Original Article

Comparison of frequency of obesity in high risk non diabetic young individuals with low risk non diabetic young individuals

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Abstract

Objective: To assess the body mass index and waist circumferences of high risk non diabetic young individuals and compare them with low risk non diabetic young individuals.

Method: A cross sectional, case control comparative study was conducted in the department of medicine, LUMHS from January 2008 to March 2009. Five hundred individuals 20-40 years of age were selected and divided into two groups i.e. Group A: high risk (250 individuals) and Group B: low risk (250 individuals) on the basis of same age and gender. Group A included those who had positive family history of type 2 DM in 1st degree relatives while group B had no family history of type 2 DM in 1st degree relatives. The blood pressure, BMI and Waist Circumference was measured and Fasting Blood Sugar was estimated in each individual. In each group 125 (50%) were males and 125 (50%) were females.

Results: In group A 58% and in group B 28.8% individuals represented raised BMI whereas 42% in group A and 36% in group B individuals showed an increased waist circumference. Mean fasting blood glucose was significantly higher in Group A than in Group B (P=0.001).

Conclusion: Impaired Fasting Glucose is strongly associated with family history of type 2 diabetes mellitus. Presence of obesity specially in high risk non-diabetic young individuals emphasize the need for routine health screening for early institution of preventive measures.

Keywords: Obesity, High risk subjects, Diabetes Mellitus, Impaired fasting glucose (JPMA 61:522; 2011).

Introduction

Obesity is a well-recognized risk factor for type 2 diabetes; as revealed by studies from Rochester et al,[1] and elsewhere; increase in obesity within the general population was accompanied by rising diabetes incidence rate. Among multiethnic US adults in National Health and Nutrition Examination Survey (NHANES), overall abdominal obesity was present in 42.3% men and 62.5% women. The association of abdominal obesity with risk factors varies by ethnicity and is independently associated with high coronary heart disease risk status, further validating its clinical significance.[2] Obesity and overweight status is also related to type-2 diabetes mellitus in addition to waist-hip ratio.[3] Obesity invariably leads to impaired glucose tolerance (IGT) which is known to increase vascular risk and the risk of developing diabetes.[4] Diabetes prevalence in Pakistan is high, 12% of people above 25 years of age suffer from the condition and 10% have IGT.[5]

There is a significant difference in the fasting blood sugar, body mass index, waist circumference, between the high risk non diabetic young individuals with family history of type-2 diabetes mellitus in first degree relative and low risk non diabetic young individual without family history of type-2 diabetes mellitus in first degree relative.[6] Therefore this comparative case control study was performed to assess the body mass index and waist circumferences in high risk non diabetic young individuals and its comparison with low risk non diabetic young individuals.

Patients and Methods

This cross sectional case control comparative study was conducted in a tertiary care medical unit. The study was conducted from January 2008 to March 2009. Five hundred participants were included in this study, divided into two groups: Group-A (n=250): High risk non diabetic young individuals (study group); they were offspring of at least one diabetic parent. Group-B (n= 250): Low risk non diabetic young individuals (control group); they were offspring of non diabetic parents. Sample technique was non probability (convenience) study. Inclusion criteria for Group A were; age 20-40 years of both sexes and individuals whose first degree relatives were known cases of type-2 diabetes mellitus. Exclusion criteria were known diabetics, those with secondary obesity and pregnant women. A low risk group (control group) of healthy young non diabetic individual of same age and sex was compared with high risk group. This low risk group had no family history of type-2 diabetes in their first degree relatives. The low risk individuals included volunteers of hospital staff as doctors, paramedical staff and members of administration. Attendant of patients who fulfilled the criteria and consented were also included. An

informed consent was taken from all the participants after full explanation of the procedure. All participants were ambulatory and preliminary assessment was carried out on each participant to rule out any systemic illness.

All individuals were evaluated for family history of type-2 diabetes mellitus and obesity, and relevant general physical examination was done. Body weight (to the nearest 0.1 kg) of each individual was measured by weighing machine (Clinical Scale) that was daily calibrated by using a weight of 5kg and height (to the nearest 0.001 meters) was measured in standing position without shoes, at the level of vertex by using the wall scale. Body Mass Index (BMI) was calculated by dividing the weight in Kg by the height in the meter squares. Range of BMI according to revised criteria for Asian population[7] is described as; Normal weight (range 18.5-24 kg/m^2); Overweight (range 24.1-29.9 kg/m^2); and Obese ($\geq$ range 30 kg/m^2). BMI of 18.5-24 kg/m^2 is referred to be normal range. Waist circumference was measured by using a measuring tape midway between the iliac crest and the costal margin in horizontal plane with the subject standing. Normal values in males <90 cm (36 inches) and in females <80 cm (32 inches). The mean of three readings of each waist circumference was taken from the calculation. A fasting blood glucose level after overnight fasting for 10-12 hours of each participant was done in the pathology laboratory and by Accucheck Glucometer. The data was collected on a pre designed proforma. The normal fasting blood sugar (FBS) was taken as <100 mg/dl (5.55 mmol/l). The data were evaluated in statistical programme SPSS version 10.0. Student t-test was applied to compare the means (2 tailed) on 95% confidence interval among the numerical parameters such as age, FBS, BMI and waist circumference. The Fisher's exact test of chi square was applied among the categorical variables of family history i.e. obesity and type 2 DM to calculate frequencies and percentages. P value < 0.05 was considered statistically significant.

Results

Total 500 participants were included in this study. They were divided into two groups i.e. high and low risk groups. Two hundred and fifty participants were included in each group on the basis of same gender and age. In each group 125 (50%) were males and 125(50%) were females with mean age 27.46 ± 5.71 (20 - 40) years. Thirty (12%) participants in high risk group and 4 (1.6%) participants in low risk group were found to have impaired fasting blood glucose. Mean fasting blood glucose was 88.4+14.82 mg/dl in high risk group and 79.6+ 14.2 mg/dl in low risk group (p=0.001).

Regarding body mass index, the overall mean in high and low risk group was 25.87 ± 5.3 (range 19 - 39.50 kg/m^2) and 22.5 ± 3.3 (range 17.30 - 31.5 kg/m^2) (p = 0.001) respectively with 26.61 ± 5.45 kg/m^2 in males and 24.14 ± 4.64 kg/m^2 in females in the high risk group p = 0.13, 23.56 ± 3.30 kg/m^2 in males and 20.05 ± 1.79 kg/m^2 in females in low risk group (p = 0.001). However, in high risk group, 145 (58%) individuals were obese, of which 70 (56%) were males and 75 (60%) were females, while in low risk group 72 (28.8%) were obese, of whom 33 (26.4%) were males and 39 (31.2%) females were obese (Table).

Table: BMI (Body Mass Index) in high and low risk groups (n 500). Reference values according to revised criteria for Asian population.

Classification for BMI	BMI (reference values kg/m2)	Results	
		High Risk (n = 250)	Low Risk (n = 250)
Underweight	< 18.5	-	-
Normal weight	18.5-24	105 (42%)	178 (71.2%)
Overweight	24.1-29.9	65 (26%)	62 (24.8%)
Obesity (class 1)	30-34.9	60 (24%)	10 (4%)
Obesity (class 2)	35-39.9	20 (8%)	-
Extreme obesity (class 3)	> 40	-	-

The mean waist circumference, in high and low risk group was 82.16cm ± 12.17 (range 50-106 cm) centimeters and 82.26cm ± 9.12 (range 60 - 103 cm) centimeters p = 0.96 respectively. In males the mean was 84.05cm ± 13.53 centimeters and 77.74cm ± 6.60 centimeters in females in the high risk group p = 0.09, whereas mean waist circumference in males was 83.97cm ± 10.66 cm and 78.26cm ± 6.99 cm in females in low risk group p = 0.06 respectively. However in high risk group 105 (42%) individuals had increased waist circumference, of which 65 (52%) were males and 40 (32%) were females, while in low risk group 90 (36%) had increased waist circumference, of which 54 (43.2%) were males and 36 (28.8%) were females.

Discussion

Diabetes mellitus is a fast expanding global health problem but more so in the developing countries. Therefore it is of particular interest to study the epidemiological transition of the state and to identify the risk factors to recognize the extent of the problem.[8] It has been observed that about 50% of people from Impaired Glucose Tolerance group will become diabetic in five years if they don't change their lifestyle as well as reduce their weight. Impaired Glucose Tolerance state is potentially reversible if the overweight category loses weight and becomes more cautious in diet. In our study one hundred and forty five (58%) high risk individuals and seventy two (28.8%) low risk individuals had raised BMI. The mean age of both (high risk and low risk) group was 27.46 ± 5.71 (20 - 40) years. However in another study, the raised BMI was 28.6%. The reason of comparatively more raised BMI in our study may

be due to life style and socio-economic factors i.e. habits of sleeping at daytime, taking rich fat diet, taking more sugar in tea, drinking soft drink daily, use of sweets and sedentary life style.[9] Obesity is an important parameter of metabolic syndrome which is the collection of health risks that increase the chance of developing heart disease; stroke and diabetes.[10] The prevalence rate in many western countries is 22-23%. According to ATP (Adult Treatment Panel)-III guidelines;[11] the diagnosis of metabolic syndrome is made when at least three factors among obesity, raised blood pressure, raised fasting blood glucose, raised triglycerides or decreased HDL are present in an individual.

In this study there was significant difference in BMI between high and low risk individuals. However a local study by Basit et al on children showed that the children having positive family history for diabetes had slightly higher mean values for BMI.[12] The study conducted by Jahan et al on frequency and gender differences at an out-patient clinic, showed that 17% individuals with age group 31-40 years had metabolic syndrome.[13] In the United States, 24% men and 23% women had metabolic syndrome whereas a cohort study showed increasing frequency in metabolic syndrome with an increase in age.[14] A study comparing two possible definitions of metabolic syndrome showed two different prevalence rates; 23.9% using ATP-III guidelines and 25.1% using WHO definition.[15]

Though the normal range of BMI for Asian population according to revised criteria is 18 to 24 kg/m^2,[6] our study showed that in high risk individuals 42% had normal BMI, 26% were overweight and 32% were obese while in low risk individuals 71.2% had normal BMI, 24.8% were overweight and 4% were obese. In another study it was shown that 16% had a BMI <18.5 kg/m^2 (underweight), 36.8 % had a BMI between 18.5-24.9 kg/m^2 (normal), 44.6% had a BMI 25-26.9 kg/m^2 (overweight) and 17% were obese with a BMI of > 27 kg/m^2.[16] It is established that waist circumference (WC) predicts increased risk of morbidity and mortality beyond that explained by BMI alone. The review of literature clearly demonstrates that WC predicts the risk of diabetes and cardiovascular disease in men and women beyond that explained by the commonly evaluated cardio-metabolic risk factors (blood pressure, triglyceride, LDL and HDL cholesterol, and glucose levels) and BMI. We addressed this issue using data from the most recent National Health and Nutrition Survey (NHANES).[17] In South Asians a waist size of > 90 cm in men and > 80 cm in women is now accepted as a major risk factor for diabetes and other cardiovascular risk factors.[18] Blood pressure also increases with increasing BMI. The health survey for England 2003 found that mean systolic blood pressure was about 6 mm Hg higher in obese men and women than in those of normal weight (BMI 18.5-25). According to data from the third national health and nutrition examination survey (NHANES III) in the US, high blood pressure was the most common condition related to overweight and obesity that showed a marked increase with increasing categories of BMI.[19] In our study blood pressure was not co-related with BMI.

In our study one hundred and five (42%) and ninety (36%) individuals had raised waist circumference in high and low risk groups respectively. A study showed that individuals with high WC values were increasingly likely to have hypertension, diabetes, dyslipidaemia, compared with those with normal WC values.[20] Until recently, waist circumference demonstrated to be a better predictor of type 2 diabetes than either BMI or waist-to-hip ratio[21] however, there is no compelling evidence that waist circumference provides any clinically meaningful information that is independent of well-known cardio-metabolic risk factors.[22] In our study out of one hundred and ninety five individuals of raised WC, 162 (83%) had raised BMI and 33 (17%) had normal BMI. The National Health and Nutrition Examination Survey III (NHANES III) found that about 14% of women and 1% of men had a "high" WC but a normal BMI.[23] Men with waist circumference of 40 inches or greater and who also fell into the obese category with a BMI of 30 or greater were at more than twice the risk to get type 2 diabetes as were those who had a high BMI or a high waist circumference alone. In our study in high risk individuals, 62% males and 38% females had raised WC while in low risk individuals, 61% males and 39% females had raised WC. The circumference of a man's waist is a better predictor of his risk of developing type 2 diabetes than his body mass index (weight-to-height ratio) or waist-to-hip ratio alone.[24] Waist circumference (WC) is an independent risk factor for hypertension and type 2 diabetes mellitus in the setting of a developing country. However a study has proved that waist circumference was an independent determinant for hypertension and diabetes especially in women younger than 40 years of age.[25] The results in a study demonstrate that disparities in the prevalence of depression and anxiety exist among people with different BMI levels independent of their disease status or other psychosocial or lifestyle factors.[26] In our study depression was not co-related to various levels of BMI. The work by Han E et al suggests that obesity prevention may reduce hospitalizations, a major component of rising healthcare costs. The impact of successful obesity prevention is likely to be larger in women than in men and similar in blacks and whites.[27] A significantly large number of adults are suffering from obesity in our set up. A number of factors contribute towards the increase in the risk of obesity. The main factors are socioeconomic influences, urbanization, and familial aggregation. It is important for

family physicians to identify patients with obesity, and to intervene aggressively to reduce the risk of diabetes and macrovascular disease. There is strong evidence that a structured programme of diet and exercise can reduce the risk of progression to type 2 diabetes in the patients with impaired glucose tolerance. The true prevalence of obesity should be determined for management. Awareness is essential through media in developing countries, especially for prevention of complications.

Conclusion

Our study concluded that the risk of obesity is more frequent in people with diabetic parents than in people of non diabetic parents. This calls for increasing awareness to prevent the sequelae.

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