ORIGINAL ARTICLE

Frequency of Prediabetes, Raised BMI and Low Plasma HDL-Cholesterol in Offspring of Diabetes

Meraj Rahim[1], Mariam Rahim[2], Masood A Qureshi[1], Shaheen Sharafat[3] and Zaman Shaikh[4]

ABSTRACT

Background: World wide approximately 470 millions people are getting affected by a prediabetic state. Risk of diabetes is doubled when there is a family history of diabetes (FHD) in parents. Pakistan is ranked at 6th place amongst the top 10 countries of the world including India, China and USA in the report predicting cases of diabetes for the future. Prediabetes is a term for impaired fasting glucose [IFG].
Aims/hypothesis: A positive (FHD) is associated with increased risk for raised BMI,prediabetic state and low HDL(High density lipoprotein).
Methodology: This was a cross-sectional study. Young healthy subjects between 18- 24 years were classified according to familial history of T2DM as single diabetic parent (SDP), with both diabetic parents (BDP) and with no diabetic parents (NDP). BMI, Plasma Cholesterol,Plasma HDL and Fasting plasma glucose was assessed.
Results: Significantly higher statistical values were observed in the body weight of offspring of both diabetics as compared to NDP and SDP. The mean values for Fasting plasma glucose for BDP, SDP and NDP are 4.73±0.75, 4.65±0.47 and 4.61±0.24 respectively. Mean values for BMI among BDP were 25.58 ±5.15, 22.26 ±6.80 in SDP and NDP it was 21.02 ±6.19 and 4.91±6.78. IFG was detected 5.1% and 4.2 % in offspring of BDP and SDP.Low HDL –Cholesterol was found to be 4.2%,12.9% and 10.3% in BDP,SDP and NDP.
Conclusion: Prediabetes, raised BMI and low HDL-Cholesterol was reported in positive FHD in offspring suggesting that these parameters may be the risk factors of development of diabetes and cardiovascular diseases in future life.

Key words: Prediabetes, family history, BMI, low HDL-cholesterol.

How to cite this article: Rahim M, Rahim M, Qureshi MA, Sharafat S, Shaikh Z. Frequency of prediabetes, raised BMI and low plasma HDL-cholesterol in offspring of diabetes. J Dow Uni Health Sci 2014; 8(2): 67-71.

INTRODUCTION

World wide approximately 470 million people are getting affected by a prediabetic state[1].

Risk of diabetes is doubled when there is a family history of diabetes (FHD) in parents[2]. Wagner et al also found that a prediabetic state existed when there is positive history of diabetes in family[3]. The most common causes of deaths worldwide is also due to cardiovascular diseases[4]. Raised cholesterol, lowered HDL, sedentary lifestyles, cigarette smoking and hypertension all increases the risk for diabetes and cardiovascular diseases[5]. Specially dyslipidemia is a major factor for cardiac diseases[6].

Pakistan is ranked at 6th place amongst the top 10 countries of the world including India, China and USA in the report predicting cases of diabetes for the future: the number of estimated cases with diabetes in our country were 5.2 million in 2000 and projected to be 13.9 million in 2030[7]. Prevalence of Diabetes Mellitus (DM) and Impaired Glucose Tolerance (IGT) among urban Pakistani population has been shown 6.0% in men and 3.5% in women[8]. Further, family history of diabetes and frequency of overweight in Sindh reflected a positive correlation with both fasting and insulin levels[9].

Thus, there is a genetic factor, which is worsened by

Department of Physiology[1], Dow International Medical College / Final year MBBS student[2], Department of Microbiology[3], Dow Medical College / National Institute of Diabetes and Endocrinology[4], Dow University of Health Sciences, Karachi, Pakistan.

Correspondence: Dr. Meraj Rahim, Department of Physiology, Dow International Medical College, Dow University of Health Sciences, Karachi, Pakistan.

Email: meraj.rahim@duhs.edu.pk

insulin resistance, sedentary lifestyle and visceral obesity[10]. Family history which is an important component for future diabetes represents a strong genetic background[11]. A greater probability to acquire T2DM was seen among offspring of single diabetic parents and offspring of both diabetic parents compared to those of non diabetic parents in Framingham population[12].

Briefly, there is a strong genetic component in risk for T2DM as reports on identical twins showed that a family history of T2DM probably promotes the risk for its development[13].

OBJECTIVE

The objectives of this study was to analyze the frequency of raised BMI,Fasting plasma glucose,serum cholesterol and HDL-Cholesterol in offsprings of diabetic parents either single or both parents.

METHODOLOGY

Healthy young adult participants were provided with a questionnaire/ proforma to get their consent as well as the information needed; age, gender, history of diabetes in either or both parents, medical history and personal habits. A brief introductory account was delivered on DM to motivate them for participation in this study and made them aware of the significance and importance of this study on an inherited disease with an emphasis on modification of lifestyle to prevent from diabetes.

The inclusion criterion was healthy young adults age between 18-24 yrs with no history of medical problems or any recent or remote diseases. All participants who had NDP (no T2DM parents), SDP (Single T2DM parent) BDP (both diabetic parents).Exclusion criteria was subjects with H/O diabetes or any known endocrinopathies.

Definition of study groups:

The information about each subject with respect to his parent's history of T2DM was used to place him under respective group. Thus the offspring with either father or mother having T2DM was placed under group SDP, whereas the one with both parents having T2DM was placed under group BDP. Those showing no family history of T2DM (none of the parents as diabetics) were considered as NDP.

Sample Collection:

The participants were instructed to come in fasting condition (12 hrs) to Dow Diagnostic Research Laboratories (DDRL) Ojha Campus. Batches of 20 subjects were inducted at each time for anthropometric measurements (height, Weight) blood collection (12 ml). After withdrawal of blood, a juice and biscuit pack was provided to them.

Study Population, Setting, design and period:

Research was conducted in young healthy people aged between 18-24 years. They were inducted from different campuses of Dow University of Health Sciences Karachi, (DUHS) eg National Institute of Diabetes and Endocrinology (NIDE), Dow College of Pharmacy and Institute of Nursing.

Cross-sectional study, was carried from 2010 to 2011, convenient sampling were used and the

Definition of study groups:

Sample size

Sample size is 180, calculated for a confidence interval of 95% and a 5% margin of error. It was estimated by taking the % prevalence of diabetes as 13.5% in our population[14].

Instrument and data collection:

The Weight was recorded by the Stadiometer which was placed on a hard floor and preferably not on a carpet. Participant was asked to remove their heavy outer garments. Participant stood on center of platform to distribute their weight otherwise weight data is affected. Height was measured and the Participants were asked to remove shoes, advised to stand upright and straight. Stadiometer's head piece was slid to press flat hair and height was measured in foot.Waist circumference (cm) was`measured at a level between the lower rib margin and iliac crest with the tape all around the body in horizontal position. Feet approximated and breathe normally, tape in horizontal position and measured. Hip measurement was done at fullest point at buttocks in (cm).Than Research participants sat quietly for 5 minutes. Blood pressure was recorded.

For estimation of glucose, serum cholesterol and serum HDL-Cholesterol,the blood was centrifuged in HERMLE 2323 centrifuge for 10 minutes and shifted to Roche Hitachi 902 Automated Analyzer. This analyzer uses the photometric technique of glucose estimation.

RESULTS

The body weight of offspring of BDP versus NDP and SDP versus BDP was significantly high ($p < 0.05$). The mean values for BMI were 25.58±5.15 in BPD,

22.26±6.80 in SDP, and 21.02±6.19 in NDP (Table 1). However BMI mean of offspring of both groups (BDP & SDP) was significantly greater than offspring of NDP (Table 1). In figure 1 the frequency of BMI% in offspring of BDP, SDP and NDP in underweight (BMI < 18.5) was 2.6, 19.7 and 31.4, in normal weight (BMI, 18.5 - 22.9) it was 20.5, 50.7 and 50 and in overweight (BMI=23) it was 76.9, 29.6 and 18.6 respectively. BMI was calculated by Asian –Pacific cutoffs[15].

Impaired fasting glucose was detected in 5.1% and 4.2 % in offspring of BDP and SDP in Figure 3.The criterion was according to DDRL {Dow Diagnostic Research Lab}. Normal fasting plasma glucose is < 100mg/dl and impaired fasting glucose is above 125mg/dl or (5.6-6.9 mmol/l).

In Table 3: The body weight among NDPVS BDP and SDP VS BDP showed a P value < 0.05.The BMI in NDP VS BDP reported a P value < 0.05 and Serum Cholesterol in NDP VS BDP was < 0.05.In figure 2 Low HDL –Chol % was found to be 4.2%,12.9% and 10.3% in BDP,SDP and NDP.

Data Analysis:

All statistical analyses were carried out using Statistical Package for Social Sciences version 16 (SPSS Inc, Chicago, IL, USA). Statistics of the continuous variables were reported as mean ± standard deviation (SD) and groups were compared using two-tailed Student's t-test or Anova. P- value of 0.05 or less was considered statistically significant.

Table 1: Physical characteristics of offspring of BDP.SDP & NDP

Parameters	BDP n=39	SDP n=71	NDP n=70
Body Weight (Kg)	70.38±10.78	57.27 ± 14.33	57.03 ± 10.17
BMI (Kg/m2)	25.58 ± 5.15	22.26 ± 6.80	21.02 ± 6.19

Table 2: Biochemical parameters of offspring of BDP.SDP & NDP

Parameters	BDP n=39	SDP n=71	NDP n=70
Fasting Plasma Glucose (mmol/L)	4.73 ± 0.75	4.65 ± 0.47	4.61 ± 0.24
Serum Cholesterol (mg/dl)	19.04 ± 14.57	15.55 ± 13.49	146.91±24.51
Serum HDL-Chol (mg/dl)	46.89±20.48	48.98±8.43	44.48±10.52

Table 3: Sheffe' multiple pair wise comparison of physical and biochemical parameters

Parameters	NDPVS SDP p-value	NDPVS BDP p-value	SDPVS BDP p-value
Body Weight (Kg)	0.994	0.00 <0.05	0.00 <0.05
BMI (Kg/m2)	0.537	0.005 <0.05	0.056
FPG (mmol/l)	0.701	0.451	0.874
Serum Cholesterol mg/dl	0.05	0.00<0.05	0.125

Figure 1

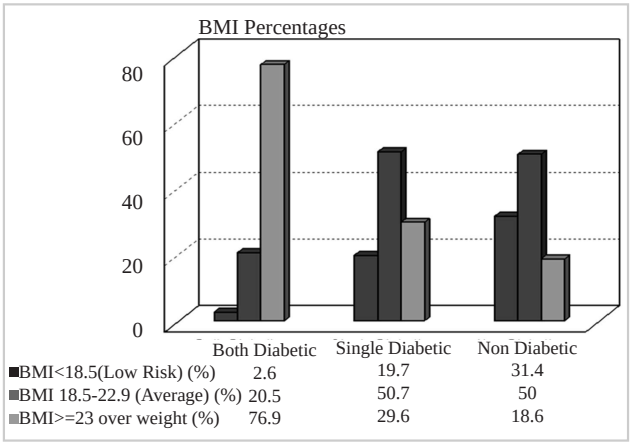


Figure 2

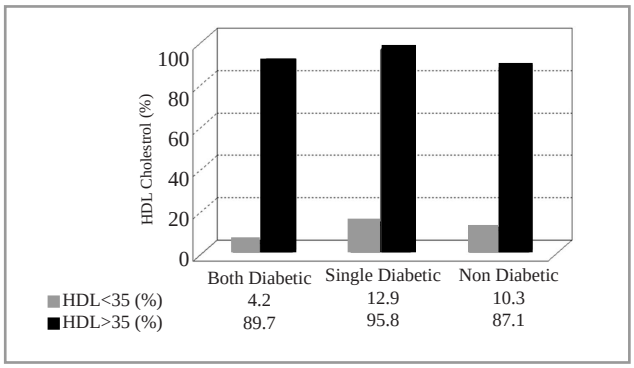
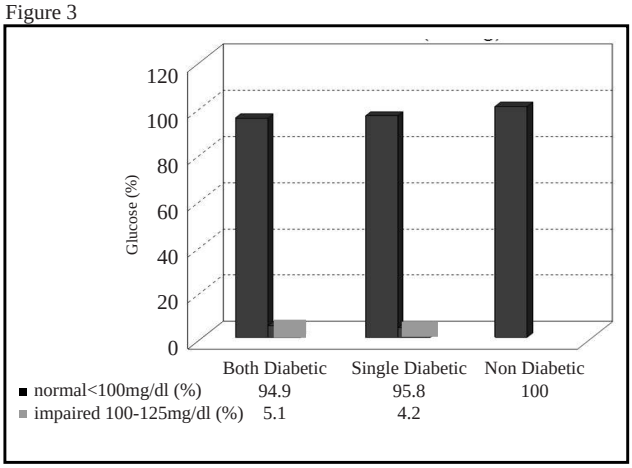


Figure 3



DISCUSSION

The present study was carried out among offsprings of diabetic parents to detect Fasting Plasma levels and Serum Cholesterol and Serum HDL at an early stage in life, which can help to establish measures for preventing the development of T2DM in future. So lifestyle modifications (dietary habits, exercise and weight loss) are accordingly advised to such individuals. Shahid et al, (2008) in their study found that the offspring of single and both diabetic parents showed

an increased prevalence of certain metabolic risk factors which may trigger or perpetuate the development of diabetes and/or cardiovascular disorders. The study conducted in Lahore also documented that offspring of T2DM are associated with increased predicting factors for developing diabetes in future exhibiting both hyperinsulinemia and hyperleptinemia prior to development of diabetes[16].This is consistent with a previous studies carried out in European population (Hunter et. al., 2004)[17]. The present study also found increased weight and BMI in offspring of both single and diabetic .

Previously, higher BMI value had been related to higher insulin resistance[18]. Sinha et al (2002) has reported importance of family history of diabetes in depicting the predicting factors like IR and raised BMI inspite of normal glucose[19]. High BMI,Cholesterol,low HDL and impaired glucose were reported in the San Antonio Heart study also[20]. In Malay subjects it was found that with positive FHD was associated with raised BMI and lowered HDL- cholesterol[21]. Tan et al study is consistent with our study that there is lowered HDL and BMI in offsprings of diabetic history in parents[22]. Similarly Anjana et al study was consistent with our study.In their study there was lowered HDL and raised BMI[23]. HDL-Cholesterol in recent studies documented that it has inverse predictor of cardiovascular diseases[24,25].

Impaired glucose tolerance (IGT) was recognized in children, in the group with positive history of diabetes in their families because obesity in childhood has noteworthy increased in recent years[25-27], and it is strongly related with insulin resistance, the main public health policies are centered on screening obese children and youths. In addition to this numerous studies, mainly in adults, have shown that family history (FH) of T2DM is associated with hyperinsulinemia[28]. Wagner et al also stated that their subjects showed prediabetic state in those with a positive FHD[3]. Our study also showed consistent results with the previous study of Wagner et al.

A recent study in Sweden also predicted a prediabetic state in their subjects with a positive history of FHD[29]. Prediabetic state was also assessed by the Nurses' Health Study showing an association of positive family history of diabetes[30]. But in another study by the European Prospective Investigation into Cancer and Nutrition (EPIC)–InterAct study did not predicted risk of a prediabetes associated with FHD[31]. Information regarding FHD in questionnaires helps in predicting future diabetes and cardiovascular risks.

In our study we structured a questionnaire to evaluate the prediabetic state and associating factors for future development of diabetes..Similarly such a questionnaires was helpful in prediction of prediabetic state in even non obese[32].

CONCLUSION

Prediabetic state,raised BMI and low HDL-Cholesterol is reported in those who give history of diabetes in their parents suggesting that these parameters may be the risk factors of development of diabetes and cardiovascular disease in future life.

Acknowledgement: We are greatful to Dow University of Health sciences for giving me the grant and support for research ,and also giving us the permission to carry out our study among students of the campus who happen to be of same age groups required in my study.

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