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Association of Glycosylated Hemoglobin and Lipid Profile Levels Among Type 2 Diabetic Patients in Sangareddy, Telangana, India.

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ABSTRACT

The present study was aimed to assess the relationship between HbA1c and lipid profile among type 2 diabetic patients. A total of 160 study subjects of both sex groups were selected from the medicine ward of MNR hospital during the period from January 2015 to December 2015. Fasting venous blood sample were analysed for fasting blood glucose (FBS), Glycated hemoglobin and lipid profile. Statistical analysis was done using student unpaired t test. HbA1c showed positive and correlations with triglycerides, total cholesterol, LDL, VLDL. The serum HDL was significantly decreased in diabetes mellitus patients compared to healthy controls. These findings indicate that HbA1c act as a potential biomarker for predicting dyslipidemia in type 2 diabetic patients in addition to glycemic control.

Keywords: Glycosylated hemoglobin (HbA1c), cardiovascular diseases (CVDs)

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INTRODUCTION

Globally diabetes mellitus became one of the major health problems and endemic with rapidly increasing prevalence in both developed and developing countries [1]. According to World Health Organization (WHO), India has a high prevalence of diabetes and declared India as the diabetes capital of the world. In India, type 2 diabetes mellitus rapidly increasing day by day due to reduced physical activity and increased obesity. According to International Diabetes Federation (IDF) in India 40 million people are living with Diabetes mellitus and are projected to increase to 70 million by 2020 [2].

Diabetes mellitus is a metabolic disorder characterized by persistently elevated levels of blood glucose with disturbances of fat, carbohydrate and protein metabolism as a result of a defect in insulin production or insulin action or both [3]. The long-term complication of diabetes mellitus includes dysfunction, damage to various organs, especially the heart, kidneys, eyes, nerves and blood vessels and are responsible for the majority of morbidity and mortality associated with the disease.

The Majority of cardiovascular deaths are associated with diabetes mellitus and dyslipidemia. These increase the risk of Atherosclerosis and increases the risk of cardiovascular disease (CVD) compared with people without diabetes. Globally there is a wide variation in serum lipid profile among different populations. Increased serum levels of triglycerides (TG), Low-density lipoproteins (LDL), Total Cholesterol (TC), and decreased High-density lipoproteins (HDL) are known to be associated with major risk factors for cardiovascular diseases (CVDs) [4,5].

Glycated hemoglobin (HbA1c) is a diabetic marker and reflects average plasma glucose over the previous 8 to 12 weeks before the blood sample was obtained [6]. An HbA1c level predicts the risk for the development of diabetic complications in diabetes patients [7]. Apart from classical risk factors like dyslipidemia, elevated HbA1c has now been regarded as an independent risk factor for CVD in subjects with or without diabetes.

So the present study was aimed to assess the relationship between HbA1C and lipid profile among type 2 diabetic patients.

MATERIALS AND METHODS

The present study was carried out at MNR Medical college & hospital situated in Sangareddy, part of Medak District, Telangana state (600 beds teaching hospital catering to rural population). A total of 160 study subjects of both sex groups were selected from the medicine ward of MNR hospital during the period from January 2015 to December 2015. This study was approved by institutional ethical committee and investigations were carried out in the biochemistry laboratory, MNR Medical College & Hospital, Sangareddy.

Collection of Blood Sample:

Blood samples were collected, after 12 hours fast from the above study subjects. 5ml of blood from the cubital vein was collected in a plain bottle after explaining the procedure to the study subjects. Serum was separated from the blood samples by a centrifuged machine at 3000 rpm for 10 minutes in the biochemistry department. Following estimations are carried out on the serum samples by standard kit methods and analyses were performed on ERBA Chem-5 semi-auto analyzer.

Parameters measured:

In the present study fallowing parameters were measured:

1. Fasting Blood Glucose
2. HbA1c
3. Total Cholesterol
4. Triglycerides
5. HDL- Cholesterol

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The serum glucose determined by using the GOD-POD method [8] and HbA1c was estimated by using direct enzymatic assay method by using Ion exchange chromatography (Crest A Coral clinical system, USA). Serum total cholesterol was measured by CHOD – PAP method [9], Triglycerides were measured by GPO-Trinder method [10], HDL- Cholesterol measured by Phosphotungstic acid method [11] and the values of LDL and Very-low-density lipoprotein cholesterol (VLDL) can be calculated by using Friedewald's equation [12] .

Statistical Analysis

The collected data were analyzed by SPSS software version 16.0. All results were presented as mean ± standard deviation (SD). A p-value of less than 0.0001 was considered significant.

RESULTS

In the present study, total 160 subjects were divided into two groups, 60 controls (non- diabetic subjects) and 100 cases (type 2 diabetic patients) with the age range of 30 – 70 years. Out of 60 controls, 36 were males and 24 females and in 100 diabetic cases, 70 were males and 30 females as shown in the [Table 1]. The mean and standard deviation (Mean ± SD) values of fasting blood glucose (174.54 ± 16.57) and Glycosylated hemoglobin (7.26 ± 0.52) in diabetes mellitus patients were significantly elevated in comparison to healthy controls (P<0.0001) **(table 2).** The mean ± SD levels of total cholesterol, triglycerides, LDL, VLDL showed statistically significant elevation in diabetic Mellitus subjects compared to control subjects (P<0.0001). The mean ± SD level of serum HDL was statistically significantly decreased in diabetes mellitus patients compared to healthy controls (P<0.0001) as shown in table 2.

Table 1: Age and Gender wise distribution of Cases and Controls.

Age	Cases(n=100)		Controls (n=60)	
	Males (%) (n= 70)	Females (%) (n= 30)	Males (%) (n= 36)	Females (%) (n=24)
30- 40	9(12.85%)	5(16.66%)	6(16.66%)	3(8.4%)
41-50	16(22.85%)	8(26.66%)	9(25%)	5(16.6%)
51-60	24(34.28%)	10(33.33%)	11(30.55%)	7(16.6%)
61-70	21(30%)	7(23.33%)	10(27.77%)	9(25%)
Total	**70(100%)**	**30(100%)**	**36(100)**	**24(100)**

Table 2: Comparison of FBG, HbA1c and Lipid Profile between controls and type 2 diabetic subjects.

Parameters	Cases (n=100)	Controls (n=60)	t- value	P-value
	Mean ± SD	Mean ± SD		
Fasting Blood Glucose (mg/dl)	174.54 ± 16.57	91.4 ± 6.9	36.92	< 0.0001 *S
HbA1c (%)	7.26 ± 0.52	4.75 ± 0.20	35.74	< 0.0001 *S
Total cholesterol (mg/dl)	228.01 ± 18.87	153.4 ± 8.31	28.00	< 0.0001 *S
Triglycerides (mg/dl)	176.03 ± 19.7	127.4 ± 9.05	17.99	< 0.0001 *S
HDL (mg/dl)	39.62 ± 2.61	49.06 ± 3.5	19.57	< 0.0001 *S
LDL (mg/dl)	154.40 ± 19.87	81.28 ± 9.47	26.71	< 0.0001 *S
VLDL (mg/dl)	33.4 ± 2.83	25.48 ± 1.81	17.91	< 0.0001 *S

S* = Statistically Significant

DISCUSSION

The incidence of diabetes is increasing in India with >62 million Indians currently diagnosed with diabetes mellitus [13]. In the present study, we evaluated the relationship between HbA1c and serum lipid profile among the rural population of Sangareddy. The Mean ± SD values of fasting blood glucose and HbA1c in diabetes mellitus patients were significantly elevated in comparison to healthy controls. Similar findings were observed by Rosediani M et al, [14] and Ito.C et al, [15]. The mean ± SD of the total cholesterol, LDL and triglycerides were significantly higher in type 2 Diabetic patients compared to healthy controls. Similar findings were observed by Erciyas F et al, [16] and Ohta T et al., [17]. The mean ± SD level of serum HDL was statistically

significantly decreased in diabetes mellitus patients compared to healthy controls. Similar findings were observed by Gambir JK et al,[18].

This study reveals that, among diabetic subject's elevated levels of triglycerides, cholesterol, LDL- C and low HDL-C levels which are a well-known risk of CVDs. Several factors are responsible for diabetes dyslipidemia; important are Insulin affects the production of apolipoprotein in the liver. The apolipoprotein regulates the enzymatic activity of lipoprotein lipase (LpL) and cholesterol ester transport protein. Among type 2 diabetes, deficiency of Insulin reduces the activity of hepatic lipase and several steps involved in the production of biologically active lipoprotein lipase [17,19].

The present study reveals that the association between HbA1c with various lipid parameters suggests the importance of glycemic control in order to control dyslipidemia. According to diabetes complications and control trial (DCCT), HbA1c act as a gold standard marker for glycemic control. The level of HbA1c value ≤ 7.0 % was said to be appropriate for reducing the risk for cardiovascular complications [13] and higher levels of HbA1c ≥ 7.0 % can reveal a significant increase in LDL –C, total cholesterol, triglycerides and low HDL-C in comparison to subjects with HbA1c value ≤ 7.0 %. So the present study reveals the severity of dyslipidemia increases in patients with higher levels of HbA1c.Similar findings were reported by Khan et al., [20]. Diabetic patients with higher levels of HbA1c and dyslipidemia can be considered as a very high risk of cardiovascular diseases. Khaw et al., [21] reported that reducing the HbA1c level by 0.2% could lower the mortality by 10%. Thus the result of our study suggests the importance of glycemic control in order to manage dyslipidemia and risk of cardiovascular events in type 2 diabetic patients.

CONCLUSION

In the present study HbA1c showed positive correlations with total cholesterol, LDL, triglycerides & VLDL and negative correlation was observed between HbA1c and HDL levels. So, HbA1c can be utilized for screening of diabetic patients for risk of CVDs.

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