

Correlation between Glycated hemoglobin and Lipid profile in Type 2 Diabetic population of district Meerut, U.P.

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Abstract

Background: The Type 2 diabetes mellitus is becoming more and more prevalent in our country India and it is estimated that approximately around 2% of the Indian population i.e around 15 million peoples are suffering from this disease and Glycated hemoglobin (HbA1c) is routinely used as a diagnostic tool for screening and measuring long term control in diabetic patient.

Aim: The study was planned to observe the relationship among Glycated hemoglobin (HbA1c), Fasting blood sugar and Lipid profile in Type 2 diabetics of western U.P population.

Material and Methods: Data of around 92 males and 112 females, from the age group of 25 to 55 years were selected from December 2014 to July 2016 in a cross sectional manner. Blood sample (3ml) was collected from each subject. Serum was separating by centrifuging blood at 3000 rpm for 10 min. Fasting blood sugar and Lipid profile were estimated by Vitros 250 auto analyzer using readymade dry chemistry kits from Ortho Clinical diagnostics, Johnson & Johnson, USA and HbA1c with kit based method.

Result: Mean value of HbA1c in control subjects was 4.62 ± 0.18 and 5.78 ± 0.19 in diabetic subjects, HbA1c values were significantly higher in Diabetic subjects (<0.001) as compared to control subjects.

The mean value of FBS in Diabetic subjects was 115.72 ± 3.83 and 92.33 ± 3.61 in control subjects. Also, FBS mean value was found to be significantly lower in control group (<0.001) as compared to Diabetic subjects.

Conclusion: Our study demonstrates that, altered Lipid profile has been associated with elevated levels of Fasting blood glucose. Thus, the adverse effect of hyperglycemia and associated dyslipidemia must not be overlooked in Diabetic subjects.

Keywords: Lipid profile, HbA1c & Type 2 diabetes mellitus.

1. Introduction

In the ancient Sanskrit Indian literature, Diabetes Mellitus (DM) was described as “honey-urine disease” and has been associated with gross emaciation and wasting. Type 2 DM comprises a cluster of common metabolic disorders. It is a global endemic having a rapidly increasing prevalence in developing countries.[1]

Diabetes mellitus is becoming more and more prevalent in our country India, it is estimated that approximately around 2% of the Indian population i.e around 15 million peoples are suffering from diabetes and the number of cases is said to be alarmingly rising day by day by around 5%-6% each year. Also, an estimated 300,000 peoples die from diabetes due to its severe complications because of uncontrolled hyperglycemia. There are around 3.5 crore

diabetic patients in India and the number will rise up to 5.2 crores by 2025.[2]

Keeping in view of the alarming increase in the incidence and prevalence of diabetics in India, WHO has declared the developing country, India as the –Diabetic Capital of the World.[3]

Glycated hemoglobin (HbA1c) is routinely used as a diagnostic tool for screening and measuring long term control in diabetic patient. It is an indicator for the mean blood glucose level in diabetic patients, HbA1c predicts the risk for the development of severe diabetic complications in diabetic patients. The UKPDS study has shown that, in patients with Type 2 diabetes mellitus, the risk of diabetic complications were strongly associated with uncontrolled hyperglycemia.

Control of hyperglycemia with decreased level of HbA1c is likely to reduce the risk of severe complications.[4]

Thus, the study was planned to observe the relationship among Glycated hemoglobin (HbA1c), Fasting blood sugar and Lipid profile in Type 2 diabetics of western U.P population.

2. Material and Methods

A total of 297 subjects who were willing to take part in the study and who had given informed written consent were selected randomly out of which data of 92 males and 112 females, from the age group of 25 to 55 years were selected from December 2014 to July 2016 in a cross sectional manner. Information about subject's age, sex, life style, family history of diabetes and other chronic diseases/disorders were written in pre design format. Height, weight and waist circumference were measured with the subject barefooted and lightly dressed. The abdominal circumference (waist) was measured at the end of expiration, by wrapping the tape at the level of the umbilicus. Blood sample (3ml) was collected from each subject. Serum was separated by centrifuging blood at 3000rpm for 10 min. Fasting blood sugar and Lipid profile were estimated by Vitros 250 auto analyzer using readymade dry chemistry kits from Ortho Clinical diagnostics, Johnson & Johnson, USA and HbA1c with kit based method.

2.1 Diagnostic criteria for diabetes

A1c $\geq 6.5\%$. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.

OR

FBG ≥ 126 mg/dl. Fasting is defined as no caloric intake for at least 8 hr.

3. Result

The sex distribution, mean age and lipid parameters are shown in the table 1.

Table 1: Mean Age and levels of lipid parameter in study and control subjects

Parameters	Study Subjects (n=132) Mean SEM	Control Subjects (n=72) Mean SEM	P value
Sex (M/F)	46/86	46/26	<0.001
Age (Years)	41.8 \pm 0.71	43.63 \pm 1.202	<0.001
Total Cholesterol (mg/dl)	180.02 \pm 3.08	160.13 \pm 3.24	<0.001
Triglycerides (mg/dl)	195.36 \pm 5.94	128.97 \pm 6.14	<0.001
HDL-Cholesterol (mg/dl)	38.7 \pm 0.57	44.48 \pm 1.18	<0.001
LDL- Cholesterol (mg/dl)	102.14 \pm 2.62	89.95 \pm 2.87	<0.001
VLDL- Cholesterol (mg/dl)	38.9 \pm 1.18	25.62 \pm 1.22	<0.001
NON HDL (mg/dl)	138.98 \pm 2.95	115.65 \pm 3.19	<0.001

The mean age value was 41.8 \pm 0.71 years in the study subjects and 43.63 \pm 1.202 in the control subjects, significant differences were observed between control and study group as shown in the table.

Table 2: Mean and SEM values of FBS and HbA1c levels in patients of diabetes and control subjects

Parameters	Diabetic Subjects	Control Subjects	P- Value
HbA1c	5.78 \pm 0.19	4.62 \pm 0.18	<0.001
FBS (mg/dl)	115.72 \pm 3.83	92.33 \pm 3.61	<0.001

SEM:- Standard error of mean

Mean value of HbA1c and FBS are also shown in (Table 2), mean value of HbA1c in control subjects was 4.62 \pm 0.18 and 5.78 \pm 0.19 in diabetic subjects. HbA1c values were significantly higher in diabetic subjects (<0.001) as compared to control subjects.

The mean value of FBS in diabetic subjects was 115.72 \pm 3.83 and 92.33 \pm 3.61 in control subjects, FBS mean value was found to be significantly lower in control group (<0.001) as compared to diabetic subjects.

4. Discussion

Results of our study showed significant correlation between FBS and Lipid profile (TC, TG, LDL, HDL, VLDL & NON HDL). Studies have shown that high level of Cholesterol, Triglyceride, LDL and low HDL is well known risk factors for coronary artery diseases [5].

Our study is in accordance with the study conducted by Khan et al. They have shown that there is a direct correlation between HbA1c and FBS with TC, TG & LDL and inverse correlation with HDL.[6]

Results of our study shows that the level of LDL, TC & TG were significantly higher in Type 2 diabetics, which is in accordance with the study conducted by Wexler et al.[7]

Diabetic patients with elevated HbA1c and altered Lipid profile can be considered as a very high risk group for severe complications. Improving glycemic control can substantially reduce the risk in diabetic patients.[8]

It has also been showed in previous study conducted by Khaw et al, that by reducing the level of glycosylated hemoglobin (HbA1c) by 0.2% could lower the mortality rate by 10%.[9]

Goldberg in their study showed that the cause of altered Lipid profile in Type 2 diabetes mellitus may be, that insulin is not working properly or secreted in a proper manner which affects the production of liver apolipoprotein.^[10] Altered Lipid profile has been frequently seen among Type 2 diabetic subjects which has been positively associated with CHD patients. Very few researchers have reported significant positive correlation between HbA1c and Lipid profile [11].

And they suggested the importance of glycemic control in normalizing altered Lipid profile.[12,13]

In our study, we found that HbA1c has direct significant and positive correlations with FBS, TC, TG &

LDL similar to many other studies conducted by various researchers.[12,13] Diabetic patients with poor and worse glycemic control had significantly higher levels of FBS, TG, TC & LDL, similar to other studies and have inverse relation with HDL.[12,14,15]

Thus, the results of our study suggest the importance of hyperglycemia in order to manage Lipid profile and to reduce the risk for cardiovascular diseases in Type 2 diabetic subjects.

5. Conclusion

Our study demonstrates that, altered Lipid profile has been associated with elevated level of Fasting blood glucose. Thus, the adverse effect of hyperglycemia and associated dyslipidemia must not be overlooked in diabetic subjects. Thus, continuous monitoring of Blood glucose level, HbA1c and Lipid profile in diabetic patients is highly recommended. Also HbA1c may be utilized for the screening of population, which is on high-risk for early intervention with hypo lipidemic drugs and thus prevents various severe complications.

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