Association Of Subcutaneous Fat With Some Anthropometric Characteristics And Lipid Profile In Vegetarian And Non-vegetarian Middle Aged Menopausal Women Of Central India

Corresponding Author:
Dr. Shyamal Koley,
Reader, Department of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Amritsar, India - India

Submitting Author:
Dr. Shyamal Koley,
Reader, Department of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Amritsar, India - India

Article ID: WMC00941
Article Type: Research articles
Article URL: http://www.webmedcentral.com/article_view/941
Subject Categories: SPORTS MEDICINE
Keywords: Serum cholesterol, Triglycerides, HDL-C, LDL-C, VLDL-C. Subcutaneous fat.

How to cite the article: Koley S. Association Of Subcutaneous Fat With Some Anthropometric Characteristics And Lipid Profile In Vegetarian And Non-vegetarian Middle Aged Menopausal Women Of Central India.
WebmedCentral SPORTS MEDICINE 2010;1(10):WMC00941

Source(s) of Funding:
No funding.

Competing Interests:
No conflict
Association Of Subcutaneous Fat With Some Anthropometric Characteristics And Lipid Profile In Vegetarian And Non-vegetarian Middle Aged Menopausal Women Of Central India

Author(s): Koley S

Abstract

The purpose of this cross-sectional study was to search the correlations of ultrasonographically estimated subcutaneous fat with some anthropometric characteristics and lipid profile of middle aged vegetarian and non-vegetarian menopausal women of central India. To solve this purpose, 47 purposively selected middle aged vegetarian (n=30) and non-vegetarian (n=17) menopausal women between the age group 40 - 60 years were collected from Jabalpur, Madhya Pradesh, Central India. The measurements included were height, weight, BMI, subcutaneous abdominal fat, five skinfold measurements, viz. biceps, triceps, subscapular, suprailiac and abdominal and seven lipid profile components, viz. serum cholesterol, High Density Lipoprotein-C (HDL-C), Low Density Lipoprotein-C (LDL-C), Triglycerides, VLDL-C, Total Cholesterol : High Density Lipoprotein-C ratios and Low Density Lipoprotein - C : High Density Lipoprotein–C ratios. Results indicated statistically significant (p

Introduction

Subcutaneous abdominal fat, a component of central obesity, has a strong association with metabolic profiles (1). Women begin to increase visceral as well as subcutaneous fat deposited at the onset of menopause (2). An android fat distribution (abdominal obesity, or "apple shaped" body) is related to an increased risk of cardiovascular disease (3). Subcutaneous abdominal fat increases insulin resistance and the related cluster of metabolic risk factors (glucose intolerance or diabetes mellitus, low HDL-cholesterol concentrations, elevated triglyceride concentrations, hypertension, and obesity) (4-6). This cluster was first described by Reaven (4) as "syndrome X" and is also referred to as the "insulin resistance syndrome" or "metabolic syndrome" (7). Indian population has a very high incidence of ischemic heart disease with lipid profile is one of the risk factors which is different from those seen in western populations. Elevated levels of triglyceride, cholesterol and LDL-C are documented as risk factors for atherogenesis. Blood level of HDL-C in contrast, bears an inverse relationship for the risks of atherosclerosis and coronary heart disease. Different plasma lipids vary significantly in various population groups due to differences in geographical, cultural, economical, social conditions.

Diabetes mellitus has become a widespread disease nowadays. According to World Health Organization report (8), around 171,000,000 people were affected with diabetes worldwide by the year 2000 and will reach around 366,000,000 by the year 2030. The prevalence of diabetes is on the rise, more alarmingly in the developing nations. In India alone 31,705,000 people were affected by the year 2000 and will reach around 79,441,000 by the year 2030. Due to the high degree of genetic predisposition and high susceptibility to environmental conditions, characterized by a low BMI, high upper body adiposity, a high body fat percentage and a high level of insulin resistance, Indian population faces higher risk for diabetes and its complications (9). Evidence in the literature has suggested that the visceral fat thickness measured by ultrasonography could be more reliable method to quantify subcutaneous visceral fat as compared with other methods (10-11).

Association of lipid profile is reported with lifestyle (12, 13), age (14), intra-abdominal adiposity (15-16), obesity (17-20), BMI (21) and waist to hip ratios (22-24). In the present study, an attempt has been made to investigate the relationship of subcutaneous abdominal fat with lipid profile along with some anthropometric variables in vegetarian and non-vegetarian middle aged menopausal women of central India.

Methods

The study was conducted within the framework of an ongoing prospective cohort study of vegetarian and non-vegetarian middle aged menopausal women of
Jabalpur, Madhya Pradesh, central India. Women were recruited from a health check-up camp organized by Digambar Jain Mahila Samiti and Punjabi Mahila Samiti at the Gorakhpur gurudwara, Jabalpur, India, between 27th June -27th July, 2007. A total of 47 middle aged (between 40-60 years) menopausal (due to small sample size pre, peri and post menopausal samples were pooled) women participated in the study. A total of 30 vegetarian Jain middle aged women and 17 non-vegetarian Punjabi middle aged women with a body mass index (BMI) ≥ 30kg/m² were screened for inclusion in the study. Exclusion criteria included self reported pregnancy, any chronic infectious disease, weight loss >6kgs during past 6 months. The study was approved by Institutional Ethical Committee and a written informed consent was obtained by all the participants.

**Anthropometric measurements**

The height was recorded during inspiration using a stadiometer (Holtain Ltd., Crymych, Dyfed, UK) to the nearest 0.1 cm. The subject was asked to stand erect on the stadiometer with bare foot. The horizontal bar of the stadiometer was placed on the vertex of the subject and the readings were recorded. Weight was measured by digital standing scales (Model DS-410, Seiko, Tokyo, Japan) to the nearest 0.1 kg. The subject was asked to stand erect on the digital weighing machine with minimum cloths and bare foot. The readings were recorded from the scales of the digital weighing machine. BMI was then calculated using the formula weight (kg)/height² (m)². Five skinfold measurements were taken from the sites, biceps (vertical skinfold raised on the anterior aspect of the biceps muscle), triceps (vertical skinfold raised on the posterior aspect of the triceps muscle, exactly halfway between the olecranon process and the acromion process when the hand is supinated), subscapular (oblique skinfold raised 1 cm below the inferior angle of the scapula at approximately 450 to the horizontal plane following the natural cleavage lines of the skin), suprailiac (diagonal fold raised immediately above the crest of the ilium on a vertical line from the mid-axilla) and abdominal (vertical fold raised at a lateral distance of approximately 2 cm from the umbilicus) using Harpenden skinfold caliper (Holtain Ltd, Crosswell, Crymych, UK) to the nearest 0.2 mm. All the anthropometric measurements were taken following the standard techniques (25). A pre-tested semi structured questionnaire was developed to obtain information on the demographic, nutritional and lifestyle profiles of the participants.

**Estimation of lipid profiles**

Venous blood samples were taken from all the subjects in the morning after fasting overnight. Plasma levels of fasting plasma glucose, total cholesterol, triglycerides, High Density Lipoprotein-Cholesterol (HDL-C), Low Density Lipoprotein-Cholesterol (LDL-C) and Very Low Density Lipoprotein (VLDL) were analyzed. Total cholesterol and triglyceride concentrations were determined with a semi-automated enzymatic analyzer (RA 50, Semi-auto Chemistry Analyzer, Thyrocare India Ltd, India). HDL-Cholesterol serum level was measured by using phosphotungstate precipitation method. The ratio of total cholesterol-to-high density lipoprotein cholesterol (HDL-C) was considered to be the best predictor of heart disease and has been used in our study. Exclusion factors were confirmed from the subject’s personal physician report and a detailed history.

**Estimation of subcutaneous fat**

The subject was asked to report in fasting position in the morning. They were made to lie in supine position on the table keeping her heels, buttock and shoulders in contact with the table. The abdominal fat distribution by ultrasonography was estimated by a real time US scanner (Sonoline Prima, Siemens, Germany) according to the standard procedure (10). Ultrasound gel was applied and a convex 3.5 MHz transducer was applied at a distance of 1 cm cranially from the umbilicus on the xypho-umbilical line. Transverse scans were performed during mid-inspiration. The subcutaneous fat thickness was measured as the distance between the skin fat and fat muscle interfaces.

**Statistical analysis**

Standard descriptive statistics (mean ± standard deviation) were determined for directly measured and derived variables. Student’s t-test was used for the comparison of various anthropometric variables between middle aged vegetarian and non-vegetarian menopausal women. Pearson’s correlation coefficients were applied to establish the relationships among the variables measured. Data were analyzed using SPSS (Statistical Package for Social Science) version 17.0. A 5% level of probability was used to indicate statistical significance.

**Results**

Table 1 shows the descriptive statistics of 16 variables in middle aged vegetarian and non-vegetarian menopausal women of central India. The middle aged vegetarian women have higher mean values in all the variables studied, except BMI, subscapular skinfold and serum HDL-C than their non-vegetarian counterparts. However, statistically no significant
differences were found in any case between those two sets of populations.
The correlation coefficients (r) of subcutaneous fat and 15 other variables in vegetarian and non-vegetarian middle aged menopausal women of central India were shown in Table 2. In vegetarian middle aged women, statistically significant positive correlations (p<0.05) were noted between subcutaneous fat and weight, BMI, subscapular.

Discussion

Early post menopausal status is associated with a preferential increase in subcutaneous abdominal fat that is independent of age and total body fat mass. This increased abdominal fat accumulation in women can be attributed to the increased androgenic activity in the postmenopausal women as the hormones are known to affect the fat distribution (2,3). Preliminary studies suggest that the menopause transition is associated with deleterious changes in body composition and body fat distribution. The association between body fat distribution and lipid profile has been shown to be the important predictor for metabolic disturbances including dyslipidemia, hypertension, diabetes, cardio vascular disease etc.

In the present study, anthropometric parameters, viz. height, weight, BMI, biceps skinfold, triceps skinfold, subscapular skinfold, suprailiac skinfold and abdominal skinfold were not the affected factors among vegetarian and non-vegetarian middle aged women (Table 1). Weight was one such factor that affects greatly towards metabolic risk. In fact, it was reported earlier too, that weight loss and/or gain was related to increased risk for abdominal fat distribution and therefore metabolic risk profile (20). No marked mean differences were found in the distribution of serum cholesterol, serum HDL-C, serum triglyceride, serum LDL-C, serum VLDL, ratio of total cholesterol: HDL-C and ratio of LDL-C: HDL-C in vegetarian and non-vegetarian middle aged women as data was collected from same geographical and socio-economic background. Elevation in any one of the components of lipid, except HDL-C, plays an important role in development of coronary heart diseases. The present study showed statistically no marked differences among all the lipid components as obesity was frequently present among middle aged vegetarians and non-vegetarian menopausal women, thus blood lipid levels altered homogenously. It showed that the increase in LDL-C and total cholesterol makes the individual more prone to metabolic risk profile (26).

In this study, subcutaneous abdominal fat was found to be negatively related to HDL-C only in the vegetarian middle aged women (Table 2). HDL-C is known to be good cholesterol (27). Reduction in plasma HDL-C impairs the normal clearance from arterial wall thereby accelerating the development of atherosclerosis (28). Improvement of HDL-C helps provides protective effect on heart. The present study is in agreement with the findings of earlier studies (29, 30) on relationship between fat distribution and serum lipids. One of the limitations of the study was the small sample size, especially in the non-vegetarian group. Future study is required considering larger sample size to draw the generalized statement.

References

Distribution of mean values and standard deviation of 16 parameters in vegetarian and non-vegetarian middle age menopausal women.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Vegetarian middle aged women (N=30)</th>
<th>Non-vegetarian middle aged women (N=17)</th>
<th>t' value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>Mean 159.40  S.D. 5.88  S.E. 1.07  Mean 155.24  S.D. 8.56  S.E. 2.08</td>
<td></td>
<td>1.97</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>Mean 63.20  S.D. 10.97  S.E. 2.00  Mean 62.76  S.D. 13.15  S.E. 3.19</td>
<td></td>
<td>0.12</td>
</tr>
<tr>
<td>BMI (Kg/m^2)</td>
<td>Mean 24.81  S.D. 3.91  S.E. 0.71  Mean 25.87  S.D. 4.15  S.E. 1.01</td>
<td></td>
<td>-0.88</td>
</tr>
<tr>
<td>Bicep skinfold (mm)</td>
<td>Mean 13.88  S.D. 3.50  S.E. 0.64  Mean 13.36  S.D. 3.61  S.E. 0.87</td>
<td></td>
<td>0.49</td>
</tr>
<tr>
<td>Triceps skinfold (mm)</td>
<td>Mean 24.12  S.D. 5.36  S.E. 0.98  Mean 22.05  S.D. 4.44  S.E. 1.08</td>
<td></td>
<td>1.35</td>
</tr>
<tr>
<td>Subscapular skinfold (mm)</td>
<td>Mean 25.75  S.D. 5.96  S.E. 1.09  Mean 26.74  S.D. 5.35  S.E. 1.30</td>
<td></td>
<td>-0.56</td>
</tr>
<tr>
<td>Suprailiac skinfold (mm)</td>
<td>Mean 23.68  S.D. 5.93  S.E. 1.08  Mean 23.32  S.D. 5.11  S.E. 1.24</td>
<td></td>
<td>0.21</td>
</tr>
<tr>
<td>Abdominal skinfold (mm)</td>
<td>Mean 32.92  S.D. 5.76  S.E. 1.05  Mean 31.32  S.D. 5.35  S.E. 1.30</td>
<td></td>
<td>0.93</td>
</tr>
<tr>
<td>S. Cholesterol (mg/dl)</td>
<td>Mean 186.67 S.D. 38.32 S.E. 7.00  Mean 177.29 S.D. 33.90 S.E. 8.22</td>
<td></td>
<td>0.84</td>
</tr>
</tbody>
</table>
Illustration 2

Table 2.

Table 2: Correlation coefficients (r) of subcutaneous fat and other 15 variables in vegetarian and non-vegetarian middle aged women.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Vegetarian (N=30)</th>
<th>Non-vegetarian (N=17)</th>
<th>Total (N=47)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>0.123</td>
<td>0.293</td>
<td>0.141</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>0.419*</td>
<td>0.647**</td>
<td>0.504**</td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td>0.409*</td>
<td>0.688**</td>
<td>0.529**</td>
</tr>
<tr>
<td>Bicep skinfold (mm)</td>
<td>0.271</td>
<td>0.663**</td>
<td>0.402*</td>
</tr>
<tr>
<td>Triceps skinfold (mm)</td>
<td>0.088</td>
<td>0.615*</td>
<td>0.219*</td>
</tr>
<tr>
<td>Subscapular skinfold (mm)</td>
<td>0.341*</td>
<td>0.483*</td>
<td>0.397**</td>
</tr>
<tr>
<td>Suprailiac skinfold (mm)</td>
<td>0.416*</td>
<td>0.493*</td>
<td>0.427**</td>
</tr>
<tr>
<td>Abdominal skinfold (mm)</td>
<td>0.275</td>
<td>0.407</td>
<td>0.289</td>
</tr>
<tr>
<td>S. Cholesterol (mg/dl)</td>
<td>-0.095</td>
<td>0.175</td>
<td>-0.022</td>
</tr>
<tr>
<td>HDL-C (mg/dl)</td>
<td>-0.237</td>
<td>0.327</td>
<td>-0.014</td>
</tr>
<tr>
<td>S. Triglyceride (mg/dl)</td>
<td>0.097</td>
<td>0.015</td>
<td>0.043</td>
</tr>
<tr>
<td>LDL-C (mg/dl)</td>
<td>-0.099</td>
<td>0.103</td>
<td>-0.046</td>
</tr>
</tbody>
</table>

* indicates P<0.05; ** indicates P<0.01.
Disclaimer

This article has been downloaded from WebmedCentral. With our unique author driven post publication peer review, contents posted on this web portal do not undergo any prepublication peer or editorial review. It is completely the responsibility of the authors to ensure not only scientific and ethical standards of the manuscript but also its grammatical accuracy. Authors must ensure that they obtain all the necessary permissions before submitting any information that requires obtaining a consent or approval from a third party. Authors should also ensure not to submit any information which they do not have the copyright of or of which they have transferred the copyrights to a third party.

Contents on WebmedCentral are purely for biomedical researchers and scientists. They are not meant to cater to the needs of an individual patient. The web portal or any content(s) therein is neither designed to support, nor replace, the relationship that exists between a patient/site visitor and his/her physician. Your use of the WebmedCentral site and its contents is entirely at your own risk. We do not take any responsibility for any harm that you may suffer or inflict on a third person by following the contents of this website.