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A Case Study Of Fbs, Ppbs, Hba$_1$c For Diabetes Mellitus Patients

Chandra Sekhar A.[1*], Sesha Pavani G.[2], Madhav P.[3]
[1]Department of Physiology, Sri Balaji Medical College, Renigunta, Tirupathi, Andhra Pradesh, India.
[2]Department of Physiology, Sri Balaji Medical College, Renigunta, Tirupathi, Andhra Pradesh, India.
[3]Department of Pharmacology, Apollo Medical College, Chittoor, Andhra Pradesh, India.
Dr.A.Chandra Sekhar EMAIL: dracs687@gmail.com

Abstract

In the development of intravascular thrombosis, aggregation of Platelets, adhesion of platelets play themain role in the development of micro vascular and macro vascular complications with alterations in the morphology of the platelets, function. On analyzing the glycemic control, it was found that the mean HbA1C was very high (10.43%, 95% CI 10.06 to 10.81), which indicates that diabetes was poorly controlled. The lowest recorded HbA1C was 10.15% and the highest recorded value was 15.70%. V Mohan et al (2013)(62) published the HbA1C study, which assessed the glycemic status among urban South Indian population. Data from 20,554 patients showed that the mean HbA1c was 9.2%, and diabetes control was worse in those with longer duration of diabetes (9.9 +/- 5.5 years). Other authors from the western countries, including Demirtas L et al (2015) (13)in their study on 307 diabetic subjects reported a mean HbA1C of 8.6 with an IQR of 6.9-10.4 which was much lower. The stark differences in HbA1c may be attributed to the long duration of diabetes, poor compliance of patients to treatment and follow up and associated conditions of healthcare in the rural Indian setting.

Keywords: HbA1C, IQR, FBG, FBS, PPBS,WBC

I INTRODUCTION

In this section presents introduction of this research work. White blood cells take part in the inflammatory process which accompanies atherosclerosis. [1]These WBC's get collected at the location of the endothelial injury, resulting in the formation of foam cells in the atheromatous plaque.[2] These activated leukocytes release Interleukins, TNF α causing endothelial dysfunction.[3] The mean Fasting Blood sugar (FBS) level observed in the present study was 207.9 mg/dl (95% CI 194.55-221.42).[4] It ranged from a minimum of 101 to a maximum of 539 mg/dl. The PPBS levels were also higher with the mean PPBS level (mg/dL) being 294.3 (95% CI 276.55 to 312.13).[5] The lowest observed value was 68 mg/dL while the highest observed value was 658 mg/dL.[6] The mean blood sugar values in this population of South Indian diabetics was much higher than those in studies mean FBG level 163.7±1.33 mg/dl, mean FBG of 150 ± 63 mg/dl and mean FBG 147.85±72.54 mg/dl. [7]These data denote that the overall mean blood glucose is higher in our population, even at the baseline. This may be attributed to poor awareness and difficulty in access to healthcare, since most of the patients were from semi-urban and rural background. [8]

In this paper presents section 2 of this paper explains the detail on the related works. In section 3 presents the materials and methods adopted and section 4 presents the details of the experiments and discussions. Finally section 5 concludes the paper by sharing our inferences and future plans.

II RELATED WORKS

In this section presents focuses the related works of this research work. The study compared the indices of complete blood count, in 260 subjects with type 2 DM on treatment, with 44 healthy controls who were nondiabetic.[9] They observed that Red cell distribution width (RDW) was significantly increased in subjects with type 2 DM compared to controls (P=0.008) and it was also increased in subjects with uncontrolled glycemia (HbA1c >7%) compared to those with adequate control (HbA1c </=7%; P=0.035). MPV was similar in both the cohorts (P=0.238). There was no significant correlation between RDW and MPV with FBG, HbA1c, or diabetes duration.[10] They concluded that RDW was significantly increased in subjects with diabetes compared to healthy controls and was especially higher in subjects with uncontrolled glycemia.[11]

The main cause of mortality in subjects withdiabetes mellitus is cardiovascular diseases while microvascular complications are the major reasons formorbidity.[(45)]The RDW is a measure of diversity of RBC volume with greater values representing higher diversity in cell sizes or anisocytosis.[12]

In subjects with type 2 DM without atherosclerosis, resting levels of acute phase reactants were higher when compared with healthy subjects.[(46)]Cytokine release from macrophages is stimulated by advanced glycation end products, which along with insulin deficiency, insulin resistance act together to produce an acute phase response.[13]

Above and beyond the creation of glycated hemoglobin, hyperglycemia results indecreased deformability of the RBC's, alterations in the mechanical properties of RBCs, amplified adhesion, and augmented fragility osmotically fragility eventually resulting in modifications in the structure of erythrocytes and their hemodynamic characteristics.[14][(48, 49)]

Hyperglycemia decreases thelifespan of RBC's,which leads to higherinconsistency in RBC volumes[(14),]decrease in the mean life span of RBCs [(50)]as described by Peterson et al which is due to activation ofcaspase-3 in Type 2 DM weakening the erythrocyte membrane integrity.[15]

III MATERIALS AND METHODS

In this section presents the materials and methods of this research work. The sample size was calculated assuming the minimumcorrelation between the HBa1C and any of the hematological parameters to be detected as 0.25 (Middle value of the range of r values reported by various studies for different hematological parameters) with an alpha error of 0.5 and 80% power of thestudy. The following formula as suggested by Hulley SBet al was used for sample size calculation.

The standard normal deviate for $\alpha = Z\alpha = 1.960$

The standard normal deviate for $\beta = Z\beta = 0.842$

$C = 0.5 * \ln[(1+r)/(1-r)] = 0.255$

Total sample size = $N = [(Z\alpha+Z\beta)/C]2 + 3 = 123$

To account for a non-participation rate of 10% it was decided to include not less than 135 subjects in the study. The final analysis has included 160 subjects.

IV RESULTS AND DISCUSSIONS

In this section focuses the results and discussions of this research work. **A total of 160 subjects were included in the analysis.**

Among the study population, the age group was less than 29 years was 3 (1.88%), 30 to 39 years was 11 (6.88%), 40 to 49 years was 41 (25.63%), 50 to 59 years was 43 (26.88%), 60 and above was 62 (38.75%). Among the study population, a number of females 81(50.63%) was higher than males 79(49.38%).

The mean FBS was 207.9 ± 86.03 mg/dL with minimum value 101 and the maximum value 539 (95% CI 194.55 to 221.42). The mean PPBS was 294.3 ± 113.9 mg/dL with minimum value 68 and maximum value 658 (95% CI 276.55 to 312.13). The mean HbA1C was 10.43 ± 2.41 % with minimum 6.10 and maximum 15.70 (95% CI 10.06-10.81) in the study population.

The mean TLC was 8403 ± 1401.19 cells with minimum 5200 cells and the maximum 11100 cells (95% CI 8184.35 to 8621.90). The mean Neutrophils was 59.08 ± 9.37 cells with minimum 32.00 and maximum 81 (95% CI 57.62 to 60.55). The mean Lymphocytes was 28.75 ± 7.38 cells with minimum 8.90 and maximum 49.7 (95% CI 27.60 to 29.90). The mean Monocytes was 6.26 ± 1.62 cells with minimum 2.0 and maximum 10.7 (95% CI6 to 7.44) The mean Eosinophils was 3.74 ± 2.71 cells with minimum 0 and maximum 17 (95% CI 3.31 to 4.16). The mean Basophils was 0.47 ± 0.29 cells with minimum 0.40 and maximum 1.80 (95% CI 0.42 to 0.51). in the study population.

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Correlation between HbA1C and neutrophils which was statistically not significant (P value: 0.196). Correlation between HbA1C and Lymphocytes which was statistically not significant (P value: 0.107). Correlation between HbA1C and monocytes which was statistically not significant (P value: 0.266). There is a correlation between HbA1C and RDW which was statistically significant (P value: <0.001).

Correlation between FBS and neutrophils which was statistically not significant (P value: 0.061). Correlation between FBS and Lymphocytes which was statistically significant (P value: 0.036).Correlation between FBS and monocytes which was statistically not significant (P value: 0.115). There is a correlation between FBS and RDW which was statistically significant (P value: 0.025).

Correlation between PPBS and neutrophils which was statistically not significant (P value: 0.117). Correlation between PPBS and Lymphocytes which was statistically not significant (P value: 0.217). Correlation between PPBS and monocytes which was statistically not significant (P value: 0.206). Correlation between PPBS and RDW which was statistically not significant (P value: 0.053).

V CONCLUSION

Finally this work concludes, the association between oxidative stress and hematological indices in subjects with and without diabetes. They did their study in Type 2 DM and 44 controls who were age matched. They witnessed that higher WBC counts were observed in the group within diabetes (p-value 0.023). They concluded that there was no correlation between FBG and Super Oxide Dismutase (SOD) activity with R-value of-0.044 and p-value of0.727 and that SOD activity was lower insignificantly in diabetic subjects whereas SOD activity correlated significantly with higher neutrophil levels (R=0.249).

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