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Research Article

EFFECT OF BIOCHEMICAL PARAMETERS SHOWING ATHEROGENICITY IN TYPE 2 DIABETIC NEPHROPATHY

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ABSTRACT
Diabetic nephropathy is one of the major complications of diabetes mellitus characterized by frequent microalbuminuria, elevated arterial blood pressure, a persistent decline in glomerular filtration rate and a high risk of cardiovascular morbidity and mortality. The study comprised of 30 Diabetic mellitus (DM) with microalbuminuria patients (Group 3), 30 DM without microalbuminuria patients (group 2) compared with 30 healthy controls (Group 1). Fasting glucose, post prandial glucose, lipid profile, fructosamine and microalbuminuria were investigated in all the groups. The significant increase in serum fructosamine, fasting and post prandial glucose levels along with increased microalbuminuria observed in group 3 patients compared to group 2 and group 1 patients. Hyperglycemia, increased fructosamine and increased Cholesterol, triglycerides with decreased HDL-cholesterol levels indicates the major risk of atherogenicity.

***Key Words*:** *Diabetic nephropathy, Microalbuminuria, Fructosamine and Atherogenicity*

INTRODUCTION
Diabetes mellitus (DM) is a disease in which the hallmark feature is elevated blood glucose concentrations due to loss of insulin-producing pancreatic β-cells (type 1 diabetes) or through loss of insulin responsiveness in its target tissues (type 2 diabetes). Type 1 diabetes usually begins to manifest in childhood and early adulthood, but type 2 diabetes is typically a disease for which increased age is a risk factor (Schwarz, 2009). Different studies have described diabetes as one of the main threat to human health in the 21st century (Zimmet, 2001). Diabetes mellitus is a major health problem worldwide. It is a serious debilitating and deadly disease that has now reached epidemic proportion and the prevalence rates are expected to go even higher in the future. Diabetic nephropathy will affect approximately 30% of all patients with diabetes (Caramori, 2006 and Hovind, 2003). Diabetic nephropathy (DN) is one of the most common microvascular complications of diabetes (Giunti, 2006) defined as rise in urinary albumin excretion rate, often associated with an increase in blood pressure, but without evidence of other causes of renal disease (Viberti, 1982).
High mortality in nephropathy is due to an excess of cardiovascular mortality (Zimmermann, 1997) and to end stage renal failure (Knowles, 1997). Albuminuric diabetes patients are 20 times more likely to die of cardiovascular disease than are non-albuminuric ones (Johnsen, 1985). The relationship between arterial blood pressure and diabetic nephropathy seems to be a complex one, nephropathy increasing blood pressure and blood pressure accelerating the course of nephropathy (Parving, 1993). The present study was mainly conducted to further understand the role of those risk factors in the type 2 diabetic nephropathy and find out the biochemical parameters and their correlations. The biochemical analytes are lipid profile, fructosamine and microalbuminuria.

MATERIALS AND METHODS
The study was undertaken in Laboratory in town area of Kancheepuram. The evaluation was comprised of three groups and total subjects 90. One was control group (males 20, females 10) 30 subjects. The control group-1 subjects were non-diabetic, non-smoker, non alcoholic and without any chronic diseases and

illness. Group 2 was type 2 diabetic with microalbuminuria patients (males 20, females 10) 30 subjects and Group 3 was type 2 diabetic without microalbuminuria patients (males 20, females 10) 30 subjects. The subjects were in the age group of 42-75 years. Inform consent was obtained and ethical clearance obtained from the local ethical committee.

After twelve hours fasting, blood samples were drawn by venipuncture and collected into plain tube for the determination of lipid profile, fructosamine and Fluoride tube used for plasma glucose. Second blood sample was collected after two hours post prandial for estimation of plasma glucose. A fasting urine sample was collected for microalbuminuria examination.

The fasting plasma sample and post prandial plasma sample used for the determination glucose by Glucose oxidase and Peroxidase method (Barham, 1972). The plain tube containing blood was allowed to stand for 30-60 minutes and serum was separated by centrifuging at 2500 rpm for 15 minutes at room temperature. Serum sample used for fructosamine and lipid profile estimations. Cholesterol determined by Cholesterol oxidase and Peroxidase method (Allain, 1974) and triglycerides by Trinders Glycerol Phosphate Oxidase-Peroxidase method (Bucolo, 1973). High density lipoprotein determined by Poly ethylene glycol (PEG) method (Demacker, 1980) and LDL cholesterol by calculation method according to Freidewald Formula (Friedewald, 1972). The microalbuminuria was determined by pyrogallol red method (Watanabe, 1986) and fructosamine was estimated by Hill *et al.*, (1990). Statistical analysis of the results was done using student't' test.

RESULTS

The results of the study are shown in table 1 and 2. The mean values of serum fructosamine and microalbuminuria in Group-1 (control normal healthy individuals), Group-2 (Type 2 diabetics without microalbuminuria) and Group-3 (Type 3 diabetics with microalbuminuria) were measured. The serum fructosamine and urinary microalbuminuria in Group 1, Group 2, and Group 3 were 210 $\pm$ 5.2, 267 $\pm$ 2.0, 310 $\pm$ 1.5 and 7 $\pm$ 2.5, 25 $\pm$ 2.2, 82 $\pm$ 3.7 respectively. Figure 1 indicates the values of fructosamine in group 1 shows within the normal, in group 2 shows little bit higher but within the normal. Group 3 fructosamine values raised above the normal range.

Table 1: Comparison of Mean and SD$\pm$ value of FBS, PPBS, Microalnuminuria and Fructosamine in different groups

Parameter	Normal Range	Control Group (G1)	Type 2 DM without Microalbuminuria (G2)	Type 2 DM with Microalbuminuria (G3)
FBS (mg/dl)	70-110	81 ± 7.2	109 ± 5.5	141 ± 8.5
PPBS (mg/dl)	upto 150	101 ± 6.5	172 ± 7.4	225 ± 5.5
Microalbuminuria (mg/dl)	1 - 35	7 ± 2.5	25 ± 2.2**	82 ± 3.7**
Fructosamine (mmol/L)	205-285	210 ± 5.2	267 ± 2.0*	310 ± 1.5*

**p<0.05-Significant, **p<0.001-Highly Significant*

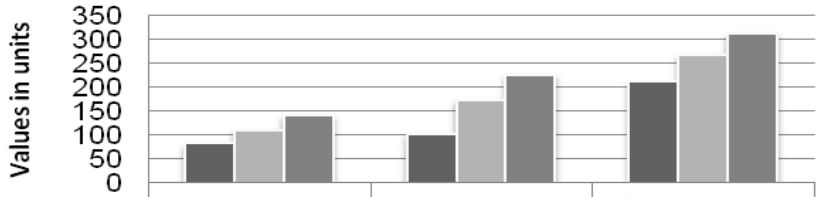
Figure 2 indicates the urinary microalbuminuria values within normal range in group 1, but significantly values were increased in group 2 and 3. The higher significant values of microalbuminuria observed in group 2 and 3. The fructosamine variation was indicated due to the variation (Figure 1) in fasting and post prandial glucose levels. The lipid profile values were determined in all groups (table 2). The cholesterol values were 156 $\pm$ 9.0, 178 $\pm$ 8.2 and 221 $\pm$ 18.4 mg/dl for group 1, group 2 and group 3 respectively.

Table: 2 Comparison of Mean and SD ± values of Cholesterol, HDL ratio, Triglycerides and LDL in different groups

Parameter	Normal Range	Control Group (G1)	Type 2 DM without Microalbuminuria (G2)	Type 2 DM with Microalbuminuria (G3)
Cholesterol (mg/dl)	130-220	156 ± 9.0	178 ± 8.2	221 ± 18.4**
HDL (mg/dl)	35 - 55	36 ± 5.0	39 ± 4.4*	34 ± 5.6*
Triglycerides (mg/dl)	upto 165	145 ± 18.2	228 ± 21.3**	241 ± 85.5**
LDL (mg/dl)	upto 132	91 ± 12.5	93 ± 15.4*	139 ± 35.5*
HDL (mg/dl)	upto 4.5	4.3	4.6	6.5**

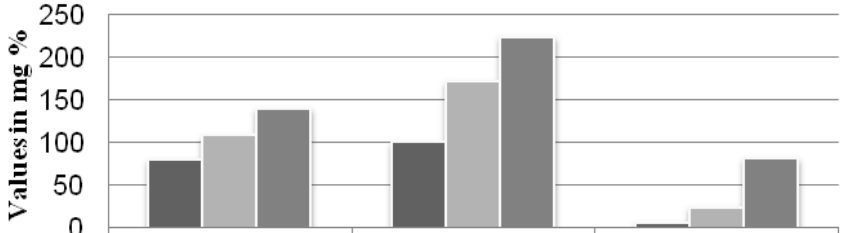
**p<0.05-Significant, **p<0.001-Highly Significant*

Fig 1 Comparison of Fructosamine for all groups



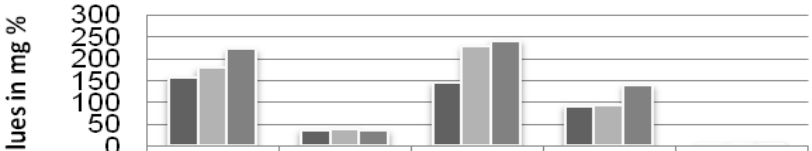
	FBS (mg/dl)	PPBS (mg/dl)	Fructosamine (mmol/l)
Control Group (G1)	81	101	210
Type 2 DM Without Microalbuminuria (G2)	109	172	267
Type 2 DM With Microalbuminuria (G3)	141	225	310

Fig 2 Comparison of Microalbuminuria for all groups



	FBS (mg/dl)	PPBS (mg/dl)	Microalbuminuria (mg/dl)
Control Group (G1)	81	101	7
Type 2 DM Without Microalbuminuria (G2)	109	172	25
Type 2 DM With Microalbuminuria (G3)	141	225	82

Fig 3 Comparison of cholesterol, HDL, Triglycerides, LDL and HDL ratio for all groups



	Cholesterol (mg/dl)	HDL (mg/dl)	Triglycerides (mg/dl)	LDL (mg/dl)	HDL Ratio
Control Group (G1)	156	36	145	91	4.3
Type 2 DM Without Microalbuminuria (G2)	178	39	228	93	4.6
Type 2 DM With Microalbuminuria (G3)	221	34	241	139	6.5

The triglycerides values were 145 $\pm$ 18.2, 228 $\pm$ 21.3 and 241 $\pm$ 85.5 mg/dl for group 1, group 2 and group 3 respectively. The High Density Lipoprotein –cholesterol (HDL) calculated by Friedewald's formulae and the values were 36 $\pm$ 5.0, 39 $\pm$ 4.4 and 34 $\pm$ 5.6 mg/dl for group 1, group 2 and group 3 respectively. The values of cholesterol increased and HDL decreased in high significant. The ratio of Cholesterol and HDL calculated as 6.5 for group 3.

DISCUSSION

Fructosamine used as an index to monitor short term diabetic control, and its measurement is sensitive to changes in diabetic control due to shorter life span of albumin. Thus, it alerts the physician to understand the glycemic status much earlier than glycosylated hemoglobin (HbA1c) therefore; a higher fructosamine value indicates the poor glycemic control (Baker, 1983 and Lim, 1985). In present study the occurrence of hyper cholesterolemia, hyper triglyceridemia and lower levels of HDL (Figure 3) seen in diabetic nephropathy. There was also increased occurrence of LDL cholesterol levels. There was a significant increase in microalbuminuria for group 3 compared to without microalbuminuria groups. This is because diabetes mellitus is one of the systemic diseases affecting the renal function. Lipid profile parameters were altered in diabetic with increased levels of microalbuminuria. The higher levels of triglycerides, cholesterol, LDL and lower levels of HDL accounts of contribution to coronary heart disease risk (Vigstrup, 1985).

Conclusion

The glycemic condition along with the lipid profile values and regular monitoring of microalbuminuria should be kept under strict control so that complications associated with diabetes would be postponed and also correlated with increased risk of cardiovascular diseases.

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