ORIGINAL ARTICLE

Association Between Physical Activity and Overweight/Obesity in Rural Populations: A Community-Based Cross-Sectional Study

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ABSTRACT

Background: Overweight and obesity are emerging public health concerns in rural India due to rapid lifestyle transitions and declining physical activity. Evidence regarding their association with physical activity in rural central India remains limited. **Objectives:** To estimate the prevalence of overweight and obesity and to assess their association with physical activity among adults in rural areas of Jabalpur district. **Methods:** A community-based cross-sectional study was conducted among 770 rural adults selected through multistage random sampling. Data were collected using a predesigned questionnaire, anthropometric measurements, and the WHO Global Physical Activity Questionnaire (GPAQ). Body Mass Index (BMI) was classified using WHO criteria. Physical activity was categorized as low (<600 MET-min/week), moderate (600–2999 MET-min/week), and high (≥3000 MET-min/week). Chi-square test and multivariable logistic regression were applied. A p-value <0.05 was considered statistically significant**. Results:** The overall prevalence of overweight and obesity was 20.8% (12.5% overweight and 8.3% obesity). Overweight/obesity was significantly higher among participants with low physical activity (20.9%) compared to moderate (6.8%) and high activity levels (9.6%) (χ^2=32.08, p=0.001). Moderate/high physical activity showed a significant protective association against overweight/obesity (OR=0.233; 95% CI: 0.149–0.365; p=0.001). Educational status, occupation, and socioeconomic status were significantly associated with overweight/obesity, while age, gender, religion, caste, and marital status were not significantly associated. **Conclusion:** Overweight and obesity are increasing in rural populations of Jabalpur district. Low physical activity is a significant modifiable risk factor. Strengthening community-based interventions to promote physical activity may help reduce the growing burden of obesity in rural settings.

KEYWORDS

Overweight, Obesity, Physical Activity, Rural Population, BMI, GPAQ, Non-communicable Diseases.

INTRODUCTION

Overweight and obesity have emerged as major public health concerns worldwide and are defined by the World Health Organization (WHO) as abnormal or excessive fat accumulation that presents a risk to health.[1] Globally, obesity has nearly tripled with more than 1.9 billion adults overweight and over 650 million obese in 2025.[2,3] Overweight and obesity are major risk factors for non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes, musculoskeletal disorders, and certain cancers.[4,5] Raised BMI is strongly associated with increased morbidity and mortality from these conditions. India is undergoing rapid epidemiological transition with rising prevalence of overweight and obesity. As per NFHS-5, the prevalence of overweight or obesity (BMI ≥25 kg/m²) among women is 24% and among men is 22.9%.[6] In rural Madhya Pradesh, the prevalence is 13% among women and 12.1% among men, indicating a growing problem in traditionally less-affected populations.[7]

Physical inactivity is a key modifiable determinant of overweight and obesity. Energy imbalance due to reduced physical activity and increased caloric intake contributes significantly to excess weight gain.[8] Globally, 23% of adults aged 18 years and above are insufficiently physically active.[9] Urbanization, mechanization, sedentary occupations, and changing transportation patterns have contributed to declining physical activity levels in both urban and rural populations.[10]

Given that physical activity is a modifiable lifestyle factor, understanding its association with overweight and obesity is essential for developing targeted public health interventions. However, limited community-based comparative studies have examined this association in both urban and rural settings of central India. Therefore, the present study was conducted to assess the prevalence of overweight and obesity and its association with physical activity in urban and rural areas of Jabalpur district.

Aims and objective

- To estimate the prevalence of overweight and obesity in rural area.
- To find out the association of overweight and obesity with physical activity among rural study subjects.

Material & Methods

The sample size was calculated using Cochran's formula: $n = Z^2pq/d^2$, where n is the required sample size, Z is the standard normal deviate at 95% confidence level (1.96), p is the prevalence of overweight/obesity, $q = 1 - p$, and d is the allowable error. Based on the NFHS-5 Madhya Pradesh fact sheet, the prevalence of overweight and obesity in the rural population was 12.1 %. An allowable error of 20% of the prevalence was considered. The minimum calculated sample size was 697, which was increased to 770 after accounting for a 10% non-response rate.

Rural participants were selected using multistage random sampling. Out of seven rural blocks in Jabalpur district, three were selected randomly. From each selected block, four villages were chosen by simple random sampling (total 12 villages). Households were then randomly selected from village lists obtained from ASHAs, and eligible participants were enrolled until the required sample size was achieved. A total of 770 rural adults were included in the study.

Data were collected through a house-to-house survey using a predesigned and pretested questionnaire that included socio-demographic details, Anthropometric measurements and the World Health Organization's Global Physical Activity Questionnaire (GPAQ).

Global Physical Activity Questionnaire (GPAQ)

The GPAQ consists of 16 items assessing physical activity across three domains: work-related activity, transport (walking/cycling), and recreational activity, along with sedentary behavior.Physical activity levels were expressed in Metabolic Equivalent Task (MET)-minutes per week, calculated according to WHO guidelines. Moderate-intensity activities were assigned 4 METs and vigorous-intensity activities 8 METs across all domains. Total physical activity was computed by summing MET-minutes/week from work, transport, and recreational domains.Participants were categorized into three levels of physical activity:

- **High:** ≥3000 MET-min/week
- **Moderate:** 600–2999 MET-min/week
- **Low:** <600 MET-min/week

Anthropometric Measurements: Weight and height were measured using standard techniques. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared. BMI was classified according to WHO criteria. WHO BMI cut-offs were used to maintain comparability with NFHS estimates. Participants with BMI ≥25 kg/m² were categorized as overweight or obese.

Statistical Analysis: Data were entered in Microsoft Excel and analyzed using SPSS version 29. Descriptive statistics were used to summarize the data. The chi-square test was applied to assess associations between physical activity and overweight/obesity. Multivariable logistic regression analysis was performed to identify independent predictors. A p-value <0.05 was considered statistically significant.

Ethical Considerations: Ethical clearance was obtained from the Institutional Ethics Committee of NSCB Medical College, Jabalpur. Written informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were maintained throughout the study.

Results

Figure 1: Prevalence of overweight & obesity in study subjects as per WHO classification of BMI

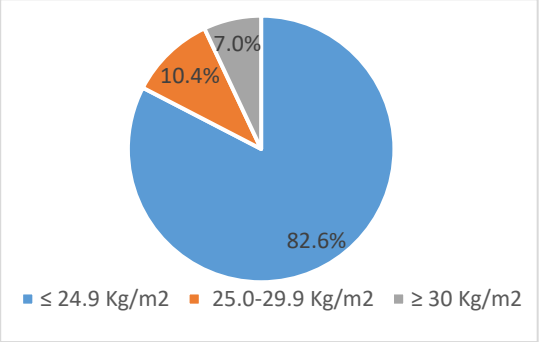

Table 1: Association of overweight & obesity with socio-demographic variables among study subjects.

Variables	(N= 770) Overweight/ Obese (n=92)		Non-Obese (N=218)		Total N (%)	P value X^2 value
Age group	**N**	**%**	**N**	**%**		
18-30 years	24	10.6	204	89.4	228(100)	**0.715**
31-40 years	27	12.5	190	87.5	217(100)	**1.358(3)**
41-50 years	29	14	179	86	208(100)	
>50 years	16	13.7	101	86.3	117(100)	
Gender						
Male	44	12.6	305	87.4	349(100)	0.914
Female	52	12.4	369	87.6	421(100)	0.01(1)
Religion						
Hindu	77	11.4	602	88.6	679(100)	0.08
Muslim	3	10.4	26	89.6	29(100)	4.8(2)
Others	16	25.8	46	74.2	62(100)	
Caste						
General	24	10.3	210	89.7	234(100)	0.437
OBC	52	13.8	325	86.2	377(100)	1.65(2)
SC/ST	20	12.6	139	87.4	159(100)	
Marital status						
Married	69	12.3	492	87.7	561(100)	**0.079**

Variables	(N= 770) Overweight/ Obese (n=92)		Non-Obese (N=218)		Total N (%)	P value X^2 value
Age group	**N**	**%**	**N**	**%**		
Unmarried	11	7.9	129	92.1	140(100)	**5.06(2)**
Widow/widower/Divorced/Separated	16	23.2	53	76.8	69(100)	
Educational qualification						
Postgraduate	4	33.3	8	66.7	12(100)	**0**
Graduate	16	34	31	66	47(100)	**65.37(6)**
Intermediate	32	14.7	186	85.3	218(100)	
High School	17	5	321	95	338(100)	
Middle	20	30.3	46	69.7	66(100)	
Primary	0	0	20	100	20(100)	
Illiterate	7	10.1	62	89.9	69(100)	
Occupation						
Professional	0	0	27	100	27(100)	**0.001**
Semi-professional	4	11.1	32	88.9	36(100)	**24.53(5)**
Clerical/shop/Farmer	32	19.4	133	80.6	165(100)	
Skilled/Semi-skilled worker	12	5.8	195	94.2	207(100)	
Unskilled	8	8.6	85	91.4	93(100)	
Unemployed	40	16.5	202	83.5	242(100)	
Socioeconomic Status						
Upper class	0	0	16	100	16(100)	**0.001**
Upper Middle Class	4	5	76	95	80(100)	**22.28(4)**
)Middle Class	12	11	97	89	109(100)	
Lower Middle class	44	10.9	361	89.1	405(100)	
Lower class	36	22.5	124	77.5	160(100)	

Result for Table 1

A total of 770 study participants were included in the analysis. The overall prevalence of overweight/obesity was 12.5%.

Age: The prevalence of overweight/obesity increased slightly with age: 10.6% in 18–30 years, 12.5% in 31–40 years, 14% in 41–50 years, and 13.7% in >50 years age group. However, the association between age group and overweight/obesity was not statistically significant (χ^2 = 1.358, p = 0.715).

Gender: Overweight/obesity was observed in 12.6% of males and 12.4% of females. No statistically significant association was found between gender and overweight/obesity (χ^2 = 0.01, p = 0.914).

Religion

The prevalence was 11.4% among Hindus, 10.4% among Muslims, and 25.8% among other religions. Although a higher proportion was observed in the "Others" category, the association was not statistically significant (χ^2 = 4.8, p = 0.08).

Caste: The prevalence of overweight/obesity was 10.3% in General caste, 13.8% in OBC, and 12.6% in SC/ST participants. No statistically significant association was found between caste and overweight/obesity (χ^2 = 1.65, p = 0.437).

Marital Status: Overweight/obesity was present in 12.3% of married individuals, 7.9% of unmarried participants, and 23.2% among widowed/divorced/separated individuals. Although a higher prevalence was noted in widowed/divorced/separated individuals, the association was not statistically significant (χ^2 = 5.06, p = 0.079).

Educational Qualification

A statistically significant association was observed between educational status and overweight/obesity (χ^2 = 65.37, p < 0.001). The prevalence was highest among postgraduates (33.3%) and graduates (34%), followed by middle school (30.3%). It was lowest among primary educated participants (0%) and those with high school education (5%).

Occupation: Occupation showed a statistically significant association with overweight/obesity (χ^2 = 24.53, p = 0.001). Higher prevalence was observed among clerical/shopkeepers/farmers (19.4%) and unemployed individuals (16.5%), while none of the professionals were overweight/obese.

Socioeconomic Status

Socioeconomic status was significantly associated with overweight/obesity (χ^2 = 22.28, p = 0.001). The prevalence was highest in the lower class (22.5%) and lowest in the upper class (0%).

Table 2: Association of overweight & obesity with physical activity among study subjects

Physical Activity (MET inutes/week)	Overweight/ Obese(n=96) n(%)	Non-obese (n=674) n(%)	Total(770) **n(%)**	**X^2 (d.f) p-value**
Low (<600)	62(20.9)	234(79.1)	296(100)	32.08(2) ***0.001****
Moderate (600-2999)	28(6.8)	384(93.2)	412(100)	
High (≥3000)	6(9.6)	56(90.4)	62(100)	

Table 2 shows that overweight & obesity is significantly higher in those having low physical activity (20.9%) as compared to those having moderate (6.8%) and high (9.6%) physical activity. The association of overweight & obesity with low physical activity is found to be statistically significant (p-value = 0.001).

Table 3: Multiple logistic regression analysis of overweight & obesity with physical activity

	Overweight and Obesity		
Variables	**Odd's ratio**	**95% CI**	**p-value**
Rural Physical activity (MET min/week) 0= Low (<600) 1= Moderate/High (600 – 2999)	0.233	0.149-0.365	**0.001**

Table 3 depicts that Moderate/high physical activity (OR=0.233, 95% CI : 0.149 - 0.365 ,p-value=0.001) was significantly associated with overweight & obesity. Odds of being overweight & obese decreased with moderate/high physical activity.

Discussion

The present study estimated the prevalence of overweight and obesity in the rural population of Jabalpur district and examined its association with physical activity. The overall prevalence of overweight and obesity in the rural area was 20.8% (12.5% overweight and 8.3% obesity). These findings indicate that overweight and obesity are no longer confined to urban populations and are emerging as important public health concerns in rural settings as well.

The rising rural burden may reflect ongoing lifestyle and occupational transitions. Traditionally, rural populations engaged in physically demanding agricultural and manual work. However, mechanization of farming practices, improved transportation facilities, and gradual shifts toward less physically intensive occupations have reduced daily energy expenditure. Similar trends have been reported in other studies showing increasing obesity prevalence in non-urban populations.

A key finding of the present study was the significant association between physical inactivity and overweight/obesity in the rural population. Participants with low physical activity levels had a higher prevalence of overweight and obesity compared to those performing moderate or high levels of activity. These findings are consistent with studies conducted by Feng et al. 2024[10], Patel et al. 2023[11], Regassa et al. 2021[12], and Sharma et al. 2017[13], all of whom reported significantly higher odds of overweight and obesity among physically inactive individuals. Bose et al.[14] also observed a higher prevalence of obesity in the low physical activity group, while Kshetrimayum et al. 2020[15] identified low physical activity as a major predictor of overweight and obesity. This suggests that maintaining even moderate activity levels may offer protective effects against obesity. Alsulami et al.2022[16] reported that individuals with normal BMI performed moderate to high physical activity.

Conclusion

The present study demonstrates that overweight and obesity are emerging health concerns in the rural population of Jabalpur district, with more than one-fifth of adults affected. The findings reveal a significant association between low physical activity and overweight/obesity, highlighting physical inactivity as a major modifiable risk factor in rural settings.Although rural communities were traditionally characterized by higher levels of physical labor, ongoing lifestyle transitions, mechanization, and changes in occupational patterns appear to have reduced overall physical activity. The study underscores that even in rural areas, declining physical activity contributes substantially to the increasing burden of overweight and obesity.Promoting adequate physical activity may play a crucial role in preventing and controlling excess weight gain in rural populations.

Recommendation

There is a need to strengthen community-based interventions in rural areas to promote regular physical activity as a primary strategy for preventing and controlling overweight and obesity. Health education and behavior change communication activities should be conducted at the village level to increase awareness regarding the importance of maintaining adequate physical activity in daily life. Promotion of active lifestyles, such as walking, cycling, and engagement in moderate-intensity occupational or recreational activities, should be encouraged through community participation and local leadership involvement.

Physical activity counselling and routine BMI screening should be integrated into primary healthcare services under existing programs such as NPNCD to ensure early identification and management of individuals at risk. Frontline health workers can play a key role in motivating rural populations to adopt healthier lifestyle practices. Additionally, rural development initiatives should support environments that facilitate active living by encouraging the use of open spaces and safe pathways for walking and other forms of physical activity.A sustained, multisectoral approach involving the health system, local governance, and community stakeholders is essential to curb the rising burden of overweight and obesity in rural populations.

Authors Contribution

All authors have contributed equally.

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Nil

Conflict of Interest

There are no conflicts of interest.

Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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