



## A study on the status of serum High Sensitive C - Reactive Protein and Fasting Blood Sugar in Patients with Hyperlipidemia attending a Super Specialty Teaching Hospital in North Kerala

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### ABSTRACT

This study was aimed to analyse the serum Hs-CRP level and fasting Blood Sugar level in patients with Hyperlipidemia in a Super Specialty Teaching Hospital in north Kerala. This was a hospital-based prospective observational study which was conducted to study the status of Hs-CRP and Fasting Blood sugar level on lipid profile status of newly diagnosed Hyperlipidemia patients which was compared with Normal Lipid Profile people. Healthy subjects were recruited as a control group and newly Diagnosed Hyperlipidemia patients were recruited as Test group. Study subjects of both gender in an age group of 30 to 70 were selected for the study. Serum Hs CRP, Fasting Blood sugar and serum lipid profile were estimated after overnight fasting condition. After the biochemical estimation, values were entered in an Excel sheet and level of test and control group was statistically analyzed by using Student's t-test using SPSS software. The values were expressed in Mean  $\pm$  Standard Deviation (SD) and the status of serum Hs CRP, fasting Blood Sugar and Lipid Profile Parameters were shown a statistically significant difference ( $p < 0.01$ ) between Control and Test groups. The result of the study points out that the elevated level serum Hs-CRP and Fasting Blood Sugar can be used as predictive markers of Hyperlipidemia.



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### INTRODUCTION

The prevalence of non-communicable diseases will account for 69% of all deaths, with cardiovascular diseases in the leading position (Upadhyay, 2012). Coronary artery disease (CAD) is assuming increasing importance among the adult population in both developed and developing countries (Malakar et al., 2019). The globalization and industrialization, the lifestyle of people, has changed a lot globally. These changes have produced many consequences in the type of disease pattern worldwide, and that has increased the prevalence of chronic diseases like

Diabetes Mellitus, Hypertension and Dyslipidemia. The prevalence of CAD is rising rapidly in Urban India and Hyperlipidemia is referred to as the most common serious risk factor in the younger aged populations (Gupta *et al.*, 2008). Surveillance of cardiovascular risk factors conducted by the Indian Council of Medical Research (ICMR) in different Indian states showed that the urban Indian population has a higher prevalence of Hyperlipidemia than the rural population (Joshi *et al.*, 2014). There are considerable variations in the prevalence of Hyperlipidemia were observed among rural populations in different Indian states, with south Indian states reporting the highest prevalence (Pandey *et al.*, 2013). The prevalence of Hyperlipidemia in Indian population is found to be around 13.9%. But the regional disparity exists in prevalence rate with its highest rate in the south Indian population, which is 18.3% (Gupta, 2012).

Lipids such as cholesterol and triglycerides are insoluble in plasma. Circulating lipid is carried in lipoproteins that transport the lipid to various tissues for energy use, lipid deposition, steroid hormone production, and bile acid formation (Rigotti *et al.*, 2003). Hyperlipidemia refers to elevated levels of lipids in the blood and most of the people who have Hyperlipidemia experience no symptoms. The National Cholesterol Education Programme (NCEP) guidelines define Hyperlipidemia on the basis of serum Total Cholesterol levels more than 200 mg/dl, Triglyceride level more than 150 mg/dl, High-Density Lipoprotein cholesterol level less than 40 mg/dl (for men) and less than 50 mg/dl (for women) and Low-Density Lipoprotein Cholesterol level more 130 mg/dl (Grundy *et al.*, 2004). The abnormalities in lipoprotein metabolism are a major predisposing factor to atherosclerosis, increasing the risk for Coronary Heart Diseases (Hahn *et al.*, 2008). Cardiovascular disease (CVD) due to atherosclerosis of the arterial vessel wall and to thrombosis is the foremost cause of increased morbidity and mortality rate. Sedentary lifestyle, poor quality of life, social habits like smoking and alcoholism, intake of junk foods are the key players in the development of Hyperlipidemia and associated complications. The most common comorbidities associated with the development of Hyperlipidemia include Diabetes Mellitus, Hypertension, Thyroid dysfunction, central obesity and hormonal variations (Golden *et al.*, 2012). Lifestyle changes and aggressive control of risk factors are urgently needed to reverse this trend. C - Reactive Protein (CRP) is a sensitive index of overall inflammatory activities in the body. In healthy individuals, CRP levels are negligible, but levels of CRP in

the blood circulation increase under acute inflammatory conditions (Slade *et al.*, 2003). Biologically CRP stimulates circulating monocytes and induces their recruitment to the arterial wall and It is also involved to be in the uptake of LDL Cholesterol by macrophages and induces expression of cell adhesion molecules and tissue factor. The CRP concentration in peripheral Circulation can be considered as the useful clinical marker in Metabolic Syndrome; because of its analytical stability, reproducible results, and commercial availability of high sensitivity (Pearson *et al.*, 2003). Recent studies suggest that CRP may have direct pro-inflammatory effects and contributes to the initiation and progression of atherosclerotic lesions (Paffen and Demaat, 2006). Scientific studies during the past decade have supported the significance of Hs-CRP level in predicting the incidence of Hyperlipidemia.

## MATERIALS AND METHODS

This prospective observational study was conducted to compare the level of Hs-CRP and lipid profile status in newly diagnosed Hyperlipidemia patients with Normal Lipid Profile people. This study was conducted at the Department of Cardiology in a Post Graduate level Teaching Hospital, after obtaining the approval from the Institutional Ethics Committee (IEC). Newly Diagnosed Hyperlipidemia patients of both gender in an age group of 30 to 70 years attending the out-patient department were selected for the study. Healthy subjects of both gender falling the above age group were selected as a control group. The demographic parameters of the study subjects were recorded in the previously designed data collection form. All of the study subjects participated in the study in the overnight fasting status and blood was collected from each participant and Serum was separated from the whole blood for Biochemical analysis. The quantitative estimation of Total Cholesterol, Triglycerides, High-Density Lipoprotein, Low-Density Lipoprotein level, Fasting blood Sugar level and High sensitive C - reactive protein was analyzed using suitable kits. After the biochemical estimation, values were entered in an Excel sheet and level of test and control group was statistically analyzed by using Student's t-test using SPSS software (version 21.0). The values were expressed in Mean  $\pm$  Standard Deviation (SD) and P value less than 0.05 ( $p < 0.05$ ) was considered as the statistically significant.

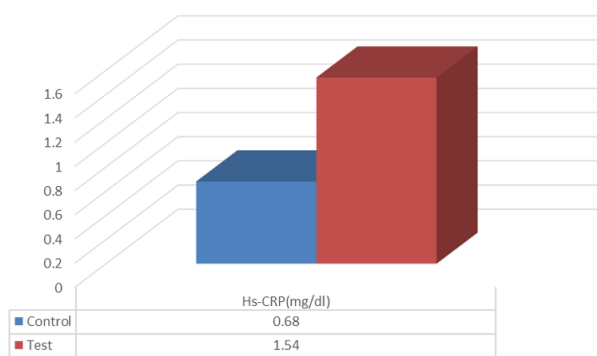
## RESULTS AND DISCUSSION

The control group comprised of 150 healthy subjects and test group comprised of 350 Patients

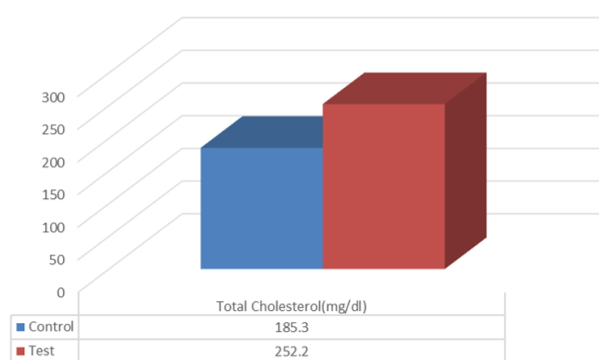
**Table 1: Comparison of status of serum High sensitive C - reactive protein, Fasting Blood sugar Level and Lipid Profile between Control and Test Groups**

Parameters	Category		t-test	p-value
	Control (n=150)	Test (n=350)		
Hs-CRP (mg/dl)	0.68 ± 0.43	1.54 ± 0.97	-9.38	<0.01**
FBS (mg/dl)	86.3 ± 6.7	131.2 ± 34.6	-14.12	<0.01**
TC (mg/dl)	185.3 ± 13.8	252.8 ± 35.7	-20.22	<0.01**
TG(mg/dl)	103.7 ± 17.23	143.9 ± 38.28	-15.25	<0.01**
HDL (mg/dl)	48.6 ± 6.1	42.9 ± 5.5	9.55	<0.01**
LDL (mg/dl)	109.3 ± 13.1	145 ± 23.1	-16.13	<0.01**

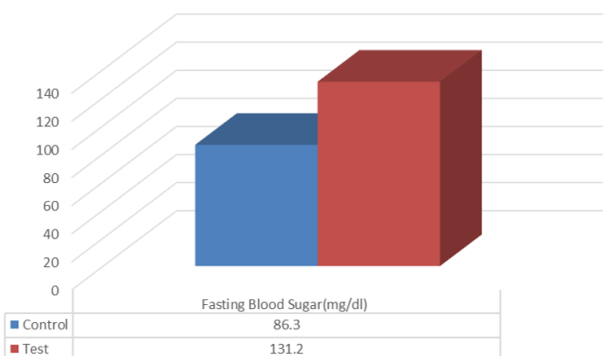
The statistical test used: t-test. \*\* p<0.01 Highly significant, \*P<0.05 Significant



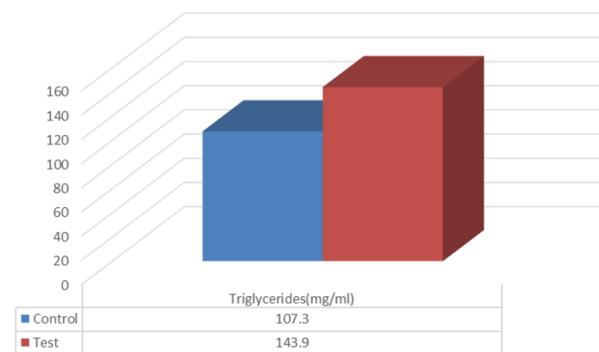
Graph 1: Serum Hs CRP level of Control and Test groups



Graph 3: Total cholesterol level of Control and Test groups



Graph 2: Fasting Blood sugar of Control and Test groups

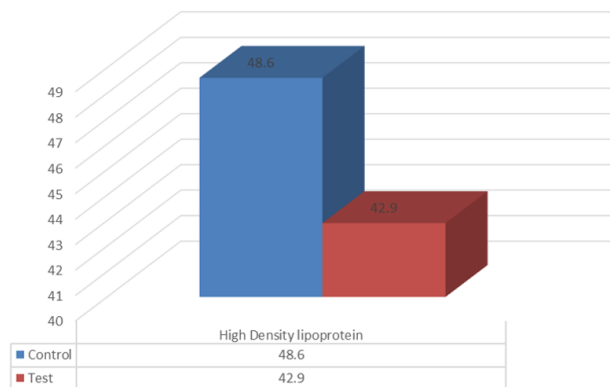


Graph 4: Triglyceride level of Control and Test groups

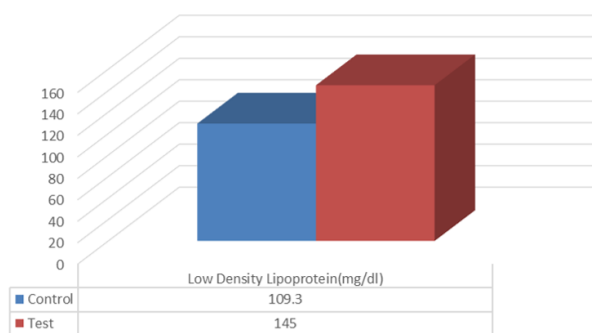
newly diagnosed with Hyperlipidemia. The student's t-test was performed to analyze the difference in Lipid Profile Parameters such as Serum Total Cholesterol, Low-Density Lipoprotein, High-Density Lipoprotein and Triglycerides between Control and Test groups. Table 1 details the serum High Sensitive C-Reactive Protein level, Fasting Blood Sugar level, Total Cholesterol, Triglycerides, High-Density Lipoprotein and Low-Density Lipoprotein levels in both groups. All the values are expressed in Mean

± Standard Deviation (SD). The student's t-test was performed to compare the biochemical parameters between control and Test groups. The t-test of serum Hs CRP, Fasting Blood Sugar and Lipid Profile Parameters are shown a statistically significant difference (p<0.01) between Control and Test groups.

The result shows the mean ± SD of High Sensitive C Reactive Protein were 0.68 ± 0.43 in the control group and 1.54 ± 0.97 in the test group. That means the serum High Sensitive C Reactive Protein was



Graph 5: High-Density Lipoprotein level of Control and Test groups



Graph 6: Low Density Lipoprotein level of Control and Test groups

found to be significantly higher in hyperlipidemia population when compared to that of people with normal lipid profile. The graphical representation of the serum High Sensitive C Reactive Protein is given in Graph 1. The mean  $\pm$  SD of Fasting Blood Sugar level in the control group was  $86.3 \pm 6.7$  and that of the test group was  $131.2 \pm 34.6$ . That means the Fasting Blood Sugar Level was found to be significantly higher in patients with Hyperlipidemia when it is compared to that of people with normal lipid profile. The graphical representation of the Fasting Blood Sugar Level in two groups is given Graph 2. The mean  $\pm$  SD of serum Total Cholesterol in the control group was  $185.3 \pm 13.7$  and that of the test group was  $252.8 \pm 35.7$ . The Fasting Total Cholesterol was found to be significantly higher in Hyperlipidemic population when compared to that of people with normal lipid profile. The graphical representation of Total Cholesterol level of two groups is plotted in Graph 3. The mean  $\pm$  SD of Triglycerides in the control group was  $103.7 \pm 17.1$ , and that of the test group was  $143.9 \pm 38.2$ . The level of Triglycerides in fasting condition was found to be significantly higher in Hyperlipidemic population when compared to that of Normolipidemic group.

The graphical representation of Triglyceride level of two groups plotted in Graph 4. The mean  $\pm$  SD of High-Density Lipoprotein of the control group was  $48.5 \pm 6.1$ , and that of the test group was  $42.9 \pm 5.4$ . That means the High-Density Lipoprotein in fasting condition was found to be significantly higher in test Hyperlipidemic population when compared to that of the control population. The graphical representation of High-Density Lipoprotein level of two groups plotted in Graph 5. The mean  $\pm$  SD of Low-Density Lipoprotein level in the test group was  $109.3 \pm 13.1$ , and that of the test group was  $145 \pm 23.11$ . It indicates that the Low-Density Lipoprotein level in fasting condition was found to be significantly higher in people with Hyperlipidemia when compare to that of Normolipidemic group. The graphical representation of the Low-Density Lipoprotein level of two groups plotted in Graph 6. From this study, the elevated level of Hs CRP, and Fasting Blood Sugar level in patients with Hyperlipidemia group point that there may be some factors in common with all three parameters. Also, the control group population; people with normal Lipid Profile showed the level of serum HsCRP and Fasting blood Sugar in their normal limits. The elevation in Blood Sugar level in patients with Hyperlipidemia would definitely cause more Insulin secretion and the association between elevated High Sensitive C Reactive Protein level and Diabetes Mellitus in Hyperlipidemia need to be thoroughly studied.

**CONCLUSION**

Serum Hs-CRP and Fasting Blood Sugar were significantly associated with Hyperlipidemia. The glucose is considered as source Triglycerides and by controlling blood sugar by a diet with minimal carbohydrate and medium intensity exercise would become practically useful to maintain good health. Low serum insulin level would definitely reflect the Hs-CRP level. However; the Sedentary lifestyle along with smoking and use of alcohol would make the cardiac health and Coronary arteries more complicated in the new era. The medication therapy is highly recommended in Hyperlipidemia patients with other comorbidities such as diabetes, hypertension and central obesity.

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**Conflict of Interest**

The authors declare that they had no conflict of interest for this study.

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