

A study of the demographic and socioeconomic determinants of body mass index among people of working age from Chennai city

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Abstract:

Obesity is a complex condition with severe social and psychological dimensions that affects virtually all age and socioeconomic groups and threatens to overwhelm both developed and developing countries. Obesity is defined by the World Health Organization (WHO) as a body mass index (BMI) of 30kg/m² or greater (WHO 2015). The prevalence of obesity in men has more than doubled in the past 20 years across the globe (WHO 2020). Demographic and socioeconomic factors significantly impact the body weight of people of working age. This study aims to identify relationships between the body mass index and selected demographic and socioeconomic variables in working-age residents of the city of Chennai districts, choola medu area was selected for the study based on familiarity, easy approachability and easy advisability of the subjects. The study involved 200 respondents (131 men and 69 women) aged 30-50 years from Chennai. The sample selection was random and purposive, using multilevel stratification. The authors' cross-sectional diagnostic questionnaire of socioeconomic status was the applied research tool. The respondents' body weight was categorized according to WHO criteria based on the collected data. Most respondents (60%) had an average body weight, while 40% were overweight or obese. The difference was statistically significant ($p < 0.001$). Sex, age, occupational status, marital status, number of people in the household, having a steady source of income, disposable (net) income, and savings were significantly correlated ($p < 0.001$) with respondents' body mass index. Public health programs promoting healthy lifestyle behaviours should be addressed primarily to groups at the highest risk of overweight and obesity.

Keywords: Obesity, BMI, men, overweight, demographic status.

1. Introduction

Obesity is a complex condition with severe social and psychological dimensions that affects virtually all age and socioeconomic groups and threatens to overwhelm both developed and developing countries. Obesity is defined by the World Health Organization (WHO) as a body mass index (BMI) of 30kg/m² or greater (WHO 2015). The prevalence of obesity in men has more than doubled in the past 20 years across the globe (WHO 2020). The prevalence of overweight and obesity has increased dramatically in recent decades. From 1975 to 2014, global rates of obesity (body mass index 30 kg/m²) increased from 3.2 to 10.8% in men and from 6.4 to 14.9% in women. In England, overweight/obese adults increased from 36% to 62% between 1980 and 2013. If trends continue, it is estimated that by 2025, 18% of men and 21% of women worldwide will be obese. Since 2006, the increase in obesity in developed countries has slowed down. In the USA, the rate of adult obesity remained steady at 35% between 2003 and 2004 and 2011 and 2012, although rates of morbid obesity (BMI > 40) continued to rise (Kinlen *et al.* 2017). The increased risk for cardiovascular disease/coronary heart disease and metabolic abnormalities associated with abdominal obesity may be mediated, at least in part, by increased systemic inflammation. More significant physical activity and fitness may reduce inflammation associated with greater visceral adiposity. Increased adiposity and low levels of physical activity or fitness are risk factors for atherosclerotic disease and type 2 diabetes and the increased mortality associated with them. Increased physical activity/fitness reduces disease and mortality risk regardless of body mass index but does not completely abrogate the risks associated with obesity (Zoeller, 2007)

Earlier population studies have indicated that body weight is affected by factors such as age, gender, place of residence, level of education, marital status, family situation, professional status, or financial situation [17–24]. Several studies [25–29] to date have used aggregated socioeconomic status indices and estimated the direction and strength of these indices' impact on body weight measured with the body mass index (BMI). Pigeyre *et al.* [25] and Christine *et al.* [26] revealed negative correlations between BMI and socioeconomic status, while Wagner *et al.* [27] found these correlations only among women. On the other hand, Akinyemiju *et al.* [28] and Araujo *et al.* [29] noted positive correlations between BMI and socioeconomic status.

Therefore, despite some earlier observations, the relationship between BMI and socioeconomic status is still not fully explained, and socioeconomic status determinants, such

as having a steady income, have not been considered. So far, the research on BMI and socioeconomic status have only focused on selected age groups: children and adolescents, adults, or the elderly. However, the relationship between the BMI and socioeconomic status in working-age people in the broad age bracket of 30–50 years [30,31] has been rarely investigated. Meanwhile, people in this age range constitute the majority of labour resources, which are essential for functioning societies and economies.

The present study attempts to close the indicated research gaps by considering a scope of demographic and socioeconomic variables as determinants of body weight, assessed with the BMI in working-age people.

The study aims to identify the relationships between the body mass index and selected demographic and socioeconomic variables in working-age men residents of Chennai, India. Two research questions have been formulated:

According to WHO criteria, what percentage of Chennai working-age respondents are characterized by normal body weight?

Are age, gender, education, occupational status, marital status, religion, family size and type, having a steady source of income associated with the respondents' BMI?

2. Materials and Methods

2.1 Selection of sample:

Overweight was found to be more prevalent among the overweight and obese men group leading a sedentary lifestyle. A group of 200 subjects aged 36 - 50 yrs in Chennai districts, choolaimeedu area, were selected for the study based on the subjects' familiarity, easy approachability, and easy advisability. The sample selection was random and purposive, using a three-level stratification. The general information was collected from the subjects. The interview is an important data gathering technique involving verbal communication between the researcher and the subject. The interview questionnaires were framed in the combination of two ranges. A range of approaches to interviewing, from completely unstructured in which the subject is allowed to talk freely about whatever they wish, to highly structured in which the subject responses are limited to answering direct questions (Mathers, 2000).

2.2 Study Design

The study was cross-sectional and conducted using a diagnostic survey questionnaire based on a direct interview technique. The interviews were conducted by the authors and their collaborators, who, if needed, explained in detail the structured questionnaire items and answers to the respondents. The main research instrument was developed on the structured questionnaire of socioeconomic status, consisting of eleven questions grouped into statements regarding demographic and socioeconomic variables. The questionnaire tool was developed in English and translated into Tamil. The questionnaire was developed by reviewing the research literature of many studies, in particular, Akinyemiju et al., Araujo et al., Basto-Abreu et al., Christine et al., Compernelle et al., Hong et al., Kolahi et al., Kriaucioniene et al., Mbada et al., Mehboob et al., Micklesfield et al., Pigeyre et al., Puciato et al., Rengma et al., Stewart-Knox et al., and Wagner et al. [1]. This consisted of a questionnaire with some questions regarding the age, gender, occupation, income, marital status, type of family size, etc. were typed in a definite order on a form. The interview method of collecting data involves the presentation of oral-verbal stimuli and reply in terms of oral-verbal responses. It affords excellent facilities in collecting data from large, diverse and widely scattered groups (Kothari, 2005).

Prior to the central part of the study, the reliability of the questionnaire was assessed using the test-retest method [32]. The reliability of the tool was established by the inter-rater reliability method. Based on the obtained results, the reliability correlation coefficient r-value was 0.02. The correlation found from the tool to be highly reliable for this research study. The respondents' suggestions were also used to correct the perceived errors and uncertainties in the questionnaire.

The answers to the socioeconomic status questionnaire yielded information on the respondents' demographic variables: gender (woman, man), age (18–24, 25–34, 35–44, 45–54, 55–64), and education (primary, secondary, university). The questionnaire was also used to collect data on the respondents' socioeconomic status, i.e., occupation (manual worker, white-collar worker, self-employed, student, unemployed), marital status (single, married), number of family members (1, 2, 3, 4, 5, or more), having per annual income (Less than 72000, 72000 - 1.5 lakhs, 1.5 lakhs - 2.5 lakhs, 1.5 lakhs - 2.5 lakhs)

Data on the respondents' height and body weight were collected during the interviews. Body Mass Index (BMI) is an important screening tool used to identify underweight or overweight individuals. BMI is an anthropometric index of weight and height that is defined as body weight in kilograms divided by height in meters squared (Garrow, 2000). On that basis, the body mass index (BMI) was calculated for each respondent, which was then used to categorize all study participants following WHO criteria; For Men, BMI is age-specific because BMI changes substantially as weight changes. BMI-for-age is the measure used for men aged 15 to 45 years. The WHO BMI charts were used for this purpose. A woman with BMI > 95th percentile of BMI for age was considered obese and BMI > 85th percentile but less than the 95th percentile of BMI for age, was overweight and at risk of obesity (Oqden *et al.* 2002). BMI was calculated for the subjects into four categories underweight, overweight, normal and obese. (www.who.int/BMI).

2.3 Statistical Analysis

The data were analyzed in terms of the number and frequency of variable categories, arithmetic means, standard deviation, and minimum and maximum values. The differences between the selected categories of variables were checked with the chi-squared test. The chi-squared test, p-value, were used to assess the relationships between the body mass index and demographic and socioeconomic variables. The variables fitting the model were selected using stepwise regression. The level of statistical significance was set at $\alpha = 0.05$. All statistical calculations were made using IBM SPSS Statistics 26.0 (IBM Corporation, Armonk, NY, USA).

3. Results and Discussion:

Table 1 Demographic and socioeconomic determinants of body mass index among people

Variables		BMI.Group			
		Low BMI Group		High BMI Group	
		Frequency	Percentage	Frequency	Percentage
Age	56 to 66 years	7	36.8%	12	63.2%
	46 to 55 years	16	44.4%	20	55.6%
	36 to 45 years	22	37.3%	37	62.7%
	25 to 35 years	41	47.7%	45	52.3%
Gender	male	53	40.5%	78	59.5%
	Female	33	47.8%	36	52.2%
Occupation	Others	21	40.4%	31	59.6%
	Unemployed	24	38.1%	39	61.9%
	Daily Wages Labour	11	47.8%	12	52.2%
	Clerical Workers	9	42.9%	12	57.1%
	Large Business	6	60.0%	4	40.0%
	Small Business	15	48.4%	16	51.6%
Education	More than two degree	6	33.3%	12	66.7%
	Master Degree	25	49.0%	26	51.0%
	Bachelor	24	36.4%	42	63.6%
	High School	24	45.3%	29	54.7%
	Illiterate	7	58.3%	5	41.7%
Income	More than 4 lakhs	18	40.0%	27	60.0%
	1.5 lakhs to 2.5 lakhs	20	42.6%	27	57.4%
	72,000 to 1.5 Lakhs	30	41.1%	43	58.9%
	> 72,000	18	51.4%	17	48.6%
Marital Status	Unmarried	7	31.8%	15	68.2%
	Married	79	44.4%	99	55.6%
Religion	Christian	4	26.7%	11	73.3%
	Muslim	5	45.5%	6	54.5%
	Hindu	77	44.3%	97	55.7%

Table 1 presents the division of respondents according to their BMI, following WHO criteria. The majority (40%) of the respondents were of normal body weight, while 60% were overweight ($p < 0.001$).

Apart from having an income, almost all demographic and socioeconomic variables revealed a statistically significant correlation ($p < 0.001$) with the Wrocław residents' body weight, as evaluated according to the WHO criteria. The women were significantly more likely to be of normal body weight (47.8%) than men (40.8%). Therefore, according to WHO standards, the bodyweight of most examined men (59.5%) was excessive. The highest percentage of individuals with over body weight was found among respondents aged 56-66 (63.2%) and 36-45 (62.7%) years, and the lowest among respondents aged 25-35(52.3%) and 46-55 (55.6%) years. Therefore, the majority of respondents from the two oldest age groups were characterized by excessive body weight. Considering the level of education, the high BMI group was most often found in people with more than two degrees (66.7%) and bachelor (63.6%), while it was least frequently observed in people with illiterate (41.7%). The highest percentage of people with a high BMI group was noted unemployed (61.9%), and the lowest was the large business (40.0%). Most representatives of the latter (61.9%) were therefore characterized as overweight. Normal body weight was also noted in 38.1% of unemployed, 40.4% of the others, and 42.9% of clerical workers. As recommended by WHO, BMI values were also observed in 68.2% of unmarried respondents and in 55.6% of married ones. The highest percentage of respondents with normal body weight was noted in those living in the most numerous households, i.e., with Seven (68.2%) and one to four persons (56.8%), and the Five to Seven persons (52.8%) in households. The analysis of monthly gross income per capita showed that the highest percentage of people with overweight was in the four groups of respondents with the highest income (60.0%—more than four lakhs), while the lowest was among those with the income (48.6%—below 72,000). Similar patterns were observed in terms of disposable (net) income. The highest percentage of religion with overweight (73.3%) was found in those Christian and the lowest (54.5%) in religion with the Muslim. However, differences between the percentages of respondents from both groups were not statistically significant ($p = 0.055$).

There are both strengths and weaknesses in this article. Socioeconomic status is considered across various variables, making it one of its main strengths. Moreover, few studies have involved such a broad age range and sample size of urban populations, particularly in

developed nations. This article has two main limitations: a cross-sectional perspective of the findings and its limited geographical focus. In the future, research should be continuous and should include populations from across the country, not just from Chennai.

Conclusions:

According to WHO criteria, in the study of Chennai residents aged 25 to 66 years, two-fifths were overweight. However, three-fifths were of average weight. Among the significant determinants of body mass index were age, gender, occupational status, marital status, education, number of people in the household, and having a steady income. A cross-sectional study aims to develop suggestions for public health interventions. Therefore, decision-makers need to suggest programs that will improve proper nutrition and physical activity, targeting populations with the highest risk of obesity. As part of these programs, they should consider the characteristics of the subjects' professions, including physical exertion, stress, working conditions, and their coworkers' impact on lifestyle patterns.

Conflict of Interest

The authors declare no conflict of interest

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