Study of serum fructosamine as risk assesor in non-diabetic first degree relatives of type 2 diabetes mellitus patients

S A Patel[*], M V Bimanpalli[**], A M Siddiqui[***], H N Khan[***]

[*]Assistant Professor, Department of Biochemistry, SRTR Government Medical College, Ambajogai, Maharashtra, INDIA.
[**]Professor and HOD, Department of Biochemistry, Government Medical College, Chandrapur, Maharashtra, INDIA.
[***]Associate Professors, Department of Biochemistry, Dr. S. C. Govt. Medical College, Nanded, Maharashtra, INDIA.
Email: shabeenapatel@rediffmail.com

Abstract
Introduction: Type 2 Diabetes Mellitus is the commonest endocrinal disorder worldwide. A positive family history of Diabetes Mellitus increases the risk of developing the disease to manifold in off-springs. Serum fructosamine (glycated albumin) depicts short term glycaemic control. The purpose of the study is to estimate serum fructosamine and its comparison with the established markers in the non diabetic first degree relatives of type 2 Diabetes Mellitus. **Aim and Objectives:** 1) To measure waist circumference (WC), body mass index (BMI), fasting plasma glucose (FPG) and serum fructosamine in normal controls and non-diabetic first degree relatives of type 2 Diabetes Mellitus patients. 2) To compare WC, BMI, FPG and serum fructosamine in these groups. **Material and Methods:** The study was conducted in Dr. S.C. Govt. Medical College, Nanded from 22/1/2015 to 1/3/2015. Total 50 participants were selected and grouped as Group 1 consisting of 25 healthy controls and Group 2 consisting 25 non-diabetic first degree relatives of type 2 Diabetes Mellitus patients. WC, BMI, FPG and serum fructosamine were estimated and compared. The data was analyzed statistically. **Results:** In group 1 the mean values of WC, FPG and serum fructosamine were 68.9 ± 8.6 cm, 72 ± 9.5 mg/dl and 211 ± 3.2 mg/dl respectively. In group 2 the mean values of WC, FPG and serum fructosamine were 86.5 cm, 104 ± 6.7 mg/dl and 275 ± 3.2 mg/dl respectively which were significantly high as compared to group 1 .The correlation of serum fructosamine with WC and FPG in group 2 is positively significant as per Pearson's correlation co-efficient. **Conclusion:** WC, FPG and serum fructosamine are elevated in first degree relatives of type 2 Diabetes Mellitus indicating that these patients have a high risk of development of Diabetes Mellitus. Serum fructosamine can be used as a risk assessor of type 2 Diabetes Mellitus but further studies on large scale are required.
Keywords: serum fructosamine, diabetes mellitus.

Access this article online	
Quick Response Code:	
	Website: www.statperson.com
	DOI: 06 June 2016

INTRODUCTION

Type 2 Diabetes Mellitus is the commonest endocrinal disorder worldwide.[1] Type 2 Diabetes Mellitus constitutes 95% of diabetic population.[1] According to 'The Diabetes Mellitus Atlas 2006' published by International Diabetes Mellitus Federation India has 40 million diabetics. The number may rise to 80 million by 2025.[2] Family history of Diabetes Mellitus, increased BMI, WC, hypertension, dyslipidaemia and stressful jobs are the established markers for increased susceptibility of Diabetes Mellitus.[3] Therefore the non-diabetic first degree relatives of type 2 Diabetes Mellitus patients should be considered as the earliest target population to introduce preventive measures or to study the risk predictors. Fructosamine is the end product of non-enzymatic glycation of proteins. It represents the glycaemic status over last 2-3 weeks.[4] The objective of the study was to measure WC, BMI and to estimate serum fructosamine in non-diabetic first degree relatives of type 2 Diabetes Mellitus and to compare it with normal controls without family history of type 2 Diabetes Mellitus. This will help to weigh the benefit of this glycaemic index in categorizing the high risk subjects.

MATERIAL AND METHODS

The study was conducted in department of Biochemistry in Dr. S .C Govt. Medical College, Nanded from 22/01/2015 to 1/03/2015 taking 50 subjects. Consent of the patients and ethical committee approval was taken. The subjects were divided into two groups Group 1 (n=25) consisted of healthy controls with no family history of Diabetes Mellitus. Group 2 (n=25) consisted of non-diabetic first degree relatives of type 2 diabetics. Subjects with FPG $\geq$ 126 mg/dl, chronic alcoholics, pregnant females and those with infection were excluded from the study. After overnight fasting (10 hrs) venous blood from the ante -cubital vein was drawn and collected in fluoride and plain bulbs. Fluoride bulb sample was used for evaluating fasting plasma glucose which was measured by GOD-POD Method. Serum was obtained by centrifugating the samples for 15 minutes at 3000 RPM and was used for estimating serum fructosamine by enzymatic kit method. Samples were analyzed on Erba XL-640 autoanalyzer. Age (yrs), sex, WC (cms), weight (kg) and height (mt) were documented. BMI was calculated as

BMI= Weight in kg/ height in meters[2]

Statistical analysis was performed by using the SPSS software using unpaired 't' test. The cutoff value for statistical significance was <0.05 Pearson's correlation co-efficient was used to compare the data. The cut off value for significant positive co-relation was >0.04

RESULTS

[Table-1] illustrates the anthropometric measures, serum FPG and serum fructosamine of the study groups. Among the anthropometric measurements, the two groups showed no significant difference in BMI whereas the waist circumference was significantly higher in Group 2 compared to Group 1. Among the glycaemic indices both FPG and Serum Fructosamine of Group 2 were significantly higher compared to Group 1. Table 2 shows the comparison of Serum Fructosamine with WC, BMI and FPG. It was found that Serum Fructosamine correlated well with WC and FPG whereas no association was found between Serum Fructosamine and BMI.

Table 1: Comparison of WC, BMI, FPG and Serum Fructosamine in study groups

	Parameters	Group 1	Group 2	p value
1	WC (cm)	68.9 ± 8.6	86.5± 9.0	< 0.05
2	BMI	21.4 ± 4.5	25.9± 5.3	> 0.05
3	FPG (mg/dl)	72 ± 9.5	104± 6.7	< 0.05
4	Serum Fructosamine (mg/dl)	211 ± 3.2	275± 3.2	< 0.05

Table 2: Comparison of Serum Fructosamine with FPG, WC and BMI (Pearson's correlation)

	Group 1	Group 2	r value
Serum Fructosamine v/s FPG	0.075	0.510	>0.04
Serum fructosamine v/s WC	0.067	0.515	>0.04
Serum Fructosamine v/s BMI	0.027	0.089	< 0.04

DISCUSSION

BMI and WC, the established markers of increased risk of type 2 Diabetes Mellitus[2] were assessed as the indicators of metabolic status and were compared with the glycaemic index serum fructosamine. The first degree relatives were comparable in age with the control group but had a significantly higher WC [Table-1]. Mishra *et al*, Joshi *et al*, Ramchandran *et al* and Mohan *et al* have explained the fact that Asian Indians have more total abdominal and visceral fat for any given BMI and that for any given body fat they have more insulin resitance[5-8].Ramchandran *et al*[7] stated that though BMI in Indian population was low or near normal , the WC- the measure of central adiposity ,was higher. Bjorntop. P *et al* have proved that the excess abdominal fat is in turn a high risk factor for Diabetes Mellitus due to insulin resistance which arises from release of free fatty acids .[9] Mishra *et al*, Joshi *et al*, Ramchandran *et al* and Mohan *et al* found that waist girth strongly correlated with cluster of findings which were associated with metabolic syndrome.[58] Serum fructosamine depicts glycaemic index over a shorter period of timeof three weeks. Johnson *et al* stated that serum fructosamine is used to distinguish between the normal and well-controlled Diabetes Mellitus from the poorly controlled one.[10] Wahid *et al* stated that it is useful in the screening of the "at- risk" subjects.[11] The first degree relatives presently show serum fructosamine values in the upper normal range but significantly higher values as compared to controls with FPG at the normal cut-offs suggesting the glycation of proteins at relatively lower levels of FPG in "at-risk" patients. Furthur serum fructosamine of the first degree relatives showed significant correlation with WC and FPG but it was non-significant with the BMI.

CONCLUSION

WC, FPG and serum fructosamine are elevated in first degree relatives of type 2 Diabetes Mellitus indicating that these patients have a high risk of developing Diabetes Mellitus This group also had a larger waist girth which significantly correlated with the FPG. Thus the presence of one risk factor i.e. a family history of Diabetes Mellitus predisposes these people to the earlier development of Diabetes Mellitus or the metabolic

syndrome. Serum fructosamine can be thus be used as a risk assessor of type 2 Diabetes Mellitus in the high risk subjects like the first degree relatives of type 2 Diabetes Mellitus. Hence, monitoring of the serum FA, FPG along with the WC should be taken up in first degree relatives. But furthur studies on a larger scale are required.

REFERENCES

1. Enas.A. "Prevalence of coronary artery disease in Asian Indians". American journal of cardiology, 1992; 70:945-950.
2. WHO Report on Diabetes Mellitus Mellitus 2006(International Federation of Diabetes Mellitus)
3. Assmann G, Nofer JR, Schulte H. Cardiovascular risk assessment in the metabolic syndrome: view from PROCAM. Endocrinol Metab Clin North Am 2004; 33: 377-92.
4. Baker JR, O'Connor JP, Metcalf PA, Lawson MR, Johnson RN: Clinical usefulness of estimation of serum fructosamine concentration as a screening test for Diabetes Mellitus mellitus.Br Med I 287:863-67, 1983
5. Misra A, Vikram NK. The insulin resistance syndrome (metabolic syndrome) and Asian Indians. Current Science 2002; 83(12):1483-97.
6. Joshi SR. The metabolic syndrome — emerging clusters of the Indian phenotype. JAPI 2003; 51:445-46.
7. Ramachandran A, Snehalatha C, Satyavani K, Sivasankari S, Vijay V. The metabolic syndrome in urban Asian Indian adults—a population study by using the modified ATP III criteria. Diabet Res Clin Pract 2003; 60 (3): 199-204.
8. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. The epidemiology of type 2 Diabetes Mellitus: the Indian scenario. Indian J Med Res 2007; 125:217-30.
9. Bjorntorp P. Metabolic implications of the body fat distribution. Diabetes Mellitus Care 1991; 14: 1132-43.
10. Jhonson RN, Metcalf PA, Baker JR. Fructosamine; a new approach for the estimation of serum glycosylprotein. An index of the diabetic control. Clin Chem Acta 1983; 127:87-95.
11. Wahid ST, Sultan J, Handley G, Saeed BO, Weaver JU, Robinson ACJ. Serum fructosamine as a marker of a 5-year risk of developing Diabetes Mellitus mellitus in patients who exhibit stress hyperglycaemia. Diabet Med 2002; 19: 543-48.