**ORIGINAL ARTICLE**

# Family History is an early Predictor of Obesity, Diabetes and Hypertension in adults

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## ABSTRACT

**Background:** Family history conveys information on genes and environment shared by close relatives.
**Objective:** To study the relation between family history of diabetes and hypertension with lipid profile and BMI in medical students.
**Place of study:** The study was done on students of third year of FJMU Lahore.
**Methods:** Seventy students were selected. Family history of diabetes and hypertension was noted. Their BMI was calculated. Serum Cholesterol, serum Triglycerides and serum Lipoproteins (HDL, LDL) were carried out by Standard kit methods.
**Results:** The study showed that there was significant increase in values of BMI in group C and D ($P<0.05$) when compared with control group (A) and there was non- significant increase in serum cholesterol and serum triglyceride in group B and decrease in serum HDL levels in group B, C and D as compared to group A (Control group)
**Conclusion:** Family history of diabetes and hypertension was shown to be a significant predictor of diabetes, hypertension and obesity. We advocate the inclusion of family history assessment in public health prevention and screening programs.
**Keywords:** Family history, Lipid Profile, BMI, hypertension, diabetes.

## INTRODUCTION

A major health challenge faced by the community includes diabetes mellitus. It may progress undetected for years, and remainedunidentified until onset of clinical symptoms or complications[1]. In 2002, diabetes was rated as the sixth leading cause of death[2]. Another main public health challenge is the increasing occurence of type 2 diabetes in adults, children, and adolescents through the past two decades[3]. This disease contributes to significant morbidity, including cardiovascular, cerebrovascular, renal disease, and premature mortality[1]. Family history of diabetes shows the relationship between different aspects like environmental, behavioral, and genetic factors[4]. Insulin resistance and type 2 diabetes are associated with plasma lipids and lipid abnormalities. Increased hepatic secretion of triglycerides rich VLDL and impaired clearance of VLDL appear to be of central importance in pathophysiology of dyslipidemia[5]. Impaired endothelial functions are associated with increased total cholesterol and its lipoproteinsand may be due to increased vascular endothelial stress and inflammation[6].

Obesity is a complex disease caused by genetic, biological, economic, environmental, psychosocial, and behavioral determinants. It may results from the interactions of a wide variety of genetics and environmental factors including behavioral aspects[7]. The reported estimates of obesity with positive family history range from 30 to 70%.[8]In adults, the diagnosis of obesity is based on the levels of BMI (Body mass index). A healthy BMI is 18.5 to 24.9 kg/m$^2$; overweight is 25 to 29.9 kg/m$^2$; and obesity is ≥30 kg/m$^2$. Obesity is further sub-defined into class I (30.0–34.9 kg/m$^2$), class II (35.0–39.9 kg/m$^2$), and class III (≥40 kg/m$^2$)[7].

Obesity represents major risk factor for the development of cardiovascular diseases, including hypertension, myocardial ischemic disease, and cardiac arrhythmias[9]and has been strongly linked with insulin resistance in normoglycemic individuals.[10,11]Specific markers of obesity include increased level of triglyceride, a low high-density lipoprotein cholesterol concentration, a high ratio of triglycerides to high-density lipoprotein cholesterol, or a combination of an enlarge waist and elevated triglyceride concentration[12].

Family history of hypertension is a primary predictor of high blood pressure (BP). Offspring of hypertensive parents had increased BP and impaired arterial properties, mainly arterial compliance. Alteration in arterial function in young may be a risk factor for hypertension and may contribute to the progression to hypertension later in life[13]. It has been known for numerous decades that hyper-cholesterolemia could be documented at an early age. Reduction in cholesterol helps in reducing risk of

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developing heart disease in later life and thus screening is frequently recommended[14]. Teenagers with hypertensive first degree relative create a special risk group that should be strictly monitered[15].

## SUBJECTS AND METHODS

This was a comparative study of three groups of third year medical students having

1. No family history of diabetes or hypertension (Control) (Group A )
2. Positive family history of diabetes (Group B)
3. Positive family history of hypertension (Group C)
4. Positive family history of diabetes and hypertension (Group D)

Data was collected from FJMU third year students. Letter of consent was taken from each subject.A total of 70 students aged 20-22 years were selected for the study.Participants less than 18 years, pregnant women, unknown diabetes status, weight or height, fasting for less than 8 hours or over 24 hours or a missing family history of diabetes and hypertension were excluded from the study.

Out of 70 students 20 students had no family history of diabetes and hypertension and taken as control group, while 17 students with positive family history of diabetes, 13 students with positive family history of hypertension and 20 students with positive family history of diabetes as well as hypertension. Their BMI was calculated. Serum Cholesterol, serum Triglycerides and serum Lipoproteins (HDL, LDL) was carried out by Standard kit methods (Merck).

**Statistical Analysis:** The data was analyzed by using SPSS-20.0. Quantitative variables likebody mass index, level of serum cholesterol, triglyceride, serum lipoproteins were reported by using mean±S.D and compared these variables with controls using student't' test. The body mass index (BMI) was calculated according to the formula BMI = weight/height$^2$ (kg/m$^2$).LDL lipoprotein was calculated by using formula. P value of $\leq$ 0.05 was considered statistically significant.

## RESULTS

The values of BMI, serum Cholesterol, serum Triglycerides and serum Lipoproteins (HDL and LDL) were noted (Table). It was observed that there was significant increase in value of BMI in group C and D ($P<0.05$) and non-significant increase in group B as compared to group A (control group). There was increase in the value of serum cholesterol in group B and D as compared to group A but it was non-significant. The mean values of HDL-Cholesterol were decreased insignificantly in group B, C and D as compared to group A. Serum LDL-Cholesterol and serum triglycerides were increased insignificantly in group B as compared to group A.

Table: Levels of BMI, Serum Cholesterol, HDL-Cholesterol, LDL-Cholesterol and serum triglycerides in students
Values expressed as mean ± SD. No of students in parenthesis

| Parameter | With no Family History of diabetes or Hypertension (20) (Group A) Control | With Family History of diabetes (17) (Group B) | With Family History of Hypertension (13) (Group C) | With Family History of diabetes and Hypertension (20) (Group D) |
|---|---|---|---|---|
| BMI Kg/m$^2$ | 18.51± 1.90 | 19.95 ± 2.64 | 25.1 ± 6.60* | 25.42 ± 1.87* |
| Serum Cholesterol(mg/dl) | 142.3 ± 35.95 | 158.3 ± 43.98 | 135.3 ± 15.88 | 145.9 ± 34.78 |
| HDL-Cholesterol (mg/dl) | 52 ± 18.95 | 51.8 ± 16.14 | 33.0 ± 22.51 | 45.25 ± 18.99 |
| LDL-Cholesterol (mg/dl) | 120.5 ± 55.59 | 125.3 ± 62.83 | 92.6 ± 15.14 | 96.4 ± 29.4 |
| Serum Triglyceride (mg/dl) | 54.5 ± 4.99 | 82.6 ± 44.8 | 48.6 ± 27.22 | 58.75 ± 25.09 |

*P<0.05 = Significant difference

## DISCUSSION

Family history conveys information on genes and environment shared by near relatives[16] and is a constant and independent risk factor for several common chronic diseases, and expertadvices usually include the use of family history to assess health risk, start interventions, and encourage behavioral changes[17].

In this study we assessed the relationship of family history of diabetes and hypertension with lipid profile and BMI in medical students. The results of this study showed that there was significant increase in mean value of BMI in subject with family history of diabetes and hypertension as compared to controls. Our study is in accord with studies who observed that risk of diabetes imposed by family history is evident along a broad range of adult ages and BMI.[18]Another study stated a direct relationship with increasing BMI categories is particularly observed for diabetes mellitus and dyslipidemia[19].

Our study found that adults with a family history of hypertension had a significant higher body mass

index (BMI) and an increased risk of obesity than those without a family history of hypertension[20]. A study from India established that BMI was significantly higher in members with a family history of diabetes than in those without such a family history, but BMI was not significantly higher in participants with a family history of hypertension[21].

Obesity is almost always found to be predictive of higher risk of dyslipidaemia and hyperinsulinemia even in childhood and adolescence[22]. Environments with plentiful food and lack of physical activity are well matched for the development of obesity and ultimately type 2 diabetes. However, the development of type 2 diabetes in such environment also involves a permissive genetic component[23].

In a study it has been seen that family history of hypertension showed a significantly higher mean BMI and blood pressure than those without a family history of hypertension[24]. In Japan a study done in children showed that a maternal family history of hypertension was certainly associated with the risk of obesity[25].

This study also showed that there was non-significant increase in levels of serum cholesterol and LDL cholesterol in group B with family history of diabetes and non -significant decrease in the level of HDL cholesterol in all three groups as compared to group A (control group). It is suggested that although family history is a non-changeable risk factor but it is useful for screening purposes[26], to recognize high risk population long before it is diagnosed[27] and to aim interventions and disease prevention. Additionally it is thought that awareness of risk is a factor that helps better and earlier health related behavior[28] and lifestyle alterations are of established efficacy in primary prevention of hypertension.[29] Previous studies have also recognized an association between the family history of hypertension and presence of metabolic disorders and assembling of these disorders in children of the effected patients.[30] Studies have revealed that a positive family history of hypertension is associated with an initial increase in markers of inflammation and plaque instability in otherwise healthy young normotensive individuals, likely carrying a tendency to develop early atherothrombosis[31] and the relative risk for developing coronary artery disease or cardiovascular death is increased in patients with a family history of high blood pressure[32].

Thereforegenerally there is likely potential for the use of family history as a public heath tool aiding prevention of hypertension and diabetes. Families with positive history for diabetes or hypertension should be educated to encourage healthy lifestyle in their children. Use of family history as a predictor should be tested more frequently in large prospective studies, just to be sure that the ascertainment of the familial risk actually precedes the disease status.

## CONCLUSION

Family history of diabetes and hypertension was shown to be a major predictor of diabetes, hypertension and obesity. We believethat the inclusion of family history evaluation, preventing and screening programs in public health are valuable and cost effective source of genomic information and detection of diabetes, hypertension and obesity risk.

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