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Pathology

CORELATION OF GLYCOSYLATED HAEMOGLOBIN LEVEL WITH LIPID RATIO AND INDIVIDUAL LIPIDS IN TYPE 2 DIABETIC PATIENTS

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ABSTRACT Objective: To study the correlation of lipid ratios and individual lipid indexes of patients with type 2 diabetes with				

ABSTRACT Objective: To study the correlation glycosylated hemoglobin (HbA1c).

Methods: Samples were collected from 297 type 2 diabetic patients (aged 19-90 years; male 187, female 110. The sera were analyzed for HbA1c, total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C and low-density lipoprotein cholesterol (LDL-C). According to the HbA1c level, the patients were divided into three groups, group A (HbA1c<7%, n=170), group B (7%>HbA1c 10%, n=78), and group C (HbA1c>10%, n=49). The correlation of HbA1c with lipid ratios & individual lipid indexes were analyzed.

Results: With the increased level of HbA1c, LDL-C had a significantly increasing trend (P<0.05); whereas TC went up with the increased HbA1c, without any significant differences between three groups. There was no significant correlation between HbA1c and TG or HDL-C. With the increased level of HbA1c, TC/HDL-C, LDL-C/HDL-C ratios were gradually increased, with significant differences among groups (P<0.05). The lipid ratios, especially LDL-C/HDL-C ratio was more susceptible to impaired lipid metabolism in T2DM patients than individual lipid.

 $\hat{\mathbf{C}}$ onclusions: LDL-C/HDL-C ratio is helpful in assessing and reducing the risk of cardiovascular disease caused by impaired lipid metabolism in type 2 diabetic patients.

KEYWORDS: type II dIabetes , lipid profile , glycosylated hemoglobin

Introduction:

Diabetes is a global disease with rapid increase in both developed and developing countries[1].Hyperglycemia is one remarkable feature of diabetes patients. As an important indicator of long-term blood glucose control, glycosylated hemoglobin(HbA1c) can reflect cumulative blood glucose for 2-3 months[2]. Diabetes Complications and Control Trial has established HbA1c as the gold standard for glycemic control, and proposes HbA1c at < 7% as critical value for reducing the risk of vascular complications[3]. Elevated HbA1c has been regarded as an independent risk factor for coronary heart disease(CHD) in patients with or without diabetes[4]. Ravipati et al[5] also observed a direct correlation between HbA1c concentration and the severity of coronary artery disease (CAD) in diabetic patients. It is reported that most patients with type 2 diabetes could have dyslipidemia at varying degrees, characterized by increased levels of TG and LDL-C and decreased HDL-C. Giansanti et al[6] also observed significantly higher levels of hypercholesterolemia and hyperlipidemia in type 2 diabetic patients with cardiovascular disease(CVD) compared to diabetic patients without CVD, which may elevate the mortality rate of these patients[7]. At recent years, more data support that the lipid ratio is more sensitive in reflecting the morbidity and severity of CHD than individual lipid[8,9]. However, little is known about the relationship between hyperglycemia and lipid ratio levels in type 2 diabetes mellitus (T2DM) patients.

In this study, we examined the correlation between the severity of glucose intolerance, which was reflected by HbA1c level, and blood lipid ratio & individual lipid, to evaluate which is the most sensitive in predicting risk and severity of CVD in T2DM patients.

Materials and Methods

The present study was conducted in G.S.V.M Medical College KANPUR, India . A total of 297 patients with T2DM admitted during January 2017 to june 2017 to our hospital were selected, aged 18-90 years old [(60.05 ± 14.58) yrs], including male 187 and female 110. All patients underwent oral glucose tolerance test and were diagnosed as T2DM. All of them had no lipid-controlled drug in recent three months.

Venous blood samples were collected after at least 8 h fasting. The sera were analyzed for HbA1c, total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C). HbA1c was measured by microcolumn chromatography,TC and TG by enzymatic method, HDL-C and LDL-C by the direct method. TG/HDL-C, TC/HDL-C, LDL-C/HDL-C ratios were calculated, respectively. All patients were categorized into 3 groups according to their HbA1c level: group A (HbA1c <7%, n=170, group B (7%> HbA1c <10%, n=78), and group C (HbA1c >10%, n=49). The correlation of lipid ratios and individual lipid indexes among three groups were analyzed.

The data was analyzed by SPSS16.0 statistical software. Data are expressed as the mean +SD. The relation of HbA1c and various blood lipid parameters was evaluated by oneway analysis of variance (ANOVA). P<0.05 was considered as statistically significance.

Results and Discussion

Correlations between blood individual lipid indexes

TC was gradually increased as increasing HbA1c; however, there was no significant correlation between TC and HbA1c (Table 1) (F=2.738, P=0.059). LDL-C was increased as increasing HbA1c, and there was a significant correlation between HbA1c and LDL-C (F=4.300, P=0.012). HbA1c did not show any significant correlation with TG (F=1.133, P=0.215), or HDL-C (F=1.827, P=0.195).

Correlations between blood lipid ratio and HbA1c

HbA1c and TG/HDL-C ratio did not show any significant correlation with HbA1c (Table 2) (F=1.213, P=0.201). With the increased level of HbA1c, TC/HDL-C and LDL-C/HDL-C ratio showed a definite increasing trend, and there was a significant correlation between HbA1c and TC/HDL-C ratio

(F=3.326, P=0.026). LDL-C/HDL-C ratio was also gradually increased which had significant correlation with HbA1c (F =6.284, P=0.002). The lipid ratios, especially LDL-C/HDL-C ratio was more susceptible to impaired lipid metabolism in T2DM patients than individual lipid

Group	TG ((mg/dl))	TC (mg/dl)	HDL-C	LDL -
_			(mg/dl)	C(mg/dl)
Α	122.4±58.5	192 .9± 58.52	57.8±16.9	118.1±46.7
В	160.6±91.7	210.6±71.21	50.35±18.55	126.1±43.7
С	165.1±88.2	223.2±84.01	46.72±17.72	143.6±63.10
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Table 2 Correlations between blood lipid ratio and HbA1c.

Group	TG /HDL-C	TC /HDL-C	LDL-C/HDL -C
A	1.48 ± 1.37	3.37±1.12	1.71±0.69
В	$1.50\pm.72$	3.02±1.05	3.37±0.73
С	2.02±2.32	3.35±1.62	3.97±1.08

Discussion

We observed significant correlation between HbA1c and LDL-C in diabetic patients, which is in agreement with the findings of several other investigators who also reported significant correlations between HbA1c and individual blood lipid[10,11]. However, we did not observe significant correlation of HbA1c with TG, TC or HDL-C. Diabetic patients with poor glycaemic control exhibited a significant increase in TC/HDL-C and LDL-C/HDL-C ratios, especially in LDL-C/ HDL-C ratios. The result of this study clearly showed that the control of impaired glycaemic which is defined by HbA1c was proportionally related with degree of dyslipidemia, including LDL-C, TC/HDL-C and LDL-C/HDL-C ratios, especially LDL-C/HDL-C ratio. The reason maybe because that the change of ratios is earlier than individual lipid, especially in patients with normal blood lipid.CVD is the main cause for mortality and disability in individuals older than 65 years, despite the progressive decline in the incidence of CVD since 1970s[12]. Therefore, prevention of CVD is essential[13]. It is reported that T2MD patients had increased susceptibility to vascular disease associated with LDL-C[14]. To the contrary, Cardenas et al[15]found that HDL-C level was a major and independent risk factor, and had more relationship with the development of CAD than total cholesterol and LDL-C level. Elizabete et al[16] also reported that low HDL-C was a risk factor for CVD of the elder, whereas LDL-C showed no significant association with the development of CVD. Blood lipid ratio is more meaningful than individual blood lipid level in judging the severity of CAD[17]. Pan et al[18] showed lipid ratio is more meaningful in the early prevention and diagnosis of CHD than the individual serum lipids. LDL-C/HDL-C ratio is increased more obviously than other lipid indicators inT2DM patients complicated with CAD[19]. Shai et al[8] reported TC/HDL-C, LDL-C/HDL-C and apo B/apo A ratios are more susceptible to increased cardiovascular mortality than individual blood lipid, and they deemed that ratios have the effect of inducible-arteriosclerosis and anti arteriosclerosis. In conclusion, most patients with type 2 diabetes have dyslipidemia to varying degrees. With the increased levels of HbA1c, dyslipidemia become more severe. Compared with individual lipid indexes, the changes of lipid ratio can reflect impaired lipid metabolism at earlier stage, and the most sensitive indicator is LDL-C/HDL-C ratio. Thus, LDL-C/ HDL-C ratio is helpful in assessing and reducing the risk of cardiovascular disease due to impaired lipid metabolism in type 2 diabetic patients

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