ORIGINAL RESEARCH PAPER

Volume-7 | Issue-4 | April-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

STUDY OF ASSOCIATION BETWEEN GLYCATED HAEMOGLOBIN WITH LIPID PARAMETERS IN TYPE-2 DIABETES MELLITUS PATIENTS IN A TERTIARY CARE HOSPITAL

Diabetology

Dr. Bency Baby* PG Resident 3rdyr, Jhalawar Medical College, Jhalawar. *Corresponding Author

ABSTRACT

Introduction: DCCT has established HbA1C as the gold standard for glycemic control. Early management of dyslipidemia and improvement of glycemic control are helpful in reducing incidence of CVD among T2DM patients.

Aim: To evaluate the association between HbA1c and lipid parameters

Methods: Among 100 subjects, 50 healthy control and 50 type 2 diabetic mellitus patients included. Fasting blood sample was collected for estimation of lipid profile and HbA1c

Results: Total cholesterol, triglyceride and very low density lipoprotein were observed significantly higher in diabetic subject compared to healthy subject. Glycated haemoglobin showed significant positive correlation with total cholesterol triglycerides LDL and fasting blood in diabetic subject

Conclusion : HbA1c can be utilized for screening high-risk diabetic patients for timely intervention with lipid lowering drugs.

KEYWORDS

HbA1C, Dyslipidemia, Diabetes mellitus

INTRODUCTION

In 2014, the IDF(International diabetic federation) estimated that 8.2% of adults aged 20–79 (387 million people) were living with diabetes and is on the increase. Glycated haemoglobin (HbA1c) is routinely used marker for long term glycemic control. 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.

In accordance with its function as an indicator for the mean blood glucose level, HbA1c predicts the risk for the development of diabetic complication in diabetes patients. Estimated risk of CVD has shown to be increased by 18% for each 1% increase in absolute HbA1c value in diabetic patients[1].

Positive relationship between HbA1c and CVD has been demonstrated in non-diabetic cases even within normal range of HbA1c1. The aim of this study was to find out association between glycaemic control (HbA1c as a marker) and serum lipid profile in type 2 diabetic patients and effect of the ant diabetic treatments. Low HDL cholesterol, high VLDL cholesterol, total cholesterol, LDL-C and triglycerides are powerful risk indicators for coronary heart disease events in patients with type2 diabetes mellitus. This study is an attempt to evaluate the diagnostic value of glycated haemoglobin (HbA1c) in predicting diabetic dyslipidemia; risk of coronary heart disease than similarly dyslipidaemic non diabetic subjects.

OBJECTIVE OF THE STUDY

- To evaluate the association between HbA1c and various lipid parameters

Materials & Methods

- It is an observational cross sectional study conducted in 100 subjects; in which 50 are apparently healthy, remainining are diabetic patients which were randomly selected.

Inclusion Criteria

Diabetic patients

- Type 2 DM patients in age group of 35-70 years with >1 year history of type-2 diabetes and/or on treatment with oral anti-hyperglycaemic of any duration.
- Fasting blood glucose levels >126mg/dl.

Controls

- Cases of age and sex matched non-diabetic people.

Exclusion Criteria

- Patients having history of type 1 diabetes
- Hypertensive patients
- Chronic alcoholics and drug addicted.
- Pregnancy and gestational diabetes
- Adverse renal and liver disease.
- Acute and chronic inflammatory disease

A detailed clinical history of each patient was recorded in a self-constructed proforma which include age, sex, address occupation, socioeconomic status, personal history, past and present medical history. 5ml fasting blood sample was collected in plain vials for estimation of Lipid profile and HbA1c from healthy subjects and patients with the type 2 diabetic mellitus.

Statistical Analysis

Data was analysed by using SPSS 20.0 (trial version) software and appropriate statistical test were used to analyse the data. Results were expressed as mean ± standard deviation and were analyzed by unpaired Student's t-test and correlation test . The value of $P < 0.01$ was considered significantly.

Results

In this study, the pattern of lipid profile parameters in diabetic subjects and its correlation with HbA1c was evaluated. The levels of HbA1c and FBG did not differ significantly between male and female .

There were no significant difference in TC (p=0.698), TG (p=0.443), LDL (p=0.737) and HDL (p=0.245) levels between male and female in type 2 diabetic patients in local population of Jhalawar .

HbA1C levels have shown significant positive correlation with total cholesterol (p<0.001), triglyceride (p=0.015) and low density lipoprotein (p<0.001) which are well known risk factors for cardiovascular diseases.

Discussion

In this study, HbA1C levels have shown significant positive correlation with total cholesterol (p<0.001), triglyceride (p=0.015) and low density lipoprotein (p<0.001) which are well known risk factors for cardiovascular diseases.

In various studies, HbA1c level was eminent as showing positive correlation with TC, LDL-C and TG in diabetic patients1,2,3 Insulin regulates the enzymatic activity of lipoprotein lipase (LpL) and Cholesterol ester transport protein. All these factors are likely cause of dyslipidaemia in type 2 diabetes4. Moreover, insulin deficiency reduces the activity of hepatic lipase and several steps in the production of biologically active LpL may be altered in diabetes5. HDL cholesterol showed nonsignificant negative correlation with the HbA1c in this study. Moreover, NCEP ATPIII has recommended using Non-HDL cholesterol in assessing CVD risk in patients with diabetes.

The correlation of HbA1c with LDL and total cholesterol was found to be more significant than correlation of HbA1c with triglyceride (TG) in the study. In a prospective cohort study with inclusion of 418 Type 2 diabetic individuals with follow-up until the appearance of a cardiovascular event5, showed that the main lipid predictor of vascular events was mean TC/HDL-C ratio with hazard ratio (HR) of 1.46. In the same study, the predictive power of the TC/HDL ratio was found to be higher than that of Non-HDL cholesterol and study concluded that

TC/HDL-C can be used as a treatment guides for diabetic dyslipidaemia.

The Diabetes complications and control trial (DCCT) established HbA1c as the gold standard of glycaemic control. The level of HbA1c value ≤7.0% was said to be appropriate for reducing the risk of cardiovascular complications6. The diabetic patients with HbA1c value > 7.0% exhibited a significant increase in TC, LDL-C, TG and LDL without any significant alteration in HDL.

Khan et al7. showed the impact of glycaemic control on various lipid parameters in which the diabetic patients were categorized into 3 groups according to their HbA1c levels: group 1, good glycaemic control (HbA1c<6%); group 2, poor glycaemic control (HbA1c >6%–9%) and group 3, worst glycaemic control (HbA1c>9%). Though there was no significant differences in LDL in 3 groups with regard to glycaemic control, alterations in other lipid parameters were statistically significant in three different groups.

Severity of dyslipidaemia increases in patients with higher HbA1c value. As elevated HbA1c and dyslipidaemia are independent risk factors of CVD, diabetic patients with elevated HbA1c and dyslipidaemia can be considered as a very high risk group for CVD. Improving glycaemic control can substantially reduce the risk of cardiovascular events in diabetics8.

Significant correlations between HbA1c and the lipid parameters and a linear relationship between HbA1c and dyslipidaemia point towards the usefulness of HbA1c for screening high-risk diabetic patients. Furthermore, there were no significant interactions between sex or age and HbA1c with respect to lipid profile suggesting the validity of HbA1cfor predicting dyslipidaemia irrespective of patient's gender and age.

Table : 1 Demographics and clinical variables of the study population

Parameters	Cases (n=100)	Control (n=50)	Diabetic (n=50)	p-value
Age(Years)	49.49±0.95	48.14±1.33	50.84±1.32	p=0.1536
Weight(Kg)	64.72±11.41	67.12±12.95	64.72±11.41	p=0.327
Female (%)	44%	42%	46%	
Height(Cm)	161.54±8.51	162.56±8.62	160±8.37	p=0.135
BMI(Kg/m2)	26.41±4.02	24.29±2.44	26.01±4.30	p=0.015
FBS (mg/dl)	_	105.62±8.61	258.68±83.37	p<0.001
HBA1c	_	5.27±0.33	11.58±3.39	p<0.001
Cholesterol	_	175.4±47.73	217.3±37.41	p=0.004
TRIG	_	102.04±42.68	154.92±60.08	p=0.010
HDL	_	50.22±13.83	50.66±14.50	p=0.876
LDL	_	120.9±32.51	136.70±35.16	p=0.224
VLDL	_	21.16±9.16	25.04±9.40	p=0.039

Values are presented as Mean ± Standard deviation (SD). P<0.05 was considered statistically significant difference. Independent sample t-test was used to compare means of demographics, and clinical variables of subjects. BMI: Body Mass Index, TRIG:Triglycerides, HDL: High density lipoprotein, LDL: Low density lipoprotein, HBA1C: Glycated haemoglobin, HB: Haemoglobin. Data are given as mentioned as Person's correlation coefficient, r (p value summary; 2 tailed) between respective parameters of diabetic subjects (n=50).

Table : 2 Correlation between HBA1c, fasting glucose, BMI lipid parameter in diabetic subjects

	HbA1C	BMI(Kg/m2)	FBS	T.Chol	LDL	TG	HDL	VLDL
HbA1C	1	-0.17 (p=0.218)	0.88 p<0.001	0.59 p<0.001	0.57 p<0.001	0.34 p=0.015	-0.15 p=0.297	0.34 p=0.015
BMI(Kg/m2)		1	-0.24 p=0.087	-0.05 p=0.698	-0.01 p=0.458	0.11 p=0.441	0.02 p= 0.880	0.11 p=0.441
FBS (mg/dl)			1	0.54 p<0.001	0.90 p<0.001	0.30 p=0.032	-0.13 p=0.379	0.30 p=0.032
T.Chol				1	0.90 p<0.001	0.27 p=0.059	0.18 p=0.204	0.27 p=0.059)
LDL					1	0.04	-0.15 (p=0.307)	0.04 (p=0.763)
TG						1	-0.24 (p=0.099)	-
HDL							1	-0.24 (p=0.098)
VLDL								1

Conclusion

Significant correlations between HbA1c and the lipid parameters and a linear relationship between HbA1c and dyslipidaemia point towards the usefulness of HbA1c for early diagnosis and screening high-risk diabetic patients. Furthermore, there were no significant interactions between sex or age and HbA1c with respect to lipid profile suggesting the validity of HbA1c for predicting dyslipidaemia irrespective of patient's gender and age.

The awareness of diabetic patients about their high risk of having dyslipidaemia complications and the importance of having routine screening for their lipids profile should be stressed.

References

1. Selvin, E., Marinopoulos, S., Berkenblit, G., Rami, T., Brancati, F. L., Powe, N. R. And Golden, S. H. (2004) Meta-analysis: glycosylated hemoglobin and cardiovascular disease in diabetes mellitus. Annals of internal medicine, 141, 421-431.
2. Khaw, K.-T., Wareham, N., Bingham, S., Luben, R., Welch, A. and Day, N. (2004) Association of hemoglobin A1c with cardiovascular disease and mortality in adults: the European prospective investigation into cancer in Norfolk. Annals of internal medicine, 141, 413-420.
3. Masram, S., Ghangle, S. and Bimanpalli, M. (2012) Study of Lipid Profile and Glycated Hemoglobin in Diabetes Mellitus. Indian Medical Gazette, 257-265.
4. Ginsberg, H. N., Zhang, Y.-L. and Hernandez-Ono, A. (2005) Regulation of plasma triglycerides in insulin resistance and diabetes. Archives of medical research, 36, 232-240.
5. Durrington, P. and Sniderman, A. (2002) Epidemiology and pathophysiology. pp. 71-89. Health Press, Oxford, UK.
6. Rohlfing, C. L., Wiedmeyer, H.-M., Little, R. R., England, J. D., Tennill, A. and Goldstein, D. E. (2002) Defining the relationship between plasma glucose and HbA1c. Diabetes care, 25, 275-278.
7. Khan, H., Sobki, S. and Khan, S. (2007) Association between glycaemic control and serum lipids profile in type 2 diabetic patients: HbA1c predicts dyslipidaemia. Clinical and experimental medicine, 7, 24-29.
8. Selvin, E., Wattanakit, K., Steffes, M. W., Coresh, J. and Sharrett, A. R. (2006) HbA1c and peripheral arterial disease in diabetes. Diabetes care, 29, 877-882.