Section: Pulmonary Medicine

Original Research Article

LIPID ABNORMALITIES IN PATIENTS WITH TUBERCULOSIS ALONG WITH DIABETES: A PROSPECTIVE STUDY

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Abstract

Background: Lipid abnormalities are found to be associated with tuberculosis (TB) a chronic infectious disease. Very less studies are available pertaining to metabolic abnormalities in TB patients with diabetes mellitus (DM). It is has been reported that higher level of lipoprotein in patients with pulmonary TB might be a risk factor for atherosclerosis. Hence present study was aimed to study the lipid abnormalities in patients with tuberculosis along with diabetes. **Materials and Methods:** The present study was carried out in Pulmonary Medicine department of a tertiary care hospital of south India. The study was performed from September 2015 to Feb 2016. All the enrolled patients were divided in 4 groups. Group I, comprises 35 patients with TB and no DM, Group II comprises 35 patients with TB and DM, Group III included 35 patients with DM with no TB and Group IV had 35 healthy subjects as control group. Lipid profile testing was carried out for all the subjects and the results obtained were compared. The Analysis of Variance (ANOVA) test was utilised to evaluate the means between the groups. The p-value <0.05 was taken as statistically significant. **Result:** The group III reported highest total cholesterol (175.22±42.24 mg/dL), Triglycerides (222.5±40.21 mg/dL), very low density lipoprotein (VLDL) (35.1±16.34 mg/dL). The HDL (28.09±7.12 mg/dL) was found lowest in Group II. The no-significant difference as observed between the groups (p-value=0.158) for LDL values. Group I reported Low Body Mass Index (BMI) (17.80±2.9 kg/m2). Group II patients reported highest atherogenic index in current study. **Conclusion:** A lipid profile screening can identify atherogenicity factors in patients with TB and DM, which may aid in the prediction and prevention of cardiovascular events. In addition to medication, a healthy diet is advised for TB patients, and their lipid profile status should be checked while the patients are being managed.

INTRODUCTION

A common metabolic condition called diabetes mellitus is defined by absolute or relative deficits in insulin production and/or action along with persistent hyperglycemia and changes in protein, lipid, and carbohydrate metabolism. The characteristics of the serum lipid profile have been correlated with blood glucose levels in a number of earlier investigations.[1] According to research, among the body composition factors, body fat is mostly to blame for the disease's rising prevalence. Type 2 diabetes mellitus (T2DM), essential hypertension, and hypercholesterolemia were all recognised as components of a multifactorial metabolic disorder as early as 1988.[2] However, the term "Metabolic Syndrome" is now used by both the World Health Organization (WHO) and the International Diabetes Federation (IDF) to refer to this collection of diseases. The trifecta of increased triglycerides, decreased HDL, and an overabundance of tiny, dense LDL particles is referred to as diabetic dyslipidemia.[3] Diabetes mellitus patients frequently have lipid abnormalities because key enzymes and metabolic pathways involved in lipid metabolism are impacted by insulin resistance or insufficiency. Diabetes-related chronic uncontrolled hyperglycemia leads to microvascular and macrovascular consequences, such as cardiovascular disease (CVD), retinopathy, nephropathy, and neuropathy. It's been hypothesised that compared to other kinds of dyslipidemia, the lipid particles in diabetic dyslipidemia are more atherogenic.[4] It is generally known that dyslipidemia and atherosclerosis are causally

related. The development to atherosclerosis is further accelerated by the accompanying hyperglycemia, obesity, and insulin alterations in diabetes.[5]

In a recent study, it was shown that among more than 11,000 individuals in the Atherosclerosis Risk in Communities Study, there were significant trends for growing risk of coronary heart disease, stroke, and all-cause death in connection to greater levels of baseline HbA1c.[6] There was a significant correlation between fasting blood glucose levels and coronary heart disease, stroke, or death from any cause for HbA1c groups of <6.5% and ≥6.5%. Previous research sought to associate the characteristics of the serum lipid profile with blood glucose levels, and it is obvious that those with a reduced risk of micro-vascular problems had lower HbA1c values.[7-8]

In the present study we aimed to evaluate the occurrence of Lipid Abnormalities in Patients with tuberculosis along with Diabetes.

MATERIALS AND METHODS

The present study was carried out in General Medicine department at Government medical College hospital, omandurar government estate, Chennai. The study was performed from September 2016 to Feb 2017.

Inclusion criteria: The study included all TB patients with sputum examination evidence who were above the age of 18 and were visited the Department of Pulmonary Medicine.

Exclusion criteria: The research excluded people with endocrine disorders, renal illness, cardiac disease, neoplasms, oral hypolipidemic medication users, pregnant women, nursing women, and other retroviral diseases.

Sample size calculation: Using the widely used sample size calculator OpenEpi, which is funded by the Centers for Disease Control and Prevention, Atlanta, the sample size was determined (www.openepi. com). A total of 180 patients were selected and were further divided into four groups:

Group I (n=40): Patients with recently diagnosed TB, confirmed by sputum examination without DM.

Group II (n=40): Individuals with recently discovered TB who also have DM (Duration of DM varied among subjects from 3 months to 10 years and they were on medications). ≥126 mg/dL or less for fasting blood sugar, ≥200 mg/dL for postprandial blood sugar, or ≥6.5% for glycated haemoglobin (HbA1c).

Group III (n=40): Only DM patients (Newly diagnosed and pre-existing).

Group IV (n=40): This was a control group made up of healthy individuals who had had a standard physical examination and were free of the condition. We measured the participants' height, weight, waist and hip circumferences. Weight (kg) divided by the square of height is the formula used to determine body mass index (BMI) (m2). RBS was randomly selected from patient records.

Procedure

After centrifuging a 5 mL blood sample from these individuals who had been fasting for 12 hours, the following tests were carried out using a Vitros 250 autoanalyser.

- Triglyceride (tgl): L-α-glycerol-phosphate oxidase and peroxidase method was used for estimation of triglyceride.
- Total Cholesterol (TC): Cholesterol oxidase peroxidase method was used for estimation of TC.
- High-Density Lipoprotein (HDL): Enzymatic method was used for estimation of HDL
- Very Low-Density Lipoprotein (VLDL) and Low-Density Lipoprotein (LDL): The estimate of LDL and VLDL employed a calculated approach based on Freidman's computation.

$$VLDL=TGL/5$$

$$LDL=TC\ (HDL+VLDL).$$

This formula cannot be used if TGL levels are ≥450 mg/dL

Statistical Analysis

Data were input into Microsoft Office 2019. The statistical analysis was performed using the SPSS statistics programme, version 22.0. Percentages and proportions were used to visualise descriptive statistics. When the data did not follow the normal distribution curve, ANOVA was employed for parametric tests as well as non-parametric testing (Kruskal-Wallis test). The p-value of 0.05 or less was regarded as statistically significant in each analysis.

RESULTS

In present study mean age of group II patients with TB and pre-existing DM was found to be 49.6±12.16 years and Group I patents with only TB reported mean age of 36.23±11.2 years. Whereas patients with only DM (Group III) and healthy volunteers (Group IV) had mean age of 47.93±11.46 and 55.82±12.76 years respectively. All groups were found with almost same gender distribution Group II which had significantly higher proportion of males. All group also had same number of subjects (n=40) in our study. Group I patients were found with lowest BMI (17.80±2.9), waist circumference (76.85±11.1) and hip circumference (81.67±11.03). Whereas Group III reported the patients with highest BMI (24.34±2.89), waist circumference (88.6±4.8) and hip circumference (91.22±12.8). Patients of Group II observed with normal BMI but lower than that reported in Group III patients ($p<0.05$).

Group III patients had higher levels of total cholesterol (175.22±42.24), triglycerides (222.5±40.21), and VLDL (35.1±16.34) than patients with TB in Group II ($p<0.05$). In comparison to the other groups, HDL was the lowest ($p < 0.05$) in Group II patients. No significant

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difference between the groups was seen in the LDL values, p-value=0.158 [Table 1].

Table 1: General variables and biochemical parameters between groups

Male	23 (57.5%)	28 (70%)	17 (42.5%)	24 (60%)	-
Female	17 (42.5%)	12 (30%)	23 (57.5%)	17 (40%)	-
Age (years)	36.23±11.2	49.6±12.16	47.93±11.46	55.82±12.76	<0.001
Basal Metabolic Index (BMI)	17.80±2.9	20.6±2.6	24.34±2.89	22.69±3.7	<0.001
Waist circumference (cm)	76.85±11.1	82.22±10.78	88.6±4.8	81.12±2.9	<0.001
Hip circumference (cm)	81.67±11.03	85.81±10.79	91.22±12.8	84.42± 13.1	<0.001
Total cholesterol (TC) (mg/dL)	133.43±30.22	141.34±42.43	175.22±42.24	154.5±26.23	<0.001
Triglycerides (mg/dL)	110.12±41.05	148.8±52.98	222.5±40.21	137.1±25.3	0.008
VLDL (mg/dL)	24.21±8.87	31.19±10.78	35.1±16.34	26.08±4.69	0.006
HDL (mg/dL)	31.97±11.7	28.09±7.12	35.65±5.05	45.14±21.09	<0.001
LDL (mg/dL)	78.71±21.18	81.18±41.51	96.18±40.06	91.17±21.98	0.158
Random blood sugar (RBS) (mg/dL)	101.7±20.17	204.1±89.13	238.61±75.19	154.3±32.14	<0.001

HDL: High density Lipoprotein; LDL: Low density lipoprotein; VLDL: Very low density lipoprotein

A non-parametric test (Kruskal-Wallis test) was performed to compare BMI with AIP since the data did not follow the normal distribution curve ($p<0.05$)). The atherogenic index of plasma (AIP) was determined by log10 (TGL/HDL). To create the graph, we multiplied the AIP values by a factor of 20 after measuring them in decimals; 0.52±0.22; group II: 0.69±0.19; group III: 0.61±0.28; group IV: 0.60±0.18 [Figure 1].

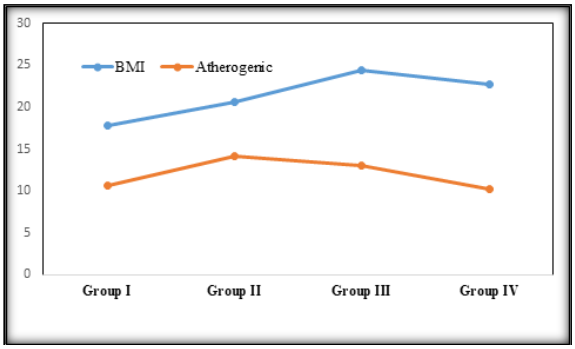

Figure 1: Comparison of BMI and Atherogenic index in the groups

The lipid profiles of TB patients in different age groups, as well as the genders of group I and group II patients, did not differ significantly [Table 2, 3]. Figure 2 demonstrates that there was a generalised cardiovascular risk in men in groups I and II, but that the risk was lower in group I for both males and females than in group II. Although all groups had significant risk levels according to the AIP index, group II patients had the highest levels.

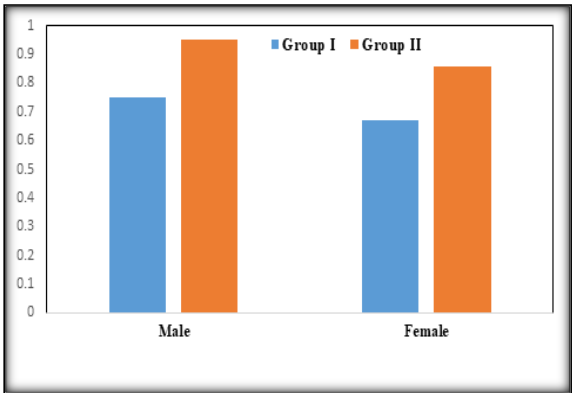

Figure 2: Comparison of the Atherogenic Index of Plasma (AIP) with gender in TB and TB+DM groups

DISCUSSION

The results of the current study are comparable to the investigating of Oyedeji et al on TB patients without DM.[9] The study revealed that TB patients had low levels of lipids and were vulnerable to oxidative stress. Taparia et al. and Musharaf et al. also reported similar in their study. Both the investigation came to the same conclusion that TB patients had abnormal lipid profile values.[10-11]

Similar findings between patients with TB with pre-existing DM were reported by Vrieling et al., who demonstrated that TB patients had wasting illness, represented by lower amino acid levels, such as histidine and alanine, in contrast to lipid profile levels.[12] However, high levels of VLDL, triglycerides, and LDL cholesterol are indicators of diabetes in individuals. The TB-DM patients showed metabolic signs of both wasting and dyslipidemia, and researchers came to the conclusion that these people had a unique plasma lipid profile with pro-atherogenic qualities.

The AIP is thought to have a better predictive capacity than looking at standard lipid levels for detecting dyslipidaemia, atherosclerosis, and cardiovascular diseases (CVD). According to AIP levels, the risk of CVD may be divided into: Low risk levels are below 0.11, intermediate risk values are between 0.11 and 0.21, and high risk values are over 0.21. The BMI found higher in patients with DM and patients with TB and DM. TB patients had lower BMI. AIP was higher in patients with TB and DM. Atherogenic findings were seen in Vrieling et al., which concluded that TB+DM patients possessed pro-atherogenic properties.[12]

Limitation of The Study

Larger sample size trial are required to confirm significant results in TB patients concerning lipid profiles in various age groups and gender. In addition, from determining the lipid profile other pro-atherogenic variables can provide a better

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picture of risk for CVD in tuberculosis patients with DM.

CONCLUSION

Since TB patients lipid levels were low, a healthy, nutrient-rich diet was advised in addition to chemotherapeutic treatment. The state of the lipid profile should be monitored while treating these individuals. High cholesterol levels were discovered in TB with DM patients, indicating that monitoring their lipid profiles may be useful for assessing and preventing cardiovascular events. These results encourage more study into the benefits of better blood lipid management in the treatment of TB with DM patients. We further recommend other biomarkers of oxidative stress and atherogenicity to support the cardiovascular risk diseases in patients with TB and DM.

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