

## ORIGINAL ARTICLE

**Utility of HS-CRP as an add on to Lipid Profile for Cardiovascular Risk Stratification in Adults with Type II Diabetes Mellitus**IQTIDAR-UD-DIN<sup>1</sup>, TAYYABA BATOOL<sup>2</sup>, SYED HYDER RAZA<sup>3</sup>, ALARD YASIR<sup>4</sup>, RIZWAN ABDUL SALAM<sup>5</sup>, NASREEN AKHTAR<sup>6</sup><sup>1</sup>Associate Professor Cardiology, Qazi Hussain Ahmad Medical Complex/ Nowshera Medical College, Nowshera<sup>2</sup> PhD Scholars, Assistant Professor Biochemistry, Quaid-e- Azam Medical College, Bahawalpur<sup>3</sup>Professor, Department of Pharmacology, Niazi Medical & Dental College, Sargodha<sup>4</sup>Registrar Internal Medicine, Armed Forces Hospital, Jeddah, KSA<sup>5</sup>Assistant Professor Oncology, Sahara Medical College, Narowal<sup>6</sup>Associate Professor, Gynae/ Obs, Divisional Headquarters Teaching Hospital Mirpur Azad KashmirCorresponding author: Iqtidar-Ud-Din, Email: [iqi\\_kmc@yahoo.com](mailto:iqi_kmc@yahoo.com)**ABSTRACT****Background:** Diabetes mellitus (DM), which has a significant mortality and morbidity percentage, has emerged as a major health hazard. The aim of this study to evaluate the effects of hs-CRP with lipid profile effects on CVS risk in type II diabetic patients.**Study design:** It was a cross-sectional study conducted in the People's University of Medical and Health Sciences for Women, Nawabshah, for six month duration from March 2022 to August 2022.**Methodology:** The total participants were 250 which included 180 diabetic participants and other remaining 70 were non-diabetic participants. These participants were divided into two groups, one group was non-diabetic participants serve as control group and other was diabetic group. The data analyses were done by SPSS 21 version.**Results:** The mean age of the male and female participant was 50.5±9.9 and 49.48±10.5. There was no significance change in the demographic variables like BMI, weight, systolic pressure and diastolic pressure  $p > 0.005$  in diabetic and control group. The participants were 31% and 72% raised CVS risk due to increase of LDL and hsCRP levels. The LDL, TC and TG were statistically significant in the participants having  $> 4$  mg/dl of hs-CRP. The HDL and ratio of HDL/LDL level were reduced significantly having  $> 4$  hs-CRP mg/dl.**Conclusion:** According to our observations, patients who are diabetic participants commonly have raised hs-CRP levels along with dyslipidemia. Continuous monitoring of these indicators can sometimes support in reducing the CVS risk among patients.**Keywords:** lipid profile, dyslipidemia, significant mortality and morbidity.**INTRODUCTION**

Diabetes is considered one of the most serious diseases global health of the 21st century. Diabetes mellitus affects approximately 415 million people across the world with diabetes mellitus taking account for more than 90% of diabetic patients. Diabetes mellitus (DM) is a significant cardiovascular disease risk factor (CVD), cause of mortality. DM is a metabolic disorders elevated blood glucose levels triggered by issues with insulin production, insulin use, or both. According to the International Diabetes Federation, an estimated 415 million people effected by diabetes worldwide in 2015, and increase the number of diabetic patients 642 million by 2040.<sup>1,2</sup> The high incidence of impaired glucose tolerance due to unaware of their condition about 193 million people, who suffered diabetes. Diabetes Mellitus has become increasingly prevalent.<sup>3</sup>

Dyslipidaemia is a significant predictor for diabetes-related atherosclerotic cardiovascular disease.<sup>4</sup> These findings point to a deeper connection between increased hsCRP and future atherogenic index plasma changes than vice versa, highlighting the essential need for combined evaluation and treatment of chronic inflammation and atherogenic dyslipidemia in prevention and treatment, especially for those who have subclinical T2D risks.<sup>5</sup> The common chronic inflammation was assumed to be a widely accepted pathogenetic link between diabetes and cardiovascular disease (CVD). The hs-CRP concentration has seemed to assist in the identifying of individuals increased and diagnostic biomarker at risk of developing cardiovascular disease in diabetic patients.<sup>6,7</sup> Pro-inflammatory cytokines have also been connected to platelet activator and erythrocyte, CRP deregulations is specifically connected to some molecules dysregulation which indicate strong sign of systemic inflammation.<sup>8</sup> CRP originally belonged to the pentraxin proteins member that play an important role in diseases condition.<sup>9</sup> When interleukin and CRP released from the hepatic cells and circulate through the blood to whole body.<sup>10</sup> Furthermore, high levels of hsCRP can be associated with inflammation or infection of a various aetiology, indicating the non-specificity of this biomarker. Considerations that hsCRP measurement is not particular for vascular disease stem from studies that have demonstrated similar or higher hsCRP levels in individuals with some other diabetic complications. hsCRP levels

may also be effective in stratifying patients who are at intermediate risk for a stroke or heart attack.<sup>11</sup> The objective of this research was that to estimate the level of serum hs-CRP with lipid profile and their effects on CVS risk in type II diabetic patients.

**METHODOLOGY**

This was cross sectional study carried out in the People's University of Medical and Health Sciences for Women, Nawabshah, for six month duration from March 2022 to August 2022. The total number of participants were 250 which included 110 male and 70 female participants which serve as diabetic group and remaining 70 which serve as control group. The age group of man and women type II diabetic participants from (21-77) years and the prevalence age of diabetes peak above 40 years. According to the inclusion criteria included  $> 40$  years in both diabetic gender. Teenage, kidney disorder and hypertension are excluded in this study. Different parameters of lipid profile and hs-CRP were measured in serum by fully automated analyzer-Roche/Hitachi. The approval was obtained from the "Hospital Ethical Committee," and informed/written consents were obtained from all cases. All data was analyzed by SPSS 21 version. A  $p$ -value of  $< 0.05$  was considered as statistically significant.

**RESULTS**

The purpose of this study to analyses the role of hs-CRP in cardiovascular risk in diabetic participants. The hs-CRP is an indicator of inflammatory marker has been associate with lipid profile parameters such as TC, HDL, LDL, and TG. There were 60 females and 110 males participants.

The mean age of the male and female participant was 50.5±9.9 and 49.48±10.5. There was significant difference in weight, BMI, systolic and diastolic pressure ( $p < 0.002^{**}$ ,  $p < 0.001^{**}$ ,  $p < 0.01^{*}$ ) in the diabetic group as compared to the control group were seen in Table 1.

The means±SD of lipid parameters and hs-CRP of participants were shown non-significant in diabetic group. The means of TG were 134(95,172) mg/dl and 159(132, 220) mg/dl

and hs-CRP were 1.4(1.2, 2.9) and 2.5(1.0, 3.1) mg/dl in diabetic group respectively were seen Table 1.

Table 1: Demographic variables

Variables	Control group n=70		Diabetic group n=180		P=value
	Male(n=40)	Female(n=30)	Male(n=110)	Female(n=70)	
Age	35.5±8.9	39.40±8.52	50.5±9.9	49.48±10.5	0.54
weight	40.45±9.21	43.45±61.3	80.45±8.51	76.55±51.5	0.002**
BMI	25.12±7.33	23.17±6.11	45.22±5.83	43.47±67.1	0.001**
Systolic Bp mmHg	104.11±19.21	119.52±9.01	164.11±12.31	119.12±9.11	0.01*
Diastolic Bp mmHg	39.56±6.61	38.61±7.70	90.76±8.31	88.31±5.90	0.01*

Mean±SD; ANOVA SPSS 21 Test \*p<0.01; \*\*<0.001; \*\*\*p<0.0001

Table 2: Lipid profile along with hs-CRP in control group and diabetic group

Variables	Control group n=70		Diabetic group n=180		P=value
	Male(n=40)	Female(n=30)	Male(n=110)	Female(n=70)	
HDL(mg/dl)	22.69±8.8	19.55±9.7	45.4±9.6	41.2±5.55	0.23
LDL(mg/dl)	20.11±5.2	21.13±8.7	98.2±20.4	94.1±19.5	0.51
HDL/LDL(mg/dl)	21.43±6.0	20.23±5.3	0.5±0.3	0.6±0.2	0.76
TC(mg/dl)	20.77±4.1	21.54±3.2	171.5±39.5	191.3±39	0.66
TG(mg/dl)	23.22±2.2	22.15±2.5	134(95,172)	159(132,220)	0.03
hs CRP(mg/dl)	19.5±7.7	20.6±8.1	1.4(1.2, 2.9)	2.5(1.0, 3.1)	0.31

Mean±SD; ANOVA SPSS 21 Test \*p<0.01; \*\*<0.001; \*\*\*p<0.0001

Table 3: Evaluate LDL level in the different range of hs CRP

LDL(mg/dl)	hs CRP		
	0-1(n=55)	1-4(n=90)	>4(n=35)
≥100	35	72	1
<100	5	23	31

Table 4: Evaluate three group of hs-CRP compare with the different lipid parameters of lipid profile

hs CRP(mg/dl)	0-1	1-4	>4	P=value
HDL(mg/dl)	41±31	40±4	35±8	0.005
LDL(mg/dl)	81±15	89±17	110±20	0.001**
TC(mg/dl)	149±30	185±31	197±46	0.001**
HDL/LDL(mg/dl)	0.5±0.1	0.6±0.3	0.8±0.2	0.002**
TG(mg/dl)	99(91, 153)	160(119, 125)	185(145, 275)	0.01*

Mean±SD; ANOVA SPSS 21 Test \*p<0.01; \*\*<0.001; \*\*\*p<0.0001

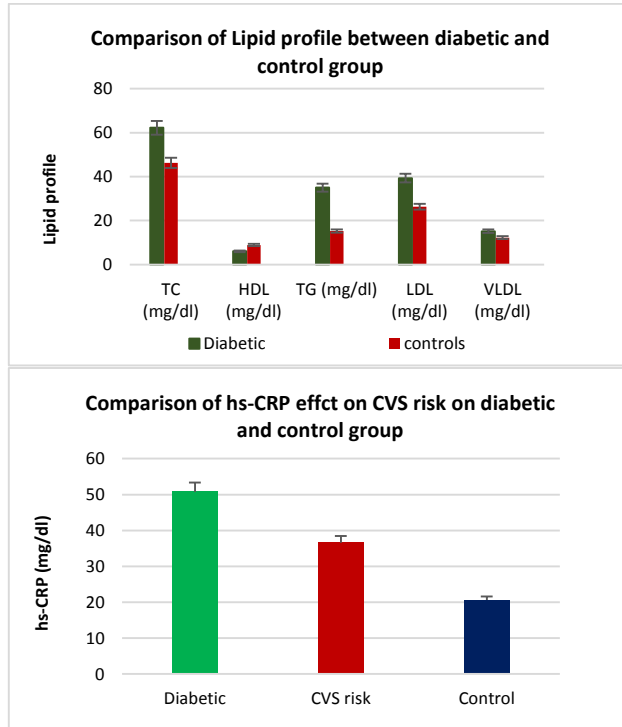
The participants were split into two groups depending on their LDL and hs-CRP levels. The level of hs-CRP level 0-1 mg/dL, 1-4mg/dL and >4mg/dL distribute as low, medium and high risk groups for cardiovascular risk. The LDL marker was used to evaluate CVS in diabetic participants, its range below 100mg/dl. However, 31% and 72% of participants were increased cardiovascular risk due to increase of LDL and hs-CRP level were seen Table 3.

The hs-CRP was show significant differences positive and negative correlation among different parameters. hs-CRP was show significantly positive correlation with LDL ( $r=0.618$ ,  $p<0.001^{**}$ ), TC ( $r=0.255$ ,  $p<0.001^{**}$ ), and TG ( $r=0.310$ ,  $p<0.01^{*}$ ) and significant negative correlation with HDL ( $r=-0.599$ ,  $p<0.005$ ) and HDL/LDL ratio ( $r=-0.586$ ,  $p<0.002^{**}$ ). In this study to find that LDL, TC and TG were increased significantly in the participants >4 mg/dl of hs-CRP than 1-4 mg/dl of hs-CRP. The HDL and ratio of HDL/LDL level were reduced significantly having >4 hs-CRP mg/dl then 0-1 mg/dl hs-CRP were seen in Table 4.

## DISCUSSION

Diabetes dyslipidemia is frequent and is classified by hypertriglyceridemia with decreased HDL levels and increased LDL levels.<sup>12, 13</sup> Dyslipidemia is very prevalent in type II diabetes, impacting 72%-85% of patients. Lipid parameters, inflammatory biomarkers such as CRP, fibrinogen, and total plasma homocysteine are examples of such markers.<sup>14, 15</sup>

Our findings support the idea that increased serum hs-CRP levels are related to abnormal lipid metabolism in adults. The age, cardiac history, body mass index BP, smoking and CRP are all associate with lipid condition.<sup>16</sup> We emphasized the possibility that rapid change of lipid profile due to treatment could slow the progression of onset diabetes and reduce the risk of complications such as coronary disease.<sup>17</sup> Our study found that the most commonly elevated lipid parameter was serum LDL, TC and TG levels, revealing that hypertriglyceridemia is the most prevalent lipid abnormality in diabetic patients. The median hs-CRP level was 1-4 mg/dl, indicate a medium CVS risk. The hs-CRP and triglyceride (TG) level was greater in female than male. They also revealed that compared to participants with CRP levels in the maximum range >4mg/dl had significantly lower HDL and higher TG, LDL, and TC.<sup>18, 19</sup> hs-CRP with lipid profile show positive relation while hs-CRP with HDL show negative relation. In previous study, there was a positive relation between ferritin with TG and an inverse relationship between LDL after sufficient modification.<sup>20</sup> In male, high hs-CRP levels were correlate to lower plasma HDL whereas in females, HDL were not linked to hs-CRP levels.<sup>21</sup> LDL has been recognized as a distinct indicator of CVS risk, and its serum level in Diabetes mellitus must be maintained lower 100mg/dl.<sup>22</sup> In our study, some patients had normal LDL levels but hs-CRP levels 1-4 in the moderate CVS risk category. It may be



(a) (b)  
Figure 1: (a) Show comparison of lipid parameters between diabetic and control group. Lipid parameters such as TC, TG, HDL and LDL were significantly change in diabetic as compared to control group. (b) Show hs-CRP level increase CVS risk in diabetic group as compared to control group.

favorable to be more carefully with these patients and reduced CVS risk. The dyslipidaemia, hypertension and insulin-resistant raised the level of CRP. The CRP has been found more accurate indicator of cardiovascular disorder than LDL and people with high CRP and low LDL have a higher CVS risk. With all of this information on hand, if we regularly estimate hs-CRP levels in diabetic patients, we would be able to anticipate and minimize CVS challenges, with LDL levels normal and deemed to be at limited CVS risk.<sup>23, 24</sup>

## CONCLUSION

According to our observations, patients who are diabetic participants commonly have raised hs-CRP levels along with dyslipidemia. Continuous monitoring of these indicators can sometimes support in reducing the CVS risk among patients.

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