Evaluation of Lipid Profile in Newly Diagnosed Tuberculous Patients

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MSM AJ conceived idea, MSM SR drafted the study, MSN UU collected data, MSM SR did statistical analysis and interpretation of data MSM MSN UU critical review manuscript, All approved final version to be published.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

Abstract

Background: Cholesterol is a hormone that helps to regulate basic cellular metabolism. Lipid profile especially serum cholesterol in tuberculosis patients is lower when compared healthy individuals. So far yet it is not clear if this is a risk factor or as result of disease itself.

Objective: The present study was conducted with the objective to find out lipid profile in newly diagnosed tuberculosis patients.

Methodology: It was cross sectional study conducted from July 2019 till March 2020 at Gulab Devi Hospital Pulmonology Department. A total of 78 tuberculous patients were included, after meeting inclusion criteria in the study. Demographic information such as name, age, gender, and contact details were taken. 10mls of venous blood were drawn into serum tubes after 8 hours of fast. The blood sample tubes were then sent to hospital laboratory where blood was analyzed for lipid profile of the patients. Blood reports were obtained, and data was collected on proforma. Levels of TG, LDL, HDL, and total cholesterol were measured. Data was entered and analyzed through SPSS 22.

Results: The mean age in our study was 34.55 ± 5.80. There were 47(60.3%) male and 31(39.7%) female case. The mean total cholesterol was 114.62 ± 29.81 and mean TG was 112.01 ± 13.47. The mean HDL value was 3807 ± 7.02 and mean LDL in this study was 89.00 ± 23.49.

Conclusion: This study concludes that parameters of lipid profile were deranged in our tuberculous cases. To achieve maximum response of TB treatment we must consider normalizing lipid profile along with standard treatment for better recovery.

Keywords: Infectious Diseases; Pulmonary Tuberculosis; Total cholesterol; Triglycerides; Low Density Lipoproteins; High Density Lipoproteins

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Introduction

Tuberculosis (TB) is an endemic infectious disease in Pakistan. Among twenty-two high burden countries, Pakistan unfortunately stands fifth among these countries.[1] Despite the availability of highly effective drug treatment regimen, the mortality due to TB is still high in Pakistan and worldwide.[2] Pakistan is a major contributor to TB burden in EMRO region accounting for 44% of total burden of disease in the region. According to WHO, incidence of smear positive cases in Pakistan is 80/100000 per year out of 177/100000 for all types of cases.[3] TB disease remains a global scourge. Stop TB Partnership has set the targets to reduce the global total TB burden almost nil by 2050.[2,4] Lipids are not only the important constituents of human diet that determine nutritional status, but they also play an important role immune function regulation and modulation.[5]

Role of cholesterol and other serum lipoproteins is well known in CVD. However, increasing evidence indicates link between low cholesterol level and several human diseases including TB.[6] There is lack of local data regarding lipid profile, its peroxidation, antioxidants, and oxidative stress and lipid fractions in our country and especially in tuberculous patients.

The aim of present study is to investigate the levels of lipid in our TB patients and to provide information that would help to enhance the cure rates in treatment and management of TB patients in our country.

Methodology:

Study Design, Setting and Duration

It was a cross sectional study that used non-probability, consecutive sampling. The study was conducted at Department of Pulmonology Al-Aleem Medical college/Gulab Devi Teaching Hospital Lahore from July 2019 to March 2020. The study cases consists of both gender with >18 years with MTB positive at the time of study. The exclusive criteria for this study was to excluded such patients with deranged LFTs, RFTs and any other co – morbidities or pregnant female lady.

Data Collection Procedure

A total of 78 TB cases were enrolled, after meeting the inclusion criteria. After taking written informed consent from patients, their demographic data such as name, age, gender, and contact details were taken. 10ml of blood from vein was collected into serum tubes with aseptic measures, after 8 hours of fasting.

The collected blood sample tubes were then sent to hospital laboratory where the serum was extracted by centrifuging. The whole blood then was analyzed for lipid profile. Fasting lipid profile reports were collected, and data was noted on proforma. Levels of TG, LDL, HDL, and total cholesterol were recorded.

Data Analysis

Data was entered and analyzed through SPSS 22. Quantitative variables like age, Cholesterol, HDL, LDL, TG, height, weight, BMI was calculated as mean ± SD. Qualitative variables like gender and obesity was presented as frequency and percentage. Data for age, gender, duration of TB symptoms and BMI to address the effect modifiers was stratified. Post stratified t-test was applied, by taking p-value <0.05 as significant.

Results

Demographic Data

The mean age in our study was 34.55 ± 5.80 years. There were 47(60.3%) male and 31(39.7%) female case (Figure 1). The mean weight, height and BMI in this study were 74.26 ± 14.87 kg, 1.72 ± 0.17 m and 25.50 ± 5.89 respectively (Table 1). There were 20 (25.6%) cases that were obese and 58(74.4%) cases

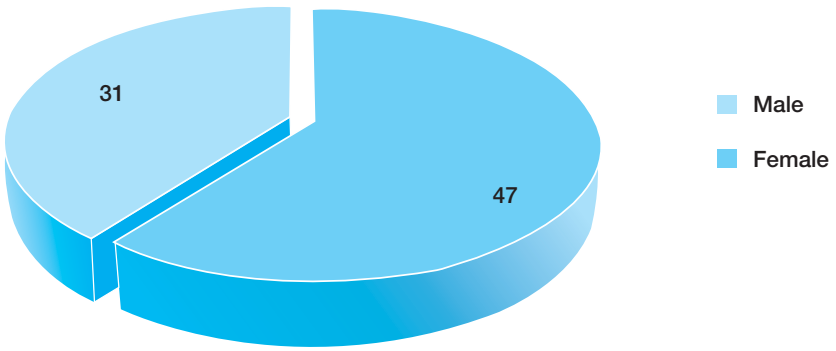

Figure 1. Gender distribution of study cases

Table 1. Descriptive statistics of weight, Height and BMI

	Weight (kg)	Height (m)	BMI
Mean ± S.D.	74.26 ± 14.87	1.72 ± 0.17	25.50 ± 5.89
Minimum	50.00	1.43	14.15
Maximum	107.00	2.00	36.93

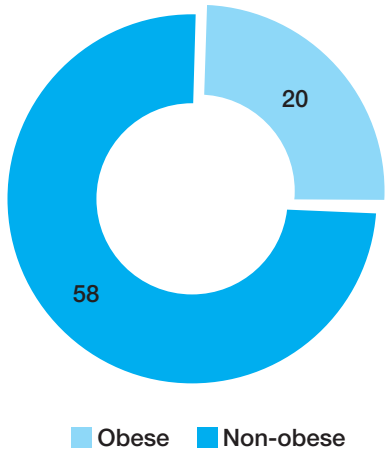

Figure 2. Frequency distribution of study cases on the basis of obesity

were non-obese (Figure 2).

Lipid Profile Comparison Data

The mean total cholesterol was 114.62 ± 29.81 mg/dl with minimum and maximum value of 63.57 and 181.62. The mean TG was 112.01 ± 13.47 mg/dl with minimum and maximum value as 85.76 and 131.17 respectively. Similarly, the mean HDL value was 38.07 ± 7.02 mg/dl with minimum and maximum value of 29.26 and 70.63 and the mean LDL in this study was 89.00 ± 23.49 mg/dl with minimum and maximum value of 51.46 and 145.30 respectively (Table 2).

Table 2. Descriptive statistics of Lipid Profile

	T.cholesterol (mg/dl)	TG (mg/dl)	HDL (mg/dl)	LDL (mg/dl)
Mean	114.62	112.01	38.07	89.00
S. D	29.81	13.47	7.02	23.49
Range	118.05	45.40	41.37	93.84
Minimum	63.57	85.76	29.26	51.46
Maximum	181.62	131.17	70.63	145.30

Comparative data of Lipids with age, gender, BMI, and duration of symptoms

When data for age, gender, BMI, and duration of TB symptoms was stratified, we found no difference in mean of Total cholesterol, LDL, TG, and HDL in relation to age groups, gender, body mass index and symptoms duration (Tables 4-7).

Table 3. Comparison of Lipid Profile with age groups

Lipid Profile	Age groups	Mean	S.D.	Minimum	Maximum	P-value
Total cholesterol (mg/dl)	18-29	112.41	33.26	63.57	167.49	0.732
	30-40	115.24	29.04	63.57	181.62	
TG (mg/dl)	18-29	114.37	13.76	85.76	129.15	0.417
	30-40	111.35	13.43	86.77	131.17	
HDL (mg/dl)	18-29	39.47	6.96	31.28	55.50	0.356
	30-40	37.68	7.05	29.26	70.63	
LDL (mg/dl)	18-29	86.95	31.03	51.46	144.29	0.687
	30-40	89.57	21.21	51.46	145.30	

Table 4. Comparison of Lipid Profile with Gender

Lipid Profile	Gender	Mean	S.D.	Minimum	Maximum	P-value
Total cholesterol (mg/dl)	Male	116.68	30.40	63.57	181.62	0.45
	Female	111.51	29.10	63.57	178.59	
TG (mg/dl)	Male	112.47	13.56	85.76	131.17	0.71
	Female	111.32	13.51	89.80	131.17	
HDL (mg/dl)	Male	37.20	3.83	29.26	44.40	0.18
	Female	39.38	10.06	29.26	70.63	
LDL (mg/dl)	Male	89.33	24.46	51.46	145.30	0.88
	Female	88.50	22.32	56.50	141.26	

Table 5. Comparison of Lipid Profile with BMI

Lipid Profile	BMI	Mean	S.D.	Minimum	Maximum	P-value
Total cholesterol (mg/dl)	Obese	114.87	28.39	82.74	181.62	0.96
	Non-obese	114.54	30.52	63.57	178.59	
TG (mg/dl)	Obese	114.57	12.29	89.80	131.17	0.032
	Non-obese	111.13	13.84	85.76	131.17	
HDL (mg/dl)	Obese	38.19	4.09	31.28	44.40	0.93
	Non-obese	38.03	7.81	29.26	70.63	
LDL (mg/dl)	Obese	89.45	27.83	51.46	145.30	0.22
	Non-obese	88.84	22.07	51.46	141.26	

Table 6. Comparison of Lipid Profile with duration of symptoms

Lipid Profile	Duration of Symptoms	Mean	S.D.	Minimum	Maximum
Total cholesterol (mg/dl)	< 6 months	116.23	31.50	63.57	181.62
	6 months or more	111.42	26.39	63.57	178.59
TG (mg/dl)	< 6 months	111.67	13.64	85.76	131.17
	6 months or more	112.70	13.35	89.80	131.17
HDL (mg/dl)	< 6 months	37.76	7.41	29.26	70.63
	6 months or more	38.69	6.27	29.26	61.55
LDL (mg/dl)	< 6 months	89.70	25.11	51.46	145.30
	6 months or more	87.59	20.25	56.50	144.29

Discussion

Mycobacterium tuberculosis complex is the century old organism responsible for tuberculosis. Tuberculosis is a worldwide bacterial infection effecting all ages, rich and poor.[9] Among communicable diseases, tuberculosis is the second most leading cause of mortality worldwide, with two million deaths each year. Overcrowding, malnutrition, smoking, depressed immunity are the important risk factors for the disease to occur.[10]

Low levels of total serum cholesterol and HDL have been shown in tuberculous patients. It has been hypothesized that diet fortified with cholesterol might accelerate the sputum sterilization in these patients. A close relationship has been linked between acute phase reactant and HDL cholesterol, that may explain disease in nutritionally deficient patients.[11] Several studies found that lipid levels, especially of high-density lipoproteins, were low in pulmonary TB when these were compared to the normal healthy individuals.

A study included 32 cases of TB reported mean total cholesterols in TB cases was 114.41±15.5mg/dl, triglyceride 98.6 ± 22.25mg/dl, HDL 30.37±2.0mg/dl, LDL 64.31±13.0mg/dl and VLDL was 19.72 ± 4.5mg/dl.[7] Another study reported similar results.[8] According to Perez Guzman et. al., low serum cholesterol might be a factor for the development of pulmonary TB. They also found that values of about 90 mg/dL were strongly associated with mortality in

those patients with miliary disease. Although very scantily investigated, these associations have been already mentioned by others.

In our study, we found that mean total cholesterol was 114.62 ± 29.81mg/dl, mean TG was 112.01±13.47 mg/dl, the mean HDL was 38.07 ± 7.02 mg/dl and mean LDL in was 89.00 ± 23.49mg/dl. The results are comparable to others in our study. A study conducted by Taparia P et al. included 32 cases of TB and they reported men total cholesterols of 114.41 ± 15.5mg/dl, triglyceride 98.6 ± 22.25 mg/dl, HDL 30.37 ± 2.0mg/dl, LDL 64.31 ± 13.0mg/dl and VLDL 19.72 ± 4.5mg/dl in their tuberculous patients.[7] Another study reported almost similar results i.e. triglyceride 0.55 ± 0.2mg/dl, cholesterol4.8±1.0mg/dl, HDL 1.02 ± 0.27 mg/dl and LDL 2.7 ± 0.9 mg/dl.[8]

A study showed that hypo-cholesterolaemia was identified in 140 out of 323 (43.3%, 37.9 – 48.8) pulmonary tuberculous patients. There was high prevalence of lower cholesterol at diagnosis, 51 vs 91 (56.0%, 45.8 – 66.3). This hypo-cholesterolaemia prevalence improved at completion of treatment 19 vs 59 (32.2%, 20.9 – 44.3). Further analysis showed that male, diabetes, and tuberculous treatment duration were associated more with hypo-cholesterolaemia. However, no significant association was found between HIV infection status, presence of cavitary lesions on chest x-ray and hypo-cholesterolaemia at diagnosis and during tuberculous treatment in this study. Hence the study concluded that the overall prevalence of hypo-cholesterolaemia among participants was high especially in males with pulmonary tuberculosis.[13]

Similarly, another study was conducted to determine lipid-levels in newly diagnosed and re-treatment PTB patients, with objective of to find association between lipid-levels with disease severity and inflammatory levels. Newly diagnosed (n=32) and re-treatment (n=26) cases of PTB were enrolled in the study. Patients enrolled were of both genders. The average age for men and women was 37.16±1.2 years, 39.44 ± 1.5 years, respectively.[25] Healthy persons that were age and gender matched healthy subjects were taken as controls for comparison. TC, TG, HDL, LDL, VLDL, C-reactive proteins (CRP) along with adenosine deaminase level (ADA) were estimated. The result showed that lipid parameters were statistically ($p< 0.05$) low in both newly diagnosed and re-treatment cases of PTB than controls. Total cholesterol and LDL-levels were significantly higher in re-treatment patients than new PTB cases. Inflammatory markers (ADA and CRP) increased significantly ($p< 0.05$) in both new and re-treatment group according to control group. LDL and Cholesterol were correlated to serum ADA as compared to CRP. No significant correlation was seen between other lipid parameters with either ADA or CRP. Thus, this study has shown that hypocholesterolemia exists in both newly diagnosed and re-treatment PTB patients and is one of the many nutritional factors predisposing to TB infection.[7]

Similarly, Rao et al. performed another study to determine the levels of LDL, serum cholesterol, and HDL in patients of PTB and analyzed its correlation with disease-severity and sputum-positivity.[14] Fifty patients of pulmonary tuberculosis were enrolled. Levels of LDL, serum cholesterol, and HDL were determined and compared to radiological extent and positivity of sputum. The study showed that the lipid levels (LDL, serum cholesterol, and HDL) were found to be significantly lower in smear-positive versus smear-negative group. Similarly, the lipid-levels were significantly lower in the advanced tuberculosis group as compared to early stages, [cholesterol (133.16 ± 22.59 vs 159.36 ± 16.94 vs 190.79 ± 29.02, $P < 0.05$), HDL (31.36 ± 3.89 vs 34.36 ± 4.2 vs 37.29 ± 4.29, $P < 0.05$), and LDL (97.60 ± 13.92 vs 119.36 ± 4.11 vs 122.64 ± 13.86, $P < 0.05$)].

Our study is very much reflecting the same trend in our population. LDL, serum cholesterol, and HDL levels can be utilized as a marker of tuberculosis severity assessment, the lower levels of which indicates advanced disease. Further research is needed on dyslipidemias in TB patients and policy improvements regarding assessment of these lipids and nutritional management.[13] This might implicate on tuberculosis control programs, especially in countries with high prevalence and burden of tuberculosis.[14]

Conclusion

This study concludes few of the parameters of lipid profile were not normal indicating the derangement of these parameters in cases of tuberculosis. To achieve maximum response of TB treatment we must consider normalizing such parameters along with standard treatment to achieve better outcome.

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