



ETIOLOGICAL FACTORS OF HYPONATREMIA AMONG – HOSPITALIZED DIABETIC PATIENTS – A RETROSPECTIVE STUDY

Dr. Nandakumar . C

(DNB), Assistant professor , Department of General Medicine. Shri Sathya Sai Medical College and Research Institute, Ammapettai Kanchipuram Tamilnadu, India.

Dr. Divya. J*

(M.D).Assistant professor. Department of pathology. ACS Medical college , Velappanchavadi, Tamilnadu, India. *Corresponding Author

ABSTRACT

Introduction-Hyponatremia is one of the most common electrolyte abnormality observed among hospitalized patients along with co morbid illnesses

Objective-The objectives of the study was to determine the common etiological factors of hyponatremia among hospitalized patients with diabetes.

Subjects and Methods- The study was done over a period of one year , 100 consecutive diabetic patients who were admitted in the department of internal medicine were taken up for the study and analysed.

Results and conclusion- The study was conducted among 100 diabetic patients who were found to have hyponatremia .It was found that the mean age group among patients with hyponatremia was 57 years. The minimum and the maximum age were found to be 23 years and 88 years respectively. In our study the majority of them were male patients . (63.3%). and the females were 36.7%. The most common etiological factor among diabetic patients was salt losing nephropathy.(41.7%)

KEYWORDS : Hyponatremia, SIADH, Nephropathy.

INTRODUCTION

Hyponatremia is defined as serum sodium < 135 mEq/ L. Hyponatremia is a common electrolyte abnormality observed in hospitalized patients¹ The incidence is more among patients with co morbid conditions with diabetes patients. Diabetes is found to have increased frequency of hyponatremia. Hyponatremia is usually underdiagnosed and management is often inadequate. Hyponatremia frequently indicates underlying severe illnesses therefore it has been recognized as an indicator of poor prognosis in several diseases².

The etiological factors of hyponatremia vary widely from hospital to hospital. The over all prevalence of hyponatremia among admitted patients have been reported any where between 2.5-4.5%³. Glucose being an osmotically active molecule, the variation of serum glucose will affect the serum sodium directly. It has been calculated that serum sodium falls by 1.5 to 2.4mmol/L⁴ for every 5mmol rise of blood glucose.

AETIOLOGY OF HYPONATREMIA

Aetiology of hyponatremia depend on the plasma osmolality ..plasma osmolality is calculated by below mentioned formula - $2(\text{Na}) + \text{blood glucose}/18 + \text{blood urea nitrogen}/2.8$ The normal plasma osmolality ranges between 270-290 mosm/kg.

Based on the plasma osmolality patients with hyponatremia are categorized as hypertonic ,isotonic and hypotonic variants⁵. The above categories will give us the etiological factors of hyponatremia .

The volume status is also equally important to diagnose patients with low plasma osmolality status , to diagnose the varied aetiological factors among patients with hyponatremia.

In addition to the feature associated with extracellular volume reduction and expansion as described above there are clinical manifestations due to hyponatremia perse. The severity of hyponatremic symptoms depend upon both the absolute serum sodium concentration and its rate of fall. ⁶ Chronic mild hyponatremia is often totally asymptomatic.

METHODOLOGY

Study design- Retrospective and prospective study
This study was conducted in the Department of Internal medicine in Ammapettai, at Shri Sathya Sai Medical College and Research Institute.

All the patients who were above 15 years of age were admitted in the Department of Internal medicine during the period from 1.3.2018 till date after applying the inclusion and exclusion criteria were taken up for this study.

INCLUSION CRITERIA

All the patients with diabetes above 15 years of age admitted during the period from 1.3.18 till date

EXCLUSION CRITERIA

Patients less than 15 years ,Non diabetic patients ,Patients with surgical illness, Head injury patients ,Post operative patients,Patients admitted in critical care ,Patients with incomplete medical records.

A detailed history was obtained and a thorough examination was done on 100 patients, who were already diagnosed to have diabetes. An informed consent was obtained from the patients and blood samples were collected from the patients for relevant investigations. Investigations were done as per protocol, base line random blood sugar , blood urea, serum creatinine, serum electrolytes ,urine osmolality, and urine sodium were done.

RESULTS

A total number of 100 patients were analyzed.in this study

Table I - Age Distribution Of Patients With Diabetic Hyponatremia Among Different Age Groups

AGE GROUP	NO OF PATIENTS	PERCENTAGE
<35 YEARS	02	5.8
35-55 YEARS	35	33.4
ABOVE 55 YEARS	63	60.8
TOTAL	100	100

A majority of our patients were above 55 years of age (60.8%) , one third of patients were in the age group between 35 to 55 years (33.4%) only a few patients were below 35 years of age

Pie Chart 1 Age Distribution Of Patients With Diabetic Hyponatremia Among Different Age Groups

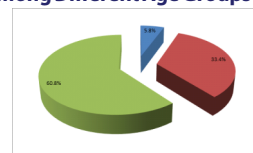


Table 2- Gender Distribution Of Patients With Diabetic Hypo natremia

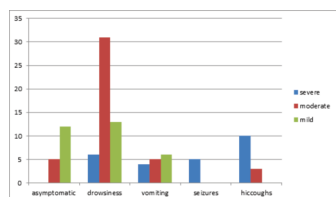
GENDER	NUMBER OF PATIENTS	PERCENT
FEMALE	34	36.7
MALE	66	63.3
TOTAL	100	100

In our study nearly two thirds were male patients which was 63.3 % and just one third were female patients which was 36.7 %. (Table 2)

Table- 3 Correlation Between Symptoms And Severity Of Hypo natremia

SYMPTOMS	SEVERE <115mEq/L	MODERATE 115-124mEq/L	MILD >125mEq/L
ASYMPTOMATIC	0	5	12
DROWSINESS	6	31	13
VOMITING	4	5	6
SEIZURES	5	0	0
HICCOUGHS	10	3	0
TOTAL	25	44	31

Chart 1 Correlation Between Symptoms And Severity Of Hypo natremia



Among patients with mild hyponatremia one third were asymptomatic. One third of severe hyponatremic patients had seizure , however one third of severe and two thirds of moderate hyponatremia had drowsiness (table 3)

Table 4- Different Etiologies Of Hyponatremia Among Patients With Diabetes

DIAGNOSIS	NO OF PATIENTS	PERCENTAGE
DILUTIONAL	10	10
ENDOCRINE	6	6
SIADH	35	35
SALT LOSING	41	41
GI LOSS	8	8
TOTAL	100	100

Among diabetic patients salt losing nephropathy and SIADH were the leading factors contributing for the etiology of hyponatremia , which was about 35 % of among the total number of patients in our study (table 4)

Pie Chart- 2 Different Etiologies Of Hyponatremia Among Patients With Diabetes

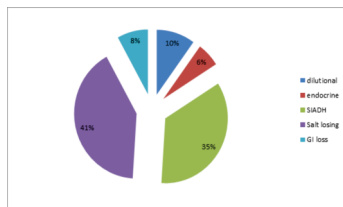


Table 5 Drug Used Among Diabetic Patients

DRUGS	NO OF PATIENTS	PERCENTAGE
DIURETICS	41	44
ACE IINHIBITORS	32	30
DIURETICS + ACE INHIBITORS	27	26
TOTAL	100	100

DISCUSSION

This is a retrospective study designed to analyse the various

etiological factors among diabetic patients with hyponatremia. A total of 100 patients were analysed in this study

Out of 100 diabetic hyponatremic patients the majority were in the age group of more than 55 years. In our study and most of the other studies hyponatremia was common in elderly ^{7,8}..The elderly were more likely to have other comorbid conditions that predispose to hyponatremia, they are also more likely on drugs such as Diuretics, ACE-I and other medications which may further contribute to hyponatremia ^{9,10}.

Male preponderance was noted, many similar studies have also concluded the same ^{11,12}, however many studies have concluded that gender is not an important risk factor for hyponatremia ¹³

A majority of our patients had mild to moderate hyponatremia, only one fourth of our patients had severe hyponatremia. However among patients with severe hyponatremia two thirds of patients were in the age group of more than 55 years. Several studies have reported that increasing age itself is a strong independent risk factor for hyponatremia ^{14,15}.

Nearly one fifth of our patients were asymptomatic . Drowsiness was the most common symptom in our study. Patients with more severe degree of hyponatremia were more likely to be symptomatic, seizures was seen in severe hyponatremia.. Many studies have also been reported the same ¹⁶

Among the diabetic patients salt wasting nephropathy was the commonest cause of hyponatremia,(as many patients had mild to moderate renal impairment) .The next common cause was SIADH SIADH among diabetic patients in vast majority were due to drug induced , since all the diabetic patients were on Diuretic or ACE.I therapy or both. Many studies have been reported that diabetic patients have hyponatremia possibly due to associated renal failure and drug induced SIADH ^{17,18}.

CONCLUSION

Hyponatremia is common in elderly..Severity of hyponatremia becomes more as age advances Patients with moderate to severe hyponatremia were more likely to be symptomatic Drowsiness is the common symptom. Seizures are present in severe hyponatremia.

The commonest cause of hyponatremia among diabetic patients was salt wasting nephropathy and closely followed by SIADH . In diabetic patients with SIADH drug induced is the commonest cause of SIADH. Diuretics , ACE-I and both were the commonest cause of drug induced SIADH.

ABBREVIATIONS

SIADH- Syndrome of inappropriate secretion of Anti Diuretic Hormone , ACE-I Angiotensin converting enzyme inhibitor,-GI-Gastrointestinal

REFERENCES

- DeFronzo RA. Hyperkalemia and hyporeninemic hypoaldosteronism. *Kidney Int* 1980; 17: 118-134 [PMID: 6990088]
- Cada DJ, Ingram KT, Leiven TL, Baker DE. Canagliflozin. *Hosp Pharm* 2013; 48: 855-867 [PMID: 24421439 DOI: 10.1310/hpj4810-855]
- Arruda JA, Battle DC, Sehy JT, Roseman MK, Baronowski RL, Kurtzman NA. Hyperkalemia and renal insufficiency: role of selective aldosterone deficiency and tubular unresponsiveness to aldosterone. *Am J Nephrol* 1981; 1: 160-167 [PMID: 6758577]
- Oxlund Cs, Henriksen JE, Tarnow L, Schousboe K, Gram J, Jacobsen IA. Low dose spironolactone reduces blood pressure in patients with resistant hypertension and type 2 diabetes mellitus: a double blind randomized clinical trial. *J Hypertens* 2013; 31: 2094-2102 [PMID: 24107738 DOI: 10.1097/HJH.0b013e3283638bla]
- Raebel MA, Ross C, Xu S, Roblin DW, Cheetham C, Blanchette CM, Saylor G, Smith DH. Diabetes and drug-associated hyperkalemia: effect of potassium monitoring. *J Gen Intern Med* 2010; 25: 326-333 [PMID: 20087674 DOI: 10.1007/s11606009-1228-x]
- Van den Driessche A, Eenkhoorn V, Van Gaal L, De Block C. Type 1 diabetes and autoimmune polyglandular syndrome: a clinical review. *Neth J Med* 2009; 67: 376-387 [PMID: 20009114]
- Pham PC, Pham PM, Pham SV, Miller JM, Pham PT. Hypomagnesemia in patients with type 2 diabetes. *Clin J Am Soc Nephrol* 2007; 2: 366-373 [PMID: 17699436 DOI: 10.2215/CJN.02960906]

8. Liamis G, Liberopoulos E, Alexandritis G, Elisaf M. Hypomagnesemia in a department of internal medicine. *Magnes Res* 2012; 25: 149-158 [PMID: 23261516 DOI: 10.1684/mrh.2012.0325]
9. Svare A. A patient presenting with symptomatic hypomagnesemia caused by metformin-induced diarrhoea: a case report. *Cases J* 2009; 2: 156 [PMID: 19946527 DOI: 10.1186/1757-1626-2-156]
10. Paolisso G, Sgambato S, Passariello N, Giugliano D, Scheen A, D'Onofrio F, Lefebvre PJ. Insulin induces opposite changes in plasma and erythrocyte magnesium concentrations in normal man. *Diabetologia* 1986; 29: 644-647 [PMID: 3539681]
11. Matsumura M, Nakashima A, Tofuku Y. Electrolyte disorders following massive insulin overdose in a patient with type 2 diabetes. *Intern Med* 2000; 39: 55-57 [PMID: 10674850]
12. Bauza J, Ortiz J, Dahan M, Justiniano M, Saenz R, Velez M. Reliability of serum magnesium values during diabetic ketoacidosis in children. *Bol Asoc Med P R* 1998; 90: 108-112 [PMID: 10224681]
13. Liamis G, Milionis HJ, Elisaf M. Medication-induced hypophosphatemia: a review. *QJM* 2010; 103: 449-159 [PMID: 20356849 DOI: 10.1093/qjmed/hcq039]
14. Kroll MH, Elin RJ. Relationships between magnesium and protein concentrations in serum. *Clin Chem* 1985; 31: 244-246 [PMID: 3967355]
15. Corsonello A, Ientile R, Buemi M, Cucinotta D, Mauro VN, Macaione S, Corcia F. Serum ionized magnesium levels in type 2 diabetes with microalbuminuria or clinical proteinuria. *Am J Nephrol* 2000; 20: 187-192 [PMID: 10878399 DOI: 10.1159/000013582]
16. Pham PC, Pham PM, Pham PA, Pham SV, Pham HV, Miller JM, Yanagawa N, Pham PT. Lower serum magnesium levels are associated with more rapid decline of renal function in patients with diabetes mellitus type 2. *Clin Nephrol* 2005; 63: 429-436 [PMID: 15960144]
17. Sakaguchi Y, Shoji T, Hayashi T, Suzuki A, Shimizu M, Mitsumoto K, Kawabata H, Niihata K, Okada N, Isaka Y, Rakugi H, Tsubakihara Y. Hypomagnesemia in type 2 diabetic nephropathy: a novel predictor of end-stage renal disease. *Diabetes Care* 2012; 35: 1591-1597 [PMID: 22498805 DOI: 10.2337/dc12-0226]
18. Weisinger JR, Bellorin-Font E. Magnesium and phosphorus. *Lancet* 1998; 352: 391-396 [PMID: 9717944 DOI: 10.1016/S0140-6736(97)10535-9]
19. Barbagallo M, Dominguez LJ. Magnesium metabolism in type 2 diabetes mellitus, metabolic syndrome and insulin resistance.