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Original Article

NECK CIRCUMFERENCE AS A SCREENING TOOL FOR OVERWEIGHT AND OBESITY IN ADULTS: A HOSPITAL BASED CROSS SECTIONAL STUDY

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ABSTRACT

Background: Overweight and obesity are major public health problems worldwide and are increasing rapidly in low and middle income countries such as India. Body mass index (BMI) and waist circumference (WC), though widely used, have several limitations in community and clinical settings. Neck circumference (NC), an indicator of upper body subcutaneous fat, has emerged as a simple and feasible anthropometric measure for screening overweight and obesity.
Objectives: To evaluate neck circumference as a screening tool for overweight and obesity in adults and to determine sex specific neck circumference (NC) cut off values for predicting overweight and obesity.
Methods: A hospital based cross sectional study was conducted in the Department of Medicine at a tertiary care centre, from February 2018 to July 2019. A total of 210 adults aged 18–60 years were included. Anthropometric measurements including height, weight, BMI, WC, hip circumference (HC), waist hip ratio (WHR), and NC were recorded using standardized techniques. Pearson's correlation coefficient was used to assess the relationship between NC and other anthropometric indices.
Results: The mean age of participants was 40.82 ± 12.79 years. Mean NC was 38.8 ± 3.3 cm. NC showed a strong positive correlation with BMI ($r = 0.736$), WC ($r = 0.587$), HC ($r = 0.594$), and body weight ($r = 0.722$) ($p < 0.001$).
Conclusion: Neck circumference is a simple, reliable, and cost effective anthropometric measure for screening overweight and obesity in adults. NC values can aid early identification of at risk individuals, especially in resource limited settings.

Keywords: *Neck circumference; Obesity; Overweight; Body mass index; Anthropometry.*

INTRODUCTION

Overweight and obesity are defined as abnormal or excessive fat accumulation that poses a risk to health and are among the leading preventable causes of morbidity and mortality worldwide [1]. According to the World Health Organization (WHO), the global prevalence of obesity has nearly tripled since 1975, with more than 1.9 billion adults classified as overweight and over 650 million as obese in 2016 [2]. India, traditionally burdened with undernutrition, is currently undergoing a rapid epidemiological transition characterized by a rising prevalence of obesity and obesity-related non-communicable diseases such as diabetes mellitus, hypertension, and cardiovascular disease [3-8].

Body mass index (BMI) and waist circumference (WC) are the most commonly used anthropometric indices to assess obesity. BMI provides an estimate of generalized obesity but fails to differentiate between fat mass and lean mass and does not adequately reflect body fat distribution [9]. Waist circumference, a marker of central obesity, is influenced by factors such as posture, abdominal distension, respiration, cultural sensitivity, and observer variability, limiting its

routine use in large-scale screening programs [10,11]. Furthermore, both BMI and WC require calculations or partial disrobing, which may reduce feasibility in busy clinical settings and community-based surveys [12].

Neck circumference (NC) has emerged as a novel anthropometric parameter representing upper-body subcutaneous fat distribution. Measurement of NC is simple, quick, inexpensive, culturally acceptable, and relatively stable throughout the day [13,14]. Upper-body fat accumulation, as reflected by increased NC, is metabolically active and has been shown to be associated with insulin resistance, dyslipidemia, hypertension, and cardiovascular risk [15–17]. The Framingham Heart Study highlighted that upper-body subcutaneous fat measured by NC may represent a unique pathogenic fat depot with independent metabolic significance [18].

Several studies conducted across different populations have demonstrated a significant correlation between NC and established indices of adiposity such as BMI, WC, hip circumference, and body fat percentage [13,14,19–22]. Despite this growing body of evidence, data from Indian adult populations remain limited, and optimal sex-specific NC cut-off values vary across ethnic groups [23–25]. Establishing population-specific NC thresholds is therefore essential for its effective application in clinical practice and public health settings. The present study was undertaken to evaluate the validity of neck circumference as a screening tool for overweight and obesity in adults and to determine appropriate sex-specific NC cut-off values in an Indian population.

OBJECTIVES

1. To evaluate neck circumference as a screening tool for overweight and obesity in adults.
2. To assess the correlation of neck circumference with BMI, waist circumference, hip circumference, and waist-hip ratio.

MATERIALS AND METHODS

Study Design and Setting: This hospital-based cross-sectional study was conducted in the Department of Medicine, J.L.N. Medical College and Hospital, Ajmer, Rajasthan, after obtaining approval from the Institutional Ethics Committee.

Study population and selection criteria: Adults aged 18–60 years of both genders attending the medicine outpatient department or admitted to medical wards were included after obtaining informed consent. A total of 210 participants (110 males and 100 females) were enrolled. Overweight or obese adults aged 18–60 years were included in the study. Known endocrine or metabolic disorders; thyroid disease or cervical pathology; pregnancy; professional bodybuilders; and Individuals on medications known to affect body weight were excluded from the study.

Methodology: Measurements were taken with participants wearing light clothing and no footwear. Weight was measured using a digital scale to the nearest 0.1 kg, and height using a stadiometer to the nearest 1 mm. BMI was calculated as weight (kg)/height² (m²). Waist circumference was measured at the midpoint between the costal margin and iliac crest, and hip circumference at the level of the greater trochanter. Neck circumference was measured at the midpoint between the mid-cervical spine and the mid-anterior neck, just below the laryngeal prominence in men. Data were analyzed using SPSS version 20.0. Continuous variables were expressed as mean ± standard deviation. Pearson's correlation coefficient was used to evaluate associations between NC and other anthropometric indices. A p-value < 0.05 was considered statistically significant.

RESULTS

The mean age of study participants was 40.82 ± 12.79 years, with the majority belonging to the 41–50-year age group. The mean NC of the study population was 38.8 ± 3.3 cm. Mean BMI was 31.04 ± 3.7 kg/m². Neck circumference showed a strong positive correlation with BMI ($r = 0.736$), body weight ($r = 0.722$), waist circumference ($r = 0.587$), hip circumference ($r = 0.594$), and waist-hip ratio ($r=0.178$), all of which were statistically significant ($p < 0.01$). A negative correlation was observed between NC and height ($p>0.05$).

Table 1: Distribution of age among the study participants

Age group	Number	%
≤20 years	24	11.4
21-30 Years	36	17.1
31-40 years	45	21.4
41-50 years	61	29.0
51-60 years	44	21.0
Mean ± SD	**40.82±12.79 years**	

Table 2: Mean anthropometric measurements among the study population

Anthropometric measurements	Mean	SD
Weight (Kg)	83.1	8.6
Body mass index (Kg/m^2)	31.04	3.7
Height (Mtr)	1.63	0.1
Waist circumference (cm)	102.8	7.7
Hip circumference (cm)	107.7	7.1
Waist hip ratio	0.95	0.03
Neck circumference (cm)	38.8	3.3

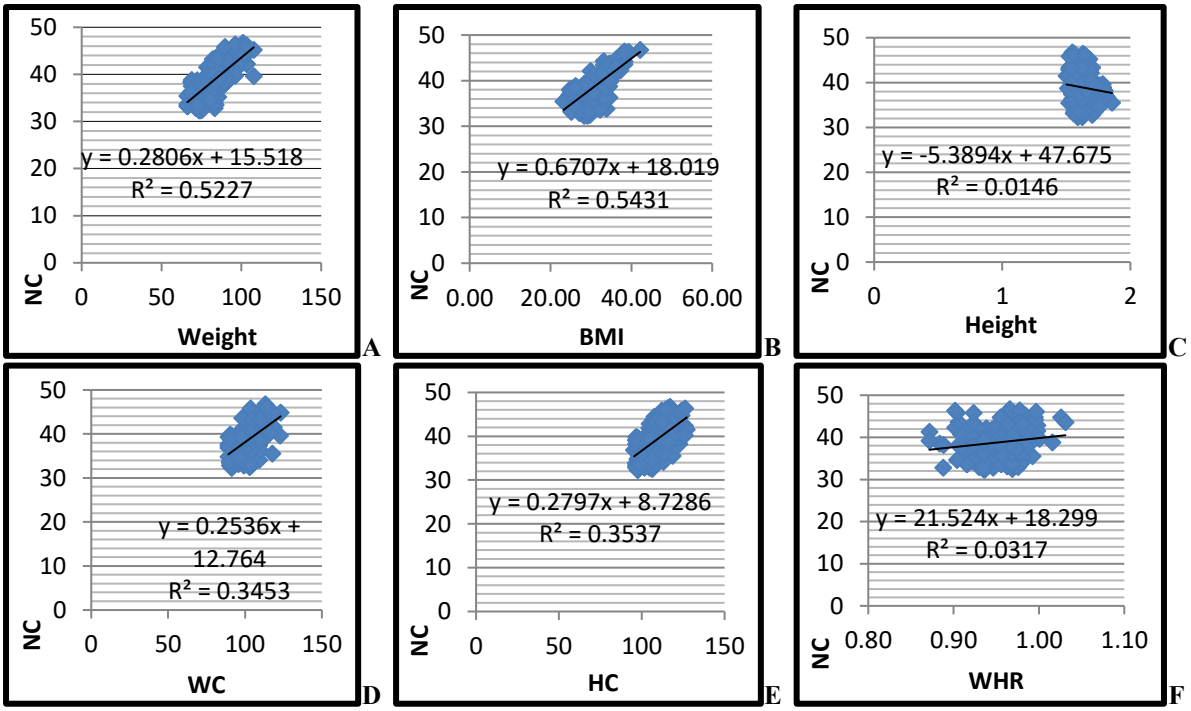

Figure: Scatter plots showing Linear regression equations and Pearson's correlation of NC (Neck circumference) versus - (A)Weight; (B)BMI; (C)Height; (D)Waist Circumference; (E)Hip Circumference; and (F)Waist-Hip Ratio.

Table 3: Pearson's correlation of Neck circumference and (A)Weight; (B)BMI; (C)Height; (D)Waist Circumference; (E)Hip Circumference; and (F) Waist-Hip Ratio

(NC vs -)	Weight	BMI	Height	WC	HC	WHR
R-value	0.722	0.736	-0.120	0.587	0.594	0.178
P-value	0.0001(S)	0.0001(S)	0.081(NS)	0.0001(S)	0.0001(S)	0.009(S)

DISCUSSION

The present study demonstrates that neck circumference is a reliable and practical anthropometric measure for identifying overweight and obesity in adults. NC showed a strong positive correlation with BMI, waist circumference, hip circumference, and body weight, findings that are consistent with those reported in earlier studies conducted in Indian and international populations [13,14,22,26]. These correlations support the concept that NC reflects upper-body subcutaneous fat accumulation, which is metabolically active and strongly associated with cardiometabolic risk factors [15–18].

The practical advantages of NC measurement—including ease of assessment, minimal equipment requirements, cultural acceptability, and cost-effectiveness—make it particularly suitable for large-scale screening programs in resource-limited settings [13,19,27]. In peripheral health centers where accurate measurement of weight or waist circumference may not always be feasible, NC offers a simple alternative for early identification of individuals at risk of overweight and obesity. Overall, the findings of the present study support the inclusion of neck circumference as an adjunct anthropometric measure for obesity screening. However, larger population-based studies incorporating metabolic parameters are warranted to further validate its predictive value for obesity-related comorbidities.

Limitations: Hospital-based study design limits generalizability; relatively modest sample size; and lack of biochemical markers of metabolic risk.

CONCLUSION

Neck circumference is a simple, inexpensive, and effective screening tool for overweight and obesity in adults. NC values can facilitate early identification of individuals at risk and support obesity prevention strategies, particularly in low-resource settings.

REFERENCES

1. World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO Consultation. WHO Technical Report Series 894. Geneva: WHO; 2000.
2. World Health Organization. Fact sheet: Obesity and overweight. Geneva: WHO; 2016.
3. Wang Y, Chen HJ, Shaikh S, Mathur P. Is obesity becoming a public health problem in India? Obes Rev. 2009;10:456–74.
4. Srinath RK, Shah B, Varghese C, Ramadoss A. Responding to the threat of chronic diseases in India. Lancet. 2005;366:1744–9.
5. Sharma I, Chawdhary V, Mathur R, Purohit A. Correlation of serum insulin and homa-ir with anthropometric parameters and blood pressure in obese children. Int J Pharm Clin Res. 2024; 16(3); 435-8.
6. Tiwary N, Kansal D. Pregnancy outcomes of metformin use in pregnant women with PCOS: A comparative study. Biomed Biopharm Res. 2025;22(2):878-84.
7. Suman SK, Kumar A, Ghanchi CL, Ola S, Singh UN. A comparative study of acute-on-chronic liver failure (ACLF) patients with respect to diabetes mellitus and metabolic syndrome. Eur J Cardiovasc Med. 2023;13(3):1007-12.
8. Suman SK, Sinha MK, Sirvi GC, Purohit K, Singh UN. Impact of diabetes mellitus (DM) and metabolic syndrome (MS) on acute liver disease (ALD) and chronic liver disease (CLD). Eur J Cardiovasc Med. 2023;13(3):965-70.
9. Rothman KJ. BMI-related errors in the measurement of obesity. Int J Obes (Lond). 2008;32(Suppl 3):S56–9.
10. Misra A, Chowbey P, Makkar BM, Wasir JS, Chadha D, Joshi SR, et al. Consensus statement for diagnosis of obesity and abdominal obesity for Asian Indians. J Assoc Physicians India. 2009;57:163–70.
11. Banerji MA, Faridi N, Atluri R, Chaiken RL, Lebovitz HE. Body composition and insulin resistance in Asian Indian men. J Clin Endocrinol Metab. 1999;84:137–44.
12. Chandalia M, Abate N, Garg A, Stray-Gundersen J, Grundy SM. Relationship between generalized and upper body obesity to insulin resistance in Asian Indian men. J Clin Endocrinol Metab. 1999;84:2329–35.
13. Ben-Noun L, Sohar E, Laor A. Neck circumference as a simple screening measure for identifying overweight and obese patients. Obes Res. 2001;9:470–7.
14. Ben-Noun L, Laor A. Relationship of neck circumference to cardiovascular risk factors. Obes Res. 2003;11:226–31.
15. Kissebah AH, Vydelingum N, Murray R, Evans DJ, Hartz AJ, Kalkhoff RK, et al. Relation of body fat distribution to metabolic complications of obesity. J Clin Endocrinol Metab. 1982;54:254–60.
16. Fantin F, Comellato G, Rossi AP, Grison E, Zoico E, Mazzali G, et al. Relationship between neck circumference and insulin resistance. Eur J Prev Cardiol. 2017;24:1532–40.
17. Zhou JY, Ge H, Zhu MF, Wang LJ, Chen L, Tan YZ, et al. Neck circumference as an independent predictor of cardiometabolic syndrome. Cardiovasc Diabetol. 2013;12:76.
18. Preis SR, Massaro JM, Hoffmann U, D'Agostino RB Sr, Levy D, Robins SJ, et al. Neck circumference as a marker of upper body subcutaneous adipose tissue. Obesity (Silver Spring). 2010;18:198–204.
19. Hatipoglu N, Mazicioglu MM, Kurtoglu S, Kendirci M. Neck circumference: an additional tool for screening obesity. Eur J Pediatr. 2010;169:733–9.
20. Yang GR, Yuan SY, Fu HJ, Wan G, Zhu LX, Bu XL, et al. Neck circumference and metabolic syndrome in Chinese subjects. Diabetes Care. 2010;33:2465–7.
21. Androutsos O, Grammatikaki E, Moschonis G, Roma-Giannikou E, Chrousos GP, Manios Y. Neck circumference: a useful screening tool of cardiovascular risk in children. Pediatr Obes. 2012;7:187–95.
22. Hingorjo MR, Qureshi MA, Mehdi A. Neck circumference as a marker of obesity. J Pak Med Assoc. 2012;62:36–40.
23. Patil C, Deshmukh J, Yadav S, Patil S, Sheikh A. Neck circumference: a novel anthropometric tool for screening obesity in adults. Int J Collab Res Intern Med Public Health. 2017;9:711–20.
24. Verma M, Rajput M, Sahoo SS, Kaur N. Neck circumference: independent predictor for overweight and obesity in adults. Indian J Endocrinol Metab. 2017;21:803–8.
25. Qureshi NK, Hossain T, Hassan MI, Akter N, Rahman MM, Sultana MM, et al. Neck circumference as a marker of overweight and obesity. Indian J Endocrinol Metab. 2017;21:803–8.
26. Aswathappa J, Garg S, Kutty K, Shankar V. Utility of neck circumference as anthropometric marker of obesity. World J Pharm Sci. 2014;3:1618–29.
27. World Health Organization. Physical status: The use and interpretation of anthropometry. WHO Technical Report Series 854. Geneva: WHO; 1995.