ORIGINAL RESEARCH ARTICLE

Status of Serum Fructosamine in Diabetic Subjects in Udaipur, Rajasthan

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Abstract:

Background:

Estimation of glycated haemoglobin and fructosamine in diabetic patient for the assessment of glycemic control isgaining importance now a day. Little data is available about assessment of fructosamine in our area. Hence the present study was undertaken to know the levels of fructosamine in diabetic patients.

Material and Methods:

Total 150 subjects were involved in present study and divided into two groups. Out of 150 subjects 50 were healthy subjects and 100 type II diabetes mellitus patients. In all subjects, fasting blood glucose level, postprandial blood glucose level, glycated haemoglobin and fructosamine were measured.

Results:

Fasting and post prandial blood glucose was significantly increased in diabetic patient as compared to healthy controls ($P < 0.001$). Moreover, the glycated haemoglobin and fructosamine levels were significantly increased in diabetic patient ($P < 0.001$). However, when these parameters were used to see the difference between males and females, there was no statistical difference seen.

Conclusion:

The results of current study show that glycated haemoglobin and fructosamine levels are significantly increased in diabetic patients and measurement of fructosamine is having more importance than glycated haemoglobin.

Key Words:

Glycated Hemoglobin, Fructosamine, Diabetes Mellitus, Rajasthan

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Introduction:

Endocrine system and nervous system are two major systems present in the body which regulate all the physiological activities. These two systems interact with one another and regulate the body functions.[1]Measurement of glycated haemoglobin ($HbA1_c$) and fructosamine has growing role in the assessment of glycemic control but their utility for screening the population is questionable.[2]In the mid-seventies, the measurement of glycated haemoglobin was found to be a reliable marker for elevated glucose concentration in the preceding 4 to 6 weeks.[3]

Fructosamine can also refer to a specific compound 1 –amino – 1-deoxy – D – fructose. The physiological role of fructosamine 3-kinase has been seen by incubating human erythrocytes in presence of high glucose concentration and of a specific inhibitor of this enzyme.[4] It converts glycated haemoglobin to a form of haemoglobin with alkaline labile phosphate, presumably corresponding to fructosamine 3-phosphate residues. This phosphorylation triggers the spontaneous decomposition of fructosamine 3-phosphate residues to free amine, inorganic phosphate and 3 – deoxyglucosone, which can oxidize to 2-keto-3-deoxygluconate in red blood cells.[5]

Udaipur, which lies in southern part of Rajasthan, is festooned with Aravali hills and presents a unique mixture of two subsets of population with contrasting lifestyle. Due to increase in mining, it is on fast track of socio-economic resurgence with urbanization and brisk changes of lifestyles, whereas on the other side, peoples in rural and tribal area suffer from silent hunger and poverty. Till date there is no data of fructosamine in diabetic patient from Udaipur region and the etiological reports are very scanty and meager. Hence this study was undertaken to estimated fructosamine and glycated haemoglobin in diabetic patients of our region.

Material and Methods:

The study was carried out at Geetanjali Medical College and Hospital, Udaipur between the period of October 2014 to March 2015. Total 150 subjects participated in this study, out of which 50 were healthy control and 100 were type II Diabetes Mellitus. The controls and subjects (cases) were age matched. Inclusion criteria were patients proven type II diabetes mellitus and undergoing treatment for the same. Exclusion criteria were patients undergoing treatment for any thyroid disorders, patients taking lipid-lowering drugs, patients with malignancy, and pregnant women. The study was approved by ethical committee of Geetanjali Medical College and Hospital, Udaipur.

Blood sample were collected and serum was separated. The following parameters were estimated in all subjects.

1. Fasting and Post prandial blood glucose level.
2. Glycated Hemoglobin ($HbA1_c$)
3. Fructosamine

Estimation of blood glucose level was done by hexokinase method.[6] Glycated haemoglobin was estimated by the turbidimetric inhibition immunoassay method[7] and fructosamine by kinetic fixed time nitroblue tetrazolium method.[8] The blood glucose and glycated haemoglobin tests were performed on Roche/ Hitachi Cobas C – 311 fully automated analyser and fructosamine test on Erba Chem 5 plus V_2 semi-automated biochemistry analyser. Data obtained were analysed statistically by using online student t – test calculator. P value less than 0.05 was considered statistically significant.

Results:

Out of the 50 healthy control subjects, 29 were male and 21 female, whereas in diabetic group, out of 100 subjects, 62 were male and 38 female. Fasting blood sugar level was 88.02 $\pm$ 8.4 in control and 214.45 $\pm$ 21.1 in diabetic group and was statistically significant (P value 0.001; Table 1). Post prandial blood glucose was 121.17 $\pm$ 9.3 in control and 327.62 $\pm$ 33.24 in diabetic group and was statistically significant (P value 0.001; Table 1). In healthy controls, glycated haemoglobin was 5.44 $\pm$ 0.32 and in diabetic was 9.51 $\pm$ 1.49 and was statistically significant (P value 0.001; Table 1). In healthy controls, fructosamine level was 223.84 $\pm$ 9.0 and in diabetic was 395.33 $\pm$ 70.24 (P value 0.001; Table 1).

Table 1: Showing values of various parameters in control and diabetic group

	Control (n = 50)	Diabetic (n = 100)	P Value
Fasting blood glucose (mg/dL)	88.02 ± 8.4	214.45± 21.1	0.001
Post prandial blood glucose (mg/dL)	121.17± 9.3	327.62± 33.24	0.001
Glycated haemoglobin (%$HbA1_c$)	5.44± 0.32	9.51± 1.49	0.001
Fructosamine (µmol/L)	223.84± 9.0	395.33± 70.24	0.001

We also tried to see the statistically significance of values of glycated haemoglobin and fructosamine between males and females of healthy control and diabetic group. However, no statistical significance was seen in between males and females of glycated haemoglobin level of control group (P value 0.912; Table 2) and diabetic group (0.974; Table 2).

Table 2: Showing values of glycated haemoglobin (%$HbA1_c$) in male and female of control and diabetic group

	Control (n = 50)	Diabetic (n = 100)	P Value
Male	5.45± 0.31	9.52 ±1.56	0.001
Female	5.44± 0.30	9.51 ±1.36	0.001
P value	0.912	0.974	

Similarly, there was no statistical significance seen in between males and females of fructosamine level of control group (P value 0.830; Table 3) and diabetic group (P value 0.320; Table 3).

Table 3: Showing values of fructosamine (µmol/L) in male and female of control and diabetic group

	Control (n = 50)	Diabetic (n = 100)	P Value
Male	223.54 ± 9.95	387.75 ±74.25	0.001
Female	224.15 ± 0.30	402.92 ±73.03	0.001
P value	0.830	0.320	

Discussion:

In our study, we found that fasting and post prandial blood glucose was significantly increased in diabetic patient as compared to healthy controls. Also the glycated haemoglobin and fructosamine levels were significantly increased in diabetic patient as compared to healthy controls. However, when these parameters were used to see the difference between males and females, there was no statistical difference.

The results of our study also correlated with the study done by other authors.[9–12] But since this study was related to an area where less data is available to come to a conclusion, the results obtained in our study add more to the existing data.

Fructosamine and glycated hemoglobin are two different parameters and both are used to monitor diabetic control. Each measurement provides information for a specific time frame that is related to the analyte being measured. Since the life span of red blood cells is near to 6-8 weeks, a glycated hemoglobin measurement reflects the average glucose concentration over this longer period.[13] Fructosamine explains the short-term diabetic control as opposed to the longer term for glycated hemoglobin.

Chronic hyperglycemia may be the responsible for vascular complications of diabetes mellitus, and methods of accurate assessment of glycemic control should be encouraged. The fructosamine levels has been found to be more sensitive than random glucose measurement for glycemic control determinations and contributed a different view of glycemia than that of glycated hemoglobin. Since the half-life of albumin and other serum proteins is considerably shorter than that of hemoglobin, the concentration of fructosamine levels can change more rapidly than those of glycated hemoglobin.

Conclusion:

The results of our study show that glycated haemoglobin and fructosamine levels

are increased in diabetic patients. Considering the time frame, measurement of fructosamine is more reliable than glycated haemoglobin.

Conflict of interest: None to declare

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