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ASSESSMENT OF DYSLIPIDEMIA PATTERN IN PREDIABETES INDIVIDUAL

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ABSTRACT

Background: Diabetes Mellitus is one of the leading non-communicable diseases all over the world . Diabetes is often preceded by a prodromal condition termed pre-diabetes. Pre-diabetes is a condition in which the blood glucose level is above normal but below the diagnostic threshold for diabetes mellitus. Impaired lipid profile is commonly present in type 2 diabetes and can also occur in pre-diabetes. Dyslipidemia occurring in diabetic patients, play a critical role in acceleration of macrovascular atherosclerosis and contribute to the excess risk of CVD. Keeping in view the prevalence and increased risk of cardiovascular disease in diabetes, it is becoming necessary to diagnose prediabetic individuals and assess their lipid profile and prevent them from developing overt diabetes and hence preventing their further morbidity and mortality.

Aim: To study lipid profile in prediabetes.

Material and Methods: This was a cross-sectional case control study, carried out between September 2016 - march 2017, which included 64 cases (prediabetic subjects) and51 healthy controls. Lipid profile of all identified prediabetic individuals and normal healthy controls was done and statistically analysed.

Result: Total cholesterol, low density lipoprotein (LDL), triglyceride (TG), very low density lipoprotein, TG/HDL ratio and LDL/HDL ratio were significantly raised in prediabetic individuals as compared to normal healthy subjects, whereas high density lipoprotein (HDL) was significantly lower in prediabetic individuals as compared to normal healthy subjects.

Conclusion: Prediabetics had deranged lipid profile as compared to normal healthy subjects. These prediabetic individuals, because of their dyslipidemia, are at higher risk for developing cardiovascular disease. Lifestyle modification or pharmacotherapy in such individuals becomes a clinical consideration.

Introduction:

Prediabetes or impaired fasting glycemia or impaired fasting glucose (IFG) refers to a condition in which the fasting blood glucose is elevated above what is considered normal levels but is not high enough to be classified as diabetes mellitus. According to the International Federation of Diabetes, 415 million adults around the world are suffering from diabetes, and it is estimated that the numbers will reach around 642 million by 2040.[1] Nearly 80% of the total adult diabetics are in low- or middle-income countries. India leads the World and stands at the second position after China, with 69 million persons affected by diabetes poses a daunting challenge to the sustainable development of the nation as almost every tenth adult (9.3%) in India is estimated to be affected by diabetes. The prevalence of prediabetes (impaired fasting glucose and/or impaired glucose tolerance) were 8.3% in Tamilnadu, 12.8% in Maharashtra, 8.1% in Jharkhand and 14.6% in Chandigarh.[2] Effects of the disease can be macrovascular, as seen in the cardiovascular system, or microvascular, as seen with retinopathy, nephropathy, and neuropathy. IFG sometimes progresses to Type 2 diabetes mellitus (T2DM). There is a 50% risk over 10 years of progressing to overt diabetes. A recent study cited the average time for progression as less than three years. Both IFG and IGT are associated with increased cardiovascular risk.[3] Dyslipidemia, frequently occurring in T2DM patients, play a critical role in acceleration of macrovascular atherosclerosis and contribute to the excess risk of CVD.[4] The dyslipidemia in T2DM is, in general, characterized by elevated triglycerides (TG), reduced high density lipoprotein (HDL) cholesterol, and predominant presence of small dense low density lipoprotein (sdLDL) particles.[5] The lack of prediabetes guidance/consensus and the screening on diabetes creates the condition that makes prediabetes goes unknown and unwatched.[6] Keeping in view the prevalence and increased risk of cardiovascular disease in diabetes, it is becoming necessary to diagnose prediabetic individuals and assess their lipid profile and prevent them from developing overt diabetes and hence preventing their further morbidity and mortality.

Material and Methods

Study Design: Cross-sectional case control study. Sample Size: 64 cases (prediabetic subjects) and 51 controls admitted in VHRC REWA. Duration of Study: 7 months (September 2016 - MARCH 2017).

Inclusion Criteria: Patients of prediabetes of either sex (male/female). All the patients with:

- Fasting blood glucose level is between 110 mg/dl and 125 mg/dl (IFG) and, or
- Two-hour plasma glucose level after 75-g OGTT is between140 to 199 mg/dL (IGT) [WHO 1999].
- Age and sex matched controls were included in the study.

Exclusion Criteria: Not consenting patients, patients with Type 1/ Type 2 diabetes mellitus, hypothyroidism, smokers and alcoholics. Biochemistry measurements including fasting blood sugar (FBS), 2 hour OGTT, serum total cholesterol (TC), triglyceride (TG), high density lipoprotein (HDL), and low density lipoprotein (LDL) and very low density lipoprotein (VLDL) were done. Normal levels of lipids were considered as per NCEP ATP III classification.

Statistical Analysis : Statistical analysis was done by using descriptive statistics and inferential statistics, using chi-square test, odd's ratio, Pearson's correlation coefficient, and multiple regression analysis. A p value <0.05 was considered as a level of significance.

Results

The overall presence of abnormal serum total cholesterol, LDL, triglycerides, VLDL, TG/HDL ratio and LDL/HDL ratio with statistical significance is given in Table 1.

		Mean+/- sd	P value
Total cholestrol	Prediabetes	192.75 ± 42.02	0.020
	Control	176.99 ± 36.27	
triglycerides	prediabetes	139.5 ± 47.24	0.0002
	Control	106.81 ± 61.97	
Ldl cholestrol	prediabetes	138.39 ± 23.34	0.001
	Control	107.84 ± 29.57	
Hdl cholesterol male	prediabetes	35.12 ± 6.44	0.0001
	Control	43.16 ± 6.58	
HDL cholesterol Female	prediabetes	36.32 ± 6.26	0.0001
	Control	41.71 ± 6.58	
TG/HDL ratio	case	4.01 ± 1.59	0.0001
	control	2.57 ± 1.42	
HDL/LDL	case	3.45 ± 1.24	0.0001

	control	2.43 ± 0.77	
VLDL CHolestrol	case	29.07 ± 20.08	0.001
	control	22.27 ± of 14.32	

Discussion

In our study, mean value of total cholesterol for cases (192.75 ± 42.02 mg/dL) was more than controls (176.99 ± 36.27 mg/dL). P-value was 0.020 (p<0.05) i.e. significant.

Similarly, Williams et al., studied data from National Health and Nutrition Examination Survey done in 1999-2000(NHANES). The mean total cholesterol of the prediabetic subjects were higher (174.2mg/dl) than the controls (157.5mg/dl). They concluded that adolescents with impaired fasting glucose had significantly high total cholesterol than adolescents with normal fasting glucose.[7] In our study, mean value of LDL for case (138.39 ± 23.34 mg/dL) was more than controls (107.84 ± 29.57 mg/dL). P-value was 0.001 (p<0.05) i.e. significant. Similarly, Rahbar et al reported that pre-diabetics are at higher risk of having increased level of LDL cholesterol (LDL-c).[8] Also, Magge et al. observed that obese prediabetic adolescents have a significantly more atherogenic lipoprotein profile compared with obese normoglycemic peers.[9] Shin et al. also found a statistically significant difference in LDL between non-diabetes controls (n=172) and prediabetes subjects (n=138) with a mean LDL 134±34.6mg/dl and 150.5±38.0 mg/dl respectively. They proved that there was a positive correlation between raised blood glucose and low density lipoprotein (LDL).[10]
In our study, mean value of HDL for male case (35.12 ± 6.44 mg/dL) was lower than male controls (43.16 ± 6.58 mg/dL). P-value was 0.0001 (p<0.05) i.e. significant. Mean value of HDL for female case (36.32 ± 6.26 mg/dL) was lower than female controls (41.71 ± 6.58 mg/dL). P-value was 0.0001 (p<0.05) i.e. significant. Similarly Miyazaki et al observed low HDL levels in prediabetic subjects than controls.[10] Shin et al also concluded that there is statistical significant difference in mean HDL between non-diabetes controls (n=172) and prediabetes (n=138) subjects with a mean HDL (mg/dl) 54.7±13.3 mg/dl and 49.9±11.6 mg/dl respectively. They proved that there is a positive correlation between raised blood glucose and HDL.[11]

Mean value of triglyceride for case (139.5 ± 47.24 mg/dL) was higher than controls (106.81 ± 61.97 mg/dL). P-value was 0.0002 (p<0.05) i.e. significant.

Similarly, Rahbar et al showed that pre-diabetics are at higher risk of having high triglyceride (TG).8 Also, Barzi et al, Gaziano et al and Boizel R et al observed that TG levels were significantly higher in IFG/IGT compared to NFG/NGT.[12-14] Similarly Miyazaki et al in their study observed raised TG levels in prediabetic subjects.[10]

In our study, mean value of VLDL for case (29.07 ± 20.08 mg/dL) was more than controls (22.27 ± of 14.32 mg/dL). P-value was 0.001 (p<0.05) i.e. significant. However we have taken this parameter (VLDL) and found out statistical significance between the two groups, but we did not find any study suggesting direct relationship between very low density lipoprotein and prediabetes in the literature.

Triglyceride /High Density Lipoprotein Ratio (TG/HDL)

In our study, mean value of TG/HDL ratio for case (4.01 ± 1.59) was more than controls (2.57 ± 1.42). P-value was 0.0001 (p<0.05) i.e. significant.

Similarly, Barzi et al in 2005, Gaziano et al and Boizel et al showed that TG/HDL were significantly higher in IFG/IGT compared to NFG/NGT.[12-14] Miyazaki et al also observed that IFG/IGT subjects had higher TG/HDL ratio (4.0 ± 2.5 for cases and 2.7 ± 1.9 for controls). These results suggested that elevation of postprandial levels of plasma glucose and insulin based on whole body insulin resistance contributed to atherogenic lipids profile.10 McLaughlin et al, concluded that a TG/HDL-C ratio ≥3.5 had been proposed as a cut-off value to predict the presence of insulin resistance (IR). They found that this cut-off had high sensitivity (79%) and specificity (85%) in their study population and concluded that a plasma triglyceride/high-density lipoprotein cholesterol concentration ratio might provide a simple means of identifying insulin resistant, dyslipidemic patients who are likely to be at increased risk of cardiovascular disease. These studies also shown that TG/HDL-C is as close as fasting plasma insulin concentration with IR and could be used as an indicator of IR in clinical setting, as TG/HDL >3.5 is a strong indicator of the presence of IR.[15]

In our study, mean value of LDL/HDL ratio for case (3.45 ± 1.24) was more than controls (2.43 ± 0.77). P-value was 0.0001 (p<0.05) i.e. significant.

Whereas Miyazaki et al. in their study showed that there was no significant difference for LDL/HDL ratio between case group and control group.[10]

However, we did not found any study in the literature showing direct relation between LDL/HDL Ratio and Prediabetes.

Conclusion

Total cholesterol, LDL, TG, VLDL, TG/HDL ratio and LDL/HDL ratio were significantly raised in prediabetic individuals as compared to normal healthy subjects whereas HDL was significantly lower in prediabetic individuals as compared to normal healthy subjects.

These prediabetic individuals, because of their dyslipidemia, are at higher risk for developing cardiovascular disease.
Lifestyle modification or pharmacotherapy in such individuals becomes a clinical consideration.

We recommend proper screening for prediabetics and their associated dyslipidemia and introduce a healthy lifestyle or pharmacotherapy for those prediabetic individuals to decrease the risk of cardiovascular disease.

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