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Dr. Anju Luthra
Associate Professor, Department of Physical Education, Jesus & Mary College, University of Delhi, New Delhi, India

Correspondence
Dr. Anju Luthra
Associate Professor, Department of Physical Education, Jesus & Mary College, University of Delhi, New Delhi, India

Relationship between selected measures of visceral fat distribution and cardio-respiratory fitness

Dr. Anju Luthra

Abstract
The study was conducted to determine the relationship between selected measures of visceral fat distribution, girth and cardio-respiratory fitness. The study was conducted on 40 adult females in the age group of 35-40 years. To determine the relationship between selected measures of visceral fat distribution with cardio-respiratory fitness, product moment correlation (r) was employed. The result indicates that an inverse significant correlation between abdominal height (AbH) and cardio-respiratory fitness (CRF) since the value obtained for calculated "r" was -0.447. A significant correlation was obtained for abdominal height with body mass index, upper arm circumference, waist: height ratio since the value obtained for calculated "r" were 0.791, 0.501 and 0.598 respectively. A significant correlation was also obtained for body mass index (BMI) with upper arm circumference (UAC) and waist: height ratio (WHtR) since the value obtained for calculated "r" were 0.560 and 0.758 respectively. Upper arm circumference was correlated significant with waist: height ratio since the value for calculated "r" were 0.378 which was above than the value of tabulated "r" 0.361 significant at 0.05 level. An inverse correlation was obtained between abdominal height and cardio-respiratory fitness while an insignificant correlation was obtained between cardio-respiratory fitness with the other selected measures of visceral fat distribution and girth, namely body mass index, upper arm circumference, waist: height ratio.

Keywords: Abdominal height, waist: height ratio, upper arm circumference, body mass index and cardio-respiratory fitness

Introduction
Over the last 20 years, the global nature of many problems in health care has become much more evident. In the realm of health, this has meant that countries across the globe have started to experience the same kinds of behavioral shifts (overeating, reduced physical activity and smoking), and with them massive increases in cardiovascular risk factors. This behavioral shift has brought a global epidemic- Obesity as a major issue all over the world. The obesity epidemic is actually a worldwide pandemic that has global implications for health and disease.
At present obesity has reached epidemic proportions globally, with more than 1 billion adults overweight - at least 300 million of them clinically obese - and is a major contributor to the global burden of chronic disease and disability.
Economic growth, modernization, urbanization and globalization of food markets are just some of the forces thought to underlie the epidemic. As incomes rise and populations become more urban, diets high in complex carbohydrates give way to more varied diets with a higher proportion of fats, saturated fats and sugars. At the same time, large shifts towards less physically demanding work have been observed worldwide. Moves towards less physical activity are also found in the increasing use of automated transport, technology in the home, and more passive leisure pursuits.
Obesity has also reached epidemic proportions in India in the 21st century, affecting 5% of the country's population. India is also following a trend of other developing countries that are steadily becoming more obese. Unhealthy, processed food has become much more accessible following India's continued integration in global food markets. Indians are genetically susceptible to weight accumulation especially around the waist.
According to a survey around two to three lakh people in Delhi suffer from morbid obesity, which does not respond to the usual means of weight loss like controlled diets and exercise programme.

In our study we have selected Central adiposity as one of our variable because central adiposity—where fatness is heavily concentrated around the waistline—is a better measure of disease risk than overall or total adiposity. However, it is difficult to assess which is the better measure of disease risk when total adiposity and central adiposity are so highly correlated (Kuller 1999; Obarzanek 1999). Certain abdominal skin fold measures, waist-to-hip ratio (WHR) and waist circumference are considered to be markers of central adiposity or intra-abdominal fat. Similar to BMI, health risks increase as waist circumference increases. Waist circumferences greater than 102 cm (men) and 88 cm (women) indicate substantially increased risk. Anthropometric measures have served as noninvasive markers because obesity, particularly abdominal obesity, is closely associated with cardiovascular risks factors. Therefore in our study we had chosen various anthropometric measures assessment with cardio-respiratory fitness. Assessment of Selected Measures of Visceral Fat Distribution, Girth and Cardio-Respiratory Fitness in Women was the primary objective of the study along with to find the inter-relation between them. After going through the literature it was hypothesized that there would be an inverse correlation between the selected Measures of Visceral Fat Distribution, Girth and cardio-respiratory fitness.

Procedure and methodology

The study was conducted on 40 adult females in the age group of 35-40 years. The subjects were selected from West Delhi (Punjabi Bagh). Prior consents were obtained from the subjects for the purpose of the study. It was ensured from the medical examination records of the subject that all of them were medically fit forgoing through the test. The variables used in the study were Abdominal Height, Waist: Height Ratio, Upper Arm Circumference, Body Mass Index and Cardio-Respiratory fitness. The criterion measure used were

a. Body weight of the subject was measured to the nearest 0.5 kilogram (kg) using a standard weighing machine.
b. Height of the subject was measured to the nearest meter by using a stadiometer.
c. Abdominal Height was measured by assessing the thickness of the abdomen at the waist level to the nearest centimeter, with the help of a portable abdominal caliper while the subject was in supine lying position on the examination table.
d. Waist: Height Ratio was calculated after measuring the waist circumference and height of the subject. To get the ratio, the waist circumference was divided by height of the subject.
e. Body Mass Index was calculated by using the formula body weight (kg)/height^2 (m^2).
f. Upper Arm Circumference was measured by taking the circumference of the upper arm at the belly of the biceps muscle.
g. Cardio-Respiratory fitness was assessed by administering 1mile ROCKPORT test.

To assess the Abdominal Height, Waist: Height Ratio, Upper Arm Circumference, Body Mass Index and Cardio-Respiratory fitness in Women, Mean and Standard Deviation along with maximum and minimum value were calculated. To find out the inter-relation between Abdominal Height, Waist: Height Ratio, Upper Arm Circumference, Body Mass Index and Cardio-Respiratory fitness product moment correlation(r) was employed at 0.05 level

Analysis of data and findings of the study

Table 1: Descriptive statistics of selected measures of visceral fat distribution, girth and cardio-respiratory fitness in women

	N	Minimum	Maximum	Mean	SD
AbH	30	18.00	28.00	22.73	2.75
BMI	30	24.12	38.63	30.08	3.11
UAC	30	24.00	36.00	31.50	3.22
WHtR	30	0.46	0.58	0.52	0.03
CRF	30	27.61	52.32	33.21	5.15

Table 1 indicates that abdominal height (AbH) variable is having the mean value of 22.73 and standard deviation (SD) of 2.75 with the maximum value of 28 and minimum value of 18.00. Similarly the mean value for body mass index (BMI) is 30.08 and standard deviation (SD) of 3.11 with the maximum value of 38.63 and minimum value of 24.12. The mean value of upper arm circumference (UAC) is 31.50 and standard deviation (SD) of 3.22 with the maximum value of 36.00 and minimum value of 24.00. The mean value of waist: height ratio (WHtR) is 0.52 and standard deviation (SD) of 0.03 with the maximum value of 0.58 and minimum value of 0.46. The mean value of cardio-respiratory fitness (CRF) is 33.21 and standard deviation (SD) of 5.15 with the maximum value of 52.32 and minimum value of 27.61.

Table 2: Relationship between selected measures of visceral fat distribution, girth and cardio-respiratory fitness in women

	AbH	BMI	UAC	WHtR	CRF
AbH	1	0.791**	0.501**	0.598**	-0.447*
BMI		1	0.560**	0.758**	-0.215
UAC			1	0.378*	-0.310
WHtR				1	-0.032
CRF					1

**Correlation is significant at 0.01 level ($r_{0.01}$ (28) = 0.463)
*Correlation is significant at 0.05 level ($r_{0.05}$ (28) = 0.361)

It is evident from table 2, an inverse correlation was obtained between abdominal height (AbH) and cardio-respiratory fitness (CRF) since the value obtained for calculated "r" was -0.447 which was above than the value of tabulated "r" which was 0.361 significant at 0.05 level. However, there was an insignificant correlation obtained between cardio-respiratory fitness (CRF) with the other selected measures of visceral fat distribution and girth, namely body mass index (BMI), upper arm circumference (UAC), waist: height ratio (WHtR). The above table also reveals a significant correlation was obtained between abdominal height (AbH) with body mass index (BMI), upper arm circumference (UAC) and waist: height ratio (WHtR) since the value obtained for calculated "r" for abdominal height with body mass index, upper arm circumference, waist: height ratio were 0.791, 0.501 and 0.598 respectively which were above than the value of tabulated "r" which was 0.463 significant at 0.01 level. A significant correlation was also obtained between body mass index (BMI) with abdominal height (AbH), upper arm circumference (UAC) and waist: height ratio (WHtR) since the value obtained for calculated "r" for body mass index (BMI) with abdominal height (AbH), upper arm circumference (UAC) and waist: height ratio (WHtR) were 0.791, 0.560 and 0.758 respectively which were above than the value of tabulated "r" which was 0.463 significant at 0.01 level. A significant correlation was also obtained between upper arm circumference (UAC) with abdominal height (AbH) and body mass index (BMI) as the value obtained for

calculated “r” were 0.501and 0.560 respectively which were above than the value of tabulated “r” which was 0.463 significant at 0.01 level. Upper arm circumference was also correlated significant with waist: height ratio since the value for calculated “r” were 0.378 which was above than the value of tabulated “r” 0.361 significant at 0.05 level. A significant correlation was also obtained between waist: height ratio with abdominal height and body mass index as the value obtained for calculated “r” were 0.598 and 0.758 respectively which were above than the value of tabulated “r” which was 0.463 significant at 0.01 level. While the waist: height ratio was correlated significant with upper arm circumference since the value for calculated “r” were 0.378 which was above than the value of tabulated “r” 0.361 significant at 0.05 level.

An inverse correlation was obtained between abdominal height and cardio-respiratory fitness while an insignificant correlation was obtained between cardio-respiratory fitness with the other selected measures of visceral fat distribution and girth, namely body mass index, upper arm circumference, waist: height ratio. A significant correlation was obtained between abdominal height with body mass index, upper arm circumference and waist: height ratio. A significant correlation was also obtained between body mass index with abdominal height, upper arm circumference and waist: height ratio. A significant correlation was also obtained between upper arm circumference with abdominal height, body mass index and waist: height ratio. A significant correlation was also obtained between waist: height ratio with abdominal height and body mass index.

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