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ORIGINAL RESEARCH

ASSOCIATION OF LIPID PROFILE PARAMETERS WITH ASTHMA SEVERITY

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Abstract

Introduction: Asthma is characterized by continuous inflammation of the respiratory tract in children & adults. Twenty percent of all children suffer from asthma, making it a major global health issue. Recent studies have linked asthma to lipid metabolism. Poor lipid metabolism is connected to asthma. This study will contribute to our understanding of the role of Dyslipidemia in asthma & will help us to develop a more effective approach to treating the condition because similar studies on the association between lipid profile parameters & asthma are lacking from this state. **Methods:** The study was conducted on OPD & IPD patients >18 years old in the Department of Respiratory Medicine, TMMC&RC among 77 patients >18 years attending OPD & IPD & diagnosed as a case or a known case of asthma. The aim of the study was to analyse the association of lipid profile parameters with asthma severity. **Results:** Out of 77 subjects, 58.4% were males & 41.6% were females. Most of the age group of 18-30 years (40.26%) followed by 31-40 & 41-50 years. 21 out of total 77 patients had comorbidities (n=21,27.3%) out of which maximum patients had a history of tuberculosis (n=17,22.1%) followed by diabetes mellitus(n=1,1.3%) and only 1 patient had hypothyroidism (1.3%). Mean VLDL, TC (mg/dL), TG (mg/dL), HDL-C (mg/dL) & LDL-C (mg/dL) among the study subjects 26.44±11.69, 194.44±43.22, 121.11±76.68, 48.67±12.86 & 119.30±37.97 respectively. Mean FVC, FEV1 (Predicted), FEV1 (VOL), FEV1% & FEVI (% Predicted) among the study subjects was 3.24±0.67, 2.70±.62, 314.42±137.78, 22.82±11.73 & 56.62±20.65 respectively. VLDL, TC, HDL-C & LDL-C was found to be comparable w.r.t. asthma severity. TG was found maximum in subjects with severe asthma (151.12) followed by moderate (111.42) & mild asthma (109.65), though no significant difference was found. No significant association was found between BMI & asthma severity. HDL-C & LDL-C level were found to be comparable w.r.t. asthma severity overall. VLDL, TC, TG, HDL-C & LDL-C were found to be comparable w.r.t. asthma severity in subjects having BMI between >24.9. **Conclusion:** Many studies have associated oxidant-antioxidant imbalance resulting in dyslipidemia and associated asthma severity and many studies have observed no association between these two. TG was found maximum in subjects with severe asthma followed by moderate & mild asthma in subjects having BMI between 18.5-24.9 with statistically significant difference as $p<0.05$.

Keywords: Asthma, Respiratory tract, lipid profile, BMI

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Introduction:

Asthma is characterized by continuous inflammation of the respiratory tract in children & adults. Around 358.2 million people worldwide were affected by asthma in 2020, making it the most prevalent chronic respiratory condition. Twenty percent of all children suffer from asthma, making it a major global health issue.[1] Since 1990, there has been a 30% increase in asthma-related issues over the world.[2]

It's linked to genetics, host variables (obesity, illness, allergy sensitivity) & environmental factors (air pollution, mold, pollen & tobacco smoke).[3] A variety of environmental factors both initiate & sustain asthma's chronic inflammatory condition.[4] Recent studies have linked asthma to lipid metabolism. Poor lipid metabolism is connected to asthma. Asthma & atherosclerosis are characterized by immune cell accumulation, mast cell & smooth muscle activation& high Ig E levels.[5,6] Immune system activation promotes dyslipoproteinemia by producing cytokines that activate lipoprotein lipase & hepatic lipase.[7,8] Hydrogenated fatty acid consumption has been linked to an increase in inflammatory cytokine production.[9] It is widely known that hypercholesterolemia raises the expression of pro inflammatory processes, which in turn raises the levels of pro inflammatory cytokines,[10] cellular adhesion molecules,[11] & inflammation sensitive plasma proteins. Inflammation of the airways persists over time, which is what causes asthma symptoms. In addition, hypercholesterolemia promotes inflammation by increasing cellular adhesion molecules in the endothelium & stimulating the production of inflammatory cytokines. Mucus hypersecretion, bronchial hyperreactivity& subepithelial fibrosis are all factors implicated in asthma pathogenesis that may be exacerbated by dyslipidemia.[9,12]

Transfering lipids in the serum is mostly dependent on lipoproteins. Proteins called apolipoproteins (Apo) A & Apo (B) are crucial building blocks of HDL & LDL, respectively.[13,14] Having allergic asthma has been linked to the development of atherosclerosis in mice.[15]

Research has linked asthma with lipoprotein levels. Barochia et al,[16] found a favorable correlation between Apo A-I & big HDL particles & FEV1 in atopic & asthmatic individuals. Serum triglycerides (TG), low-density lipoprotein (LDL) cholesterol & apolipoprotein B all were linked to worsening airflow obstruction.

In a study of metabolic syndrome & adult asthma, high blood triglyceride (TG) & low HDL-C levels were linked to wheeze.[17] According to a national survey of the US population, Non-atopic asthma is more common in kids & teens than atopic asthma.[18] Teens are less likely than adults to have comorbidities such as high blood pressure, diabetes & smoking. It's logical to study dyslipidemia's role in asthma in a statistically significant group of young people.[19] Since previous research linking lipid profile characteristics with asthma severity has yielded mixed results, the present investigation was undertaken to resolve the discrepancy. This study will contribute to our understanding of the role of hyperlipidemia in asthma & will help us to develop a more effective approach to treating the condition because similar studies on the association between lipid profile parameters & asthma are lacking from this state.

Aim & Objectives

Aim: To study association of lipid profile parameters with asthma severity at TMMC & RC.

Objectives:

1. To identify asthma patients.
2. To categorize asthma patients on the basis of severity.
3. To estimate lipid profile levels in asthma patients.
4. To find association between lipid profile parameters & severity of asthma.

Material and Methods

Inclusion Criteria

1. Patients >18 years attending OPD & IPD & diagnosed as a case or a known case of asthma.
2. Patients willing to participate in research & give informed written consent.

Exclusion Criteria

1. Evident serious systemic infection

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2. Liver diseases
3. Pregnant women with eclampsia or pre eclampsia.
4. Patients with haemoptysis.
5. Unstable cardiovascular status or recent myocardial infarction.
6. Recent eye, thoracic, abdominal or any major surgery.
7. Patients on oral contraceptives.

Table Asthma severity scoring system

Variables	Score levels*		
	1	2	3
FEV_1 (% predicted)	>80	70-80	<70
Asthma attacks in the preceding year	2	3-6	>6
Hospitalizations in the preceding year	0	1-2	>2
Inhaled or oral corticosteroids taken in the preceding year	Inhaled corticosteroids	Oral corticosteroids	–

*Each criterion was scored as 1, 2, or 3 with the exception of corticosteroid use, with a cumulative asthma severity score ranging from 4-11. Severity levels were defined as mild (score 4-5), moderate [6], or severe (>7). FEV_1, forced expiratory volume in one second.

Results

Table 1: Gender distribution among the study subjects

Gender	N	%
Male	45	58.4
Female	32	41.6
Total	77	100

The study was conducted on OPD & IPD patients >18 years old in the Department of Respiratory Medicine, TMMC&RC among 77 patients >18 years attending OPD & IPD & diagnosed as a case or a known case of asthma. The aim of the study was to analyse the association of lipid profile parameters with asthma severity. Out of 77 subjects, 58.4% were males & 41.6% were females [Table 1].

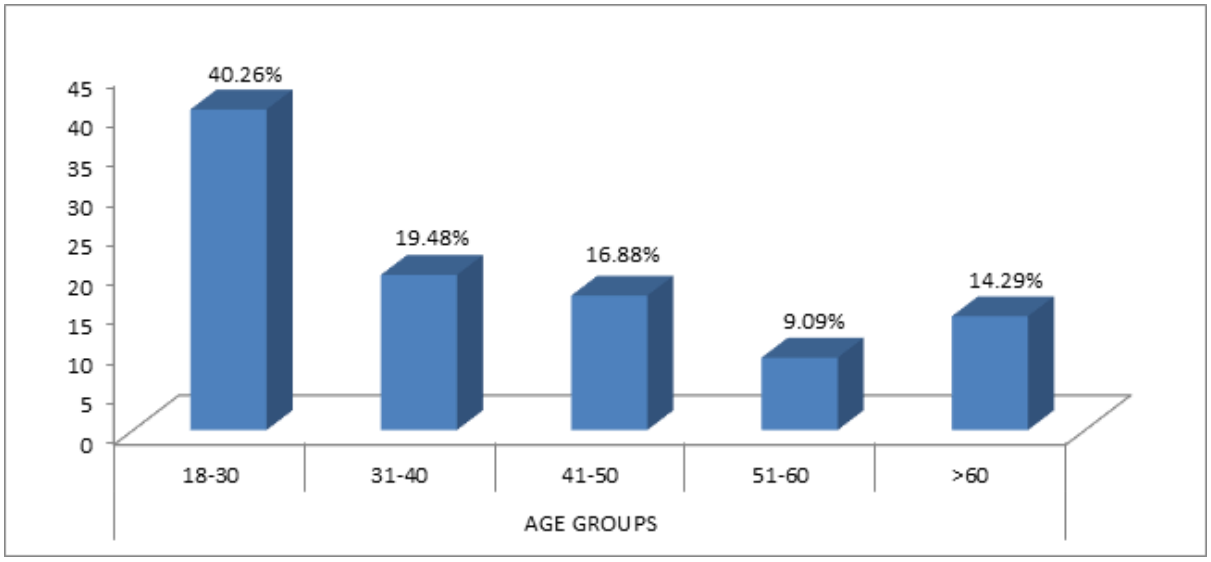

Figure 1: Age distribution among the study subjects

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Most of them of age group of 18-30 years (40.26%) followed by 31-40 & 41-50 years. Minimum subjects were from the group of 51-60 years (9.09%) followed by >60 years as shown in [Figure 1].

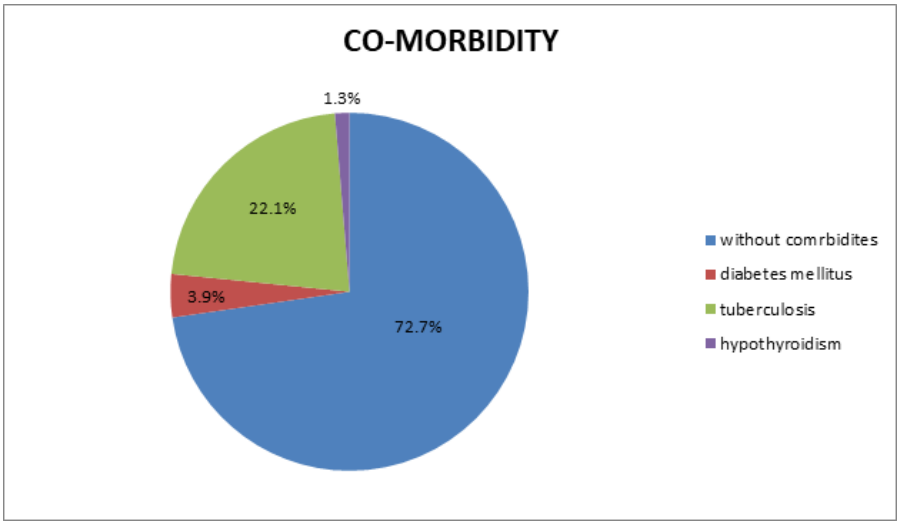

Figure 2: Co-morbidities among the study subjects

Co-morbidities was present in 27.3% of the subjects, out of which diabetes mellitus, hypothyroidism &TB was revealed in 3.9%, 1.3% & 22.1% of the subjects respectively [Figure 2].

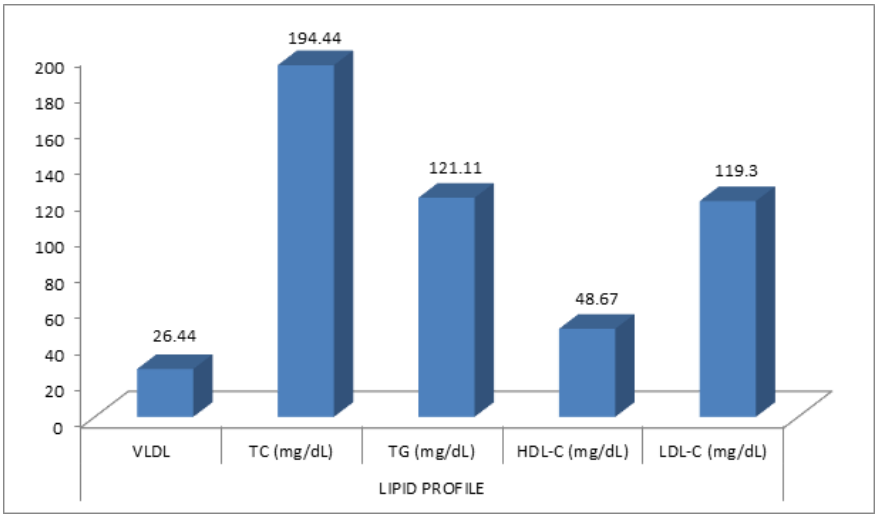

Figure 3: Descriptive analysis of lipid profile

Mean VLDL, TC (mg/dL), TG (mg/dL), HDL-C (mg/dL) & LDL-C (mg/dL) among the study subjects 26.44±11.69, 194.44±43.22, 121.11±76.68, 48.67± 12.86&119.30±37.97 respectively [Figure 3].

Table 2: Descriptive analysis of spirometry parameters

Parameters	Minimum	Maximum	Mean	SD
FVC	1.81	4.48	3.24	.67
FEV1 (Predicted)	1.18	3.87	2.70	.62
FEV1 (VOL)	160	880	314.42	137.78
FEV1%	9.0	58.0	22.82	11.73
FEVI (% Predicted)	14	99	56.62	20.65

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Mean FVC, FEV1 (Predicted), FEV1 (VOL), FEV1%& FEVI (% Predicted) among the study subjects was 3.24±0.67, 2.70±.62, 314.42±137.78, 22.82±11.73&56.62±20.65 respectively [Table 2].

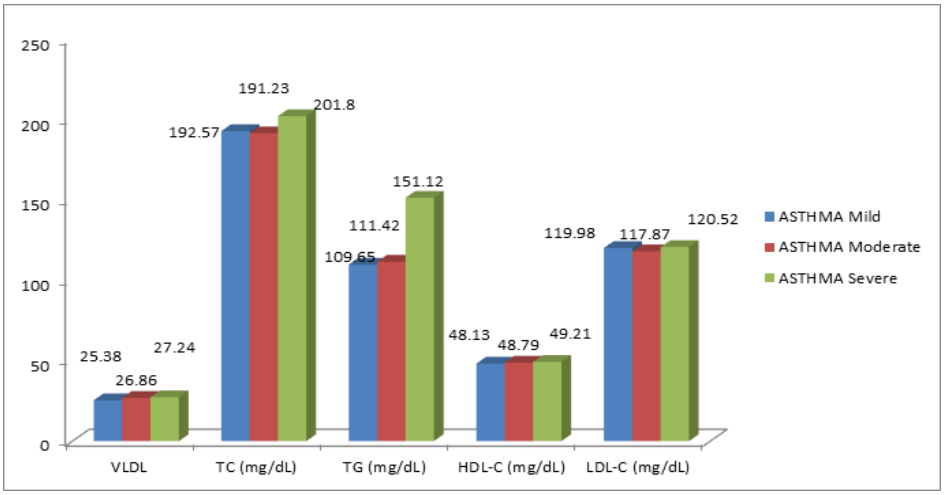

Figure 4: Association between lipid parameters & asthma severity

VLDL, TC, HDL-C & LDL-C was found to be comparable w.r.t. asthma severity. TG was found maximum in subjects with severe asthma (151.12) followed by moderate (111.42) & mild asthma (109.65), though no significant difference was found [Figure 4].

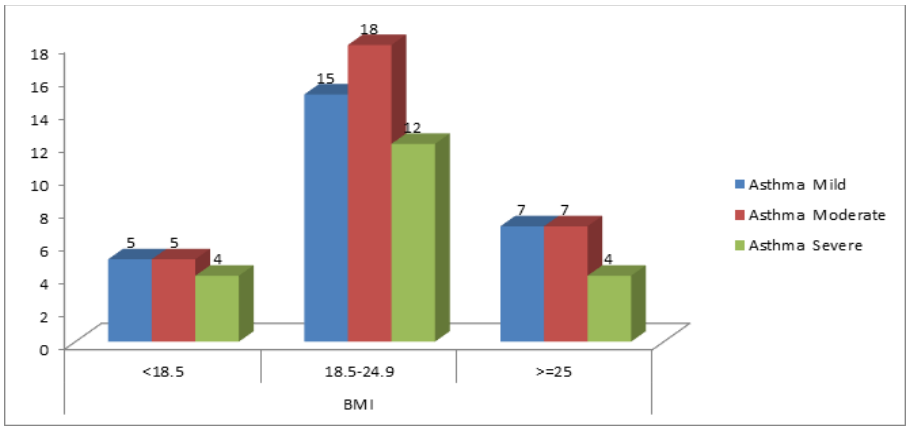

Figure 5: Association between BMI & asthma severity

-Among 27 patients with mild asthma 5 patients had BMI <18.5, 15 had BMI in the range of 18.5-24.9 & 7 patients had BMI >7.
-Among 30 moderate asthma patients 5 patients had BMI <18.5, 18 patients had BMI between 18.5-24.9& 7 patients had BMI >25.
-Among 20 severe asthmatic patients 4 patients had BMI <18.5, 12 patients had BMI between 18.5-24.9& 4 patients had BMI >25.
There was no significant association between BMI & asthma severity. [Figure 5]

Table 3: Association between lipid parameters & asthma severity among subjects with BMI>24.9

Severity		VLDL	TC (mg/dL)	TG (mg/dL)	HDL-C (mg/dL)	LDL-C (mg/dL)
Mild	Mean	26.97	216.0	118.73	49.29	140.49
	SD	10.83	35.64	56.94	10.39	41.27
Moderate	Mean	33.69	187.30	161.41	41.03	117.24
	SD	22.07	50.19	105.88	4.64	53.91
Severe	Mean	27.60	197.75	125.50	48.30	123.08
	SD	9.64	33.21	45.82	8.75	35.07

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p value		0.71	0.45	0.58	0.17	0.63

VLDL, TC, TG, HDL-C & LDL-C was found to be comparable w.r.t. asthma severity in subjects having BMI between >24.9 [Table 3].

Discussion

The study was conducted on OPD & IPD patients >18 years old in the Department of Pulmonary Medicine, TMMC&RC among 77 patients >18 years attending OPD & IPD & diagnosed as a case or a known case of asthma. The aim of the study was to analyse the association of lipid profile parameters with asthma severity. The findings of the study are summarized as below:

Out of 77 subjects, 58.4% were males & 41.6% were females. Most of the patients were in the age group of 18-30 years (40.26%) followed by 31-40 & 41-50 years respectively. Similarly, A. K. Singh et al,[20] found that the majority of their cases (over 50%) occurred among people aged 16 to 30. 45.5% & 54.5% of the subjects in this study lived in rural & urban area respectively. Smoking history was found in 27.3% of the study subjects. We observed in our study that 21 out of total 77 patients had comorbidities (n=21,27.3%) out of which maximum patients had a history of tuberculosis(n=17,22.1%) followed by diabetes mellitus(n=1,1.3%) and only 1 patient had hypothyroidism (1.3%). Majority of patients were free of co-morbidities (n=56,72.7%). Contrary to our observation, study done by Xinming su et al,[21] in 2016 concluded that the odds ratios of the prevalence of comorbidities including diabetes mellitus, hypothyroidism were significantly higher. Mean VLDL, TC (mg/dL), TG (mg/dL), HDL-C (mg/dL) & LDL-C (mg/dL) among the study subjects 26.44±11.69, 194.44±43.22, 121.11±76.68, 48.67±12.86 & 119.30±37.97 respectively. Mean FVC, FEV1 (Predicted), FEV1 (VOL), FEV1%(difference between pre bronchodilator & post bronchodilator)& FEVI (% Predicted) among the study subjects was 3.24±0.67, 2.70±.62, 314.42±137.78, 22.82±11.73 & 56.62±20.65 respectively.

Maximum subjects had <2 asthma attacks in preceding year. 26% of the subjects were hospitalized in preceding year. 35% of the participants were found to have mild asthma, 39% had moderate asthma & 26% had severe asthma. All individuals had at least one asthma episode per year & the median was two. About a quarter of the people studied had recent hospitalizations. Of the study participants, 92.2% reported using an inhaled corticosteroid in the previous year, whereas 7.8% reported using an oral corticosteroid. VLDL, TC, HDL-C & LDL-C was found to be comparable w.r.t. asthma severity. TG was found maximum in subjects with severe asthma (151.12) followed by moderate (111.42) & mild asthma (109.65) with a significant association found in patients with normal BMI, though no other significant difference was found.

No significant association was found between BMI & asthma severity as p>0.05.HDL-C & LDL-C level was found to be comparable w.r.t. asthma severity. VLDL was found to be lowest while TC & TG was maximum in subjects (BMI<18.5) with severe asthma.TG was found maximum in subjects with severe asthma followed by moderate & mild asthma in subjects having BMI between 18.5-24.9 with statistically significant difference was found as p<0.05. VLDL, TC, TG, HDL-C & LDL-C was found to be comparable w.r.t. asthma severity in subjects having BMI between >24.9. After accounting for potential confounding factors, Lu M et al.[41] also observed no relationships between lipid levels & asthma in kids & teens using multivariate analysis. These results are in line with those of two case-control studies (Picado C et al,[22] Erel F et al,[23]) that also found no correlations between asthma & lipids in adults.

Conclusion:

Bronchial Asthma is a heterogeneous disease with a variety of clinical presentations resulting from multifactorial pathological mechanisms interacting with variety of environmental triggers. Many studies have associated oxidant-antioxidant imbalance resulting in dyslipidemia and associated asthma severity and many studies have observed no association between these two.

There was no correlation found between asthma severity & lipid profile in this investigation. Only in patients with a normal body mass index was a correlation between asthma severity & TG levels shown to be statistically significant. Therefore, more research is required to comprehend the connections between lipids & asthma.

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