

Study Of High Sensitivity C-Reactive Protein In Chronic Type 2 Diabetes Mellitus- A Hospital Based Study

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Abstract— Introduction: Diabetes Mellitus is a group of metabolic diseases characterized by hyperglycemia resulting in defects in insulin secretion, insulin action or both. Chronic stage of diabetes mellitus is associated with long term damage, dysfunction and failure of different vitals organs, especially, the eyes, kidneys, heart and blood vessels. Generally affect above 10% of the world population between 29 to 50 years aged persons. Glycated Hemoglobin (HbA1c) increased in Type 2 Diabetes Mellitus and also increased Glycation of protein including Hemoglobin which lead to the formation of Advanced Glycated End Products (AGE). Among several markers of inflammation, high sensitivity C- reactive protein (hsCRP) is found to be significantly higher in people with diabetes. hsCRP has emerged as the 'golden marker for inflammation'. CRP (C-reactive protein) is a strong acute phase reactant that increases in inflammatory and infectious conditions. The present study for the study of High Sensitivity C-Reactive Protein with respect to Glycated Hemoglobin in chronic type 2 diabetes mellitus patients.

Aim & Objectives: To estimate and correlate the level of Serum Highly Sensitive C-protein in Chronic Type 2 Diabetic Mellitus patients along with glycated hemoglobin.

Material & Methods: A total of 100 patients suffered from chronic stage of type 2 diabetes mellitus are chosen for the study. Estimation of Blood Sugar (Fasting & PP) by Trinder P (1969) method, Glycated Hemoglobin (HbA1c) by Nathan D M et al. (2008) method & Highly Sensitive C-Reactive Protein (hs-CRP) by Rifai N et al. (2008) method.

Results & Observations: Mean±SD of Fasting Blood Sugar was 99±9.71 mg/dl for control group and 174.56±38.68 mg/dl for diabetes mellitus patients and significant. Whereas, Mean±SD of PP was 125.12±17.21 mg/dl for control group and 271.76±48.34 mg/dl for diabetes mellitus patients and was significant. Mean±SD of HbA1c level for diabetes mellitus group was 8.65±1.42% whereas for control group was 5.46±0.31% and was significant. The comparison of fasting blood sugar in negative hs-CRP group of Diabetes mellitus was 157.92±22.73 mg/dl and in positive hs-CRP group of Diabete Mellitus was 189.92±44.56 mg/dl and was significant. Also, the comparison of PP in negative hs-CRP group of Diabetes mellitus was 265.17±45.68 mg/dl and in positive hs-CRP group of Diabete Mellitus was 277.85±51.74 mg/dl and was non significant. And finally, the comparison of HbA1c in negative hs-CRP group of Diabetes mellitus was 8.30±1.31% and in positive hs-CRP group of Diabete Mellitus was 8.98±1.49% and was non significant.

Discussion: The value of hs-CRP level was increased in chronic stage of type 2 diabetes mellitus in the present study which also resembled with other studies also. So, Gohel and Chacko in their study showed statistically significant increase in concentration of hs-CRP in type 2 DM compared to healthy persons. Amanullah et al. also showed significant increase of hs-CRP in subjects with type 2 DM.

Conclusion: The present study was carried out in the Department of Biochemistry, Index Medical College, Hospital and Research Center, Indore. The present study involved 100 subjects, were diagnosed as type 2 diabetes mellitus. The findings of this study was FBS levels was significantly increased (with a p value of <0.05) in hs-CRP Positive type 2 diabetics when compared to hs-CRP Negative type 2 Diabetics.

Keywords— Diabetes Mellitus Type 2, HbA1c, Fasting Blood Sugar, PP, hs-CRP

I. INTRODUCTION

Diabetes Mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia⁽¹⁾. Diabetes is a common clinical condition affecting above 10% of the general population (more prevalent after the age of 50) also becoming common among age group between 29 to 50⁽²⁾. Diabetes mellitus is a metabolic disease, more accurately a disorder of fuel metabolism⁽³⁾. It is a metabolic disorder resulting either from deficiency of **insulin** or **resistance to its action** causing increased blood glucose level (hyperglycemia) which leads to several systemic complications. Type 2 diabetes mellitus is one of the major global public health challenges of the 21st century⁽⁴⁾. About 90% of diabetes patients belong to this category. It usually affects the individual after 40 years of age (hence it is also called **adult-onset diabetes**).

Glycated Hemoglobin (HbA_{1c}) is formed by post-translation and non-enzymatic process which is substrate-concentration dependent irreversible process. Increased Glycation of protein including Hemoglobin which lead to the formation of Advanced Glycated End Products (AGE) in case of Chronic Hyperglycemic condition.

Among several markers of inflammation, high sensitivity C- reactive protein (hsCRP) is found to be significantly higher in people with diabetes. hsCRP has emerged as the 'golden marker for inflammation'. CRP (C-reactive protein) is a strong acute phase reactant that increases in inflammatory and infectious conditions. Hs-CRP may be an independent predictor that reflects early stage cardiovascular disease. Many studies have confirmed that hs-CRP is a predictor of cardiovascular disease, diabetes and metabolic syndrome (MetS). Hyperglycaemia is known to stimulate the release of the inflammatory cytokines TNF- α and IL-6 from various cell types, and hyperglycaemia can result in the induction and secretion of acute phase reactants by the liver in response to factors released by fat cells (adipocytes).

The present study for the study of High Sensitivity C-Reactive Protein with respect to Glycated Hemoglobin in chronic type 2 diabetes mellitus patients.

II. AIM & OBJECTIVES:

Aim: To estimate the level of Serum Highly Sensitive C-protein in Chronic Type 2 Diabetic Mellitus patients.

Objectives:

- To estimate the level of Fasting Blood Sugar, PP & HbA_{1c} in Chronic Type 2 Diabetes Mellitus Patients and control group.
- To estimate the level of Serum Highly Sensitive C-protein in Chronic Type 2 Diabetes Mellitus Patients

and control group.

- To correlate between level of HbA_{1c} and Highly sensitive C-protein in Chronic Type 2 Diabetes Mellitus Patients and control group.

III. MATERIAL & METHODS:

A total of 100 patients suffered from chronic stage of type 2 diabetes mellitus are chosen for the study. The analysis following standard operating procedure of Clinical Biochemistry Laboratory, Index Medical College, Hospital and Research Center for the following parameters:

1. Estimation of Blood Sugar (Fasting & PP) by Trinder P (1969)⁽⁵⁾ method.
2. Estimation of Glycated Hemoglobin (HbA_{1c}) by Nathan D M et al. (2008)⁽⁶⁾ method.
3. Estimation of Highly Sensitive C-Reactive Protein (hs-CRP) by Rifai N et al. (2008)⁽⁷⁾ method.

IV. OBSERVATIONS & RESULTS:

Table- 1: Comparison of the AGE (years) between CONTROL group and DIABETIC group.

	Control Group	Diabetic Group	P Value
AGE (years) (Mean \pm SD)	47.24 \pm 11.26	46.32 \pm 11.10	> 0.05

*Non-Significant

Comparison of the AGE (years) between the two groups shows that AGE (years) difference in Diabetic group and Control Group is statistically non significant with a p value of >0.05.

Table- 2: Comparison of the FASTING BLOOD SUGAR (mg/dl) between CONTROL group and DIABETIC group.

	Control Group	Diabetic Group	P Value
FASTING BLOOD SUGAR (mg/dl) (Mean \pm SD)	99.00 \pm 9.71	174.56 \pm 38.68	< 0.001

* Significant

Comparison of the FASTING BLOOD SUGAR (mg/dl) between the two groups shows that FASTING BLOOD SUGAR (mg/dl) is higher in DIABETICS group and is statistically significant with a p value of <0.001.

Table- 3: Comparison of the POST PRANDIAL BLOOD SUGAR (mg/dl) between CONTROL group and DIABETIC group.

	Control Group	Diabetic Group	P Value
POST PRANDIAL BLOOD SUGAR (mg/dl) (Mean±SD)	125.12±17.21	271.76±48.34	< 0.001

* Significant

Comparison of the POST PRANDIAL BLOOD SUGAR (mg/dl) between the two groups shows that POST PRANDIAL BLOOD SUGAR (mg/dl) is higher in DIABETICS group and is statistically significant with a p value of <0.001.

Table- 4: Comparison of the HbA1C (%) between CONTROL group and DIABETIC group.

	Control Group	Diabetic Group	P Value
HbA1C (%) (Mean±SD)	5.46±0.31	8.65±1.42	< 0.001

* Significant

Comparison of the HbA1C (%) between the two groups shows that HbA1C (%) is higher in DIABETICS group and is statistically significant with a p value of <0.001.

Table- 5: Comparison of the AGE (years) in diabetic patients between Negative hs-CRP group (n=48) and Positive hs-CRP group (n =52).

	DIABETICS		P Value
AGE (years) (Mean±SD)	Negative hs-CRP Group	Positive hs-CRP Group	> 0.05
	43.25±13.10	49.15±8.43	

* Non-Significant

Comparison of the AGE (years) between the two groups shows that AGE (years) difference is statistically non significant with a p value of >0.05.

Table- 6: Comparison of the FASTING BLOOD SUGAR (mg/dl) in diabetic patients between Negative hs-CRP group (n=48) and Positive hs-CRP group (n=52).

	DIABETICS		P Value
FASTING BLOOD SUGAR (mg/dl) (Mean±SD)	Negative hs-CRP Group	Positive hs-CRP Group	< 0.05
	157.92±22.73	189.92±44.56	

* Significant

Comparison of the FASTING BLOOD SUGAR (mg/dl) between the two groups shows that FASTING BLOOD SUGAR (mg/dl) is higher in DIABETICS with POSITIVE hs-CRP group and is statistically significant with a p value of <0.05.

Table- 7: Comparison of the POST PRANDIAL BLOOD SUGAR (mg/dl) in diabetic patients between Negative hs-CRP group (n=48) and Positive hs-CRP group (n=52).

	DIABETICS		P Value
POST PRANDIAL BLOOD SUGAR (mg/dl) (Mean±SD)	Negative hs-CRP Group	Positive hs-CRP Group	>0.05
	265.17±45.68	277.85±51.74	

* Non-Significant

Comparison of the POST PRANDIAL BLOOD SUGAR (mg/dl) between the two groups shows that difference in POST PRANDIAL BLOOD SUGAR (mg/dl) is statistically non significant with a p value of >0.05.

Table- 8: Comparison of the HbA1C (%) in diabetic patients between Negative hs-CRP group (n=48) and Positive hs-CRP group (n=52).

	DIABETICS		P Value
HbA1C (%) (Mean±SD)	Negative hs-CRP Group	Positive hs-CRP Group	>0.05
	8.30±1.31	8.98±1.49	

* Non-Significant

Comparison of the HbA1C (%) between the two groups shows that difference in HbA1C (%) is statistically non significant with a p value of >0.05.

V. DISCUSSION

Inflammation plays a major role in the pathogenesis of T2DM and its complications. Hence inflammatory markers or acute phase markers have gained the importance as indicators and predictors of the diabetic process.⁽⁸⁾

It was perceived that chronic low-grade inflammation as evidenced by elevated hs-CRP might potentially be a cause underlying the etiology and manifestation of T2DM⁽⁸⁾. Hs-CRP is an inflammatory marker. Increased level of which is seen in Type 2 Diabetes Mellitus patients accompanied with complications like Diabetic Nephropathy. In order to find an easier method for detection of diabetic nephropathy as a screening method (before 24-hour urine collection), a relation between HS-CRP as a marker of diabetic

nephropathy and microalbuminuria has been found. In many Type-2 Diabetes Mellitus cases hs-CRP Positive patients were observed with increase level of microalbuminuria. A correlation between serum CRP levels in diabetic patients and even in the general population has been seen. Low-grade inflammation, reflected by high serum hs-CRP levels, may play a role in the induction of microalbuminuria, which can be considered as a risk factor of cardiovascular diseases⁽⁹⁾.

The present study suggest that the value of hs-CRP level was increased in chronic stage of type 2 diabetes mellitus which also resembled with other studies also. So, Gohel and Chacko in their study showed statistically significant increase in concentration of hs-CRP in type 2 DM compared to healthy persons⁽¹⁰⁾. Amanullah et al. also showed significant increase of hs-CRP in subjects with type 2 DM⁽¹¹⁾. A study concluded that there is a strong association between inflammatory markers in Type 2 DM and suggested a significant role of inflammatory markers like hsCRP in the pathogenesis of Type 2 DM⁽¹²⁾. Another study was conducted and it was observed that hsCRP levels were elevated in patients with Type 2 DM⁽¹³⁾.

VI. CONCLUSION

The present study was carried out in the Department of Biochemistry, Index Medical College, Hospital and Research Center, Indore. The present study involved 100 subjects, were diagnosed as type 2 diabetes mellitus.

The findings of this study is:

1. The FBS levels was significantly increased (with a p value of <0.05) in hs-CRP Positive type 2 diabetics when compared to hs-CRP Negative type 2 Diabetics.

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