

Co-Relation of High Sensitivity C-Reactive Protein (hs-CRP) with HbA1C in Patients with Type 2 Diabetes Mellitus

Dr. Manjiri Naik¹, Dr. Indira Kanjani²

¹Professor, Department of Medicine, M.G.M Medical College and Hospital, Aurangabad

²Resident, Medicine, M. G. M Medical college and hospital, Aurangabad

Abstract: *Aim:* To study the co relation of hs-CRP with HbA1C in patients of type 2 Diabetes mellitus. *Methods:* An observational study was carried out in patients with Diabetes mellitus admitted in medicine ward and not suffering from any other inflammatory condition. The hs-CRP levels were measured by Behring Nephelometer analyser system and HbA1C was performed by high performance liquid chromatography. *Result:* Out of 125 patients, 14 patients had low hs-CRP levels, 12 had intermediate and 99 had high hs-CRP levels. 21 patients had HbA1C levels of <6.5 and 104 patients had HbA1C levels of >=6.5. It was observed that patients with higher HbA1C levels had higher hs-CRP levels. *Conclusion:* In this study, hs-CRP levels correlated with HbA1C levels in type 2 diabetic patients.

Keywords: HbA1c, DIABETES MELLITUS, hs CRP

1. Introduction

Diabetes mellitus (DM) is a metabolic and multifactorial syndrome with disordered metabolism and hyperglycemia. On the etiological basis, factors which contributed to the Diabetes Mellitus and hyperglycemia are reduced secretion of insulin, inherited or acquired insulin deficiency, ineffectiveness of insulin, and low glucose utilization with high production of glucose. There has been an increasing interest in the involvement of low grade inflammation in the pathogenesis of type 2 diabetes¹. Inflammation has also been postulated to play a role in the pathogenesis of type 2 diabetes. C-reactive protein (CRP) is a protein of acute phase condition and a strong biomarker of inflammation in the progression of various diseases like coronary heart disease, cancer, diabetes, and others. It has emerged as the 'golden marker for inflammation'. In the acute phase condition of inflammation the CRP levels may rise up to the 1000 fold². Higher levels of hs-CRP are a marker of chronic inflammation in apparently normal healthy individuals. Glycated hemoglobin (HbA1c) is the best measure of long term glycemic control, since it represents the average blood glucose levels over 3 months.³ Glycemic control is defined as excellent if the measured HbA1c is < 6.5 %, very good if HbA1c is 6.5 to 7.0 %, good if HbA1c is 7.1 to 7.5 %, acceptable if HbA1c is 7.6 to 8.0 % and poor if HbA1c is > 8.0 %.⁴

Recent prospective studies have suggested that an elevated level of CRP is associated with an increased risk of developing type 2 diabetes⁵⁻⁸. The present study was undertaken with objective of studying the relation of High Sensitivity CRP (hs-CRP) with HbA1c in type 2 Diabetes Mellitus.

2. Materials and Methods

This observational study carried out in 125 patients with type 2 DM (according to WHO criteria) admitted in

medicine ward and not suffering from any active or chronic inflammatory disease during the period from May 2015 to May 2017. HbA1C was performed by high performance liquid chromatography and High sensitivity CRP was analyzed using a modification of Behring Latex Enhanced CRPSA on the Behring Nephelometer analyser system with a 2% interassay coefficient of variation. Cases were classified on their relative risk of future cardiovascular events as:

- Low risk: hs-CRP < 1.0 mg/L
- Intermediate risk: hs-CRP 1.0-3.0 mg/L
- High risk: hs-CRP > 3.0 mg/L

3. Result

Out of 125 patients, 14 patients had low hs-CRP levels, 12 had intermediate and 99 had high hs-CRP levels. 21 patients had HbA1C levels of <6.5 and 104 patients had HbA1C levels of >=6.5. It was observed that patients with higher HbA1C levels had higher hs-CRP levels.

Table 1: Mean values among patients:

Characteristic	Mean
Age	57.42 ± 11.73 years
Sex	
Male	70
Female	55
BMI	26.29 ± 3.07 kg/m ²
FBS (mg/dl)	189.82 ± 58.82 mg/dl
PBS (mg/dl)	283.50 ± 84.35 mg/dl
HbA1c %	8.97 ± 2.30%

The above table shows distribution of patients according to mean blood sugar levels. It was observed that mean fasting and post prandial blood sugar among patients was 189.82 ± 58.82 mg/dl and 283.50 ± 84.35 mg/dl respectively. It was observed that mean HbA1c among patients was 8.97 ± 2.30%.

Table 2: Association of hsCRP and HbA1c

hsCRP	HbA1c		Total
	<6.5	≥6.5	
<1	09	05	14
1-3	10	02	12
>3	02	97	99
Total	21	104	125

($\chi^2= 76.06$; $P=0.00001$; $P<0.05$ Statistically Significant)

The above table shows association of hsCRP and HbA1c among patients.

It was observed that there was statistically significant relation between hsCRP and HbA1c among patients with DM. ($P<0.05$)

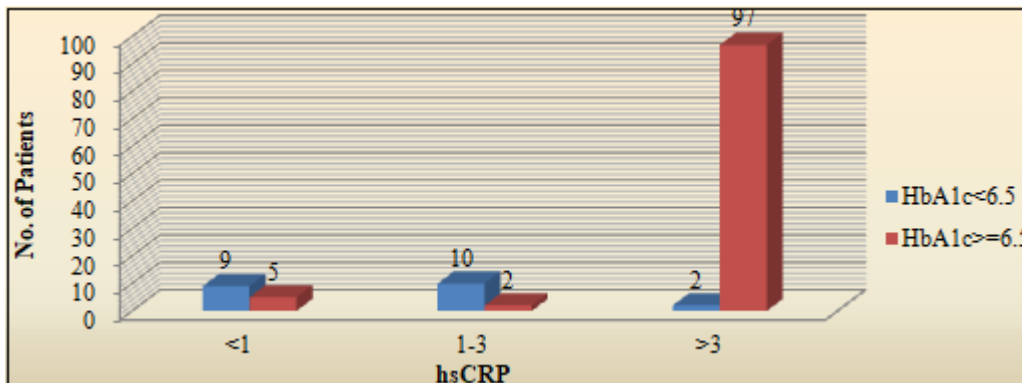


Figure: Association of hsCRP and HbA1c

4. Discussion

It has been suggested that low grade inflammation may play a role in the development of type 2 Diabetes mellitus. hs-CRP as a marker of inflammation, is increased in patients of Diabetes.

In the present study, we found significant relation between hs-CRP and HbA1c levels in patients of type 2 Diabetes mellitus. Our findings are consistent with some studies. For instances, In a national survey study, respondents with hemoglobin A1c (A1C) levels $\geq 9\%$ had a significantly higher rate of elevated CRP than those with A1C levels $< 7\%$. This suggests an association between diminished glycemic control and systemic inflammation in people with established diabetes.⁹

Sangappa Virupaxappa Kashinakunti et al¹⁰ in a study on serum high sensitive - C reactive protein levels in Type 2 Diabetes Mellitus observed among statistically significant increase in all the biochemical parameters viz FBS, PPBS, HbA1c and hs-CRP levels in cases as compared to controls. The *P* value was 0.0001 for all the parameters, which is highly significant.

Study done by YildizTutuncu et al¹¹ on comparison of hs-CRP levels in new Diabetes groups observed a positive correlation between hs-CRP levels and age, BMI, waist, hip, SBP, DBP, pulse, FPG, HbA1c, TG, non-HDL cholesterol; and there was a negative correlation with HDL-cholesterol and eGFR.

Wu and coworkers¹² reported that high levels of hs-CRP were correlated with high levels of HbA1c and FPG in men and with only FPG in women.

In this study, hs-CRP levels correlated with HbA1c levels in type 2 diabetic patients.

References

- [1] Thorand B, Lowel H, Schneider A et al C-reactive protein as a predictor for incident diabetes mellitus among middle-aged men: results from the MONICA Augsburg cohort study, 1984-1998. Arch Intern Med 2003; 163: 93-9.
- [2] D. A. A. Myles, S. A. Rule, L. J. DeLucas et al., "Rotation function studies of human C-reactive protein. Lipid, Lipoproteins, C-Reactive Protein, and Hemostatic Factors at Baseline in the Diabetes Prevention Program," Journal of Molecular Biology, 1990; vol. 216, no. 3, pp. 491-496.
- [3] Kelley D.E, Mandarin L.J. Fuel selection in human skeletal muscle in insulin resistance. A re examination. Diabetes. 2000; 49:677-683.
- [4] Kashyap S, Belfort R, Gastaldelli A, et al. A sustained increase in plasma free fatty acids impairs insulin secretion in nondiabetic subjects genetically predisposed to develop type 2 diabetes. Diabetes. 2003; 52:2461-2474
- [5] Laaksonen DE, Niskanen L, Nyysönen K et al C-reactive protein and the development of the metabolic syndrome and diabetes in middle-aged men. Diabetologia 2004; 47: 1403-10.
- [6] Nakanishi S, Yamane K, Kamei N et al. Elevated C-reactive protein is a risk factor for the development of type 2 diabetes in Japanese Americans. Diabetes Care 2003; 26: 2754-7.
- [7] Chiriboga DE, Ma Y, Li W et al. Seasonal and gender variation of the high sensitivity C-reactive protein in healthy adults: A Longitudinal study. Clinical Chemistry 2009; 55: 313-21.
- [8] Jager A, Van Hinsberg VW, Kostense PJ et al. CRP and five year mortality in diabetic subjects: The Hoorn study. ArteriosclerThromb Vase Biol 1999; 12: 3071-80.
- [9] King DE, Mainous AG 3rd, Buchanan TA, Pearson WS. C-reactive protein and glycemic control in adults with diabetes. Diabetes Care. 2003 May;26(5):1535-9.

- [10] SangappaVirupaxappaKashinakunti, ManjulaRangappa and GurupadappaShantappaKallaganada. International Journal of Biochemistry Research & Review. Serum High Sensitive - C Reactive Protein Levels in Type 2 Diabetes Mellitus -A Case Control Study.2016;11(4): 1-8.
- [11] YildizTutuncu, IlhanSatman, SeldaCelik, NevinDincag, KubilayKarsidag, AysegulTelci, SemaGenc, Halim Issever. A Comparison of hs-CRP Levels in New Diabetes Groups Diagnosed Based on FPG, 2-hPG, or HbA1c Criteria. Journal of Diabetes Research. 2016, Article ID 5827041, 1-9.
- [12] T. Wu, J. P. Dorn, R. P. Donahue, C. T. Sempos, and M. Trevisan, "Associations of serum C-reactive protein with fasting insulin, glucose, and glycosylated hemoglobin: the Third National Health and Nutrition Examination Survey, 1988–1994," American Journal of Epidemiology, 2002; vol. 155, no. 1, pp. 65–71.

