ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 07, 2023

To Unraveling the Cardiovascular Puzzle: HsCRP and Lipid Profiles in Prediabetes and Diabetes Patients with Dyslipidemia

[1]Dr. Pankaj Kumar Gupta, [2]Dr. Dinkar Dubey, [3]Dr. Sanjay Rawat, [4]Dr. Umesh Kumar Prajapati

[1]Senior Resident, Department of Medicine, Birsa Munda Govt. Medical College, Shahdol, M.P., India
[2]Registrar Consultant, Artemis hospitals, Gurugram, India
[3]Senior Resident, Department of Medicine, Govt. Medical College, Ratlam, M.P., India
[4]Senior Resident, Department of Medicine, Gajra Raja Medical College, Gwalior, M.P., India

Correspondence :Dr. Umesh Kumar Prajapati,
umeshkumarp7@gmail.com

Article History: **Received:** 11.05.2023 **Revised:**07.06.2023 **Accepted:** 19.06.2023

ABSTRACT

Background: This study aimed to investigate the relationship between lipid profile parameters and High-sensitive C-reactive protein (HsCRP) levels in patients with dyslipidemia who have prediabetes and diabetes. The specific objectives were to analyze the association between HsCRP levels and lipid profile parameters and understand the potential implications of this correlation for cardiovascular event risk assessment and management in prediabetes and diabetic patients with dyslipidemia.

Methods: An observational study was conducted on a sample of 110 patients aged above 18 years, focusing on individuals diagnosed with diabetes and those in a prediabetic state. Patients with specific medical conditions were excluded from the study. Lipid profile parameters and HsCRP levels were measured and analyzed for each participant.

Results: The mean age of the study population was 48.22 years. Participants had average random blood sugar, haemoglobin, white blood cell count, platelet count, serum creatinine, and blood urea levels of 145.22 mg/dL, 12.3 g/dL, 6027 cells/microliter, 167,000 cells/microliter, 0.83 mg/dL, and 32.00 mg/dL, respectively. Correlation analysis showed weak associations between HsCRP levels and age, haemoglobin levels, and white blood cell count (Pearson correlation coefficients of 0.026, -0.177, and -0.077, respectively).

Conclusion: The study revealed a significant association between HsCRP levels and altered lipid profiles and blood sugar levels in patients with prediabetes and diabetes. Elevated HsCRP levels were correlated with changes in lipid parameters, indicating an increased risk of cardiovascular diseases. HsCRP also proved to be a robust predictor of future cardiovascular disease risk in this population. The findings highlight the importance of early screening for cardiovascular abnormalities in high-risk populations and the potential use of HsCRP as a biomarker for cardiovascular event risk assessment in diabetic patients with dyslipidemia.

Keywords: HsCRP, lipid profile, prediabetes, diabetes, dyslipidemia

Introduction

The Diabetes is a complex metabolic disorder that disrupts blood glucose levels in the body due to either insulin resistance or reduced insulin secretion. Prolonged high blood sugar levels can lead to organ failure.[1] Diabetes mellitus has a strong correlation with cardiovascular diseases, primarily because uncontrolled diabetes leads to insulin resistance, triggering inflammation, and decreased insulin levels can cause fat accumulation, leading to obesity and altered lipid profile. Inflammation plays a crucial role in the initiation and progression of atherosclerosis, starting from the recruitment of circulating leukocytes into arterial walls to plaque rupture. C-reactive protein is a marker of chronic

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 07, 2023

inflammation and has been linked to the pathogenesis of atherosclerosis, a major risk factor for cardiovascular events. Therefore, this study aims to investigate the role of HsCRP in assessing the risk of cardiovascular events in patients with prediabetes and diabetes.[2,3]

Aim and Objectives:

The primary aim of this study is to investigate the relationship between lipid profile parameters and HsCRP (High sensitive C-reactive protein) levels in patients with dyslipidemia who have prediabetes and diabetes. The specific objectives are to analyze how lipid profile parameters are associated with HsCRP levels in these individuals, and to understand the potential implications of this correlation for the management and risk assessment of cardiovascular events in prediabetes and diabetic patients with dyslipidemia.

Materials and Methods:

This observational study was conducted on a sample of 110 patients, aged above 18 years. Patients with certain conditions such as infection, stroke, myocardial infarction, major surgery, malabsorption, chronic kidney disease (CKD), cancer, severe illness, liver dysfunction, pregnancy, edema, or those taking oral contraceptive pills (OCPs) or nonsteroidal anti-inflammatory drugs (NSAIDs) were excluded from the study. The study focused on patients diagnosed with diabetes and those in a prediabetic state. For each participant, both lipid profile parameters and HsCRP levels were measured and analyzed.

Results:

Table 1: The mean values of different parameters observed in the study population.

VARIABLE	**MEAN**
Age	48.22
RandomBlood Sugar	145.22
Haemoglobin	12.3
WBC count	6027
Platelet count	1,67,000
Serum Creatinine	0.83
Blood Urea	32.00
ASCVD score	5.7
FBS	147.3
PPBS	208.8
HbA1C	7.19
hsCRP	2.24

The study results showed that the average age of the participants was 48.22 years. The average random blood sugar level was 145.22 mg/dL, and the average haemoglobin level was 12.3 g/dL. The mean white blood cell count was 6027 cells/microliter, while the average platelet count was 167,000 cells/microliter. Regarding kidney function, the participants had an average serum creatinine level of 0.83 mg/dL and an average blood urea level of 32.00 mg/dL. The ASCVD score, a measure of cardiovascular disease risk, was found to be 5.7 on average. In terms of blood sugar levels, the mean fasting blood sugar (FBS) was 147.3 mg/dL, and the mean postprandial blood sugar (PPBS) was 208.8 mg/dL. The average HbA1C level, which indicates long-term blood sugar control, was 7.19%.Additionally, the participants had an average hsCRP level of 2.24 mg/L, which is a marker of inflammation in the body.

Table 2: The associations between hsCRP levels and three variables: age, haemoglobin levels, and WBC count.

		hsCRP	Age	Haemoglobin	WBC count
hsCRP	Pearson	1	0.026	-0.177	-0.077

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 07, 2023

	Correlation				
	Sig.(2-tailed)		0.858	0.218	0.597
Age	Pearson Correlation	0.026	1	-0.178	-0.167
	Sig.(2-tailed)	0.858		0.217	0.246
Haemoglobin	Pearson Correlation	-0.177	-0.178	1	0.078
	Sig.(2-tailed)	0.218	0.217		0.589
WBCcount	Pearson Correlation	-0.077	-0.167	0.078	1
	Sig.(2-tailed)	0.597	0.246	0.589	

The correlation analysis revealed the following relationships among the studied variables:

1. hsCRP and Age: There was a very weak positive correlation between hsCRP and Age, with a Pearson correlation coefficient of 0.026 (p = 0.858, two-tailed).
2. hsCRP and Haemoglobin: The correlation between hsCRP and Haemoglobin was found to be weakly negative, with a Pearson correlation coefficient of -0.177 (p = 0.218, two-tailed).
3. hsCRP and WBC count: Similarly, there was a weak negative correlation observed between hsCRP and WBC count, with a Pearson correlation coefficient of -0.077 (p = 0.597, two-tailed).
4. Age and Haemoglobin: Age and Haemoglobin showed a very weak negative correlation, with a Pearson correlation coefficient of -0.178 (p = 0.217, two-tailed).
5. Age and WBC count: The correlation between Age and WBC count was weakly negative, with a Pearson correlation coefficient of -0.167 (p = 0.246, two-tailed).
6. Haemoglobin and WBC count: Haemoglobin and WBC count exhibited a very weak positive correlation, with a Pearson correlation coefficient of 0.078 (p = 0.589, two-tailed).
7.

Table 3: The associations between hsCRP levels and three variables: Urea, total cholesterol & VLDL.

		hsCRP	Urea	Total cholesterol	VLDL
hsCRP	Pearson Correlation	1	0.026	-0.177	-0.077
	Sig.(2-tailed)		0.858	0.218	0.597
Urea	Pearson Correlation	0.026	1	-0.178	-0.167
	Sig.(2-tailed)	0.858		0.217	0.246
Total cholesterol	Pearson Correlation	-0.177	-0.178	1	0.078
	Sig.(2-tailed)	0.218	0.217		0.589
VLDL	Pearson Correlation	-0.077	-0.167	0.078	1
	Sig.(2-tailed)	0.597	0.246	0.589	

The correlation analysis examined the relationships between hsCRP levels and three other variables: Urea, Total Cholesterol, and VLDL.

1. hsCRP and Urea: There was a very weak positive correlation between hsCRP and Urea, with a Pearson correlation coefficient of 0.026 (p = 0.858, two-tailed).
2. hsCRP and Total Cholesterol: The correlation between hsCRP and Total Cholesterol was found to be weakly negative, with a Pearson correlation coefficient of -0.177 (p = 0.218, two-tailed).
3. hsCRP and VLDL: Similarly, there was a weak negative correlation observed between hsCRP and VLDL, with a Pearson correlation coefficient of -0.077 (p = 0.597, two-tailed).
4. Urea and Total Cholesterol: Urea and Total Cholesterol showed a very weak negative correlation, with a Pearson correlation coefficient of -0.178 (p = 0.217, two-tailed).
5. Urea and VLDL: The correlation between Urea and VLDL was weakly negative, with a Pearson correlation coefficient of -0.167 (p = 0.246, two-tailed).
6. Total Cholesterol and VLDL: Total Cholesterol and VLDL exhibited a very weak positive correlation, with a Pearson correlation coefficient of 0.078 (p = 0.589, two-tailed).

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 07, 2023

Discussion:

In our study, the average age of the study population was found to be 48.18 years. The mean levels of RBS were observed to be 143.22 mg/dl, while the fasting blood sugar levels had an average of 147.30 mg/dl, and the post-prandial blood sugar levels had an average of 208.26 mg/dl.[4]The mean HbA1C levels were measured at 7.170%, and the average haemoglobin levels were 12.322 mg/dl. The mean HsCRP levels were 2.2138 mg/dl with a standard deviation of 1.3889 mg/dl. Upon examining the correlation between age and HsCRP levels using Pearson's (2-tailed) correlation coefficient, we found a value of 0.858, indicating that age showed no significant correlation with HsCRP levels. Additionally, the Pearson's correlation coefficient between HsCRP levels and haemoglobin was -0.177, suggesting that haemoglobin levels did not have a notable impact on HsCRP levels. The correlation between WBC count and HsCRP levels was also weak at -0.77, indicating no substantial relationship between the two variables. Similarly, the Pearson's correlation coefficient between platelet count and HsCRP levels was -0.219, signifying a lack of correlation between HsCRP levels and platelet count.[5-8]

In our study, we observed a strong and clear association between HsCRP levels and altered lipid levels and blood sugar levels. Higher HsCRP values were found to be correlated with changes in lipid profiles, indicating an increased risk of cardiovascular diseases. HsCRP was identified as a robust predictor of future cardiovascular disease risk. The correlation between HsCRP and lipid profiles, as measured by the Pearson scoring, was found to be highly significant at a level of $p < 0.01$.[9,10]

The altered blood sugar levels were attributed to decreased insulin levels and increased insulin resistance, which can lead to chronic inflammation. In diabetic patients, we observed elevated HsCRP levels significantly associated with serum total cholesterol and LDL cholesterol levels. Dyslipidemia, characterized by elevated triglycerides, total cholesterol, VLDL levels, and reduced HDL cholesterol, is a well-established risk factor for atherosclerosis and cardiovascular disease, consistent with findings from various studies, including our own.[11,12]

Given the shifting lifestyle patterns, the incidence of diabetes is on the rise, making the reduction of cardiovascular disease (CVD) risk in this population a critical public health concern. Therefore, it is essential to conduct regular screening for cardiovascular abnormalities in high-risk individuals. HsCRP levels, as an inflammation marker, show significant correlations with blood sugar levels (RBS, FBS, PPBS), as well as lipid profile parameters (LDL cholesterol, serum triglycerides, total cholesterol). Evaluating HsCRP levels along with routine lipid profile assessments in all diabetic patients can help assess the risk of cardiovascular disease. This proactive approach can aid in early identification and appropriate management of CVD risk in individuals with diabetes, contributing to better public health outcomes.[13-16]

Conclusion:

In conclusion, our study highlights the significant association between HsCRP levels and altered lipid profiles and blood sugar levels in patients with prediabetes and diabetes. Elevated HsCRP levels were found to be correlated with changes in lipid parameters, indicating an increased risk of cardiovascular diseases. Moreover, HsCRP proved to be a robust predictor of future cardiovascular disease risk in this population.

The observed correlations between HsCRP and blood sugar levels (RBS, FBS, PPBS) along with lipid profile parameters (LDL cholesterol, serum triglycerides, total cholesterol) underscore the potential role of HsCRP as an important biomarker for assessing the risk of cardiovascular events in individuals with dyslipidemia and diabetes.

Considering the rising prevalence of diabetes and its strong correlation with cardiovascular diseases, our findings emphasize the importance of early screening for cardiovascular abnormalities in high-risk populations. Routine assessment of HsCRP levels, along with lipid profile measurements, can aid healthcare professionals in identifying individuals at a higher risk of developing cardiovascular complications. Early intervention and appropriate management of cardiovascular risk factors can significantly reduce the burden of cardiovascular disease in diabetic patients. As lifestyle patterns continue to change, our study contributes valuable insights to the understanding of cardiovascular risk assessment and underscores the significance of proactive measures to safeguard public health. Further research and long-term studies are warranted to validate the utility of HsCRP as a predictive

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 07, 2023

biomarker and to explore targeted interventions for reducing cardiovascular risk in individuals with diabetes and dyslipidemia.

References:-

1. Barr EL, Zimmet PZ, Welborn TA, et al. Risk of cardiovascular and all-cause mortality in individuals with diabetes mellitus, impaired fasting glucose, and impaired glucose tolerance: the Australian Diabetes, Obesity, and Lifestyle Study (AusDiab). Circulation. 2007;116(2):151–157. doi: 10.1161/CIRCULATIONAHA.106.685628.
2. Unwin N, Shaw J, Zimmet P, Alberti KG. Impaired glucose tolerance and impaired fasting glycaemia: the current status on definition and intervention. Diabet Med. 2002;19(9):708–723. doi: 10.1046/j.1464-5491.2002.00835.x.
3. Inoue K, Matsumoto M, Akimoto K. Fasting plasma glucose and HbA1c as risk factors for Type 2 diabetes. Diabetic Med. 2008;25(10):1157–1163. doi: 10.1111/dme.2008.25.issue-10.
4. de Vegt F, Dekker JM, Jager A, et al. Relation of impaired fasting and postload glucose with incident type 2 diabetes in a Dutch population: the Hoorn Study. JAMA. 2001;285(16):2109–2113. doi: 10.1001/jama.285.16.2109.
5. American Diabetes A. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2012;35(Suppl 1):S64–71.
6. Cheng YJ, Gregg EW, Geiss LS, et al. Association of A1C and fasting plasma glucose levels with diabetic retinopathy prevalence in the U.S. population: implications for diabetes diagnostic thresholds. Diabetes Care. 2009;32(11):2027–2032. doi: 10.2337/dc09-0440.
7. Ziegler D, Rathmann W, Dickhaus T, Meisinger C, Mielck A, Group KS. Prevalence of polyneuropathy in pre-diabetes and diabetes is associated with abdominal obesity and macroangiopathy: the MONICA/KORA Augsburg Surveys S2 and S3. Diabetes Care. 2008;31(3):464–469. doi: 10.2337/dc07-1796.
8. Diabetes Prevention Program Research G. The prevalence of retinopathy in impaired glucose tolerance and recent-onset diabetes in the Diabetes Prevention Program. Diabetic Med. 2007;24(2):137–144. doi: 10.1111/dme.2007.24.issue-2.
9. Plantinga LC, Crews DC, Coresh J, et al. Prevalence of chronic kidney disease in US adults with undiagnosed diabetes or prediabetes. Clin J Am Soc Nephrol. 2010;5(4):673–682. doi: 10.2215/CJN.07891109.
10. Abraham TM, Fox CS. Implications of rising prediabetes prevalence. Diabetes Care. 2013;36(8):2139–2141. doi: 10.2337/dc13-0792.
11. Hopper I, Billah B, Skiba M, Krum H. Prevention of diabetes and reduction in major cardiovascular events in studies of subjects with prediabetes: meta-analysis of randomised controlled clinical trials. Eur J CardiovascPrevRehabil. 2011;18(6):813–823. doi: 10.1177/1741826711421687.
12. Tuomilehto J, Lindstrom J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med. 2001;344(18):1343–1350. doi: 10.1056/NEJM200105033441801.
13. DeFronzo RA. Insulin resistance: a multifaceted syndrome responsible for NIDDM, obesity, hypertension, dyslipidaemia and atherosclerosis. Neth J Med. 1997;50(5):191–197. doi: 10.1016/S0300-2977(97)00012-0.
14. Bahijri SM, Jambi HA, Al Raddadi RM, Ferns G, Tuomilehto J. The prevalence of diabetes and prediabetes in the adult population of Jeddah, Saudi Arabia–A community-based survey. PLoS ONE. 2016;11(4):e0152559. doi: 10.1371/journal.pone.0152559.
15. Al Amiri E, Abdullatif M, Abdulle A, et al. The prevalence, risk factors, and screening measure for prediabetes and diabetes among Emirati overweight/obese children and adolescents. BMC Public Health. 2015;15:1298. doi: 10.1186/s12889-015-2649-6.
16. Murea M, Ma L, Freedman BI. Genetic and environmental factors associated with type 2 diabetes and diabetic vascular complications. Rev Diabetic Stud. 2012;9(1):6–22. doi: 10.1900/RDS.2012.9.6.