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Role of adenosine deaminase in dyslipidemia

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Abstract---Background and Objectives: Dyslipidemia is a family of lipoprotein metabolism disorders manifested by elevated total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), and reduced high density lipoprotein cholesterol (HDL-C) concentrations in the blood.^[1] Dyslipidemia was defined according to the criteria of the National Cholesterol Education Program Adult Treatment Panel III. Hypercholesterolemia was declared for participants with either a total cholesterol > 200 mg/dL or an LDL cholesterol > 130 mg/dL while HDL hypocholesterolemia was at HDL cholesterol < 40 mg/dL. Hypertriglyceridemia was declared for triglyceride plasma level > 150 mg/dL. A combination of hypercholesterolemia and hypertriglyceridemia was classified as mixed hyperlipidemia while atherogenic dyslipidemia was a combination of HDL hypocholesterolemia, hypertriglyceridemia and LDL hypercholesterolemia. Material and Methods : The study population included 100 subjects in which 50 were newly diagnosed patients of dyslipidemia and rest 50 healthy attending both outpatients and inpatients department Biochemistry of Rajshree Medical Research Institute Bareilly. Results: In our study we found the mean values of ADA, TC, HDL-C, LDL-C and TG in cases and controls respectively. Higher mean ADA (59.08 ± 17.98 U/L) is recorded in cases compared to controls (17.01 ± 5.86); and the variance in mean ADA among the cases and controls is found to be statistically significant with p value 0.000. Mean serum TC level is higher in cases (226.18 ± 70.64 mg/dl) than in controls (149.38 ± 28.60 mg/dl). Mean serum HDL-C level is lower in cases (42.14 ± 11.48 mg/dl) than in controls (51.56 ± 10.78 mg/dl). Mean serum LDL-C level is higher in cases (137.72 ± 69.77 mg/dl) than in controls (76.70 ± 24.22 mg/dl). Mean serum TG level is higher in cases (231.62 ± 91.14 mg/dl) than in controls (105.60 ± 26.16 mg/dl) and the Variances in mean TC, HDL-C, LDL-C and TG levels among the cases and controls are

statistically significant („ p “ = 0.000). Conclusion: it can be concluded that dyslipidemia is most common in middle aged subjects. So, clinicians should remain highly suspicious in middle aged subjects with lipid profile for increase in atherogenic parameters which may enhance the risk for atherosclerosis leading to coronary artery disease.

Keywords---obesity, dyslipidemia, metabolic syndrome, nonalcoholic fatty liver disease.

Introduction

Dyslipidemia is a family of lipoprotein metabolism disorders manifested by elevated total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), and reduced high density lipoprotein cholesterol (HDL-C) concentrations in the blood.^[1] Dyslipidemia was defined according to the criteria of the National Cholesterol Education Program Adult Treatment Panel III. Hypercholesterolemia was declared for participants with either a total cholesterol > 200 mg/dL or an LDL cholesterol > 130 mg/dL while HDL hypocholesterolemia was at HDL cholesterol < 40 mg/dL. Hypertriglyceridemia was declared for triglyceride plasma level > 150 mg/dL. A combination of hypercholesterolemia and hypertriglyceridemia was classified as mixed hyperlipidemia while atherogenic dyslipidemia was a combination of HDL hypocholesterolemia, hypertriglyceridemia and LDL hypercholesterolemia.^[2] The prevalence of dyslipidemia is increasing rapidly around the globe due to westernization of dietary patterns, reduced physical activity, obesity, aging of population and many other co factors contribution.^[3,4] Studies revealed that early onset of dyslipidemia is associated with the development of early atherosclerotic coronary and peripheral artery disease and increased incidence of cardiovascular disease(CVD) in adulthood.^[5,6] Recently, dyslipidemia is increasingly prevalent in all age groups, and the incidence tends to be younger.^[7] Dyslipidemia is a broad term that refers to a number of lipid disorders. Most (80%) lipid disorders are related to diet and lifestyle, although familial disorders (20%) are important as well. Most patients with CHD have mixed dyslipidemia (e.g. elevated LDL-C and low HDL-C), which is also commonly seen in patients with diabetes mellitus (DM).^[8] It is estimated that dyslipidemia is responsible for about 4.4 million deaths worldwide. Estimates in the US indicate that 53% of adults have dyslipidemia.^[9] Dyslipidemias may clearly contribute to accelerated atherosclerosis. Mild degrees of dyslipidemia may increase coronary artery disease (CAD) risk considerably in the presence of other CAD risk factors such as diabetes.^[10] Caucasians have higher cholesterol concentrations compared to those found in other ethnic groups, even if they live in the same region. In contrast, Asians have lower high-density lipoprotein-cholesterol (HDL-C) levels.^[11]

Materials and Method

The study population included 100 subjects in which 50 were newly diagnosed patients of dyslipidemia and rest 50 healthy individual attending both outpatient

and inpatient department Biochemistry of Rajshree Medical Research Institute, Bareilly.

Specimen collection

5ml of fasting blood sample was collected from antecubital vein into each plain vial for lipid profile and for ADA fresh serum/plasma EDTA, Citrate, heparinised or oxalate anticoagulated sample was taken from each of the subjects under all aseptic conditions after explaining the procedure to the study subjects.

Lipid Profile Assay

- Total Cholesterol (TC)
- Triglycerides (TG)
- High Density Lipoprotein-Cholesterol (HDL-C)
- Low Density Lipoprotein-Cholesterol (LDL-C)
- Very-Low Density Lipoprotein-Cholesterol (VLDL-C)

Enzyme Assay

- Adenosine Deaminase(ADA)

Parameters	Methods	
S.No	Lipid Profile Assay	
1.	TC	Cholestrol Oxidase phenol 4-aminoantipyrine Peroxidase (CHOD-PAP)
2.	TG	Glycerol - 3 - phosphate oxidase (GPO)
3.	HDL-C	Phosphotungstic acid
4.	LDL-C	Friedwald's equation
5.	VLDL-C	Friedwald's equation
Enzyme Assay		
1.	ADA	Giusti and Galanti

Inclusion criteria

- Patients of dyslipidemia were included in study group i.e. a total cholesterol > 200 mg/dL or an LDL cholesterol > 130 mg/dL while HDL hypocholesterolemia was at HDL cholesterol < 40 mg/dL. Hypertriglyceridemia was declared for triglyceride plasma level > 150 mg/dL.
- Newly diagnosed Hypothyroidism Patients
- Newly Diagnosed Type 2 Diabetes Mellitus Patients

Exclusion criteria

- Tuberculosis patients
- Kidney disorder
- Viral hepatitis

- Chronic malnutrition
- Leprosy
- Brucellosis
- Liver cirrhosis

Statistical Analysis

All the parameters of two groups were analysed for mean and standard deviation. The results were expressed as Mean $\pm$ standard deviation. Data was analysed by statistical software SPSS Version 22.0. Comparison among two groups was one by using t- Test. Pearson's correlation coefficient was used to find the correlation between ADA and Lipid profile.

Observation & Result

The present research work included 100 Subjects (50 dyslipidemia patients and 50 healthy individuals). Gender and age distribution have been done to see the prevalence of dyslipidemia and healthy among study subjects. The serum levels of Adenosine Deaminase (ADA) and Lipid Profile (TC, TG, HDLC, VLDL-C and LDL-C) obtain on analyzing specimens collected from study subjects are tabulated. The mean values and standard deviation of these parameters have been calculated for comparative study of dyslipidemia (Cases), and Healthy Individuals (Controls). The test of significance of these parameters between cases and controls was performed using student t-Test. Further, individual comparisons among groups have been done using the pearson correlation coefficient the given data was show in table no 1.

Table 1:- Analysis of variance between cases and controls

Parameters	Cases (Mean $\pm$ SD)	Controls (Mean $\pm$ SD)	P value
ADA	59.08 $\pm$ 17.98	17.01 $\pm$ 5.86	.000
TC	226.18 $\pm$ 70.64	149.38 $\pm$ 28.60	.000
HDL-C	42.14 $\pm$ 11.48	51.56 $\pm$ 10.78	.000
LDL-C	137.72 $\pm$ 69.77	76.70 $\pm$ 24.22	.000
TG	231.62 $\pm$ 91.14	105.60 $\pm$ 26.16	.000

P value < 0.05, considered as Statistically significant.

P value < 0.001, considered as highly significant.

The Table1 shows the mean values of ADA, TC, HDL-C, LDL-C and TG in cases and controls respectively. Higher mean ADA (59.08 $\pm$ 17.98 U/L) is recorded in cases compared to controls (17.01 $\pm$ 5.86); and the variance in mean ADA among the cases and controls is found to be statistically significant with p value 0.000. Mean serum TC level is higher in cases (226.18 $\pm$ 70.64 mg/dl) than in controls (149.38 $\pm$ 28.60 mg/dl). Mean serum HDL-C level is lower in cases (42.14 $\pm$ 11.48 mg/dl) than in controls (51.56 $\pm$ 10.78 mg/dl). Mean serum LDL-C level is higher in cases (137.72 $\pm$ 69.77 mg/dl) than in controls (76.70 $\pm$ 24.22 mg/dl). Mean serum TG level is higher in cases (231,62 $\pm$ 91.14 mg/dl) than in controls (105.60

± 26.16 mg/dl) and the Variances in mean TC, HDL-C, LDL-C and TG levels among the cases and controls are statistically significant („ $p^* = 0.000$).

Discussion

Dyslipidemia is a very common condition and seen more in men than in women. The result of the present comparative study also conviees male preponderance in cases and controls which comprises 60% in cases, and 62% in the control and the ratio of female over male is 1:1.5 and 1: 1.63 (1:2 approximately) respectively (Table 1) Although all age groups were presented with a high prevalence of dyslipidemia, our study indicates that there is a trend toward a higher prevalence of dyslipidemia in the age group 41- 60 years in cases (Table 1). This is in accordance with the earlier studies that is Combined dyslipidemia was the most common dyslipidemia pattern observed and this accounted for a third of the study population. Jayaram *et al.*, in a single center study in about 800 patients reported that 44.2% males and 42.97% females had combined dyslipidemia.^[12] and Wube A.T et al.^[13] The higher prevalence of dyslipidemia in men suggests that environmental/lifestyle imbalances or as a consequence of other diseases might be involved in the pathophysiology of dyslipidemia. Diabetic dyslipidemia is extremely common in type 2 diabetes mellitus and atherogenic dyslipidemia is often observed in Metabolic syndrome, obesity etc. In the present study, the mean $\pm$ SD levels of ADA were significantly difference higher in cases than that of healthy controls also serum ADA shows a statistically significant between cases and controls. Similar findings were reported by Venketeshwarlu K. et al.^[14], Nwankwo A. A. et al.^[15], Prasad D. V. et al.^[16], Oinam S. et al.^[17]

Conclusions

Biochemical screening for Adenosine Deaminase is of paramount importance in all dyslipidemic patients, as well as in all patients with unexpected worsening of their lipid profile or vice-versa because our data statistically suggest that the result of adenosine are associated with lipid disorders that are characterized by increased serum Total Cholesterol, Triglycerides, LDL-C and decreased HDL-C levels. From this study, it can be concluded that dyslipidemia is most common in middle aged subjects. So, clinicians should remain highly suspicious in middle aged subjects with lipid profile for increase in atherogenic parameters which may enhance the risk for atherosclerosis leading to coronary artery disease. Therefore, treatment and follow-up of dyslipidemia patients should include the monitoring of lipid profile parameters, and serum ADA as well in order to decrease the possible effect of changing in the level of these parameters on the risk of cardiovascular diseases. ADA can be used in daily routine laboratory assessment of most metabolic diseases especially in obese and diabetic patients Thus, targeting ADA in the treatment of metabolic diseases would be very appropriate. Hence, ADA level may be used as risk factor for atherosclerosis.

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