



**ORIGINAL RESEARCH PAPER**

**Biochemistry**

**TO STUDY THE EFFECT OF HYPERCHOLESTEROLAEMIA ON ASTHMA**

**KEY WORDS:**  
Hypercholesterolaemia, Asthma

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<b>ABSTRACT</b>	<b>Background:</b> Asthma is one of the few diseases recognized in one or the other form since the pre-Biblical times. There is an increased interest in asthma in the recent past hugely because of the recognition of an increased morbidity and mortality.
	<b>Aims and Objective:</b> to know association between blood cholesterol level and bronchial asthma.
	<b>Material and Methods:</b> The present study was undertaken in department of biochemistry, Patna Medical College, Patna cases were taken from the patients attending outdoor and admitted indoor patients from the department of medicine of Patna Medical College and Hospital, Patna. Fasting lipid profile estimation was done on 100 cases of bronchial asthma and 50 healthy individuals as controlled.
	<b>Result:</b> In present study elevated level of total cholesterol is observed in asthmatic group which is 198.72±42.2mg/dl, And elevated level of LDL is also observed in asthmatic group which is 123.42±24.3mg/dl, But level of HDL is decreased in asthmatics group which is 38.63±15.2mg/dl.
	<b>Conclusion:</b> Thus in present study elevated level of total cholesterol and LDL is associated with increases incidence of asthma whereas increased level of HDL is associated with decrease incidence of asthma.

**INTRODUCTION:**

Asthma is one of the few diseases recognized in one or the other form since the pre-Biblical times. Although known in the ancient Greek and Ayurvedic literature, it is only for the past four hundred years or so that more elaborate descriptions have become available from medieval Europe and India. Described as a "terrible disease" by Sir Thomas Willis in 1684, it continues to remain troublesome and problematic till date.[1]

There is an increased interest in asthma in the recent past hugely because of the recognition of an increased morbidity and mortality. Globally, there is a noticeable increase in health care burden from asthma. There is also a global concern on the change in asthma epidemiology and clinical spectrum. There is not only an apparent increase in general prevalence but also in the number of cases of difficult, refractory and fatal (or near fatal) asthma. It is for these reasons that international efforts such as the Global Initiative for Asthma (GINA) have emerged. Moreover, there are complex and confounding associations and relationships with infections and infestations, air pollution, tobacco smoking and passive smoking (Environmental Tobacco Smoke) exposure.[2]

Concurrent with the parallel increase in asthma and obesity prevalence, many studies have reported associations between obesity and higher asthma prevalence rates. This association is substantiated by evidence showing obesity as a risk factor for incident asthma. However, this association remains controversial because of the limited patient populations included in earlier studies.[3]

Yeh and Huang et al (2004) they showed in his study of murine model that increase in dietary cholesterol resulted in enhanced pulmonary allergic inflammation, there was a significant correlation between serum cholesterol and elevated inflammatory markers in bronchoalveolar lavage fluid.[4]

Al-Shawwa et al (2006) in his retrospective analysis of data from 188 subject including 50 asthmatics, found significantly higher mean serum cholesterol level in asthmatics as compared to control subject.[5]

There is very limited data on asthma epidemiology from the developing world, including India. India is a vast country with immense geographical, economical, social, religious and socio-political diversity.

There is new mounting evidence indicating that hyperlipidemia affects cardiovascular diseases through induction and potentiation of inflammation. For instance, high plasma cholesterol levels were found to enhance the expression of pro-inflammatory genes, cellular adhesion molecules, and pro-inflammatory cytokines.[6]

**MATERIAL AND METHODS:**

**Our study** was carried out in Department of Biochemistry Patna Medical College, Patna. Participants included 100 cases in which 58 were male and 42 was female. They were selected from outdoor and indoor patients of Pulmonary Medicine Department, Patna Medical College, Patna while the control group included 50 healthy individuals included 40 males and 10 female from local inhabitants and hospital staff.

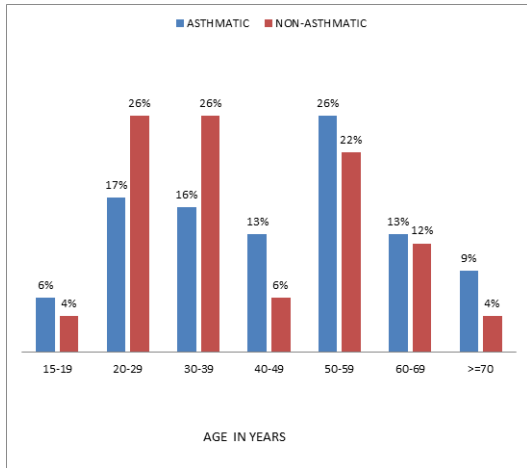
**RESULTS:**

Observation of present study are 58% male and 42% female belongs to asthmatics case group. 40% male and 10% female belong to healthy control group. [Table 1,2]

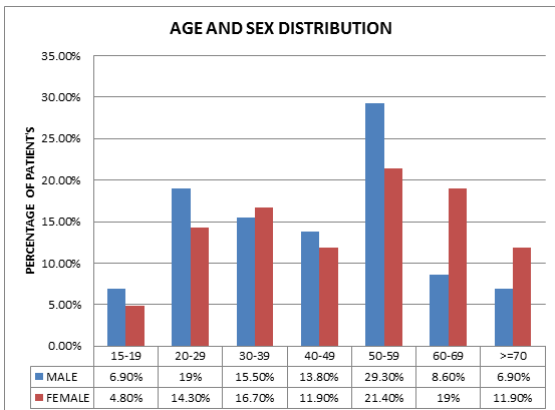
In present study elevated level of total cholesterol is observed in asthmatic group which is 198.72±42.2mg/dl, as compared to control where level of total cholesterol is 152.2±35.4mg/dl. And elevated level of LDL is also observed in asthmatic group which is 123.42±24.3mg/dl, as compared to control where level of LDL is 81.95±30.8mg/dl. But level of HDL is decreased in asthmatics group which is 38.63±15.2mg/dl, as compared to control, where elevated level of HDL is observed which is

40.36±9.8mg/dl. Thus in present study elevated level of total cholesterol and LDL is associated with increases incidence of asthma whereas increased level of HDL is associated with decrease incidence of asthma. However as the study was limited to small population, further study on this subject in larger scale will through more light on it. [Graph 1,2]

**GRAPH-1 Age (years) distribution among Asthmatic and Non-Asthmatic patients:**



**GRAPH-2 Age and sex distribution among asthmatic case group:**



**TABLE-1 Table showing BMI(kg/m<sup>2</sup>) among asthmatic and control group:**

BMI (Kg/m <sup>2</sup> )	Asthmatic	%	Control (non Asthmatic)	%	p-value
18.5-24.9	26	26%	28	56%	
25-29.9	65	65%	20	40%	
>=30	9	9%	2	4%	
mean±SD	24.35±4.27	100%	22.82±3.11	100%	p>0.05

Table showing 65% asthmatic are overweight in case group while 40% control group is overweight.

**Table 2**

Table showing comparison between asthmatic and non asthmatic group according to mean value of their biochemical finding.

	Asthmatic (n=100)	Range (mg/dl)	Control (non Asthmatic) (n=50)	Range (mg/dl)	p-Value	S
TC (mg/dl) (mean±SD)	198.72±42.2	100-323	152.2±35.4	125-234	< 0.01	S
TG (mg/dl) (mean±SD)	171.9±52.2	47-544	146.0±58.2	44-486	<0.001	S
LDL(mg/dl) (mean±SD)	123.42±24.3	28-215	81.95±30.8	30-152	<0.001	S

HDL (mg/dl) (mean±SD)	38.63±15.2	17.3-60.9	40.36±9.8	20-62	<0.01	S
VLDL (mg/dl) (mean±SD)	35.36±11.1	9.8-109	29.21±11.2	13.2-97.5	< 0.01	S

**Discussion:** The lung has never been considered as an organ sensitive to circulating lipoproteins and their cholesterol cargo in past. A number of study over the years have suggested important roles for serum lipoproteins in pathology of lung.

At present time it is important to know role of lipoproteins and cholesterol in pulmonary physiology and pathophysiology.

The level of serum low density lipoproteins (LDL) have been implicated in the inflammatory cascade in murine model of asthma. Recent finding suggest that LDL may modulate the inflammatory state of the asthmatic airways in humans.

In this study, systolic and diastolic blood pressure, weight, height, waist circumference, body mass index, total Cholesterol, Triglycerides, LDL, HDL and VLDL was evaluated. Among cases 6(6%) asthmatics patients are in age group 15-19 yrs, 17 (17%) patients in age group 20-29 yrs, 16(16%) patients in age group 30-39 yrs, 13(13%) patients in age group 40-49 yrs, 26(26%) patients in age group 50-59 yrs and 9(9%) patients in age group >=70yrs. In control groups 2(4%) healthy individuals are in age group 15-19 yrs and 13(26%) individuals in age group 20-29yrs. 13(26%) individuals are also in age groups 30-39. 3(6%) individuals are in age groups 40-49 yrs, and 11(22%) individuals were in age groups 50-59 yrs, and only 2(4%) individuals were in age groups >=70 yrs. (Table no-1)

While taking consideration of body mass index (BMI), 26(26%) asthmatics case are in normal BMI range 18.5-24.9 kg/m<sup>2</sup> and 65 (65%) asthmatics were BMI in range between 24.9-29.9kg/m<sup>2</sup> and 9(9%) asthmatics were obese BMI> 30kg/m<sup>2</sup>. Whereas in control group of individuals, 28(56%) people were in normal range of BMI. Mean and SD of case group were 24.35±4.27 kg/m<sup>2</sup> and for control group 22.82±3.11 kg/m<sup>2</sup>, which statically not significant as p >0.05 (Table no-2).

Mean level of total cholesterol in case were 198±42.2mg/dl, and in control were 152.2±35.4 mg/dl (p<0.01). Range of total cholesterol among case groups were 100- 323 mg/dl, whereas in control group range were 125-234 mg/dl. Present study shows higher level of total cholesterol in asthmatic case groups as compared to control groups. (7).

Mean level of triglyceride in case group were 171.9±52.2mg/dl, whereas in control group mean level is 146±58.2 mg/dl (p<0.001). Range of triglyceride among case group were 47-544 mg/dl, Whereas in control group 44-486 mg/dl. This shows significantly increased level of triglycerides in patients of case groups as compared to control groups. (8).

Mean level of HDL in case were 38.63±15.2mg/dl, and in control were 40.36±9.8 and p<0.01. Range of HDL in case group were 17.3-60.9mg/dl, whereas in control group range were 20-62mg/dl, Which is statically significant with p<0.01, as shown in table 5 & 9.

Mean level of LDL in case were 123.42±24.3mg/dl, and in control were 81.95±30.8 mg/dl p<0.001. Range of LDL among case groups were 28-215mg/dl, whereas in control group range were 30-152 mg/dl, . Which is statically significant with p <0.001, as shown in table no 6 & 9.

Mean level of VLDL in case were 35.36 ± 11.1mg/dl, and in control were 29.21 ± 11.2 mg/dl p<0.01. Range of VLDL

among case groups were 9.8-109 mg/dl, whereas in control group range were 13.2-97.5mg/dl, present study shows significantly higher level of VLDL in asthmatic case groups as compared to control groups(9).

Al-Shawwa et al (2006) in their retrospective analysis from 188 subjects including 50 asthmatics aged between 4 years and 20 years, found significantly higher mean serum cholesterol (205.21±41.55)mg/dl, in case group, but low level of total cholesterol (168±45.55mg/d), have shown positive association between serum cholesterol and bronchial asthma, which is consistent to present study where mean of total cholesterol is 198.72±42.22mg/dl in asthmatics group and 152.2±35.4mg/dl in control group. Both these study shown positive association between total cholesterol and bronchial asthma.

K. Ramaraju et al (2013) in their study , 40 asthmatics and 40 normal subject were examined cross sectionally and reported higher mean of serum cholesterol among asthmatics was 176±30.77mg/dl as compared to 163.33±26.38mg/dl among normal subjects. Study have shown positive association between serum cholesterol and bronchial asthma which is consistent to present study where, mean level of total cholesterol 198.72±42.2mg/dl higher among asthmatic case group as compared to normal control group where mean level of total cholesterol is 152.2±35.4mg/dl. Thus this study report a positive association between serum cholesterol level and bronchial asthma, which is consistent with findings of Al-Shawwa et al and K.Ramaraju et al.[10]

In present study mean level of serum HDL among asthmatics case group is 38.63±15.2mg/dl and among normal control group is 40.36±9.8mg/dl, which show lower level of HDL among asthmatics as compared to normal control, similar finding is also reported by Yiallourous P K et al (2014), in their study, based on logistic regression model were used to evaluate association of asthma with follow up serum HDL. At follow up they found mean level of HDL in asthmatics patients were significantly lower than in the controls( 47.9 vs 53.4mg/dl). Thus present study is consistent with finding of Yiallourous P K et al.

In present study, mean level of LDL is 123.42±24.3mg/dl among asthmatics and 81.95±30.8mg/dl among normal control, present study shows higher level of mean among asthmatics as compared to normal control group. Scichilone et al (2013) had also reported higher level of LDL among asthmatics as compared to nonasthmatics. In there study of 24 asthmatics and 24 healthy individuals mean level of LDL among asthmatics is 108±25 mg/dl, and among healthy control is 79±22mg/dl. Thus present study is consistent with findings of Scichilone et al.[11]

Rebecca KVinding et al (2015) in there study, they also found higher level of LDL and lower level of HDL among asthmatics group as compared to normal control group. In there study, level of LDL 139±37.19mg/dl among asthmatics as compared to normal control where level is 119.06±49.53mg/dl. But lower level of HDL in asthmatics 26.57±12.5mg/dl , as compared to normal control where level of HDL is 55.23±15.34mg/dl. And in present study level of LDL among asthmatics group is 123.42±24.3mg/dl and in control group level of LDL is 81.95±30.8mg/dl. And level of HDL in asthmatics is 38.63±15.2mg/dl, and level of HDL among control group is 40.36±9.8mg/dl. Thus present study is consistent with findings of Rebecca KVinding et al.

Sun-Hye Ko et al (2018) have also reported higher prevalence of bronchial asthma is associated with higher level of TC and LDL-C. In there study done on 123 adolescents with asthma and 2718 without asthma as control. In there study they reported level of total cholesterol among asthmatics were

160±36mg/dl, and among control level were 155.5±22.45mg/dl. And level of LDL among asthmatics were 129.9±20.9mg/dl, and level of LDL among control were 89.69±23.5mg/dl. In present study, Mean level of TC among asthmatics is 198.72±42.2mg/dl and in control is 152.2±35.4mg/dl. And level of LDL among asthmatics is 123.42±24.3mg/dl, and in control 81.95±9.8mg/dl. Present study is consistent with finding of Sun-Hye Ko et al.[12]

Present study is consistent with previous study that show increased level of total cholesterol, LDL, and decreased level of HDL is associated with increase prevalence of asthma, and by knowing level of plasma cholesterol, LDL, HDL and VLDL will help in regulation and treatment of bronchial asthma.

**CONCLUSION:**

Thus in present study elevated level of total cholesterol and LDL is associated with increases incidence of asthma whereas increased level of HDL is associated with decrease incidence of asthma. However as the study was limited to small population, further study on this subject in larger scale will through more light on it.

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