



Study of Lipid profile in pulmonary TB cases: pre and post anti-tuberculosis treatment

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Abstract

Tuberculosis is a major public health problem where India accounts for one fifth of the global burden of TB incident cases. Changes in blood lipid profile has been observed during the natural course of TB infection. Decrease in the level of both TC and HDL cholesterol has been observed in the early stages. This study was undertaken to study the lipid profile of newly diagnosed pulmonary TB patients, to compare it with healthy control and to subsequently study the effect of ATT on lipid profile. 50 newly diagnosed pulmonary TB patients and 50 age and sex matched healthy controls were selected for this study. All the lipid parameters were found to be significantly low in the pulmonary TB infected cases compared to control, at the time of diagnosis. After the completion of ATT, all the lipid parameters were found to increase from the initial value. Recovery from TB after successful ATT is accompanied by improvement of lipid parameters.

Keywords: *pulmonary TB, ATT, lipid profile.*

Introduction

Tuberculosis (TB) caused by the tubercle bacillus, *Mycobacterium tuberculosis* (MTB), is a potentially fatal, contagious disease which still remains a major global health care issue^[1]. It is mainly a lung disease where it forms localized infection after inhalation. TB can however affect any part of the body.

Almost one third of the world's population is infected with *Mycobacterium tuberculosis* with the majority of these individuals living in less developed countries (WHO, *Global Tuberculosis Control*, 2011). Worldwide, TB is responsible for more than 1.5 million deaths every year. India is a nation, which is both endemic and epidemic to

tuberculosis. Tuberculosis is a major public health problem where India accounts for one fifth of the global burden of TB incident cases. Almost 40 percent of the population in India is infected with the TB bacilli. It is the 2nd leading cause of death killing 2 million people each year^[2-5].

Cholesterol, mainly because of its involvement in cardiovascular diseases, has received much attention in recent years. Current recommendations for treatment are aimed at reducing the serum cholesterol levels. However, there are increasing evidences that indicate a link between low blood cholesterol levels and a number of human diseases including tuberculosis. It is reported that low total cholesterol level promotes

the development of TB whereas hypercholesterolemia confers some protection against infection with *Mycobacterium tuberculosis*. Despite the existence of such links between cholesterol and TB, it is not known as to which extent the treatment of the disease affects lipid profile in patients with TB^[6-9].

Changes in blood lipid profile has been observed during the natural course of TB infection. Decrease in the level of both TC and HDL cholesterol has been observed in the early stages with increase in TG level later^[10]. Decreased levels of HDL is a well-recognized independent risk factor for adverse cardiovascular outcomes and this has even been shown to be true in TB-infected individuals, irrespective of other risk factors^[11].

This study was undertaken to study the lipid profile of newly diagnosed pulmonary TB patients to compare it with healthy control and to subsequently study the effect of ATT on lipid profile.

Material and Methods

50 newly diagnosed pulmonary TB patients were selected for this study. 50 age and sex matched healthy controls with no complaints and no known diseases were taken as controls. Sputum and blood samples were systematically collected from all patients with clinical signs of pulmonary TB. Patients co-infected with MTB and HIV, and those who underwent an incomplete TB treatment were excluded from the study. Furthermore, patients who were on antibiotic therapy or using any antilipidemic medication, were also excluded from the study. The control group was tested negative upon TB diagnostic testing.

All the lipid profile and other biochemical parameters like glucose, urea, creatinine, AST-

ALT were estimated on fully automated analyzer. Lipid parameters were measured in 50 experimental subjects suffering from pulmonary TB and 50 control subjects. In TB patients, the same individuals were tested before treatment and at the end of treatment. Blood samples were collected after an overnight fast. Anthropometric measurements like body weight and BMI were taken.

Informed written consent was voluntarily obtained from each participant before entering the study.

Data were evaluated by Student's t-test. Quantitative data are expressed as mean $\pm$ SD. p value <0.05 is considered statistically significant.

Results

There were 33 males and 17 females in the TB infected group while the control group included 36 males and 14 females. The mean age of case and control groups were 31.6 years and 33.2 years respectively. All the lipid parameters were found to be significantly low in the pulmonary TB infected cases compared to control, at the time of diagnosis. Total cholesterol and HDL were 130 ± 25 mg/dl and 34 ± 7 mg/dl respectively. Similarly LDL and TG were 70 ± 14 mg/dl and 134 ± 39 mg/dl. The value of these parameters in the control group were 183 ± 32 mg/dl (TC), 46 ± 9 mg/dl (HDL), 110 ± 37 mg/dl (LDL) and 156 ± 28 mg/dl (TG).

After the completion of ATT of six months duration, all the lipid parameters were found to increase from the initial value. There was significant increase in total cholesterol, HDL and LDL. Triglyceride value, though increased, but the change was not significant. The lipid level after treatment were 150 ± 40 mg/dl (TC), 41 ± 8 mg/dl (HDL), 76 ± 15 mg/dl (LDL) and 138 ± 42 mg/dl (TG).

Table 1 Comparative study of lipid profile(mg/dl) in cases before ATT and control.

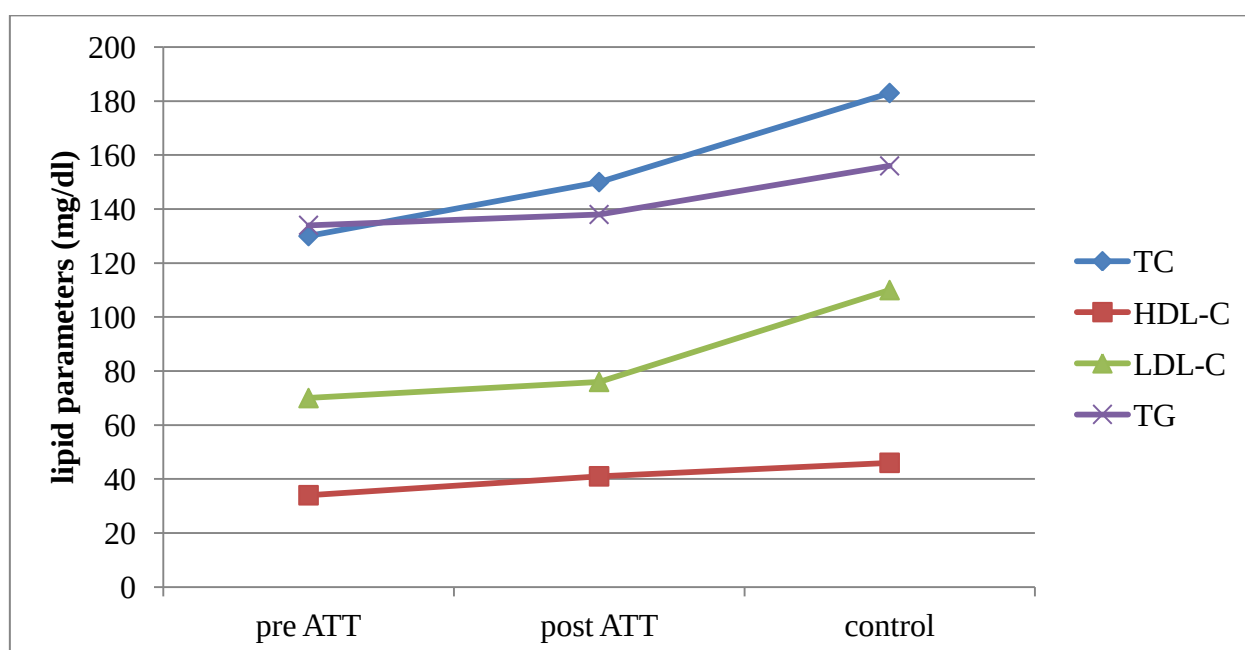
Lipid profile	Pre ATT	control	p value
TC	130 ± 25	183 ± 32	<0.001
HDL	34 ± 7	46 ± 9	<0.001
LDL	70 ± 14	110 ± 37	<0.001
TG	134 ± 39	156 ± 28	<0.002

Table 2 Comparative study of lipid profile(mg/dl) in cases after ATT completion and control.

Lipid profile	Post ATT	control	p value
TC	150 ± 40	183 ± 32	<0.001
HDL	41 ± 8	46 ± 9	0.004
LDL	76 ± 15	110 ± 37	<0.001
TG	138 ± 42	156 ± 28	0.01

Table 3 Comparative study of lipid profile(mg/dl) in cases before and after completion of 6months ATT.

Lipid profile	Pre ATT	Post ATT	p value
TC	130 ± 25	150 ± 40	0.003
HDL	34 ± 7	41 ± 8	<0.01
LDL	70 ± 14	76 ± 15	0.04
TG	134 ± 39	138 ± 42	0.6

**Fig.1** Different lipid fractions in control and cases (both before and after ATT)

Discussion

Before treatment, TC, HDL and LDL levels were significantly lower in TB patients as compared to normal subjects. At the end of treatment of six months, the levels of TC remained significantly lower in TB treated patients when compared to the healthy controls. However, compared with the levels before treatment, TC and HDL levels increased significantly after treatment. Similar results were obtained by Taparia P. Et al. In their study, all the lipid parameters were significantly ($p < 0.05$) low in both newly diagnosed and relapse cases of Pulmonary Tuberculosis (PTB) than controls.

Around one third of worlds' population is infected with MTB, but only a small fraction of this

develops active disease. Therefore, some specific condition must be there which predisposes these individuals to develop active TB disease^[12].

Lipids are important determinants of nutritional status of the body. Low level of lipids in the body specially cholesterol, has been found to increase susceptibility to various infections including TB. Cholesterol constitute a major portion of the lipid content of cell membranes. It is essential for maintaining membrane fluidity. Even the macrophages require cholesterol for their phagocytic activity like cell motility, exocytosis and endocytosis. In cholesterol deficiency, its phagocytic activity is deranged^[13-17].

Studies have indicated preferential utilization of fatty acids over carbohydrates by Mycobacterium

tuberculosis. Hence, during chronic infection, cholesterol utilization by tubercle bacilli might decrease the host pool. Decreased rate of production and higher catabolism during chronic infection may also be the cause of low cholesterol level in TB patients^[18].

In this study, the level of TC was significantly lower in patients with TB. Similar observations were reported by Deniz et al and Perez-Guzman et al. An adequate level of cholesterol is necessary for the proper functioning of the immune system against infection. Perez-Guzman et al. have shown that a cholesterol-rich diet accelerates bacteriologic sterilization in patients with TB.

It was found in this study that HDL level was decreased significantly in non-treated TB patients compared to controls, and increased significantly after treatment. Similar results were obtained by Akpovid et al.

During inflammation, catabolism of HDL increases. There is overexpression of inflammatory proteins such as phospholipase A2 and circulating amyloid A, during acute phase of TB. This overexpression is in response to inflammation, which stimulates HDL catabolism. Therefore in successfully treated TB patients, HDL level is supposed to increase after ATT^[19].

Conclusion

Recovery from TB after successful ATT is accompanied by significant improvement of lipid parameters such as cholesterol and HDL. Additional research is required to more fully assess the link between TB treatment and levels of total cholesterol and other lipid components in patients with pulmonary TB.

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