

An Assessment of Anthropometric Indices and Its Association with NCDs among the Older Adults of India: Evidence from LASI Wave-1

Introduction

Ageing is a natural phenomenon that is inevitable with any demographic transition. Although all the countries across the globe are facing the ageing of the population, they may differ in the pace of ageing. In 2019, the global population consisted of 703 million persons aged 65 or above, which is projected to be 1.5 billion in 2050. The pace of population ageing has been fastest in southeastern Asia. According to the Census 2011, 8.6% of India's population was aged 60 or above, accounting for 103 million elderly people. It has been projected that size of elderly population of India will rise to 319 million in 2050, 20% share of the total population. The increasing life expectancy also possesses a higher risk of major health issues with increasing disability and illness.

In a study conducted in India by WHO-SAGE, it was found that around half of the older population suffers from at least one chronic disease. Hence, the NCDs are more prevalent in the older population. Majority of the NCDs are associated with human lifestyle. Inappropriate dietary intake, lack of physical exercise, tobacco and alcohol consumption, high body mass index, and obesity are the factors that affect the health of the person increases the risk of NCDs. The chronic diseases caused by a person's lifestyle are the leading cause of death in India. The lifestyle diseases such as cardiovascular disease (CVD), stroke, diabetes, hypertension etc., can be associated with a sedentary lifestyle lacking physical activities and an unhealthy way of living.

Obesity is found to be the major cause of non-communicable diseases. It is defined as an abnormal accumulation of body fat, i.e., greater than 20% of an individual's ideal body weight. In older people, obesity is associated with the early onset of morbidities and later functional disabilities contributing to premature mortality. According to WHO, prevalence of obesity is tripled between 1975 to 2016. In addition to this, around 2.8 million people die each year, and an estimated global DALYs of 35.8 million is caused by overweight and obesity. This is a grave scenario of concern as many severe and life-threatening diseases such as type II diabetes, heart failure, Mellitus, hyperlipidemia, and breast cancer are linked with obesity. It increases the risk of colon cancer, coronary heart disease, infertility etc.

There are other anthropometric measures that capture obesity more precisely than BMI index. Waist circumference, hip circumference, and waist-hip ratio (WHR) are few indices that can be used as an alternative to BMI. These indices can reflect abdominal adipose, a superior measure for the risk of various NCDs, including CVD. The idea of using the Waist hip ratio as a proxy arose from a cohort study, which presented that the Waist hip ratio is associated with an increased risk of stroke, ischemic heart diseases, and premature death. Among women, the waist-hip ratio showed a significant positive association with myocardial

infection, stroke, angina pectoris, and death. However, evidence suggests that waist circumference can also be used to measure CVD risk factors and overall weight management.

The Longitudinal Ageing Study in India (LASI) has created a window of opportunity for scientific investigation of health, economic, social determinants, and consequences of population ageing in India. The present study focuses on various anthropometric measures, including Body Mass Index (BMI), Waist to Hip Ratio (WHR), Waist Circumference (WC), and association with non-communicable diseases among the elderly in India. LASI provides nationally representative information on the measured anthropometric indices among the elderly in India for the first time; therefore, the primary objective of this study is to estimate the prevalence of all the described anthropometric indices among the elderly in India. Second objective of this study is to explore the association of these indices with selected chronic health conditions among the elderly population in India.

Data and Methods

Data used in current study is collated from the First Wave of the Longitudinal Ageing Study in India (LASI) conducted during 2017-18. The LASI is a full-scale national survey of scientific investigation of the health, economics, and social-determinants and consequences of population ageing in India. Wave-1 of the survey covered 65,562 older adults age 45 and above across all states and union territories of India except Sikkim. Survey recorded the self-reported prevalence of diagnosed chronic morbidities and directly examined anthropometric measures including weight and height as well as waist and hip circumference of the participants.

Variables

Primary outcome variables of our study are the prevalence of selected non-communicable lifestyle diseases including cardiovascular diseases (CVDs), chronic respiratory diseases, diabetes, cancer, and a combination of two or more aforementioned underlying conditions. Cardiovascular diseases include hypertension, heart diseases and/or stroke, while chronic respiratory diseases include chronic obstructive pulmonary disease, asthma and/or bronchitis. The explanatory variables used are age, place of residence, sex, marital status, living arrangement, religion, caste, years of schooling, work status, monthly per capita consumption expenditure, geographical regions, physical activity, smoking and drinking behaviours, and biological risk factors such as body mass index, waist circumference and waist to hip ratio of the individuals. Body Mass Index is calculated as the ratio of weight (in kg) and the square of height (in m). Based on the WHO classification, BMI levels are classified as underweight (≤ 18.4), normal (18.5 to 24.9), overweight (25 to 29.9), and obese (≥ 30). Similarly, WHO categorises waist to hip ratio (waist circumference in cm / hip circumference in cm) into low and high-risk levels for men and women separately. Critical limit classification for the high-risk waist to hip ratio for men is ≥ 0.90 and for women is ≥ 0.85 . Critical threshold value for high-risk waist circumferences for men and women is ≥ 102 cm and ≥ 88 cm, respectively.

Statistical Analysis

All statistical analyses are performed using the STATA-15. First of all, we computed the prevalence of overweight and obesity, low and high risk- waist circumference and waist to hip ratio among older adults age 45 and above in India. Descriptive statistics are used to systematically examine how the prevalence of self-reported underlying conditions varies across different demographic and socio-economic sub-groups and physical body indices. Also, we applied the chi-square test to measure the degree of association between outcome and explanatory variables. Finally, we fit multiple logistic regression models to examine the adjusted effects of biological risk factors on the prevalence of self-reported single or multi-morbidity conditions. Models are adjusted for age, sex, years of schooling, work status, place of residence, caste, wealth quintile, geographic region, physical activity status and smoking, and drinking behaviours.

Results:

The weighted proportions of the BMI category by different background characteristics among older adults aged 45 and above. The overall prevalence of underweight, overweight and obesity among older adults aged 45 and above is 20.64%, 20.65% and 7.38% respectively. The prevalence of obesity was lowest among the individuals aged 75 and above (2.57%) as compared to those aged 45-59 (8.13%) and 60-74 (6.26%). Almost 15% of the urban older adults were obese, while the proportion of obesity among rural older adults was approximately 4%. We can also see cross-region variations; the proportion of individuals who were obese was highest in southern India (12.36%), while it was lowest in the East Indian states (4%).

The prevalence of Waist Circumference (WC) and Waist-to-Hip ratio (WHR) across different socio-demographic groups among individuals 45 and above in India, Approximately 26% of older adults aged 45 and above had a high-risk waist circumference, and 77.25% had a high-risk of WHR. Extreme gender-differences are visible in the prevalence of high-risk waist circumference, with almost 40% of females having a high-risk WC in contrast with 9% of males. 41% of older adults living the urban areas had a high-risk WC, whereas 19% of rural older adults were in the high-risk WC category. Similarly, in the case of the high-risk WHR, the prevalence was slightly higher in the individuals aged 75 and above (77.55%) in comparison to its counterparts. In contrast with the high-risk WC situation, no apparent gender differences were visible in the high-risk WHR prevalence. 76% of males had a high-risk WHR, while 78.3% of females were in the high-risk category of WHR.

The weighted proportions of self-reported ever-diagnosed NCDs among different socio-demographic groups among individuals aged 45 and above. Approximately 29% of individuals aged 45 and above had a CVD. The overall prevalence of chronic respiratory disease, diabetes, and cancer in the study sample was 6.5%, 12.3%, and 0.6%, respectively. 12.5% of older adults self-reported multi-morbidity, i.e., they had two or more NCDs. The prevalence of CVDs was highest in the individuals aged 75 and above (37.5%) compared to individuals aged 45-59 (23.1%) and 60-74 (34%). Likewise, the proportion of persons having a chronic respiratory disease (10.2%), cancer (0.7%), and multi-morbidity (16.2%) was highest in the persons aged 75 and above. 24% of rural adults had any CVD, while the

prevalence of CVDs was 40% among urban adults. The proportion of older adults having multi-morbidity was highest among the individuals in the richest quintile of wealth (20.1%).

The bivariate analysis results showing the association of Physical body Indices and self-reported ever-diagnosed NCDs. Results show that the prevalence of NCDs increases as we go higher in the BMI category. The proportion of older adults having CVDs, chronic respiratory disease, diabetes, and multi-morbidity was highest in the older adults belonging to the obese BMI category, 52.3%, 9.7%, 27.5%, and 27.4%, respectively. Similarly, positive associations of physical body indices and NCDs were visible in the case of both WC and WHR. The prevalence of CVDs (44.4%, $p < 0.01$), diabetes (22%, $p < 0.01$), cancer (0.8%, $p < 0.01$), and multi-morbidity (21.1%, $p < 0.01$) were higher among older adults with a high-risk waist circumference. Likewise, a higher proportion of individuals having a high-risk WHR were having CVDs (30.8%, $p < 0.01$), diabetes (13.6%, $p < 0.01$), cancer (0.7%, $p < 0.01$), and multi-morbidity (13.4%, $p < 0.01$) as compared to those in the low-risk category of WHR.

The multiple logistic regression results show that, depicting the association of BMI, WC, and WHR with NCDs. We adjusted the regression results by age, sex, schooling level, work status, residence, caste, wealth quintile, region, physical activity status, ever smoking, and drinking status. Overall, BMI had a positive association with NCDs. The likelihood of CVDs was more than two times among the BMI-obese than the BMI-normal population (OR: 2.31, CI: 2.1-2.5). The possibility of chronic respiratory disease was more among people with abnormal BMI. The BMI-underweight population was about 50% more likely to have CRD than the BMI-normal population (OR: 1.53, CI: 1.4-1.7). Likewise, results showed a higher likelihood of diabetes (OR: 1.90, CI: 1.70-2.10) and multi-morbidity (OR: 2.37, CI: 2.00-2.80) among BMI-obese people than BMI-normal people. However, cancer was not significantly associated with BMI-category. Individuals in the high-risk category of WHR had more risk of having CVDs, diabetes, and multi-morbidity than those having low-risk WHR; (OR: 1.61, CI: 1.50-1.70), (OR: 2.27, CI: 2.10-2.50), and (OR: 1.61, CI: 1.50-1.70) respectively. The WC-high-risk population was almost 100% more likely to have CVDs than the WC-low-risk population (OR: 1.98, CI: 1.90-2.10). Similarly, people having high-risk WC had more likelihood of having CRD, diabetes, and multi-morbidity than those having low-risk WC.

Conclusion:

Our study uses nationwide representative data from the first-ever population-based survey on ageing in India. It provides a comprehensive picture of physical indices, i.e., BMI, WC, and WHR, among older adults aged 45 and above in India. It also provides the prevalence of various NCDs and investigates the association of BMI, WC, and WHR with the NCDs. The study results made it evident that being in high-risk BMI, WC, and WHR increases NCDs' risk and multi-morbidity among older adults. Thus, the policies on reducing the share of the elderly population in high-risk groups of BMIs, waist-hip ratio, and waist circumference should follow a multi-sectorial approach. A focus on specific subgroups of the elderly is required.