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Original Article

Biochemistry Section

Lipid Profile Levels in Type 2 Diabetes Mellitus from the Tribal Population of Adilabad in Andhra Pradesh, India.

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ABSTRACT

Introduction: Dyslipidaemia is one of the common disorders which is seen in most of the diabetes patients, which causes cardio vascular disorders.This study was conducted to compare the lipid profile of diabetic patients and healthy controls.

Methods: The lipid profiles and the fasting blood sugar values of 160 known diabetics and 160 healthy subjects were studied. Their serum samples were assessed for fasting blood glucose (FBG), total cholesterol (TC), triacylglycerols (TG), low density lipoprotein cholesterol (LDL-C) and high density lipoprotein cholesterol (HDL-C) by using standard biochemical methods.

Results: The mean total cholesterol, triacylglycerols, LDL-C and the fasting blood sugar levels were highly significant in the diabetics as compared to those in the controls. The mean HDL-C concentration was non significantly lower in female diabetics as compared to that in the male diabetics. The correlation studies showed a non significant negative correlation of FBG with HDL-C and a positive correlation of FBG with TC, TG and LDL-C.

Conclusion: The frequencies of the high TC , high TG and high LDL-C levels were higher in the diabetic group, thus indicating that diabetic patients were more prone for dyslipidaemia, which could cause cardiovascular disorders.

Key Words: Diabetes mellitus, Dyslipidaemia, Lipid profile, Triglycerides, HDL-C and LDL-C

INTRODUCTION

Diabetes mellitus (DM) is a hereditary, chronic and endocrine metabolic disorder which causes deaths world wide [1]. Certain ethnic and racial groups of Africa and Asia have a greater risk of developing diabetes [2]. India, a developing Asian country with fast industrialization and a modern lifestyle is facing a grave problem in having the largest number of people with diabetes [3,4] which is estimated to reach 80 million by the year 2030 [5,6]. It is close to becoming the diabetic capital of the world. The literature on Indian studies showed a threefold rise in the diabetic prevalence in rural as well as urban areas [7,8]. Andhra Pradesh is no exception to the above said rise and it harbours a substantial number of people with diabetes. The most common symptom of diabetes is no symptom and by the time the disorder is diagnosed, an abnormal lipid profile, hypertension and retinal changes may be already present often. Diabetes is associated with a greater risk of mortality from cardiovascular disease (CVD) which is well known as dyslipidaemia, which is characterized by raised triglycerides, low high density lipoprotein and high small dense low density lipoprotein particles. It may be present at the diagnosis of type 2 Diabetes mellitus and is a component of the metabolic syndrome. Abnormal serum lipids are likely to contribute to the risk of coronary artery disease in diabetic patients [9] and the determination of the serum lipid levels in people with diabetes is now considered as a standard of the diabetes care [10]. Abnormal lipid profiles and lipoprotein oxidation (especially LDL-C) are more common in diabetes and are aggravated with a poor glycaemic control. The measurement of the lipid profile of diabetic patients is needed to investigate how their lipid metabolism is affected by diabetes, as they have different genetic compositions and lifestyles. Hence, the present work was taken up to assess the lipid profile of a randomly selected group of adult diabetic patients and to compared them with that of the controls.

MATERIALS AND METHODS

The subjects who were enrolled in this study were diabetic patients who attended the Out Patients Department of the Rajiv Gandhi Institute of Medical Sciences, Adilabad. A total of 160 diabetic patients (80 males and 80 females) with a history of diabetes for 10 years and 160 healthy controls (80 males and 80 females) were randomly selected and they were examined for dyslipidaemia. Patients with other ailments and metabolic disorders were excluded from the study. Laboratory tests were used to confirm the absence of diabetes in the control group and also by asking questions about the sings of diabetes such as polyuria, polydipsia and recent weight loss. Ethical clearance was sought and obtained for the study from the hospital. The aim of the study was explained to the subjects and those who gave their consent were included in the study.

In both the patients and the controls, about 5 ml of fasting blood was obtained by venipuncture by using sterile disposable syringes and needles. The blood was collected into centrifuge tubes. It was allowed to clot and it was then centrifuged at 3000 rpm for 15 min at room temperature. The serum which was obtained was pipetted into a clean blood sample bottle and analyzed on the day of collection for serum sugar and lipid profile tests. Serum total cholesterol was determined by an enzymatic (CHOD-PAP) colorimetric method [11] and triglycerides were determined by an enzymatic (GPO-PAP) method [12]. HDL-Cholesterol was estimated by a pre-

cipitant method [13] and LDL-Cholesterol by was estimated by using Friedewald's formula [14] as has been shown below:

LDL-C = TC - HDL-C – (TG/5).

Serum glucose was determined by using the glucose oxidase enzymatic method [15]. All the parameters which were under investigation were determined in the serum of the subjects by using commercially available reagent kits. The lipid profile of the subjects was classified, based on the ATP III model [16].

The values of all the parameters were given in mg/dl and they were expressed as mean ± SD. The statistical significance of the difference between the control and the study groups were evaluated by the Student's t-test. Pearson's correlation test was performed to examine various correlations.

RESULTS

The mean age of the subjects were 51.04 ± 11.79 and 47.20 ± 10.65 years for the diabetic and the control groups respectively. The sex distribution showed an equal number of males and females in all the groups. [Table/Fig 1] shows the mean total cholesterol, triacylglycerols, LDL-C and the fasting blood sugar levels which were highly significant in the diabetics as compared to those in the controls.

[Table/Fig 2] shows the comparison between the mean biochemical variables with respect to gender in the diabetics and the controls respectively. The results showed that the mean HDL-C concentration was non significantly lower in the female diabetics as compared to that in the male diabetics. However, it was on par when it was compared with the controls. [Table/Fig 3] shows the frequencies of the TC, TG, HDL-C and the LDL-C concentrations in both the diabetic and the control groups. The results showed that the frequency of high TC was higher in the diabetic group (10% Vs 1%).

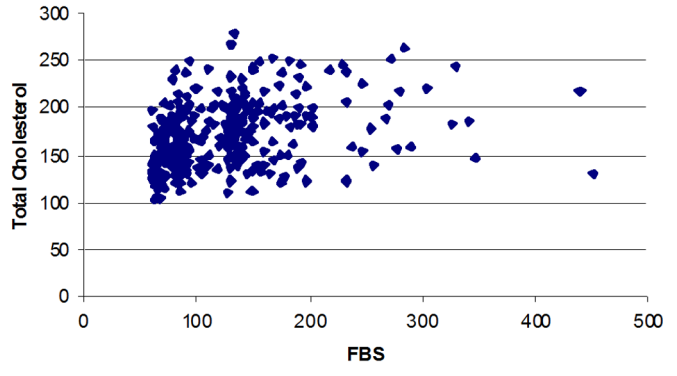
The control group had a borderline higher frequency of low HDL-C than that in the diabetic group. The mean TG was highly significant and LDL-C was significant among the lipid profile of the male/female diabetics, whereas TC and LDL-C were significant among the lipid profile of the male/female control groups. The correlation studies (Figure 1) showed a negative correlation of FBG with HDL-C and a positive correlation of FBG with TC, TG and LDL-C.

Parameters	Diabetics (n=160) Mean ± SD	Control (n=160 Mean ± SD	t table value
Total cholesterol (mg/dl)	184.27 ± 35.82	160.37 ± 27.34	6.69**
Triacylglycerols (mg/dl)	198.18 ± 111.02	131.98 ± 53.08	6.78**
HDL-C (mg/dl)	37.44 ± 4.47	37.68 ± 5.99	0.39
LDL-C (mg/dl)	106.96 ± 35.10	96.53 ± 25.71	3.02**
FBS (mg/dl)	170.29 ± 57.75	82.14 ± 12.83	18.79**

[Table/Fig-1]: Biochemical Parameters of Diabetic and Control Groups

Parameter Total cholesterol (mg/dl)	Diabetics (%)	Controls (%)
Desirable (<200)	113 (71%)	145 (91%)
Borderline high (200-239)	31 (19%)	13 (8%)
High (≥240)	16 (10%)	2 (1%)
Triacylglycerols (mg/dl)		
Normal (<150)	61 (38%)	130 (81%)
Borderline high (150-199)	39 (24%)	17 (11%)
High (200-249)	60 (38%)	21 (8%)
HDL-C (mg/dl)		
Low (<40)	113 (71%)	100 (63%)
Borderline high (40-59)	45 (28%)	54 (34%)
High (≥60)	2 (1%)	6 (3%)
LDL-C (mg/dl)		
Optimal (<100)	69 (43%)	103 (65%)
Near optimal (100-129)	51 (32%)	42 (26%)
Borderline high (130-159)	26 (17%)	11 (7%)
High (160-189)	7 (4%)	2 (1.25%)
Very high (≥190)	7 (4%)	1 (0.75%)

[Table/Fig-3]: Frequency of the Biochemical Variables in the Diabetic and Control Groups according to the ATP III classification.



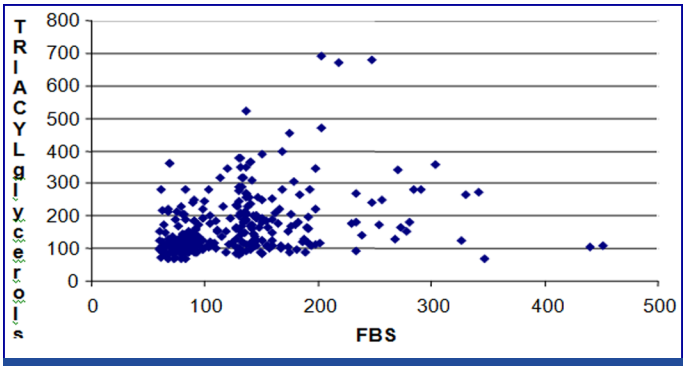
[Table/Fig-4]: Frequency of the Biochemical Variables in the Diabetic and Control Groups according to the ATP III classification.

DISCUSSION

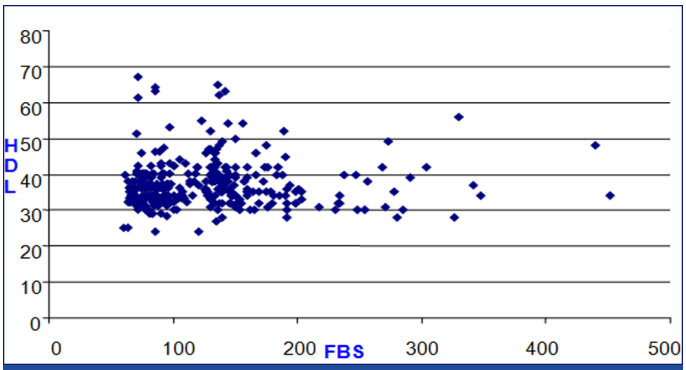
Diabetic patients have many complications which include elevated levels of LDL-C and triacylglycerols, low levels of HDL-C and a preponderance of abnormalities in the composition of the small-

Parameters	Diabetics			Controls		
	Male (n=80) Mean ± SD	Female (n=80) Mean ± SD	T Table value	Male (n=80) Mean ± SD	Female (n=80) Mean ± SD	T Table value
Total cholesterol (mg/dl)	184.18 ± 38.59	184.36 ± 32.81	0.03	154.95 ± 25.90	165.79 ± 27.67	2.49
Triacylglycerols (mg/dl)	228.05 ± 137.09	168.30 ± 63.82	3.51**	129.16 ± 58.04	134.80 ± 47.44	0.67
HDL-C (mg/dl)	37.28 ± 6.17	37.08 ± 5.75	0.26	37.44 ± 5.06	37.45 ± 3.79	0.02
LDL-C (mg/dl)	100.29 ± 36.67	113.63 ± 32.08	2.63*	91.68 ± 25.08	101.38 ± 25.41	2.45
FBS (mg/dl)	175.61 ± 68.61	164.96 ± 43.63	1.16	80.90 ± 13.74	83.39 ± 11.72	1.22

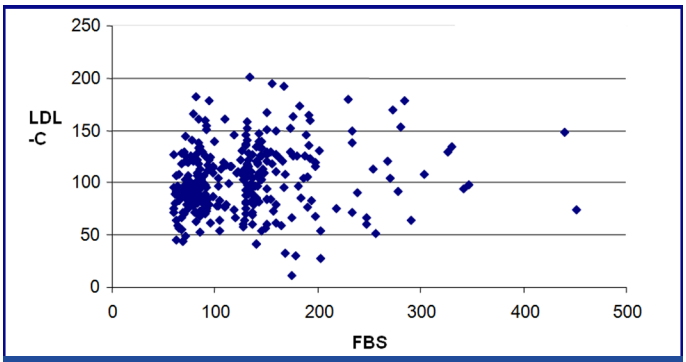
[Table/Fig-2]: Comparison of the Biochemical Parameters in the Males and Females in both Groups.



[Table/Fig-5]: Correlations between FBS and Triglycerides



[Table/Fig-6]: Correlations between FBS and HDL



[Table/Fig-7]: Correlations between FBS and LDL-C

er, dense particles [17]. In the present study, the results showed that the lipid and the lipoprotein profiles of the diabetics were higher than that of the controls and that they were in agreement with the findings of Idogun et al., [18] and Albrki et al., [19]. This study also showed that while the mean (± SD) of the variables were separated for the male and the female subjects, TG and LDL-C were significantly different in the diabetic group. The results showed a gender difference in the lipid metabolism between the diabetic and the non-diabetic males and females, which was in agreement with the findings of Gustafsson et al., [20]. However, Vinter-Repalust et al., [21] reported no significant differences in the prevalence of type 2 diabetes mellitus between males and females. The prevalence rates for high TC, combined high and very high LDL-C and low HDL-C in the diabetic subjects were 10%, 8% and 71% respectively. The prevalence rates of high TC and TG in this study were 10% and 38% respectively. The correlation studies showed a negative non significant correlation (r = -0.024) between FBG and HDL-C, whereas positive significant correlations were recorded between FBG and TC (r = 0.584) and FBG and TG (r = 0.514). This study revealed that dyslipidaemia was observed in the diabetic population, but that HDL-C was not significantly decreased.

CONCLUSION

The diabetic patients had a higher prevalence of high serum cholesterol, high triacylglycerol and high LDL-C than the controls, indicating that diabetic patients were more prone to cardiovascular diseases.

ABBREVATIONS

TC **Total Cholesterol**

TG **Triacylglycerols**

HDL **High Density Lipoprotein**

LDL **Low Density Lipoprotein**

FBS **Fasting Blood Sugar**

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