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OCCURRENCE OF DYSLIPIDEMIA IN PRE-DIABETIC INDIVIDUALS: A HOSPITAL-BASED OBSERVATIONAL STUDY

General Medicine

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ABSTRACT

Background: Pre-diabetes (PD) is the precursor stage of diabetes mellitus, in which the subject's plasma glucose is higher than normal but lower than diabetes mellitus thresholds. Lipid profile disorders are significantly associated with prediabetes and diabetes. Individuals with pre-diabetes have a high risk of progression to diabetes. Assessment of serum lipids is warranted not only for T2DM patients but also for those with prediabetes. **Methods:** The study was carried out in the Department of Medicine, Gauhati Medical College and Hospital, Guwahati from 1st June 2021 to 31st May 2022. After satisfying the inclusion and exclusion criteria 120 prediabetic patients were included in the study and were evaluated. Patients were categorized according to ATP III classification. **Result:** In our study group, out of 120 patients, a maximum number of patients belonged to the age group of 41-50 yrs and the mean age was 48.17±10.5 years with 60.8% male and 39.2% female cases. Among the different lipids, we found hypercholesterolemia in 23.4%, hypertriglyceridemia in 62.5%, and high LDL was found in 76.7% of prediabetic subjects. In our study, we found low HDL (<40 mg/dl)levels in 64.2% of prediabetic patients. The mean value of total cholesterol was 171.1 ±50.2 , Triglyceride was 170.2 ±76.5 , HDL was 38.3 mg/dl±9.4, LDL was120.8 ±33.5 and VLDL was 30.5 ±8.6. HbA1c has a significant positive correlation (p-value <.001) with TC, TG LDL, and VLDL and a significant negative correlation (p-value< .001) with HDL. **Conclusion:** Pre-diabetic individuals often exhibit an atherogenic pattern of risk factors that include high levels of total cholesterol (CHOL), low-density lipoprotein cholesterol (LDL), triglycerides (TG), and low levels of high-density lipoprotein cholesterol (HDL), it predisposes to premature atherosclerosis causing cardiovascular and cerebrovascular complications in the long term in this individuals if not evaluated early.

KEYWORDS

Prediabetes(PD), lipid profile, ATP III classification,HbA1C

INTRODUCTION

Pre-diabetes (PD) is the precursor stage of diabetes mellitus. PD stage is diagnosed with Fasting plasma glucose (FPG) in between 100-125 mg/dl (both included), HbA1C value in between 5.7-6.4% (both included), or two-hour plasma glucose (2-h PG) in between 140-199mg/dl [(1)]. Individuals with pre-diabetes have a high risk of progression to diabetes. It is estimated that 70% of prediabetic persons will develop diabetes in the long term [(2)]. According to National Urban Diabetes Survey, the estimated prevalence of prediabetes is 14 percent in India [(3)] The numerous comorbidities, including obesity and lipid abnormalities are associated with the risk of developing diabetes in prediabetic individuals [(4)]. Pre-diabetic individuals often exhibit an atherogenic pattern of risk factors that include high levels of total cholesterol (CHOL), low-density lipoprotein cholesterol (LDL), and triglycerides (TG) and low levels of high-density lipoprotein cholesterol (HDL)[(5)(6)(7)]. Although the association between lipid abnormality and T2DM has been investigated in various populations, few studies have been conducted to evaluate this association in pre-diabetic patients as a high-risk population.

AIM AND OBJECTIVES

1. To study serum lipid profile in pre-diabetic individuals.
2. To study the correlation between HbA1C and lipid profile in these individuals.

METHODS

A hospital-based cross-sectional study was carried out in the Department of Medicine, Gauhati Medical College and Hospital, Guwahati after ethical committee approval, from 1st June 2021 to 31st May 2022. We obtained written informed consent from all the study participants before enrolling them in the study. A total of 120 prediabetic patients were included in the study and were evaluated after satisfying all the inclusion and exclusion criteria. Patients were categorized according to ATP III classification of dyslipidemia for evaluation of serum lipid profile. Data gathered were analyzed keeping the aims and objectives in mind with appropriate statistical methods. Statistical analysis was done using the Statistical Package for the Social Sciences version 29 (SPSS 29). For the comparison of categorical variables between groups, the Chi-square test was used whenever appropriate. For all analysis, the statistical significance was fixed at a 5% level of significance (p-value <0.05).

Inclusion Criteria

1. Patient with an age greater than 18 years.
2. Patients with fasting blood glucose between 100 and 125(both included).
3. Patient with oral glucose tolerance test between 140 to 199 (both included).
4. Patient with HbA1C between 5.7% to 6.4%(both included).

Exclusion Criteria

1. Diabetes mellitus
2. Chronic kidney disease
3. Patients on lipid-lowering drugs.
4. Patients with Hb < 10 g/dl and any history suggestive of hemoglobinopathy.

RESULTS

Table 1: Age-wise Distribution Of The Study Subjects

Age-group(in years)	Number of patients	Percentage
18-30	14	11.7
31-40	25	20.8
41-50	42	35.0
51-60	33	27.5
>60	6	5.0

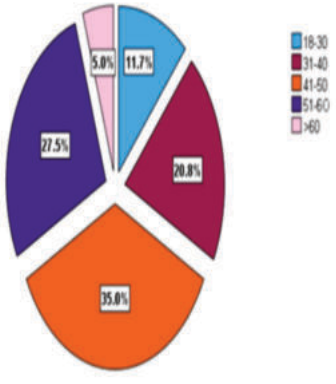

Fig 1: Age-wise Distribution Of The Study Population

The most common age group was found to be in between 41-50 years (35%) followed by 51-60 years (27.5%). The mean age of patients in our study group was 48.17±10.5. Only 6 patients (5%) belonged to the age group of >60 years.

Table 2: Gender-wise Distribution Of The Study Population

Gender	Number of patients	Percentage (%)
Male	73	60.8
Female	47	39.2

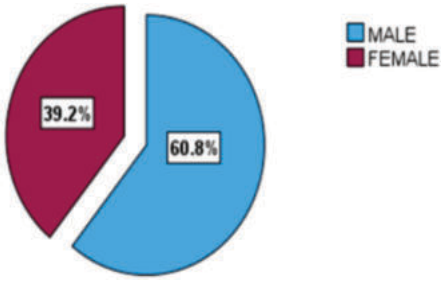

Fig 2: Gender-wise Distribution Of The Study Population

Among 120 patients 73 were male(60.8%) and 47 were female (39.2%)

Table 3:Dyslipidemia Based On Total Cholesterol In Cases

CHOLESTEROL (mg/dl)	No of cases	
<200: NORMAL	Count	92
	% of Total	76.6%
200-239: BORDERLINE HIGH	Count	23
	% of Total	19.2%
≥240: HIGH	Count	5
	% of Total	4.2%

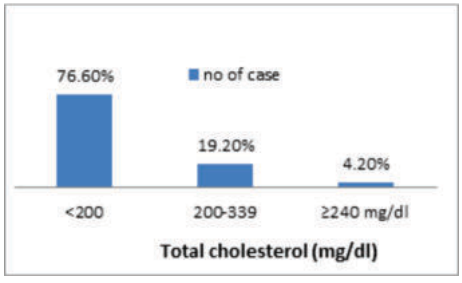

Fig 3: Dyslipidemia Based On Total Cholesterol

Out of 120 patients, we found borderline high cholesterol (200-239 mg/dl) in 19.2%, high TC (≥240mg/dl) in 4.2%, and total hypercholesterolemia in 23.4% of the study population.

Table 4: Dyslipidemia On The Basis Of Total Triglyceride In Cases

TRIGLYCERIDE (mg/dl)	No of cases	
<150: NORMAL	Count	45
	% of Total	37.5%
150-199: BORDERLINE HIGH	Count	48
	% of Total	40.0%
200-499: HIGH	Count	24
	% of Total	20.0%
≥500: VERY HIGH	Count	3
	% of Total	2.5%

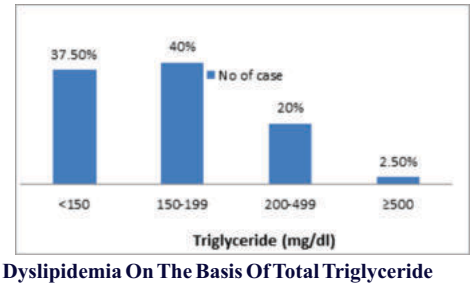

Fig 4: Dyslipidemia On The Basis Of Total Triglyceride

Out of 120 patients we found borderline high triglycerides (150-199mg/dl) in 40%, high triglycerides (200-499 mg/dl) in 20% and very high triglycerides (>500 mg/dl) in 2.5% .So total hypertriglyceridemia was found in 62.5% of study population.

Table 5: Dyslipidemia Based On Hdl In Cases

HDL (mg/dl)	No of cases	
40-60:NORMAL	Count	35
	% of Total	29.2%
<40:LOW	Count	77
	% of Total	64.2%
>60:HIGH	Count	8
	% of Total	6.7%

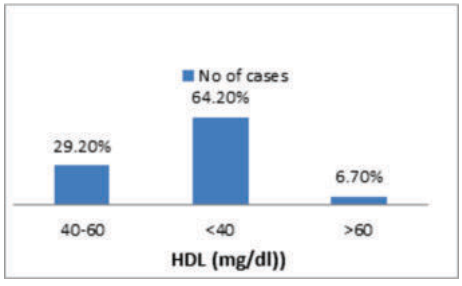

Fig 5: Dyslipidemia Based On Hdl

Out of 120 patients, we found low HDL (<40 mg/dl) levels in 64.2% of prediabetic patients.

Table 6: Dyslipidemia Based On LDLIn Cases

LDL (mg/dl)	No of cases	
<1OO: OPTIMAL	Count	28
	% of Total	23.3%
100-129: ABOVE OPTIMAL	Count	47
	% of Total	39.2%
130-159: BORDERLINE HIGH	Count	25
	% of Total	20.8%
160-189: HIGH	Count	17
	% of Total	14.2%
≥190: VERY HIGH	Count	3
	% of Total	2.5%

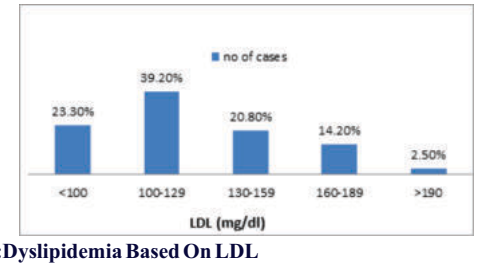

Fig 6:Dyslipidemia Based On LDL

Out of 120 patients, we found above optimal LDL (100-129 mg/dl) in 39.2%, borderline high LDL (130-159 mg/dl) in 20.8%, high LDL (160-189 mg/dl) in 14.2% and very high LDL (≥190 mg/dl) in 2.5% and a total high LDL was found in 76.7% of prediabetic subjects.

Table 7:Relationship Between HbA1C And Lipid Profile

	TC		TG		HDL		LDL		VLDL		P-value
HbA1C	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
5.7-<6	137.3	20.8	118.3	41.0	43.9	7.9	94.6	23.2	23.9	5.9	<.001
6-6.4	200.5	49.8	215.6	71.4	33.3	7.6	143.7	22.6	36.3	6.0	
Total	171.1	50.2	170.2	76.5	38.2	9.4	120.8	33.5	30.5	8.6	

HbA1C had a significant positive correlation (P-value<.001) with TC, TG, LDL, and VLDL, and a negative correlation with HDL (P-value<.001).

DISCUSSION

Dyslipidemia has been identified as an important marker in the development of atherosclerosis and, ultimately, CVD in patients with prediabetes and diabetes[6]. In our study group, a maximum number of patients belonged to the age group of 41-50 yrs and the mean age was 48.17±10.5 years. A similar type of age distribution was found in a study conducted by Rathi H et al 2022 with a mean age of 51.6 ±14.3 years. [6]Among 120 patients 73 were male(60.8%) and 47 were female (39.2%). Similarly Rathi H., et al 2022 observed that 58.4% of prediabetes patients were male and 41.6% of prediabetes were female in their study population[6]. Among the different lipids, we found borderline high cholesterol (200-239 mg/dl) in 19.2%, high TC (≥240MG/DL) in 4.2%, and total hypercholesterolemia in 23.4%, borderline high triglycerides (150-199mg/dl) in 40%, high triglycerides (200-499 mg/dl) in 20% and very high triglycerides (>500 mg/dl) in2.5%.So total hypertriglyceridemia was found in 62.5%. We found above optimal LDL (100-129 mg/dl) in 39.2%, borderline high LDL (130- 159 mg/dl) in 20.8%, high LDL (160-189 mg/dl) in 14.2%, and very high LDL (>190 mg/dl) in 2.5% and a total high LDL was found in 76.7%, low HDL (<40mg/dl) levels in 64.2% of prediabetic patients. Chakraborty M et al 2019, Rathi Het al 2022 and Kansal S et al 2016 in their study had shown that Total cholesterol, low-density lipoprotein (LDL), triglyceride (TG), and very low-density lipoprotein 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[5][6][7]. In our study it was observed that there was a more deranged lipid profile with a higher HbA1C level in the study population. HbA1c has a significant positive correlation (p-value <.001) with TC, TG LDL, and VLDL and a significant negative correlation (p-value<. .001) with HDL which is similar to the study conducted by Jain HR et al 2016,Rosmee et al 2016 and Pushparaj JL et al 2014.[8][9][10] So apart from functioning as an indicator for mean plasma glucose level, HbA1C can also predict the risk of occurrence of dyslipidemia in prediabetic individuals.

CONCLUSION

Individuals with pre-diabetes have a high risk of progression to diabetes. Dyslipidemia is commonly associated with prediabetic individuals and it predisposes to premature atherosclerosis causing cardiovascular and cerebrovascular complications. Early detection and intervention of lipid abnormalities among prediabetic patients might lower their progression to diabetes and ultimately decrease the incidence of dyslipidemia-related complications making them a prime target for primary prevention.

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