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Research Brief

Gender differences in central obesity: Implications for cardiometabolic health in South Asians

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ABSTRACT

This study estimates the prevalence of central obesity in South Asian adults and examines gender differences in central obesity across cardiometabolic determinants. An urban community-based survey was conducted using multi-stage random sampling. Asia-Pacific criterion for waist circumference (WC) was used to measure central obesity. Amongst 1178 participants, females had a higher age-adjusted central obesity (48%), and more than two-fold increased odds of central obesity. Increased prevalence of central obesity and female preponderance are indicative for a gender-sensitive population-level intervention to tackle cardiometabolic risk. WC may be an effective population-level measurement tool for cardiometabolic risk assessment in South Asian adults.

1. Introduction

Childhood obesity and adult adiposity are growing public health challenges internationally. Earlier, we have reported an increased obesity prevalence of 37% in a specific urban adult population in Eastern India, with distinct ethnic and cultural characteristics, employing revised Asia–Pacific criteria.[1] In the same community, we have also demonstrated the methodological limitations of body mass index(BMI),[2] which may not be considered an ideal metric of adipoisty in South Asians, who generally have a characteristic South Asian phenotype, with relatively lower BMI but a higher level of central obesity and body fat.[3,4]

Measurements of central obesity, which are user-friendly and cost-effective, are yet to be developed and validated across different population settings. Central adiposity is emerging as a better indicator for predicting cardiometabolic risk rather than generalised adiposity.[4,5] Earlier, we had reported that both waist circumference (WC) and weight for height ratio (WHtR) could be better clinical tools to assess central obesity among South Asian adults.[2] However, gender-differences in central obesity across cardiometabolic risk factors among South Asian adults have not been adequately addressed, despite significant heterogeneity between the sexes in developing metabolic consequences of obesity.[6] Hence, we set out to explore this heterogeneity further by employing WC, as the central obesity measurement tool, and to determine underlying gender differences in central obesity among South Asian adults for cardio-metabolic determinants.

2. Methods

The study methods have been published earlier.[1] In brief, our study was a cross-sectional community-based survey, and the study population was selected using a multistage random sampling technique. The sampling frame constituted 37 electoral wards spread across an urban population of Berhampur Municipal Corporation of Odisha state in Eastern India. A total of 1200 eligible subjects who were 20–80 years of age were selected. Central obesity has been defined as per revised criteria specific for Asian–Pacific populations with a value of waist circumference (males: ≥90 cm and for females: ≥80 cm). Demographic, socio-economic, self-reported behavioural information, anthropometric measures, biochemical, and electrocardiographic data were collected. Possible recall and measurement biases were minimised

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through a mixture of approaches, such as the administration of previously validated questionnaire, trained interviewers and the utility of calibrated diagnostic tools. The estimated sample size was 1200 from an urban population of Berhampur City. All the potential risk factors have been factored in multivariable regression analyses. Significant differences in proportions of several covariates studied across two groups of non-obese and centrally obese individuals were tested using Pearson's Chi–Square test. To identify significant predictors of central obesity, multivariable backward elimination logistic regression was employed utilising SPSS software (Version 22, United States). The institutional ethical committee has accepted the study proposal. Written and informed consent has been obtained from all participants prior to the study.

3. Results

1178 individuals (590 males; 588 females) participated in the study out of 1200 eligible subjects, suggesting a response rate of over 98%.There is an increased prevalence of cardiometabolic risk factors-glycaemic abnormalities, hypertension, hypercholesterolemia and metabolic syndrome.(Table 1)The age-standardised prevalence (with 95% CI) of central obesity was 41.6% (38.8–44.4); females reported a higher prevalence of 48.3% (44.2–52.4) compared to males at 33.0% (29.1–36.8). Significant sex differences across different levels of central obesity in cardiometabolic risk factors were identified (Table 1). Furthermore the study reports that females are two-and-half times as likely to be centrally obese compared to males in this South Asian cohort following simultaneous adjustment of relevant cardio-metabolic and socio-demographic determinants (Table 2).

Table 2
Correlates of Central Obesity (WC ≥ 90 cm in Males and WC ≥ 80 cm in Females) (backward elimination logistic regression modeling).

Variables	Adjusted Odds Ratios (AOR)	95% Confidence Intervals (CI)
Female gender	2.63	2.01–3.45
Age (45–64)	1.68	1.28–2.20
SES – middle	2.46	1.67–3.61
SES – High	3.12	1.79–5.42
Physical inactivity	1.66	1.26–2.21
Family History Diabetes	1.64	1.21–2.24
Hypertension	2.37	1.78–3.14
Diabetes	2.28	1.53–3.40
Hypertriglyceridaemia	2.08	1.58–2.73

WC: waist circumference, SES: Socio economic status.

4. Discussion

4.1. Key results

The study findings suggest that females have a relatively higher prevalence of central obesity (48.3 vs 33%) compared to their male counterparts amongst the participants. The study also suggests a biologic gradient in cardiometabolic risk across different levels of central obesity, and this gradient was maintained across both sexes, but with distinct gender variations.(Table 1) Finally, the modeled estimates indicate that females had more than two-fold increased odds of developing central obesity when both socio-demographic and cardio-metabolic risks were accounted for (Table 2).

There are mutiple worldwide studies highlighting gender differences in prevalence of overweight and obesity levels.[7] More commonly women report to be centrally obese than men do.[8–10] Moreover these gender differences are more pronounced amongst women in developing countries.[7] Despite obesity being a complex issue, marked gender differences in upstream factors, including biological and social determinants of obesity, have been reported.[11] Additional explanations around physical activity levels, sociocultural beliefs, biological factors and the degree of urbanisation have been provided for observed gender differences.[7] But the public health discourse of such observations are very limited, despite biological evidence of variations in excess weight gain being related to gender.[12] Furthermore, our study findings are consistent with the growing body of evidence suggesting that WC is a significant cardiometabolic risk predictor.[13–15] It would be interesting and worth considering of a gender-sensitive anti-obesity interventions to tackle both central obesity and the rising epidemic of cardiometabolic risk among South Asian adults.

4.2. Limitations of the study

Our study is a cross-sectional study limited to urban subjects and may not be accurately representative of the general Indian population. This study examined the relationship of anthropometric indices with cardiometabolic risk parameters rather than cardiovascular events or diabetes onset. A computerised tomographic scan to assess fat distribution in subcutaneous and intra-abdominal adipose tissue could not be undertaken due to logistical and resource limitations. Strengths of this study include a large community-based sample of a unique ethnic characteristic, a reproducible, standardised methodology, the application of WHO

Table 1
Prevalence of cardiometabolic risk factors according to Waist Circumference.

Risk Factors	Group I WC in M < 80 or F < 70 cm			Group II WC in M80-89 cm or F70-79 cm			Group III WC in M ≥ 90or F ≥ 80 cm		
Gender wise prevalence	Male (n = 156)	Female (n = 97)	Total (n = 253)	Male (n = 187)	Female (n = 162)	Total (n = 349)	Male (n = 247)	Female (n = 329)	Total (n = 576)
Impaired fasting glucose	13(8.3)	7(7.2)	20(7.9)	36(19.3)*	20(12.3)	56(16.0)*	69(27.9)†‡	77(23.4)†‡	146(25.3)†‡
Impaired glucose tolerance	8(5.1)	6(6.2)	14(5.5)	28(15.0)*	12(7.4)	40(11.5)*	68(27.5)†‡	70(21.3)†‡	138(24.0)†‡
Diabetes	11(7.1)	2(2.1)	13(5.1)	27(14.4)*	7(4.3)	34(9.7)*	67(27.1)†‡	71(21.6)†‡	138(24.0)†‡
Hypertension	37(23.7)	13(13.4)	50(19.8)	52(27.8)	39(24.1)*	91(26.1)	138(55.9) †‡	152(46.2)†‡	290(50.3)†‡
Metabolic Syndrome	12(7.7)	9(9.3)	21(8.3)	25(13.4)	36(22.2)*	61(17.5)*	165(66.8) †‡	262(79.6)†‡	427(74.1)†‡
Hypercholesterolaemia	20 (12.8)	16 (16.5)	36 (14.2)	36 (19.3)	38 (23.5)	74 (21.2)*	72 (29.1) †‡	91 (27.7) †	163 (28.3) †‡
Hypertriglyceridaemia	32 (20.5)	16 (16.5)	48 (19.0)	66 (35.3)*	44 (27.2)	110 (31.5)*	134 (54.3) †‡	152 (46.2) †‡	286 (49.7) †‡
Increased LDL	37 (23.7)	21 (21.6)	58 (22.9)	39 (20.9)	47 (29.0)	86 (24.6)	51 (20.6)	70 (21.3)	121 (21.0)
Low HDL cholesterol	13 (8.3)	76 (78.4)	89 (35.2)	17 (9.1)	134 (82.7)	151 (43.3)	26 (10.5)	287 (87.2) †	313 (54.3) †‡

Values are shown as no (%),*Group I versus II; statistical significance at the $p < 0.05$ level.
†Group I versus III; all statistical significant ($p < 0.05$); ‡Group II versus III statistical significance ($p < 0.05$).

standardised data collection protocols, and a comprehensive clinical assessment of multiple cardiometabolic risk factors.

4.3. Conclusion

Gender differences in central obesity across cardiometabolic risk factors were observed in this urban community showing both a higher central obesity prevalence amongst females and a higher odds of females being centrally obese. Such high central obesity and a female preponderance are worth investigating for a tailored population-level intervention. Hence WC, may be worth considering as a clinical practice tool for cardiometabolic risk assessment in South Asian adults.

4.4. Generalisability

Present study is of adequate statistical power and representative of the healthy adult population bordering two neighbouring states of India.

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Declaration of Competing Interest

All authors have none to declare.

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