INTRODUCTION

Diabetes Mellitus (DM) and hypertension are interrelated disorders coexisting and attributing as risk factors for cardiovascular disease.\(^1\) DM is influenced by an elevated body mass index (BMI) and hypertension is comorbidity for developing DM.\(^2\) The risk of macro vascular complications of DM which includes stroke, coronary artery disease, heart failure and myocardial infarction is also associated with hypertension.\(^3\)

One fourth of the world’s population had metabolic syndrome and is at increased risk of
cardiovascular events. The increasing burden of Non-communicable disease (NCDs) in developing countries is leading to 80% of NCD deaths worldwide.5

Leptin a product of obese gene secreted mainly by white adipocytes, is positively correlated with BMI and total body fat with linear relationship in obese patients.6 Leptin resistance is pathognomonic mechanism rather than leptin deficiency.7 An elevation in leptin levels is consistent with hypertension, insulin resistance, obesity, Polycystic Ovary Syndrome (PCOS) and type 2 diabetes.8

Renin, a proteolytic enzyme, mainly secreted by the juxtaglomerular cells in the kidney in response to renal hypoperfusion, systemic hypotension, low plasma sodium levels and increased sympathetic outflow helps regulation of normal blood pressure and sodium homeostasis.9 Plasma renin activity among the hypertensive patients may be elevated; normal or decreased.10 Essential hypertensive patients with high PRA are at greater risk of developing stroke, cardiovascular disease (CVD) and renal complications.11

We conducted this study to observe the differences of various biochemical and clinical parameters with respect to Family History (FH) of Non-communicable Diseases (NCDs) in fourth year Bachelor of Medicine, Bachelor of Surgery (MBBS) students.

METHODS

The observational study was conducted at Baqai Institute of Diabetology & Endocrinology (BIDE) including 50 students of Dow University of Health Sciences (DUHS) Karachi, from December 2013 to January 2014. We focused on patients with type 2 diabetes, hypertension and CVD for NCDs in this study.

Inclusion criteria: Non diabetic, non-hypertensive healthy students (males and females), aged 20 - 25 years were eligible for the study.

Exclusion criteria: The students with any comorbid condition like hypertension, diabetes, renal disease, liver disease, pulmonary tuberculosis (TB), Polycystic disease, metabolic syndrome and CVD were excluded to rule out any derangements in the laboratory values.

The ethical approval was obtained from the Institutional Review Board (IRB) of BIDE. The participants were briefed about the study and informed consent was taken. An interview based Performa (demographic data along with age, height, weight, waist hip circumference, systolic and diastolic pressure, medical history, family history and drug history) and physical examination was conducted. Weight, height (to the nearest of 0.1cm and 0.1 kg) and a resting state blood pressure was measured. An adult footed mercury sphygmomanometer was used on brachial artery of hand with a 5 minutes delay in recording the reading. A mean value of two readings was used. Hypertension was defined as blood pressure ≥140/90 mmHg.12 Twelve hours peripheral fasting blood samples were collected for the estimation of biochemical parameters. Samples of clotted blood were centrifuged to separate serum for analysis. EDTA plasma was separated for plasma renin estimation.

Fasting blood glucose, serum lipid profile, magnesium and uric acid levels were measured with the enzymatic colorimetric method (Selectra Pro S, ELItech, France).13 Serum leptin, plasma renin and serum insulin were determined by Enzyme-Linked Immunosorbent Assay (ELISA) method. Association of serum leptin and plasma renin with FH of NCDs, specifically the diabetes and hypertension was observed. All test were performed in BIDE clinical and research laboratory.

Statistical Analysis: Statistical Package for Social Sciences (SPSS) version 13.0 was used for data analysis. The continuous variables i.e. Age, Weight, Height, Waist circumference, Body mass index (BMI), Systolic and Diastolic blood pressure, Fasting plasma glucose, Serum Cholesterol, Serum Triglycerides, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), Serum Leptin, Plasma Renin, Insulin and HOMA IR were presented as Mean ± SD. T-test and z-test were applied (p<0.05 statistically significant).

RESULTS

Baseline clinical and biochemical characteristics of the study population gender wise are shown in Table-I. The mean age of study population was (21.56 ± 0.90) years, BMI (20.36 ± 2.83), mean weight (58.97 ± 11.88) kg and mean waist circumference was (80.12 ± 17.90) cm. Mean values of plasma renin and serum leptin of the study population were found to be 22.12 ± 24.21 and 2.60 ± 1.09 respectively. A significant difference was observed in the obese male subjects as compared to female (p=0.007). No such significant difference was found in normal and overweight. Table-II shows the comparison of FH of NCDs for the continuous variables. Statistically significant difference was observed in the mean value of age
Students with positive FH of NCDs had cholesterol significantly higher than those with negative FH (163.87 ± 24.16 vs. 144.33 ± 19.03, p=0.005). LDL mean values in students with positive FH of NCDs increased significantly than those with negative FH (91.12 ± 23.52 vs. 71.38 ± 22.66, p=0.006). The findings of serum leptin and plasma renin showed no significant difference as negative FH of NCDs was slightly higher than the positive FH of NCDs (2.39 ± 0.93 vs. 3.15 ± 1.18, p<0.0001) and (25.90 ± 24.00 vs. 24.11 ± 24.21, p=0.004) respectively. Insulin levels were slightly higher in positive FH of NCDs than in negative FH of NCDs (10.90 ± 4.68 vs. 10.32 ± 5.09, p=0.685).

Central obesity showed no significant difference in the of positive FH of NCDs and negative FH of NCDs of male and female both (p>0.05). In positive FH of NCDs, the percentage of obese were higher than in negative FH of NCDs. Normal and overweight percentages were also higher in the positive FH of NCDs than negative FH of NCDs but the statistical significance is not met.

**DISCUSSION**

We have found higher association of positive FH of NCDs particularly CVD with BMI, BP and LDL. Our results showed that FH of hypertension have higher association with total cholesterol. Literature search sowed that in a study of BRICS (Brazil, Russia, India, China, and South Africa) countries, association of obesity with hypertension and diabetes in all the four countries was studied. Similarly a study on Chinese steelworkers showed significant association of fatal CVD with hypercholesterolemia. In Estonian adult population study, a decrease in high density lipoprotein (HDL) cholesterol and increase in triglyceride were associated with increased probability of hypertension. Yet another study showed an inverse relationship between risk factors control and BMI. Another study showed a significantly higher BMI in the high blood pressure group and increased levels...
of LDL cholesterol. A study of Korean adolescents
had BMI correlated positively with Systolic Blood
Pressure in the normal weight and overweight
groups. High BMI and high waist circumference
(WC) significantly increased the incidence of high
Systolic Blood Pressure.

A higher association of HDL, TG, Leptin & Renin
was seen with having FH of diabetes in our study.
In a patient control study, higher concentrations of
total cholesterol and triglycerides and lower HDL
cholesterol were noted in diabetics as compare to
controls. In another study dyslipidaemia was
elevated LDL-C in type 2 diabetes (T2DM). Low
HDL cholesterol, high LDL cholesterol,
hypercholesterolaemia and hypertriglyceridemia
were found in T2DM group of subjects. Clinical
and biochemical parameters are important tool for
the prediction of high risk population with respect
to NCDs.

Table-II: Comparison of Family history of NCDs.

|                          | Positive FH of NCDs n=32 | Negative FH of NCDs n=18 | p-value   | Overall n=50 |
|--------------------------|--------------------------|--------------------------|-----------|--------------|
| Age (years)              | 21.78 ± 0.65             | 21.17 ± 1.15             | 0.020     | 21.56 ± 0.907|
| Systolic blood pressure (mmHg) | 110.62 ± 12.87      | 110.83 ± 12.27           | 0.956     | 110.70 ± 12.53|
| Diastolic blood pressure (mmHg) | 74.68 ± 10.87         | 76.38 ± 9.97             | 0.587     | 75.30 ± 10.48|
| Weight (kg)              | 59.68 ± 13.49           | 57.69 ± 8.50             | 0.574     | 58.97 ± 11.88|
| Height (cm)              | 166.87 ± 9.76           | 168.86 ± 8.64            | 0.475     | 167.59 ± 9.33|
| Waist circumference (cm) | 81.37 ± 21.13           | 77.76 ± 9.30             | 0.508     | 80.12 ± 17.90|
| Hip circumference (cm)   | 93.89 ± 15.06           | 93.82 ± 7.52             | 0.986     | 93.87 ± 12.81|
| Body mass index (kg/m²)  | 21.15 ± 2.73            | 19.13 ± 2.67             | 0.095     | 20.36 ± 2.83 |
| Fasting blood sugar (mg/dl) | 76.31 ± 6.23         | 78.00 ± 5.90             | 0.354     | 76.92 ± 6.11 |
| Serum cholesterol (mg/dl) | 163.87 ± 24.16         | 144.33 ± 19.03           | 0.005     | 156.84± 24.18|
| Serum triglyceride (mg/dl) | 78.31 ± 38.36          | 76.83 ± 39.41            | 0.897     | 77.78 ± 38.34|
| High density lipoprotein (mg/dl) | 53.12 ± 13.82    | 48.00 ± 9.62             | 0.171     | 51.28 ± 12.62|
| Low density lipoprotein (mg/dl) | 91.12 ± 23.52     | 71.38 ± 22.66            | 0.006     | 84.02 ± 24.89|
| Serum creatinine (mg/dl) | 0.89 ± 0.13            | 0.91 ± 0.10              | 0.604     | 0.90 ± 0.12  |
| Serum Leptin (ng/ml)     | 2.39 ± 0.93            | 2.98 ± 1.27              | 0.068     | 2.60 ± 1.09 |
| Plasma Renin (pg/ml)     | 21.73 ± 25.88          | 22.79 ± 21.60            | 0.884     | 22.11 ± 24.21|
| Insulin levels (uIU/ml)  | 10.90 ± 4.68           | 10.32 ± 5.09             | 0.685     | 10.70 ± 4.79 |
| HOMA IR                  | 2.08 ± 0.99            | 2.00 ± 1.07              | 0.787     | 2.05 ± 1.01 |

Central Obesity (%)

|                          | Male normal | Male abnormal | Female normal | Female abnormal |
|--------------------------|-------------|---------------|---------------|-----------------|
| Male normal              | 62.5        | 37.5          | 0.157         | 100.0           |
| Male abnormal            | 71.4        | 28.6          | 0.108         | 100.0           |
| Female normal            | 63.2        | 36.8          | 0.104         | 100.0           |
| Female abnormal          | 71.4        | 28.6          | 0.108         | 100.0           |

Body mass index (%)

|                          | Normal weight | Over weight | Obese |
|--------------------------|---------------|-------------|-------|
| Normal weight            | 59.5          | 40.5        | 0.103 |
| Over weight              | 66.7          | 33.3        | 0.248 |
| Obese                    | 85.7          | 14.3        | 0.007 |

Data presented as Mean ± SD,     P < 0.05 considered as statistically significant
Comparison in percentages: p-value calculated by z-test.

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Biochemical and clinical parameters and their differences with family history of NCDs

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