Demographic and dietary predictors of abdominal obesity among adults in Jabalpur district – A cross-sectional study

Manas Nigam, Rajesh Tiwari

Department of Community Medicine, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India

CORRESPONDING AUTHOR

Dr Manas Nigam, Department of Community Medicine, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India
Email: manasnigam2025@gmail.com

ABSTRACT

Background: Abdominal obesity is a major public health concern associated with increased risk of type 2 diabetes, cardiovascular disease, and hypertension. It is a more reliable predictor of metabolic risk than general obesity measured by Body Mass Index. With increasing urbanization and dietary transitions, India is witnessing a rise in abdominal obesity, yet region-specific data, especially from central India, remains limited. **Aims & Objectives:** To estimate the prevalence of abdominal obesity and determine the influence of socio-demographic factors and dietary factors on abdominal obesity among participants. **Methodology:** A community-based cross-sectional study was conducted from April to August 2024 in rural areas of Jabalpur district. A total of 770 adults (aged >18 years) were selected using simple random sampling from seven rural blocks. Data on socio-demographic variables and dietary intake (via Food Frequency Questionnaire) were collected using a pre-tested, semi-structured tool. Abdominal obesity was defined using WHO Asia-Pacific criteria. Data was analysed using SPSS. **Results:** Abdominal obesity was present in 35 % of participants. It was more prevalent among individuals aged 41–50 years and >50 years (p = 0.001), females (p = 0.713), unemployed (0.066) and those with intermediate and high school education (p = 0.001). lower middle class showed the highest prevalence (p = 0.014). Higher frequency of fresh fruit intake and fast-food consumption was associated with abdominal obesity (p = 0.001 and p = 0.001, respectively). Logistic regression revealed that frequent intake of fresh vegetables (OR = 0.743, p = 0.03) was protective, while frequent intake of sweets significantly increased the risk (OR = 2.802, p = 0.019). **Conclusion:** The study revealed a high burden of abdominal obesity in rural Jabalpur, with significant association with age, education, socioeconomic status, and diet. The findings emphasize the need for targeted public health interventions promoting healthy dietary practices and physical activity. Region-specific data such as this is crucial for designing localized strategies to curb the growing epidemic of abdominal obesity and associated non-communicable diseases.

INTRODUCTION

Obesity is an increasing global public health concern, with abdominal obesity posing a greater risk for cardiometabolic diseases such as type 2 diabetes, hypertension, and cardiovascular disease. Abdominal or central obesity is characterized by excessive visceral fat accumulation and is commonly assessed using waist circumference (WC) or waist-to-hip ratio (WHR), which are considered better predictors of metabolic risk than body mass index (BMI) alone (1,2). In recent decades, the prevalence of abdominal obesity has increased in both developed and developing countries, including India, largely due to rapid urbanization, sedentary lifestyles, and changes in dietary patterns (3).

India is currently experiencing an epidemiological transition marked by a rising burden of non-communicable diseases (NCDs), many of which are strongly associated with central obesity. Previous

studies conducted in different regions of India have reported a high prevalence of abdominal obesity, influenced by demographic, socioeconomic, and lifestyle factors (4). Dietary practices such as high consumption of refined carbohydrates, saturated fats, and low intake of dietary fiber have been linked to increased central fat accumulation (5). In addition, factors such as age, gender, income, education, and physical activity significantly influence the risk of abdominal obesity (6).

However, region-specific data from central India, particularly Jabalpur district of Madhya Pradesh, remain limited. Therefore, this study aims to assess the demographic and dietary predictors associated with abdominal obesity among adults in Jabalpur district.

Aims & Objectives
1. To estimate the prevalence of abdominal obesity among participants.
2. To determine the influence of socio-demographic factors and dietary factors on abdominal obesity among participants.

MATERIAL & METHODS

Study Type and Study Design
A community-based cross-sectional study was conducted to assess the demographic and dietary predictors of abdominal obesity among adults.

Study Setting
The study was carried out in the rural areas of Jabalpur district, Madhya Pradesh, India. Jabalpur is a rapidly developing district with a heterogeneous population distributed across urban and rural areas.

Study Population
The study population consisted of adults aged ≥18 years residing in the selected rural areas of Jabalpur district who were willing to participate and provided informed consent.

Study Duration
The study was conducted over a period of five months from April to August 2024.

Sample Size Calculation
The sample size was calculated using the prevalence of obesity in rural areas of Madhya Pradesh reported in the NFHS-5 fact sheet (12.1%). With a 5% level of significance, 20% relative precision, and 10% non-response rate, the calculated sample size was 768, which was rounded off to 770 participants.

Inclusion Criteria
- Adults aged 18 years and above
- Permanent residents of the selected villages
- Individuals willing to participate and provide informed consent

Exclusion Criteria
- Individuals with known mental illness or endocrine disorders
- Pregnant and lactating women

Strategy for Data Collection
A four-stage multistage random sampling technique was adopted. Jabalpur district consists of seven rural blocks. In the first stage, three blocks were selected randomly. In the second stage, four villages from each selected block were selected using simple random sampling. In the third stage, households were selected randomly from the list provided by the Accredited Social Health Activist (ASHA) in each village. In the fourth stage, eligible participants from the selected households were included until the required sample size was achieved.

Data were collected using a pre-tested semi-structured questionnaire covering socio-demographic variables such as age, gender, education, occupation, marital status, and socioeconomic status assessed using the Modified B.G. Prasad classification. Dietary intake was assessed using a Food Frequency Questionnaire (FFQ) covering nine major food groups consumed during the previous week. Frequency of consumption was categorized as ≥3 times per week and <3 times per week.

Working Definition
Abdominal obesity was defined according to WHO Asia-Pacific guidelines, with waist circumference ≥90 cm for men and ≥80 cm for women.

Ethical Issues and Informed Consent
Ethical approval was obtained from the Institutional Ethics Committee of Netaji Subhash Chandra Bose Medical College, Jabalpur. Written informed consent was obtained from all participants prior to data collection. Confidentiality and privacy of the participants were maintained throughout the study.

Data Analysis and Software
Data was entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 29. Descriptive statistics were used to summarize the data. Chi-square test was applied for bivariate analysis of categorical variables. Multivariable logistic regression analysis was performed to identify independent predictors of abdominal obesity. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated, and p-values <0.05 were considered statistically significant.

RESULTS

Table 1 shows Age had a significant association with abdominal obesity (p = 0.001). The highest prevalence was observed among individuals aged

41–50 years (36.4%) compared to younger adults. Gender was not significantly associated (p = 0.713), although abdominal obesity was slightly higher among females (53.9%) than males (46.1%). Occupation demonstrated a borderline association (p = 0.066). Abdominal obesity was more common among unemployed individuals (32.7%), followed by semiskilled (26.4%) and unskilled workers (14.9%). Education level was significantly associated with abdominal obesity (p = 0.001). Participants with high school (44.6%) and intermediate education (32.0%) had a higher prevalence compared to other groups. Socioeconomic status (SES) also showed a significant association (p = 0.014) where lower middle class (53.5%) had the highest proportion of abdominal obesity.

Table 1: Association between Abdominal obesity and Sociodemographic determinants

Sociodemographic variables	Abdominal obesity Present (N=269)		Abdominal Obesity absent (N=501)		p- value
	No	%	No	%	
Age					
18-30 years	40	14.9	187	37.3	0.001
31-40 years	92	34.2	126	25.1	
41-50 years	98	36.4	110	22.0	
>50 years	39	14.5	78	15.6	
Gender					
Male	124	46.1	224	44.7	0.713
Female	145	53.9	277	55.3	
Occupation					
Professional	24	8.9	38	7.6	0.066
Semi professional	16	5.9	12	2.4	
Clerk & Sales	12	4.5	23	4.6	
Skilled	18	6.7	34	6.8	
Semiskilled	71	26.4	177	35.3	
Unskilled	40	14.9	62	12.4	
Unemployed	88	32.7	155	30.9	
Education					
Post-graduation	4	1.5	8	1.6	0.001
Graduation	8	3.0	39	7.8	
Intermediate	86	32.0	132	26.3	
High school	120	44.6	277	55.3	
Middle school	40	14.9	26	5.2	
Primary school	8	3.0	12	2.4	
Illiterate	3	1.1	7	1.4	
Socioeconomic Status (Mod. B.G. Prasad)					
Upper Class	12	4.5	4	0.8	0.014
Upper Middle Class	26	9.7	54	10.8	
Middle Class	36	13.4	73	14.6	
Lower Middle Class	144	53.5	260	51.9	
Lower Class	51	19.0	110	22.0	

In table 2 Participants consuming **fresh fruits <3 times/week** had a higher proportion of abdominal obesity (74.7%) compared to those consuming fresh fruits ≥3 times/week (25.3%). Similarly, intake of **fresh vegetables <3 times/week** was significantly associated with abdominal obesity (66.2%) (p = 0.001). Abdominal obesity was markedly higher among participants who had frequent intake of **sweets ≥3 times/week** (55.4%) compared to those without abdominal obesity (23.8%) (p = 0.001). Likewise, frequent **fast-food consumption ≥3 times/week** was significantly more common among those with abdominal obesity (76.2%) than those without (17.6%) (p = 0.001). There was no significant association between abdominal obesity and intake of cereals/pulses, milk products, meat/fish, or eggs.

Table 2: Association between Abdominal obesity and dietary determinants

FOOD FREQUENCY QUESTIONNAIRE

Dietary Determinants	Abdominal Obesity Present (N=269)		Abdominal Obesity Absent (N=501)		p-value
	No	%	No	%	
Frequency of Intake of Cereals and Pulses	259	96.3	488	97.4	0.382
≥ 3 times a week	10	3.7	13	2.6	
<3 times a week					
Frequency of Intake of Fresh Fruits					
≥3 times a week	68	25.3	199	39.7	0.001
<3 times a week	201	74.7	302	60.3	
Frequency of Intake of fresh Vegetables	91	33.8	48	9.6	0.001
≥3 times a week	178	66.2	453	90.4	
<3 times a week					
Frequency of Intake of milk and milk products	185	68.8	359	71.7	
≥3 times a week					0.402
<3 times a week	84	31.2	142	28.3	
Frequency of Intake of meat and fish					
≥3 times a week	12	4.5	21	4.2	0.860
<3 times a week	257	95.5	480	95.8	
Frequency of Intake of eggs					
≥3 times a week	12	4.5	36	7.2	0.136
<3 times a week	257	95.5	465	92.8	
Frequency of Intake of sweets					
≥3 times a week	149	55.4	119	23.8	0.001
<3 times a week	120	44.6	382	76.2	
Frequency of Intake of fast food					
≥3 times a week	205	76.2	88	17.6	0.001
<3 times a week	64	23.8	413	82.4	

Table 3 shows that after adjusting for other dietary variables, frequent intake of **fresh vegetables ≥3 times/week** was found to be **protective**, with **OR = 0.743** (95% CI: 0.383–0.994, p = 0.007). Frequent intake of **sweets ≥3 times/week** significantly increased the odds of abdominal obesity (**OR = 2.802**, 95% CI: 1.184–6.632, p = 0.019). Fast-food consumption ≥3 times/week significantly increased the odds of abdominal obesity (**OR = 6.434**, 95% CI: 3.645–9.745, p = 0.002). Intake of fresh fruits ≥3 times/week did not show statistically significant association in the adjusted model (p = 0.121).

Table 3: Logistic regression analysis of dietary determinants

Determinants	Odd's ratio	95% C.I lower limit	95% C.I upper limit	p-value
Frequency Of Intake of Fresh Fruits 0= (<3 times a week) 1= (≥3 times a week)	0.832	0.459	1.508	0.121
Frequency of Intake of fresh Vegetables 0= (<3 times a week) 1= (≥3 times a week)	0.743	0.383	0.994	0.007
Frequency of Intake of sweets	2.802	1.184	6.632	0.019

0= (<3 times a week)				
1= (≥3 times a week)				
Frequency of Intake of fast food	6.434	3.645	9.745	0.002
0= (<3 times a week)				
1= (≥3 times a week)				

DISCUSSION

This study examined the sociodemographic and dietary predictors of abdominal obesity among adults in rural Jabalpur district. The prevalence of abdominal obesity in the present study was 35%, indicating a substantial burden in the community. The findings highlight that abdominal obesity is influenced by multiple demographic and lifestyle factors.

Age showed a strong and statistically significant association with abdominal obesity, with the highest prevalence observed among participants aged 41–50 years and >50 years. This trend aligns with studies by Kumar et al. (8) and other Indian research, suggesting that increasing age is associated with physiological changes such as reduced basal metabolic rate, hormonal alterations, and progressive decline in physical activity, all contributing to central fat deposition.

Although gender did not show a significant association in this study, abdominal obesity was slightly more common among females. Similar variations have been observed in earlier studies by Chauhan et al. (9) where females exhibited higher adiposity, possibly due to hormonal influences, cultural dietary patterns, and reduced physical activity. However, several contrasting studies, including those by Kumar et al. (8) and Sen et al. (5), have reported higher abdominal obesity among males.

Education level and socioeconomic status demonstrated significant associations with abdominal obesity. Participants with high school and intermediate levels of education showed higher obesity levels, consistent with findings by Saha et al. (2023) (10). Increased education may contribute indirectly through sedentary occupations or higher affordability of calorie-dense foods. Abdominal obesity was also notably higher among the lower middle class, consistent with the pattern seen in studies by Shrivastava et al. (11) This may reflect lifestyle transitions, increased access to processed foods, and reduced occupational physical activity.

Dietary habits emerged as important predictors. Lower intake of fresh fruits and vegetables was significantly associated with abdominal obesity, a finding supported by studies from Feng et al. (2024) (12), Regassa et al. (2022) (13), and Peng et al. (2019) (14). Fruits and vegetables are rich in fibre and micronutrients that aid satiety and prevent excessive calorie intake. Logistic regression further showed that frequent intake of fresh vegetables had a protective effect.

Conversely, frequent consumption of sweets and fast food significantly increased the odds of abdominal obesity. Participants consuming sweets ≥3 times per week had almost three times higher risk, while fast-food consumption increased the risk more than sixfold. This is consistent with global evidence demonstrating that high intake of refined carbohydrates, sugars, and processed foods contributes to visceral fat accumulation.

CONCLUSION

This study highlights the burden of abdominal obesity among adults in rural area of Jabalpur district, with nearly 35 % prevalence. Female gender, older age and unhealthy dietary habits were found as key predictors of obesity. Abdominal obesity, a silent epidemic, needs to be prioritized in health planning at both local and state levels to reduce the future burden of diabetes, hypertension, and heart disease.

RECOMMENDATION

Incorporation of abdominal obesity screening (via waist circumference) into routine health check-ups. Targeted awareness campaigns in rural areas should be launched, focusing on the risks of abdominal obesity and strategies to reduce it. Nutrition education should be promoted by emphasizing reduced consumption of fast foods and processed foods, and encouraging the intake of fresh fruits and vegetables.

LIMITATION OF THE STUDY

The study had some limitations. The cross-sectional design restricts causal inference. Dietary data were self-reported, and thus subject to recall and social desirability bias. Nonetheless, the findings provide important insights into modifiable determinants of abdominal obesity in rural central India.

RELEVANCE OF THE STUDY

This study provides region-specific evidence on the prevalence and determinants of abdominal obesity among adults in rural Jabalpur district. It highlights the role of sociodemographic factors and modifiable dietary habits, particularly the consumption of sweets and fast foods, in the

development of abdominal obesity. The findings contribute to existing knowledge and can help guide targeted community-based interventions to prevent abdominal obesity and related non-communicable diseases.

AUTHORS CONTRIBUTION

MN and RT jointly contributed to the conceptualization and design of the study. MN was involved in data collection, data analysis, and preparation of the initial manuscript draft. RT provided supervision and critically reviewed the manuscript for important intellectual content. Both authors read and approved the final version of the manuscript.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil

CONFLICT OF INTEREST

There no conflict 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.

REFERENCES

1. Bray GA, Popkin BM. Dietary fat intake does affect obesity! **Am J Clin Nutr.** 1998;68(6):1157-73.
2. World Health Organization. **Waist circumference and waist-hip ratio: report of a WHO expert consultation.** Geneva: WHO; 2008.
3. Després JP. Body fat distribution and risk of cardiovascular disease: an update. **Circulation.** 2012;126(10):1301-13.
4. Misra A, Shrivastava U. Obesity and dyslipidemia in South Asians. **Nutrients.** 2013;5(7):2708-33.
5. Sen J, Mondal N, Dutta S. Factors affecting overweight and obesity among urban adults: a cross-sectional study. **Epidemiol Biostat Public Health.** 2013;10:e8741.
6. Anil Bindhu S, Thankam K, Jose R, Benny PV, Beevi N, Haran JC. Prevalence of obesity and overweight among adults in a rural area in Trivandrum: a cross-sectional study. **Int J Prev Ther Med.** 2014;2:1-7.
7. Binu J, Harnagle R. A study on the prevalence of overweight and obesity and its influencing factors among rural geriatric population in Kerala. **Int J Curr Microbiol Appl Sci.** 2014;3:284-93.
8. Kumar S, Garg SK, Singh JV, Bhatnagar M, Chopra H, Bajpai SK. Socio-demographic correlates of overweight and obesity among adults in rural Meerut. **Indian J Community Health.** 2014;26:385-9.
9. Chauhan RC, Chauhan NS, Manikandan, Purty AJ, Mishra AK, Singh Z. Obesity among adult population of a rural coastal area in South India. **Int J Sci Rep.** 2015;1:155-8.
10. Saha A, Mandal B, Muhammad T, Barman P, Ahmed W. Gender-specific determinants of overweight and obesity among older adults in India: evidence from a cross-sectional survey, 2017–18. **BMC Public Health.** 2023;23:2313.
11. Shrivastava SR, Ghorpade AG, Shrivastava PS. Prevalence and epidemiological determinants of obesity in rural Pondicherry, India: a community-based cross-sectional study. **Al Ameen J Med Sci.** 2015;8:3-10.
12. Feng X, Zhu J, Hua Z, Yao S, Yin H, Shin Q, Zhou J. Prevalence and determinants of obesity and its association with upper gastrointestinal diseases in people aged 40–69 years in Yangzhong, southeast China. **Sci Rep.** 2024;14:21153.
13. Regassa B, Mosisa G, Biru B, Fekadu G. Prevalence and factors associated with overweight and obesity among adults in selected towns of Western Ethiopia: a community-based cross-sectional study. **J Obes Overweight.** 2021;7(1):104.
14. Peng W, Liu Y, Liu Y, Zhao H, Chen H. Major dietary patterns and their relationship to obesity among urbanized adult Tibetan pastoralists. **Asia Pac J Clin Nutr.** 2019;28(3):507-19.
15. Singh R, Deepti S, Vinay S, Rohit T. Socio-demographic and lifestyle factors associated with abdominal obesity among adults in North India. **Indian J Community Med.** 2020;45(3):290-4.
16. Esmaeili M, Kianmehr M, Eskafi Noghani M, Basirimoghadam A, Pouryousef M, Rasekhi H. Dietary patterns and their associations with general and abdominal obesity among adults in Gonabad in 2019: a cross-sectional study. **Nutr Food Sci Res.** 2021;8(3):11-8.
17. Patil P, Patil M, Tiwari S. Prevalence and determinants of abdominal obesity among adults in India: findings from National Family Health Survey-4. **Int J Community Med Public Health.** 2021;8(4):1791-6.
18. Verma M, Das M, Sharma P, Kapoor N, Kalra S. Epidemiology of overweight and obesity in Indian adults: a secondary data analysis of the National Family Health Surveys. **Diabetes Metab Syndr.** 2021;15(4):102166.
19. Alsulami S, Baig M, Ahmad T, Althagafi N, Hazzazi E, Alsayed R, Alghamdi M, Almohammadi T. Obesity prevalence, physical activity, and dietary practices among adults in Saudi Arabia. **Front Public Health.** 2023;11:1124051. doi:10.3389/fpubh.2023.1124051.