age distribution between males and females. However, the findings of Sood N et al (2020) [11] were in close correlation with the present study. They reported that there were more males than females in the present study. 1.25:1 was the male to female ratio. According to Babaliche et al [13] men (59%) make up the majority of hyponatremia cases. Rahil et al [14] reported a similar pattern of gender distribution, with 20 (37.7%) female and 33 (62.3%) male hyponatremia patients. Bakhtar et al. also reported a male predominance.[15]

Patients are more prone to develop hyponatremia with increase in age due to development of co morbidities like hypertension, diabetes mellitus, cardiac failure/shock, liver cirrhosis and use of drugs like diuretics, antidepressants which are known to cause or aggravate hyponatremia. Nausea, vomiting are most common gastrointestinal symptoms and headache, giddiness, slurred speech and drowsiness are most common neurological symptoms of hyponatremia. Euvolemic hyponatremia (43%) is the most common type of hyponatremia followed by hypervolemic (38%) and hypovolemic hyponatremia (19%). In the present study, the most common complaint of patients with hyponatremia in present study was Breathlessness with facial puffiness & decreased urine output (25%) followed by altered mental status (21.9%), vomiting (13.8%), fever (11.9%) and Hemiparesis (11.3). Abdomen pain (6.9%), Abdominal distended (6.3%) and Diarrhoea (8.1%0 were the other common complains made by patients with hyponatremia.

Baji PP et al [12] reported that nausea and vomiting were the most common gastrointestinal symptoms present in 54% and 48% of patients respectively. Like other studies, drowsiness was the most common neurological symptom (42%). Seizures were present in 9 (11%) patients. Higher number of patients with seizures in their study was

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probably due to more underlying neurological problems e.g., seizure disorder (n=3), neurological infections (n=1), brain metastasis (n=2) and intracranial haemorrhage (n=2) together present in 90% of patients.

According to Sood N. et al. (2020) [11] altered sensorium was the most prevalent general symptom among the hyponatremia patients in our study, followed by anorexia and vomiting. Pillai et al [16] observed that among the intensive care unit (ICU) admissions, the different symptoms attributed to hyponatremia included nausea (69.3%), malaise (80%), drowsiness (61.3%), confusion (41.3%), lethargy (24%), frequent falls (1.3%), convulsions (2.7%), altered sensorium (41.3%) and delirium (9.3%). In their study of 37 patients with hyponatremia, Krishnamurthy and Srinivas found that vomiting accounted for 29.6% of the cases, giddiness for 2.4%, altered sensorium for 8.5%, headache for 9.2%, chest pain for 6.4%, generalised weakness for 8.4%, fever for 12.3%, cough for 15.2%, unconsciousness for 0.7%, nausea for 22.5%, loose stools for 5%, fatigue for 10.4%, breathlessness for 17.8% [17]

On analysing the general condition of patients with hyponatremia it was revealed that majority had general condition below average (63.1%), 30.6% had poor condition whereas only 6.3% had average general conditions. We also observed various characteristics pertaining to these patients. Mean total duration of stay in hospital (Days), Pulse Rate, SBP, DBP, HB, TLC, Platelets, Urea, Creatinine, HBa1C, RBS, T. Bilirubin, Sr. Magnesium, Sr. Sodium, Sr. Potassium, TC and TG was 6.51±1.939, 94.23±13.21, 129.18±84.12, 78.09±11.62, 9.912±1.84, 9308.36±3116.87, 2.17±0.71, 49.59±33.08, 2.11±2.03, 6.071±1.75, 175.20±76.12, 0.88±0.90, 1.28±0.42, 123.73±4.04, 3.942±0.66, 160.03±55.15 and 173.35±65.89 respectively. Out of 160 patients with hyponatremia, 28 (17.5%0 were on MV support, 9 (5.6%) were on NIV support and 69 (43.1%) were on oxygen support. There were 54 (43.1%) patients who were on room air in present study. Pillai et al [16] observed that 28% of the patients had SBP <100 mmHg on admission, 63.3% had SBP between 100 and 140 mmHg and 18.6% had SBP ≥140 mm Hg. Glasgow Coma Scale (GCS) score of ≤10 was seen in 36% of patients. In a prospective study conducted in a general medical-surgical setting, 66 patients (34%) had euvolemic hyponatremia, 38 (19%) had hypervolemic hyponatremia associated with oedematous disorders and 33 (17%) had hypo-volemic conditions, chiefly related to GI fluid loss or diuretic use [18].

Mortality rate in present study was 18.1%. While Nair et al. reported a 7% higher mortality with hyponatremia (serum sodium content 135 mEq/L) in a single-center trial, Zilberberg used a large administrative database to find no increased mortality with hyponatremia compared with normonatremia in hospitalised patients with pneumonia.[19]. While severe hyponatremia (serum sodium concentration 120-124 mEq/L) was not associated with an increased risk of death in sepsis, pneumonia, or hospital admissions for respiratory disorders, it was associated with an increased risk of death in liver disease. Mortality in this trial was 21%, according to Baji PP et al [32]. Each individual was diagnosed with a life-threatening underlying condition. Death rates ranged from 9-30% in another research [20]. Serum sodium levels are not statistically different between the living and the dead. Patients who passed away typically suffered from illnesses such malignancies and liver cirrhosis in addition to severe sepsis and congestive heart failure (p= 0.715). Mortality was related more to the primary cause of illness. Hyponatremia appeared to be marker of underlying disease which carries poor prognosis and association of hyponatremia with outcome was probably not directly related.

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In their study mortality of patients with cardiac failure/shock was 33.3% which was comparable to the study done by Clayton et al [21] which was 29.6%, while Rawal JR et al [22] in their study of hyponatremia in heart failure patients, reported very high mortality rate (57.14%). The probable reason was that they studied mortality in patients with very low serum sodium concentration (Sr. Na< 105 mmol/L).

A significant association was obtained between outcome and severity of hyponatremia was observed in present study as revealed by the significant p value of <0.001. Death was more common in patients with severe hyponatremia (58.6%) followed by those with moderate hyponatremia (41.4%). None of the patients with mild hyponatremia had mortality in present study.

CONCLUSION

Hyponatremia is a common electrolyte abnormality in hospitalised patients. There is an increasing tendency for it to occur with increasing age, hypertension, diabetes mellitus and use of drugs (diuretics). Nausea, vomiting and drowsiness are the commonest symptoms. Mortality is high, though not directly related to serum sodium levels. Hyponatremia acts as a poor prognostic marker of primary disease.

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