



Incidence of Imbalance of Sodium Ion in Traumatic Brain Injury Patients

KEYWORDS

Hyponatremia, Hypernatremia, Traumatic Brain Injury.

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ABSTRACT *Objective: To determine the incidence of sodium ion imbalance in traumatic brain injury patients.*

Materials and methods : 100 patients of traumatic brain injury were included in the study. The patients are of either sex between 20 – 60 years of age group were included. Electrolyte evaluation with computerized tomography (CT scan) of each patient was done to know the incidence of hyponatremia and hypernatremia during the hospital stay of the patient.

Results : The age group of 31-40 years of age group of male patients about 93.93% were most commonly affected. Low serum sodium level was found in about 50% of cases and high serum sodium was found in 24% of cases.

Conclusion : Electrolyte disturbances mainly of sodium should be treated at the right time to prevent morbidity and mortality in patients of traumatic brain injury.

INTRODUCTION

Each cell of human being depends on its internal environment for proper functioning, even for survival. The inorganic electrolytes i.e., sodium, potassium, calcium, magnesium, chloride etc. are important constituents in body fluid as they play a vital role in cellular function and survival. Increased incidence of road traffic accidents in modern era specially urban areas is due to – increase in number of population, use of more vehicles, undevelopment of roads, stressful & hurry life style. This is relevance of traumatic brain injury in modern era [1, 2]. Electrolyte abnormalities are more common in patients with head injuries occurring atleast once during the hospital course of 59% of traumatic brain injury patients [3,4].

If Blood Brain Barrier is injured following trauma, the permeability of osmotically active particles increased at the injured site. Sodium disturbance is the most common of all the electrolyte disturbances found in neurologically ill patients [5]. Change in sodium has a profound effect in neurological status of patient. Chronic bed rest, surgery also disturb regulation of sodium ion and water [5].

Hyponatremia is also common electrolyte disorder in acute brain disorder. Hypernatremia is due to decrease water intake and decrease access to water due to neurological deficit. In recent times, the increasing severity of accidents & increase in traumatic brain injury along with electrolyte imbalance may be due to the critical illness itself or as sequelae of the treatment [4,5]. Therefore, suitable investigative protocols should be devised to promptly detect even minor disturbances in the neurointensive care. Electrolyte imbalance poses a threat to life and also to recovery in traumatic brain injury patients. Its diagnosis and appropriate management plays a great role. The aim of the study was to find out the incidence of serum sodium imbalance in traumatic brain injury patients. So this study was carried out to find out the frequency of serum sodium imbalance in traumatic brain injury patients

MATERIALS AND METHODS

The study was compiled in the Physiology department of S.C.B Medical college Hospital with the help of department of Neurosurgery between the year 2010 July to 2012 July. Total 100 patients of traumatic head injury patients were included. The patient's clinical status was grossly assessed with Glasgow Coma Scales (GCS), the GCS with rating for eye opening response, motor response and verbal response. All subjects underwent detailed history, clinical examinations and laboratory investigations. Non contrast computed tomography scan were done and X ray in suspicious cases were done.

All head injury cases of either sex between 20-60 years of age with head injury cases either due to road traffic accident or fall from height or physical assaulted are taken in the study. Patients with hypertension, renal diseases, heart diseases, endocrine disorders were excluded.

Each patient's blood was investigated for his serum sodium pattern on : during the period of hospital stay. The serum electrolyte was done in Biochemistry laboratory, by the instrument Electrolyte Analyser. Normal range of serum Na⁺ is 136 – 142 meq / L. The reference range for parameters High serum sodium value > 142 meq/L and Low serum sodium value <136 meq/L were taken. All these parameters were done during the hospital stay after 3-4 days of admission of the traumatic brain injury patients in the Neurosurgery ward.

RESULTS :

Among 100 patients enrolled, 31 (93.93%) patients were male of age group of 31-40 years and 18 (38.88%) patients were females of age group of 51-60 years. Then according to the mode of head injuries the road traffic accident was most common case of head injury in all age groups. In the age group of 20-30 years road traffic accident was about 46.87%. Mostly males about 93.75% had head injury due road traffic accident. Due to fall from height the head injury incidence was 81.25% in males.

According to GCS Score most head injury cases were belonged to the severe variety of head injury (38%) . the head injury cases with low serum Na⁺ level were about 71% . In this study Hyponatremia had high incidence .

Table 1: Age Distribution Of Head Injury Cases

Age group (yrs)	No. of cases	Percentage(%)
20 – 30	21	21%
31 – 40	33	33%
41 – 50	28	28%
51 – 60	18	18%
Total	100	100%

Table 2: Sex Distribution Of Head Injury Cases

Age group (yrs)	Total No. cases	Male	Percentage (%)	Female	Percentage(%)
20 - 30	21	19	90.47	2	9.52
31 - 40	33	31	93.93	2	6.06
41 - 50	28	23	82.14	5	17.85
51 - 60	18	11	61.11	7	38.88
Total	100	84		16	

Table 3: Age Wise Distribution Of Cases In Different Types Of Head Injury

Mode Of Injury	Total No. Of cases	20 - 30 Years	31 - 40 Years	41 - 50 Years	51 - 60 Years
		Age group	Age group	Age group	Age group
Road Traffic Accident	64	30 (46.87%)	20 (31.25%)	15 (35.73%)	4 (6.25%)
Fall From Height	16	4 (25%)	3 (18.75%)	6 (37.5%)	3 (18.75%)
Physical Assault	20	8 (40%)	6 (30%)	4 (20%)	2 (10%)

Table 4: Sex Distribution Of Cases In Different Types Of Head Injury Cases

Mode Of Injury	Total No. Cases	Male	Percentage (%)	Female	Percentage (%)
Road Traffic Accident	64	60	93.75	4	6.25
Fall from Height	16	13	81.25	3	18.75
Physical Assault	20	11	55	9	45
TOTAL	100	84	84%	16	16%

Table 5: Cases Associated With Type Of Head Injury (GCS Score)

GCS Score	Type of Head injury	No. of cases	Percentage (%)
3 - 8	Severe	38	38
9 - 12	Moderate	32	32
13 - 15	Mild	30	30
Total		100	100

Table 6: Serum Na⁺ Value According To GCS Score

Type of Head injury	No. of cases	Low (Na ⁺) value	High (Na ⁺) value	Normal range (Na ⁺) value
Severe	38	27 (71.05%)	7 (18.42%)	4 (10.52%)
Moderate	32	15 (46.87%)	9 (28.12%)	8 (25%)
Mild	30	8 (26.66%)	8 (26.66%)	14 (46.66%)
Total		50	24	26

DISCUSSION :

Traumatic brain injuries associated with electrolyte imbalance is an important cause for morbidity and mortality . Most commonly the young adults are more prone to motor vehicle accidents. This study was a prospective study based on the incidence of serum sodium imbalance in head injury patients. Coming to the causes for head injuries in our patients , road traffic accidents were the commonest cause(64%) . It is due to increase in number of population, use of more vehicles, development of roads , stressful and hurry lifestyle [6] . Next most common cause of head injury was by fall from height (16%) . Our study was consistent with the done by Gururaj G. et al[7] . As in several studies mild and moderate head injuries are commoner than severe head injuries, but in our study severe head injuries were about 38%.

Electrolyte imbalance is common after traumatic head injury with noticeable changes seen in serum sodium level. The incidence of sodium disorders was high with severe head injury . In our study 71.05% of severe head injury patients of Low sodium and 18.42% of severe head injury patients of High sodium level were found. The study done by Upadhyaya et al [8] and Cerda et al [9] got the similar level of sodium value. According to Donati-Genet Pc et al .(2001), hyponatremia is a well known complication of traumatic and non traumatic cerebral injury, often related to the syndrome of inappropriate antidiuretic hormone secretion (SIADH) [10] . Akram Aksar, Nauman Tarif et al. (2007), Cerebral Salt Wasting Syndrome (CSWS) is defined as the renal loss of sodium during intracranial diseases leading to hyponatremia and decrease in extracellular fluid volume [11] .

The most common causes for hypernatremia in traumatic head injury is Diabetes Insipidus (DI) , which may be due to use of antidiuretics like mannitol . In our study High sodium value / Hypernatremia was evaluated in severe type of head injury about 18.42%.

CONCLUSION :

The implication of fluid and electrolyte imbalance that occur in the traumatic brain injury cases can not be reiterated often enough. Sodium disturbances , in particular, are of prime importance, not only because they cause neurological symptoms per se, but also because , if untreated , they worsen the outcome of the patient. Hyponatremia is more common complication. Hypernatremia is associated with increased risk of death in patients with severe traumatic brain injury. So meticulous attention should be paid to fluid administration and electrolyte balance. Special attention should be paid to the changes in relation to the severity of head injury , surgical procedures, therapeutic procedures and preoperative factors influencing these changes.

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