

Urban–rural disparities in nutritional status and lifestyle behaviors among adults in West Sumatra, Indonesia: Evidence of an ongoing nutrition transition

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ABSTRACT

Background: Urbanization and rapid technological development have altered dietary behaviors and physical activity patterns, contributing to ongoing nutrition transitions and potential urban–rural disparities in adult nutritional status in low- and middle-income countries, including Indonesia.

Objective: This study examined urban–rural differences in nutritional status, dietary intake, and physical activity among adults in West Sumatra, Indonesia.

Methods: A cross-sectional study was conducted among 416 adults aged 18–59 years, equally recruited from urban and rural areas with a balanced sex distribution. Nutritional status was assessed using body mass index (BMI) and waist circumference. Dietary intake was evaluated using a 24-hour dietary recall, and physical activity was measured using metabolic equivalent tasks (METs) derived from the Global Physical Activity Questionnaire. Group differences were analyzed using chi-square tests and Mann–Whitney U tests.

Results: Waist circumference and the prevalence of abdominal obesity were significantly higher among urban than rural women ($p = 0.001$ and $p = 0.018$, respectively), and to-

tal protein intake was significantly higher among urban participants ($p = 0.018$). However, mean BMI, total energy intake, most macronutrient intakes, and physical activity levels did not differ significantly between urban and rural populations (all $p > 0.05$).

Conclusion: This study provides evidence of an ongoing nutrition transition in West Sumatra, characterized by emerging urban–rural differences in abdominal obesity among women and dietary protein intake, while overall BMI, total dietary intake, and physical activity levels remain similar. These findings emphasize the need to include central obesity indicators in nutritional surveillance and to implement context-specific public health interventions addressing nutrition transition.

KEYWORDS

Abdominal obesity, nutritional transition, physical activity (GPAQ), protein intake, West Sumatra, Indonesia.

INTRODUCTION

Adulthood represents a critical phase of the life course, characterized by increasing social, occupational, and family responsibilities that require optimal physical condition and nutritional status¹. Unhealthy lifestyle behaviors during this period substantially increase the risk of developing non-communicable diseases (NCDs) in later life². Currently, approximately

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70% of all deaths globally are attributable to NCDs, including cardiovascular diseases, diabetes mellitus, and cancer, most of which are strongly linked to modifiable risk factors such as unhealthy diets, insufficient physical activity, overweight, and obesity^{3,4}.

Overweight and obesity have emerged as major public health challenges in both developed and developing countries⁵. Adults with excess body weight are at a significantly higher risk of developing diabetes, hypertension, cardiovascular diseases, and certain types of cancer^{6–8}. According to the World Health Organization, more than one billion people worldwide are affected by overweight or obesity, with a pronounced upward trend in low- and middle-income countries, including Indonesia⁹. Data from the 2023 Indonesian Health Survey indicate that 36.8% of Indonesian adults experience abdominal obesity. West Sumatra is one of the provinces with a high prevalence (34.6%)¹⁰.

Obesity in adulthood is a multifactorial problem influenced by various factors, including the living environment and dietary habits^{11,12}. Residential context plays a critical role in shaping dietary patterns and physical activity behaviors. Urban populations tend to have greater access to processed foods high in fat, sugar, and salt and are more intensively exposed to instant lifestyle patterns driven by digital penetration¹³. In contrast, rural communities, which have traditionally maintained diets based on local foods, are increasingly experiencing lifestyle changes due to expanding digital access and the mechanization of daily activities. These dynamics reflect a complex nutrition and lifestyle transition occurring across urban and rural settings¹⁴. Concurrently, the shift toward more sedentary formal-sector employment in urban areas elevates the risk of excess body weight, while rural areas continue to face constraints in accessing diverse and nutritionally balanced foods^{15,16}.

Indonesia is undergoing a dietary transition marked by a shift from fresh foods toward processed and ready-to-eat products¹⁷. Consumption of sugar, saturated fat, and sodium has increased, while intake of dietary fiber, fruits, and vegetables has declined¹⁸. This pattern is more pronounced in urban areas but is increasingly evident in rural settings as access to commercial food products expands. These changes signal a shift in the national nutrition burden from undernutrition toward overnutrition and NCDs, which now represent a major challenge for health development in Indonesia¹⁹.

West Sumatra Province also demonstrates distinctive characteristics of the nutrition transition. Minangkabau culinary culture, marked by the frequent use of coconut milk and meat-based dishes as accompaniments to staple foods in main meals, contributes to high energy and fat intake²⁰. More recent study among Minangkabau women of reproductive age showed the highest proportion of energy intake came from carbohydrates (68%), which exceeded the acceptable range

of 50%–60%. Carbohydrate sources mostly come from refined grains, for example rice and flour²¹. In parallel with lifestyle changes, several studies have reported shifts in physical activity patterns²². Although urbanization and digital technology are often associated with sedentary behavior, recent evidence suggests an increasing trend in recreational physical activity and community-based exercise, particularly in urban settings²³. Working-age adults have also shown greater participation in moderate-to-vigorous physical activity as part of growing health awareness and body consciousness^{24–25}.

Despite these trends, comprehensive studies comparing nutritional status, dietary intake, and physical activity among adult populations across urban and rural settings in Indonesia particularly in West Sumatra Province remain limited. Therefore, this study aims to examine differences in nutritional status, dietary intake, and physical activity between urban and rural adults in West Sumatera. The findings are expected to provide evidence-based insights to inform context-specific nutrition and public health policies and interventions aligned with local characteristics.

METHODS

Study Design

This study employed a descriptive quantitative approach with a cross-sectional design to assess nutritional status and health among adults of productive age (18–59 years) in West Sumatra, Indonesia, and to examine sociodemographic, lifestyle, and work-related factors associated with these outcomes.

Study Setting and Period

The study was part of a national survey conducted in two districts/cities in West Sumatra Province, selected to represent Indonesia's diversity in population characteristics, ethnicity, geography, and food culture. Padang City was selected as the urban study area, while Padang Pariaman Regency represented the rural area. Data collection was carried out from June to December 2025.

Study Population and Sample

The target population comprised adults aged 18–59 years residing in the two study areas. Participants were selected using multistage cluster random sampling with probability proportional to size (PPS)²⁶. The primary sampling units were villages/urban wards (nagari/kelurahan), each comprising approximately 400–550 households. The sample size was calculated based on an obesity prevalence of 23.4%¹⁰, a 5% margin of error, and a 95% confidence level. The final sample included 416 respondents, equally distributed between urban (n = 208) and rural (n = 208) areas.

Sampling Procedure

In each study area (urban and rural), six villages/urban wards were randomly selected, followed by the selection of four neighborhood units (RW) and one smaller administrative unit (RT) within each RW. From each RT, eight to ten households were recruited. Within each selected household, one adult was selected using purposive criteria to ensure a balanced distribution of sex and age groups across urban and rural samples. Inclusion criteria comprised adults aged 18–59 years who had resided in the study areas (Padang City for urban areas and Padang Pariaman Regency for rural areas) for at least six months, were able to communicate effectively, were in generally good health, and provided written informed consent. Exclusion criteria included individuals with cognitive or mental impairments that could interfere with the interview process, pregnant or lactating women, and those diagnosed with severe chronic diseases, such as renal failure, cancer, or chronic liver disease that could influence dietary intake or physical activity. Participants who declined to complete all stages of data collection or had incomplete data were excluded from the final analysis.

Data Collection

Data were collected through face-to-face interviews using a structured questionnaire covering sociodemographic characteristics, urbanization, identity perception, eating norms and practices, social eating behaviors, food representations, physical activity, nutrition knowledge and attitudes, stress, and nutritional status. Nutritional status was assessed using body mass index (BMI) and waist circumference. Body weight was measured using a digital scale with 0.1 kg precision, and height was measured using a Shorr Board with 0.1 cm precision. Measurements were conducted with participants barefoot and wearing light clothing. BMI was calculated as weight (kg) divided by height squared (m^2) and classified according to WHO criteria (2000): underweight ($<18.5 \text{ kg}/m^2$), normal weight ($18.5\text{--}24.9 \text{ kg}/m^2$), overweight ($25.0\text{--}29.9 \text{ kg}/m^2$), and obesity ($\geq 30.0 \text{ kg}/m^2$). Waist circumference was measured using a flexible measuring tape at the midpoint between the lowest rib and the iliac crest in a standing position. Central obesity was defined based on WHO criteria (2008): $\geq 90 \text{ cm}$ for men and $\geq 80 \text{ cm}$ for women²⁷.

Dietary intake was assessed using a 24-hour multiple-pass dietary recall, with a second recall conducted in 20% of respondents to improve reliability. Portion sizes were estimated using a standardized food photo atlas. Anthropometric measurements (weight, height, and waist circumference) were performed by trained enumerators using equipment compliant with national standards. Blood pressure was measured twice using a digital sphygmomanometer following WHO procedures.

Physical activity levels were assessed using the Global Physical Activity Questionnaire (GPAQ) developed by the

World Health Organization. Data on frequency (days) and duration (minutes) of activities were converted into metabolic equivalent task (MET) values to estimate total physical activity. Total physical activity was calculated as MET-minutes per week ($\text{MET} \times \text{minutes} \times \text{days}$). Physical activity levels were classified according to WHO recommendations (2020) as insufficient ($<600 \text{ MET-minutes/week}$) or sufficient ($\geq 600 \text{ MET-minutes/week}$)²⁸.

Ethical Considerations

This study received ethical approval from the Ethics Committee of Perintis University, Indonesia (Approval No. 1178/KEPK.F1/ETIK/2025, 23 May 2025). Written informed consent was obtained from all participants prior to data collection, and confidentiality of all data was ensured.

RESULTS

Table 1 shows the characteristics of the 416 study participants, with an equal distribution between urban ($n = 208$) and rural ($n = 208$) areas. The sex distribution was balanced, with men and women each comprising 50% of the sample, and half of the participants were aged 18–35 years. Educational attainment differed significantly between urban and rural populations ($p = 0.002$), with urban participants more likely to have completed secondary or higher education, while rural participants predominantly had primary-level education. Most respondents were married and living with their spouse (56.3%), and nuclear families were the most common household type (73.8%). The number of children differed significantly between areas ($p = 0.023$), with rural households having a higher number of children.

Table 2 shows the mean body mass index (BMI) and waist circumference were largely comparable between urban and rural men. No significant differences were observed in BMI (22.3 ± 4.5 vs. $22.6 \pm 4.1 \text{ kg}/m^2$; $p = 0.794$) or waist circumference (81.1 ± 12.4 vs. $81.2 \pm 11.0 \text{ cm}$; $p = 0.652$). Among women, BMI tended to be higher in urban than in rural areas, although the difference was not statistically significant (25.8 ± 5.3 vs. $24.7 \pm 5.5 \text{ kg}/m^2$; $p = 0.093$). In contrast, waist circumference among urban women was significantly higher than that of their rural counterparts (86.9 ± 12.6 vs. $81.7 \pm 12.1 \text{ cm}$; $p = 0.001$).

Figure 1 shows the distribution of nutritional status by area of residence and sex. The prevalence of obesity was higher among urban residents (37.5%) than among rural residents (32.2%), with the highest prevalence observed in urban women (51.5%), followed by rural women (41.9%). In contrast, normal nutritional status was more prevalent in rural populations (39.4%) than in urban populations (34.6%), particularly among rural men (45.6%). The prevalence of underweight was relatively low across all groups but tended to be higher among men than women in both urban and rural areas.

Table 1. Sociodemographic Characteristics of Urban and Rural Populations

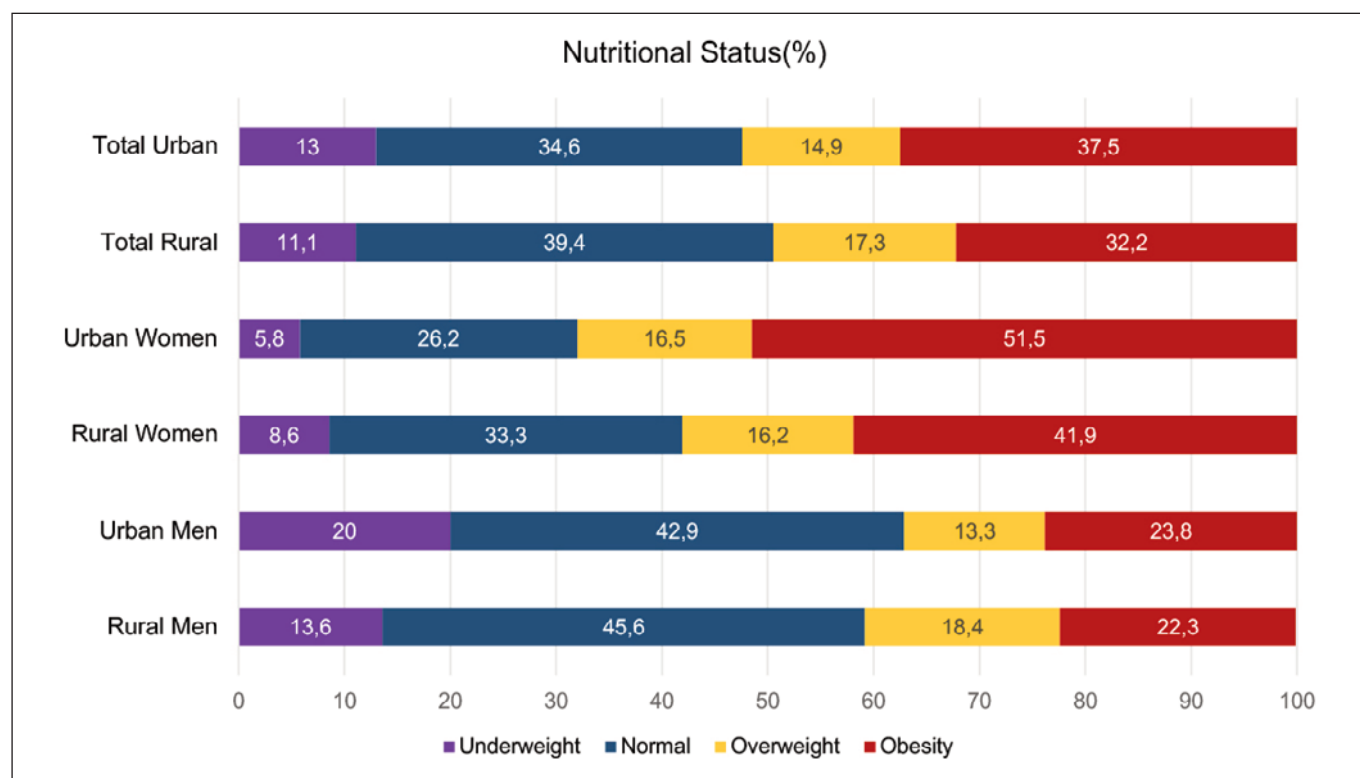
Variable	Urbann (%)	Ruraln (%)	Totaln (%)	p-value
Sex				
Men	105 (50.5)	103 (49.5)	208 (50)	0.845
Women	103 (49.5)	105 (50.5)	208 (50)	
Age Group				
18 – 35 years	106 (51)	102 (49)	208 (50)	0.568
36 – 55 years	72 (34.6)	68 (32.7)	140 (33.7)	
>55 years	30 (14.4)	38 (18.3)	68 (16.3)	
Religion				
Islam	207 (99.5)	208 (100)	415 (99.8)	0.317
Non-Islam	1 (0.5)	0 (0)	1 (0.2)	
Highest educational attainment				
No formal education	1 (0.5)	6 (2.8)	7 (1.6)	0.002
Did not complete primary school	8 (3.8)	9 (4.3)	17 (4.1)	
Completed primary school	9 (4.3)	27 (13)	36 (8.75)	
Completed junior high school	25 (12)	37 (17.9)	62 (14.9)	
Completed senior high school	124 (59.6)	106 (51.2)	230 (55.4)	
Diploma	13 (6.3)	3 (1.4)	16 (3.9)	
Bachelor’s degree	27 (13)	20 (9.7)	47 (11.3)	
Master’s/Doctoral degree	1 (0.5)	0 (0)	1 (0.2)	
Marital Status				
Single / never married	69 (32.2)	58 (27.95)	127 (30.5)	0.476
Married and living together	116 (55.8)	118 (56.7)	234 (56.3)	
Widowed	12 (5.8)	24 (11.5)	36 (8.7)	
Divorced	5 (2.4)	4 (1.9)	9 (2.2)	
Married but living separately	6 (2.9)	4 (1.9)	10 (2.4)	
Number of Children				
No children	79 (38)	70 (33.7)	149 (35.8)	0.023
1–2 children	67 (32.2)	60 (28.8)	127 (30.5)	
3–4 children	52 (25)	50 (24)	102 (24.5)	
≥5 children	10 (4.8)	28 (13.5)	38 (9.1)	
Family Type				
Nuclear family	148 (71.2)	159 (76.4)	307 (73.8)	0.130
Extended family	59 (28.4)	45 (21.6)	104 (25.0)	
Living alone	1 (0.5)	4 (1.9)	5 (1.2)	
Wealth Index				
Low (T1)	81 (39.5)	93 (45.8)	174 (42.6)	0.437
Middle (T2)	61 (29.8)	54 (26.6)	115 (28.2)	
High (T3)	63 (30.7)	56 (27.6)	119 (29.2)	

Values are presented as n (%). Differences between urban and rural populations were analyzed using the chi-square test. Statistical significance was set at $p < 0.05$.

Table 2. Mean BMI and waist circumference between urban and rural populations

Variable	Urban (n=208)	Rural (n=208)	Total (N=416)	p-value
BMI (kg/m²), mean ± SD				
Men	22.3 ± 4.5	22.6 ± 4.1	22.4 ± 4.2	0.794
Women	25.8 ± 5.3	24.7 ± 5.5	25.3 ± 5.4	0.093
Waist circumference (cm), mean ± SD				
Men	81.1 ± 12.4	81.2 ± 11.0	81.2 ± 11.7	0.652
Women	86.8 ± 12.0	81.7 ± 12.0	84.2 ± 12.2	0.001

* Values are presented as mean ± SD. Normality was assessed using the Kolmogorov Smirnov test. Differences between urban and rural populations were analyzed using Mann-Whitney U tests. BMI: Body Mass Index. Statistical significance was set at $p < 0.05$.

**Figure 1.** Distribution of nutritional status between urban and rural populations

Statistical analysis showed no significant difference in overall nutritional status distribution between urban and rural areas ($p = 0.563$). Overall, these findings show distinct patterns in nutritional status across urban and rural settings, with a greater obesity burden among women, particularly in urban areas.

Figure 2 shows the prevalence of abdominal obesity by area of residence and sex. In urban areas, abdominal obesity was substantially higher among women (78.6%) than men (20.9%), while a similar pattern was observed in rural areas,

with higher prevalence among women (58.1%) compared with men (17.4%). Overall, the prevalence of abdominal obesity was higher in urban populations (49.5%) than in rural populations (37.9%), whereas normal waist circumference was more prevalent among rural residents (62.0%). These findings show that women, particularly those living in urban areas, experience the highest prevalence of abdominal obesity. Statistical analysis showed a significant difference between urban and rural areas ($p = 0.018$).

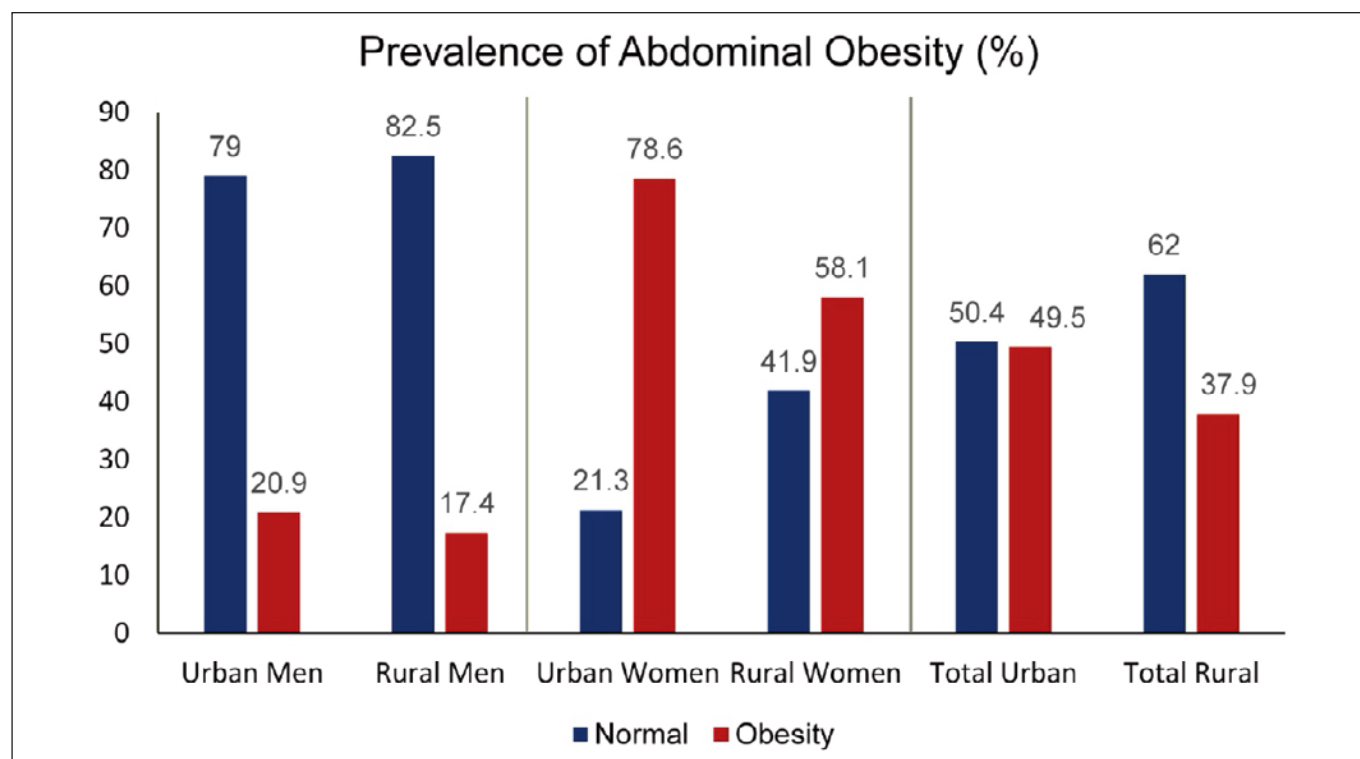


Figure 2. Comparison of abdominal obesity prevalence between urban and rural populations

Table 3 shows dietary intake among urban and rural participants stratified by sex. Among men, total energy intake and the percentage of recommended energy intake did not differ significantly between rural and urban areas. However, protein intake and the percentage of recommended protein intake

were significantly higher among urban men compared with rural men ($p = 0.006$ and $p = 0.013$, respectively). In contrast, dietary fiber intake and the percentage of recommended fiber intake were significantly higher among rural men than urban men ($p = 0.028$). No significant differences were observed in

Table 3. Mean daily energy and dietary intake between urban and rural populations by sex

Variable	Rural Men (n=103)	Urban Men (n=105)	p-value	Rural Women (n=105)	Urban Women (n=103)	p-value
Energy (kcal)	1690.4±370.0	1795.1±416.4	0.093	1561.9±403.8	1613.4±411.7	0.335
%RDA Energy	80.4± 17.6	85.4±19.8	0.093	74.3±19.2	76.8±19.6	0.335
Protein (g)	50.2± 18.7	57.6±21.2	0.006	49.7±19.7	49.3±16.1	0.543
%RDA Protein	12.0± 3.4	13.0±3.7	0.013	12.8±3.0	12.5±3.2	0.373
Fat (g)	50.9± 23.9	55.7±26.9	0.264	47.7±24.5	52.0±27.0	0.172
%RDA Fat	26.4±10.7	26.5±9.3	0.742	26.3±9.7	27.5±10.1	0.177
Carbohydrate (g)	254.3±69.9	263.5±63.2	0.370	230.3±60.5	236.8±62.8	0.302
%RDA Carbohydrate	61.5±12.0	60.3±10.2	0.293	60.9±10.5	59.9±11.0	0.403
Fiber (g)	6.1±3.9	4.9±2.6	0.028	5.8±3.0	6.0±4.6	0.666
%RDA Fiber	20.6±13.3	16.4± 8.8	0.028	19.4± 10.0	20.2±15.3	0.666

* Values are presented as mean ± SD. Normality was assessed using the Kolmogorov Smirnov test. Differences between urban and rural populations were analyzed using Mann–Whitney U tests. RDA: Recommended Dietary Allowance. Statistical significance was set at $p < 0.05$.

fat and carbohydrate intake, nor in the percentages of recommended fat and carbohydrate intake, between rural and urban men (all p -values > 0.05). Among women, no significant differences were found between rural and urban areas for any dietary intake variables, including energy, protein, fat, carbohydrate, and fiber, as well as their respective percentages of recommended intake (all p -values > 0.05).

Table 4 shows that overall energy intake and most dietary intakes did not differ significantly between urban and rural populations. Mean energy intake and the percentage of recommended energy intake tended to be higher among urban participants than rural participants; however, the differences were not statistically significant ($p = 0.076$). Total protein intake was significantly higher in the urban population compared with the rural population (53.5 ± 19.3 g vs. 49.9 ± 19.2 g; $p = 0.018$), although the percentage of recommended protein intake did not differ significantly between groups ($p = 0.261$). No significant differences were observed in fat or carbohydrate intake, nor in the percentages of recommended intake for these nutrients, between the two groups (all p -values > 0.05). Dietary fiber intake and the percentage of recommended fiber intake tended to be higher among rural participants than urban participants, but these differences did not reach statistical significance ($p = 0.063$).

Figure 3 shows the percentage distribution of physical activity levels by area of residence. Overall, physical activity patterns

Table 4. Mean daily energy and dietary intake between urban and rural populations

Variable	Total Urban (n=208)	Total Rural (n=208)	p-value
Energy (kcal)	1705.1 $\pm$ 423.0	1625.5 $\pm$ 391.	0.076
%RDA Energy	81.1 $\pm$ 20.1	77.4 $\pm$ 18.6	0.076
Protein (g)	53.5 $\pm$ 19.3	49.9 $\pm$ 19.2	0.018
%RDA Protein	12.7 $\pm$ 3.5	12.4 $\pm$ 3.3	0.261
Fat (g)	53.8 $\pm$ 26.9	49.3 $\pm$ 24.2	0.089
%RDA Fat	27.0 $\pm$ 9.7	26.3 $\pm$ 10.2	0.272
Carbohydrate (g)	250.3 $\pm$ 64.3	242.2 $\pm$ 66.3	0.130
%RDA Carbohydrate	60.1 $\pm$ 10.5	61.2 $\pm$ 11.2	0.188
Fiber (g)	5.4 $\pm$ 3.79	6.0 $\pm$ 3.5	0.063
%RDA Fiber	18.3 $\pm$ 12.6	20.0 $\pm$ 11.7	0.063

* Values are presented as mean $\pm$ SD. Normality was assessed using the Kolmogorov Smirnov test. Differences between urban and rural populations were analyzed using Mann-Whitney U tests. RDA: Recommended Dietary Allowance. Statistical significance was set at $p < 0.05$.

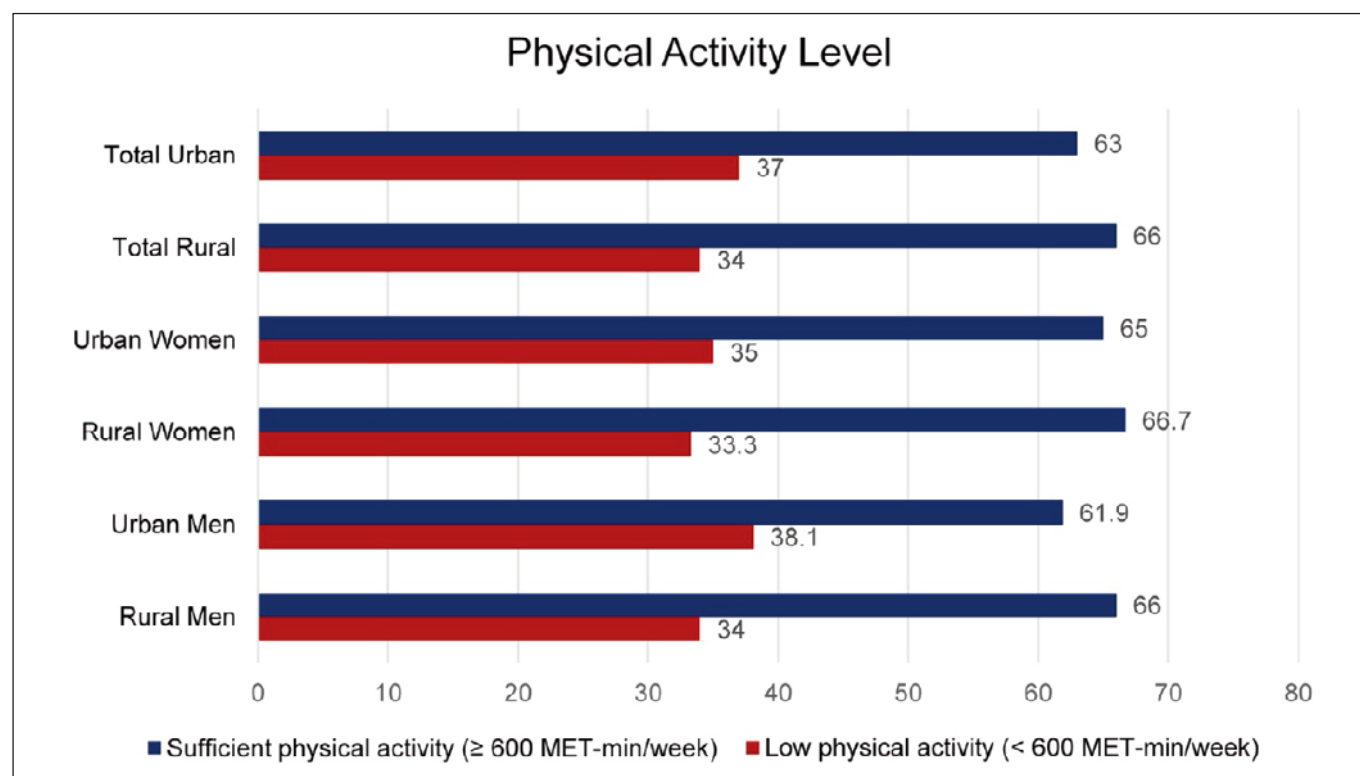


Figure 3. Comparison of physical activity levels among urban and rural populations

were comparable between urban and rural areas, and statistical analysis confirmed no significant difference between the two groups ($p = 0.538$). The majority of respondents achieved sufficient physical activity levels (≥ 600 MET-minutes/week), with a higher proportion observed in rural than in urban areas. Overall, sufficient physical activity was reported by 66.0% of rural participants and 63.0% of urban participants, while insufficient physical activity was more prevalent in urban areas (37.0%) than rural areas (34.0%). A similar pattern was observed across both sexes, with men and women in rural areas showing higher proportions of sufficient physical activity compared with their urban counterparts.

DISCUSSION

The findings of this study indicate that the demographic characteristics of respondents in urban and rural areas of West Sumatra were relatively balanced in terms of sex distribution and age groups. However, significant differences were observed in educational attainment and the number of children, with rural respondents tending to have lower levels of education and larger family sizes compared with their urban counterpart. These findings reflect persistent social disparities between regions and are consistent with national data indicating limited access to formal education and family planning services in rural areas²⁹.

Regarding nutritional status, mean body mass index (BMI) did not differ significantly between urban and rural populations for either sex, indicating a generally comparable body weight profile across settings. However, an important finding of this study was the significantly higher waist circumference observed among urban women compared with rural women, suggesting a greater risk of central obesity in this group. This finding underscores that waist circumference provides critical information on metabolic risk that may not be fully captured by BMI, particularly among women³⁰. Although no statistically significant differences were observed between urban and rural areas, the prevalence of obesity tended to be higher among urban residents, especially urban women. Conversely, normal nutritional status was more common among rural populations, particularly among rural men. This pattern indicates that the burden of excess nutrition is more pronounced among women in urban settings.

With respect to dietary intake, no significant differences were found between urban and rural areas in total energy, fat, and carbohydrate intake, either overall or by sex. However, a significant difference was observed in protein intake among men, with urban men consuming higher amounts than rural men. This difference is likely related to better access to protein sources and greater household purchasing power in urban areas. The rise in protein consumption alongside economic development is influenced by educational attainment and income³¹, as well as increasing awareness of the importance of protein intake for maintaining health³². In contrast,

fiber intake tended to be higher in rural populations, although the difference did not reach statistical significance. This reflecting the continued predominance of traditional plant-based diets in rural communities³³. Dietary fiber intake is inversely associated with waist circumference, with lower fiber consumption linked to greater abdominal^{34,35}.

Regarding physical activity, the majority of respondents in both urban and rural areas met the recommended level of ≥ 600 MET-minutes per week. Although the proportion of individuals achieving sufficient physical activity was higher in rural areas, the difference was not statistically significant. Notably, these findings may indicate an overall improvement in physical activity patterns among urban populations. Field observations suggest that increased participation in physical activity in urban settings is reflected in the growing engagement in fitness training, running, group exercise, and walking. This trend may be supported by improved health awareness, as well as the widespread use of digital technologies and social media platforms, such as Instagram, TikTok, and YouTube, which function as channels for promoting healthy lifestyle behaviors through public figures and influencers³⁶. Physical activity is closely associated with nutritional status and body composition. In the modern era, lower levels of physical activity are associated with higher body mass index, greater waist circumference, increased fat mass, and elevated visceral fat^{37,38}.

Overall, the findings illustrate a selective nutrition and lifestyle transition in West Sumatra. While energy intake and BMI were largely similar between urban and rural areas, important differences were observed in the risk of central obesity among women, protein intake patterns among men, and tendencies in physical activity levels. These patterns suggest a coexistence of traditional and modern behaviors rather than a uniform shift toward unhealthy lifestyles.

The implications of these findings emphasize the importance of context-specific nutrition interventions. In urban areas, efforts to prevent central obesity, particularly among women should be prioritized through the promotion of balanced diets and sustained physical activity. In rural areas, interventions should focus on preserving fiber-rich dietary patterns while improving access to high-quality protein sources. Public health nutrition programs should also leverage digital technologies as effective tools for education and positive behavior change.

Several limitations should be considered when interpreting the findings of this study. The cross-sectional design provides a useful snapshot of associations between dietary intake, physical activity, and nutritional status; however, it does not allow for causal inferences. The study employed a multistage cluster sampling approach with probability proportional to size to ensure broad population representation. Within households, one adult respondent was selected to achieve balanced

distributions of sex and age, thereby strengthening the comparability of the sample across key demographic groups.

Dietary intake was assessed using a single 24-hour dietary recall, which is widely used in population-based studies, although it may not fully capture day-to-day variation in individual intake. Physical activity was measured using the Global Physical Activity Questionnaire (GPAQ), a standardized and validated instrument, although, like other self-reported measures, it may be subject to reporting bias.

In addition, while baseline sociodemographic characteristics were comparable between urban and rural groups, further analytical approaches, such as multivariable modeling, could enhance the assessment of independent associations by accounting for potential confounding factors. Finally, as the study was conducted in West Sumatra Province, the findings provide important contextual insights but should be generalized to other regions with consideration of differing socioeconomic and cultural characteristics.

CONCLUSION

This study demonstrates that urban–rural disparities among adults in West Sumatra are selective, primarily reflected in a higher risk of abdominal obesity among urban women and greater protein intake among urban men, while overall BMI and total energy intake remain largely comparable. Notably, physical activity levels in urban populations show a tendency to improve, coinciding with increased use of digital technologies and social media to promote healthy lifestyle practices. Collectively, these findings indicate an ongoing nutrition transition in which changes in dietary patterns and physical activity occur simultaneously, underscoring the need for context-specific nutrition interventions that prevent abdominal obesity while reinforcing active living behaviors.

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