Relationship among HbA1c and Lipid Profile in Punajbi Type 2 Diabetic Population

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Abstract

This study was planned to evaluate the relationship among glycated haemoglobin (HbA1c) and lipid profile in type 2 diabetic males of Punjabi population. A total of 120 type 2 diabetics with an age ranged from 30 to 70 years volunteered to participate in this study. The glycated haemoglobin (HbA1c) & lipid profiles were recorded with standard procedure. The statistical analysis was done by using SPSS version 16.0. The mean HbA1c was $7.34 \pm 1.24\%$. There were 59% subjects with high total cholesterol (TC) levels and 98% were with raised LDL levels. The 65% of the subjects were having lower HDL level. HbA1c demonstrated significant positive relationship with total cholesterol, TC (r=0.29), triglyceride, TG (r=0.26), high density lipoprotein cholesterol, HDL-C (r=0.19) and with low density lipoprotein cholesterol, LDL-C (r=0.5). It was concluded from the results of this study that HbA1c can also be used as a predictor of dyslipidaemia in type 2 diabetics in addition to as a glycemic control parameter. Thus, early diagnosis of dyslipidaemia can be used as a preventive measure for the development of cardiovascular disease (CVD) in type 2 diabetics.

Keywords: Diabetes mellitus, Dyslipidemia, CVD.

Introduction:

The diabetes mellitus is becoming more and more prevalent in Indian society. In India, it is estimated that approximately 2% of the population, 15 million people have diabetes *(Swami, 1984).* The number of cases is said to be rising by 5%-6% each year and an estimated 300,000 people die from diabetes and its complication *(Herman et al., 1984).* There are about 3.5 crore diabetics in India and the figure will rise to about 5.2 crores by 2025. Every 5th patient visiting a consulting physician is a diabetic, and, every 7th patient visiting a family physician is a diabetic. Prevalence of diabetes is higher in Indian subcontinent & it is estimated that 20% of global burden resides in South East Asia Region (SEAR) area, which will be tripled to 228 million by the year 2025 from the current 84 million *(Park, 2007).* Keeping in view the alarming increase in the incidence and prevalence of diabetics in India, WHO has declared India as the "Diabetic Capital of the World" *(Gupta, 2002).* Chronic hyperglycemia is associated with significant long-term complications, particularly damage to the nerves, heart, blood vessels, eyes and kidneys *(Yki-Yarvinen, 1998).* The abnormalities like insulin resistance, hyperinsulinemia, hyperglycemia, dyslipidemia, and hypertension in type 2 diabetics tend to cluster and are often referred to as the "metabolic syndrome *(Grundy,1998)."* Elements of the

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metabolic syndrome are strong risk factors for cardiovascular disease *(Lamarche et al., 1998 and Reaven & Law, 1994).* An early intervention to normalize circulating lipids has been shown to reduce cardiovascular complications and mortality *(Windler, 2005).* The glycated haemoglobin (HbA1c) provides an index of a type 2 diabetics' average blood glucose level during the past 2–3 months and considered to be the most objective and reliable measure of long-term metabolic control of glucose *(Nathan, 1984).* American Diabetes Association (ADA) proposed the use of HbA1c in the definition of diabetes and the category of increased diabetes risk (which also includes impaired fasting glucose and impaired glucose tolerance) in 2010 *(American Diabetes Association-Diabetes Care, 2010).* Estimated risk of CVD has shown to be increased by 18% for each 1% increase in absolute HbA1c value in diabetic population *(Selvin, 2004).* Thus, the aim of this study was to observe the relationship among glycated haemoglobin (HbA1c) and lipid profile in male type 2 diabetics of Punjabi population.

Materials and methods

The present study was conducted on one hundred twenty type 2 diabetic male patients belong to Patiala district of Punjab after obtaining their informed written consent and selected them as subjects and their age ranged from 30-70 years. The study protocol was approved by the Ethics Committee of Punjabi University, Patiala. The Lipid Profile - total cholesterol (TC), high density lipoprotein (HDL), very low density lipoprotein (VLDL) & Triglycerides (TG)] of each subject was measured by using Erba Blood Analyzer. The low density lipoprotein (LDL) was calculated by using Friedewald formula: LDL= TC – (TG/5) - HDL. The glycated haemoglobin (HbA1c) was estimated by appropriate standard kits. The data was analyzed with SPSS version 16.0. The mean, SD and correlation (Pearson's) test was used to interpret the results.

Results

The mean age, HbA1c, total cholesterol, triglycerides, high density lipoprotein, low density lipoprotein and very low density lipoprotein were 50.3 ± 11.8 years, $7.34 \pm 1.24\%$, 203.9 ± 15.8 mg/dl, 151.1 ± 17.7 mg/dl, 37.7 ± 6.2 mg/dl, 124.4 ± 11.9 mg/dl and 32.3 ± 7.1 mg/dl respectively. According to NCEP-ATPIII guideline, hypercholesterolemia is defined as TC>200 mg/dl, high LDL-C when value >100 mg/dl, hypertriglyceridemia as TAG >150 mg/dl and low HDL-C when value <40 mg/dl. Dyslipidemia was defined by presence of one or more than one abnormal serum lipid concentration. Diabetes was defined as per American Diabetes Association (ADA) criteria. Results shows that 59% type 2 diabetics in this study had hypercholesterolemia, 53% Hypertriglyceridemia, 98% abnormal LDL levels and 65% of them the HDL was less than 40 mg/dl (Table 1).

Table 1: Mean ± SD of HbA1c & lipid profile of type 2 diabetics

Variables	Mean
Age (years)	50.3 ± 11.8
HbA1C (%)	7.34 ± 1.24
TC (mg/dl)	203.9 ± 15.8
HDL (mg/dl)	37.7 ± 6.2
LDL (mg/dl)	124.4 ± 11.9
VLDL (mg/dl)	32.3 ± 7.1
TG (mg/dl)	151.1 ± 17.7

TC- total cholesterol, HDL- high density lipoproteins, LDL-low density lipoproteins, VLDL- very low density lipoproteins, TG- triglycerides

Further, it was found that glycated haemoglobin (HbA1c) was positively and significantly related with total cholesterol (r=0.29), high density lipoproteins (r=0.19), triglycerides (r= 0.26) and very low density lipoproteins (r=0.16). However, low density lipoproteins (r=0.5) did not show any significant relationship with HbA1c.

Table 2. Correlation among HbA1c and lipid profile of type 2 diabetics

Variables	TC	HDL	LDL	VLDL	TG
HbA1C	0.29[**]	0.19[**]	0.05	0.16[*]	0.26[**]
TC	-	0.28[**]	0.66[**]	0.50[**]	0.58[**]
HDL		-	0.09	0.20[**]	0.44[**]
LDL			-	0.39[**]	0.32[**]
VLDL				-	0.66[**]

**p<0.01; * p<0.05
HbA1c-glycated haemoglobin, TC- total cholesterol, HDL- high density lipoproteins, LDL-low density lipoproteins, VLDL- very low density lipoproteins, TG- triglycerides

Discussion

Results of this study show that the levels of LDL, HDL, TC and TG were significantly higher in type 2 diabetics. These findings were in agreement with the previous studies *(Wexler et al., 2005)*. High prevalence of hypercholesterolemia, hypertriglyceridemia and high LDL and low HDL was found in type 2 diabetics in this study which are well known risk factors for cardiovascular diseases. *Goldberg (1996)* reported that the cause of dyslipidaemia in type 2 diabetes mellitus may be that insulin is not working properly which affects the liver apolipoprotein production. The apolipoprotein regulates the enzymatic activity of lipoprotein lipase (LpL) and Cholesterol ester transport protein

(Goldberg, 1996). A highly positive significant relationship of HbA1c with dyslipidemia was observed in the present study. *Erciyas et al, (2004)* also reported positive correlation of HbA1c level with TC and TG in diabetic patients. The Diabetes complications and control trial (DCCT) established HbA1c as the gold standard of glycemic control. The level of HbA1c value ≤7.0% was said to be appropriate for reducing the risk of cardiovascular complications. The diabetic patients with higher HbA1c value (value > 7.0%) can exhibit a significant increase in TC, LDL, TAG and HDL in comparison to patients with HbA1c value ≤7.0% *(Rohlfing et al., 2002)*. *Khan et al., (2007)* also reported that 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 glycemic control can substantially reduce the risk of cardiovascular events in diabetics *(Selvin et al, 2006)*. It has been reported that reducing the HbA1c level by 0.2% could lower the mortality by 10% *(Khaw et al, 2001)*. Thus, the results of the present study suggest the importance of glycemic control in order to manage dyslipidaemia and risk for cardiovascular diseases in type 2 diabetics.

Conclusions

It was concluded from the results of this study that HbA1c can be used as a predictor of dyslipidaemia in type 2 diabetics in addition to as glycemic control parameter. Thus, early diagnosis of dyslipidaemia can be used as a preventive measure for the development

of cardiovascular disease (CVD) in type 2 diabetics.

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