Research Article

IJMPR

Association between high sensitivity C-Reactive protein and glycatedhemoglobin in patients with Type 2 Diabetes Mellitus

Lakshmi Deepika Yarlagadda[1], Rohit Kumar Bonthapally[2]

[1]Consultant Biochemist, Vijaya Diagnostic Centre, Hyderabad, Telangana, India.
[2]Senior Resident, Department of Biochemistry, All India Institute of Medical Sciences, Bibinagar, Telangana, India.

ABSTRACT

Background: Hyperglycemia is considered an inflammatory condition. Among several markers of inflammation, hs-CRP (high sensitive C-reactive protein) takes a front seat in people with diabetes. So we conducted this study to find the association between hs-CRP and HbA1c(glycatedhemoglobin) levels in type 2 diabetics.
Methods: This is a retrospective study of 70 (Males=42, Females=28) type 2 diabetic patients in NIMS (Nizam's Institute of medical sciences) hospital, Hyderabad, India. We divided the patients into two groups based on their HbA1c levels (HbA1c <53 mmol/mol [7%]- well controlled [group1] and >53 mmol/mol [7%] – poorly controlled [group2] and compared hs-CRP levels between the two groups. Mann Whitney U testand Spearman correlation were performed. p-value<0.05 was considered significant.
Results: Median(Range) for hs-CRP in group1 is 1.5mg/L(0.1-7.6) and for group 2 poorly controlled group is 6.2mg/L(1.3-118).We found a statistically significant difference in hs-CRP between the two groups (p=0.0008). We also found a positive correlation between hs-CRP and HbA1c.
Conclusion: In this study, hs-CRP levels positively correlated with HbA1C levels in type 2 diabetic patients.

Key Words: *hs-CRP, HbA1c, Diabetes mellitus, inflammation*

*Corresponding Author
Dr. Rohit Kumar Bonthapally
Senior Resident, Department of Biochemistry, All India Institute of Medical Sciences, Bibinagar, Hyderabad

INTRODUCTION:

Diabetes is currently one of the leading non-communicable diseases in the world. Because of the increased sedentary lifestyle and westernization of diet, its prevalence in India has risen dramatically in the last decade. Its prevalence has increased from 2.4% to 15% in rural India and from 3.3% to 19% in urban India from 2015 to 2019[1]. An estimated 70 million people are currently affected with diabetes in India, and the numbers are expected to cross 100 million by 2030. Many research activities on diabetes are mainly aimed at understanding the pathogenesis and preventing long-term complications. In the past few years, research has linked the dysfunction of beta cells and insulin resistance to inflammation. A growing body of data supports the concept that in type 2 diabetes, inflammation plays a pivotal role in the pathogenesis and links Diabetes mellitus(DM) with concomitant conditions with inflammatory components [2]. Since poor glycemic control, pathogenesis, and complications of DM appear to be due to various components involving inflammation, we found it interesting to study hs-CRP levels in diabetic subjects.

Aim:

This study aims to find the association between hs-CRP and HbA1C levels in type 2 diabetics.

Material and methods:

This is a retrospective study of 70 (Males=42, Females=28) (Figure1) type 2 diabetic patients in NIMS hospital, Hyderabad. Subjects were divided into two groups based on their HbA1c levels - Group1 - HbA1c <53mmol/mol ([<7%]- well controlled), N=35, Group2 - HbA1c >53mmol/mol% ([>7%]- poorly controlled), N=35 (Figure 2).hs-CRP levels were compared between two groups. Mann Whitney U test and Spearman correlation were performed. p-value<0.05 was considered significant.
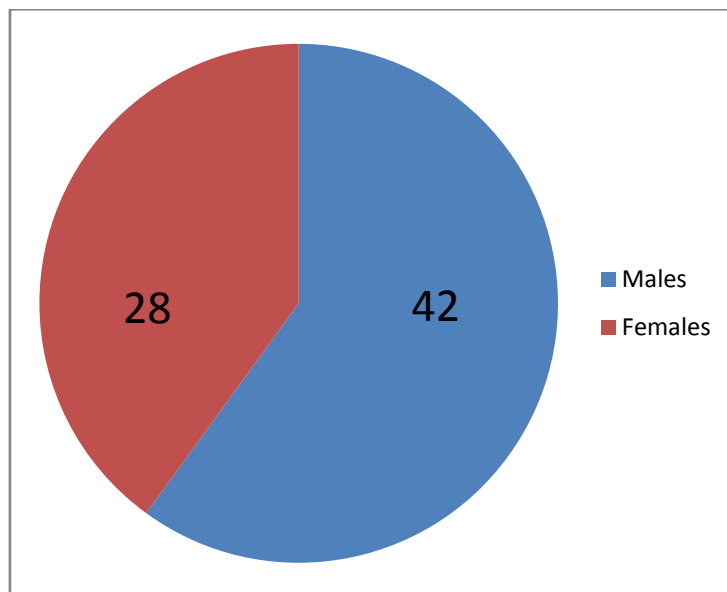
Dr. Rohit Kumar Bonthapally et al.: Association between high sensitivity C-Reactive protein and glycated hemoglobin in patients with Type 2 Diabetes Mellitus

184

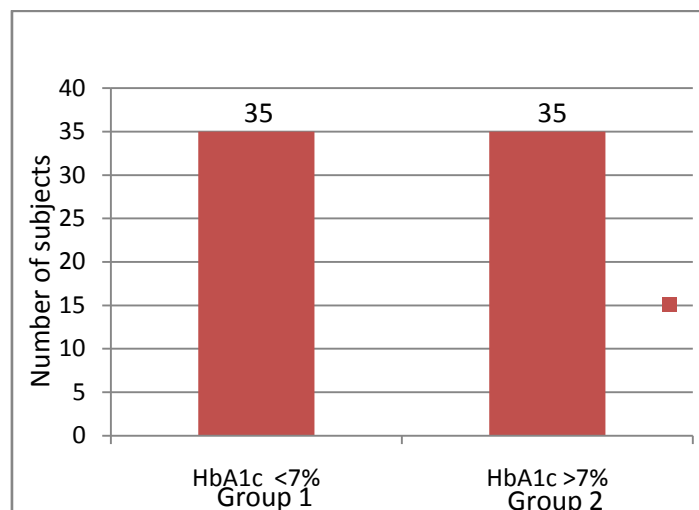**Figure-1: Gender distribution among subjects**

Figure 2: Distribution of subjects into groups according to HbA1c levels

Results:

Median (Range) for hs-CRP in group1 is 1.5mg/L (0.1-7.6) and for group 2 poorly controlled group is 6.2mg/L (1.3-118) (Table 1, Figure 3). We found a statistically significant difference in hs-CRP between the two groups (p=0.0008). We also found a positive correlation between hs-CRP and HbA1c (r_s=0.5).

Table 1:hs-CRP levels in both groups

	GROUP 1 HbA1c <7% N=35	GROUP 2 HbA1c > 7% N=35	P-VALUE
Age(mean± SD) (Years)	55.4 ± 12.2	51.6 ± 12.5	NS
hsCRP(Median) (mg/L)	1.5	6.2	0.0008
hsCRP (IQR) (mg/L)	0.1-7.6	1.3-118	

Dr. Rohit Kumar Bonthapally et al.: Association between high sensitivity C-Reactive protein and glycated hemoglobin in patients with Type 2 Diabetes Mellitus
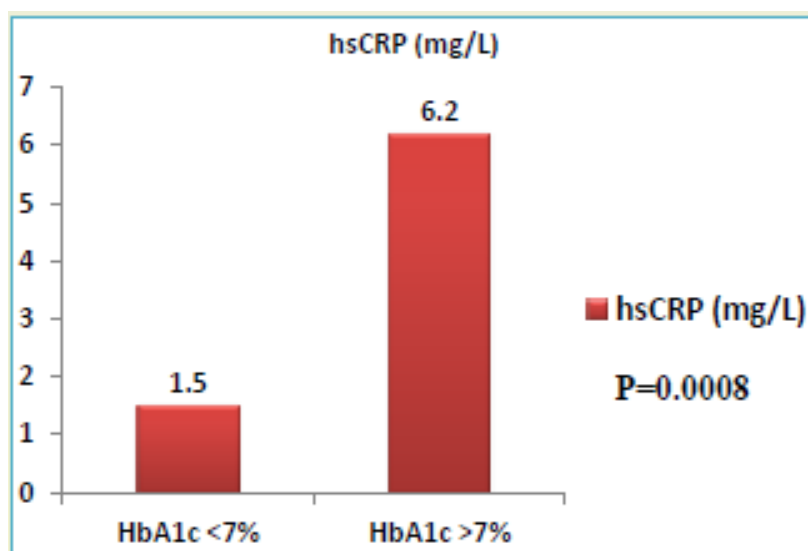
185

Figure 3:hsCRP levels in both groups

DISCUSSION:

hs-CRP levels in our study were significantly higher in poorly controlled type 2 diabetes patients compared to the well-controlled group and correlated well positively with Hba1c levels. Sarinnapakorn V et al.[3], in their retrospective study, found a good positive correlation between hs-CRP and HbA1c which is in agreement with our research. Another study [4] reported significantly higher levels of hs-CRP in poorly controlled diabetic patients in comparison to the well-controlled group. Yo-Han Seo et al.[5], in their study, observed that even after adjusting for several related variables (sex, age, BMI, waist circumference, triglycerides, HDL-cholesterol, and hypertension), HbA1c increased significantly as hs-CRP increased. Festa et al.[6]demonstrated that elevated levels of CRP are associated with obesity, insulin resistance, and glucose intolerance, suggesting the role of inflammation in type 2 diabetes. In their prospective study, Laaksonen et al. [7] indicated that an elevated level of CRP is associated with an increased risk of developing type 2 diabetes. It is hypothesized that insulin resistance and hs-CRP synthesis can be induced by chronic inflammation in DM. This explains the relationship between inflammatory response and insulin resistance [8, 9].

CONCLUSION:

The occurrence of hyperglycemia, as indicated by elevated hbA1c, and low-level inflammation, as indicated by elevated hs-CRP together, shows the need for the determination of hs-CRP in type 2 diabetes mellitus patients. The awareness gained from the link between hyperglycemia and inflammation can yield predictive and prognostic information for further management of patients.

Limitations:

Ours was a retrospective cross-sectional study with limited sample size. Other confounding factors such as BMI(Body mass index), waist circumference, hypertension, and triglycerides were not considered. Further longitudinal studies are necessary to confirm the association between high sensitivity C–reactive protein and HbA1c concerning complications and management in type 2 diabetic patients with a larger sample size.

REFERENCES:
1. Ranasinghe, P., Jayawardena, R., Gamage, N., Sivanandam, N., &Misra, A. (2021). Prevalence and trends of the diabetes epidemic in urban and rural India: A pooled systematic review and meta-analysis of 1.7 million adults. Annals of epidemiology, 58, 128–148.
2. Ford E. S. (2003). The metabolic syndrome and C-reactive protein, fibrinogen, and leukocyte count: findings from the Third National Health and Nutrition Examination Survey. Atherosclerosis, 168(2), 351–358.
3. Sarinnapakorn, V., &Wanicagool, W. (2013). Association between hs-CRP and Hba1c in overweight type 2 diabetic female patients. Journal of the Medical Association of Thailand, 96 Suppl 3, S54–S58.
4. Li, C. Z., Xue, Y. M., Gao, F., & Wang, M. (2004).Determination of serum highly sensitive C-reactive protein in patients with type 2 diabetes. Academic journal of the first medical college of PLA, 24(7), 791–793.
5. Seo, Yo-Han, and Hee-Young Shin. "Relationship between hs-CRP and HbA1c in Diabetes Mellitus Patients: 2015-2017 Korean National Health and Nutrition Examination Survey." Chonnam Medical journal vol. 57,1 (2021): 62-67.
6. Festa, A., D'Agostino, R., Jr, Tracy, R. P., Haffner, S. M., & Insulin Resistance Atherosclerosis Study (2002). Elevated levels of acute-phase proteins and plasminogen activator inhibitor-1 predict the development of type 2 diabetes: the insulin resistance atherosclerosis study. Diabetes, 51(4), 1131–1137.

Dr. Rohit Kumar Bonthapally et al.: Association between high sensitivity C-Reactive protein and glycated hemoglobin in patients with Type 2 Diabetes Mellitus

186

7. Laaksonen, D. E., Niskanen, L., Nyyssönen, K., Punnonen, K., Tuomainen, T. P., Valkonen, V. P., Salonen, R., &Salonen, J. T. (2004). C-reactive protein and the development of the metabolic syndrome and diabetes in middle-aged men. Diabetologia, 47(8), 1403–1410.
8. Temelkova-Kurktschiev, T., Siegert, G., Bergmann, S., Henkel, E., Koehler, C., Jaross, W., &Hanefeld, M. (2002). Subclinical inflammation is strongly related to insulin resistance but not to impaired insulin secretion in a high risk population for diabetes. Metabolism: clinical and experimental, 51(6), 743–749.
9. Pickup, J. C., & Crook, M. A. (1998). Is type II diabetes mellitus a disease of the innate immune system?.Diabetologia, 41(10), 1241–1248.