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Original Article

A study of the basic and derived anthropometric indices among the healthy adults (20-30 years of age) of amritsar city (punjab) having family history of hypertension.

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ABSTRACT

Introduction :- Family history represents the integration of shared genomic and environment risk factors. First degree relatives (IDRs) share half their genomic information and also behaviour, life styles, beliefs, culture and physical environment, so their disease experience may offer a clue to shared susceptibilities. This suggests that a low tech clinical approach-family history-might be a practical and useful way to target interventions and disease prevention efforts to those most at risk The Global Burden of Disease Study projected hypertension as the leading cause of death in the year 2020 .Thus , it is clear that hypertension is an enormous health problem and is one of the biggest health challenge of the 21ST century. 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. This study has been conducted to determine whether such abnormalities can be detected in healthy young adults with a family history of hypertension at an early age that may presage the onset of this chronic disease. Materials and Method:- The present study will be conducted among 200 healthy adults (20-30 years of age) of Amritsar city (100 having family history of hypertension and 100 age matched adults serve as control group).The basic anthropometric measurements of height, weight, hip circumference, waist circumference and the derived indices body mass index (BMI),waist hip ratio (WHR) and waist height ratio(WHtR) were determined from these basic measures. Results:- The various basic and derived anthropometric indices showed changes in healthy adult offspring of the parents with history of hypertension.The results were statistically analysed by using SPSS Software version 17.0 . Conclusion:- All the derived anthropometric indices (BMI,WHR,WHtR) are significantly increased in young healthy adults (20-30yrs of age) having positive family history of hypertension.

1. Introduction

Family history represents the integration of shared genomic and environment risk factors. First degree relatives (IDRs) share half their genomic information and also behaviour, life styles, beliefs, culture and physical environment, so their disease experience may offer a clue to shared susceptibilities. This suggests that a 'low tech' clinical approach-family history-might be a practical and useful way to target interventions and disease prevention efforts to those most at risk [1] . The unprecedented economic development and rapid urbanization in Asian countries, particularly in India has led to a shift in health problems from communicable to non-communicable diseases. Of all the non-communicable diseases, diabetes and cardiovascular diseases lead the list [2]. Cardiovascular diseases, particularly hypertension

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account for high mortality in the form of coronary heart disease (CHD) in western countries and stroke in countries like India, Taiwan and Japan. Hypertension also contributes to cardiac or renal failure. The higher the blood pressure, the greater is the risk of cardiac and renal failure and lower is the expectancy of life. Many of the risk factors associated with the development of hypertension are preventable. Mean blood pressure and prevalence of hypertension increased with social class , salt intake , parental history of hypertension , weight , height and body mass index [3].

The Global Burden of Disease Study projected hypertension as the leading cause of death in the year 2020 .Thus , it is clear that hypertension is an enormous health problem and is one of the biggest health challenge of the 21ST century [4]. 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]. A number of studies have been conducted abroad regarding changes in various anthropometric measurements among children and grandchildren of patients of hypertension but not much work has been done in India. So this study of young adults, in this geographical region, having family history of hypertension has been conducted so that preventive measures of health can be provided to save them from the morbidity and mortality caused by this chronic disease.

2.Materials and Method

The present study was conducted among 200 healthy adults (20-30 years of age) of Amritsar city (Pb.) (100 having family history of hypertension and 100 age matched adults serve as control group)..The subjects were taken from the general population of Amritsar city. The subjects were informed about the study, formal consent was taken from them and then relevant informations were taken from them. Complete General Physical Examination was performed and various Anthropometric Measurements were taken.

2.1. ANTHROPOMETRIC MEASUREMENTS:- Following basic and derived anthropometric measurements (indices) were taken in each subject, using standard methodology.

A. Basic Anthropometric Measurements

1) Height:- Height in centimeters was measured(to the nearest 0.1centimeter) with a steel ,anthropometric rod, with the subject, standing barefooted in an erect position against a vertical scale of portable stadiometer and with the head positioned so that the top of the external auditory meatus in level with the inferior margin of the bony orbit.[6]
2) Weight:- Weight in kilograms(to the nearest 0.5kg) was recorded with the subject standing motionless on the weighing scale, barefooted wearing minimum clothes and maintaining the privacy.[6]
3) Circumferences: - The waist and hip circumferences in centimeters were measured with a non-stretchable measuring tape. These circumferences were measured twice, to the nearest centimeter and the mean was used for subsequent analysis.

I) Waist circumference (WC) was measured by using bone landmarks as references. The WHO guidelines recommend the measurement of waist circumference at the mid point between the lowest rib and the iliac crest (the highest point of the ilium).7 Elevated WC was defined as WC=102cm for men and 88cm for women.[6]

ii) Hip circumference (HC) was measured at the level of the greater trochanters in centimeters. [6]

B.Derived Anthropometric Indices

1) Body Mass Index (BMI):- BMI was calculated as weight in kilograms divided by squared height in meters(weight in kg/height m2) . Conventional BMI cut off points were applied to classify the studied population into the following6:-
   i) Underweight (BMI <18.5 Kg/m^2).
   ii) Normal weight (BMI > 18.5 - <25.0 Kg/m^2)
   iii) Over weight (BMI ≥25.0 Kg/m^2)
2) Waist-Hip Ratio (WHR):- It was calculated using following formula :
   WHR = WC(cm) /HC(cm)
   Elevated WHR = 0.95 for men and 0.88 for women.[6]
3) Waist-Height Ratio (WHtR) or Waist-Stature Ratio (WSR):-It was calculated using following formula :
   WHtR = WC(cm)/Height(cm)
   The cut-off value used was 0.5 for both sexes (men & women).[8]

All the instruments were calibrated and verified before they were used. The measurements were taken single handed by the investigator herself.

2.2.Statistical analyses

All data were analyzed by SPSS (Statistical Package for socialsciences, Version 17, SPSS). Mean, standard deviation, Post Hoc Test and Pearson's Chi-Square (x2) 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.

3.Results

Table 1. Classification of the subjects according to the family history

No. of Subjects (20-30 years of age)	Criteria
100	With no family history of hypertension
100	With positive family history of hypertension

Table 1. shows the study was categorized into two groups with 100 healthy adults (20-30 years of age) in each group.

Group I. Healthy adults (20-30 years of age) with no family history of hypertension.

Group II. Healthy adults (20-30 years of age) with positive family history of hypertension.

Table 2. Basic Statistical Characteristics of the studied sample of 200 healthy adults (20-30 yrs) of Amritsar city. (Mean values and standard deviation)

Anthropometric and Physiological variables	Group I (n=100) Mean±SD	Group II (n=100) Mean±SD
Age (Years)	22.06±1.98	22.11±2.44
Weight (Kg)	57.38±9.88	59.43±12.12
Height (cm)	165.96 ±8.12	161.84 ±8.37
Systolic Blood Pressure (mm of mercury)	111.42±11.04	114.82±11.67
Diastolic Blood Pressure (mm of mercury)	73.66±7.21	76.04 ±7.32
Hip Circumference (cm)	93.03±6.38	93.77±6.67
Waist Circumference (cm)	79.00±7.33	82.22±7.81
Body Mass Index (Kg/m^2)	20.76±2.68	22.61±3.65
Waist Hip Ratio	0.85±0.05	0.88±0.05
Waist Height Ratio	0.48±0.04	0.51±0.05

Table 2. shows the basic statistical characteristics of the overall studied sample of 200 healthy adults (20-30 years of age) with the mean values and standard deviations of all anthropometric and physiological variables viz age, weight, height, systolic blood pressure, diastolic blood pressure, hip circumference, waist circumference, , body mass index, waist hip ratio and waist height ratio respectively.

Table 3. Statistical analysis for comparison between groups according to Mean difference of Anthropometric and Physiological variables .

Anthropometric and Physiological variables	Mean difference	P value
Systolic Blood Pressure (mm of mercury)	3.400	0.133^{NS}
Diastolic Blood Pressure (mm of mercury)	2.380	0.068^{NS}
Hip Circumference (cm)	0.740	0.853^{NS}
Waist Circumference (cm)	3.220	0.027*
Body Mass Index (Kg/m^2)	1.851	0.001**
Waist Hip Ratio	0.027	0.001**
Waist Height Ratio	0.032	<0.001***

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

In table 3 on statistical analysis it was observed that increase of systolic blood pressure, diastolic blood pressure and hip circumference was not significant between group I Vs group II.The mean difference of increase of waist circumstance was significant between group I Vs group II (p<0.05) and mean difference of increase in BMI and WHR was more significant (p<0.01) while increase of maen value of WHtR showed highly significant results between group I Vs group II (p<0.001).

In table 4 BMI showed 21%underweight cases, 72% normal cases, 7% overweight cases in group I while 11%underweight cases, 58% normal cases, 31% overweight cases in group II respectively. It was observed that number of overweight cases was more in group II than group I.

Table 4. Showing Statistical Significance with Pearson Chi Square(x2) test for comparison for the number of subjects according to Body Mass Index(BMI)

BMI	Group I	Group II
Underweight (BMI <18.5 Kg/m^2)	21	11
Normal (BMI > 18.5 - <25.0 Kg/m^2)	72	58
Overweight (BMI ≥ 25.0 Kg/m^2)	7	31
Total	100	100

Chi-Square (x2)= 19.791 , p = < 0.001***
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

On statistical analysis it was observed that on comparison of BMI between group I Vs group II(chi sq =19.791, p<0.001) was highly significant .(Table 4) Table 5 showed that in a studied sample of 200 subjects, elevated WC was seen in 7%cases in group I & 12%cases in group II on statistical analysis it was observed that it was not significant. The elevated WHR was seen in 12%cases in group I &28%cases in group II. On statistical analysis it was observed that comparison of WHR between group I Vs group II more significant (chi sq=8.000, p<0.01).The elevated WHtR was seen in 26%cases in group I& 49%cases in group II showing more significant results(chi sq=11.285, p<0.01).

Table 5. Showing Statistical Significance with Pearson Chi Square(x2) testfor comparison for the number of subjects having normal and elevated values according to Waist Circumference (WC), Waist Hip Ratio (WHR) & Waist Height Ratio (WHtR)

		No of cases			
Anthropometric variables	Group	Normal	Elevated	Chi-Square (x^2)	P Value
WC	Gp I Gp II	93 88	07 12	1.454	0.228^{NS}
WHR	Gp I Gp II	88 72	12 28	8.000	0.005**
WHtR	Gp I Gp II	74 51	26 49	11.285	0.001**

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

4.Discussion

Obesity is an increasing world-wide health problem and is a major risk factor for the development of chronic diseases such as type 2 diabetes mellitus and hypertension and for mortality. The risk of cardiovascular events rises with increasing body mass index (BMI). The World Health Organization recommends measurement of the BMI as a universal criterion of overweight (25) and obesity (30); measures of abdominal fat distribution such as waist circumference (WC) or waist to hip ratio (WHR) and waist height ratio (WHtR) are also encouraged. Prospective epidemiological

studies have shown increased abdominal fat accumulation to be an independent risk factor for hypertension [9,10]. Risk factors for developing hypertension, peculiar to the Indian population are high familial aggregation. In India nearly 75% of the hypertensives have first degree family history of hypertension indicating a strong familial aggregation.2The aim of our study was to see the changing trends of increasing various anthropometric measurements in healthy adults having positive family history of this chronic disease. So that by controlling the obesity we could presage the early onset of this chronic disease in healthy young adults.

In the present study, 200 healthy adults (20-30 years of age) were taken in two groups to compare the various anthropometric indices among them.

The increase of hip circumference was not significant statistically between the studied group(group II) and control group(group I). Increased HC is not a good indicator for the onset of this chronic disease [11].

On comparison increase of WC between study and control group showed statistically significant results. Our study is corroborative with the study of people of South Asian origin having increased cardiovascular risk due to more centralized deposition of body fat with higher mean of WC and WHR [12]. Cases of elevated WC from the cut off values was seen 12% in group II and 7% in groupI .On statistically this comparison of elevated cases was not significant. BMI of studied and control group showed more significant results statistically.Our study is corroborative with the study done in Jawaharlal Institute Urban Health Center, Pondicherry in age group 15-19 years [3]. In our study it was seen that according to WHO, BMI ≥ 25.0 Kg/m2 were over weight cases, these cases were 30% in group II and 7% in group I. This showed that percentage of overweight cases were more in healthy adults having positive family history of hypertension 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 hypertension. Comparison of increase of WHR between study and control group showed more significant results statistically. The percentage of number of cases of increase WHR from the cut off values was also more in group II(28%) than in group I(12%). This comparison of number of cases of increase WHR between group I Vs group II showed more significant results statistically. In this regard our study is corroborative with an Indian study showing that WHR is a better predictor for hypertension [12].

Statistically the comparison of increase WHtR between study and control group was highly significant . The percentage of number of cases of increase WHtR from the cut off values was more in studied group (49%) than control (26%). Statistically this showed more significant results. Our present study is corroborative with various international studies [8,13] in which also WHtR predicts the risk for cardiovascular diseases like hypertension.

5. Conclusion

The various basic and derived anthropometric indices showed changes in healthy adult offsprings of the parents having hypertension. BMI, WC, WHR and WHtR which are the anthropometric indices gave important inferences by showing increasing values in predicting the onset of this chronic disease in healthy adults in their later life if family history happened to be positive . They should be advised to do regular exercise to control their weight and avoid obesity and also educate them to abstain from taking junk and oily food and motivate them for regular monitoring of their blood pressure. This sincere effort on our part will help them to live a healthy active life free from the chronic disease hypertension.

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