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Obesity, Overweight Rates, and Related Factors Among Adults in the Rustic Realm of Western India

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Abstract

Background: Obesity and overweight pose significant challenges in developing countries, underscoring the need for evidence-based prevention strategies. This study focuses on assessing the prevalence and associated factors of overweight and obesity in the rural areas of Jamnagar district, Gujarat, India.

Methods: Data collection encompassed six tehsils within Jamnagar district, with primary health center selection via simple random sampling. Individual selection employed the consecutive sampling approach. Statistical analysis was conducted using SPSS software. Regression analysis was employed to identify the independent factors linked to overweight and obesity.

Results: The analysis included 408 participants, revealing a higher obesity prevalence among men (20.8% vs 13.5%). Strong evidence suggests that married and physically inactive individuals have 2.8 times higher odds of being overweight or obese. After thorough adjustments, homemakers and physically inactive individuals had 5.9-fold higher odds.

Conclusions: The study findings illuminate a pronounced prevalence of overweight and obesity among adults in the study area, signifying an emerging issue that necessitates prompt attention.

Keywords: adults, India, noncommunicable diseases, obesity, overweight

INTRODUCTION

In the swiftly evolving global landscape of health, the disease spectrum is undergoing a dramatic transformation, seizing the attention of medical experts and policymakers worldwide. This transformation is pronounced in low- and middle-income countries. At the forefront of this paradigm shift are the widespread epidemics of obesity and other non-communicable diseases. Obesity alone contributes to 2.6 million annual deaths worldwide, solidifying its status as one of the most critical public health challenges.[1] This obesity epidemic serves as the vanguard of a cluster of noncommunicable diseases known as the new world syndrome, casting an immense socioeconomic and public health burden on regions with limited resources.[2]

Rooted in causes such as sedentary lifestyles, unhealthy dietary habits, genetic predisposition, and behavioral elements such as tobacco use, alcohol consumption, and stress, obesity is a key instigator of severe health conditions, including the ominous metabolic syndrome. This syndrome includes disorders such as obesity, hypertension, glucose intolerance, and dyslipidemia.[3] Shockingly, by 2014, nearly 39% of adults globally were classified as overweight (body mass index [BMI] 25.0–29.9 kg/m^2) or obese (BMI > 29.9 kg/m^2), marking a twofold surge since 1975.[4] Drawing from the National Family Health Survey (NFHS-5) data, India also reflects a disconcerting trend, with a combined prevalence of overweight and obesity reaching 24% in women aged 15–54 years and 23.7% in men of the same age group. These figures indicate a worrisome increase of at least 3% in women and 4% in men.[5]

Even within the rural confines of India, living conditions have witnessed substantial improvements across transportation, dietary choices, and education levels. Increased household income, coupled with easy access to urban areas and television, has led to inadvertent lifestyle shifts. These factors collectively drive a significant increase in BMI for both sexes.[6] With these dynamics in play, this study was meticulously conducted to unveil the prevalence of obesity and its associated determinants among adults inhabiting the rural expanse of Jamnagar.

METHODS

Before the study was started, an ethical approval letter (Project No. 125/05/02/2021) was obtained from the Institutional Ethics Committee.

This cross-sectional community-based study enrolled men and women aged 20–60 years residing in the study area. The study was conducted in the rural area of the

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Jamnagar district of Gujarat state between May 2022 and July 2022. The sample size was calculated by using the following formula for a single proportion: $n = Z^2 p (1 - p) / L^2$. Considering the prevalence of overweight + obesity (p) as 20% from the NFHS-5 data for Gujarat, the final sample size was obtained for 95% confidence interval (CI) with an absolute error of 4% and a nonresponse rate of 5%, which is 403.[5]

Regarding the population criteria, all individuals aged 20–60 years and those who provided informed consent were considered, whereas all individuals aged <20 and >60 years of age, antenatal women, and persons having severe morbidity or disability were not considered in the study.

This study aimed to assess the prevalence of overweight and obesity among adults in a rural Indian community. The objectives of this study include determining the overall occurrence of these conditions, identifying demographic and lifestyle associations, examining the role of education, and contributing insights for targeted interventions.

The district encompasses six distinct tehsils or talukas. Employing a systematic approach, one primary health center (PHC) was selected from each hospital by simple random sampling. The following PHCs were earmarked for comprehensive examination: Latipur PHC within the Dhrol tehsil/taluka, Dhrafa PHC in Jamjodhpur tehsil/taluka, Dared PHC within Jamnagar district, Hadiyana PHC in the Jodiya tehsil/taluka, Mota Vadala PHC in the Kalavad tehsil/taluka, and Padana PHC within the Lalpur tehsil/taluka.

The overall sample size (N = 403) was judiciously distributed among these PHCs, resulting in an equitable allocation of 68 study participants from each PHC. Consequently, the cumulative sample size was 408 participants. The consecutive sampling approach was adopted for participant selection. In accordance with this strategy, the initial 68 individuals attending the outpatient department (OPD) and satisfying the stipulated criteria were consecutively enlisted as study participants.

The process was meticulously executed within the operational hours of the PHCs and was overseen by proficient female health workers trained for this purpose. To ensure precision and uniformity, a predesigned and pretested semistructured questionnaire was deployed as the primary tool for data acquisition. This questionnaire was meticulously curated based on a review of relevant literature, supplemented by insights gleaned from a pilot study involving 40 participants, which was approximately 10% of the target study population. Following this pilot phase, necessary refinements were incorporated to fine-tune the questionnaire, culminating in the development of the definitive version employed for data collection.

For anthropometric measurements, height was meticulously recorded using a standardized measuring tape affixed to the wall, following predefined markings. Participants' posture was adjusted to ensure that their heels, calf muscles, buttocks, shoulder blades in the back, and occiput contacted the wall. This procedure ensured accurate measurement, with the results rounded to the nearest centimeter. Similarly, weight measurements were performed using a calibrated electronic weighing machine adhering to standardized protocols. Then, weight measurements were rounded off to the nearest 100 g, preserving precision in the data collection process. BMI was calculated using the formula weight (in kg) / height (in m^2).[7] The Asian Classification of BMI was used. BMI less than 16.5 kg/m^2 was categorized as severely underweight, with BMI of 16.5–18.5 kg/m^2 for underweight, 18.5–23 kg/m^2 for normal, 23–24.99 kg/m^2 for overweight/pre-obese, and BMI more than 25 kg/m^2 for obesity.[8]

The Chi-square test was used to determine the association between sociodemographic profile and obesity. Univariate logistic regression was applied for various factors associated with overweight or obesity. A multivariable logistic regression model was used to adjust for various associated factors.

RESULTS

The study population comprised 408 individuals. Predominant demographic characteristics featured a male majority (53.9%), with marital status predominantly being married (77.0%). A significant portion of the participants were engaged in occupational roles (29.6%), and a noteworthy segment held college-level education (31.2%), as detailed in Table 1. These participants were 20–59 years old, with an average age of 37.31 years (standard deviation = 11.8 years).

Furthermore, a distinctive observation surfaced concerning the BMI of the participants. Specifically, men exhibited a higher adiposity measure in terms of BMI than their female counterparts. This divergence in BMI was quantified as a mean of 24.39 ± 3.50 kg/m^2 for men compared with 23.85 ± 3.5 kg/m^2 for women.

As shown in Table 2, the prevalence of overweight was higher among women than among men (overweight = 13.5% vs 11%), and obesity was higher in men than in women (20.8% vs 13.5%). Married participants had a higher prevalence of overweight and obesity than single participants (overweight, 20.1% vs 4.4%; obesity, 29.7% vs 4.7%).

Table 3 shows the factors associated with overweight or obesity on univariate logistic regression analysis. Married and physically inactive participants demonstrated 2.8 times higher odds of being overweight or obese (odds ratio [OR] 2.817; 95% CI, 1.754–4.526), and 1.55 times higher odds

were observed for physically inactive individuals (OR, 1.55; 95% CI, 1.042–2.305) compared with their respective counterparts. Occupational factors also played a role, with homemakers exhibiting 10-fold higher odds of being overweight or obese than their counterparts (OR, 10.303; 95% CI, 3.94–26.902). In addition, 40% had lower odds of being overweight or obese among current smokers than nonsmokers (OR, 0.608; 95% CI, 0.392–0.942).

The final multivariate logistic regression model was adjusted for age, marital status, employment status, caste, smoking status, alcohol consumption status, and physical activity. After full adjustments, data showed that homemakers and participants who were physically inactive had 5.9-fold (adjusted OR [aOR], 5.929; 95% CI, 1.91–18.32) and 2.34-fold (aOR, 2.34; 95% CI, 1.446–3.786) higher odds of being overweight or obese than their counterparts. Data showed 80% lower odds of being overweight or obese among people age <30 (aOR, 0.203; 95% CI, 0.097–0.424)

The multiple regression model had a Hosmer–Lemeshow test that was nonsignificant, indicating a good model fit ($\chi 2 = 1.987$, $p = 0.981$).

DISCUSSION

The nutrition transition in the rural West Indian district has resulted in a growing burden of overweight and obesity, in addition to a persistent burden of being underweight in approximately one-third of the adult population. The transition is still in the early stages: even with the application of the Asian-specific cutoff point of BMI 23 kg/m^2, the prevalence of overweight in this population was relatively high, with a mean BMI of 24.14 kg/m^2.

TABLE 1. Characteristics of the study population

Variable	Total	Male N (%)	Female N (%)
Age			
<30	259	142 (34.8)	117 (28.7)
>30	149	78 (19.1)	71 (17.4)
Mean age = 37.31 years, SD = 11.8 years			
Religion			
Hindu	380	206 (50.5)	174 (42.6)
Others	28	14 (3.4)	14 (3.4)
Native of Gujarat			
Yes	353	181 (44.4)	172 (42.0)
No	55	39 (9.6)	16 (4.0)
BMI			
Normal	168	90 (22.1)	78 (19.1)
Overweight	100	45 (11.0)	55 (13.5)
Obese	140	85 (20.8)	55 (13.5)
Marital status			
Single	94	49 (12.0)	45 (11.0)
Married	314	171 (42.0)	143 (35.0)
Education status			
Uneducated	24	10 (2.4)	14 (3.4)
Secondary school	257	125 (30.6)	132 (32.4)
Graduate/postgraduate	127	85 (20.8)	42 (10.4)
Employment status			
Employed (job/business)	121	105 (25.7)	16 (3.9)
Farmer	111	77 (18.9)	34 (8.3)
Student	35	18 (4.4)	17 (4.2)
Homemaker	119	2 (0.05)	117 (28.7)
Retired	22	18 (4.4)	4 (0.1)
Current smoker			
Yes	127	123 (30.2)	4 (0.1)
No	281	97 (23.8)	184 (45.9)
Current alcohol consumption			
Yes	63	59 (14.5)	4 (0.1)
No	345	161 (39.5)	184 (45.9)
Physical activity			
Yes	207	101 (24.8)	106 (26.0)
No	201	119 (29.2)	82 (20.0)

TABLE 2. Prevalence of adiposity among sociodemographic groups

Variable	Normal (N = 168) N (%)	Overweight (N = 100) N (%)	Obese (N = 140) N (%)	*p*
Overall crude prevalence (%)	41.17	24.5	34.31	
Gender				0.055
Male	90 (22.1)	45 (11.0)	85 (20.8)	
Female	78 (19.1)	55 (13.5)	55 (13.5)	
Religion				0.074
Hindu	162 (39.7)	92 (22.5)	126 (30.9)	
Others	6 (1.5)	8 (2.0)	14 (3.4)	
Native of Gujarat				0.386
Yes	141 (34.6)	87 (21.3)	125 (30.6)	
No	27 (6.6)	13 (3.2)	15 (3.7)	
Marital status				0.000
Single	57 (14.0)	18 (4.4)	19 (4.7)	
Married	111 (27.2)	82 (20.1)	121 (29.7)	
Education status				0.776
Uneducated	10 (2.5)	6 (1.5)	8 (2.0)	
Secondary school	111 (27.2)	63 (15.4)	83 (20.3)	
Graduate/postgraduate	47 (11.5)	31 (7.6)	49 (12.0)	
Employment status				0.000
Employed (job/business)	41 (10.0)	29 (7.1)	51 (12.5)	
Agriculture	52 (12.7)	27 (6.6)	32 (7.8)	
Student	29 (7.1)	2 (0.5)	4 (1.0)	
Homemaker	38 (9.3)	36 (8.8)	45 (11.0)	
Retired	8 (2.0)	6 (1.5)	8 (2.0)	
Current tobacco usage				0.009
Yes	42 (10.3)	28 (6.9)	57 (14.0)	
No	126 (30.9)	72 (17.6)	83 (20.3)	
Current alcohol consumption				0.027
Yes	17 (4.2)	22 (5.4)	24 (5.9)	
No	151 (37)	78 (19.1)	116 (28.4)	
Physical activity				0.044
Yes	96 (23.5)	51 (12.5)	60 (14.7)	
No	72 (17.6)	49 (12.0)	80 (19.6)	

TABLE 3. Factors associated with overweight and obesity on univariate logistic regression analysis

Variables	Number of cases (N = 240)	OR (95% CI)	*p*
Age <30 (ref: age >30)	56	0.245 (0.160–0.376)	0.000*
Female (ref: male)	110	0.976 (0.657–1.457)	0.906
Level of education (ref: uneducated)			
Graduation	148	1.216 (0.500–2.940)	0.666
Occupation (ref: student/retired)			
Homemaker	81	10.303 (3.94–26.902)	0.000*
Office worker	80	9.430 (3.625–24.534)	0.000*
Married (ref: single)	203	2.817 (1.754–4.526)	0.000*
Other caste (ref: Hindu)	218	0.367 (0.145–0.926)	0.034*
Native Gujarati (ref: migrated)	212	1.450 (0.820–2.564)	0.201
Nonsmoker (ref: smoker)	155	0.608 (0.392–0.942)	0.026*
Nonalcoholic (ref: alcoholic)	194	0.475 (0.262–0.861)	0.014*
Not physically active (ref: physically active)	129	1.550 (1.042–2.305)	0.031*

*Included in the multivariate logistic regression analysis. CI, confidence interval; OR, odds ratio; Ref, reference category

Adiposity is a well-known risk factor for cardiovascular disease, type 2 diabetes mellitus, and cancer.[9–11] Delving into the context of our community-based investigation, a striking revelation emerges: approximately three out of every five participants bear the imprint of either overweight or obese. A slew of factors have been identified as influential determinants of this phenomenon.

The influence of sex, marital status, and occupational roles were noteworthy determinants of this burgeoning issue.

Being male, along with being married and engaged in an office-based occupation or a homemaker, correlated with a higher likelihood of being overweight or obese. This suggests the potential influence of occupational factors and lifestyle choices on adiposity. A countervailing pattern emerged among current smokers who displayed a diminished likelihood of experiencing these conditions when juxtaposed with their nonsmoker counterparts. In addition, a nuanced relationship with age emerged, where participants aged <30 years displayed a lower propensity for being overweight or obese, suggesting that younger age may be a protective factor against adiposity, particularly when coupled with regular engagement in physical activities.

In this study, obesity had an incidence of 34.31%, and 24.5% of the participants were identified as overweight. A comparative analysis by Karmakar *et al*., conducted among adults in rural Bengal, revealed noteworthy differences. In their study, 22.4% of individuals were categorized as overweight, whereas 30.4% fell into the obese category. These variations in incidence rates could be indicative of regional differences or distinct factors influencing weight status among adult rural populations in different parts of India. In this study, the incidence rates of obesity and overweight were 34.31% and 24.5%, respectively, which is about sixfold higher than that reported by Sobngwi *et al*. 2002 in rural western Cameroon.[12] The incidence of overweight and obesity reported in this study was also higher than the rates of 20.9% and 8.4%, respectively, reported by Adebayo *et al*. 2014 in a Nigerian adult rural population[13] and of 19.9% and 8.6%, respectively, reported recently in an Ethiopian urban setting.[14] A possible reason for the observed disparity in obesity rates could be that Gujrat is a developed state in India; thus, its population may have a more sedentary lifestyle and better living conditions. This hypothesis aligns with existing research, as developed regions often face unique lifestyle-related challenges, such as increased sedentary behavior and access to energy-dense foods.

However, the prevalence of overweight and obesity in our study was lower than that in the adult population reported in previous studies.[16,17] We observed an overall tendency toward normal weight in our study population (mean BMI, 24.14 kg/m^2), which is higher than that reported by Simo *et al*. (mean BMI, 22.77 kg/m^2).[18] One possible reason for this disparity could be attributed to various factors, including differences in lifestyle, dietary habits, genetic predisposition, and environmental influences across these diverse geographic and cultural settings.

After adjusting for other factors, age <30 years, being a homemaker or an office worker, being married, belonging to a caste other than Hindu, being a nonsmoker, being a nonalcoholic, and being physically inactive remained significantly associated with overweight or obesity. These findings emphasize the multifactorial nature of adiposity, with lifestyle, sociocultural, and behavioral factors playing pivotal roles.

This study showed that the incidence of overweight and obesity was the highest among those who were educated up to secondary school (35.7%), followed by graduates and postgraduates (19.6%). However, a previous study showed that the prevalence was higher among those who were educated up to primary school (11.5%) than those who were educated up to secondary school (6.5%) and higher secondary school (1.2%).[19]

In this study, Gujarati participants showed a significantly higher tendency to be overweight or obese, which is seen as a sign of being well-fed and consuming energy-dense traditional meals by the people of Gujarat.

The associations between married status and obesity or overweight have been documented in a previous study.[20] Marriage confers a greater sense of security than being single, which may explain this association since married people no longer worry about finding a partner, and married couples tend to spend more time together, thus eating more regular and energy-dense foods.[21]

In summary, this study not only uncovers the ongoing nutritional shift in the rural landscape of Western India but also underscores the pressing need to comprehend and address the multifaceted factors driving this transition. The implications for public health, particularly given the association with a constellation of serious medical conditions, demand proactive interventions tailored to the unique attributes of this demographic.

CONCLUSIONS

The current findings indicate that the prevalent issue of overweight and obesity in Jamnagar (Gujarat), an Indian community, affects a significant proportion of the population. The identified factors, such as sex, marital status, occupation, physical activity, and education, underscore the multifaceted nature of this health concern. Addressing these factors through targeted interventions is imperative to mitigate the growing burden of overweight and obesity in this population.

CONFLICT OF INTEREST

No conflicts are declared.

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