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A STUDY OF LIPID PROFILE AMONG PATIENTS OF PULMONARY TUBERCULOSIS

Medicine

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ABSTRACT

Objectives: To study the relationship between pulmonary tuberculosis and hypolipidemia.
Methods: It was a case control study where 80 participants attending our hospital were enrolled after their written and informed consent. Case group was composed of 40 patients having pulmonary tuberculosis based on sputum AFB staining by direct microscopy and/or X-ray chest findings while in control group 40 normal healthy individuals were included. Demographic data, history, anthropometry, sputum AFB by direct smear, chest X- ray and lipid profile of all subjects were recorded. Total cholesterol (TC), low density lipoprotein (LDL) and high density lipoprotein (HDL) were compared between two groups.
Results: A significantly high number of participants had lower than normal levels of TC, HDL and LDL in case as compared to control group. There were lower than normal levels of TC in 52.5% (21) subjects in case group and 12.5% (5) in control group (P<0.0001), where as 35% (14) subjects in case group and 10% (4) in control group (P=0.007) had below normal levels of HDL. LDL values were found to be lower in 80% (32) participants in case group and 52.5% (21) in control group (P=0.009). Thus, in our study, we observed a significantly higher prevalence of hypolipidemia amongst pulmonary TB patients, as compared to normal healthy individuals.
Conclusions: The findings of our study are consistent with the hypothesis that low lipid levels are associated with high incidence of tuberculosis. In our country, hypolipidemia is often a consequence of poor nutritional and lower socioeconomic status, which is proven to be associated with a high incidence of tuberculosis. The effect of low lipid level on occurrence of tuberculosis needs to be studied in detail at molecular level and further research is warranted to support the hypothesis of providing fat rich diet to tuberculosis patients to fasten their recovery.

KEYWORDS

Pulmonary tuberculosis; lipid profile; TC; LDL; HDL

INTRODUCTION

Pulmonary tuberculosis (TB) is an infection of the lung and occasionally surrounding structures caused by the bacterium Mycobacterium tuberculosis complex (MTB). Tuberculosis is a contagious disease that progresses from a systemic infection. Most commonly, M. tuberculosis is spread from person to person mainly by airborne transmission of droplet nuclei. Despite a relatively low transmission rate compared with other contagious diseases and the existence of effective chemotherapy for six decades, tuberculosis remains a major global public health problem with approximately one-third of the world's population is infected with tuberculosis.

Gutierrez and her colleagues[1] at the Pasteur Institute have concluded that the progenitor of M. tuberculosis emerged from an array of mycobacterial species around 3 million years ago, all modern members of the M. tuberculosis complex evolved from a common ancestor 15,000– 20,000 years ago[2-3]. The earliest archaeological evidence of human TB comes from Egyptian art and mummies and there is ample evidence of spinal TB as early as 5,500 years ago.[4-6]

The etiology of this disease is multifactorial. Very few study addressed effect of hypolipidemia on tuberculosis. Recent literature shows a vital role of Cholesterol in immunity. This study evaluates the effect of lipid levels on incidence of pulmonary tuberculosis.

Elevated cholesterol has a beneficial effect on tuberculosis resistance through the immune system. They cite the well known fact that cholesterol constitutes about one-third of the cell membrane lipids content and participates in the fluidity of this structure, in the activity of membrane-bound enzymes and in membrane functions, such as phagocytosis and cell growth.

Cholesterol's vital role is in essential hormone synthesis and in memory formation in the brain. In the past few years, specialized regions of the cell membrane known as lipid rafts have attracted interest due to their critical role in receptor-mediated signaling and cell to cell interactions. In contrast to the rest of the cell membrane, which is composed by phospholipids, lipid rafts are composed by gangliosides tightly packed by cholesterol into well-ordered phases. Cholesterol is essential in the correct assembly of these regions, since its removal leads to dissociation of most proteins from rafts and makes them non-functional. In recent years researchers have demonstrated again and again that cholesterol reduction leads to dissociation of these lipid rafts with bizarre effects on the resulting physiologic outcomes. Cholesterol is thereby

critical to the proper functioning of the immune system. Memory formation, essential hormone production and fighting tuberculosis - all dependent upon our natural cholesterol levels.[7-8]

MATERIAL AND METHODOLOGY

The study proposal was prepared and presented before Human research and ethics committee of H.M. Patel center for medical care and education, karamsad and approval to conduct the study was granted. This study was performed to know the prevalence of dyslipidemia among pulmonary tuberculosis and to determine whether Lipid Profile affects the occurrence of pulmonary tuberculosis or not.

It was an observational & analytic type of study. We have analyzed 40 patients who were diagnosed as pulmonary tuberculosis and 40 participants were without any diseases with their written & informed consent meeting the inclusion criteria. Study was done at Department of Respiratory medicine, Shree Krishna Hospital, Karamsad, Anand, Gujarat. Diagnosis of Pulmonary Tuberculosis was based on Sputum examination and chest X-rays findings. The period of study was around 2 years. Synopsis of the study was submitted to the institutional Human Research Ethics committee and approval was taken to perform the study.

We had selected patients as cases of either sex with age between 10 years to 70 years attending out patient department or admitted as indoor patients in Shree Krishna Hospital and diagnosed with pulmonary tuberculosis based on sputum examination and chest x-ray. We had selected participants as control of either sex with age between 10 years to 70 years normal individuals without any co-morbidity.

Individuals who were not willing to participate in the study and having co-morbidities (hypertension, diabetes mellitus, HIV infection, congenital and acquired metabolic disorders, leukemia and chronic renal failure) and on medications which could affect lipid profile and

individuals having age less than 10 years and more than 70 years were excluded from study.

After taking informed consent in the language best known to them, personal data, medical history including demographic features, drug history and vitals were obtained. All the individuals were fasted overnight and 3 ml of venous blood samples were collected after routine aseptic precautions. Cholesterol, HDL, LDL reports were obtained. Patients were divided according to age, sex, cases and controls. Chi-Square Tests were applied between 2 groups and BMI, Cholesterol, HDL, LDL. P<0.05 was considered statistically significant. Thus, we have found correlation between pulmonary tuberculosis and BMI, Cholesterol, HDL, LDL.

RESULTS

Total 40 cases and 40 controls were included in study. All participants were investigated for lipid profile. In diagnosed pulmonary tuberculosis patients, total 28 were males and 12 were females, where as in controls 15 were males & 25 were females. Maximum participants (23) were in age group between 41-50 years. Mean age was around 44 years. Most common symptom in case group which brought patient to physician was cough(Table1).

Table 1: Distribution According To Presenting Symptoms In Pulmonary Tuberculosis:

Symptoms	Cough	Hemoptysis	Dyspnea	Chest Pain	Fever	Anorexia	Weight Loss
No of Patients	38	1	28	16	35	31	29

Other symptoms were dyspnea, chest pain, fever, anorexia, weight loss, and hemoptysis.

Among cases of pulmonary tuberculosis and control group, participants were categorized according to BMI. Mean BMI in case was 18.34 kg/m^2 , maximum 25.15 kg/m^2 and minimum 11.43 kg/m^2, while In controls mean BMI was 22.50 kg/m^2, maximum 26.90 kg/m^2 and minimum 17.60 kg/m^2.

There was significant numbers of low lipid levels in form of TC, HDL, LDL noted in pulmonary tuberculosis than in control group. Out of 40 cases of pulmonary tuberculosis, 14 patients were smokers and total 4 had smoking history in control group. For TC 29%, HDL 29%, LDL 31% had lower than normal values among smokers in pulmonary tuberculosis. According to age group maximum low lipid levels in pulmonary tuberculosis were in 41-50 years (Table 2).

Table 2: Mean Comparisons Of Bmi, Total Cholesterol, Hdl, Ldl :

Variables	Subjects			
	n	Case group Mean(S.D.)	n	Control Group Mean(S.D.)
BMI	40	18.34(3.95)	40	22.50(2.26)
Total Cholesterol	40	130.01(35.4589)	40	163.27(32.71)
HDL	40	34.72(16.09)	40	45.82(14.94)
LDL	40	79.03(27.48)	40	97.46(26.85)

BMI: Body Mass Index HDL : High Density Lipoprotein LDL: Low Density Lipoprotein

Chi square test of association revealed that proportion of tuberculosis is statistically significantly higher who had lower than normal level of TC ($p < 0.0001$), HDL ($p=0.007$) ,LDL ($p=0.009$) and lower than normal level of BMI ($p=0.000$) as compared to control group (Table 3).

Table 3: P Values Of Different Variables In Two Groups:

Variables		Subjects		P value
		Cases	Control	
BMI(kg/m^2)	Less than 18	18	2	0.000
	18-25	21	32	
	More than 25	1	6	
Total Cholesterol (mg/dl)	Less than 130	21	5	0.000
	130-220	19	35	
HDL (mg/dl)	Less than 30	14	4	0.007
	30 or More	26	36	
LDL(mg/dl)	Less than 100	32	21	0.009
	100 or More	8	19	

Thus, there is a significant correlation between higher prevalence of hypolipidemia amongst Pulmonary Tuberculosis patients as compared to normal healthy individuals.

DISCUSSION

Pulmonary Tuberculosis is chronic inflammatory disease of lungs caused by mycobacterium tuberculosis. Lipids and its metabolites have beneficial effect on tuberculosis resistance through the immune system. Extensive research on lipids has been carried out in various disease conditions especially cardiovascular and diabetes mellitus. However, there is paucity of information on the role of lipids in immune system to fight against infections. The findings in this study could therefore serve to evaluate the pattern of lipid profile in relation to prevalence of pulmonary tuberculosis. We had found some relatively similar studies that we have discussed here.

A study conducted by Pérez-Guzmán et al.(89) Mexico, was published in Medline Rev Med Inst Mex Seguro Soc. 2008; 46(3):247-52(ISSN: 0443-5117). Study Showed that hypo-cholesterolemia might be a risk factor for the development of pulmonary tuberculosis. They studied 25 pulmonary tuberculosis patients and 44 household contacts and compared their serum lipid profile. They had found that total cholesterol, LDL and triglycerides concentrations increased with age in contacts but not in pulmonary tuberculosis patients, with statistically significant differences in regression lines (age versus lipid level). Multiple linear regression analysis confirmed that being a household contact was associated with higher levels of total cholesterol, LDL, HDL and triglycerides. They had concluded that lipid profile differed between pulmonary tuberculosis patients and their household contacts, thus supporting that low cholesterol levels might be a risk factor for developing pulmonary tuberculosis. The similarity between this and our study is both have addressed correlation between lipid profile and pulmonary tuberculosis.

Second study was by Pérez-Guzmán; et al Instituto Nacional de Enfermedades Respiratorias, Tlalpan 4502, CP 14080, México City, Mexico. They studied that hypocholesterolemia was common among tuberculousis patients and was associated with mortality in milliary cases. With the objective to determine whether a cholesterol-rich diet could accelerate sputum sterilization in patients with pulmonary tuberculosis. For that an 8-week follow-up, randomized, controlled trial carried out from March 2001 to January 2002. Adult patients with newly diagnosed pulmonary tuberculosis were hospitalized for 8 weeks and randomly assigned to receive a cholesterol-rich diet (800 mg/d cholesterol [experimental group]) or a normal diet (250 mg/d cholesterol [control group]).All patients received the same four-drug anti tubercular regimen (isoniazid, rifampicin, pyrazinamide, and ethambutol). Every week, a quantitative sputum culture and laboratory tests were done and respiratory symptoms were recorded. Patients in the experimental group (10 patients) and the control group (11 subjects) were HIV-negative and harbored Mycobacterium tuberculosis that was fully sensitive to anti tubercular drugs. Sterilization of the sputum culture was achieved faster in the experimental group, as demonstrated either by the percentage of negative culture findings in week 2 (80%; control group, 9%; $p = 0.0019$) or by the Gehan-Breslow test for Kaplan-Meier curves ($p = 0.0037$). Likewise, the bacillary population decreased faster ($p = 0.0002$) in the experimental group. Respiratory symptoms improved in both groups, but sputum production decreased faster in the experimental group ($p < 0.05$). The study concluded that a cholesterol-rich diet accelerated the sterilization rate of sputum cultures in pulmonary tuberculosis patients, suggesting that cholesterol should be used as a complementary measure in anti tubercular treatment.

Another study by Dr. Deniz et al Department of Pulmonary Medicine and Tuberculosis, Gulhane Military Medical Academy, Ankara, Turkey showed that low serum total cholesterol (TC) concentrations in patients with pulmonary tuberculosis have been demonstrated. It was shown that a cholesterol-rich diet might accelerate the sterilization rate of sputum cultures in PTB patients. It is known that smear positivity might be related to the radiological extent of disease (RED) in PTB patients. They have hypothesized that there might be a relationship between initial serum TC concentrations; the degree of RED (DRED) and the degree of smear positivity (DSP) in PTB patients. In study Eighty-three PTB patients and 39 healthy controls were included. Serum TC, TG, HDL, VLDL and LDL concentrations were determined in all subjects. PTB patients were classified for their chest X-ray findings as minimal/mild, moderate and advanced. Correlations between serum lipid concentrations, DRED and DSP (0, 1+, 2+, 3+,

4+) were investigated. PTB patients and controls were also compared for serum lipid concentrations. Significant differences between PTB patients and controls were detected for serum TC, HDL and LDL concentrations. On step wise logistic regression analysis, DRED was found as one of the significant independent predictors of serum TC levels. They also found significant correlations between DRED and serum HDL concentrations (r=-0.60, p=0.0001) and between DRED and serum LDL concentrations (r=-0.28, p=0.011). Their study suggests that serum TC, HDL and LDL concentrations are generally lower in patients with PTB than those in healthy controls. In addition, changes in these parameters might be related to DRED and DSP in PTB patients.

Few more study also address role of lipids in immunity against pulmonary tuberculosis and decrease the prevalence of tuberculosis.
At the end of discussion we have concluded that still further research and studies are needed to confirm or exclude the role of lipids in tuberculosis prevalence.

CONCLUSION

From our study we could summarize that there were significant statistical correlation between hypolipidemia and prevalence of pulmonary tuberculosis so further investigation and studies are needed to confirm any correction between pulmonary tuberculosis and hypolipidemia.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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