The effect of diabetic control on serum sodium disturbances in Salah Al-Deen general hospital

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Abstract

Background: Diabetes mellitus is regarded as a common disease that is highly accompanied with higher incidence of electrolyte disturbances. The aim of this study was to assess the effect of duration of type 2diabetes mellitus on the serum electrolyte disturbances in Salah Al-Deen General Hospital.

Patients and methods: This study is a descriptive case control study conducted in Consultancy Clinics of Salahaldin General hospital in Tikrit city through the period from 1st of October, 2017 to 28 of April 2018 on a convenient sample of 100 patients with type 2 diabetes mellitus and sample of 100 healthy controls. HbA1c test and serum sodium were assessed in both diabetic patients and controls.

Results: Poor glycemic control was observed among 84% of diabetic patients with a highly significant difference in HbA1c level between diabetic patients and healthy controls ($p<0.001$). There was a significant association between hypernatraemia and diabetic patients ($p<0.001$).

Conclusions: Hypernatraemia and hypocalcaemia are frequent clinical entities of type 2 diabetic patients.

Key words: DM, HbA1C, S. Sodium, s. electrolyte

Introduction

Hyperglycemia is the early complication of diabetes and the prominent risk factor for slow destruction of many body organs, mainly heart, eyes, blood vessels, nerves and kidneys. Raised blood glucose, a common effect of uncontrolled diabetes, may, over time, lead to serious damage to the heart, blood vessels, eyes, kidneys and nerves [1]. The demographic patterns of type 2 diabetic patients in Arab countries is obviously different from other developed and developing countries with a predominance of diabetes population in less than 60 years age group with decline in incidence curve toward younger age group. This higher prevalence is the outcome of accelerated increase in obesity prevalence with sedentary lifestyle of these populations [2]. The acquired disorders of electrolyte balance had poor prognosis although some of them are classified as mild [3]. The etiology of electrolyte distorted balances is commonly of a multi-factorial nature, many risk factors involved in the pathophysiology picture of electrolyte imbalances [4,5].

In Iraq, DM is an endemic disease with increasing incidence because of illiteracy, poor health educational, westernization of the dietary habits, sedentary lifestyle and economic transition, are all potentiating mortality and disability adjusted life years of diabetes mellitus in Iraq [6]. The electrolyte disturbances among Iraqi type 2 diabetic patients were frequent in emergency care centers and always correlated with poor glycemic control and abnormal lipid profile of patients [7]. Increased diabetes type 2 prevalence among the population with poor glycemic control represented a big burden on the national health system in Iraq[8]. This study aimed at assessing the effect of the type 2 diabetic control on the serum sodium disturbances in Salah Al-Deen General Hospital.

Patients and Methods

This study is a descriptive case control study conducted in Consultancy Clinics of Salah Al-Deen General hospital in Tikrit city from 1st October 2017 to 28th April, 2018. A convenient sample of 100 type 2 DM patients and 100 healthy controls were randomly selected. The data collection was carried out through direct interview by a questionnaire sheet. The patients were assessed by full history and clinical examination, confirmation of diagnosis, DM history, and duration. The results of each patient were taken on the same day and recorded in the questionnaire. The Spectrum kits were used for sodium (France). The kits used for HbA1c test were Stan Bio kits (USA). Normal limits of investigations; Serum sodium (135-145 mmol/L) [4]. Ethical approval was obtained from Salah Al-Deen General Hospital Directorate. A written oral informed consent was taken from the patients and controls.

Results

The present study included 100 diabetic patients with mean age of 53.1±11.6 years; (range 25-85 years); Female diabetic patients were more than male patients with female to male ratio as 1.4:1. No significant differences were observed between diabetic patients and healthy controls regarding age and gender. All these findings are shown in Table 1.

There was a highly significant difference in HbA1c level between diabetic patients and healthy controls ($p<0.001$), about 84(84%) of the diabetic patients had poor glycemic control versus none of the control group. All these findings are shown in Table 2.

Studying the serum electrolytes of diabetic patients showed that mean serum sodium was 143.1±5.4 mmol/L for diabetic patients in comparison to the controls (142.7±3.2). About 2% of patients had low serum sodium level while 33% of patients had high serum sodium level. All these findings are shown in Table 3 and Figure 1. There was a significant association between high serum sodium level among diabetic patients 33(33%) versus control 16(16%), ($p<0.001$). All these findings are shown in Table 3.

There was no significant correlation observed between normal or high serum sodium level of diabetic patients and each of patients' age, gender, BMI, HbA1c level, DM duration, smoking, HT history, anti-hypertensive drugs, anti-diabetic drugs, family history of DM and regular checking of RBS. All these findings are shown in Table 4.

Table 1: Distribution of diabetic patients and controls according to age and gender

Variable	Diabetics		Controls		P
	No.	%	No.	%	
Age					
Mean±SD (years)	53.1±11.6		54.3±7.3		0.4**
Gender					0.1*
Male	41	41	32	32	
Female	59	59	68	68	
Total	100	100	100	100	

*Chi-square test, ** Independent sample t-test.

Table 2: Distribution of BMI and HbA1c level according to Diabetics and Controls

Variable	Diabetics		Controls		P
	No.	%	No.	%	
HbA1c level					<0.001* S
Good glycemic control	16	16.0	100	100.0	
Poor glycemic control	84	84.0	0	-	
Total	100	100	100	100	

Table 3: Distribution of serum electrolyte levels according to diabetics and controls

Variable	Diabetics		Controls		P
	No.	%	No.	%	
Serum sodium					
Low	2	2	0	-	
Normal	65	65	84	84	0.006*S
High	33	33	16	16	
Total	100	100	100	100	
Mean±SD (mmol/L)	143.1±5.4		142.7±3.2		0.5** NS

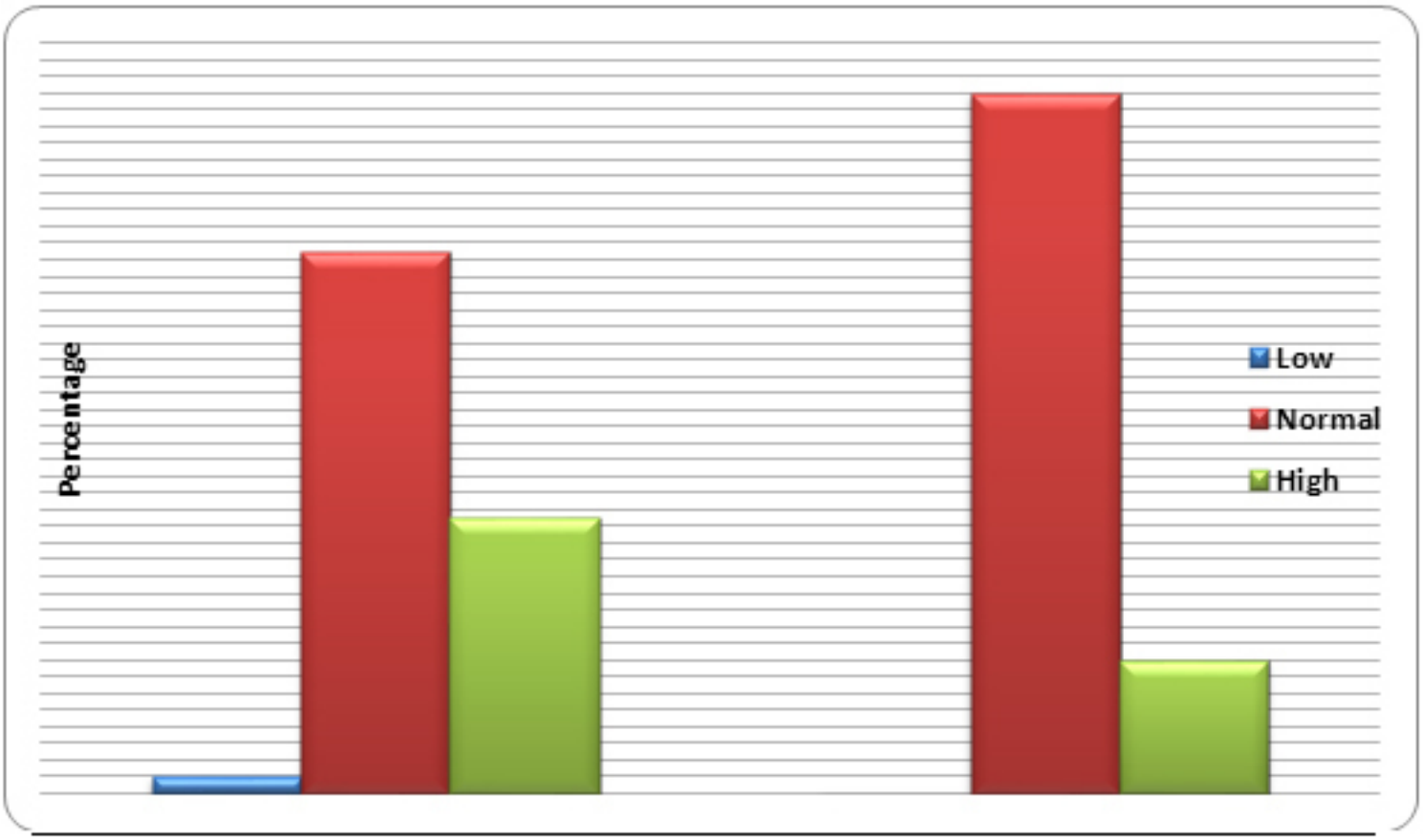
* Fishers exact test, ** Independent sample t-test, *** Chi-square test, NS=Not significant, S=Significant.

Table 4: Correlations between study variables and serum sodium of diabetic patients.

Variable	Serum sodium	
	r	P value
Age	0.002	0.9 NS
Gender	0.07	0.4 NS
BMI	0.1	0.06 NS
HbA1c	-0.03	0.7 NS
DM duration	-0.1	0.2 NS
Smoking	0.08	0.3 NS
HT history	-0.08	0.4 NS
Anti-hypertensive drugs	0.01	0.8 NS

NS Not significant.

Figure 1: Distribution of serum sodium according to diabetics and controls



Discussion

The studied type 2 diabetic patients had mean age of 53.1±11.6 years with predominance of female gender. This finding is close to results of Nassar et al's [9] study in Iraq which included 336 type 2 diabetic patients in Al-Faiha Specialized Diabetes, Endocrine and Metabolism center in Basrah city and found that mean age of them was 54.4 years with predominance of female gender. In the current study, mean BMI of type2 diabetic patients was 28.1±4.4 Kg/m2; 79% of them were overweight and obese.

The HbA1c level of diabetic patients in the present study was significantly higher than HbA1c level of controls ($p<0.001$), with 84% of diabetic patients having poor glycemic control. This poor glycemic control proportion is higher than that reported by Mansour's study in Iraq as 76.7% of diabetic patients who presented to diabetes center in Basrah city had poor glycemic control (≥7% HbA1c) [10].

The current study finding is also higher than results of Al-Rowais' study [11] in Saudi Arabia which measured the glycemic control among type 2 diabetic patients who attended the diabetic center of a tertiary hospital and found that 60% of them had poor glycemic control. This higher proportion of poor glycemic control in the present study might be due to different reasons like high prevalence of obesity, irregular monitoring and treatment of diabetes in addition to bad security and political situations in Salahaldin province which made disconnection and inappropriate follow up of diabetic patients. McBrien et al's study in Canada found that absence of patients' confidence and poor social support by health care staff are the main barriers of good glycemic control [12]. In Iraq, the common barriers of good glycemic control were long DM duration, lack of self-monitoring of blood glucose and obesity of diabetic patients [6].

The present study showed that 33% of diabetic patients had high serum sodium level while 16% of controls had high serum sodium level with a significant difference ($p=0.006$). This finding is consistent with results of Liamis et al's study in Greece which included 113 patients with diabetes and found that 34.5% of them have hypernatremia [13]. This hypernatremia is caused by osmotic diuresis in which the water loss is insufficiently replaced [13]. Inconsistently, Wang et al's [14] study in China found a significant decrease in both serum levels of sodium and magnesium among diabetic patients in comparison to normal healthy controls. The hypernatremia is proved to be the prevalent electrolyte disturbance with high incidence rate of 1-3% and high death rates of 40-60% all over the world [15]. Many authors documented that Hypernatremia had higher prevalence rates among older populations and among patients with metabolic diseases complications like DM [15,16].

Although the present study findings reported the hypernatraemia, Palmer et al's [17] study in USA stated that the common presentation of sodium level abnormalities among diabetes mellitus patients were as hypernatremia due to high osmotic flow of water and higher dilution effect. They also reported that in some cases (like in this study) with poor replacement of water loss, the osmotic diuresis leads to hypernatremia [17].

Conclusions

Concerning the result of this study, it indicates hypernatremia are frequent clinical entities of type 2 diabetic patients. Poor glycemic control prevalence among type2 diabetic patients in Salahaldeen is high, affecting the S. Sodium and may lead to further metabolic complications, therefore Salahaldeen is in urgent need for implementation of a diabetic clinic program.

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