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Original Article

Biochemistry Section

Lipid Profile as a Nutritional Status Marker in Tuberculosis

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ABSTRACT

Introduction: Tuberculosis (TB) is a global health problem. India has the highest cases in the world and accounts for nearly one fifth of global cases. TB is a chronic disease and in long term leads to malnutrition. Lipids are important constituents in the body that determine the nutritional status and immune function.

Aim: To study lipid profile as a nutritional status marker in pulmonary TB.

Materials and Methods: Fifty patients of pulmonary TB and fifty healthy subjects in age group of 18-60 years were included for study. The lipid profile was analysed to assess the nutritional status of the patients. Unpaired t-test was used to study the significance of study parameters in cases and controls group. The p-value of <0.05 was considered to be statistically significant.

Results: Out of 100 subjects 63% were males 37% were females. Significant decreased levels of total cholesterol, Triglycerides, High Density Lipoprotein-Cholesterol (HDL), Very Low Density Lipoprotein-Cholesterol (VLDL), Low Density Lipoprotein-Cholesterol (LDL) were seen in cases as compared to controls.

Conclusion: In this study, it was observed that lipid profile could play a significant role as a biochemical marker of nutritional status in pulmonary TB patients. Thus, knowledge of these levels can help in providing a proper balanced diet to these patients which can ultimately help in better quality treatment.

Keywords: Balanced diet, Malnutrition, Total cholesterol

INTRODUCTION

TB is the world's seventh leading cause of death [1]. India has the highest TB burden in the world and accounts for nearly one-fifth (20 percent) of global burden of TB, 2/3rd of cases in South-East Asian Region [2,3]. Every year approximately, 0.8 million people are newly found to be smear positive TB cases which are highly infectious. Annual risk of becoming infected with TB is 1.5 percent and once infected there is 10 percent life-time risk of developing TB disease [2,3].

TB is an infectious airborne deadly disease mainly caused by *Mycobacterium TB* which belongs to the genus Mycobacterium. The commonly observed symptoms of TB include chronic cough with blood tinged sputum, chest pain, fever, night sweats and weight loss [4]. The number of people infected with TB and the deaths reported every year is enormously high. TB often leads to severe weight loss which in turn, affects the inflammatory response, suppresses cellular immunity and aggravates the outcome of TB [5,6].

Lipids are important constituents in the body that determine the nutritional status and immune function [7]. They serve as concentrated fuel reserve of the body in the form of triacylglycerols. They provide twice the energy content compared with carbohydrates and proteins, 1 gm of fat provides 9 kcal of energy. They help in transport and absorption of four fat soluble vitamins in diet i.e., Vitamin A, D, E and K. They are important determinants of nutritional status of the body. Malnutrition can lead to TB and vice versa. Cholesterol is one of the constituents of lipid that maintains membrane structure and membrane permeability [8]. The macrophages require cholesterol for their motility, phagocytosis, endocytosis and exocytosis. When there are decreased levels of cholesterol macrophage activity is disturbed. An adequate level of cholesterol is necessary for the proper functioning of the immune system against infection [9,10].

Changes in blood lipid profile like decrease in total cholesterol, HDL and triglyceride levels with increase in later stages are known [11]. Malnutrition and increased free radical generation are common findings with TB patients. TB patients have reduced concentrations of lipid fractions [12].

In the present study, lipid profile is studied to see whether it can be used as a nutritional status marker so that a link can be established between status of nutrition and lipid profile in TB thus helping to assess the overall health of these patients.

MATERIALS AND METHODS

A single centric, case-control study was conducted at Grant Government Medical College, Mumbai from October 2016 to November 2017. The study was approved by Institutional Ethics Committee (IEC/106/2018), written informed consent was taken from all patients included in the study.

For sample size calculation, Power analysis method was used and results were obtained from OpenEpi, Version 3, open source calculator-SS Mean, keeping 95% confidence interval.

Fifty newly diagnosed (sputum positive) patients of Pulmonary TB, in the age group of 18 to 60 years, were studied. Fifty age and sex matched healthy control group (those visiting the hospital OPD) with no complaints and no known diseases were taken.

Exclusion criteria were patients with Multidrug Resistant (MDR) TB, patients of extra pulmonary TB and patients of TB with HIV infection.

An 8 mL of venous blood sample was collected from antecubital vein from the subjects under all aseptic precautions. All samples were centrifuged at 4500 rpm for five minutes to obtain clear serum. All the lipid profile parameters were estimated such as Serum Total cholesterol by Cholesterol oxidase Peroxidase method [13], Serum Triglyceride by Glycerophosphate oxidase peroxidase method [13,14], Serum HDL Cholesterol by Direct method [15] on automated analyser. The value of LDL cholesterol and VLDL cholesterol calculated by using Friedewald's equation [15].

STATISTICAL ANALYSIS

Descriptive statistical analysis was carried out in the present study. Results on continuous measurements were presented as Mean±SD. Unpaired t-test was used to study the significance of study parameters in cases and controls group. The p-value of <0.05 was taken statistically significant. For statistical analysis the

Graphpad Quick cal version 7 software was used. Microsoft word and excel have been used to generate tables and graphs.

RESULTS

The study was conducted on 100 participants. Majority were males (63%) and most of them belonged to age group 18-45 years (77%) [Table/Fig-1].

Variables	N (%)
Gender	
Males	63 (63%)
Females	37 (37%)
Age distribution (in years)	
18-45	77 (77%)
>45	23 (23%)

[Table/Fig-1]: Age gender distribution of study participants.

[Table/Fig-2] shows a significantly ($p<0.05$) decreased total cholesterol, Triglycerides (TG), HDL, VLDL, LDL levels in cases as compared to controls.

Lipid parameter	Cases Mean±SD (mg/dL)	Controls Mean±SD (mg/dL)	p-value (Unpaired t-test)
Total cholesterol	166.26±28.15	176.9±18.34	**0.02**
TG	85.68±30.94	99.58±17.85	**0.007**
HDL	37.54±13.57	59.66±12.89	**0.0001**
VLDL	17.1±6.63	20±4	**0.009**
LDL	101.34±19.59	113±24	**0.009**

[Table/Fig-2]: Results are expressed as Mean±SD.
p-value less than 0.05 was considered to be significant

DISCUSSION

The present study showed that the levels of total cholesterol, triglycerides were significantly decreased and the levels of HDL and VLDL cholesterol were marginally decreased in cases as compared to controls. The findings were similar to those seen in study by Perez-Guzman C et al., they found that most patients with pulmonary TB had low total cholesterol levels and that values of about 90 mg/dL were strongly associated with mortality in those patients with miliary disease [16,17]. Padmapriyadarsini C et al., found dyslipidemia in TB patients with HIV infection [18].

Samuel O et al., concluded that malnutrition and increased free radical generation are common findings with TB patients and these can impair antioxidant capacity of an individual. Authors found significantly reduced concentrations of total-cholesterol, LDL-cholesterol and triglyceride ($p<0.01$), similar to the index study. The study showed that TB patients are predisposed to oxidative stress and have reduced concentrations of lipid fractions. While managing patients, lipid profile should be monitored and antioxidants supplements should be included in diet [12].

Thanoon IA and Alrahman AA, their study showed that active disease did not affect the glycaemic control, serum leptin levels and lipid profile but after two months of anti-TB drugs therapy showed increase in serum leptin and triglyceride levels, but no significant changes in glycaemic control and other lipid parameters [19].

Sultan KM did an assessment of BMI and nutritional status in pulmonary TB patients found the TC, HDL-C, LDL-C and TG were significantly lower in TB patients when compared with controls. They found a significant nutritional depletion in TB patients than controls [20]. Serum Cholesterol and LDL cholesterol were significantly ($p<0.05$) lower in TB patients whereas triglycerides and Serum HDL were not, as studied by Hussein RA et al., [21].

Metwally MM and Raheem HA reported hypocholesterolemia in Egyptian patients with pulmonary TB at the time of diagnosis and they concluded that it is a consequence of the disease rather than a risk factor as serum cholesterol and serum HDL significantly increased while serum triglycerides decreased in such patients after treatment [22].

Ofor IB et al., did evaluation of lipids and protein profile in pulmonary TB patients on Anti-tubercular therapy, this study showed that patients of pulmonary TB had hypoalbuminaemia and hypocholesterolaemia. It can be corrected with regular intake of anti-TB therapy and normal diet. The findings of the study are of diagnostic importance in pulmonary TB infection and could be used to assess the severity of the disease and progress of treatment [23].

Akpovi DC et al., observed that the level of total cholesterol was significantly lower in TB patients. They showed that the total cholesterol and HDL-C levels return to normal gradually. Despite the rise of lipid parameter levels in TB treated patients, atherogenic indices were normal. They highlighted that additional research is needed to fully assess the link between TB treatment and levels of total cholesterol and its components in patients with pulmonary TB. Authors said it would be interesting to study supplementation of cholesterol alone or with anti-TB therapy [24].

Taparia P et al., did a pilot study of lipid profile in pulmonary TB patients and relapse cases in relation with disease severity and observed that all lipid parameters were significantly ($p<0.05$) low in both newly diagnosed and relapse cases of Pulmonary TB than controls. TC and LDL level were significantly higher in relapsed patients than new PTB cases. They also observed that lipid parameters can be correlated with smear positivity extent indicating that it is a better measure to assess disease severity with progressive decrease in lipids [25]. Suresh KK, found that lipid profile was strongly affected by pulmonary TB. Serum levels of total cholesterol, high density lipoprotein cholesterol, low density lipoprotein cholesterol and triglycerides were significantly lower on diagnosis and only serum cholesterol increased significantly after treatment than before it ($p<0.01$) [26].

Deniz O et al., mentions that Serum HDL levels are low in the patients infected by TB due to the increased catabolism of HDL [27]. Sahin F and Yıldız P assessed the total cholesterol, HDL-c, albumin and BMI and found significantly low levels in patients. The acute phase in TB determines its severity. There is a decrease in lipoproteins and BMI at this stage which corelates with the radiological extent of the disease [28].

Limitation(s)

The limitations of the present study are the socio-economic status was not taken into consideration. Also, the BMI was not assessed in this study.

CONCLUSION(S)

Association between TB and malnutrition is well recognised. TB leads to anorexia and weight loss therefore causes malnutrition, because of which there is decreased intake of proper balanced diet thus leading to reduced levels of lipids, amino acids etc. Therefore, low levels of lipids can be used as a nutritional status marker for TB which can help in better quality treatment in these patients and improve their overall health and well-being.

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