A Study Of Anthropometric Indices Of Young Adults With Family History Of Diabetes

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Abstract: **Background& Objectives:** Increased incidence of lifestyle diseases seen in India are like hypertension, type II Diabetes Mellitus, and ischemic heart diseases. Family history represents the integration of shared genomic and environment risk factors. **Aims and objectives**: To study the correlation of anthropometric indices in young individuals with family history of diabetes. **Material and Method:** This study was conducted in 164 healthy medical students of age group 18 – 25 yrs, from which 82 were with family history of diabetes and 82 with no family history of diabetes (control group). Anthropometric measurements of height, weight, waist circumference, hip circumference were taken. Body mass index (BMI), waist - hip ratio (WHR), waist -height ratio (WHtR) was determined from these basic measures. **Results:** Statistical analysis was carried using SPSS software. BMI, Waist circumference, WHR were statistically more significant ($p<0.001$) in subjects with family history of diabetes as compared to control group ($p >0.001$).Among the subjects with family history of diabetes, 57.3% were overweight (according to World Health Organisation criteria for Asians) while 18.3% were overweight in control group. **Conclusion:** The study concluded that, the anthropometric indices (Weight, Waist circumference, Hip circumference, BMI, WHR) were higher in young healthy adults of 18-25yrs age having family history of diabetes.

Keywords: anthropometric indices, diabetes, BMI

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Introduction: India is undergoing a rapid epidemiological transition with increased urbanization and socio-economic development which has resulted in a dramatic change in lifestyle, consisting of physical inactivity, diet rich in fat, sugar and salt coupled with a high level of mental stress. This has led to increased incidence of lifestyle diseases like hypertension, type II Diabetes Mellitus dyslipidemia, obesity and ischemic heart diseases. Obesity also contributes to these diseases.[1] First degree relatives share half of their genomic information and also behaviour, life styles, beliefs, culture and physical environment, so their disease experience may offer a clue to shared susceptibilities[2]. Type 2 Diabetes Mellitus in the presence of a low BMI is more strongly familial than that at a higher BMI[3]. Family history, thus, could be used as a tool for genomic studies in order to understand the underlying shared gene-environment interrelation associated with complex traits in managing various diseases. The need for its primary prevention has been increasingly emphasised, although only during the past 10–15 years. Since type II diabetes is a heterogeneous and multifactorial disorder, preventive measures must be based upon modification of several risk factors simultaneously. The existing evidence, however, suggests that even a single intervention, e.g. increased physical activity in sedentary people or weight loss in the obese, can lead to a marked reduction in the risk of type 2 diabetes[2,4,5]. The association between these conditions is so close that many experts consider obesity and type II DM to be as different ends of the same spectrum therefore together called as'diabesity'[1] . Anthropometry provides the single most portable, universally applicable, inexpensive and non-invasive technique for assessing the size, proportions and composition of the human body. Basic anthropometric measurements (weight, height, waist-circumference and hip circumference) and their derived indices (body mass index, waist-hip ratio and waist-height ratio) are used as indicators for the presence of diseases and their assessment in clinical practice[5]. The prevalence of diabetes in India is expected to increase from 31.7million in 2000 to 79.4 million in 2030 [6]. Prevalence of Impaired Fasting Glucose (IFG) also seems to be higher in women than men in the Indian population [7]. It is very important to note that people with impaired fasting glycaemic levels can change their life style to delay the onset of diabetes [8]. Fasting Plasma Glucose (100-125 mg/dl) is the preferred diagnostic tool because it is more convenient, less expensive and still more reliable [8]. Family history has been recognized in clinical medicine as an important, yet non-modifiable, disease risk factor that when present might influence the probability of a suspected diagnosis. However, collection and interpretation

of family history has rarely been applied in the practice of preventive medicine to assess disease risk and influence early detection and prevention strategies. Family history of Type II DM had significant effect on individuals with multiple syndromes as compared to their counterparts (individuals having no family history of Type II Diabetes Mellitus [8]. The cardiometabolic profile of the parents was similar to that of the adolescents. Parental history of type II diabetes mellitus increases risk of not only glucose intolerance but also other cardiometabolic risk factors like overweight, low high-density lipoprotein cholesterol, and high blood pressure in Asian Indian adolescents[9]. A positive family history shown to be associated with increased risk of IFG/IGT (Impaired Fasting Glucose /Impaired Glucose Tolerance)and type II DM as well as higher levels of obesity, HOMA-IR, fasting triglyceride (TG), and lower levels of high density lipoprotein (HDL) cholesterol and HOMA-β[10]. A number of studies have been conducted abroad regarding changes in various anthropometric measurements among children and grandchildren of patients of diabetes but not much work has been done in India with family history of diabetes in healthy adults. The study has been conducted so that preventive measures of health can be implemented to prevent from morbidity and mortality caused by diabetes. . The WHO Expert Consultation concluded that the proportion of Asian people with a high risk of type 2 diabetes and cardiovascular disease is substantial at Body Mass Index's(BMI) lower than the existing WHO cut-off point for overweight (≥ 25 kg/m^2). However, the cut-off point for observed risk varies from 22 kg/m^2 to 25 kg/m^2 in different Asian Indian populations[3, 12-14].

The present study was conducted in 164 subjects (healthy young adults at tertiary hospital). Athropometric measuresurements of weight, height, body mass index (BMI) with waist circumference, waist to hip ratio(WHR), waist-height ratio (WHtR) are determined and its correlation with family history (mother/father/both).

Materials and Metrhods: The study was done on 164 apparently healthy young subjects, of tertiary health centre of Municipal Corporation of Greater Mumbai in the age group of 18–25 years. Family history of type-2 diabetes mellitus was enquired in 82 subjects. Controls (82) were selected from the same age group with no family history of type-2 diabetes mellitus. Informed consent was obtained from all the participants and ethical approval for the study was obtained from the local ethical committee. Complete General Physical Examination was performed and various Anthropometric Measurements were taken.

Anthropometric Measurements: Following basic and derived anthropometric measurements (indices) were taken in each subject, using standard methodology. Screening for normal fasting glucose levels (100-125mg/dl) with glucometer.

1. Height : Height in centimetres will be measured(to the nearest 0.1centimeter) with a steel , anthropometric rod, with the subject, standing barefooted in erect position
2. Weight: in kilograms (to the nearest 0.5kg) will be recorded with the subject standing on the weighing scale, barefooted wearing minimum clothes.
3. Circumferences: - The waist and hip circumferences in centimetres measured with a non-stretchable measuring tape.
4. Waist circumference (WC) - measured midway between iliac crest and lowermost margin of ribs. According to guidelines, cut-offs for waist circumstances will now be 90 cm for Indian men (as opposed to 102 cm globally) and 80 cm for Indian women (as opposed to 88 cm at the international level)[3]
5. Hip circumference (HC) - measured at the level of the greater trochanters in centimetres.
6. Body Mass Index (BMI):- BMI calculated as weight in kilograms divided by squared height in meters (weight in kg/height in m^2)[3, 11, 13-15].
   Normal weight (BMI > 18.5 – <23.0 Kg/m^2)
   Over weight (BMI ≥ 23.0 Kg/m2)
7. Waist-Hip Ratio (WHR):- It was calculated using following formula:
   WHR = WC(cm) /HC(cm)
   Elevated WHR = 0.95 for males and 0.88 for females [3, 11, 15].
8. Waist-Height Ratio (WHtR) or Waist-Stature Ratio (WSR):-It was calculated using following formula : WHtR = WC(cm)/Height(cm)The cut-off value will be 0.5 for both sexes (men & women) [3, 11,15]

9. Fasting plasma glucose: capillary blood measured with glucometer after 12 hrs of fasting. Normal level: 100-125mg/dl

All the instruments were calibrated and verified before they were used. The measurements were taken single handed by the investigator herself. Statistical Analysis: All data were analyzed by SPSS (Statistical Package for social sciences, Version 17, SPSS). Mean, standard deviation, Pearson's Chi-Square (x^2) test and student't' test were used to investigate the results and a conclusion was drawn. p" is level of significance NS; p > 0.05; Not Significant; *p < 0.05; Significant at 5% significance level; **p < 0.01; more Significant at 1% significance level; ***p < 0.001; Highly Significant.

Results: The results are expressed as mean ± standard deviation. The classification, mean age and the distribution of cases and controls with respect to gender are shown in Table 1, Table 2, Table 3 and figure 1 show the various anthropometric indices among cases and controls. . There is a statistical significant increase ($P < 0.05$) in the BMI, WC, HC, WHR, and WHtR in study group. The anthropometric values are high in apparently healthy individuals with a family history of type-2 Diabetes Mellitus (study group) than in the control group

Table no 1. Classification of the subjects according to the family history

No. Of subjects (18-25 years)	Criteria
82	With family history of Diabetes
82	With no family history of Diabetes

Table no.1 shows study categorized into two groups with 82 healthy subjects in each group

Study group: Healthy young adults (18-25yrs) with family history of diabetes.

Control group: Healthy young adults (18-25yrs) without family history of diabetes.

Table no.2 Gender distribution

Parameters	Control group	Study group
No. of Cases	82	82
Mean(age)	18.62±0.81	18.59±0.78
Male Female	*48 (58.5) 34 (41.5)	32 (39.0) 50 (61.0)

By Chi-square test *p<0.05 significant

Table no.3 Anthropometric parameters

Anthropometric and Physiological variables	Control group(82)	Study group(82)	P value
Weight(kg)	58.91 ± 10.75	63.45 ± 11.72	*P =0.0106
Height(cm)	167.63 ± 08.98	164.33 ± 10.27	*P =0.0299
Hip Circumference (cm)	94.26 ± 06.56	97.80 ± 08.39	*P= 0.0030
Waist Circumference (cm)	78.84± 09.19	80.56± 10.96	*P< 0.0001
Body Mass Index (Kg/m2)	20.89 ± 03.04	23.37 ± 02.68	*P< 0.0001
Waist Hip Ratio	0.84 ± 0.07	0.81 ± 0.08	*P= 0.0115
Waist Height Ratio	1.20 ± 0.10	1.24 ± 0.12	*P= 0.0217

By Student't'test *p<0.05 significant

Figure 1

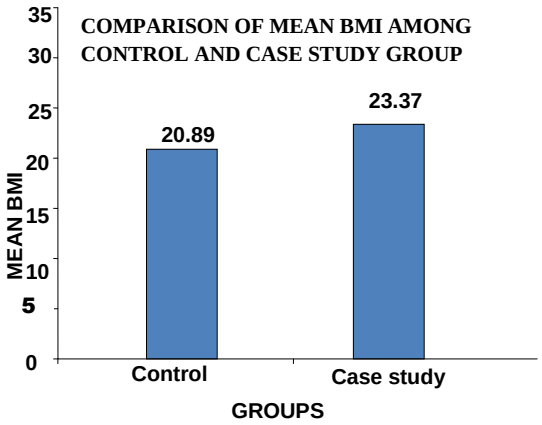
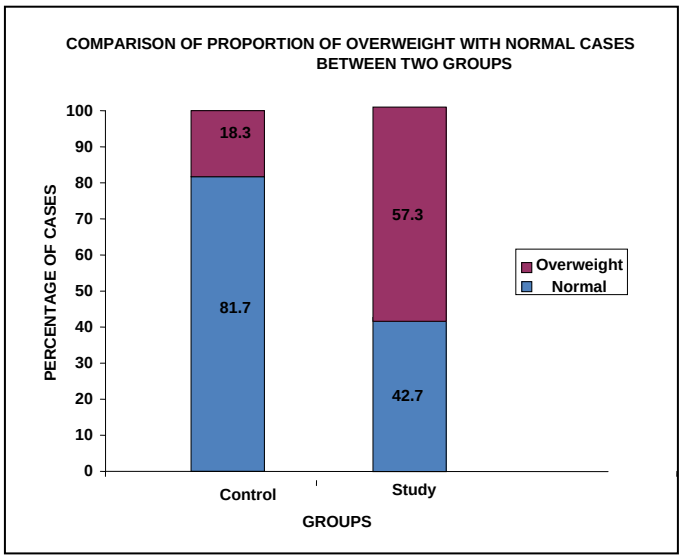


Table no.3 show the basic statistical characteristics of the studied sample of 164 healthy young adults (18-25 yrs) with mean values, standard deviation and statistically significant values of all anthropometric indices viz. Weight(kg), Height(cm), Hip Circumference (cm), Waist Circumference (cm), Body Mass Index (Kg/m^2), Waist Hip Ratio, Waist Height Ratio.

The above figure 1, shows that the mean BMI of among study group was 23.37, which was statistically more significant ($p<0.0001$) as compared to 20.89 among control group

Figure 2:



As per the above figure, **57.3%** of the cases among study group were overweight (BMI ≥ 23.0 Kg/m^2), which was statistically more significant as compared to **18.3%** among control group.

Discussion: Obesity is an increasing world-wide health problem and is a major risk factor for the development of chronic diseases such as type II diabetes mellitus and hypertension and for mortality. Anthropometric indices in obese and type-II diabetics are gaining lot of importance at present because of its feasibility and accuracy. Family history represents the integration of shared genomic and environment risk factors. Parental history of type II diabetes mellitus increases risk of not only glucose intolerance but also other cardiometabolic risk factors like overweight, low high-density lipoprotein cholesterol, and high blood pressure in Asian Indian adolescents[9].

The present study was conducted in 164 subjects. Anthropometric measuresurements of weight, height, body mass index (BMI) , waist circumference, waist to hip ratio(WHR),waist-height ratio(WHtR) are determined and its correlation with family history. The present study showed significant increase in BMI in study group as shown in the table no. 1 and figure 1 as compared to control group. The study it was seen that according to WHO, BMI ≥ 23.0 Kg/m2 were overweight cases, these cases were 57.3% in study group and 18.3% in control group . This showed that percentage of overweight cases were more in healthy adults having positive family history of diabetes than subjects having no such family history. Statistically these results were highly significant. Thus increase of BMI is a better indicator for the onset of diabetes [18]. Comparison of increase of WC, WHR, and WHtR between study and control group showed more significant results statistically.

The present study is corroborative with various previous studies[10, 12, 16, 17]. The studies showed that the risk of becoming a diabetic for an individual with a positive family history of diabetes increases by two- to fourfold an offspring's chance and individuals with a positive family history of diabetes have higher body mass index (BMI) than controls[18-20]. Obesity and body fat distribution, lifestyle, impaired glucose tolerance (IGT), and a family history of type-2 Diabetes Mellitus, represent risk factors for type-2 Diabetes Mellitus [19-24].

Study conducted by Samata et al. showed that healthy individuals with family history of type-2 diabetes mellitus have higher anthropometric values and lower physical fitness than the controls[10]. The limitation of the study is that the study should be extended in large population for better results and prediction of correlation.

Conclusion: The study concluded that, the anthropometric indices (Weight, Waist circumference, Hip circumference, BMI, WHR) were higher in young healthy adults of 18-25yrs age having family history of diabetes. The fact that recurrence-risk ratios were elevated only in families with one or two diabetic parents indicates that susceptibility to Type 2 diabetes is transmitted primarily through an affected parent[16]**.** Early identification of the simple clinical, anthropometric and biochemical parameters which are strongly associated with early onset Type 2DM in young Asian Indians may be useful for primary prevention[25]. Hence, a check on these parameters may help in controlling the predisposing factors and therefore diabetes. So that by controlling the obesity we could presage the early onset of this chronic disease in healthy young adults.

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