

Correlation of Neck Circumference with Body Mass Index as a Measure of Overweight and Obesity

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Research Article

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Abstract

Aim: To correlate neck circumference with body mass index.

Setting: In patients from a medical unit of a semi-rural medical college hospital in southern India.

Methods: 99 subjects with a BMI>25 were studied.

Results: The Pearson correlation between neck circumference and BMI was 0.285, which was significant at the 0.01 level (2-tailed).

Conclusion: A correlation was found between the neck circumference and BMI.

Keywords: Fatty acid; Hypertension; Type2 diabetes mellitus; Dyslipidemia; Cardiovascular disease

Introduction

Obesity is associated with adverse health, social, psychological and physical problems [1]. Its distribution in different regions has been recognized to modify the metabolic effects (eg. worse outcomes with android obesity). A number of anthropometric measures are used in clinical practice such as body mass index, ponderal index, waist circumference, waist-hip ratio. Upper body fat stores are the principal source of fatty acid release; these lead to insulin resistance.

Useful as the above mentioned measures are, in assessing adiposity, they suffer from difficulties in standardization and convenience. In an effort to identify a simple and efficient method, measurement of neck circumference was studied in relation to insulin resistance and other related conditions.

There are few Indian studies, particularly from non-urban areas [2]. The current exploratory study was performed to evaluate the relation of neck circumference with body mass index in subjects from a rural area of southern India.

Subjects and Methods

Ninety nine inpatients older than 18 years with BMI>25kg/m² admitted to the PES Hospital medical wards of Kuppam were studied. They all had a body mass index (BMI) >25kg/ m². Exclusion criteria were: pregnancy, fluid retaining conditions, and those with thyromegaly. Body mass index (BMI) was calculated as body weight (kilogram) divided by square of height (expressed in meters). Obesity was classified according

to WHO guidelines. Neck circumference was measured according to standard procedure at the mid-neck height.

Results are presented as mean \pm standard deviation. Correlation between neck circumference and BMI was performed by 2-tailed Pearson correlation.

Results

The Pearson correlation between neck circumference and BMI was 0.285, which was significant at the 0.01 level (2-tailed).

Co-morbid conditions consisted of hypertension (52%), type 2 diabetes mellitus (54%), dyslipidemia (44%) and cardiovascular disease (26%) [3] (Table 1).

Age (yrs)	56.02 \pm 12.71
Height (cm)	156.90 \pm 8.83
Weight (kg)	72.78 \pm 10.18
Body mass index (BMI)	29.41 \pm 3.54
Neck circumference (cm)	36.17 \pm 2.97

Table 1: Characteristics of the subjects (n: 99).

Discussion

In this exploratory study from a semi-urban area of south India, we showed that the neck circumference showed a significant correlation with the BMI, a well-accepted measure of overweight and obesity used in clinical practice.

In 2001, Ben-Noun et al from Israel showed that neck circumference could be used as a simple screen to identify overweight and obesity [4]. A series of studies from China showed that neck circumference was an independent predictive contributor to the cardio metabolic syndrome [5], cardio metabolic risk [6], and as synergistic to metabolic risk factors of insulin resistance [7]. The group also reported that neck circumference was a marker of fat in the neck and abdominal visceral fat [8], and an early stage atherosclerosis [9]. In these studies, neck circumference served as an additional risk factor for atherosclerosis and insulin resistance. Similar results were obtained from Israel. Noun et al showed that changes in neck circumference positively correlated with components of metabolic syndrome [10]. Even in children, neck circumference correlated with adiposity as measured by BMI [11].

Subjects with acute coronary syndrome were also shown to have association between neck circumference and risk factors [12]. Hypertension was also reported to correlate with neck circumference in the National Hypertension Registry (RENATA Study) of Argentina [13].

Hingorjo et al. from Karachi concluded that measurement of neck circumference was a potentially useful tool to screen for overweight and obesity [14]. A positive correlation was reported between neck circumference and BMI from Baghdad [15].

Confirmatory results were obtained from a rural area of South India [2] and from Karachi [16] about the predictive value of neck circumference in identifying metabolic syndrome. A recent study from a metropolitan city of south India has also shown that neck circumference was a good predictor of metabolic syndrome and risk factors associated with cardiovascular disease [17].

The possible reason for such association was suggested from a large cohort from the Framingham Heart Study (n: 3307) [18]. Neck circumference could be considered a proxy for upper body fat, which is primarily responsible for systemic free fatty acids. They reported an association of neck circumference with cardio metabolic risk factors, and an independent risk with BMI. Aside from an increased release of proinflammatory free fatty acids, increased neck circumference could be associated with sleep apnea syndrome, another well known risk factor of metabolic syndrome.

In summary we showed a correlation between neck circumference and body mass index in a sample of individuals from a semi-rural area of southern India. Replication in larger samples from different geographic areas, as well as longitudinal studies would throw greater light on the importance of this easily measurable anthropometric value as a risk factor for future metabolic disease.

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