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Risk factors associated with metabolic syndrome in older people in slum areas: a cross-sectional study

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ABSTRACT

Introduction: Older people are at high risk of metabolic syndrome (MetS), non-communicable diseases, and mortality. This makes it difficult for older people in slum areas to achieve healthy and productive quality of life (QOL). In Indonesia, a developing country with a significant and growing number of slum areas, research on this issue remains scarce. This study aimed to analyze the risk factors that play a role in the incidence of MetS in older people living in slum areas.

Methods: This was a cross-sectional study. The participants were male and female residents aged ≥45 years, with a total sample size of 150. The participants were selected through simple random sampling from a list of older people. Data analysis was performed using the chi-squared test for bivariate analysis and binary logistic regression for multivariate analysis.

Results: The majority of the participants were female (62%), aged between 60-74 years (53.33%), with low-level education (86%), nutritional status in the overweight and obese categories (41.4%), and residence duration <5 years (70%). There was a significant association between district ($p < 0.001$) and body mass index (BMI) ($p < 0.001$) with MetS. Overweight participants were more likely to have MetS (AOR 3.75; 95%CI, 1.37-10.24), and the risk was higher among those with obesity (AOR 11.85; 95%CI, 3.90-35.97).

Conclusions: The risk of MetS in slum dwellers is higher if they are overweight or obese. Periodic evaluation of body weight can help to control the incidence of MetS.

Keywords: metabolic syndrome, obesity, older people, public health, risk factors

Introduction

The population of people aged 60 and over has increased from 382 million in 1980 to 962 million in 2017, with projections estimating it to approach 2.1 billion by 2050(Coley *et al.*, 2021). Seniors aged 55-64 years are twice as likely to develop metabolic syndrome (MetS) as those aged 45-54 years(Moreira *et al.*, 2022). Older people are at a high risk of developing MetS, non-communicable diseases, and mortality. MetS is a cluster of conditions that heightens the risk of several diseases, including insulin resistance, dyslipidemia, hypertension, and type 2 diabetes mellitus(Ananthy, Priyadharsini and Subramanian, 2021).

The global prevalence of diabetes mellitus (DM) is projected to increase from 10.5% (536.6 million) in 2021 to 12.2% (783.2 million) by 2045, with the highest prevalence found among those aged 75-79 years(Sun *et al.*, 2022). Asian countries are prone to DM epidemics, including China, which has the largest center of DM(Ali *et al.*, 2012). Cardiovascular disease (CVD) is also increasing in Asian nations, making it a leading cause of health problems in the Asia-Pacific region. The prevalence of abnormal or high total cholesterol ranged from 30.2-47.7% in Malaysia, Australia, Vietnam, Thailand, Philippines, and Indonesia, whereas abnormal or high triglyceride levels ranged from 13.9-38.7% in the same countries(Lee *et al.*, 2021). In 1990, there were 331 million women and 317 million men with hypertension; by 2019,

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these figures increased to 626 million women and 652 million men despite a constant global age-standardized prevalence(Zhou *et al.*, 2021). The prevalence of hypertension in Indonesia has increased significantly from 25.8% in 2013 (Ministry of Health, 2013) to 34.1% in 2018(Ministry of Health, 2019; Kurnianto *et al.*, 2020).

A recent study reported a significant prevalence of MetS among older populations residing in urban slums. Research conducted in India revealed that almost 40% of female respondents had MetS, with the prevalence increasing with age(Krupp *et al.*, 2023). Another study indicated that approximately 26% of the urban slum population had MetS(Patil and Gothankar, 2023). A study of the homeless community in Taipei City revealed a MetS prevalence of 53%, with a significant correlation to dyslipidemia(Gu *et al.*, 2021).

Several factors contribute to the increased incidence of MetS among older adults in slum areas. Decreased physical activity in older and non-working women is projected to be a significant risk factor for MetS(Patil and Gothankar, 2023). Limited access to healthcare services, insufficient dietary intake, and high psychological stress are common in urban areas, thereby increasing the risk of MetS. Lifestyle factors, including physical inactivity and poor nutritional habits, exacerbate this risk(Sutanto, Lukito and Basrowi, 2020).

These findings underscore the urgent need to address MetS risk factors in the older populations living in slum areas. In Indonesia, a developing country with a significant and growing number of slum areas, only a few studies have reported the prevalence of MetS among older people in slum areas. The difference in this study lies in Indonesia's diverse geographical conditions and socioeconomic disparities, leading urban people to live in slum areas. Therefore, this study aimed to analyze the risk factors contributing to the incidence of MetS among older adults in slum areas.

Materials and Methods

Study Design and Location

This study used a cross-sectional design. This study was conducted in Sleman Regency (slums located close to urban areas) and Kulonprogo Regency (slums located in rural areas) in Daerah Istimewa Yogyakarta (DIY) Province. The slum areas were determined based on Regent's Decree, which categorized them as light slum areas. A slum area is mainly a form of settlement with a type of occupancy level; population and building density are very close together. We collected samples from the slum area of two districts (Sleman and Kulon Progo). Sleman represents the Urban Slum Area and Kulon Progo represents the Rural Slum Area. The study was conducted from January to September 2024.

Population

The study recruited older persons, both males and females, residing in slum areas. Participants were residents aged 45 years or older who had settled in the research location. A total sample size of 150 was determined by sample size calculation using the formula to estimate the population proportion with specified absolute precision. Participants were chosen through simple random sampling from a sample list. A sample list was obtained from the Older People Integrated Serving Unit (*Posyandu Lansia*) under the Center of Public Health in the slum area. They were chosen considered The inclusion criteria were as follows: the participants were not sick, could have anthropometric measurements taken, and had not travelled for a long time/moved house.

The researcher approached the participants through an invitation letter, providing a written explanation of the research and procedures to be conducted, followed by obtaining informed consent from the participants. The process began with compiling a list of older residents in the study area. The list was refined after applying the inclusion criteria. The final sample was selected using Probability Proportional to Size (PPS) sampling to ensure representativeness.

The Sample Size

The sample size was used for proportion estimation with absolute precision. The sample size formulation was as follows:

$$n = \frac{z^2_{1-\alpha/s} P\,(1-P)}{d^2}$$

n = minimum sample size
z^2_1-α/sP (1-P) = standard normal distribution value
α^2 = variance value
d = tolerable absolute error
P: metabolic syndrome in older people, 15.5%; 95% confidence level. Precision value: 0.05. The sample size was 142 plus a reserve of eight people divided into two districts. Each district was comprised of 75 people. Total sample size: 150.

Study Materials

The research materials used were reagents for examining fasting blood glucose, total cholesterol, LDL, HDL, and triglycerides levels. This study assessed metabolic syndrome using fasting blood glucose, waist circumference, triglycerides, HDL cholesterol, blood pressure, and history of blood pressure medication use according to criteria from the World Health Organization (WHO) and the Indonesian Endocrinology Association or *Perhimpunan Endokrinologi Indonesia* (PERKENI)(Ministry of Health, 2019). Metabolic syndrome was defined as a composite condition in which hyperglycemia (fasting blood glucose ≥ 126 mg/dl) was present, plus at least two of the following conditions:

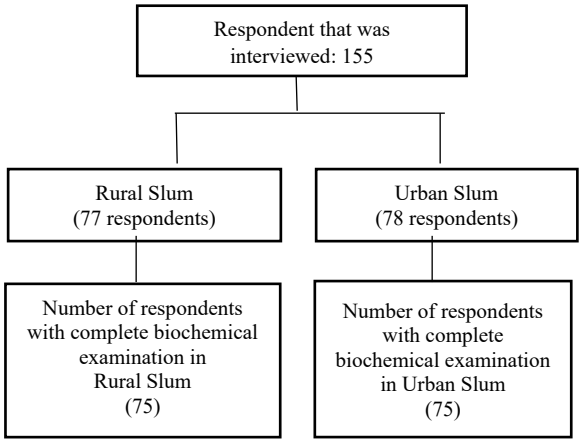

Figure 1 Stages of determining respondents in research

abdominal circumference >80 cm for female and >90 cm for male, dyslipidemia (high triglycerides ≥ 150 mg/dl or low HDL cholesterol < 40 mg/dL, blood pressure ≥ 140/90 mmHg, or consumption of blood pressure medication.

In this study, normal blood glucose levels were defined as 70–100 mg/dl. Total cholesterol levels were classified into three groups: normal (< 200 mg/ dl), borderline high (200-239 mg/dl), and high (≥ 240 mg/dl). HDL cholesterol levels were categorized as low (< 40 mg/ dl) or high (≥ 60 mg/dl). LDL cholesterol levels were classified into five categories: optimal (< 100 mg/dl), near-optimal (100-129 mg/dl), borderline high (130-159 mg/dl), high (160-189 mg/dl), and very high (≥190 mg/ dl). Triglyceride levels were classified into four groups: normal (< 150 mg/dl), borderline high (150-199 mg/dl), high (200-499 mg/dl), and extremely high (≥ 500 mg/dl). Waist circumference measurements above normal of ≥ 94 cm. blood pressure was above normal (≥ 140/90 mm Hg).

Data Collection and Instruments

Questionnaire-based data collection

The data were collected using structured questionnaires. The information collected included the participants' name, sex, age, education, duration of residence, district, diabetes status, and intake of lipid-lowering or antihypertensive medication.

Biochemical measurements (lipid profile)

Biochemical measurements included glucose, triglycerides, High-Density Lipoprotein Cholesterol (HDL-C), Low-Density Lipoprotein Cholesterol (LDL-C), and Total Cholesterol (TC) levels in blood. About 3 ml of venous blood samples were collected from each participant after a minimum of 12 hours of overnight fasting. A portion of venous blood samples in anticoagulant tubes was centrifuged at 3000 rpm for 10 min at room temperature. Method specifications used for fasting glucose analysis were hexokinase analyzer, triglycerides with Glycerol Phosphate Oxidase - Para Amino Phenazone (GPO-PAP) analyzer method, HDL-C, LDL-C, and TC with Cholesterol Oxidase - Para Amino Phenazone (CHOD-PAP) method. The samples were analyzed at the Yogyakarta Health and Calibration Laboratory Center, Health Office, Daerah Istimewa Yogyakarta.

Blood pressure (BP) measurements were obtained with the subject seated in a chair position using an Omron digital blood pressure monitor. Height and body weight were measured to the nearest 0.1 cm and 0.1 kg, respectively, using standardized equipment and procedures. Waist circumference (WC) was measured at minimal respiration to the nearest 0.1 cm at the level of the iliac crest.

Study Variables

There were two types of research variables: independent and dependent variables. Factors that have been considered include slum area, age, sex, education level, body mass index (BMI), and duration of residence in the study site. Metabolic syndrome was used as the dependent variable.

Sex was categorized as either male or female. Age was grouped into <50, 50-59, 60-74, and ≥75. Education level was categorized as middle-high or low. Based on the WHO criteria, a BMI below 18 is considered underweight, normal weight if the BMI is 18.5–24.9 and overweight or above normal when the BMI is 25–29.9. BMI was classified as obesity I, II, or III if it equaled or exceeds 30(Fathima and Khanum, 2019). The duration of residence was categorized as < 5 years or ≥ 5 years.

Data were obtained through interviews conducted by researchers and trained enumerators, using a structured questionnaire. The nutritionists conducted anthropometric measurements. Blood pressure measurements were performed by a doctor. The data collection procedure was carried out in one session per location and divided into three shifts, with 25 respondents in each shift.

Data Analysis

Descriptive analysis was performed using a univariate test to determine the number and percentage of each variable. This was followed by a bivariate test (chi-square) to analyze the relationship between each independent variable and the dependent variable. Finally, a multivariate test with binary logistic regression was used to determine the association between independent variables and MetS after controlling for other independent variable categories. The relationship between variables was considered significant if the p-value was less than 0.05.

Ethics

This study obtained ethical approval for health research from the Health Research Ethics Committee National Research and Innovation Agency, with number 045/KE.03/SK/03/2024.

Table 1. Descriptive analysis based on the area of residence of the older people (n=150)

Variable	Urban Slum Areas		Rural Slum Areas		Total	
	n	%	n	%	n	%
Sex						
Male	21	28.0	36	48.0	57	38
Female	54	72.0	39	52.0	93	62
Age (years old)						
< 50	7	9.3	2	2.7	9	6
50-59	34	45.3	23	30.7	56	37.33
60-74	34	45.3	46	61.3	80	53.33
≥ 75	-	-	5	5.3	5	3.33
Education						
Middle-high	9	12.0	12	16.0	21	14
Low	66	88.0	63	84.0	129	86
BMI						
≤ 18,5	3	4.0	8	10.8	11	7.3
18.5-24.9	30	40.0	46	62.2	76	50.7
25-29.9	26	34.7	14	18.9	40	26.7
≥ 30	16	21.3	6	8.1	22	14.7
Duration of residence (years)						
< 5	67	89.3	48	64	105	70
≥ 5	8	10.7	27	36	45	30

Results

Table 1 shows that the majority of the participants were females (62%), more than half of the participants were aged between 60-74 years (53.33%), the majority of older people had low-level education (86%), more than a third of the number of older people had nutritional status in the overweight and obese categories (41.4%), and most of the duration of residence was <5 years (70%) compared to residents who resided longer or ≥ 5 years. This suggests that most of the population in slum areas comprises of migrants.

Figure 2 shows that older people living in rural slum areas do not have MetS compared to those living in slum areas adjacent to urban slums. Conversely, older people living in rural slum areas have less MetS than those living in slum areas adjacent to urban areas.

Older people living in rural slums suffer from MetS at a lower rate of 12% than those living in slums adjacent to urban areas (29.3%).

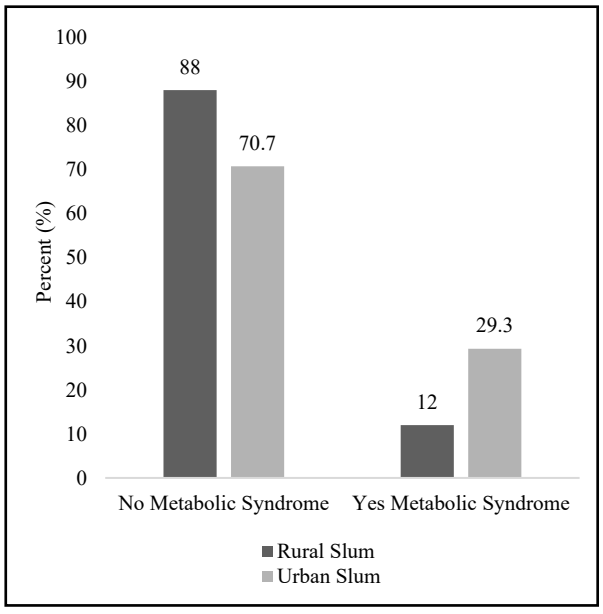

Figure 2. Proportion of metabolic syndrome in older people in slum area

Percentages of biochemical indicators represent the proportion of participants within each classification category and are not cumulative.

The fasting blood glucose levels were abnormal (18.7%). Total cholesterol levels greater than 50% were borderline high and high. The HDL levels were high (30%). LDL levels were approximately 59%, ranging from borderline high to very high. Triglycerides were more than 25%, from borderline high to extremely high. The waist circumference was 18.7% above the normal range. Approximately 48.7% of older patients with MetS did not take high blood pressure medication.

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Table 3 shows the significant relationship between district (p<0.001) and BMI (p<0.001) with MetS. In contrast, sex, age, education, and residence duration were not significantly associated with MetS (p>0.05).

Table 4 shows that the risk of finding older people with MetS increased with increasing BMI category and was statistically significant after controlling the variables of residential location, gender, age, and duration of residence. The odds of MetS being found in older people with BMI categories 25-29.9 kg/m2 and BMI ≥30 kg/m2 were 3.75 times (AOR 3.75, 95%CI: 1.37-10.24) and 11.85 times (AOR 11.85, 95%CI: 3.90-35.97) higher than older people with BMI ≤24.9 kg/m2, respectively.

Discussions

This study found that MetS was significantly more common in urban slum regions, with a higher proportion of MetS than in rural slum areas. Although both were classified as slums, their demographics differed. Urban

Table 2. Biochemical measurements and waist circumference in the elderly

Variable	Urban Slum Areas		Rural Slum Areas		Total	
	n	%	n	%	n	%
Fasting Blood Glucose (mg/dl)						
>100 (abnormal)	17	22.7	11	14.7	28	18.7
Total cholesterol (mg/dl)						
≥240 (high)	15	20.0	9	12.0	24	16.0
200-239 (borderline high)	33	44.0	29	38.7	62	41.3
HDL (mg/dl)						
≥60 (high)	24	32.0	21	28.0	45	30.0
<40 (low)	7	9.3	5	6.7	12	8.0
LDL (mg/dl)						
≥190 (very high)	5	6.7	4	5.3	9	6.0
160-189 (high)	17	22.7	8	10.7	25	16.7
130-159 (borderline high)	28	37.3	28	37.3	56	37.3
100-129 (near optimal)	22	29.3	29	38.7	51	34.0
Triglycerides (mg/dl)						
≥500 (extremely high)	0	0	1	1.3	1	0.7
200-499 (high)	10	13.3	8	10.7	18	12.0
150-199 (borderline high)	12	16.0	10	13.3	22	14.7
Waist circumference (cm)						
≥94 cm (above normal)	15	20.0	13	17.3	28	18.7
Blood pressure (mmHg)						
≥140 /90 (above normal)	50	66.7	50	66.7	100	66.7
Taking blood pressure medication						
Not taking	31	41.3	42	56.0	73	48.7

slums are more densely populated, whereas rural slums, typically located on the city's edge, have lower densities and agricultural livelihoods.

Meanwhile, the Sleman area is closer to Yogyakarta City and has a denser population; most older people are retired employees who earn a living outside the agricultural sector. Most of the older people in Wates are farmers who do not recognize the term retirement, but still carry out physical activity. According to previous research, MetS is more common in metropolitan regions than in rural regions(Sundarakumar *et al.*, 2022). There is a strong correlation between the increase in MetS cases in cities and the fact that people lead fewer active lives and eat more processed foods high in calories, sugar, and saturated fat. Additionally, people in cities tend to work less physically and for lower-paying jobs than their rural counterparts do(Goryakin, Rocco and Suhrcke, 2017; Tamaoki *et al.*, 2022). Industrial expansion has

Table 3. Bivariate analysis metabolic syndrome based on characteristics (n=150)

Characteristics	Metabolic syndrome				Total n	p-value
	No		Yes			
	n	%	n	%		
District						
Rural slum	66	88.00	9	12.00	75	<0.001
Urban slum	53	70.67	22	29.33	75	
Sex						
Male	48	84.21	9	15.79	57	0.248
Female	71	76.34	22	23.66	93	
Age group (years old)						
<50	5	83.33	1	16.67	6	0.983
50-59	47	78.33	13	21.67	60	
60-74	64	80.00	16	20.00	80	
≥ 75	3	75.00	1	25.00	4	
Education level						
Middle-high education level	19	90.48	2	9.52	21	0.174
Low education level	100	77.52	29	22.48	129	
BMI						
≤24.9 (Normal)	79	90.8	8	9.2	87	<0.001
25-29.9 (Overweight)	29	72.5	11	27.5	40	
≥30 (Obesity)	10	45.5	12	54.5	22	
Duration of residence						
<5	22	19.1	93	80.9	115	0.400
≥5	9	25.7	26	74.3	35	

Table 4. Binary logistic regression for BMI risk of metabolic syndrome in older people in slum area

Variable	B	p-value	Odd Ratio	95.0% C.I for EXP(B)	
				Lower	Upper
BMI ≤24.9		<0.001			
BMI 25-29.9	1.32	0.01	3.75	1.37	10.24
BMI ≥30	2.47	<0.001	11.85	3.90	35.97
Constant	-2.29	<0.001	0.10		

Variable(s) entered in step 1 are location cat, sex cat, age_cat, education_cat, BMI_cat, and duration of residence cat.

eliminated the green spaces surrounding cities and affected people's diets. They eat more ultra-processed, high-calorie food. This increases the likelihood of acquiring hypertension, dyslipidemia, obesity, and diabetes.(Gebreegziabiher *et al.*, 2021; Wisniewska *et al.*, 2024)

BMI is one of the parameters used to measure nutritional status, and it is a factor that influences MetS. Individuals with obese nutritional status have a higher risk of developing MetS(Swarup, Ahmed and Grigorova, 2024). In this study, there was a statistically significant correlation between BMI and MetS occurrence. MetS is more likely to occur in people with a higher BMI. Consistent with other studies, this study found that BMI was significantly related to MetS parameters (Al-Bachir and Bakir, 2017), including blood glucose levels, blood cholesterol levels (triglycerides, LDL, and HDL), and blood pressure. (Sihombing and Tjandrarini, 2015) reported that MetS is more likely to occur in older adults and in those with a higher BMI. Older age has a greater risk; 55-65 years old has a four-fold higher risk than those aged 25-34 years. Respondents who had a BMI in the obese category had a risk of seven times compared of those who were not obese. This indicates that a normal BMI is needed to prevent MetS.

According to our results, there appears to be no statistically significant correlation between sex and MetS in older adults. Rapid urbanization, increased industrialization, and an aging population may explain why MetS has become more common over the past 20 years. Although MetS has been consistently linked to age, its relationship with sex has not always been consistent(Liu *et al.*, 2021). There was no correlation between sex and MetS according to our results and a prior study in Semarang, Central Java (Indonesia), where the condition was characterized using the NCEP-ATP III-2001 criteria(Septianti *et al.*, 2020). The sex distribution of MetS varies; some reports suggest that women are more frequently affected than men, while others suggest the opposite(Meloni *et al.*, 2023). Women had a greater prevalence of MetS among older people (23.66% vs. 15.79%) according to the univariate analysis. MetS is more prevalent in males than in women, and is thought to have a protective factor that lowers the risk of acquiring the condition. MetS is more common in women than in males, and this disparity becomes more pronounced after menopause when the sex-specific protective effects of estrogen begin to wear off(Alipour *et al.*, 2024). We believe that this might be caused by a substantial decrease in estrogen concentrations during menopause, which triggers an increase in abdominal fat and possibly causes insulin resistance, a rapid increase in blood pressure, and a significant decline in endothelial function(Meloni *et al.*, 2023). Effective methods must be applied to improve healthy aging and reduce metabolic diseases.

This study found no correlation between age and MetS incidence in older people. The findings of this study contradict those of several prior studies that indicated an increase in the incidence of MetS with age(Silva *et al.*, 2019). The prevalence of MetS varies across age groups. Despite a significant increase in the frequency of MetS among older people, those over 65 years of age were less likely to experience the condition(Moreira *et al.*, 2022). Moreover, there is a trend indicating an increasing frequency of MetS among young adults(Hirode and Wong, 2020). These results indicated that age is not the sole cause of MetS. Genetic, environmental, and individual factors contribute to MetS onset (Nilsson, Tuomilehto and Rydén, 2019). Older adults maintain a healthy lifestyle and regularly engage in physical activity, which may decrease their risk of MetS(Costa *et al.*, 2020). Furthermore, older participants in this study resided in urban areas, facilitating access to health services and increasing their likelihood of utilization(Laksono, Dwi Wulandari and Soedirham, 2019). Therefore, respondents may have obtained health information and programs related to MetS or had prior MetS treatment.

The level of education in older people, middle and high education categories, and low education levels showed no significant relationship with MetS . In older people, age is often a stronger risk factor than educational level. Natural aging can cause metabolic changes that increase the risk of MetS development. Previous studies have shown that MetS is more common in patients with low or middle levels of education because of the level of acceptance of information about MetS. Studies have shown a significant difference in the prevalence of MetS between individuals with a low education and those with a higher education(Rus *et al.*, 2023). Lower education levels are often associated with limited health knowledge. Low education levels are associated with a lack of cognitive ability, which makes it difficult to understand information(Zahodne, Stern and Manly, 2014). Individuals with low education have less access to health resources and are more likely to engage in unhealthy lifestyle behaviors such as poor diet and physical inactivity(Walli-Attaei *et al.*, 2020).

This study found that the length of time spent living in a slum area did not have a significant relationship with the incidence of MetS in the respondents. These findings are different from those of previous research conducted in India, which explains that respondents who live in slum areas have the potential to experience MetS due to limited access to health services, poor sanitation, and chronic stress, which are the main risk factors for MetS(Krupp *et al.*, 2023). However, duration of residence does not have a significant relationship with MetS in older people; routine assistance and health evaluation of older people need to continue to be improved, considering that older people are vulnerable individuals whose health needs to be protected and maintained. The

quality of health of older adults is related to the quality of health of all individuals in society(Van Leeuwen *et al.*, 2019).

This study has several strengths. This is one of the first studies to explore the health profiles of older individuals residing in both rural and urban slum areas, providing valuable insights into a previously underrepresented population. We employed rigorous laboratory testing with accredited facilities to ensure accurate and reliable metabolic profile measurements, thereby enhancing the validity of our diagnoses. This study's unique setting allows for a nuanced understanding of the health challenges faced by this vulnerable population, informing targeted interventions. However, this study had some limitations. The results might have been underestimated or overestimated owing to potential biases in participant selection, which could impact the representativeness of the sample. Future studies should consider more robust sampling methods to validate and expand these findings.

Conclusion

District variables and BMI were predictors of MetS. Being overweight or obese raises the risk of MetS according to BMI values. Therefore, assessing BMI is essential to reduce the prevalence of MetS in both urban and rural slums. The periodic evaluation of body weight is an effort to control the incidence of MetS.

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Availability of data and materials

The data that support the findings of this study cannot be made publicly available due to the protection of research participants' privacy.

Authors' contributions

S.S: Data collection, writing-original draft, validation, writing-review and editing; formal analysis, data curation; M.K.: Data collection, writing-original draft, writing-review and editing, validation.; I.K.: Data collection, writing-original draft, writing-review and editing, formal analysis; A.W.: Data collection, writing-original draft, writing-review and editing; T.K.: Data collection, writing-original draft, writing-review and editing, validation; S.P.: Data collection, writing-original draft, writing-review and editing; T.H.: Data collection, writing-original draft, writing-review and editing; T.S.: Data collection, Writing-original draft, writing-review and editing; and S.R.: Data collection, writing-original draft, writing-review and editing, formal analysis.

Conflict of Interest

The author stated that there was no conflict in the research.

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Supplementary for multivariate variables region, BMI, sex, age, education, duration of residence

		B	Sig.	AoR	95% C.I.for AoR	
					Lower	Upper
Step 1[a]	Region	1.110	0.045	3.034	1.027	8.967
	BMI < 24.9 kg/m^2		0.000			
	BMI 25-29.9 kg/m^2	1.235	0.030	3.439	1.127	10.494
	BMI > 30 kg/m^2	2.532	0.000	12.581	3.584	44.158
	Female	-0.338	0.517	0.713	0.256	1.984
	<50		0.474			
	50-59	0.827	0.521	2.287	0.183	28.591
	60-74	1.291	0.320	3.637	0.285	46.448
	≥ 75	2.536	0.167	12.635	0.347	460.440
	edu_cat(1)	0.761	0.358	2.141	0.423	10.849
	dor_cat(1)	-1.794	0.249	0.166	0.008	3.513
	Constant	-2.717	0.210	0.066		
Step 2[a]	Region	1.042	0.054	2.835	0.984	8.171
	BMI < 24.9 kg/m^2		0.000			
	BMI 25-29.9 kg/m^2	1.192	0.034	3.295	1.097	9.901
	BMI > 30 kg/m^2	2.415	0.000	11.192	3.389	36.965
	<50		0.506			
	50-59	0.822	0.526	2.276	0.179	28.965
	60-74	1.280	0.328	3.596	0.276	46.823
	≥ 75	2.415	0.188	11.189	0.308	406.786
	edu_cat(1)	0.750	0.363	2.118	0.420	10.671
	dor_cat(1)	-1.630	0.288	0.196	0.010	3.952
	Constant	-2.994	0.160	0.050		
Step 3[a]	Region	0.763	0.125	2.144	0.810	5.677
	BMI < 24.9 kg/m^2		0.001			
	BMI 25-29.9 kg/m^2	1.110	0.042	3.034	1.043	8.829
	BMI > 30 kg/m^2	2.246	0.000	9.449	3.000	29.765
	edu_cat(1)	0.890	0.276	2.434	0.491	12.076
	dor_cat(1)	-1.428	0.346	0.240	0.012	4.673
	Constant	-2.000	0.248	0.135		
Step 4[a]	Region	0.658	0.169	1.931	0.755	4.939
	BMI < 24.9 kg/m^2		0.000			
	BMI 25-29.9 kg/m^2	1.214	0.022	3.368	1.191	9.529
	BMI > 30 kg/m^2	2.268	0.000	9.662	3.069	30.418
	edu_cat(1)	0.936	0.251	2.549	0.517	12.572
	Constant	-3.416	0.000	0.033		
Step 5[a]	Region	0.697	0.142	2.008	0.792	5.094
	BMI < 24.9 kg/m2		0.000			
	BMI 25-29.9	1.196	0.023	3.307	1.179	9.277
	BMI > 30	2.279	0.000	9.771	3.134	30.466
	Constant	-2.602	0.000	0.074		
Step 6[a]	BMI < 24.9 kg/m2		0.000			
	BMI 25-29.9	1.356	0.008	3.879	1.416	10.626
	BMI > 30	2.472	0.000	11.850	3.904	35.973
	Constant	-2.290	0.000	0.101		

a. Variable(s) entered on step 1: region, bmiwho3, sexn, age_cat, edu_cat, dor_cat.