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Lipid Profile of Diabetic Related Healthy Subjects

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ABSTRACT

Study was designed to investigate whether the presence of diabetes mellitus in a family had effect on serum lipids in healthy relatives of diabetic patients (diabetic related groups). Sixty three healthy first degree and second degree relatives of diabetic patients of both sexes, of the age group of 20-45 years from lower and middle socioeconomic group with normal fasting glucose level were compared with 30 control subjects with no known family history of diabetes mellitus.

Key Words: Triglyceride; Cholesterol; Lipoproteins

INTRODUCTION

Diabetes mellitus is a heterogeneous disorder resulting from interaction of numerous genetic and environmental factors (Boerwinkle *et al.*, 1991; Lehmann & Spinas, 1994). It has been demonstrated that patients with non-insulin dependent diabetes mellitus (NIDDM) have defects in the ability of both glucose disposal and suppress plasma free fatty acid and glycerol concentration (Pei *et al.*, 1995). The correlation between increased level of glucose, cholesterol, triglyceride, low density lipoprotein cholesterol (LDL-chol), VLDL-chol and decreased high density lipoprotein cholesterol (HDL-chol) with diabetes mellitus is well documented (Briones *et al.*, 1984; Ronnemaa *et al.*, 1989; Boerwinkle *et al.*, 1991; Rainwater & Haffner, 1994).

Subjects with impaired glucose tolerance or newly diagnosed NIDDM patients had higher levels of triglyceride and lower level of HDL-chol (Mykanen *et al.*, 1991). At diagnosis of NIDDM patients, they already have large vessel disease, micro- or macro albuminuria, retinopathy, hypertriglyceridemia or hypertension (Kelestimur, 1998). Thus, investigation of the population related to diabetic patients has gained great importance for detection of early changes to suggest possible measures to arrest some of the complications. Present study is aimed to investigate whether the presence of diabetes mellitus in a family show effect on serum lipids in healthy relatives of the diabetic patients.

MATERIALS AND METHODS

This study included 63 apparently healthy first (parents, siblings and progeny) and second degree (uncle, aunts, grant parents) relatives of diabetic patients of both sexes and 30 normal control subjects with no known family history of diabetes mellitus. Both control and diabetic related subjects were in age of 20-45 years, from lower and middle socioeconomic group and had normal fasting blood glucose level. Among control group there were 15 males and 15 females while in diabetic related group there were 19 males and 44 females. These males and female were further subdivided according to age (i.e 30 < years and > 30 years) and relation to diabetic patients.

Fasting blood samples of both control and diabetic related persons were drawn. Plasma glucose level was determined by glucose oxidase method (Barham & Trinder, 1972) using Randox glucose kit. Enzymatic methods were used for determination of serum cholesterol (Roeschlan *et al.*, 1974) using Bio-Diagnostic Kit and triglyceride (Trinder, 1969) by Human triglyceride kit. Estimation of HDL-chol was done by precipitation method (Lopes-Virella *et al.*, 1977) method using Boehinger Mannheim. HDL precipitant and subsequent determination of cholesterol by enzymatic method (Trinder, 1969). LDL-chol was calculated according to the formula given by Friedwald *et al.* (1972). Statistical significance of the results was evaluated by student 't' test (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

The data regarding mean age, height, weight and body mass index have been presented in Table I. It has been found that no significant difference was noted between non-diabetic related controls and diabetic related subjects. The mean serum triglycerides level in diabetic related males and female groups have been found higher than non-diabetic related control group respectively (Table II).

Table I. Age, height, body weight and body mass index (Mean±S.E.) of non-diabetic related controls and diabetic related subjects

Group	Age (years)	Height (cm)	Weight (kg)	Body mass index
Controls				
Male (15)	30.67±2.05	169.7±1.49	63.73±1.3	22.10±0.40
Female(15)	30.0±2.27	157.3±1.12	54.13±1.9	21.8±0.73
Subjects				
Male (19)	30.32±1.56	169.9±1.95	64.37±1.5	22.44±0.70
Female(44)	31.59±1.32	154.8±1.03	55.73±0.7	23.20±0.22

This increase appeared to be contributed by first degree relations of diabetic patients and high age group subjects (Table III). These observations are in conformity to the previous studies reported that increased level of serum triglycerides among members of NIDDM families (Elbein *et al.,* 1994; Haffner *et al.,* 1997). It was also reported that men and women who developed NIDDM later had significantly increased. The mutation of the lipoprotein lipase gene may contribute to hypertriglyceridaemia among members of female NIDDM. Hypertriglycerdaemia has also been shown to be associated with insulin resistance postulating that at least impart is a consequence of increased VLDL production and this over production may be a reflection of insulin resistance (Steiner, 1981; Vuorinen-Markola & Tki-Jarvinen, 1994). However, Osel *et al.* (1991) reported no change in triglycerides level in relatives of diabetic patients as compared with non-diabetic related controls.

The results in Table III indicate that the mean triglycerides and total cholesterol levels of diabetic related groups of age < 30 years showed no significant difference where as the mean triglycerides levels of diabetic related male and females of age <30 years were significantly ($P<0.05$) higher than non-diabetic related control groups of the same age group. It was also observed and has been shown in Table II and III that the mean total cholesterol

Table II. TG, TC, HDL-c, LDL-c and HDL-c/TC ratio (Mean±S.E.) of non-diabetic related controls and diabetic related group

Group	TG (mg/dL)	TC (mg/dL)	HDL-c (mg/dL)	LDL-c (mg/dL)	HDL-c/TC
Controls					
Male (15)	126.6±10.3	196.1±6.27	41.40±1.68	129.41±5.8	0.21±0.01
Female (15)	119.6±9.23	185.5±8.38	47.67±1.02	113.95±8.7	0.26±0.01
Subjects					
Male (19)	180.5±18.3@	211.8±12.49	38.89±1.87	136.41±11.4	0.19±0.10
Female (44)	158.5±8.2*	210.0±9.13	43.36±1.55	134.93±9.6	0.22±0.01

Table III. TG, TC, HDL-c, LDL-c and HDL-c/TC ratio (Mean±S.E.) of non-diabetic related controls and diabetic related group of age upto 30 years and above 30 years

Group	TG (mg/dL)	TC(mg/dL)	HDL-c(m,g/dL)	LDL-c(mg/dL)	HDL-c/TC
Controls					
<30 years					
Male (9)	126.1±13.55	184.8±8.04	41.3±2.5	118.3±6.7	0.22±0.02
Female(9)	125.3±13.37	178.0±10.1	47.1±1.23	105.2±11.8	0.27±0.23
>30 years					
Male (6)	127.3±17.3	213.0±7.81	41.5±2.14	146.0±6.14	0.19±0.00
Female (6)	111.0±11.95	196.3±14.10	48.5±1.84	126.3±12.3	0.25±0.01
Subjects					
<30 years					
Male (11)	154.0±21.1	200.4±16.8	41.27±2.02	128.45±15.9	0.22±0.02
Female (23)	157.9±13.24	205.5±13.2	45.7±1.84	128.1±13.5	0.25±0.02
>30 years					
Male (8)	216.8±30.7@	227.8±10.2	35.3±3.26	148.8±17.1	0.16±0.01
Female (21)	150.1±11.4*	214.6±12.2	40.1±2.47	142.2±11.83	0.20±0.02

@P<0.05 as compared to male control group; *P<0.05 as compared to female control group

Table IV. TG, TC, HDL-c, LDL-c and HDL-c/TC ratio (Mean±S.E.) of 1st and 2nd degree relatives of non-diabetic controls and diabetics

Group	TG (mg/dL)	TC (mg/dL)	HDL-c (mg/dL)	LDL-c(mg/dL)	HDL-c/TC
Controls					
Male (15)	126.6±10.3	196.1±6.27	41.0±1.6	129.4±5.88	0.21±0.01
Female (9)	119.6±9.23	185.5±8.38	47.7±1.02	113.9±8.78	0.26±0.16
1st degree relative subject					
Male (11)	238.0±15.9**††††	234.9±17.1*†	37.3±2.17	149.9±17.1	0.17±0.01
Female (27)	187.3±8.7**††††	224.1±10.29•†††	41.8±2.19	144.8±11.03	0.2±0.01*†††
2nd degree relative subject					
Male (8)	101.4±9.73	180.13±11.36	41.0±3.32	118.5±11.9	0.23±0.02
Female (17)	112.7±10.77	187.5±15.38	45.0±2.2	119.8±15.2	0.27±0.03

TG= Triglyceride, TC= Total cholesterol, HDL-c = High density cholesterol, LDL-c = Low density cholesterol; *P<0.05 as compared with male controls; *P<0.01 as compared with male controls; •P<0.05 as compared with female controls; **P<0.05 as compared with female controls; †P<0.05 as compared with 2nd degree relative male group; †††P<0.05 as compared with 2nd degree relative male group; ††††P<0.05 as compared with 2nd degree relative male group

level did not show any significant difference between these groups. The results reported in Table IV describe the mean triglycerides and total cholesterol levels of first degree diabetic related to males and females groups were significantly ($P<0.05$) higher than non-diabetic related control groups as well as with second degree relatives of diabetic patients. Our findings have shown a rise in the level of total cholesterol in both males and females of first degree relatives of diabetics (Table IV) suggesting that high cholesterol level in the first degree relatives of diabetic patients is due to the closeness of relation that appeared to be related to raised cholesterol level. Gonzalez-Ortiz *et al.* (1997) reported that only the total cholesterol was increased in heartily young individuals with a strong family of NIDDM in the paternal branch.

The results pertaining to the levels of HDL- chol and LDL- chol of diabetic related groups have been shown in Table II, III showing that there was no significant difference in the level of HDL- chol and LDL- chol of diabetic related groups. It was also found that HDL- chol/Total Cholesterol (TC) ratio of first degree diabetic related female group was significantly ($P<0.01$; $P<0.05$) lower than control female groups and second degree diabetic related females group, respectively (Table IV). The HDL- chol and LDL- chol levels did not show any significant change in diabetic related groups (Table II & III). Similar observations have been made by earlier workers (Gonzalez-ortiz *et al.,* 1997; Gelding *et al.,* 1994) where as Elbein *et al.* (1994) found lower levels of LDL-C in diabetic relative subjects. The lowered HDL- chol/TC ratio in the 1st degree females relatives of diabetic individuals indicated a tendency of increased total cholesterol and a decrease in HDL- chol.

CONCLUSION

Increase in serum triglycerides and total cholesterol levels appeared to be strongly related to closeness of relation to diabetic persons. The increase in triglycerides levels in diabetic related group has been observed to be contributed by the increasing age. Different effects of family history of diabetic mellitus on lipid profile in relatives of diabetic patients warrant population based studies.

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