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A study on lipid profile and myeloperoxidase level in Type II diabetes mellitus with respect to age and gender

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ABSTRACT

HDL, LDL, VLDL are the lipoproteins which enables lipids like cholesterol and triglycerides to be transported within the water based blood stream. MPO exhibits a wide array of proatherogenic effects. These include induction of oxidative damage to LDL and HDL, cholesterol and promotion of plaque vulnerability. The objectives of this study was to estimate the levels of myeloperoxidase, LDL, HDL, VLDL, cholesterol and triglycerols and their relationship in the type 2 diabetes mellitus patients with respect to age and gender. This study was conducted on total 100 subjects attending the central research lab, A.B. Shetty Memorial Institute of Dental Sciences. Fasting Blood sample was collected, blood sugar and lipid profile was estimated by standard commercial kit. MPO level is estimated spectrophotometrically using 4amino antipyrine. Data is statistically analyzed using student t test. The MPO level significantly increases in case of male diabetes type II patients with increase in age compared to the female diabetic patients. And it is associated with the elevation in total cholesterol and triglycerol levels. The MPO level significantly increases in case of male diabetes type II patients compared to that of female.

Keywords: Non Insulin Dependent Diabetes Mellitus, Triglycerides, Total cholesterol, High Density Lipoprotein, Low Density Lipoprotein , Very Low Density Lipoprotein , Random Blood Sugar.

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INTRODUCTION

Diabetes mellitus arises when insufficient insulin is produced or when the available insulin does not function correctly. Without insulin the amount of glucose in the blood stream is abnormally high, causing unquenchable thirst and frequent urination. Diabetes mellitus type 2 is a disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. Type 2 diabetes can arise from and be exacerbated by obesity, hypertension, elevated cholesterol (combined hyperlipidemia), and with the condition often termed Metabolic syndrome (it is also known as Syndrome X, Reaven's syndrome, or CHAOS). Other causes include acromegaly, Cushing's syndrome, thyrotoxicosis, pheochromocytoma, chronic pancreatitis, cancer and drugs. Additional factors found to increase the risk of type 2 diabetes include aging, high-fat diets and a less active lifestyle [1].

The lipid profile is a blood test done to assess the status of fat metabolism in the body and is important in heart diseases. This includes measuring lipids (fat) and its derivatives known as lipoproteins. Lipoproteins are compounds containing fat and proteins and include free cholesterol, cholesterol esters, triglycerides, phospholipids and apoproteins. Total cholesterol comprises all the cholesterol found in various lipoproteins such as high density lipoprotein [HDL], low density lipoprotein [LDL], and very low density lipoprotein [VLDL]. Triglycerides are neutral fats found in the tissue and blood .Triglycerides containing lipoproteins may also contribute to the disorder related to coronary heart disease.

The main function of HDL is to help soak up excess cholesterol from the walls of blood vessels and carry it to the liver, where it breakdown and is removed from the body in the bile .It is thus called "good cholesterol" .LDL contains the greatest percentage of cholesterol and is responsible for cholesterol deposits on the walls of artery resulting in coronary artery disease (bad cholesterol) [2]. Triglycerides, as major components of very low density lipoprotein (VLDL) and chylomicrons, play an important role in metabolism as energy sources and transporters of dietary fat. They contain more than twice as much energy (9 kcal/g) as carbohydrates and proteins [3]. In the human body, high levels of triglycerides in the bloodstream have been linked to atherosclerosis, and, by extension, the risk of heart disease and stroke.

Myeloperoxidase (MPO) is a peroxidase enzyme most abundantly present in neutrophil granulocytes. It is a lysosomal protein stored in azurophilic granules of the neutrophil. MPO has a heme pigment, which causes its green color in secretions rich in neutrophils, such as pus and some forms of mucus.MPO produces hypochlorous acid (HOCl) from hydrogen peroxide (H_2O_2) and chloride anion (Cl^-) (or the equivalent from a non-chlorine halide) during the neutrophil's respiratory burst. It requires heme as a cofactor. Furthermore, it oxidizes tyrosine to tyrosyl radical using hydrogen peroxide as oxidizing agent. Hypochlorous acid and tyrosyl radical are cytotoxic, so they are used by the neutrophil to kill bacteria and other pathogens [4]. Therefore we wanted to estimate the levels of Myeloperoxidase and lipid profile (LDL, HDL, VLDL, cholesterol and triglycerols) in type 2 diabetes mellitus patients and to compare the above parameters with respect to age and sex.

MATERIALS AND METHODS

This study was conducted in the central research laboratory of Nitte University after obtaining the approval from the institutional ethical committee. The study group included 50 Diabetic patients from the oral medicine department of A.B Shetty Memorial institute of dental science.

1 ml of blood sample collected in fluoride bottle to separate plasma. 2ml of blood collected in a plain bottle, centrifuged to separate serum. Plasma was tested for blood glucose using GOD-POD method. Serum was used to estimate lipid profile and MPO. Triglycerides tested by GPO-PAP Method, Cholesterol & HDL by CHOD-PAP Method. VLDL and LDL were also calculated. The absorbance was read at 505nm (500-540) by spectrophotometer. Myeloperoxidase was estimated using Malheston method. The obtained data was statistically analyzed by student t-test.

ESTIMATION OF VLDL & LDL

VLDL & LDL-C was calculated by the following formula.

$$\text{VLDL} = \text{TG}/5.$$

$$\text{LDL} = \text{TC} - [\text{HDL} + \text{VLDL}]$$

RESULTS

In the present study, we estimated the levels of Myeloperoxidase and lipid profile (LDL, HDL, VLDL, cholesterol and triglycerols) in type 2 diabetes mellitus patients and compared these parameters in different age groups and sex. In this study we found that, all parameters like Total cholesterol, Triglyceride, LDL, VLDL and MPO were significantly less ($p<0.05$) in females as compared to males, whereas the HDL level was significantly higher ($p<0.05$) in females (Table-1, Fig-1& 2). These parameters were also compared with patients belongs to different age groups such as 40-50 and 50-60 years. We found that all the above mentioned parameters are significantly higher in the patients belongs to 50-60 years ($p<0.05$) as compared to the patients belongs to 40-50 years (Table-2, Fig-3&4). This shows that as age advances lipid profile shows an increasing tendency.

Table-1: Representation of Lipid profile and MPO levels as Mean \pm SD in Male and Female Type II D M (p<0.05 is statistically significant).

| Parameters | MALES | FEMALES | p Value |
|------------|-------------------|-------------------|---------|
| TC | 232.7 \pm 33.16 | 173.4 \pm 20.22 | 0.001 |
| Tg | 202.2 \pm 33.01 | 125.1 \pm 32.45 | 0.0001 |
| HDL | 29.80 \pm 5.317 | 45.70 \pm 9.810 | 0.0003 |
| LDL | 168.4 \pm 30.92 | 112.9 \pm 20.18 | 0.0003 |
| VLDL | 47.68 \pm 6.053 | 28.0 \pm 8.667 | 0.0002 |
| MPO | 82.41 \pm 41.01 | 30.21 \pm 15.33 | 0.0043 |

Note: TC=Total cholesterol, Tg= Triglyceride, MPO=Myeloperoxidase.

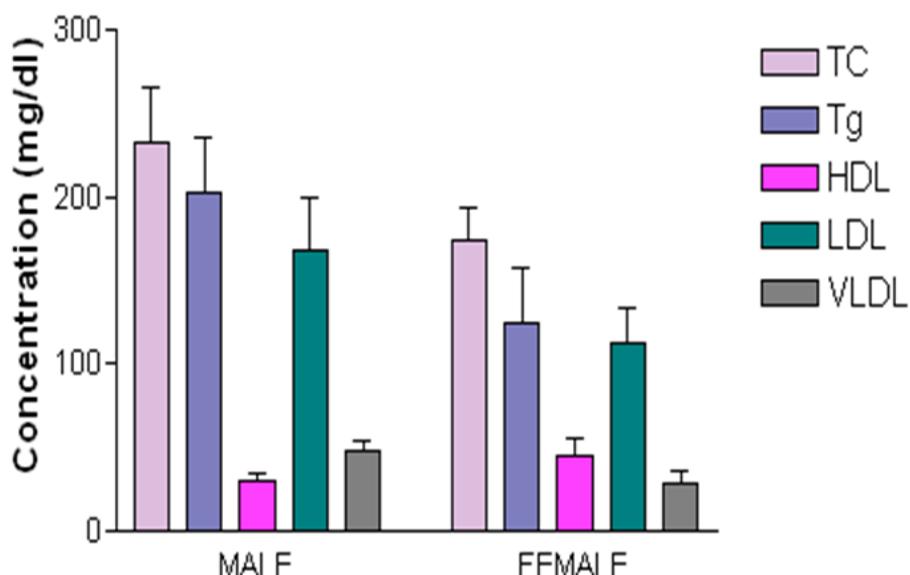


Fig-1: Comparison of lipid profile between diabetic males and females

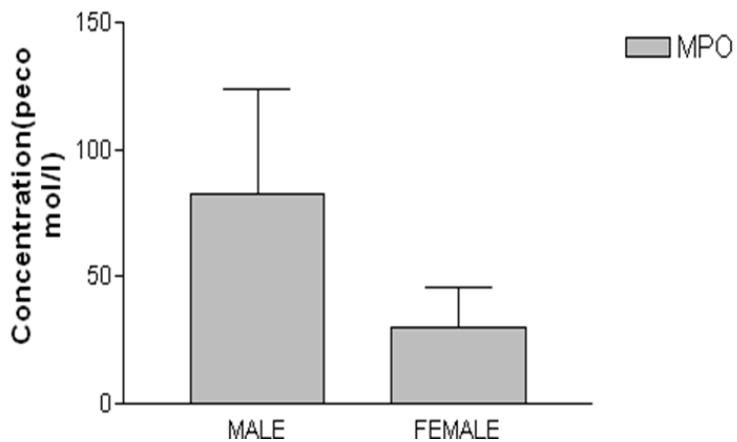


Fig-2: Comparison of Myeloperoxidase level between diabetic males and females

Table-2: Representation of Lipid profile and MPO data as Mean \pm SD in Type II DM patients of age group 40-50 and 50-60 years ($p<0.05$ is statistically significant)

| | TC | TG | HDL | LDL | VLDL | MPO |
|---------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 40-50 | 161 \pm 33.95 | 154.2 \pm 24.46 | 29.80 \pm 5.317 | 125 \pm 38.82 | 39.64 \pm 15.82 | 82.41 \pm 41.01 |
| 50-60 | 206.6 \pm 47.27 | 249.2 \pm 32.49 | 33.78 \pm 4.482 | 150.6 \pm 39.97 | 35.0 \pm 11.07 | 30.21 \pm 15.33 |
| P value | 0.0358 | 0.001 | 0.021 | 0.1871 | 0.48709 | 0.0043 |

Note: TC=Total cholesterol, Tg= Triglyceride, MPO=Myeloperoxidase.

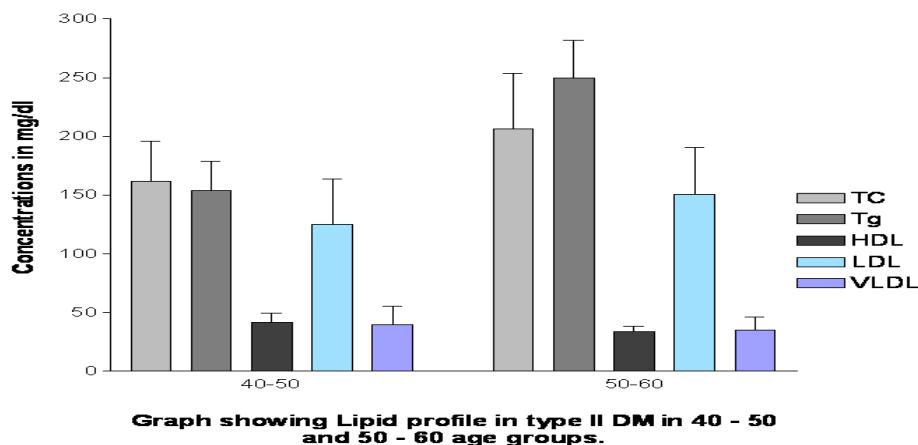
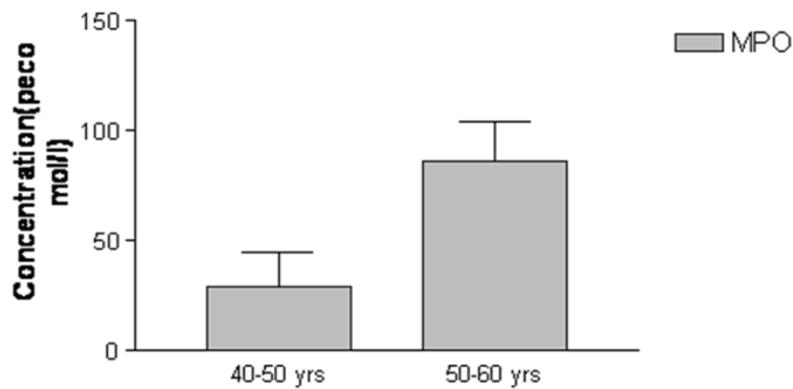


Fig-3: Comparison of lipid profile in type II DM patients of age group 40-50 and 50-60 years.



Graph showing MPO in Type II DM in 40-50 and 50-60 Age Groups

Fig-4: Comparison of Myeloperoxidase level in type II DM patients of age group 40-50 and 50-60 years.

DISCUSSION

When comparison is done between Diabetic males and females it is found that in diabetic males has high lipid profile, so they are more prone to cardiac disorder. It is also found that old age group individuals are having more risk of Diabetes than young generation and the lipid profile level decreases after 60 years. This might be because of the age related problems. There is a correlation found between lipid profile and blood glucose level. when there is an increased level of blood glucose ,the lipid profile (TC, TG, LDL-C)was found to increase, but the HDL-C was found to decrease. It has been suggested that the increase in triglycerides may be due to insulin deficiency which results faulty glucose utilization, causes hyperglycemia and mobilization of fatty acids from adipose tissue. In addition blood glucose is not utilized by tissue resulting in hyperglycemia. My results indicate a high lipid profile associated with Diabetes mellitus ,which might lead to cardiac disorder in patients with Type II Diabetic mellitus. The MPO level significantly increases in case of male diabetes type II patients with increase in age compared to the female diabetic patients and normal subjects. And it is associated with the elevation in total cholesterol and triglycerol levels [5-15].

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