FREQUENCY OF HYPONATREMIA IN TUBERCULOUS MENINGITIS

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ABSTRACT

Introduction: Tuberculous meningitis caused by Mycobacterium tuberculosis is an extremely devastating manifestation of tuberculosis, which was universally fatal in the age before anti tuberculous therapy.TBM accounts for around 1% of all cases of tuberculosis, carries a high mortality and a distressing level of neurological morbidity.

Objective: To determine the frequency of hyponatremia in tuberculous meningitis

Methodology: This study was conducted at Department of Medicine, Khyber Teaching Hospital Peshawar. The study is a descriptive cross sectional study and the duration of the study was one year from 10th October 2016 to 10th October 2017, in which a total of 196 patients were observed. All cases of tuberculous meningitis and CSF routine examination of both genders and age range 15 to 60 years were included. All diagnosed cases of tuberculous meningitis were screened for hyponatremia from day of admission to the day of discharge and GCS plus other clinical parameters e.g. headache, vomiting, confusion, impaired consciousness and seizure etc were recorded. All of the above mentioned information including name, gender and presence or absence of hyponatremia was recorded in a predesigned proforma.

Results: In this study, mean age was 48 ± 2.16 years. Forty two percent patients were male and 58% patients were female. Moreover, 52% patients had hyponatremia while 48% patients didn't have hyponatremia.

Conclusion: Tuberculous meningitis is a frequently reported problem in our part of the world. Hyponatremia is one of the common complications. All patients should be assessed for the presence of risk factors affecting mortality of the disease.

Key Words: Frequency, hyponatremia, tuberculous meningitis

INTRODUCTION

Meningitis is usually a serious inflammation of the meninges. There are three types of infectious meningitis i.e. viral, bacterial and fungal[1]. Although meningitis is a notifiable disease in many countries, the exact incidence rate is unknown. As of 2010 it is estimated that it resulted in 420,000 deaths.[2] Tuberculous meningitis is a severe form of extra-pulmonary tuberculosis. In countries with high burden of pulmonary tuberculosis, the incidence is expected to be proportionately high.[3]

Meningitis is associated with many acute and chronic complications. One of the acute complications is hyponatremia; it is defined as a serum sodium concentration of less than 135 mEq/L[4]. It is the most common electrolyte abnormality in hospitalized patients. Mismanagement of hyponatremia can cause neurological catastrophes for example, Osmotic demyelination syndrome. Most cases of hyponatremia reflect water imbalance and abnormal water handling, not sodium imbalance, indicating the primary role of ADH in the pathophysiology of hyponatremia. Symptoms of hyponatremia include nausea, vomiting, headache, confusion, lethargy, fatigue, loss of appetite, restlessness, irritability, spasms, or cramps, seizures, and decreased consciousness or coma[5]. As all of these features can also occur in meningitis by itself so it is difficult clinically, to attribute these features to hyponatremia that is why it is important to serially check the serum electrolytes to rule out hyponatremia because it can cause cerebral edema resulting in hyponatremic encephalopathy. This can cause tentorial herniation. The current study is to determine the frequency of hyponatremia in tuberculous meningitis in our local adult population as most studies are available in pediatric group. The purpose of the study is to highlight the condition because hyponatremia is one of the causes of deterioration in this clinical condition. This study will help us to generate local statistics assessing the magnitude of the problem. The results of this study will be useful in strategizing the management of electrolytes abnormalities in general and hyponatremia in particular during treatment of such patients and this will be an effort to reduce mortality and morbidity due to hyponatremia.

OBJECTIVE

To determine the frequency of hyponatremia in tuberculous meningitis

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METHODOLOGY

This study was conducted in the Department of Medicine, Khyber Teaching Hospital Peshawar. This is a descriptive cross sectional study and the duration of the study was one year from 10th October 2016 to 10th October 2017, in which a total of 196 patients were observed by taking 5% margin of error, 95% confidence interval, taking expected percentage of hyponatremia in meningitis patients that is 49% calculated by using WHO sample size calculator. Moreover, non probability consecutive sampling technique was used for sample collection. All cases of tuberculous meningitis based on clinical features (mentioned in operational definitions) and CSF routine examination with either gender and age range 15 to 60 years were included whereas, those patients who were having other possible causes of hyponatremia e.g. heart failure, cirrhotic patients, nephritic syndrome and other fluid over load states and those patients who are already on diuretics were excluded. The study was conducted after the approval from the hospital ethical and research committee. All patients meeting the inclusion criteria were included in the study through OPD and A&E department. All diagnosed cases of meningitis were screened for hyponatremia from day of admission to the day of discharge and GCS plus other clinical parameters e.g. headache, vomiting, confusion, impaired consciousness and seizures etc were recorded. The purpose of, and benefits of the study were explained to the patient and a written informed consent was obtained provided the patient was fully conscious and oriented, consent was taken from the attendant in case the patient was not oriented. All the necessary laboratory investigations were done from a single hospital laboratory under supervision of an expert pathologist having a minimum experience of 5 years. All of the above mentioned informations including name, gender and presence or absence of hyponatremia were recorded in a predesigned proforma. Strict exclusion criteria had been followed to control the confounders and bias in the study results. All the data collected through the proforma was entered in SPSS version 16 and analyzed through its statistical package. Mean ± SD was calculated for numerical variables like age, sodium levels etc. Frequencies and percentages were calculated for categorical variables such as gender, tuberculous meningitis etc. Hyponatremia was stratified among the age and gender in patients with tuberculous meningitis to see the effect modifications. Post stratification chi square test was applied in which P value <0.05 was taken as significant value. All results were presented in the form of tables, charts and graphs.

RESULTS

In this study, age distribution among 196 patients was analyzed as 35(18%) patients were in age range 20-30 years, 47(24%) patients were in age range 31-40 years, 55(28%) patients were in age range 41-50 years, 59(30%) patients were in age range 51-60 years.

Table no 1: Age distribution (n=196)

Age	Frequency	Percentage
20-30 years	35	18%
31-40 years	47	24%
41-50 years	55	28%
51-60 years	59	30%
Total	196	100%

Mean age was 48 years with SD ± 2.16

Table no 2: Gender distribution (n=196)

Gender	Frequency	Percentage
Male	82	42%
Female	114	58%
Total	196	100%

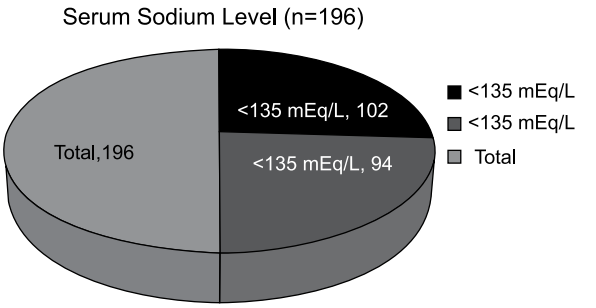

Chart No. 1 Mean Serum sodium level was 132 with SD ± 3.51

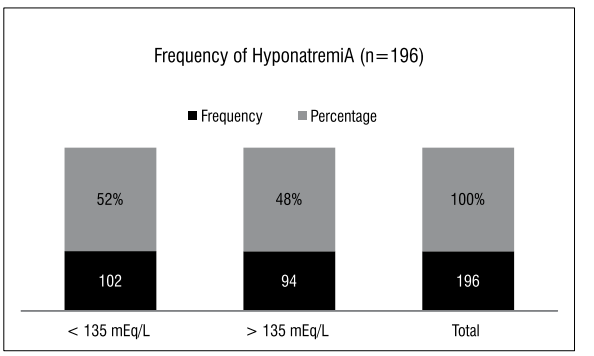

Chart No. 02

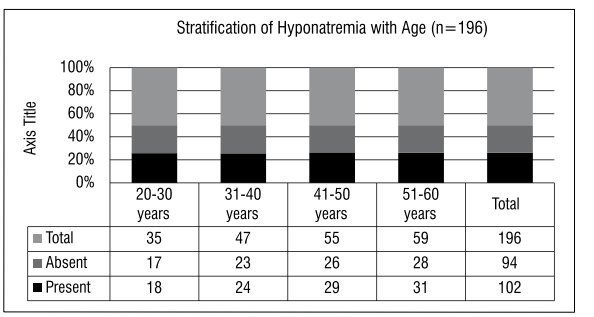

Chart No. 3 Chi square test was applied in which p value was 0.9979

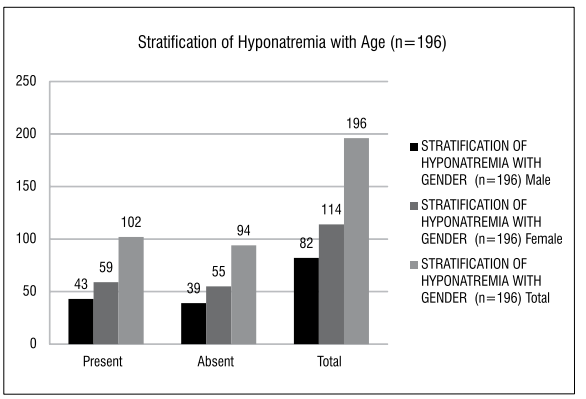

Chart No. 4 Chi square test was applied in which p value was 0.9245

Mean age was 48 years with SD ± 2.16. (table No 1). Gender distribution among 196 patients was analyzed as 82(42%) patients were male and 114(58%) patients were female. (table No 2), Serum sodium level among 196 patients was analyzed, 102(52%) patients had a serum sodium level < 135 mEq/L while 94(48%) patients had a serum sodium level > 135 mEq/L. Mean Serum sodium level was observed to be 132 with SD ± 3.51. (chart No 1) and the frequency of hyponatremia among 196 patients was analyzed as 102(52%) patients had hyponatremia while 94(48%) patients didn't have hyponatremia. (chart No 2), Stratification of hyponatremia with age and gender is given in chart No. 3,4.

DISCUSSION

Tuberculosis is a grave disease of worldwide importance with a rising incidence in the developing countries such as the Middle East and southern Asia and developed countries in the recent years. Tuberculous Meningitis, has an extremely variable presentation, hard to diagnose and even more difficult to treat. It continues to be a serious illness with a high neurologic morbidity and mortality and if left untreated is almost fatal.[1,2] The disease affects both males and females equally as it is observed in our study that 53.6% patients were females.

Our study shows that mean age was 48 years with SD ± 2.16. Forty two percent patients were male and 58% patients were female. Moreover, 52% patients had hyponatremia while 48% patients didn't have hyponatremia. Similar results were found in other studies as in a study done at Auckland City Hospital, New Zealand the magnitude of hyponatremia was noted to be 49% in tuberculous meningitis[6]. Sometimes, a patient who initially improves with treatment but deteriorates later on for which the possible explanation is that the patient has developed complications like hyponatremia, hydrocephalus or cerebral abscess. In this case serum electrolyte will rule out hyponatremia.

Similar results were found in another study conducted by Salekeen S et al[7] in Karachi in which the mean age of the patients was 36.29±16.7 years with an equal gender distribution. The presenting complaints were fever 51 (98.1%), neck-stiffness 44 (84.61%), and altered level of consciousness 40 (76.9%), headache 31 (59.6%), vomiting 19 (36.5%) and focal weakness 10 (19.2%). Among CNS signs, 47 (90.4%) patients had signs of meningeal irritation, 14 (26.9%) had cranial nerve palsies with abducent nerve being the most commonly involved cranial nerve (25%). Mean GCS was 11.4±2.9 and most of the patients presented with medical research council Stage 2 of tuberculous meningitis (which is minimally altered level of consciousness with minor focal neurological signs). Overall mortality was 21.1%. Univariate analysis revealed old age; advanced stage of tuberculous meningitis, serum sodium < 125 mmol/l, TLC >9000/mL development of hydrocephalus and use of mechanical ventilation as major predictors of mortality.

Hyponatraemia was found to be the most common electrolyte abnormality associated with tuberculous meningitis in our study. Other studies have also reported the same. Hyponatraemia is attributed to the association of SIADH with TBM.[8] Chest radiographs revealed findings consistent with pulmonary tuberculosis in fifteen patients (28.8%). Most commonly found abnormality was the presence of infiltrates in 21.2%.[9] Other studies report a higher frequency of infiltrates from 35 - 50%.[10,11,12]

CSF pleocytosis with predominant lymphocytes, increased proteins and reduced sugar was found in fifty patients. Two patients were however found to have neutrophilic pleocytosis. Evidence shows that atypical findings in CSF do not rule out tuberculous meningitis.[13] AFB smear was found positive in two patients only (3.8%) which correlates well with other local studies.[10,11] The reason for low yield may be the small quantity of CSF which is usually taken. The findings of neuroimaging studies in our patients revealed the most common finding to be meningeal enhancement, usually basal. Most of other studies however have described hydrocephalus as the most frequent finding.[9-14] MRI showed even more findings in cases where CT scan results were suspicious especially in case of meningeal enhancement or tuberculomas. In literature most of the hydrocephalus associated with TBM is non-communicating type but communicating hydrocephalus has been seen in upto 26.9% in some studies.[11] However, studies from India report otherwise.[12] To the best of our knowledge none of the local studies in Pakistan have reported the frequency of both types of hydrocephalus in TBM.[10,11]

Evidence has shown that steroids reduce mortality when administered as an adjunct to anti-tuberculous therapy.[14-17] In our study all the patients were treated similarly. This study revealed an overall mortality of 21.1% in total with eight in-hospital deaths and three deaths during follow-up. Mortality in all local studies range from 20% to 25%[16] while in studies abroad it

ranges from 6.9% - 77%.[18,19] This is probably due to the fact that tuberculosis is more common in our community and a high index of suspicion among our physicians in tertiary care setup for early detection of tuberculosis is required. Mortality rate of extra pulmonary TB is dependent on site, stage of disease, degree of resistance of mycobacterium and other factors. The referred studies where mortality was high is not due to their low index of suspicion but must be accounted by other factors like extensive disease, GCS state, critical care facilities for patients, multi drug resistant (MDR) or extensively drug resistant (XDR) cases and delayed presentation. Regarding predictors of mortality, study by Queshi et al has revealed age >60 years and use of mechanical ventilation to be the sole independent predictor of mortality.[16] This study reveals use of mechanical ventilation to be the most determining factor of mortality in TBM.

CONCLUSION

Tuberculous meningitis is a frequently reported problem in our part of the world. Hydrocephalus is a common complication. Whenever suspected, CT scan should be repeated for hydrocephalus and VP shunting planned if necessary to reduce hydrocephalus. Most common predictors of mortality include mechanical ventilation followed by advanced age and presence of hyponatraemia. All patients should be assessed for the presence of these risk factors to prognosticate outcome and to enhance management.

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