

Study of Lipid Profile in Prediabetics

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Abstract

The precursor state to diabetes mellitus is called as Prediabetes, in which all symptoms of diabetes are absent but the blood sugar is borderline high. Early diagnosis of type 2 Diabetes mellitus is difficult as mostly it is asymptomatic and presents with complications. Prediabetic individuals, have a higher risk of progression to diabetes in the future. Dyslipidemia occurs in diabetic patients, which is responsible for macrovascular atherosclerosis which leads to cardiovascular and cerebrovascular diseases, Prediabetic screening can stop early progression to diabetes and also prevent complications. So it become necessary to diagnose prediabetic individual and trace their dyslipidemia to prevent further complications. To study the prevalence of dyslipidemia in prediabetic patients. A hospital based case control study was conducted between march 2021 to September 2022 in 178 subjects, with following two groups of 89 subjects each Healthy

participants and established diagnosis of prediabetics. Result is Lipid profile in prediabetic subjects containing Total cholesterol ,TG ,LDL are remarkably raised compared to normal healthy subjects and HDL cholesterol is lower than normal subjects. Conclusion is Lipid profile in prediabetic subjects was deranged compared to normal healthy subjects. Study of lipid profile in prediabetics for screening of dyslipidemia is helpful for early prevention of cardiovascular and cerebrovascular complications.

Keywords: Prediabetics, Lipid Profile, Cardiovascular Diseases, Dyslipidemia.

Introduction

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia with deranged fat, carbohydrate and protein metabolism that results from improper secretion or action of insulin.¹ Early diagnosis of type 2 DM is difficult as mostly it is asymptomatic and presents with complications. About half the diabetes

in the world is not diagnosed, according to recent studies.¹ It is a modern day epidemic. The WHO Global Report on Diabetes has revealed that the number of adult diabetics in the world was 422 million in 2014 in comparison to 108 million in 1980.² The age standardized prevalence of diabetes has become 8.5% in the adult population, almost double that of the 4.7% in 1980 due to which WHO estimates that diabetes will become the seventh most common cause of mortality, worldwide, in the year 2030.³ Diagnosis of type 2 DM is difficult as mostly it is asymptomatic and presents with complication such as cardiovascular disease, nephropathy, neuropathy, retinopathy cerebrovascular disease like stroke and peripheral vascular disease. The precursor state to diabetes mellitus is called as Prediabetes, in which all symptoms of diabetes are absent but the blood sugar is borderline high. Prediabetic individuals, have a higher risk of progression to diabetes in the future. There is 50% risk of progression of prediabetes to overt diabetes in a average duration of 10 years.⁴ American Diabetic Association has defined pre-diabetes as Impaired Fasting Glucose, when fasting plasma glucose level is from 100 to 125 mg/dl and Impaired Glucose Tolerance, when plasma glucose level 2-h after an oral glucose tolerance test is from 140 to 199mg/dl.⁵ The ADA however continues to use term pre-diabetes and defines it as IFT,IGT, and now, HbA1c of 5.7% to 6.4%.⁶ As a consequence of Insulin Resistance (IR) in T2DM the inhibitory effect of insulin on hormone-sensitive lipase is removed leading to increased lipolysis in the fat cells in adipose tissue, which leads to increased delivery of free fatty acids (FFAs) to the liver.³ Increased delivery of FFA to liver increases VLDL formation (insulin resistance also increase Apo-B formation in the Liver) due to which

plasma VLDL and hence TG level is increased.³ VLDL exchanges its TGs with HDL via cholesteroester transfer protein (VLDL gives away TG and accepts cholesterol ester from

HDL).The mechanism is same for conversion of cholesterol ester to TG from LDL. Lipoprotein lipase enzyme and hepatic lipase enzyme eats the TG acquired from HDL and LDL.

Lipoprotein	Concentration (mg/dL)	Interpretation
TC	< 200	Desirable
	200-239	Borderline high
	≥240	High
LDL-c	<100	Optimal
	100-129	Near/above optimal
	130-159	Borderline high
	160-189	High
	≥190	Very high
HDL-c	<40	Low
	≥60	High
TG	<150	Normal
	150-199	Borderline high
	200-499	High
	≥500	Very high

Figure 1

Dyslipidemia in characterized by elevation of total cholesterol, Triglycerides, LDL,VLDL and decreased level of HDL as per given in table 1 which occurs in diabetic patients, which is responsible for macrovascular atherosclerosis, which leads to cardiovascular and cerebrovascular diseases.⁷ so Prediabetic screening can stop early progression to diabetes and trace their dyslipidemia to prevent further complications so aim is To study prevalence of dyslipidemia in prediabetic patients.

Material and Methods

A hospital based case control study was conducted in 178 subjects to evaluate the role of lipid profile in prediabetics. The study was done in Tertiary care center Ashwini Rural Medical College Hospital, Kumbhari, Solapur in between march 2021 to September 2022. The present study was carried out with following two groups of 89 subjects each:

Group 1(control): Healthy participants between ages 20-70 years of both sexes who on clinical evaluation were not suffering from diabetes, any acute or chronic ailments, on any medication which could influence lipid profile
 Group 2(cases): Men and women aged 20-70 years having established diagnosis of prediabetics.

Inclusion Criteria

Patients more than 18 years with prediabetic status, according to ADA criteria

1. FBG is 100 mg/dL(5.6mmol/L) to 125 mg/dL(6.9mmol/L)
2. 2-h PPG after the 75-g OGTT is 140mg/dL (7.8 mmol/L) to 199mg/dL (11.0mmol/L)(IGT)
3. HbA1c 5.7-6.4 %
4. Patients who are willing to give written consent.

Exclusion Criteria

1. Type 1 and Type 2 Diabetic patients.
2. Patients with active autoimmune disease, malignancy, hypothyroidism, SLE, Lipid metabolism disorders.
3. Patients having concomitant use of drugs like glucocorticoids and statins.

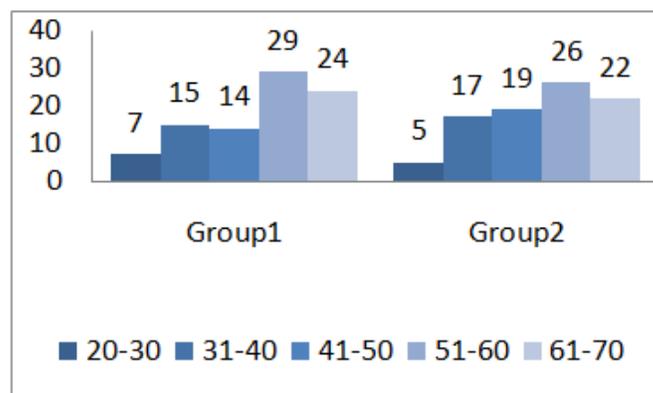
The study was initiated after the ethical committee clearance from our institute. A clinical judgment to inspire testing for prediabetes: propelling age, obesity, different highlights of the metabolic disorder, family ancestry of diabetes or CVD, indications of atherosclerotic pathology.

Biochemistry investigations which include Fasting blood sugar(FBS), 2 hr OGTT, HbA1C, 12 hr Fasting lipid profile includes serum total cholesterol(TC), triglyceride(TG), high density lipoprotein(HDL), low density lipoprotein(LDL) and very low density lipoprotein(VLDL). Normal levels of lipid levels were considered as per mentioned in Table 1.

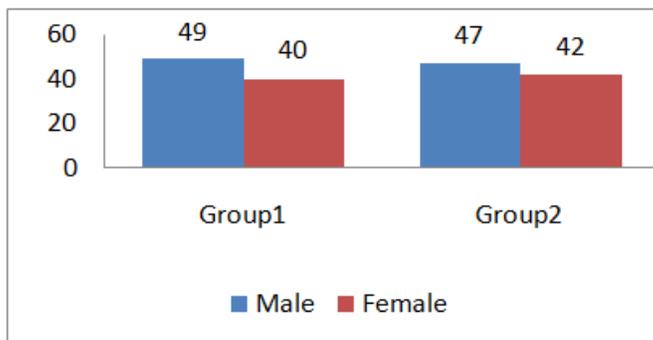
Association among the study groups is assessed with the help Fisher test, student 't' test and Pearson's chi-squared test. 'p' value less than 0.05 is taken as significant. SPSS ver.20 had used for statistical analysis and the graphical representation done in MS Excel 2010.

Result & Discussion

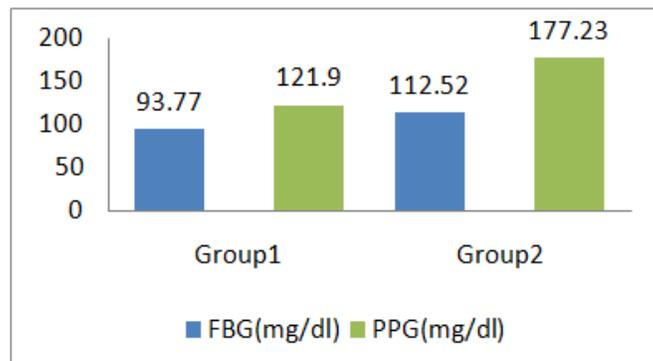
Graph 1: Distribution of subjects according to Age



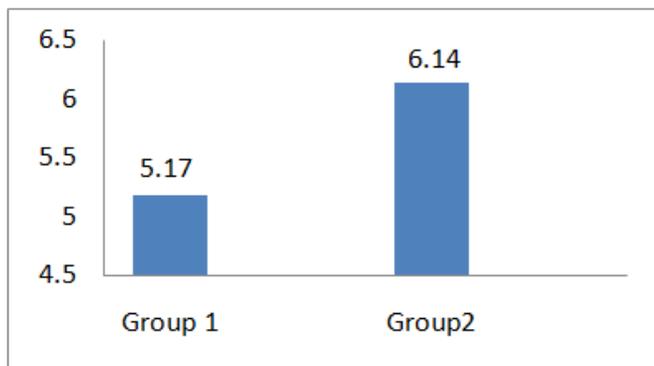
Graph 2: Distribution of subjects according to gender



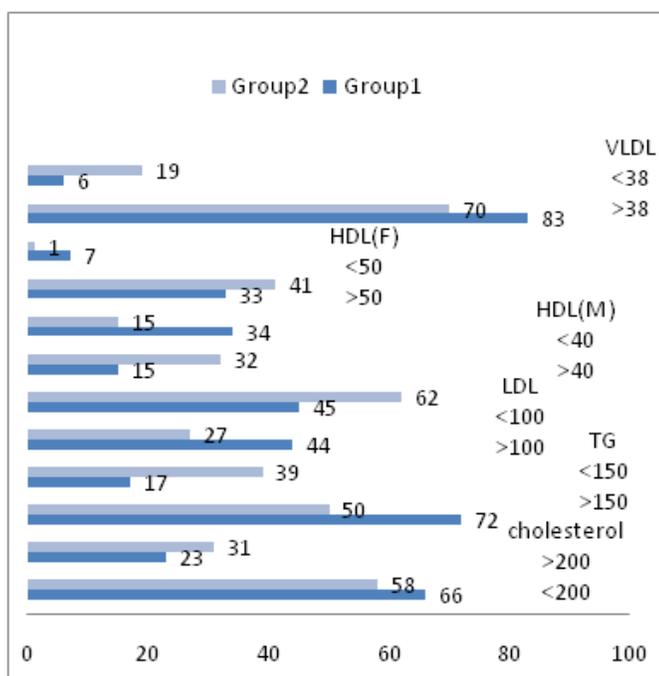
Graph 3: Comparison of Blood Glucose Levels of subject



Graph 4: Comparison of HbA1C of subjects



Graph 5: Comparison of Lipid Profile parameters of subject



A hospital based cross sectional case control study was conducted with 178 subjects to evaluate the role of lipid profile in prediabetics. The present study was carried out with following two groups, 89 subjects in each Group1&Group 2. The mean age of the subjects was 50.30 ± 12.64 years. There were 49 (55.1%) and 47 (52.8%) male subjects in Group 1 and Group 2 respectively while female subjects constituted 44.9% and 47.2% of the study groups respectively. The FBS and PPBS values of subjects in Group 1 were

significantly lesser (93.77 ± 15.47 mg/dl and 121.79 ± 11.29 mg/dl) as compared of subjects in Group2 (112.52 ± 16.40 mg/dl and 177.23 ± 17.31 mg/dl). It was observed in our study that the Glycated Haemoglobin (HbA1c) values of subjects in Group 1 ($5.27 \pm 0.25\%$) were significantly lesser as compared of subjects in Group 2 ($6.14 \pm 0.34\%$) Bhowmik B et al⁸, population-based cross-sectional study investigating serum lipids and their association with glucose intolerance status (T2DM and prediabetes) reported T2DM showed a significant association with TC(OR: 2.43, $p < 0.001$);TG (OR: 3.91, $p < 0.001$); and HDL-C (OR: 2.17, $p = 0.044$). Relation of prediabetes was significant with TG (OR: 1.96, $p < 0.001$) and HDL-C (OR: 2.93, $p = 0.011$).. In a National Health and Nutrition Examination Survey done by Williams DE et al⁹, the study observed mean TC of the prediabetic subjects were higher (174.2mg/dL) than the controls (157.5 mg/dL). They concluded that IFG had significantly high TC with normal fasting glucose (NFG).In our study the mean Total Cholesterol value in Group1 (172.75 ± 34.57 mg/dL) was significantly lower than Group2 (183.28 ± 43.76 mg/dL). RahbarS et al¹⁰ study proved value of LDL cholesterol were significantly increased in prediabetic subjects compared to normal healthy subjects. In our study the mean LDL value in Group 1 (97.97 ± 16.03 mg/dL) was significantly lower than Group 2 (120.62 ± 28.60 mg/dL). Shin JY et al.¹¹also observed that VLDL in prediabetic were significantly raised compared to normal healthy subjects.The mean VLDL value in Group 1 (23.56 ± 7.85 mg/dL) was significantly lower than Group2 (31.57 ± 7.40 mg/dL).). Kansal S et al¹² cross-sectional case control study assessing the role of lipid profile in prediabetes reported mean value of triglyceride for case (139.5 ± 47.24 mg/dL) was significantly higher

than controls (106.81 ± 61.97 mg/dL). P-value was 0.0002 ($p < 0.05$). In our study the mean Triglyceride value in Group 1 (109.56 ± 30.20 mg/dL) was significantly lower than Group 2 (139.78 ± 23.52 mg/dL) Balgi V et al¹³ cross-sectional case-control study evaluating the lipid profile of Prediabetes as compared to normal subjects reported mean value of HDL for case (27.28 ± 9.55 mg/dL) was significantly lower than controls (39.72 ± 9.63 mg/dL). Kansal S et al¹² cross-sectional case control study assessing the role of lipid profile in prediabetes reported mean value of HDL for male case (36.12 ± 6.44 mg/dL) was significantly lower than male controls (41.16 ± 6.58 mg/dL). P-value was 0.0001 ($p < 0.05$). Mean value of HDL for female case (36.32 ± 6.26 mg/dL) was significantly lower than female controls (42.71 ± 6.58 mg/ dL). P-value was 0.0001 ($p < 0.05$). In our study, the mean HDL value in male patients of Group 1 (44.02 ± 8.55 mg/dL) was significantly higher than male patients of Group 2 (38.17 ± 7.37 mg/dL). The mean HDL value in female patients of Group 1 (42.50 ± 13.34 mg/dL) was significantly higher than female patients of Group 2 (36.14 ± 6.80 mg/dL). While Magge SN et al¹⁴ study confirmed that obese prediabetic individuals have greater chances of dyslipidemia than non prediabetic obese individual. Miyazaki Y et al.¹⁵ study stated that lipid profile in prediabetic subjects were very similar to subjects of T2DM.

Conclusion

Lipid profile in prediabetic subjects containing Total cholesterol ,TG, LDL, VLDL are remarkably raised compared to normal healthy subjects and HDL cholesterol is lower than normal subjects. The absence of prediabetes direction and screening on diabetes drives the condition that makes prediabetes unnoticed and

unwatched. Taking a gander at the predominance and the intricacy related with cardiovascular illness in diabetes, it is getting to be important to analyze prediabetes and think about their lipid profile to keep them from creating over diabetes. Hence the present study was done at our tertiary care centre to assess the role of lipid profile in prediabetics, compared between group of asymptomatic diabetes and healthy controls. Lipid profile in prediabetic subjects was deranged compared to normal healthy subjects. These prediabetic individuals are high risk for development of cardiovascular and cerebrovascular disease. Study of lipid profile in prediabetics for screening of dyslipidemia is helpful for early prevention of cardiovascular and cerebrovascular complications.

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