CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.3232982

Available online at: http://www.iajps.com Research Article

A CROSS SECTIONAL STUDY TO OBSERVE THE RATE OF ELECTROLYTE DISPARITY WITH THE EXISTENCE OF MAGNESIUM, POTASSIUM, CHLORIDE AND SODIUM INTENSITIES IN CASES WITH UNBALANCED DIABETES

[*]Dr Muhammad Tariq Zarkoon, *Dr Tayyaba Urooj, *Dr Elahi Bakhsh

*Quaid-e-Azam Medical College, Bahawalpur

Article Received: March 2019 **Accepted:** April 2019 **Published:** May 2019

Abstract:

Objective: We aimed in this analysis to observe the rate of electrolyte disparity with the existence of magnesium, potassium, chloride and sodium intensities in cases with unbalanced diabetes.

Study design: An expressive type of cross-sectional analysis.

Place and Duration: This analysis was conducted in the Medicine Department of Bahawal Victoria Hospital, Bahawalpur for a period of one year from January 2018 to January 2019.

Methodology: Number of 181 enrolled and OPD patients of unbalanced high blood sugar with the value of HbA1c above than a percentage of 7.0 % were sorted in this analysis and their list of more than one disease, serum electrolyte intensities, fasting and random blood glucose, demographics, medicine literature and microvascular complexities were stated.

Results: Reduction in intensities of serum sodium and chloride were examined to be maximum definite according to statistics where the value of P was minimum than or equal as 0.05 whereas the level of magnesium and potassium presented indefinite values in the patients of unbalanced diabetes mellitus (DM). intensity of sodium for microalbumin was almost examined to refusing along raising of form of urine.

Conclusion: Disparity of electrolyte is usually existed in patients with un-balanced diabetes so serum electrolytes must be evaluated on daily bases in patients of type 2 diabetes mellitus (DM). For the observation of electrolytes, serum blood glucose could be processed.

KEYWORDS: Hyperglycemia, Electrolyte imbalance, Fasting blood glucose, Diabetes mellitus (DM).

Corresponding author:

Muhammad Tariq Zarkoon,

Quaid-e-Azam Medical College, Bahawalpur

QR code

Please cite this article in press Muhammad Tariq Zarkoon et al., ***A Cross Sectional Study To Observe The Rate Of Electrolyte Disparity With The Existence Of Magnesium, Potassium, Chloride And Sodium Intensities In Cases With Unbalanced Diabetes.,*** *Indo Am. J. P. Sci, 2019; 06(05).*

INTRODUCTION:

High blood sugar is recently the most usual disease that is not infectious directly from one person to another and globally viral. From the year 1980 to 2014 the number of diabetic patients is increased from 108 million to 422 million respectively. The universal occurrence of high blood sugar in grownups having age above 18 years is increased with the percentage of 4.7 % to 8.5 % from the year 1980 to 2014 respectively [1]. Occurrence of high blood sugar is increasing frequently central and non-progressive countries. High blood sugar is a main influence of lower limb amputation, heart attacks, stroke, blindness and kidney failure [2.3].

An approximated number of 1.5 million mortalities were happened straightly because of high blood sugar and number of 2.2 million mortalities were caused due to hyperglycemia within the year 2012. Approximately ½ of mortalities were happened before the 70 years of age because of diabetes. The 7th associative influence of mortality in the year 2030 as an observation by WHO would be due to high blood sugar. In the world there are above than number of 425 million diabetic people and almost number of 38.7 million in Middle East and North Africa Zone would increase to 82 million by the year 2045. In Pakistan there were number of 7.5 million of high blood sugar patients by the year 2017 [4]. Electrolytes play a vital act in various body mechanism like it helps to balance acid base, maintain body fluid, nerve conduction, muscle contraction and membrane potential. Modifications in electrolytes homeostasis could direct physiologic diseases. Medicine used for diabetic patients presented to activate Na ± / K ± -ATPase activity by minimum sodium and potassium metabolism as an outcome and therefore pass across bio-membranes and in delayed monosaccharide approved through intestinal epithelia comes up. The hyperglycemia influence glucose caused osmotic diuresis with maximum loss of fluids of body and electrolytes in high blood sugar mellitus [5].

The intensities of electrolytes in high blood sugar mellitus in various countries were evaluated through various analysis and presented the relativity among electrolytes and hyperglycemia [6]. Matching of glibenclamide and metformin and mixture of these both for the observation of the influence on electrolyte disparity was performed by Javaid A et al in an analysis of him and observed that minimum sodium and maximum potassium was found in all these patients with indefinite variation [7]. Minimal intensities of electrolytes that are phosphorus, magnesium, calcium, chloride, potassium and sodium were observed in an analysis by Yasmin et al [8]. This analysis was processed to check the electrolyte disparity in case of unbalanced DM in our number of people as this analysis was conducted in Pakistan because maximum of these analyses was carried out in western countries consisting of various genetics and race so as per our knowledge only two analyses with reference number 7 and 8 were carried out in Pakistan.

METHODS:

An expressive type of cross-sectional analysis. This analysis was conducted in the Medicine Department of Bahawal Victoria Hospital, Bahawalpur for a period of one year from January 2018 to January 2019. Number of 181 enrolled and OPD patients of unbalanced high blood sugar with the value of HbA1c above than a percentage of 7.0 % were sorted in this analysis and their list of more than one disease, serum electrolyte intensities, fasting and random blood glucose, demographics, medicine literature and microvascular complexities were stated. Value of samplings evaluated through WHO sample size evaluator by carrying on the confidence interval (CI) and margin of error equal to the percentage of 95.0 % and 5.5 % respectively and predicted the occurrence of electrolyte disparity as a percentage of 18.7 % in the earlier analysis [9].

The patients with both sexes, having HbA1c of above than or equal to the percentage of 6.5 %, having type 2 diabetes mellitus, having age above than or equal to 30 years, diagnosed through various oral hypoglycemic representatives and insulin regiments for minimum one year and more that are observed on medical records and history were sorted out by non-possibility of consecutive samples of wards and outpatient department [10]. Patients were entitled as un-balanced DM with HbA1c of above than or Equal to a percentage of 7.0 % [11]. The information was gathered on standardized written agreement form by post graduate trainees and house officers of Internal Medicine Department after getting the informed statements from the patients. The differences were consisting of medication history which were calcium channel antagonists, insulin, oral hypoglycemic representatives and beta blockers, fasting blood glucose, period of DM, Urine for microalbumin, intensities of electrolytes, MR number, gender, age, disease rate of patients, weight, height and demographics of patients. High blood sugar neuropathy was examined through 10 g of Semmes-Weinstein Monofilament. It was observed through the impression of pressure by processing the buckling 10 g monofilament on selective areas of foot and asked

from the patient to answer in yes or no [12]. Fundus examination which was conducted by an ophthalmologist was used to treat the High blood sugar retinopathy. Patients regardless of score of retinopathy as proliferative high blood sugar retinopathy, non-proliferative high blood sugar retinopathy and macular edema were sorted live existence of high blood sugar retinopathy. High blood sugar nephropathy was observed through measuring the urine to evaluate the intensity of microalbumin, intensities of microalbumin above than 30 mg in a duration of 24 hours urinary protein collection were sorted to have high blood sugar nephropathy [13].

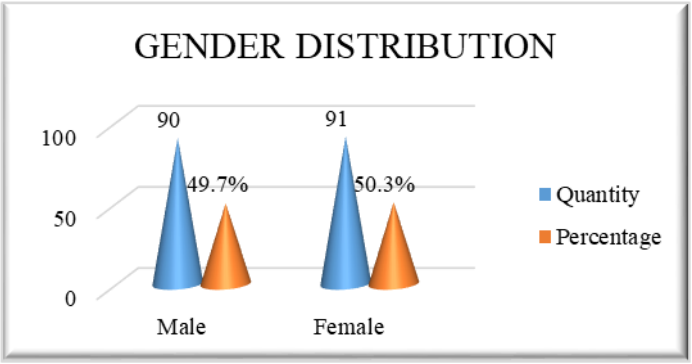
The steroids, ACE inhibitors, renal tubular acidosis, connective tissue disorders, patients previously having diuretics, type 1 high blood sugar patients, handicapped, pregnant, disabled, Addison's ailment, malabsorption syndrome, Cushing and Conn's syndrome and hepatic failure or renal failure cases were not included in this analysis. This analysis was verified by Ethical Committee of Services Hospital, Lahore. The information of patients was studied through SPSS 20. The details of Age, BMI, intensities of electrolyte and Urine for microalbumin was shown as average by SD and median by Range values. Linear regression study was processed for the prediction of intensities of electrolytes by the help of fasting blood glucose, design was almost settled for BMI, Age and gender. Scatter plot graphs were shown to present the trend among fasting blood glucose and electrolytes. The Values of P was lower than or equal to 0.05 suggested to be definite according to statistics.

RESULTS:

Number of 181 patients were included through the current analysis from which number of 91 were female and number of 90 were male with the percentage of 50.3 % and 49.7 % respectively. 131 persons were having age group value of 46 years to 75 years with the percentage of 73.5 %. Group of more than one disease was stated and number of 20 patients were hypertensive with the percentage of 11.0 5 and Ischemic Artery Disease patients having hypertension were 10 with the percentage of 5.5 %. 16 patients have existence of retinopathy with the percentage of 8.8 % whereas number of 32 patients with the percentage of 17.7 % had neuropathy. Medicine literature shown that 21 patients with the percentage of 11.6 % were getting in the oral hypoglycemic representatives, 5 patients with the percentage of 2.8 % were calcium channel antagonists and number of 3 patients with the percentage of 1.7 % were on beta blockers. The information of quantitative parameters of analysis is presented in the following table number 01.

Table No 01: Basic characteristics of all selected patients

Characteristics		Quantity	Percentage
Gender	Male	90	49.70%
	Female	91	50.30%
Age Groups	30-45 Years	28	15.50%
	45-75 Years	133	73.50%
	> 75 Years	20	11%
Co-morbidity	None	151	83.40%
	Hypertension	20	11%
	Hypertension and ischemic heart disease	10	5.50%
Retinopathy	Present	16	8.80%
	Absent	165	91.20%
Neuropathy	Present	32	17.70%
	Absent	149	82.30%
Oral Hypoglycemic Agents	Yes	21	11.60%
	No	160	88.40%
Calcium Channel Antagonists	Yes	05	2.80%
	No	176	97.20%
Beta Blockers	Yes	03	1.70%
	No	178	98.30%
Insulin	Yes	24	13.30%
	No	157	86.70%



The outcomes presented that the average of age was 58.97 ± 12.75 years, the mean for the period of high blood sugar was 10.6 ± 7.3. Average of BMI was evaluated as 25.46 ± 5.61 kg per m^2, and average of fasting blood glucose was 179.6 ± 77.6. Averages of sodium, potassium, chloride and magnesium were 140.2 ± 6.1, 4.2 ± 0.53, 101.9 ± 5.9 and 1.9 ± 0.33 respectively between the electrolytes.

Table No 02: Basic parameters of all selected patients

Parameters	Mean	±SD
Age (years)	59	12.8
Duration of diabetes (years)	10.6	7.30
Weight	71	17.6
Height	162.5	10
BMI	25.5	5.60
Urine for microalbumin	42.3	63
FBS	179.6	77.6
Sodium	140.2	6.10
Potassium	4.20	0.53
Chloride	101.9	5.90
Magnesium	1.9	0.33

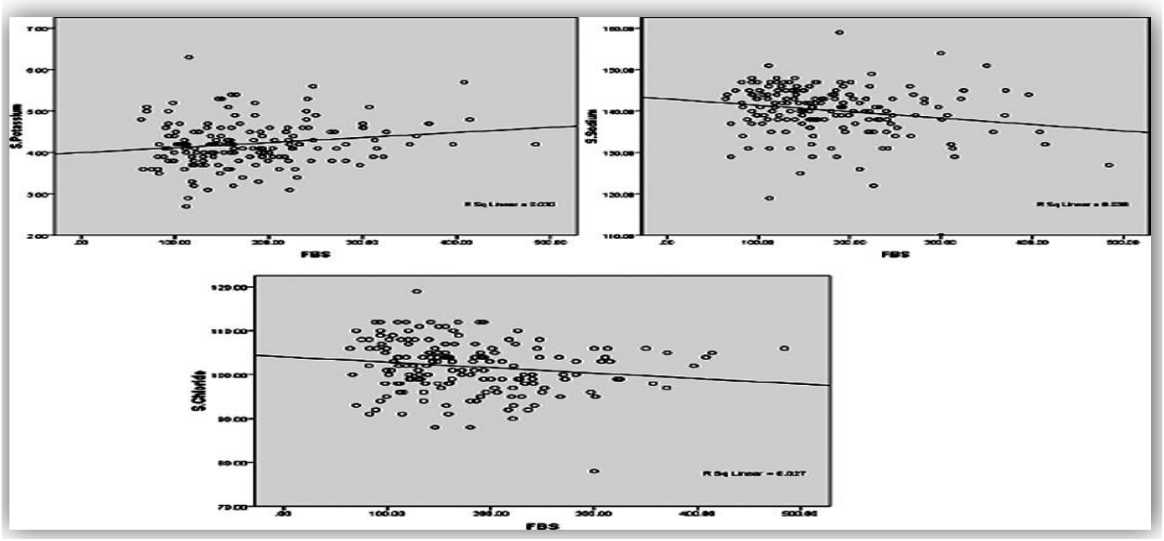
The regression model outcomes by beta coefficients and by 95.0 % CI, it was observed that fasting blood glucose differentiated opposingly by chloride and sodium whereas there was a positive inter-relevance among fasting blood glucose and serum potassium that a unit variation raise in fasting blood glucose places average of 0.02 decline in intensities of chloride and sodium and gives value of 0.01 unit raise in potassium through this analysis. There was no definite relativity observed with comorbidities consisting IHD and High blood pressure, medicine history, age and gender. The model r square for sodium, potassium and chloride with the percentages of 3.3 %, 2.6 % and 2.1 % respectively while magnesium has no definite influence of fasting blood glucose. More model was designed for BMI, age and gender to observe the influence of fasting blood glucose, the outcomes presented that serum sodium had instantly opposite influence on fasting blood glucose in the existence of BMI, gender and age whereas else electrolytes have indefinite influences on fasting blood glucose as shown in table number 03.

Table No 03: Linear regression modeling for estimation of serum electrolytes using FBS

Dependent Variables	Un-Adjusted Model	Adjusted Model**
Serum Sodium	-0.02* (-0.03, -0.01)	-0.03* (-0.04, -0.01)
Serum Potassium	0.01* (0.01,0.01)	0.01 (-0.01, 0.01)
Serum Chloride	-0.02* (-0.03, -0.01)	-0.01 (-0.03, 0.01)
Serum Magnesium	-0.02 (-0.03, -0.01)	0.01 (-0.01, 0.01)

*p<0.05 was considered significant.
**Model were adjusted for age, gender and BMI.
Predictor: FBS.

Linear trend of fasting blood glucose is presented in Figure no 01.



DISCUSSION:

Usually the electrolyte disparity is existed in patients with type 2 DM. The factor is mostly multifactorial but mostly outcomes through insulin shortage in high blood sugar ketoacidosis and hyperglycemia [14]. The current analysis presented definite decrease in intensities of serum chloride and sodium by raising fasting blood glucose and raise in intensities of serum potassium. Although, there was indefinite variation in intensities of serum magnesium. This reducing form of variation in intensities of serum sodium as fasting blood glucose raises mostly verified earlier analyzations like presented by an analysis processed in India by Parmar SK stated reduction in intensities of serum sodium and chloride as fasting blood glucose raised [15]. Osmotic diuresis is physiologically a good acknowledged factor of dysnatremia in high blood sugar patients. The intensities of serum sodium in patients with unbalanced high blood sugar changes in association with the equality among the hyperglycemia generated water displacement out of the cells that decreases sodium and the glucosuria generated osmotic diuresis which raises sodium. Raises in intensities of blood glucose extract water from cells of extracellular place directing towards hyponatremia [16]. Intensities of serum sodium almost presented opposite association with urine for intensities of microalbumin advising that like renal activity regrets intensities of serum sodium strive to reduce almost [17]. The startup of renal renin angiotensin system is accountable to progress the nephropathy of high blood sugar a main factor of last stage of renal ailment that is verified by Giacchetti et al [18]. The outcomes of analysis accomplished by Al

Jameil N in Zone of Saudi Arabia were same as our analysis in which the hypochloremia was associated with hyponatremia [19]. Another association of analysis from zone of Saudi Arabia which shown indefinite variations in intensities of serum potassium in patients with even balanced and unbalanced intensities of blood glucose was same as number of people in our analysis where intensities of serum potassium were although not instantly moved with glycemic strictures [20]. However definite changes in intensities of serum potassium were presented in else analysis, a reducing form of intensities of serum potassium with increased fasting blood glucose were stated by Saito et al and Parmar SK et al [21]. Almost intensities of serum magnesium persisted normal in our analysis while reducing of intensities of serum magnesium as intensities of HbA1c raised which is stated by Arpaci D et al [22].

CONCLUSION:

Current analysis presented the significance of evaluating serum electrolytes in patients with type 2 high blood sugar mellitus. Electrolytes mostly potassium, sodium and chloride turn out to be most unbalanced instantly when fasting blood glucose increases. Almost increased fasting blood glucose deteriorates renal activity as presented by a raise in intensities of microalbumin in urine. Intensities of serum sodium changes opposingly by urine for microalbumin through our analysis. Thus, evaluating serum electrolytes in type 2 high blood sugar cases would be completed as part of regular patient care.

REFERENCES:

1. IDF diabetes atlas. [Internet]. 2015 [Cited 2018 June 15]. Available from: https://www.idf.org/sites/default/ files/Diabetes%20and%20Impaired%20Glucose %20 Tolerance_1.pdf.
2. Bourne RR, Stevens GA, White RA, Smith JL, Flaxman SR, Price H, et al. Causes of vision loss worldwide, 1990-2010: a systematic analysis. Lancet Global Health. 2013;1(6): e339-e349. doi: 10.1016/S2214-109X (13)70113-X.
3. Sarwar N, Gao P, Seshasai SR, Gobin R, Kaptoge S, Di Angelantonio, et al. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Emerging Risk Factors Collaboration. Lancet. 2010;375(9733):2215-2222. doi: 10.1016/S0140-6736(10)60484-9
4. IDF MENA Pakistan. [Internet]. 2017 [cited on 2018, June 15]. Available from: http://www.idf.org/membership/ mena/pakistan.
5. Ojiako OA, Chikezie PC. Blood Na±/K± and Cl levels of Hyperglycemic rats administered with traditional herbal formulations. Pharmacognosy Communications. 2015;5(2):140-144. doi: 10.5530/pc.2015.2.5.
6. Kitabchi, AE, Umpierrez GE, Murphy MB, Kreisberg RA. Hyperglycemic crisis in adult patients with diabetes: A consensus statement from the American diabetes association. Diabetes Care. 2006; 29:2739-2748. doi: 10.2337/ dc06-9916.
7. Javaid A, Hasan R, Zaib A, Mansoor S. A comparative study of the effects of hypoglycemic agents on serum electrolytes in diabetic patients. Pak J Pharm Sci. 2007;20(1):67-71.
8. Yasmin F, Haleem DJ, Haleem MA. Intraerythrocyte and serum electrolytes in diabetic patients with hypertension. J Coll Physicians Surg Pak. 2006;16(7):445-449.
9. Liamis G, Rodenburg EM, Hofman A, Zietse R, Stricker BH, Hoorn EJ. Electrolyte disorders in community subjects: Prevalence and risk factors. Am J Med. 2013;126(3):256-63. doi: 10.1016/j.amjmed.2012.06.037
10. American Diabetes Association. Classification and diagnosis of Diabetes: Standards of medical care in diabetes-2018. Diabetes Care. 2018;41(Suppl. 1): S13-S27.
11. American diabetes association. Glycemic targets: Standards of Medical Care in Diabetes—2018. Diabetes Care. 2018;41(Suppl.1): S55-S64.
12. Boulton AJM, Armstrong DG, Albert SF, Frykberg RG, Hellman R, Kirkman MS, et al. Comprehensive Foot Examination and Risk Assessment. Diabetes Care. 2008;31(8):1679-1685. doi: 10.2337/dc08-9021
13. American diabetes association. Diabetic nephropathy. Diabetes Care. 2002;25(Suppl. 1): S85-S89.
14. Liamis G, Liberopoulos E, Barkas F, Elisaf M. Diabetes mellitus and electrolyte disorders. World J Clin Cases. 2014;2(10):488–496. doi:10.12998/wjcc.v2.i10.488
15. Parmar SK, Singh S, Singh GK. Role of hyperglycemia in the pathogenesis of Na±/K± disturbance. Int J Res Med Sci. 2016;4(4):1167-1171.
16. Palmer BF, Clegg DJ. Electrolyte and acid–base disturbances in patients with Diabetes Mellitus. N Engl J Med. 2015; 373:548-59. doi: 10.1056/NEJMra1503102
17. Wang S, Xuhong H, Yu L, Huijuan L, Li W, Yuquian B, et al. Serum electrolytes relation to macro vascular complications in Chinese Patients

with Diabetes mellitus. Cardiovas Diabet. 2013; 12:146-155.
18. Giacchetti G, Sechi LA, Rilli S, Carey RM. The reninangiotensin-aldosterone system, glucose metabolism and diabetes. Trends Endocrinol Metab. 2005; 16:120-126. doi: 10.1016/j.tem.2005.02.003
19. Al-Jameil N. Estimation of Serum Electrolytes in Diabetes Patients of Saudi Region. Life Sci J. 2014;11(7):378-380.
20. Al-Rubeaan, K, Siddiqui K, Abu Risheh K, Hamsirani R, Alzekri A, Alaseem A, et al. Correlation between serum electrolytes and fasting glucose and Hb1Ac in Saudi Diabetic patients. Biol Trace Elem Res. 2011; 144:463-468. doi: 10.1007/s12011-011-9144-4
21. Saito T, Ishikawa S, Higashiyama M, Nakamura T, Rokkaku K, Hayashi H, et al. Inverse distribution of serum sodium and potassium in uncontrolled in patients with diabetes mellitus. Endocr J. 1999;46(1):75-80.
22. Arpaci D, Tocoglu AG, Ergenc H, Korkmaz S, Ucar A, Tamer A. Associations of serum Magnesium levels with diabetes mellitus and diabetic complications. Hippokratia. 2015; 19(2):153-157.