(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 5, Issue 5 , Page No: 371-375
September-October 2022

IJMSCR

Pattern of Dyslipidemia In Pre-Diabetes And Non-Diabetic Subjects From A Tertiary Hospital Of Chhattisgarh

[1]Manish Patil*, [2]Mahavir Prasad Agrawal
[1]Associate Professor, [2]Medicine specialist,
[1]Department of Medicine, Pt. J. N. M. Medical College and B. R. A. M. Hospital, Raipur, (C.G), India
[2]Government District Hospital,Gariyaband C.G

***Corresponding Author:**
Manish Patil
Associate Professor, Department of Medicine, Pt. J. N. M. Medical College and B. R. A. M. Hospital, Raipur, (C.G), India

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Prediabetes stage is a latent and asymptomatic phase before glucose levels exceed the threshold for diabetes. The risk factors for prediabetes are largely the same as that for T2DM. Hence crosses sectional observational study is designed to assess the lipid profile status in prediabetes and non-diabetic individuals. For this study 50 prediabetes and 50 non-diabetes individuals were collected prospectively. A detailed clinical evaluation was conducted and followed by biochemical investigations such as Fasting, postprandial blood sugar and lipid profile were performed on each participant.The data was analysed using chi square test and student - t tests.From the results it was interesting to note that the obesity and family history of diabetes are more in predibetes patients compared to non-diabetic subjects. The distribution of lipid profile in non-diabetic and predibetes patients showed that total cholesterol, VLDL-cholesterol and triglycerides are significantly higher in prediabetes group compared to non-diabetic group. Further, significant reduction in the HDL-cholesterol was noted in prediabetes group. Finally, the dyslipidemia is was significantly higher in prediabetes group compared to non-diabetic group. Hence it can be inferred from this study that dyslipidemia can be regarded as an independent risk factor and prognostic marker of prediabetes condition.

Keywords: Prediabeties, Lipid profile, Dyslipidemia, glucose tolerance

Introduction

Prediabetes stage is a latent and asymptomatic phase before glucose levels exceed the threshold for diabetes. Globally the prevalence of prediabetes is increasing gradually and it was projected that, by 2030 more than more than 470 million people will have prediabetes(1). Prediabetes stage includes impaired fasting glucose (IFG) and impaired glucose tolerance (IGT). With regard to etiopatogenic mechanisms these dysglycaemic disorders (IFG and IGT) reflect distinct pathological disturbances in glucose homeostasis when occurring in isolated condition (2). Individuals with bothdysglycaemicconditions are at two times greater risk of developing T2DM than individuals who have only one of them(3). Recent studies demonstrated that changes in diet and increasing the level of physical activity could prevent prediabetes from developinginto T2DM(4, 5).

The risk factors for prediabetes are largely the same as that for T2DM. Several epidemiological studies have suggested that the age is a decisive factor for greater prevalence of prediabetes besides high-calorie food intake and decreasing levels of physical activity (6). In addition, the characteristic insulin resistance and decreased beta-cell mass play a causative role in the progressive beta-cell dysfunction characteristic of prediabetes(2). Free fatty acids (FFAs) play a role in

prediabetes through various mechanisms. Increased lipolysis, which promotes the delivery of FFAs from the adipose tissue to skeletal muscle and the liver, is seen in obese patients, accentuating several physiological processes. Free fatty acids stimulate the production of glucose in the liver, interfere with the extraction of insulin by the liver, and disrupt the insulin stimulated glucose uptake, phosphorylation, and oxidation in skeletal muscles (7-9).Dyslipidemia is often co existing in prediabetes and it is a high risk factor for atherosclerosis and cardiovascular and cerebrovascular events. Hence early detection and management of above parameters is valuable in preventing cardiovascular complications. 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 to understand the underlying pathophysiology. Hence crosses sectional observational study is designed to assess the lipid profile status in prediabetes and non-diabetic individuals.

Materials and Methods

Subjects

The present study was undertaken as a cross sectional observational study with 50 prediabetes and 50 non-diabetes individuals on which the data were collected prospectively. Samples were collected from a relatively homogenous population from Chhattisgarh, India. All prediabetes patients were recruited from Dr. B.R. Ambedkar hospital, Raipur. The inclusion criterion for prediabetes groups includes one of the following aspect (1) FBS between 100 mg/dl and 125 mg/dl. (2) Two hr plasma glucose after 75g OGTT between 140 mg/dl and 199 mg/dl and (3) HbA1c level 5.7% to 6.4%. Non-diabetic individuals aged between30-50 years of either sex were recruited as comparison group from Dr. B.R. Ambedkar Hospital, Raipur, so that they broadly represent matched ethnic and socio-economic backgrounds with that of the prediabetes group. Individuals with type I / II diabetes mellitus, hypertension, hypothyroidism and familial hypercholesteraemia and history of smoking and alcohol intake were excluded from the study. The Institutional Ethical Committee of Pt. J. N. M. Medical College, Raipur, approved this study. Written informed consent was collected from the study participants before commencing the study.

Methods: Detailed clinical examination was performed on all study subjects. The socio-demographic data; age, gender, level of education and occupation was acquired by interviewing the patient. Patients with obesity, sedentary life style, boils, sleep disorders, family history of hypothyroidism, family history of hypertension were recorded. All participants underwent detailed clinical evaluation followed by biochemical investigations such as Fasting, postprandial blood sugar and lipid profile. The categorical definitions of optimal, normal, or elevated lipid levels, Adult Treatment Panel III (ATP III) guidelines of National Cholesterol Education Program was adopted.Body mass index (BMI) was calculated by dividing the weight in kilograms by the height in square meters.

Statistical Analysis

Clinical and biochemical data on the patients are reported with the mean ± standard deviations. The distribution of categorical variables between groups was analysed using chi square test. Student - t test was performed to evaluate the difference between the continuous variables of both non-diabetic and prediabetes groups. A p value of less than 0.05 was considered as significant for all statistical tests. Statistical analysis was performed using SPSS software version 17.0 (SPSS Inc, Chicago, Illinois) for Windows.

Results

The basic demographic details of the study subjects were documented in Table 1. The mean age and standard deviation (SD) was 43.20±5.41 yrs for the prediabetes cases, 41.42±5.37 yrs for the non-diabetic control subjects (p = 0.102). In male subjects are predominant in both prediabetes (62%) and non-diabetic (62%) groups. Majority of the study subjects belong middle and lower socioeconomic groups and their distribution in prediabetes and non-diabetic groups is not significantly different (p=0.533). Our study revealed that vegetarians were less and their distribution in prediabetes (26%) and non-diabetic (18%) groups is not significantly different (p=0.470). The distribution of positive family history of diabetes in prediabetes (56%) and non-diabetic (30%) groups is significantly different (p=0.015). In the present study there are no differences in age, SBP, DBP, and hemoglobin in between prediabetes and non-diabetic groups (Table 1).

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Comparison of lipid profiles between prediabetes and non-diabetic groups was documented in table 2. The mean total cholesterol, triglyceride and VLDL-cholesterol were significantly higher in prediabetesgroup compared to non-diabetic group (Table 2). Although there is no significant difference in HDL-cholesterol content between prediabetes (41.24±3.07) and non-diabetic groups (42.00±2.85), however prediabetes group showed relatively low HDL-cholesterol (p=0.202). Distribution of lipid profile in non-diabetic and prediabetes groups based on NCEP, ATP III classification was provided in table 3. Subjects with borderline and high triglyceride content were found in prediabetes group compared to the non-diabetic group (p<0.001). The dyslipidemia is more in prediabetes group (80%) compared to the non-diabetic group (30%), which is statistically significant (p<0.001). Subjects with low triglyceride content were found in prediabetes group compared to the non-diabetic group (p<0.001).Subjects with low HDL cholesterol were found to be more in prediabetes group compared to non-diabeties group (p=0.194).

Discussion

Analysis of 50 non-diabetic and 50 prediabetes subjects demonstrated that the age >45 years, family history of diabetes and higher BMI are important risk factors for prediabetes. Analysis of lipid profile showed that the total cholesterol, VLDL-cholesterol and triglycerides are significantly higher in prediabetes group compared to non-diabetic group. In contrast to this significant reduction in the HDL-cholesterol was noted in prediabetes group.

Although the risk factors for prediabetes are largely the same as those for T2DM, age remains as an important risk factor for prediabetes. A study from southern Taiwan, showed that the age >45 years is a risk factor for prediabetes(10). In Iranian urban population advancing age and obesity and low education status has increased in pre-diabetes than normoglycemic subjects(11). Data from Screening for Impaired Glucose Tolerance (SIGT) and the National Health and Nutrition Examination Survey (NHANES) studies, demonstrated the association of age with higher HbA(1c) levels (12). In consistent with these studies, our results revealed that the age of prediabetic subjects was >40 years. Further in this study the family history of diabetes mellitus is was significantly higher in prediabetes group. Results of several independent studies also indicated that family history of diabetes has a significant, independent, and graded association with the prevalence of prediabetes(13-15). Significantly higher BMI was observed in prediabetes group compared to non-diabetic group of this study is suggesting that the obesity one of the contributing factor for prediabetes. This has been supported by various independent studies in different ethnicities across the world (16-20).

This study showed significantly higher dyslipidemia in prediabetes group compared to non-diabetic group. In patients with prediabetes, the risk for cardiovascular events increases with concomitant dyslipidemia (21). Prediabetic patients often exhibit high triglycerides and low HDL (22). Dyslipedemia seen in prediabetes is due to abnormality of insulin action and not hyperglycemia per se. The prevalence of elevated fasting postprandial blood glucose, hypercholesterolemia, hypertriglyceridemia, low HDL, and high LDL were significantly higher in males than in female (21). **S**ignificantly higher dyslipidemia in prediabetics as compared to normal healthy subjects was found in studies from India and abroad (23-26).In the present study hypertriglyceridemia was found in significant proportion of prediabetes patients. Increased serum triglyceride level (TG) were found in prediabetessubjects from Jharkhand (27), United states (28),Japan (26) and Bangladesh populations (29). Besides this low HDL levels were found in 38% of prediabetes and 24% of non-diabetes subjects, which is not statistically significant. However, several studies showed documented decreased HDL-C among participants with prediabetes than those with normal (27, 29, 30). Overall prediabetic Subjects having altered lipid profile have a relatively greater risk of developing to frank diabetes and hence associated complications (31). In support of this hypothesis some thiazoladinediones improve insulin actions on peripheral tissues and lead to greater improvement in lipid levels (32).

To conclude, our study highlighted the influence of lipid profile in changing the non-diabetic subjects as predibetes. Hence it can be inferred from this study that dyslipidemia can be regarded as an independent risk factor and prognostic marker of prediabetes condition. These prediabetic individuals, because of

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their dyslipedimia, are at higher risk for developing cardiovascular disease. Life style modification or pharmacotherapy in such individuals becomes a clinical consideration.

Acknowledgements

The authors would like to thank Pt. J. N. M. Medical College and B. R. A. M. Hospital, Raipur, (C.G) for providing necessary facilities and the subjects.

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