ORIGINAL RESEARCH ARTICLE

A Study of High Sensitivity C–Reactive Protein (hsCRP) in Relation to HbA1C in Type2 Diabetes Mellitus in Tertiary Care Hospital, Mysore

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ABSTRACT

Introduction: Diabetes mellitus has become a leading cause of morbidity and mortality world over. hs-CRP is a marker of low-grade inflammation and it is raised in patients with type 2 DM. The present study was undertaken with objective of studying the relation of High Sensitivity CRP(hs-CRP) with HbA1c in type 2 Diabetes Mellitus.

Material and Methods: An observational cross section 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 Nephalometeranalyser system and HbA1C was performed by high performance liquid chromatography.

Results: Out of 77 subjects, 7 patients had low hs-CRP levels, 15 had intermediate and 55 had high hs-CRP levels. It was observed that patients with higher HbA1C levels had higher hs-CRP levels.

Conclusion: In this study, hs-CRP levels positively correlated with HbA1C levels in type 2 diabetic patients.

Keywords: HbA1c,Type 2 Diabetes Mellitus, hsCRP

INTRODUCTION

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia.[1] There has been an increasing interest in the involvement of low grade inflammation in the pathogenesis of type 2 diabetes[2]

The mechanisms by which chronic inflammation can evoke type 2 diabetes are not clear. However it is known that adipose tissue can synthesize and release the main pro inflammatory cytokines -tumor necrosis factor-alpha (TNF-α), interlelukin-1 (IL-1) and interleukin-6 (IL-6) and that inflammatory markers are associated with body fat mass. Pro-inflammatory cytokines and acute phase reactants are involved in multiple metabolic pathways relevant to insulin resistance, including regulation, reactive oxygen species, lipoprotein lipase action and adipocyte function.

C-reactive protein (CRP) is an acute-phase protein,which is an inflammatory marker produced and released by the liver under the stimulation of cytokines. It is 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.The hsCRP test is a highly sensitive quantification of CRP. The present study was undertaken with objective of studying the relation of High Sensitivity CRP(hs-CRP) with HbA1c in type 2 Diabetes Mellitus.

MATERIAL AND METHODS

This was an observational cross section study done in Krishna Rajendra Hospital, which is a tertiary care centre attached to Mysore Medical College and Research Institute, Mysuru. The study was carried out in the duration between July 2017 to December 2017. The study was done after approval from the institutional ethics committee. An informed written consent was obtained from the patients prior to inclusion in the study. This observational study carried out in 77 patients with type 2 DM (according to ADA criteria[3]) admitted in medicine ward and not suffering from any active or chronic inflammatory disease.

HbA1C was performed by high performance liquid chromatography and High sensitivity CRP was analysed using a modification of Behring Latex Enhanced CRPSA on the Behring Nephlometer analyser system with a 2% inter assay 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

STATISTICAL ANALYSIS

Continuous data are expressed as means with standard deviations, and categorical data are expressed as numbers and percentages. ANOVA test was used for comparing categorical variables between High sensitivity CRP and HbA1C.

RESULTS

Age Distribution

In the present study, a sum total of 77 cases were included in which 12 (16%) subjects were in the age group of 36- 45 years, 31(40%) subjects in the age group of 46-55 years and 34 (44%) subjects in the age group of ≥56 years ie. most of our cases are in this age group.

Gender distribution

In our study of 77 subjects, 44 (57%) subjects were males and 33 (43%) subjects were females (figure-2).

hs-CRP relative risk

In our study 7 (9%) patients had low hs-CRP levels, 15 (20%) had intermediate and 55 (71%) had high hs-CRP levels (figure-2).

Correlation between hs-CRP and mean age in years

In our study the mean age of subject with hs-CRP of < 1 is 51.14±7.5 years, mean age of subjects with hs-CRP of 1-3 is 57.53 ± 8.14 years and mean age of subjects with hs-CRP of ≥ 3 is 53.56 + 7.64, p value of 0.127 (table-2).

Age in years	Subjects, N = 77	Percentage
36 – 45	12	16
46 – 55	31	40
≥ 56	34	44

Table-1: Table showing age distribution of subjects.

hs-CRP in mg/dl	Mean age in years
≤ 1	51.14 ± 7.5
1-3	57.53 ± 8.14
≥ 3	53.56 ± 7.64

Table-2: Table showing correlation between hs-CRP and mean age in years

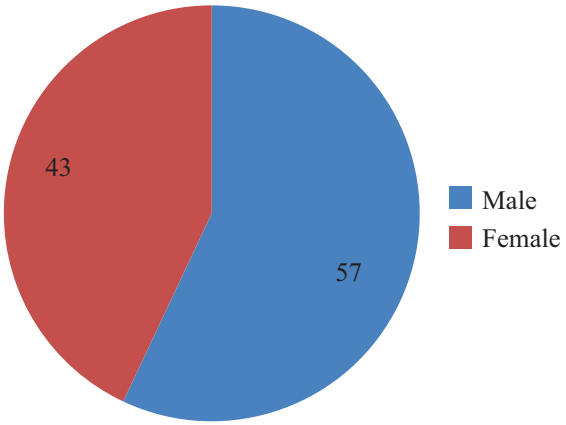

Figure-1: Figure showing gender distribution among subjects

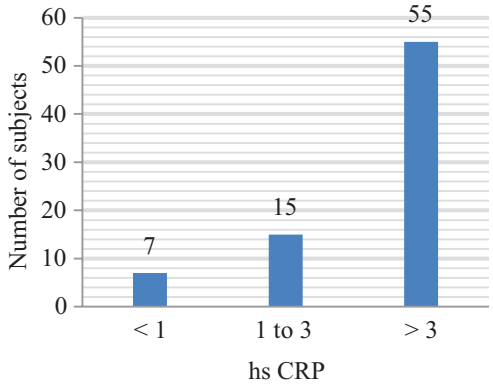

Figure-2: Figure showing distributions of subjects according to hs-CRP relative risk

Correlation between hs-CRP and fasting blood sugar

In our study the mean of FBS with hs-CRP of < 1130.85 + 49.17 mg/dl, mean of FBS with hs-CRP of 1-3 is 159.20 + 54.36 mg/dl and mean of FBS with hs-CRP of > 3 is 177.58 + 55.86, p value of 0.080 (table-3).

hs-CRP in mg/dl	Fasting blood sugar mg/dl
≤ 1	130.85 ± 49.17
1-3	159.20 ± 54.36
≥ 3	177.58 ± 55.86

Table-3: Correlation between hs-CRP and fasting blood sugar

Correlation between hs-CRP and post prandial blood sugar

In our study the mean of PPBS with hs-CRP of ≤ 1 is 224.00 ± 45.46 mg/dl , mean of PPBS with hs-CRP of 1-3 is 255.46±104.59 mg/dl and mean of PPBS with hs-CRP of ≥ 3 is 274.70 ± 80.42, p value of 0.248.

hs-CRP in mg/dl	Post prandial blood sugar mg/dl
≤ 1	224.00 ± 45.46
1-3	255.46 ± 104.59
≥ 3	274.70 ± 80.42

Table-4: Correlation between hs-CRP and post prandial blood sugar

Correlation between hs-CRP and HbA1c

In our study the mean of HbA1C with hs-CRP of ≤ 1 is 7.52±1.03, mean of HbA1C with hs-CRP of 1-3 is 8.15±1.11 and mean of HbA1C with hs-CRP of ≥3 is 8.90 ± 1.24, p value of 0.004.

hs-CRP in mg/dl	HbA1C
≤ 1	7.52 ± 1.03
1-3	8.15 ± 1.11
≥ 3	8.90 ± 1.24

Table-5: Correlation between hs-CRP and HbA1c

DISCUSSION

It has been suggest that low grade inflammation may play a role in the development and complications of type 2 Diabetes mellitus.As concluded by various studies Pick up et al[7] suggested an increasing interest in the involvement of low grade inflammation in the pathogenesis of type 2 diabetes. Laaksonan et al[8], in their prospective study suggested that an elevated level of CRP is associated with an increased risk of

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developing type 2 diabetes.

Festa et al[9] demonstrated that elevated levels of CRP are associated with obesity, insulin resistance and glucose intolerance, suggesting that inflammation is also involved in the etiology of type 2 diabetes.

In the present study, we found significant relation between hS-CRP and HbA1C levels with p value of 0.004 in patients of type 2 Diabetes mellitus .

Our findings are consistent with some of thestudies. In a national survey study, subjects with HbA1C levels ≥ 9% had a significantly higher rate of elevated CRP than those with HbA1C levels < 7%. This suggests an association between poor glycemic control and systemic inflammation in people with established diabetes.[10]

Sangappa Virupaxappa Kashinakunti et al.[11] in a study on serum high sensitivity - 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,but in our study hs-CRP was not significant with FBS and PPBS suggesting that these parameters are not a indicators for monitoring and prognostication as HbA1c.

Study done by Yildiz Tutuncu et al[12] 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,but in our study hs-CRP was not significant with age and it is suggesting that hs-CRP is not having positive correlation with age.

CONCLUSION

Raised levels ofhs-CRP in subjects with Type2 DM ,where HbA1C was above the target control level are prone for increased future relative risk of cardiovascular events and other complications. Hence Raised levels of hs-CRP indicates the role of ongoing inflammation in the management of diabetes. .

Limitations

This was a cross-sectional study, we could not establish a cause-effect relationship, further longitudinal studies are necessary to confirm the association between High Sensitivity C–reactive Protein and HbA1C also with respect to management and complications in type 2 diabetic patients.

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