Frequency of Dyslipidemia in non-obese Adolescence and its Association with family history of Diabetes

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ABSTRACT

Diabetes is an interaction of environment and genes. Positive family history of diabetes or any other disease in children point out that genetic factors are more important compared to environmental factor. However, environmental risk factors are also prominent with quality of diet and lack of physical activity in the past decades.

Methods: This study was included medical student with age range 20-21 years. Student who have positive family history of diabetes were included in the study. A family history of diabetes involving first-degree relatives was recorded via the self-reported questionnaire in the interview survey. Level of fasting blood glucose, total cholesterol, triglyceride, high-density lipoprotein (HDL) cholesterol were measured standard kits using an autoanalyzer.

Results: Mean age of male and female subjects was 20 years. Life style was inactive in most of the male/female subjects. Most of the students belong to middle socioeconomic status and their diet was mostly junk food. Level of fasting blood sugar, serum cholesterol, serum triglyceride and lipoproteins LDL-chole, VLDL chol was significantly increased in both male and subjects as compared to their controls. However the level of HDL was not significantly decreased in male/female subjects compared to their controls.

Conclusion: Estimation of dyslipidemia in adolescence with positive history of diabetes is reliable and applicable as it may serve the predictor of dyslipidemia and increase risk to develop diabetes.

Keywords: Family history of diabetes, dyslipidemia, Life style

INTRODUCTION

Diabetes is the major epidemic allocate to an interaction of environment and genes[1]. In 2013 International Diabetes Federation estimate that 382 million people with age range 20-70 years had Type 2 diabetes Mellitus (T2DM) with 80% of the living in developing countries where, diabetes is not related body mass index (BMI), but it is mainly related with family history of diabetes, dietary pattern and lack of physical activity[2]. It has been estimated that about 8.1 million people with T2DM are undiagnosed, many of whom are children and adolescent[3].

Risk factors associated with diabetes are family history of diabetes, physical inactivity, dietary habits, impaired glucose and lipid metabolism[2]. It is suggested that functional maturation of organs from fetal phase to childhood and impaired homeostasis might increase the risk of insulin resistance and development of T2DM lately[4].

Children with positive family history of diabetes and normal BMI have an increase occurrence of dyslipidemia[5]. The high incidence of diabetes in the relatively lean Asian population might be explained, that lean, normal weight diabetes showed a high use

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of insulin use indicating a failure of beta cell rapidly[6] or reduced beta-cell function rather than by insulin resistance[7]. Family history of diabetes can include environmental in addition to genetic risk factors[8]. However these associations were independent of other risk factors, like insulin resistance, obesity and lifestyle factors[7].

Positive family history of diabetes or any other disease in children point out that genetic factors are more important, because the environmental factor act for short period of time. However, environmental risk factors are also prominent with quality of diet and lack of physical activity in the past decades. Frequency and amount of foods used is also a factor. Changes in physical is mainly due to the changes of living style and the technology, which is used in daily lives[9,10].

Individual with positive family history and normal glucose tolerance have marked dyslipidemia and endothelial dysfunction compared. This may increase the risk of cardiovascular disease in prediabetic persons[11].

It is thought that there might be synergistic effect between family history of diabetes and hyperlipidemia on the risk of diabetes in population. Family history is most important factor for screening for young's at risk of diabetes and can be taken as prevention campaigns to reduce the burden of disease. Study

was designed to find the frequency and association of dyslipidemia with family history of diabetes in a group of adolescent.

METHODS

This study was included 26 medical student with age range 18-20 years. Student who have positive family history of diabetes were included in the study. Duration of study was March 2017 to September 2017. Letter of consent was taken from each student. A family history of diabetes involving first-degree relatives was recorded via the self-reported questionnaire in the health interview survey. Physical activity data were collected from the self-administered questionnaire. Overnight fasted blood samples were drawn from overnight fasting for at least 8 h. The fasting plasma concentrations of glucose, total cholesterol, triglyceride, high-density lipoprotein (HDL) cholesterol were measured standard kits using an autoanalyzer (Hitachi, Tokyo, Japan). The level of low-density lipoprotein (LDL) cholesterol was calculated using Friedewald's formula. Ratio of LDL/HDL cholesterol was also calculated. Data was analyzed by SPSS 20. Quantitative variables were presented as a mean±SD. Statistical differences between data of the subject groups, and the control group, were calculated using student 't' test. P values were significant if <0.05.

RESULTS

Mean age of male and female subjects were 21.00 and 20.00 years respectively. BMI of male was 27 and of female was 25 kg/m^2. Socioeconomic status of most of the male/female subject was middle class. Both male and female subjects used health diet. Life style was inactive in most of the male/female subjects (Table 1).

Level of fasting blood sugar, serum cholesterol, serum triglyceride and lipoproteins LDL-chole, VLDL chol was significantly increased in male subjects with family history of diabetes with a significant difference of P<0.05 and P< 0.001. However the level of HDL was non significantly increased in male controls as compared to male subjects. Ratio of LDL/HDL was also more in male subjects as compared to their male controls (Table 2).

Variation in the level of fasting blood glucose and lipid profile in female subjects with family history of diabetes is tabulated as table 2. Level of fasting blood sugar, serum cholesterol, serum triglyceride and lipoproteins LDL-chole, VLDL chol was significantly increased in female subjects with family history of diabetes with a significant difference of P<0.05 and P< 0.001. However the level of HDL was significantly increased in male controls as compared to male subjects. Ratio of LDL/HDL was also more in female subjects as compared to their female controls (Table 3).

Table 1: Demographic characterstics of male/female adolescent with family history of diabetes.

Variables	Male (14)	Female (12)
Age (year)	21.00±0.08	20.00±0.06
BMI (Kg/m^2)	24.72±4.56	25.27±3.67
Socioeconomic status	11.0 (middle class)	10.0 (middle class)
	03 (upper class)	02 (upper class)
Family Background	13 educated	13 educated
	01 uneducated	01 uneducated
Diet	08 (healthy diet)	10 (healthy diet)
	06 (vegetarian)	04 (vegetarian)
Life style	05 Active	07 Active
	09 Sedentary	07 Sedentary
Blood pressure (mmHg)	120/80	120/70

Table 2: Variation in the level of fasting blood glucose and lipid profile in male subjects with family history of diabetes

Variables	Male subjects	Male controls
Fasting Blood sugar (mg/dl)	85.75±4.86*	78.31±8.74
Serum cholesterol(mg/dl)	193.25±10.04*	183.5±17.09
Serum triglyceride(mg/dl)	192.75±18.99**	162.17±26.94
HDL-Chol(mg/dl)	39.08±2.64	48.47±21.07
LDL-Chol(mg/dl)	115.62±9.60**	105.86±16.75
LDL/HDL ratio	2.96	2.18
VLDL (mg/dl)	38.55±3.80	32.09±5.73

*P<0.05 = Significant difference   **P< 0.001= Highly significant difference

Table 3: Variation in the level of fasting blood glucose and lipid profile in female subjects with family history of diabetes.

Variables	Female subjects	Female controls
Fasting blood sugar	88.92±8.59**	72.08±12.9
Serum cholesterol (mg/dl)	226.15±33.98**	188.15±17.5
Serum triglyceride (mg/dl)	212.38±55.25**	166.2±28.52
HDL-Chol (mg/dl)	39.77±3.96*	43.43±5.4
LDL-Chol (mg/dl)	143.91±27.92**	111.41±16.89
LDL/HDL ratio	3.61	2.56
VLDL (mg/dl)	42.48±11.05*	33.24±5.70

*P<0.05 = Significant difference   **P< 0.001= Highly significant difference

DISCUSSION

According to our study mean age of male and female subjects were 21.00 and 20.00 years respectively. A study also observed that individuals with family history of diabetes are more as risk of developing diabetes in their young age as compared to people without family history[12].

We observed that socioeconomic status of most of the male/female subject was middle class. Educated family back ground was observed in both genders. It is reported that environmental factors, particularly socio-economic status is inversely related with occurrence of diabetes[13]. A study showed that both good education level and financial status are related with decreased occurrence of diabetes. It is stated that individual with educated family back and also with good education may have the ability to realize the importance of health and take interest in his or her health care properly[14].

Our subjects are all students and their diet is usually consisting of snacks, fried food and soft drink. The Life style was inactive in most of the male/female subjects.. It is reported that there are seven chronic diseases including obesity, diabetes, hypertension, dementia, cancer, artery disease and depression are due to physical inactivity[15]. According to a study poor dietary habits and sedentary life results in hypertension[16]. A survey reported inadequate nutrient was used by youngs which may increase the risk of developing disease like obesity, hypertension etc[17]. It is stated that sedentary life style may have deep effect on lipid oxidation in skeletal muscle is responsible for lipid persuade insulin resistance[18].

We observed an increased level of fasting blood sugar and dyslipidimia in both sexes of adolescent with positive family history of diabetes as compared to controls. It is proposed that there is a direct relation of accumulation of lipids with insulin resistance[19,20]. It is experimentally proved that increased level of triacylglycerol is related with reduced insulin sensitivity in skeletal muscle. This accumulation of lipid is mainly due to increased intake of fatty acid into the muscle with decreased oxidation of lipid. These fatty acids are esterified and either accumulated or metabolized to many molecules that may interfere with cellular signaling, especially insulin-mediated signal, thus impairing glucose metabolism. Impair response of insulin, may lead to type 2 diabetes mellitus. It is suggested that in most of the people the accumulation of lipid is mediated by lifestyle[21].

Family history of diabetes indicates the importance of genetic factors, because the environment has had only a short time to act. Persons with a positive family history of diabetes, show impair action of insulin actions, intolerance of glucose, dyslipidemia, altered endothelial function and change metabolic process giving energy. Study found that many pathogenic processes are engaged with the progress of diabetes. These are autoimmune damage of the β-cells, results deficiency of insulin lead to abnormalities that may result decrease action of insulin action. Study proposed that in diabetes abnormalities in the metabolism of fat, carbohydrate and protein metabolism is due to reduced action of insulin on tissues and this is the main cause of hyperglycemia and dyslipidemia[22].

Low HDL cholesterol is mainly due to increased function of liver lipase related with metabolism of HDL[23]. Low HDL-C and hypertriglyceridemia are reason of a altered metabolism of glucose[24]. It is suggested that changes in LDL receptor genes also cause impaired lipid metabolism resulting in altered ratio of LDL: HDL. It is depicted that LDL/HDL ratios may be a marker of dyslipidemia in diabetes and increase risk of cardiovascular disease[25,26].

CONCLUSION

Estimation of dyslipidemia in adolescence with positive history of diabetes is reliable and applicable as it may serve as the predictor of dyslipidemia and increase risk to develop diabetes.

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