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A Study of Electrolyte Imbalance in Diabetic Patients at a Teritary Care Hospital in Kerala

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ABSTRACT

Introduction: most of the diabetic patients will be having many complications and other co-morbidities. They often require multiple drugs for treatment. Diabetes mellitus itself, its complications and various medications all are related to development of electrolyte imbalance, which are often under-estimated or remain un-diagnosed.

Objectives: to assess the pattern of electrolyte imbalance in diabetic patients

Method: This clinical study was done in the Department of general Medicine, Believers Church Medical College Hospital, Thiruvalla during 2016-17. Data were collected by random sampling from the first 100 adult diabetic patients with electrolyte imbalance, irrespective of their cause of admission.

Results: Total number of patients were 125, male were 89 and female were 36. Mean age was 61.18 years with standard deviation of ± 13.15 years (Range 38- 80 years). Among the patients, the mean duration of the diabetes mellitus was 10.06 years with standard deviation ± 7.05 years. Over all 73% of patients had some sort of electrolyte imbalance, irrespective of cause of admission. Hyponatraemia was the most common electrolyte imbalance in this study (75%), followed by hypomagnaesemia (35%), hypokalaemia (32%) and hyperkalaemia (13%). In 10% cases there were hyponatraemia, hypokalaemia and hypomagnaesemia.

Conclusion: it can be concluded that, electrolyte imbalance is common in diabetic patients. Serum electrolytes should be checked regularly in diabetic patients irrespective of their purpose of admission.

Keywords: *Diabetes Mellitus, electrolyte imbalance, Hyponatraemia*

INTRODUCTION

Diabetes mellitus (DM) is rapidly emerging as an important cause of mortality and morbidity in developing countries[1] . It is an established risk factor for coronary heart disease (CHD), stroke and end-stage renal disease (ESRD). Diabetic nephropathy is one of the complications of diabetes mellitus, which ultimately leads to renal failure and renal failure is a cause of electrolyte imbalance among hospitalized diabetic patients; other causes are diarrhea, vomiting, diuretic use and chronic laxative use. The most common electrolyte imbalance is hyponatraemia, others are hypokalaemia, hypomagnesaemia and hyperkalaemia. Hyponatraemia, defined as a plasma sodium concentration hyponatraemia is usually due to hyperglycemia. Relative insulin deficiency causes myocyte to become impermeable to glucose. Therefore, during poorly controlled diabetes mellitus, glucose is an effective osmole and draws water from muscle cells resulting in hyponatraemia. Potassium is the principal intracellular cation and maintenance of the distribution of potassium between the intracellular and the extracellular compartments relies on several homeostaticmechanisms; when these mechanisms are perturbed, hypokalemia or hyperkalemia may occur [2-5] .

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So this study aimed to evaluate the pattern of electrolyte imbalance in diabetic patients

METHOD

This prospective study was carried out in the Department of Medicine of Believers Church Medical College Hospital ,Thiruvalla with an aim to see the pattern of electrolyte imbalance in hospitalized diabetic patients and to identify the etiological factors. Ethical committee approval was obtained before the start of the study . The study was done during the year 2016-17. Data were collected by random sampling method, through a semi-structured data collection sheet. The first 125 adult diabetic patients who were found to have electrolyte imbalance, in medical ward were included in the study. Patients with advanced renal failure (serum creatinine more than 5mg/dl), those with normal serum electrolytes, those taking electrolyte supplements and those unwilling to be included in the study were excluded. All the data were compiled and appropriate statistical analyses were done.

RESULTS

Total number of patients were 125, male were 89, female were 36, the male and female ratio was: 2.85:1. The mean age was 60.18 years with SD ± 12.15 years, ranging from 38 to 90 years. Among the study subjects, the mean duration of DM was 10.96 years with SD ± 8.05. Regarding treatment, 83 (83%) of the study subjects were on insulin therapy, 22 (22%) were on oral hypoglycemic agents and 6 (6%) were on medical nutrition therapy. Among the 125 study subjects, 71 (61%) had hypertension (HTN), 34 (24%) had ischemic heart diseases (IHD), 23 (21%) had renal diseases, 10 (8%) had dyslipidemia and 4 (4%) had liver diseases . Of the 125 study subjects, 61 (49%) had diabetic nephropathy, 39 (31%) had diabetic neuropathy and 25 (20%) had diabetic retinopathy (Table I). Among the 125 study subjects, 30 (20%) had normal sodium level and 95(80%) had hyponatremia . The mean sodium level was 127.47 mmol/L with SD ± 8.11 ranging from 110.0mmol/L to 144.0 mol/L. Of the 125 study subjects, 36 (29%) had hypokalemia, 70 (56%) had normal potassium level and 19 (15%) had hyperkalemia . The mean potassium level was 3.98 mmol/L with SD ± 1.13 ranging from 1.80 mmol/L to 7.10 mmol/L. Among the 125 study subjects, 43 (34%) had hypomagnesemia and 82 (65%) had normal magnesium level. The mean magnesium level was 0.76 mmol/L with SD ± 0.21 ranging from 0.40 mmol/L to 1.20 mmol/L .

Table 1: List of diabetic patients with complications

Diabetic complications	Number (percentage)
Diabetic Nephropathy	61(49%)
Diabetic Neuropathy	39(31%)
Diabetic retinopathy	25(20%)

DISCUSSION

It was found that 78% of the hospitalized diabetic patients had electrolyte imbalance, hyponatraemia being the most common (80%). Other studies have also shown that hyponatraemia is common in hospitalized patients and increase mortality [6-8]. Hyponatraemia can develop in hospital and it is preventable. Drug induced hyponatraemia is common in elderly females[9,10].Another study have also shown that hyponatraemia increases mortality irrespective of age, sex, cause and co-existing hypokalaemia [11]. No death occurred among our study subjects. Regarding potassium level, both hypo and hyperkalaemia were found. Hypokalaemia was present in 36 (36%) cases. Thiazide diuretics and vomiting were found as main precipitating causes in this study. In one study, hypokalaemia was found more common with indapamide and one-third of cases had concomitent hyponatraemia. Mortality of patients with hypokalaemia was found more, particularly in females than those having normal potassium level [12] . Other studies have also shown that mortality is more in hypokalaemic subjects [13,14] . Hyperkalaemia was present in 14% cases in our study. Renal impairment, ACE inhibitors, ARBs and spironolactone were the precipitating factors. In one study renal failure, drugs and hyperglycaemia precipitated hyperkalaemia in 77%, 63% and 49% cases respectively [15] .It was also stated that hyperkalaemia is associated with DM but the exact prevalence is lacking [16] . In our study 2 cases had ECG changes, but no fatality occurred. Serum magnesium level is often not routinely measured and hypomagnaesemia was found in 38% cases. In one study frequency was much higher, 63.3%[17]. In another study, prevalence was 42% in malnutrition related diabetes mellitus patients [18] .

CONCLUSION

From this study, it was found that hyponatraemia,

hypokalaemia and hypomagnaesemia were common electrolyte imbalance in hospitalized diabetic patients. Prevalence of hyperkalaemia was less common. Vomiting, diarrhea, various medications and renal impairment were the most common precipitating factors. The current study unravels the need for measuring serum electrolytes in hospitalized diabetic patients routinely and at regular intervals, particularly those having diabetic complications, other co-morbidities and those having polypharmacy. As it was a single center-based study and the study population was limited, larger multicentered studies are needed in future for policy adoption and implementation to reduce the burden of an important non-communicable disease like DM, as well as its associations and complications.

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REFERENCES

1. Zaman M M, Choudhury S R, Ahmed J, Numan S M, Islam S M, and Yoshiike N; Nonbiochemical risk factors for cardiovascular disease in general clinic-based rural population of Bangladesh. Journal of Epidemiology 2004; 14: 63-68.
2. Gary G.Singer. Electrolyte imbalance. In : Braunwald E, Fauci A, Kasper D, Hauser SL, Longo DL and Jameson JL, editors. Harrison's Principles of Internal Medicine. 16th ed. New York: McGraw-Hill. 2005: 255.
3. Kimberley J. Evans, Arthur Greenberg. Hyperkalaemia: A Review. Journal of Intensive Care Medicine 2005; 20(5):272-90 .
4. Gary G.Singer. Electrolyte imbalance. In: Braunwald E, Fauci A, Kasper D, Hauser SL, Longo DL and Jameson JL, editors. Harrison's Principles of internal medicine. 16th ed. New York: McGraw-Hill. 2005: 256-58.
5. Innerarity S. Hpoymagnesemia in acute and chronic illness. Crit Care Nurs Q. 2000 Aug; 23(2): 1-19.
6. Anderson RJ, Chung HM, Kluge R, Schrier RW. Hyponatremia: a prospective analysis of its epidemiology and the pathogenetic role of vasopressin. Ann Intern Med. 1985; 102: 164–68.
7. Chung HM, Kluge R, Schrier RW, Anderson RJ. Postoperative hyponatremia. A prospective study. Arch Intern Med. 1986; 146: 333–36.
8. Arieff AI. Acid-base, electrolyte, and metabolic abnormalities. In: Parrillo JE, Dellinger RP, editor. Critical Care Medicine: Principles of Diagnosis and Management in the Adult. 2. St. Louis: Mosby; 2002. pp. 1169–1203.
9. Adrogue HJ, Madias NE. Hyponatremia. N Engl J Med. 2000; 342: 1581–89.
10. Michael D Chapman, Ross Hanrahan, John McEwen and John E Marley. Hyponatraemia and hypokalaemia due to indapamide. The Medical Journal of Australia. 2002; 176 (5): 219-21.
11. Lee CT; Guo HR; Chen JB. Hyponatremia in the emergency department. Am J Emerg Med - 01-MAY-2000; 18(3): 264- 88
12. Lawson DH, Henry DA, Lowe JM, Gray JM, Morgan HG. Severe hypokalemia in hospitalized patients. Arch Intern Med. 1979 Sep; 139(9): 978-80.
13. Ora Paltiel. Management of Severe Hypokalemia in Hospitalized Patients. Arch Intern Med. 2001; 161: 1089-95. 14. Paice BJ. Record linkage study of hypokalaemia in hospitalized patients. Postgraduate Medical Journal 1986; 62:187-91.
15. Christopher G. Acker, John P. Johnson, Paul M. Palevsky, Arthur Greenberg. Hyperkalemia in Hospitalized Patients. Arch Intern Med. 1998; 158:917-24.
16. JarmanPR,KehelyAM,MatherHM.Hyperkalaemia in diabetes: prevalence and associations. Postgrad Med J. 1995 Sep; 71(839):551-52.
17. Haque WMM. Frequency of hypomagnesaemia in hospitalized diabetic hypokalemic patients. Dissertation for FCPS examination of BCPS, 2004.
18. Khan LA. Serum and urinary magnesium in young diabetic subjects in Bangladesh. Am J Clin Nutr, 1999; 69:70-73.