ORIGINAL ARTICLE

Study to Determine Hyponatremia in Community Acquired Tubercular and Bacterial Meningitis

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ABSTRACT

Introduction: Bacterial and tuberculous meningitis has a very high chance of fatality. In bacterial and tuberculous meningitis, hyponatremia is a complication of unknown frequency and quite significant clinically. The present research was carried out to assess the severity, symptoms, incidence, and consciousness level of hyponatremia in tuberculous and bacterial meningitis acquired from the community.

Study Design: A Descriptive Cross-sectional study.

Place and Duration: In the Medicine Department of M. Islam Medical and Dental College Gujranwala for one-year duration from June 2019 to June 2020.

Methods: This study consists of 35clinically diagnosed bacterial and tuberculous meningitis' patients attending the Medical department.The serum electrolytes and consciousness level were noted down at the time of presentation of all patients.

Results: Among the patients positive for meningitis, 35(100%) showed hyponatremia, the concentration of serum sodium fluctuated from 116-138 mmol / l; Theaverage level of sodium is 128.67± 5.66 mmol / L. It was observed that the concentration of low sodium levels in serum were mild in 22(62.9%) (> 125-135 mmol / L), moderate in 11 (110-125 mmol / L) and severe in 2(5.7%) who has less than 110 mmol/L. There was only 2 (5.7%) patient who was suffering from severe meningitis (<110 mmol / l). We found out that on 1st day, GCS ranged from 7 to 14, average SD was 11.66 ± 1.50. The concentrations of the serum sodium levels are128.67± 5.66 and 128.73±7.54 in tuberculous meningitis (n = 9) and bacterial meningitis (n = 26), the average GC recorded when patients were admitted was 11.48±2.23 and 12.05±1.50 respectively among Bacterial and TB Meningitis.

Conclusion: Even though the degree of severity, incidence rate, and the significance of hyponatremia in the patients suffering from bacterial meningitisclinically is unknown currently, however, the occurrence of this may affect the results depending on its severity in patients. So, having an idea about the frequency and severity will help healthcare professionals in deciding the appropriate therapy.

Keywords: Meningitis, hyponatremia, adults

INTRODUCTION

An acute purulent-forming infection in the subarachnoid space is known as bacterial meningitis. This disease is one of the leading causes of fatality, and responsible for the neurological outcomes for a longer period across the globe[1-2]. Bacteria which are associated to cause community acquired bacterial meningitis are Neisseria meningitides (25%), Streptococcus pneumoniae (50%), Listeria monocytes (10%), group B streptococci (10%) andH.Influenza type B (less than10%)[3]. In around 10% patients, the nervous system (CNS) gets affected due to tuberculosis, in which tuberculous meningitis tops among all. One of the complications which is related to the community acquired meningitis is hyponatremiain adults. The correct rate of occurrence and its clinical significance isstill unknown[4-5]. Patients suffering from bacterial meningitis have a good likelihood of developing acute hyponatremia, but in most of the cases, it is mild. In around one third patients that have intra-cranial disease, there is hyponatremia which is often due to tuberculosis[6]. Meningitis has not been documented in self-limiting septic or viral meningitis with a very less mortality rate. The actual process for the development ofhyponatremia in the presence of bacterial meningitis is not clearly understood, but it is often considered that it might be because of the loss of brain salt, abnormal release of antidiuretic hormone, or worsening of the aggressive fluid resuscitation[7]. There are many patients who are suffering from intracranial disease, have hyponatremia which is due to the loss of salts in brain; This leads to hyponatremia due to renal sodium loss and extracellular fluid depletion[8-9]. Therefore, the key aim behind designing this research was to make this known. To evaluate the commonness of hyponatremia in tuberculosis and bacterial meningitis which was acquired from community, analysis of the severity of hyponatremia, see presentation style, and monitor awareness levels in such patients.

MATERIALS AND METHODS

The designed study is a Descriptive Cross-sectional study held in the Medicine Department of M. Islam Medical and Dental College Gujranwala, for one-year duration from June 2019 to June 2020. The sample size included 35 patients who had tuberculous and bacterial meningitis out of which 26 were diagnosed with bacterial and 9 with tuberculous meningitis. Initially 41 people were selected for

this comprehensive analysis, out of which 6 patients were excluded because they were failed to fall into the inclusion criteria. Patients who had a history of metabolicdisorders likeendocrine diseases, encephalopathy, and other causes were excluded. Information was collected from all these patients with an interview form, their symptoms and results, cerebrospinal fluid (CSF) and blood culture results, radiographs and problems on admittance were noted. On admission, serum electrolytes were confirmed. Hyponatremia was distinct as a serum sodium concentration less than 135 mmol / L (severe <110 mmol / L, moderate 110-125 and mild> 125-135). The patient or their assistant informed consent was obtained for participation in the study. The collected data was analyzed using SPSS 21.00.

RESULTS

A total of 35 patients participated in the study. Of these, 14females and 21 were male, with a ratio of 1: 0.70. The mean age was 30 ± 15.15 SD years. All 35 (100%) patients had headache, have fever and impaired consciousness level. The length of the fever extended from 5 to 50 days; the mean time was 14.35 ± 11.12 SD days. Threecases(8.75%) had a history of seizures. Many of the cases have Kernig's sign and Neck rigidity as 91.4%correspondingly.

The patient's Clinical signs with meningitis and hyponatremia given in Table-I (N=35)		
Clinical signs	Present	Absent
Rigidity of the Neck	32 (91.4%)	3 (8.6%)
Kernig's sign	32 (91.4%)	3 (8.6%)
Brudginski's sign	4 (11.4%)	31 (88.6%)
Plantar extensor response	6 (17.1%)	29 (82.9%)
Papilledema	8 (22.9%)	27 (77.1%)

Most of the cases have had hyponatremia of mild intensity (62.9%). The mean serum concentrations of potassium, chloride and bicarbonate were 3.98 ± 0.65 SD mmol / L, 95.12 ± 17.11 SD mmol / L and 24.01 ± 2.38 SD mmol / L, respectively.

The hyponatremia Severity in patients with meningitis shown in Table II (N=35)	
Severity	%age
Severe (less than110 mmol/L)	2 (5.7%)
Moderate (110-125mmol/L)	11 (31.4%)
Mild (>125-135mmol/L)	22 (62.9%)

The mean levels of protein in the CSF were 1.27 ± 0.53 SD g / L (Table IV). 7 (20%) patients have positive CSF Gram staining. Amid the cases which were positive, gram-positive cocci were found in 4 patients and gram-negative diplococcus was found in 3 patients.

GCS and Serum sodium on the day ofadmission given in Table III		
Diagnosis	GCS (mean±SD)	Serum sodium (mmol/l)
Meningitis (N=35)	11.66±1.50	128.67± 5.66
TB Meningitis (n=9)	11.48±2.23	128.73±7.54
Bacterial (n=26)	12.05±1.50	128.65±5.03

3 (8.57%) have positive Cerebrospinal fluid culture. Both patients' reports were Neisseria meningitis positive.

Table IV shows CSF inflammation Indexes		
CSF	Mean	Std. Deviation
Cell count(cmm)	207.3	±531.13
Glucose (mg/dl)	51.86	±15.24
Protein (g/L)	1.27	±0.53

DISCUSSION

The study was conducted on 35 hospitalized patients with bacterial and tuberculous meningitis (26 bacterial and 9 tuberculosis), clinically diagnosed at the Medical department of services hospital, Lahore. The preliminaryanalysispeoplecount was 41 people. Six patients were omitted because they did not meet the criteria of inclusion, rejected to sign agreement, and were unable to participate in the studies. The study was performed to determine how hyponatremia occurs in adults with community-acquired bacterial and tuberculous meningitis, to determine the hyponatremia severity in these patients, and to monitor meningitis symptoms and levels of consciousness in these patients. The patients age in this analysisfluctuated from 15 to 60 years. Durand ML et al. It was noticed that the patients agevaries from 17 to 87.01 years[10-11]. Among subjects, GCS ranged from 7 to 13 with a mean SD of 11.66 ± 1.50 on day first. In a study by Van de beek et al., In 313 of 696, Glasgow coma below 10 points occurred. 157/208 (76%). The results of the CSF examination showed that the mean cell number was 207.3±531.13 cmm^3. The mean concentration of protein in the cerebrospinal fluid was 1.27 ± 0.53 SD g / l. An unusually increasefrequency of hyponatremia was noted in adults with meningitis caused by L. monocytogenes (73%). It was observed that there were prolonged high proportion of hyponatremiareported in tuberculous meningitis of group A and streptococci. There are only one third patients that have hyponatremia with the disease of intracranial part which has a relationship with tuberculous meningitis, which is often exacerbated with the presence ofhydrocephalus[12-13]. In our study, there were 7 patients who appeared positive after the gram staining of CSF (20%). Out of all the cases which were positive, 3 patients had the infection of gram-negative diplococcus and4 patients were positive with gram-positive cocci.3 (8.57%) have positive Cerebrospinal fluid culture. The reports were Neisseria meningitis positive. The presence of hyponatremia is a complication which is very common and is generally considered a mild complication in bacterial meningitis affected adults. In bacterial meningitis, moderate hyponatremia is self-limiting and, in most cases, regular monitoring of serum sodium is adequate. In one study, hyponatremia (125-135 mmol / l) in 20 (66.7%) patients with moderate meningitis (110-125 mmol / l) and severe (<110 mmol / l) in 9 (30%) patients)hyponatremia in 1 patient (125-135 mmol / l) patient (<110 mmol / l). 110 mmol / l) 3.3%) of the patient. Brower MC et al. The hyponatremia was characterized as severe because of 110 mmol / L in 38 (6%) patients. 3 We don't have any clinical findings currently on management of fluid for hyponatremia in adults who have established bacterial meningitis.[12-14] There is a very recent review published by Cochcrain on this topic, the study was

conducted on children who were diagnosed clinically with bacterial meningitis have gone through 6 trials clinically, out of which only three of them were included in the study[15-16]. In the studies two of them displayed no effect of 24- and 72-hour fluid resuscitation on serum sodium concentration under conditions of high mortality and late reporting[17]. In practice, however, there is sufficient evidence that babies are born early and that mortality is lower. Etiological procedure of developing hyponatremia in the patients of meningitis caused by bacteria is not yet clear. As the secretion of antidiuretic hormone is abnormal it may result from aggressive fluid resuscitation or cerebral salt wasting syndrome (CSW) and loss of salt in the brain. Patients with tuberculosis-induced hyponatremia displayed different responses to the load of water in multiple studies of small scale, which range from continuous antidiuresis to normal diuresis[18-19]. The tuberculosis is thought to be the reason of the abnormal secretion ofantidiuretic hormone syndrome (SIADH), whereas, the documentation of circulating vasopressin is very rare.SIADH is an enhanced renal water status mediated by antidiuretic hormones[20]. To get a proper and correct diagnosis is very important because the therapy for every condition entirely different. The preferred method of treatment in patients with SIADH was fluid restriction, although severe oral rehydration therapy is necessary in patients with CSW[21-22].

CONCLUSION

The limitations of the designed study involve the lack of evaluation of the etiology. Patients suffering from bacterial and tuberculous meningitis have a very high risk of developing acutehyponatremia, which will have an impact on the outcomes and treatment. Having information about thepresented relationship will help physicians to recognize the intensity of hyponatremia in these situations. Having a profound knowledge regarding nature and intensity of meningitis associated hyponatremiahave an impact on the therapeutical strategy which will help in the reduction of its negativerepercussions. Lastly, investigation regarding hyponatremia associated with bacterial meningitis requires extensive analysis further in this region.

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