Obesity is one of the most important risk factors for various cardiometabolic diseases namely diabetes, hypertension, dyslipidemia, and coronary heart disease [1-3]. With the increasing proportions of the global prevalence of obesity, it becomes important to identify measures of obesity in a quick and accurate manner. An early and quick assessment of obese individuals may help to improve the stratification of disease risk and also help in planning prevention and intervention strategies in an effective manner [4].

Body mass index (BMI) is one of the most widely used tools to assess the weight status in adults and children [5] despite the advantages of ease of measurement and interpretation, BMI is associated with significant limitations as not representing the body fat distribution [6,7]. An upper body distribution of fat, especially with increased visceral adipose tissue, is considered to be predictive of cardiometabolic outcomes. Therefore, in this study, we have studied the relationship between NC and the conventional marker of obesity, namely, body mass index (BMI) and also the triglyceride levels in a group of young adults.

Methods: There were 60 participants in this study in the age group of 18-42 years of both genders with no known major medical conditions (viz., diabetes, coronary artery disease, hypertension, thyroid diseases, or malignancy) NC was measured at mid-neck height. The analysis of serum triglycerides was carried out after an overnight fast using Beckman Coulter autoanalyzer.

Results: A significantly positive correlation was found between NC and BMI (r=0.8154, p<0.0001). A positive correlation was found between NC and triglyceride levels (r=0.0316, p=0.9934).

Measurement of NC may be more useful in morbidly obese people, bedridden patients, and pregnant women. NC is found to have a positive correlation with insulin resistance and various components of the metabolic syndrome.

Conclusion: NC can be considered as a simple, useful, and reliable tool to identify overweight and obesity. This can be used as an alternative method to assess the fat distribution in health-care centers and also in population studies.

Keywords: Obesity, Body mass index, Neck circumference.

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Table 1: Correlation between NC and BMI

<table>
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<th>Mean±SD value</th>
<th>Regression value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck circumference (cm)</td>
<td>40.5±3</td>
<td>0.8154</td>
<td>&lt;0.0001</td>
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<tr>
<td>BMI (kg/m²)</td>
<td>24.2±5.1</td>
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</table>

NC: Neck circumference, BMI: Body mass index, SD: Standard deviation

Table 2: Correlation between NC and triglycerides

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean±SD value</th>
<th>Regression value</th>
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</tr>
</thead>
<tbody>
<tr>
<td>NC (cm)</td>
<td>40.5±3</td>
<td>0.0316</td>
<td>&lt;0.0034</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>179.8±94.6</td>
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</tr>
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</table>

NC: Neck circumference, SD: Standard deviation

DISCUSSION

Obesity is a known risk factor for the development of various cardiovascular and metabolic disturbances. Obesity is usually assessed by BMI, WC, and waist/hip ratio. An independent association of NC with visceral adiposity and BMI has been demonstrated by the Framingham heart study [20]. We have observed a positive correlation between NC and BMI in our study Table 1. An upper body distribution of fat, especially with increased VAT, is considered predictive of cardiometabolic conditions [8-10].

Several studies have shown a significant positive association of NC with BMI and WC [23,25,26]. Due to cultural factors, the measurement of hip or WC may be difficult in certain situations [26]. Measurement of NC may be more useful in morbidly obese people, bedridden patients, and pregnant women [27].

A positive association has been reported between NC and serum triglyceride levels in our study Table 2. The upper body subcutaneous fat depots are one of the main determinants of the systemic-free fatty acid concentrations [28]. The free fatty acid release from upper body subcutaneous fat has been reported to be larger than that from lower-body subcutaneous fat. The measurement of upper body subcutaneous adipose tissue depots assumes greater relevance in this regard [23].

The association observed between neck fat, and components of metabolic syndrome may be attributed to an excess release of free fatty acids into plasma from the upper body subcutaneous fat [10]. NC is found to have a positive correlation with insulin resistance and the various biochemical components of the metabolic syndrome.

The NC was found to correlate with the various components of the metabolic syndrome, namely, high triglycerides and fasting glucose levels, low high-density lipoprotein cholesterol levels, and insulin resistance index in a large population-based study [10,22].

The Korean Genome and Epidemiology Study involving 10038 subjects reported a positive correlation of NC with serum triglyceride levels [29]. The limitations of our study are that the participants were chosen from a single center and only single estimations of the anthropometric measurements and blood estimations were carried out.

In conclusion, NC can be considered as a simple, useful, and reliable tool to assess the fat distribution in health-care centers and also in population studies.

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AUTHORS CONTRIBUTION

All the authors have contributed equally.

CONFLICTS INTEREST

All authors have no conflicts of interest to declare.

REFERENCES


