

Comparatively the Physiological and Biochemical Changes in Diabetic and Non Diabetic Individuals with Decrease Na⁺/K⁺-Atpase Activity

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ABSTRACT

This study was conducted to identify the complications of decreased Na⁺/K⁺-ATPase activity in the diabetic patients with type 2. This study was conducted in Jinnah Hospital Lahore according to its results the diabetic patients of type 2 showed a significant (<0.05) increase in HbA1c levels (7.2±3.2) as compared with control (4.3±0.6). It was concluded that hyperglycemic patients with diabetes type 2 has decreased activity of Na⁺/K⁺-ATPase (254±88) as compared to the healthy individuals (387±12). The results of this study indicated that high concentration of glycosylated hemoglobin decreases the activity of Na⁺/K⁺-ATPase in diabetic individuals as compared to the control. All the results of this study were significant (<0.05).

Keywords: HbA1c, Sodium-Potassium adenosine triphosphatase, Reactive oxygen species

INTRODUCTION

Current life threatening Global health issue is diabetes mellitus (DM)¹. Its syndrome indicated disturbances in the metabolic pathways of carbohydrates, Lipids and Proteins². It is basic need of diabetic Patients to control their sugar levels for better healthy life. Controlled blood glucose levels have very low medical problems in diabetic patients like Retinopathy, Nephropathy and Neuropathy¹. Many researchers described in their studies that higher levels of glucose can create number of changes in the structural sequence of macromolecules like protein nucleic acids etc³. (Na⁺/K⁺-ATPase) or sodium-potassium adenosine triphosphatase act as biological catalyst and it is located in the membranes⁴. It is biological catalyst and performs a special function for transporting of potassium and sodium in and outside from the cell membrane by using adenosine triphosphatase as power source⁵.

The hyperglycemic and hypoglycemic conditions can changed the structure and function of sodium Potassium pump⁶. It has seen in many studies that metabolic pathway of aldose reductase increases the activities of sodium pump while it decreases in case of myo-inositol⁷. Similarly higher quantity of reactive oxygen species (ROS), protein glycation, anabolic and catabolic changes in nerve growth factors are

big incidences through which activity of the sodium pump decreases¹¹. In excess omega 3 and omega 6 fatty acids can also change the activity of this pump⁸. A study stated that decrease sodium pump activity causes pathogenicity and ultimately the diabetic poly neuropathic complications¹³.

MATERIALS AND METHODS

In this study individuals were selected from diabetic and medical units of Jinnah Hospital Lahore. In this study total 50 individuals were selected and divided them into Group A and Group B. in Group A 25 individuals were diabetic of type 2 while in Group B all the individuals were normal. The patients of Group A were in between 40 to 50 years. Whereas the individuals of Group B were healthy and of age between 20 and 40 years. 5cc blood samples were taken from each individual for the estimation of random blood glucose levels and Na⁺/K⁺-ATPase activities in erythrocytes. Na⁺/K⁺-ATPase Activities in erythrocytes were prepared by adopting the DeLuise and Flier protocols¹⁴. Raw data was expressed statistically by the SPSS.

RESULTS

In this study the levels of HbA1c were high in diabetic individuals than control. Statistical presentational data was showed a significant (<0.05) changes. This study stated that erythrocytes Na⁺/K⁺-ATPase activities were less in patients with diabetes type 2 as compared to the normal individuals significantly.

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Comparison of HbA1c & Na⁺/K⁺ATPase Activity in Group A & Group B:

Biomarkers	Units (n=50)	Control (Mean)	Diabetic type 2 (Mean)	P value
HbA1c	(%)	4.3±0.6	7.2±3.2	0.02
Na ⁺ /K ⁺ ATPase Activity	Mole Pi./mg protein/h	387±12	254±88	0.04

<0.05

DISCUSSION

In the present study comparatively the activities of sodium potassium ATPase in cell membrane of erythrocytes were observed in the diabetic patients with type 2 and normal. Study showed that HbA1c levels were high in diabetic patients with type 2 as compared control. The results were significant in case of blood glucose levels. Bozo et al (1990) stated in his study a decrease in lymphocytes Na⁺/K⁺ATPase activity was concluded in the diabetic patients¹⁵. Mimura et al; (1994) similarly reported slight reduction in RBCs Na⁺/K⁺ATPase activity in the patients with type 2¹⁶. Raccach et al (1992) described that Na⁺/K⁺ATPase activity had shown a significant decreases in red blood cells of diabetic patients with type 2¹⁴. Current study described that the levels of glycosylated hemoglobin increased and Na⁺/K⁺ATPase activity decreased significantly in the individuals with diabetic type 2 than the control.

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