"Obesity and Its Determinants Among Rural Adults in Ramanathapuram District, Tamil Nadu: A Cross-Sectional Study"

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ABSTRACT

Background

Excess body weight has emerged as a major public health concern and an important contributor to the growing burden of non-communicable diseases worldwide. Rapid lifestyle transitions, increased consumption of calorie-dense foods, and declining physical activity have contributed to rising levels of adiposity in both urban and rural populations. Rural communities in India, which were traditionally considered less affected, are now experiencing increasing prevalence of overweight and obesity due to changing socioeconomic and behavioural factors.

Methods

A community-based cross-sectional study was conducted among 300 adults aged ≥18 years residing in selected rural villages of Ramanathapuram district, Tamil Nadu between March and October 2025. Participants were recruited after obtaining informed consent. Data were collected using a pre-tested structured questionnaire capturing socio-demographic characteristics, dietary patterns, access to healthcare, and physical activity levels. Anthropometric measurements including height, weight and waist circumference were obtained using standard procedures. Body mass index (BMI) was calculated and categorized into underweight, normal, overweight and obese groups. Data were analysed using SPSS version 25. Descriptive statistics summarized participant characteristics, while chi-square test, logistic regression analysis and analysis of variance were used to determine factors associated with excess body weight.

Results

Among the participants, 33.0% were overweight and 27.0% were obese, indicating that 60.0% had BMI ≥25 kg/m². Higher age (>40 years), higher income, poor access to healthy food, lack of obesity-related education, daily consumption of high-calorie foods, and low physical activity were significantly associated with excess body weight. Waist circumference increased progressively with BMI, while physical activity showed an inverse relationship.

Conclusion

A high burden of excess body weight was observed among rural adults, highlighting the need for targeted community-based interventions focusing on lifestyle modification, nutritional awareness and promotion of physical activity.

Keywords: Adiposity; Body mass index; Rural population; Lifestyle factors; Physical inactivity; Nutritional transition.

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Introduction

Obesity has emerged as one of the most significant public health challenges of the twenty-first century and is increasingly recognized as a major contributor to the global burden of non-communicable diseases. **Park's Textbook of Preventive and Social Medicine** explains that obesity is defined as abnormal or excessive accumulation of body fat resulting from long-term energy imbalance between caloric intake and expenditure. The textbook further emphasizes that obesity is a multifactorial disorder influenced by dietary habits, reduced physical activity, genetic predisposition, and socioeconomic determinants, and it significantly increases the risk of diabetes mellitus, hypertension, cardiovascular diseases, and certain cancers [1]. Similarly, the **Oxford Textbook of Global Public Health** describes obesity as a rapidly expanding global epidemic linked to economic development, urbanization, mechanization of labour, and increased consumption of calorie-dense foods. The textbook highlights that lifestyle transitions and sedentary behaviour are major contributors to the rising prevalence of obesity worldwide [2].

The magnitude of the global obesity epidemic is highlighted by international health organizations. According to the **World Health Organization (WHO)** fact sheet on obesity and overweight, more than **1 billion people worldwide are currently living with obesity**, including approximately **650 million adults, 340 million adolescents, and 39 million children**. The WHO further reports that the prevalence of obesity has nearly **tripled globally since 1975**, demonstrating the rapid escalation of this public health problem [3]. Complementing these findings, the **World Obesity Federation's Global Obesity Atlas 2023** estimates that nearly **one in every eight people globally is affected by obesity**, and projections suggest that the number of individuals living with obesity could exceed **1.9 billion by 2035** if current trends continue [4]. These global estimates clearly indicate that obesity is no longer confined to affluent populations but has become a universal health concern affecting countries at all levels of development.

The rising prevalence of obesity has substantial implications for the global burden of non-communicable diseases. The **Ministry of Health and Family Welfare (MoHFW), Government of India**, through the **National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD)**, identifies obesity as one of the most important modifiable risk factors contributing to diseases such as diabetes, cardiovascular disease, and stroke. The programme emphasizes that lifestyle-related risk factors including unhealthy diet, physical inactivity, and obesity account for a large proportion of the NCD burden in India and require targeted public health interventions [5].

Evidence from nationally representative surveys further highlights the increasing prevalence of obesity in India. The **National Family Health Survey-5 (NFHS-5)** conducted by the **International Institute for Population Sciences (IIPS) and ICF** reported that **approximately 24% of women and 23% of men in India are overweight or obese** based on body mass index criteria. The survey also documented a clear increasing trend compared with earlier rounds of NFHS, indicating that obesity prevalence has risen steadily across the country over the last decade [6]. Importantly, the survey findings reveal that overweight and obesity are no longer restricted to urban populations and are increasingly observed among rural communities as well.

The role of diet in the development of obesity has been emphasized by national nutrition authorities. The **Dietary Guidelines for Indians issued by the Indian Council of Medical Research–National Institute of Nutrition (ICMR-NIN)** report that increasing consumption of energy-dense foods, refined carbohydrates, saturated fats and sugar-sweetened beverages has contributed significantly to rising obesity prevalence in India. The guidelines note that adults consuming diets high in fats and refined carbohydrates are at substantially greater risk of weight gain, particularly when combined with reduced physical activity. The report also highlights that Indians are experiencing a dietary transition characterized by higher intake of processed foods and reduced intake of traditional cereals, fruits and vegetables, which contributes to increasing levels of overweight and obesity [7].

Evidence from international public health agencies further supports the relationship between lifestyle factors and obesity. According to the **Centers for Disease Control and Prevention (CDC)**, obesity affects approximately **42.4% of adults in the United States**, indicating the magnitude of the global obesity epidemic in developed countries. The CDC further reports that obesity prevalence has increased from **30.5% in 1999–2000 to over 42% in recent years**, illustrating a rapid upward trend. The agency attributes this increase primarily to excessive caloric intake, sedentary behaviour, reduced physical activity and environmental factors that promote unhealthy dietary patterns [8].

In the Indian context, the growing burden of obesity has become an important contributor to the rise of non-communicable diseases. The **WHO Noncommunicable Diseases Country Profile for India** reports that NCDs account for nearly **63% of all deaths in the country**, with cardiovascular diseases alone responsible for approximately **27% of total mortality**. The report identifies obesity, physical inactivity, and unhealthy diet as major behavioural and metabolic risk factors contributing to this increasing disease burden. It further emphasizes that the prevalence of overweight and obesity is steadily increasing across both urban and rural populations in India [9].

Appropriate identification and classification of obesity are essential for epidemiological studies. The **WHO Expert Consultation on Body Mass Index for Asian populations** highlighted that Asian individuals tend to develop metabolic complications at lower BMI levels compared with Western populations. Based on epidemiological evidence, the consultation recommended revised BMI cut-off points for Asian populations, suggesting that individuals with BMI values **≥23 kg/m² should be considered overweight and ≥25 kg/m² obese** in Asian populations. These lower thresholds were recommended because Asian populations demonstrate higher cardiometabolic risk even at relatively lower BMI values [10].

Biological mechanisms linking obesity with chronic diseases have also been extensively studied. **Chait and den Hartigh**, in their study published in *Frontiers in Cardiovascular Medicine*, reported that excess adipose tissue promotes chronic low-grade inflammation, insulin resistance and metabolic dysfunction. Their findings indicate that adipose tissue secretes inflammatory mediators and adipokines that contribute to metabolic disturbances, thereby increasing the risk of cardiovascular disease and diabetes mellitus. The authors emphasize that visceral adiposity, rather than overall body weight alone, plays a crucial role in determining cardiometabolic risk [11].

Epidemiological evidence from South Asia also demonstrates a substantial burden of overweight and obesity in adult populations. **Rawal et.al**, analysing nationally representative survey data from Nepal, reported that approximately **21% of adults were overweight and about 5% were obese**, indicating that nearly one-quarter of the adult population had excess body weight. The study further found that overweight and obesity were significantly associated with increasing age, urban residence, higher socioeconomic status, and sedentary lifestyle patterns [12].

Taken together, these findings from international organizations, national surveys and epidemiological studies clearly demonstrate that obesity is a growing global and national health concern. The rising prevalence of obesity, particularly in developing countries such as India, highlights the need for region-specific research to identify the determinants of obesity in different populations. Rural populations are especially important to study because lifestyle transitions, dietary changes and socioeconomic development are increasingly influencing health behaviours in these communities. Understanding these determinants is essential for developing effective public health interventions aimed at preventing obesity and reducing the burden of non-communicable diseases.

Methodology

This community-based cross-sectional study was conducted to determine the prevalence of obesity and its determinants among adults residing in rural areas of Ramanathapuram District, Tamil Nadu. The study was carried out in selected villages located within the field practice area of primary health centres in Ramanathapuram district. The study population comprised adult individuals aged 18 years and above who were permanent residents of the selected rural villages. Both male and female participants were included in the study. Individuals who were willing to participate and provide informed consent were included, while those who were seriously ill, pregnant women, and individuals with physical or mental conditions that prevented accurate anthropometric measurements were excluded from the study.

The sample size for the study was calculated using the standard formula for estimating a single population proportion in cross-sectional studies: $\mathbf{n = Z^2\ p\ q\ /\ d^2}$, where *n* represents the required sample size, *Z* is the standard normal deviate corresponding to

a 95% confidence level (1.96), p represents the expected prevalence of obesity, $q = 1 - p$, and d represents the allowable error. Based on previous national survey findings from the National Family Health Survey indicating that approximately 24% of adults are overweight or obese in India, the prevalence (p) was taken as 0.24. Accordingly, q was calculated as 0.76 and the allowable error was taken as 5% (0.05). Using the formula $\mathbf{n = (1.96)^2 \times 0.24 \times 0.76 / (0.05)^2}$, the calculated minimum sample size was approximately 280. To account for possible non-response and incomplete data, an additional margin of 5–7% was added, resulting in a final sample size of **300 participants** for the study.

Participants were selected from the rural population using a convenient sampling approach. Eligible adults attending the nearby primary health centre and residents of the selected villages were approached and screened for eligibility. Individuals meeting the inclusion criteria were recruited until the required sample size of 300 participants was achieved. The study was conducted over a period of eight months from March 2025 to October 2025.

Data were collected using a pre-tested structured questionnaire designed for the study. The questionnaire included sections on socio-demographic characteristics such as age, gender, marital status, education level, occupation, and household income. Information regarding lifestyle factors including dietary habits, physical activity patterns, smoking and alcohol consumption was also obtained. Dietary information included the frequency of consumption of calorie-dense foods such as fried foods, sweets, processed snacks, and sugar-sweetened beverages, as well as the intake of fruits, vegetables, and traditional foods. Physical activity patterns were assessed by recording the duration and type of daily activities such as occupational work, walking, household activities, and recreational exercise.

Anthropometric measurements were obtained using standard procedures. Height was measured in centimetres using a stadiometer with participants standing upright without footwear. Weight was measured in kilograms using a calibrated digital weighing scale with participants wearing light clothing. Body Mass Index (BMI) was calculated using the formula **weight in kilograms divided by height in metres squared (kg/m²)**. Participants were categorized based on BMI values according to standard classification criteria: underweight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), and obese (≥30 kg/m²). Waist circumference was also measured using a non-stretchable measuring tape at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest to assess central obesity.

Collected data were entered into Microsoft Excel and analysed using **Statistical Package for the Social Sciences (SPSS) version 25.0**. Descriptive statistics such as mean, standard deviation, frequencies and percentages were used to summarize demographic characteristics and prevalence of obesity among the study participants. Inferential statistical tests were applied to determine associations between obesity and potential determinants. The chi-square test was used to assess associations between categorical variables, while independent sample t-tests or analysis of variance were used for continuous variables where appropriate. Logistic regression analysis was performed to identify independent predictors of obesity after adjusting for potential confounding variables. A **p-value less than 0.05** was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to data collection. Confidentiality and privacy of the participants were maintained throughout the study, and all collected data were anonymized before analysis and reporting.

Results :

A total of 300 rural adults were enrolled in the study and included in the final analysis. The socio-demographic profile of the participants and the distribution of body mass index categories were assessed. The prevalence of overweight and obesity among the study population was determined. Factors associated with overweight and obesity were also evaluated.

Table 1: Socio-Demographic Characteristics of Study Participants

Category	Frequency (n=300)	%
Age		
18–30	72	24.0
31–40	78	26.0
≥41	150	50.0
Gender		
Male	138	46.0

Female	162	54.0
Education		
Low (No formal + Primary)	160	53.3
High (Secondary & above)	140	46.7
Income		
≤ ₹20,000	190	63.3
> ₹20,000	110	36.7
Healthcare Access		
Yes	210	70.0
No	90	30.0
Good	118	39.3
Fair/Poor	182	60.7
Obesity Education		
Yes	96	32.0
No	204	68.0

A total of **300 rural adults** participated in the study, with **50.0% aged ≥41 years**, followed by **26.0% aged 31–40 years** and **24.0% aged 18–30 years**. Females constituted **54.0%** of participants, while males accounted for **46.0%**. More than half (**53.3%**) had low educational status and **63.3%** reported monthly household income ≤₹20,000. Although **70.0%** had access to healthcare services, only **39.3%** reported good access to healthy food and **68.0%** had not received obesity-related education.

Table 2: Prevalence of BMI Categories

BMI Category	Frequency (n=300)	%
Underweight	21	7.0
Normal	99	33.0
Overweight	99	33.0
Obese	81	27.0

Among the **300 rural adults**, **33.0% had normal BMI**, while **7.0% were underweight**. A considerable proportion were **overweight (33.0%)** and **obese (27.0%)**, indicating that **60.0% of the population had BMI ≥25 kg/m²**. These findings demonstrate a high burden of excess body weight in the rural community. The results suggest a growing nutritional and lifestyle transition with obesity emerging as a significant public health concern.

Table 3: Univariate Analysis of Determinants of Obesity

Category	Normal/Underweight n (%) (n=120)	Overweight/Obesen (%) (n=180)	Crude OR (95 % CI)	p-value
Gender				
Male	65 (54.2)	73 (40.6)	Ref	0.019
Female	55 (45.8)	107 (59.4)	1.739 (1.095–2.762)	
Age				
≤40 yrs	72 (60.0)	78 (43.3)	Ref	0.004
>40 yrs	48 (40.0)	102 (56.7)	1.961 (1.226–3.135)	
Education				
High (Secondary/UG/PG)	62 (51.7)	78 (43.3)	Ref	0.150
Low (No Formal/Primary)	58 (48.3)	102 (56.7)	1.402 (0.884–2.224)	
Income				
≤₹20,000	88 (73.3)	102 (56.7)	Ref	0.004
>₹20,000	32 (26.7)	78 (43.3)	2.103 (1.259–	

			3.514)	
Healthy Food Access				
Good	60 (50.0)	58 (32.2)	Ref	0.002
Fair/Poor	60 (50.0)	122 (67.8)	2.103 (1.307–3.384)	
Obesity Education				
Yes	52 (43.3)	44 (24.4)	Ref	0.001
No	68 (56.7)	136 (75.6)	2.353 (1.423–3.888)	
High-Calorie Food (Daily)				
Rare/Never	70 (58.3)	58 (32.2)	Ref	<0.001
Daily	50 (41.7)	122 (67.8)	2.943 (1.824–4.747)	
Physical Activity				
≥1 hr/day	85 (70.8)	87 (48.3)	Ref	<0.001
<1 hr/day	35 (29.2)	93 (51.7)	2.587 (1.560–4.290)	

Univariate analysis showed that females had a higher prevalence of overweight/obesity (**59.4% vs 40.6% in males**) with **OR = 1.739 (p = 0.019)**. Participants aged **>40 years** had nearly **two times higher odds of overweight/obesity (OR = 1.961; p = 0.004)**, while higher income (>₹20,000) also showed increased risk (**OR = 2.103; p = 0.004**). Lack of obesity education (**OR = 2.353; p = 0.001**) and fair/poor access to healthy food (**OR = 2.103; p = 0.002**) were significantly associated with overweight/obesity. Daily high-calorie food intake (**OR = 2.943; p < 0.001**) and physical inactivity (**OR = 2.587; p < 0.001**) showed strong associations with excess body weight.

Table 4: Multivariate Logistic Regression for Determinants of Overweight/Obesity (BMI ≥25 kg/m²) (n = 300)

Category	Adjusted OR (95% CI)	p-value
Gender		
Male	Ref	0.178
Female	1.412 (0.854–2.334)	
Age		
≤40 yrs	Ref	0.023
>40 yrs	1.789 (1.083–2.957)	
Income		
≤₹20,000	Ref	0.019
>₹20,000	1.912 (1.112–3.288)	
Healthy Food Access		
Good	Ref	0.018
Fair/Poor	1.866 (1.115–3.122)	
Obesity Education		
Yes	Ref	0.014
No	1.973 (1.149–3.388)	
High-Calorie Food (Daily)		
Rare/Never	Ref	0.001
Daily	2.421 (1.452–4.037)	
Physical Activity		
≥1 hr/day	Ref	0.004
<1 hr/day	2.138 (1.270–3.601)	

Multivariate logistic regression showed that **age >40 years** was independently associated with overweight/obesity (**AOR = 1.789; p = 0.023**). Higher monthly income **>₹20,000** (**AOR = 1.912; p = 0.019**)

and fair/poor access to healthy food (**AOR = 1.866; p = 0.018**) were also significant predictors. Lack of obesity education (**AOR = 1.973; p = 0.014**) and daily consumption of high-calorie foods (**AOR = 2.421; p = 0.001**) showed strong associations. Low physical activity (<1 hour/day) increased the odds of overweight/obesity (**AOR = 2.138; p = 0.004**), while gender was not significant after adjustment.

Table 5: Comparison of Mean Variables Across BMI Categories (ANOVA)

Variable	Normal Mean ± SD	Overweight Mean ± SD	Obese Mean ± SD	p-value
Waist Circumference (cm)	82.4 ± 6.3	89.6 ± 7.4	98.2 ± 8.1	<0.001
Physical Activity (hrs/day)	2.8 ± 1.2	1.9 ± 0.8	0.9 ± 0.6	<0.001

ANOVA showed a significant increase in **waist circumference across BMI categories**, with mean values of **82.4 ± 6.3 cm in normal BMI**, **89.6 ± 7.4 cm in overweight**, and **98.2 ± 8.1 cm in obese participants (p < 0.001)**. In contrast, **mean physical activity decreased with increasing BMI**, from **2.8 ± 1.2 hours/day in normal BMI** to **1.9 ± 0.8 hours/day in overweight** and **0.9 ± 0.6 hours/day in obese individuals (p < 0.001)**. These findings indicate a progressive rise in central adiposity with increasing BMI. They also demonstrate a strong inverse relationship between physical activity and obesity in the rural population.

Discussion

In the present study conducted among **300 rural adults**, the prevalence of **overweight was 33.0% and obesity was 27.0%**, indicating that **60.0% of the study population had BMI ≥25 kg/m²**. Increasing age, higher income, daily consumption of high-calorie foods and low physical activity were significantly associated with obesity. Participants aged **>40 years had higher odds of overweight/obesity (AOR = 1.789)** and individuals with monthly income **>₹20,000 had AOR = 1.912**. Daily consumption of high-calorie foods showed **AOR = 2.421**, while physical inactivity (<1 hour/day) showed **AOR = 2.138**. Waist circumference increased from **82.4 ± 6.3 cm among normal BMI individuals to 98.2 ± 8.1 cm among obese individuals**, while physical activity decreased from **2.8 ± 1.2 hours/day to 0.9 ± 0.6 hours/day**, indicating strong lifestyle influence on obesity.

Venkatrao et al. [13] conducted a nationwide cross-sectional study in India and reported obesity prevalence ranging from **11% to 31%** across different regions. Their study also identified sedentary lifestyle and reduced physical activity as important contributors to obesity. In the present study, obesity prevalence was **27.0%**, which lies within the range reported by Venkatrao et al. Additionally, the present study also found that **physical inactivity (<1 hour/day) increased obesity risk by more than two times (AOR = 2.138)**, supporting their observation regarding the role of sedentary lifestyle.

Jaacks et al. [14] analysed global epidemiological trends and reported that overweight and obesity prevalence is rapidly increasing in developing countries due to urbanization, dietary transition and reduced physical activity. Their study described a progressive increase in obesity prevalence across multiple countries undergoing economic transition. Similarly, the present study identified a high combined prevalence of **60.0% overweight and obesity**, indicating that rural populations are also experiencing this epidemiological transition.

A large population-based analysis by **Gupta et al. [15]** examined obesity among **698,286 participants** and reported a high burden of abdominal obesity in South Asian populations, particularly among individuals with increasing age and higher socioeconomic status. In the present study, **participants aged >40 years had nearly 1.8 times higher odds of obesity (AOR = 1.789)** and individuals with higher income had **AOR = 1.912**, demonstrating similar socioeconomic and age-related patterns.

Luhar et al. [16] projected future trends of obesity in India and predicted that the prevalence of overweight and obesity will increase substantially by **2040** due to lifestyle changes and socioeconomic development. The current study already demonstrates a high burden with **60.0% of participants being overweight or obese**, indicating that the increasing trends predicted by Luhar et al. may already be emerging in rural populations.

Dhawan and Sharma [17] reported that abdominal obesity contributes to metabolic disturbances through adipokine-mediated inflammatory pathways and increases the risk of non-communicable diseases. In the present study, waist circumference increased significantly from **82.4 cm in normal BMI individuals to 98.2 cm among obese individuals**,

indicating increasing central adiposity which may contribute to metabolic complications as described by Dhawan and Sharma.

A prospective cohort study by **Huai et al. [18]** demonstrated that central obesity significantly increases the risk of **all-cause and cardiovascular mortality** compared with individuals without central obesity. In the present study, the mean waist circumference among obese participants was **98.2 ± 8.1 cm**, which is considerably higher than the **82.4 ± 6.3 cm** observed in normal BMI individuals, indicating a rising burden of central obesity that may increase future cardiometabolic risk.

Habibzadeh [19] highlighted that abdominal obesity is strongly associated with metabolic disorders including hypertension, diabetes and cardiovascular disease due to accumulation of visceral fat. In the present study, the significant increase in waist circumference among overweight and obese participants (**89.6 ± 7.4 cm and 98.2 ± 8.1 cm respectively**) reflects increasing central adiposity which may predispose individuals to similar metabolic complications.

A large meta-analysis conducted by **Wong et al. [20]** analysed data from **13.2 million individuals worldwide** and reported a significant global increase in central obesity prevalence over time. Their findings indicate that central obesity is becoming increasingly common across both developed and developing countries. Similarly, the present study observed a high burden of excess body weight with **60% of the rural population being overweight or obese**, indicating similar rising trends.

Williams and Periasamy [21] reported that Asian populations are more prone to visceral adiposity due to both genetic and environmental factors, leading to higher metabolic risk even at lower BMI levels. In the present study, the mean waist circumference among obese participants reached **98.2 cm**, demonstrating a substantial level of central adiposity consistent with the susceptibility described in Asian populations.

A nationally representative study by **Das Gupta et al. [22]** reported a considerable prevalence of abdominal obesity among Bangladeshi adults and identified increasing age and socioeconomic status as major determinants. Similarly, the present study observed that **participants aged >40 years and those with higher income had significantly higher odds of obesity (AOR = 1.789 and 1.912 respectively)**, indicating comparable socioeconomic patterns.

The **NFHS-5 national survey reports [23,24]** documented that approximately **24% of women and 23% of men in India are overweight or obese**. In comparison, the present study reported a much higher combined prevalence of **60.0% overweight and obesity**, suggesting that rural populations in the study region may be experiencing a rapidly increasing burden of excess body weight.

A study conducted in North India by **Gupta et al. [25]** reported that obesity prevalence varied depending on lifestyle behaviours and socioeconomic status. Their study also highlighted the role of unhealthy diet and reduced physical activity in obesity development. Similarly, in the present study **daily high-calorie food consumption increased obesity risk by nearly 2.4 times (AOR = 2.421)**.

A cross-sectional study in Bangladesh by **Ali et al. [26]** reported that general and abdominal obesity were significantly associated with increasing age and socioeconomic status. The present study showed comparable findings where **participants aged >40 years had increased odds of obesity (AOR = 1.789)** and those with higher income also had significantly higher risk.

A community-based study conducted in Ethiopia by **Dagne et al. [27]** reported that abdominal obesity was strongly associated with sedentary lifestyle and reduced physical activity. In the present study, **participants engaging in <1 hour/day of physical activity had more than twice the odds of overweight/obesity (AOR = 2.138)**, supporting their findings.

Finally, **Powell-Wiley et al. [28]** reported that obesity significantly increases the risk of cardiovascular disease and contributes substantially to global morbidity and mortality. In the present study, the high prevalence of **60.0% overweight and obesity**, along with increasing waist circumference up to **98.2 cm among obese individuals**, indicates a substantial future risk for cardiovascular and metabolic diseases within the rural population.

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