



DUAL BURDEN OF UNDERWEIGHT AND OVERWEIGHT AMONG ADULT WOMEN OF SUB-URBAN AREAS OF WEST BENGAL, INDIA

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Submitted: 04 August 2021;

Accepted: 16 November 2021; Published: 04 December 2021

ABSTRACT

Background: Socioeconomic status (SES) plays an important role in constructing dietary pattern and developing obesity in the community, particularly among women in developing countries. This study aimed to assess the impact of SES on nutritional status and dietary intake among adult women.

Methods: A cross-sectional descriptive study was conducted among adult women residing in Burdwan and Howrah districts of West Bengal, India. The SES of the participants was evaluated following modified Kuppaswami socio-economic status scale. Data were collected on anthropometric measurements and dietary intake. Nutritional status was determined based on the World Health Organization (WHO) cut off points for underweight, overweight and central obesity (CO). Statistical significance was set at a $p < 0.05$.

Results: The mean weight, height, and BMI of participants were 50.38 ± 8.90 kg, 150.83 ± 5.35 cm, and 22.09 ± 3.45 kg/m², respectively. The prevalence of underweight and overweight was 18.18% and 17.53%, respectively. Overweight was most common among the participants of upper-middle socioeconomic class (33.33%), followed by lower-middle (29.73%) and upper-lower (10.10%) socioeconomic class, while underweight was prevalent among the participants from upper lower socioeconomic class (22.22%). CO assessed by WHR was highest in the upper-middle socioeconomic class (50.00%), followed by the upper-lower (35.35%) and lower-middle (35.14%) socioeconomic class. Although differences in mean energy intake among SES groups were not statistically significant ($F=1.395$; $p>0.05$), carbohydrate intake ($F=8.460$; $p<0.001$), protein intake ($F=31.066$; $p<0.001$), and fat intake ($F=23.723$; $p<0.001$) showed significant variation across groups.

Conclusion: The study showed a significant socioeconomic variation in dietary intake and nutritional status among adult women. Higher SES was associated with greater protein and fat intake, while lower SES groups exhibited higher carbohydrate consumption. This is reflected in the prevalence of obesity and CO. These findings underscore the need for large scale nutritional education to combat malnutrition in the society.

Key words: Dual burden of malnutrition, Obesity, Undernutrition, Weist to hip ratio, Rural women.

INTRODUCTION

Adequate nutrition among women, especially during their reproductive years, is essential for maintaining good health, enhancing work capacity and promoting positive health outcomes in their children [1]. As per the WHO report, underweight, obesity, iron deficiency, high cholesterol, sanitation and hygiene are among the ten leading risk factors in terms of the Global Burden of Disease (GBD). These ten risk factors are responsible for more than one third of all the deaths globally [2]. The overweight/obesity can increase the risk of non-communicable diseases (NCDs), including type 2 diabetes, cardiovascular diseases, heart disease, stroke, and certain types of cancers [3-6].

According to the WHO, in 2017 globally 1.9 billion adults were either overweight or obese, while 462 million are underweight [7]. Malnutrition remains a critical public health issue in low- and middle-income countries (LMICs). More than one-third of these countries experience the coexistence of multiple forms of malnutrition, a condition most prevalent in sub-Saharan Africa, South Asia, East Asia, and the Pacific regions [8]. The Indian women are suffering from double burden of malnutrition because of simultaneous occurrence of undernutrition and overnutrition. Overweight is increasing day by day among the Indian women. As per the latest National Family Health Survey (NFHS) report the almost similar prevalence of underweight (22.9%) and overweight (20.7%) among the Indian women are observed [9].

In developing countries, limited attention has been implemented toward addressing obesity, as the primary emphasis has remained on the prevalence and consequences of undernutrition [10,11]. In this context, the present study aims to determine the prevalence of undernutrition and overweight/obesity among women living in sub-urban areas of West Bengal, India.

METHODOLOGY

Study design

This is cross-sectional descriptive study design and random sampling method were employed for selection of the participants.

Study participants

The present study was carried out between November 2019 to January 2020 on 154 participants. Participants were selected from Burdwan and Howrah districts of West Bengal, India. The eligibility criteria for enrollment of the participants for the present study were apparently healthy adult women (18-59 years) and the probable participants with chronic diseases were excluded from this study. Written consent was taken from each of the participants before the study.

Socio-economic-demographic status

A pre-structured schedule questionnaire was used for the study. Age of the participants was recorded from the valid documents. The socio-economic status (SES) was evaluated following modified Kuppuswami socio-economic status scale [12]. The SES was computed based on education and occupation of the head of the family and total monthly income of the family.

Anthropometric measurements and Nutritional status

Height and weight of the participants were measured by following standard technique and appropriate landmarks. Height was measured to the nearest of 0.1 cm using an anthropometer and weight to the nearest of 0.1 kg using a portable weighing machine. From measuring the height and weight of the participants, the body mass index (BMI) was computed using the standard equation: $BMI (kg/m^2) = \text{Weight (kg)} / \text{height}^2 (m^2)$. Nutritional status of the participants was assessed as per WHO guideline [13]. The following cut-off points were used: Underweight: $BMI < 18.50 kg/m^2$; Normal: $BMI = 18.50-24.99 kg/m^2$; Overweight: $BMI \geq 25.0 kg/m^2$. The condition of the population according the prevalence of low BMI ($BMI < 18.5 kg/m^2$), the WHO Classification of public health problem of low BMI based on BMI distribution in adult populations were followed [13]. The following percentage of population

with BMI<18.5 were used: Low prevalence (Warning sign, monitoring required): 5-9%; Medium prevalence (Poor situation): 10-19%; High prevalence (Serious situation): 20-39%; Very high prevalence (Critical situation): $\geq 40\%$.

WC and HC were measured nearest of 0.1 cm using a non-stretchable tape by following standard technique and appropriate landmarks as per WHO guideline [14]. Waist hip ratio (WHR) was computed by the standard equation: $WHR = WC/HC$. WHR more than 0.85, is considered to be Central obesity [14].

Nutrient intake

The nutrient intake of the participants was assessed by using Interview Method of the participant. The quantities of the foods consumed by the participants during past 24 hours, was recorded [15]. The mean intake of the nutrients (viz. energy, carbohydrate, protein and fat) was determined by following the data of food composition tables [16]. The computed mean intake of each nutrient was then compared with recommended dietary allowances (RDA) for adult female [17].

Statistical analysis

Statistical analyses were conducted by using SPSS for Windows. Normally distributed data were tested by Kolmogorov-Smirnov test. Data were presented as number (percentage) or mean $\pm$ SD as appropriate. One-way ANOVA analysis was undertaken to test for SES categories in mean nutrient intake (energy, carbohydrate, protein and fat). χ^2 test was performed to assess the relation between SES status and nutritional status. P value <0.05 is considered statistically significant.

RESULTS AND DISCUSSION

The mean age of the participants was 36.92 $\pm$ 10.07 years (Table 1). The major proportion (33.77%) belonged to the 30–39 years age group, followed by 40–49 years (27.27%). Participants below 30 years constituted 25.97%, while those aged 50 years or above formed only 12.99%.

The mean years of schooling among the participants were 6.29 $\pm$ 3.55 years. Most of them (35.71%) had completed primary school, while 22.73% were illiterate. 18.18%, 14.29% and 9.09% of the participants had completed Middle school, High school and intermediate or post-high school diploma respectively. The study indicated that majority of the participants were housewives (39.61%), while 36.36% were unskilled workers, followed by 16.88% semi-skilled and 7.14% skilled workers. This study showed that average years of schooling among the family head were 7.00 $\pm$ 4.02 years and majority of family heads were engaged in unskilled (53.25%) and semi-skilled (21.43%) occupations. The mean monthly family income was Rs. 15759.74 $\pm$ 8962.56. The study observed that, 64.29% of participants were from the upper-lower socioeconomic class, while 24.03% from the lower-middle class, and only 11.69% from the upper-middle class (Table 1).

The study documented that the weight, height and BMI of the participants were 50.38 $\pm$ 8.90 kg, 150.83 $\pm$ 5.35 cm and 22.09 $\pm$ 3.45 kg/m² respectively (Table 2) and the study showed that occurrence underweight and overweight were 18.18% and 17.53% respectively. While comparing the occurrence of malnutrition among the participants from different SES, it was revealed that the occurrence of underweight was highest in upper lower group (22.22%), moderate in the lower-middle socioeconomic class (16.22%). Conversely, overweight was most common among upper-middle participants (33.33%), followed by lower-middle (29.73%) and upper-lower (10.10%) socioeconomic class (Fig 1). The findings suggest a higher tendency toward underweight among participants belonging to the lower socioeconomic class, while higher tendency toward overweight among participants belonging to the upper socioeconomic class.

TABLE 1: Socio-demographic-economic characteristics of the participants

Parameters	Mean±SD / N (%)
Age (years)	36.92±10.07
<30	40 (25.97)
30-39	52 (33.77)
40-49	42 (27.27)
50-59	20 (12.99)
Education	6.29±3.55
Intermediate or post high school diploma	14 (9.09)
High school certificate	22 (14.29)
Middle school certificate	28 (18.18)
Primary school certificate	55 (35.71)
Illiterate	35 (22.73)
Occupation	
Skilled Worker	11 (7.14)
Semi-skilled Worker	26 (16.88)
Un-skilled Worker	56 (36.36)
House wife	61 (39.61)
Education of the Head of the Family	7.00±4.02
Graduation	6 (3.90)
Intermediate or post high school diploma	13 (8.44)
High school certificate	31 (20.13)
Middle school certificate	34 (22.08)
Primary school certificate	42 (27.27)
Illiterate	28 (18.18)
Occupation of the Head of the Family	
Clerical/Shop / Farm owner	10 (6.49)
Skilled Worker	29 (18.83)
Semi-skilled Worker	33 (21.43)
Un-skilled Worker	82 (53.25)
Monthly income of Family (Rs.)	15759.74±8962.56
26,355-52,733	17 (11.04)
19,759-26,354	29 (18.83)
13,161-19,758	35 (22.73)
7,887-13,160	52 (33.77)
2,641-7,886	21 (13.64)
Socioeconomic class	
Upper middle	18 (11.69)
Lower middle	37 (24.03)
Upper lower	99 (64.29)

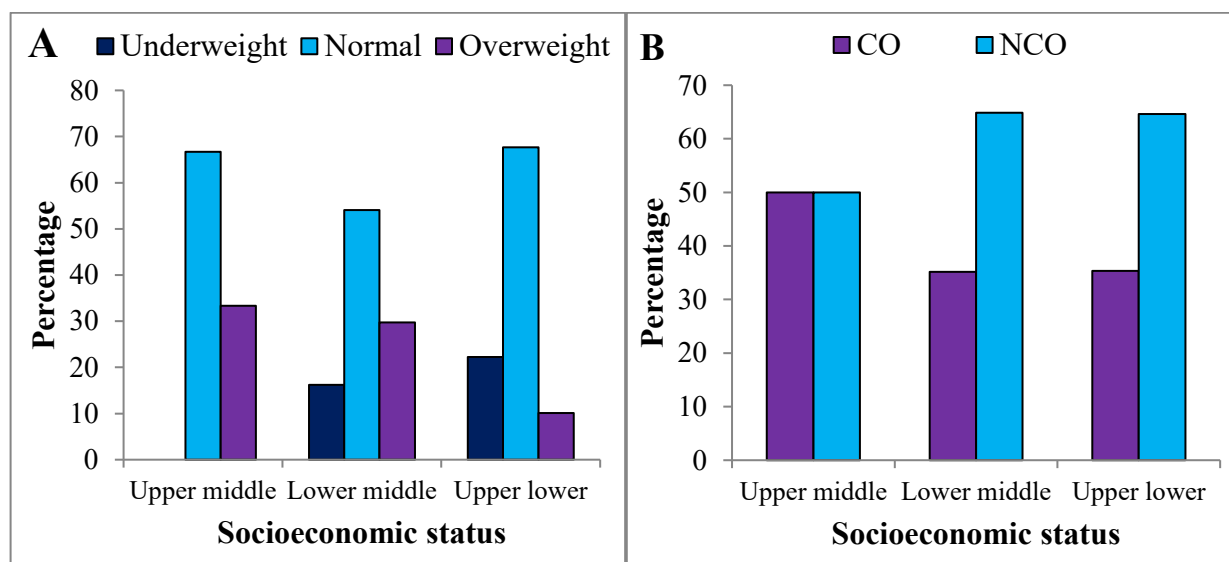


FIGURE 1: Impact of socio-economic status on nutritional status of the participants

The study showed that WC, HC and WHR of the participants were 78.87 ± 9.16 cm, 95.42 ± 7.98 cm and 0.83 ± 0.06 respectively (Table 2). Central obesity (CO) assessed by WHR showed notable differences among socioeconomic groups. CO was most prevalent in the upper-middle group (50.00%), followed by the upper-lower (35.35%) and lower-middle (35.14%) groups (Fig 1). The findings suggest a higher tendency toward CO among participants belonging to the upper socioeconomic class.

TABLE 2: Anthropometric parameters of the participants

Anthropometric parameters	Mean $\pm$ SD
Weight (kg)	50.38 $\pm$ 8.90
Height (cm)	150.83 $\pm$ 5.35
Body Mass Index (kg/m ²)	22.09 $\pm$ 3.45
Waist circumference(cm)	78.87 $\pm$ 9.16
Hip circumference (cm)	95.42 $\pm$ 7.98
Waist hip ratio	0.83 $\pm$ 0.06

Table 3 presents the nutrient intake of rural adult women. The mean energy intake (1802.79 ± 159.98 kcal) was found to be 10.39% lower than the RDA, indicating a moderate calorie deficit among the participants. Despite this, the mean carbohydrate intake (329.61 ± 39.59 g) was 9.01% higher than the RDA, suggesting that the diet was predominantly carbohydrate-based, reflecting a typical rural dietary pattern reliant on cereals. In contrast, both protein and fat intake were substantially below recommended levels. The mean protein intake (40.39 ± 3.29 g) showed a 46.22% deficit, highlighting inadequate consumption of protein-rich foods. Similarly, fat intake (35.97 ± 5.17 g) was 35.24% lower than the RDA, suggesting limited access to or affordability of fat-rich foods.

TABLE 3: Nutrient intake of the participants

Nutrients	Mean $\pm$ SD	Deviation from RDA (%)
Energy (kcal)	1802.79 $\pm$ 159.98	-10.39 $\pm$ 8.13
Carbohydrate (g)	329.61 $\pm$ 39.59	+9.01 $\pm$ 11.45
Protein (g)	40.39 $\pm$ 3.29	-46.22 $\pm$ 6.74
Fat (g)	35.97 $\pm$ 5.17	-35.24 $\pm$ 11.65

Influence of socioeconomic status on nutrient intake of the participants is presented in Table 4. Although the differences in mean energy intake among different SES groups were not statistically significant ($F=1.395$; $p>0.05$), a clear trend was observed, with the upper-lower group showing the highest mean energy intake (1815.96 ± 156.71 kcal), followed by the lower-middle (1793.33 ± 175.04 kcal) and upper-middle (1749.78 ± 140.39 kcal) groups. This finding may appear contrary to the common expectation that higher socioeconomic groups consume more energy. However, considering that lower SES women were more likely

engaged in moderate physical work, their energy requirements tended to be higher than those of sedentary women from upper SES groups.

A statistically significant difference was observed in carbohydrate intake ($F=8.460$, $p<0.001$). The upper-lower group had the highest mean carbohydrate intake (338.18 ± 36.93 g), followed by the lower-middle group (319.99 ± 40.88 g) and upper-middle group (302.26 ± 35.79 g). This trend reflects the dietary habit of the lower-income population, which relies heavily on cereal-based staples.

Table 4: Influence of socioeconomic status on nutrient intake of the participants

Nutrients	Upper middle	Lower middle	Upper lower	ANOVA
Energy (kcal)	1749.78 ± 140.39	1793.33 ± 175.04	1815.96 ± 156.71	1.395
Carbohydrate (g)	302.26 ± 35.79	319.99 ± 40.88	338.18 ± 36.93	8.460***
Protein (g)	44.52 ± 2.87	41.48 ± 3.60	39.24 ± 2.41	31.066***
Fat (g)	40.44 ± 2.60	38.72 ± 4.09	34.13 ± 4.94	23.723***

Significant level at *** $P<0.001$

Protein intake also showed a highly significant variation across SES categories ($F=31.066$, $p<0.001$). The upper-middle group had the highest protein intake (44.52 ± 2.87 g), whereas the upper-lower group recorded the lowest (39.24 ± 2.41 g). This clearly indicates that although lower SES women consumed more calories and carbohydrates, their diet lacked adequate protein sources. Economic limitations, limited access to animal-based foods, and lesser dietary diversity contribute to this shortfall.

The present study also documented that the carbohydrates remain a staple in Indian diets. It was also noted that the participants consumed more refined grains than the coarse grains. Similar finding was reported in the previous study [19]. The increasing intake of processed foods while decreasing consumption of pulses, fruits, and vegetables was also noticed in the present study. Misra et al. [19] found the similar trends in the consumption pattern in their study.

Similarly, fat intake varied significantly ($F=23.723$, $p<0.001$), with a consistent decline from upper-middle (40.44 ± 2.60 g) to upper-lower (34.13 ± 4.94 g) socioeconomic levels. This suggests that higher-income groups had better access to edible oils, dairy, and other lipid-rich foods, whereas lower-income groups relied on carbohydrate-dense but fat-deficient diets. Similar pattern of consumption of proportion of fat was reported in earlier study in India where the higher SES groups consumed higher proportion of fat (32%) than the lower SES groups (17%) in their daily diet (Shetty, 2002).

CONCLUSION

The present study highlights a complex relationship between socioeconomic status, dietary intake, and obesity risk. The nutritional interventions addressing both overnutrition and undernutrition are essential to promote balanced diets and improve their health outcomes from all socioeconomic backgrounds.

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