p-ISSN 2086-6380
e-ISSN 2548-7949

Jurnal Ilmu Kesehatan Masyarakat, Mar2022, 13(1):14-25
DOI: https://doi.org/10.26553/jikm.2022.13.1.14-25
Available online at http://ejournal.fkm.unsri.ac.id/index.php/jikm

PREVALENCE AND DETERMINANTS OF CENTRAL OBESITY AT URBAN SLUM DWELLERS IN NORTH JAKARTA

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ABSTRACT

Central obesity, widely known as a major cardiovascular disease risk factor, threatens the urban poor more than other socio-economic groups. The study intended to disclose the prevalence and determinants of central obesity in urban slum dwellers in North Jakarta. We conducted a survey study on residents aged 15 and above. The study randomly recruited two hundred forty-eight residents for direct interviews and body measurements according to the minimum sample requirement. Sociodemographic and Noncommunicable Diseases (NCDs) risk factors questionnaires were used and asked after weight, height, and waist circumference measurements. Descriptive and multivariate analyses were conducted to determine the central obesity prevalence and associated determinants. The central obesity prevalence in urban slum dwellers reaches 68.1%, presiding in women (69.4%) than men (65.3%). The multivariate binary logistic regression analysis indicates that central obesity was higher in the 30-59 y.o age group (Prevalence Ratio [PR]= 1.68; 95% Confidence Interval [CI]=1.19-2.37) and ≥ 60 y.o age group (PR = 1.76; 95%CI = 1.20-1.41). Besides, the residents who do not eat fruits and vegetables daily (PR=1.20; 95%CI=1.01-1.41) and practice less physical activity (PR=1.25; 95%CI=1.01-1.56) were more likely to have central obesity. The productive age group and elderly are at a higher risk for central obesity in an urban slum. Although notable as the main risk factors for central obesity, less consumption of fruits, vegetables and lack of physical activity highlight the urgent need to provide affordable, healthier options for urban slum dwellers.

Keywords: *central obesity, community health, determinants, noncommunicable diseases, urban slums.*

ABSTRAK

Obesitas sentral, secara luas dikenal sebagai faktor risiko utama penyakit kardiovaskular, mengancam masyarakat miskin perkotaan sebagai komunitas yang paling rentan. Penelitian ini bertujuan untuk mengetahui prevalensi dan determinan obesitas sentral pada penghuni kawasan kumuh perkotaan di Jakarta Utara. Survei dilakukan di komunitas kumuh pada penduduk berusia 15 tahun ke atas. Menggunakan sampel minimum studi survei, 248 warga berusia 15 tahun ke atas direkrut secara acak untuk wawancara dan pengukuran tubuh. Kuesioner sosiodemografi dan faktor risiko Penyakit Tidak Menular (PTM) digunakan dalam wawancara setelah pengukuran berat badan, tinggi badan dan lingkar pinggang. Analisis deskriptif dan multivariat dilakukan untuk menentukan prevalensi obesitas sentral dan determinan terkait. Prevalensi obesitas sentral pada penduduk kawasan kumuh adalah 68,1%, lebih tinggi pada perempuan (69,4%) dibandingkan laki-laki (65,3%). Uji *binary* regresi logistik menunjukkan bahwa obesitas sentral lebih tinggi pada kelompok usia 30-59 tahun (*Prevalence Ratio* [PR]=1,68; 95% *Confidence Interval* [CI]=1,19-2,37) dan ≥ 60 tahun (PR = 1,76; 95% CI = 1,20-1,41). Selain itu, penduduk yang tidak makan buah dan sayur setiap hari (PR=1,20; 95%CI=1,01-1,41) dan tidak melakukan aktivitas fisik rutin (PR=1,25; 95%CI=1,01-1,56) lebih berisiko mengalami obesitas sentral. Kelompok usia produktif dan lansia memiliki risiko tinggi mengalami obesitas sentral di kawasan kumuh perkotaan. Selain itu, kurangnya konsumsi buah dan sayur serta aktivitas fisik, meskipun dikenal sebagai faktor risiko utama obesitas sentral, menyoroti kebutuhan mendesak dalam memberikan pilihan diet sehat dan olahraga terjangkau bagi penduduk miskin perkotaan.

Kata Kunci: obesitas sentral, kesehatan komunitas, Determinan, Determinan, pemukiman kumuh.

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Received :** May 1, 2021* ***Accepted :** March 11, 2022* ***Published: March 31, 2022

Introduction

Central obesity is a significant risk factor for cardiovascular disease incidence, one of the highest causes of premature death globally.[1,2] A substantial rise in the central obesity prevalence occurred in developing countries and appeared younger than in developed countries.[3,4] The rapid increase is markedly affected by unhealthy lifestyles following rapid urbanization in low and middle-income countries.[3–5]

According to the 2018 Indonesia Basic Health Research report (*Riskesdas 2018*), the prevalence of central obesity (31%) has increased almost doubled compared to 2007 (18%).[6] Indonesia also experienced rapid urbanization, thus significantly changing people's lifestyles and significant growth of urban slums. The central obesity prevalence in Jakarta reaches 41.9% and the low-middle income group experiences the most.[7]

Urban slum dwellers are one of the groups with the worst health status.[8,9] Low incomers in urban areas have a much lower overall degree of health and a higher risk of NCDs than the middle-income group. Limited access to a healthier lifestyle and high-stress levels due to perceived disparities are the main factors for the poor health level of low economic urban.[9] High intake calorie diet, low fiber, high sugar, salt, and fat are typical in urban slum neighborhoods because of the food options' affordability to consumed daily.[8,10,11] Lifestyle changes that are not balanced with health literacy negatively affect low-income groups in urban areas. A sedentary lifestyle, high sugar-salt-fat diet, smoking, and drinking alcohol are more prevalent in the urban poor than wealthier.[2,10] A study conducted by Nagarkar and Kulkarni[12] on 559 women in urban slums highlighted the high figure of Body Mass Index (BMI) above normal, counting up to 60%, with overweight was 39% and obesity, 21%. Another study in Gujarat urban slums stated that central obesity is an independent determinant of diabetes and hypertension.[13] A recent study in an urban slum in West Africa showed that the prevalence of central obesity was more than 50%, indicating one person out of two adults had central obesity in the area. The figure was higher than other studies in West Africa with different socio-economic settings.[14]

Studies on the health status of urban slum dwellers in general and central obesity, in particular, are very limited in Indonesia. Migrants usually dominate these communities, and many are non-permanent residents; this condition makes the dwellers have a high reluctance to accept external visits and coordination. It is also challenging for these non-permanent residents to seek affordable health care in the city due to unowned health insurance. Many of them came to the hospital with complicated health conditions with high mortality risk.[15] Following those reasons, the study was initiated to convey evidence to the local government to improve urban slum dwellers' health. With support from the local government and public health center, this study aimed to

enclose the prevalence of central obesity in one of the slum neighborhoods in North Jakarta and find its associated determinants.

Methods

In December 2019, we conducted a community survey at a slum neighborhood in Pejagalan village, North Jakarta. This neighborhood is a fostered area of the Department of Public Health and Nutrition, School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia. The institution is conducting the prevention and control of NCDs program referring to the local public health center's consideration. Before the interview and measurements began, the interviewer gathered the written informed consent from participants. The local institutional ethics committee approved the study procedures with an ethical clearance number 33/08/KEP-FKUAJ/2019. The local government and public health centers granted the permission statements.

According to the Indonesian Ministry of Health, the NCDs risk factor screening criteria were conducted on a population aged 15 years and above. The total population aged 15 years and above in the study population was 2300 people. The study uses a population-adjusted survey sample formula for corrections to the number of populations. It only includes permanent residents who have lived in the area for more than six months. The sample calculation resulted in a minimum of 248 respondents with pregnant women and currently still in school as the exclusion criteria. A systematic random sampling on the neighborhood leader's residents' list was applied to select the residents. However, random sampling was then re-applied in dwellers' houses if the resident on the list was not present.

Data were collected through direct interviews and measurements using a modified, translated questionnaire from the World Health Organization (WHO) STEPwise approach to chronic disease risk factor surveillance (STEPS) in analyzing determinants for central obesity. According to the WHO anthropometry measurement guideline, a trained interviewer measured the height with a stadiometer on a flat surface. At the same time, the participant stood with head, shoulders, buttocks, and heels touching the wall. Bodyweight was scaled using calibrated portable scales with the thinnest cloth possible. The measurement of waist circumference followed the WHO STEPS protocol using non-stretched tape meters. The interviewer measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest.[16] The Asian male and female waist circumference references determined the central obesity status (>90 centimeters in men; >80 centimeters in women).[17] Data were collected by trained field health officers and randomly supervised by the principal investigator to ensure the quality of the data. The independent variables in the study included;

Sociodemographic characteristics include gender, age group, marital status, level of education, and working status. The age group was recorded as 15-29 years, 30-59 years, and ≥ 60

years of age, following the presiding age group of central obesity prevalence in developing countries (30-50 years) and differing the elderly population based on the Indonesian Ministry of Health definition of senior citizen (≥60 years old). Lifestyle (physical activity, the consumption level of salt, fat, and sugar, smoking, alcohol drinking, fruits and vegetable diet, and paying attention to food composition labels), and, NCDs statuses that a health professional already diagnoses.

The central obesity prevalence was determined using descriptive analysis, including the distribution of sociodemographic characteristics and determinants. The continuous variables were analyzed using an independent t-test, and the categorical variables were analyzed using Chi-squared to evaluate dependency. The multivariate binary logistic regression was performed on all variables with stepwise suggestions to assess multicollinearity. The prevalence ratio (PR) was employed to measure the effect size of each central obesity determinant. The analysis used 95% confidence intervals (95%CI) with a 5% significance level was assumed. STATA software (Ver 16, Stat. Corp) carried out the descriptive and logistic regression analysis.

Results

The dwellers' mean age was 44.2±14.2 years old, with the youngest being 16 and the oldest being 96 years. The study population's overall prevalence of central obesity reached 68.1% (n=169). The highest proportion of central obesity by age group occurred in the elderly group at 76.5% (n=26). Women were more prevalent, with 69.4%, than men at 65.3% (Table 1).

Table 1. Urban Slum Dweller's Characteristics by Central Obesity Distribution

Characteristics	Central Obesity		*P*	PR (CI 95%)
	Yes	No		
	Freq. (%)	Freq. (%)		
Age (years): Mean±SD*; Min-Max	44.2±14.2	16-96		
15-29	20 (43.5)	26 (56.5)		Ref
30-59	123(73.2)	45 (26.8)	0.02	3.5 (1.8-6.9)
≥ 60	26 (76.5)	8 (23.5)		4.2 (1.6-11.3)
Gender				
Male	49 (65.3)	26 (34.7)	0.30	Ref
Female	120 (69.4)	53 (30.6)		1.2 (0.7-2.1)
Highest Level of Education				
No Education	23 (77)	8 (23)		0.7 (0.2-3.2)
Primary Education	91 (72)	45 (28)	0.31	0.5 (0.1-1.9)
Secondary Education	43 (68.8)	23 (31.2)		0.5 (0.1-1.8)
Higher	12 (80)	3 (20)		Ref
Marriage Status				
Married	138 (69.3)	61 (30.7)		Ref
Single	14 (48.3)	15 (51.7)	0.02	0.4 (0.2-0.9)
Widowed	2 (50)	2 (50)		0.4 (0.1-3.2)
Divorced	15 (93.8)	1 (6.3)		6.6 (0.9-50)
Occupation				
Formal Sector Worker	19 (63.3)	11 (36.7)		Ref
Informal Sector Worker	52 (70.3)	22 (29.7)	0.05	1.4 (0.6-3.3)
Not working	98 (68)	46 (32)		1.2 (0.5-2.8)

*SD= Standard Deviation; Ref=Reference group

The dwellers with a higher education level are more likely to experience central obesity (80%), followed by the group with no education with 77%. Divorced (94%) and informal workers (70.3%) also tend to suffer central obesity (Table 1). In the anthropometric measurements, the mean waist circumference of the dwellers was 87.4 ± 13.0 centimeters (cm). The average body weight was 6.0 ±12.0 kg, height 157.0 ± 9.7 cm, and BMI 27.7±4.6 kg/m^2. The proportion of dwellers with central obesity who read food labels was higher (74%) than non-sufferers. Central obesity sufferers rarely buy food outside (75%), do not eat vegetables and fruit every day (76%), have irregular physical activity (68%), avoid fatty foods (72.0%), and consume alcohol (78.6%) (Table 2).

Table 2. Anthropometric Measurements and Lifestyles by Central Obesity Distribution

Variable	Central Obesity		Mean±SD*	Min-max	*P*	PR* (95% CI)
	Yes	No				
	Freq. (%)	Freq. (%)				
Waist Circumferences (cm)			87.4±13	50-155	0.03	
Weight (kg)			61±12	34-101	0.02	
Height (cm)			157±9.7	125-190	0.30	
Read Food Composition						
Yes	23 (74.2)	8 (25.8)			0.71	Ref
No	146 (67.3)	71 (32.7)				0.7 (0.3-1.7)
Often Buy Outside Food						
Yes	89 (63)	52 (37)			0.32	0.6 (0.3-1.1)
No	80 (75)	27 (25)				Ref
Daily Fruits & Vegetable						
Yes	99 (63.5)	57 (36.5)			0.04	Ref
No	70 (76)	22 (24)				1.8 (1-3.2)
Regular Physical Activity						
Yes	48 (53.9)	41 (46.1)			0.03	Ref
No	108 (68)	51 (32)				1.8 (1.1-3.1)
High Sugar Diet						
Yes	117 (68)	55 (32)			0.32	0.9 (0.5-1.7)
No	52 (68.4)	24 (31.6)				Ref
High Salt Diet						
Yes	116 (66.7)	58 (33.3)			0.20	1.3 (0.7-2.3)
No	53 (71.6)	21 (28.4)				Ref
Currently Smoking						
Yes	20 (55.6)	16 (44.4)			0.33	0.5 (0.3-1.1)
No	149 (70.3)	63 (29.7)				Ref
Alcohol Drinking						
Yes	11 (78.6)	3 (21.4)			0.43	1.8 (0.5-6.5)
No	158 (67.5)	76 (32.5)				Ref

*SD= Standard Deviation; Ref=Reference group

In the multivariate model (Table 3) using multivariate binary logistic regression (adjusted R-squared [R^2] = 0.210), the prevalence of central obesity in respondents had a significant association with the 30-59-year-old group (p=001) and the elderly group (p=003). Respondents who do not consume fruits and vegetables daily (p=015) and undergo irregular physical activity (p=030) were more likely to have central obesity.

Table 3. Logistic Regression Analysis of Central Obesity Risk Factors

Variable	Coeff.	p-value	PR* (95%CI)
Age Group			
30-59 years	1.27	0.001	1.68 (1.19-2.37)
≥60 years	1.56	0.003	1.76 (1.20-2.56)
No Daily Fruits & Vegetables	17	0.015	1.20 (11-1.41)
Irregular Physical Activity	1.43	0.030	1.25 (11-1.56)

*PR=Prevalence Ratio

Discussion

The prevalence of central obesity among the population aged 15 years and over in the slum neighborhood in Pejagalan Village reaches 68.1%. This figure far exceeds the prevalence of the Jakarta province (41.9%) and the national (31%).[7] The proportion of female respondents (69.8%) is higher than men (30.2%). The proportion follows the 2018 *Riskesdas* report, where the prevalence in women (46.7%) was higher than that of men (15.7%). In the previous studies conducted by Puspitasari,[18] Rachmi et al.,[19] and Kim et al.[20], the proportion of central obesity in women is higher than in men. Sudikno et al.[21] showed that women have a hazard ratio (HR) of 5.53 times faster to experience central obesity than men. Several factors influence the high prevalence of central obesity in women. We assumed that women in the low-middle socio-economic classes, mostly homemakers, pay less attention to bodyweight because they are too busy caring for their children. The high levels of energy, carbohydrate, and fat intake are not accompanied by appropriate physical activity, leading to obesity in women. High-calorie intake and low physical activity have a four times greater risk of becoming obese.[22] Based on the age group in the distribution of central obesity, the elderly group has the highest proportion of 76.5%. Several studies support this result, suggesting that slow metabolism and obesity in adulthood affect central obesity in the elderly.[23] Besides, in the elderly, there is a decrease in muscle mass and changes in several hormones that trigger abdominal fat accumulation. A study by Ozkaya et al.[24] and Subedi et al.[25] stated that the age factor is related to obesity in the elderly.

The slum dwellers who have higher education tend to have a high waist circumference. This result aligns with the 2018 *Riskesdas* report, which showed that the higher education level correlated with increasing obesity prevalence.[7] However, in some studies, the results are the opposite; subjects with low education have a higher percentage of obesity than subjects with high education.[18] Hence, education does not determine a person's nutritional knowledge. Respondents with divorce status have a relationship with less attention to food consumed and less attention to appearance.[26] Workers in the informal sector consisting of laborers, motorcycle taxi drivers, drivers, and traders, are associated with more leisure time than workers in the formal sector.[27] This encourages them to behave more passively, associated with central obesity.

The multivariate results show that the independent determinant for central obesity in slum dwellers is 30 years older. Supporting the results, studies on urban populations aged 25-65 years suggest a positive correlation between age and the incidence of obesity.[21] Ford et al. four also noted that the current overweight trend is more prevalent in lower-middle-income countries. We found different results in respondents in the upper-middle-class environment, where central obesity was negatively associated with an increase in age.[4] In urban slum neighborhoods, the elderly are assumed to have less physical activity than in rural areas. A packed housing and environment make the elder have less physical activity and a higher chance of being exposed to unhealthy lifestyles; thus, they have a higher risk of contracting NCDs than the ones in the better neighborhoods.[28] The explanation of obesity and abdominal obesity in the elderly follows the changes in body composition in the aging process. Muscle mass is estimated to decrease by 40% between age 20 and 70. Centralized redistribution of fat mass to the visceral component, muscle, and liver happens in aging, thus inducing pro-inflammatory cytokines, causing muscle loss and sarcopenia due to their catabolic effects.[23,29] The loss leads to decreased mobility. Besides, in the elderly, energy intake does not increase significantly and may even decrease over time, which plays an essential role in increasing fat mass.[24] In addition to reducing resting metabolic rate, physical activity decreases, and sitting time increases, accompanied by a high saturated fat diet commonly found in the low-socioeconomic neighborhood. Endocrinological changes such as a decrease in growth hormone, dehydroepiandrosterone, leptin, and insulin also play a role in obesity pathophysiology in the elderly.[30]

Less consumption of fruits and vegetables and irregular physical activity were independently associated with central obesity in the dwellers. These findings are consistent with a cross-sectional study conducted in Iran that found that fiber consumption was negatively associated with waist circumference.[31] Besides, an experimental study in Abu Dhabi also stated that high-fiber diet interventions significantly reduced body weight and waist circumference in the obese population.[32] Several biological mechanisms may explain the fiber–insulin resistance-central obesity relationship. Evidence indicates that fiber intake likely affects insulin sensitivity through alterations in fatty acid flux. Insoluble fiber found in plant-based food increased postprandial insulin sensitivity with decreased circulating levels of short-chain and nonesterified fatty acids. Moreover, insoluble fiber increased ghrelin levels significantly.[32,33] A low level of ghrelin is associated with abdominal fat distribution due to slowing metabolism and increasing appetite.

A study conducted in Nepal stated a relationship between physical activity and the BMI index.[34] The results of other studies on the relationship of action with the incidence of central obesity showed that subjects with low physical activity had a hazard ratio 1.2 times faster than their counterparts.[21,32] Physical activity training specifically elicits an anti-inflammatory effect, independent of weight loss. Other physical activity benefits were associated with systemic

inflammation, abdominal obesity, and arterial stiffness.[35] The anti-inflammatory mechanism of physical activity reduced adipose tissue hypoxia, resulting in improved capillary density blood flow and lowered oxidative stress. The condition will enhance glucose tolerance, insulin resistance, lipid metabolism, blood pressure, and reduced visceral fat levels, particularly in the abdomen.[30,36] Research indicates that a sedentary lifestyle with less physical activity is an independent risk factor for abdominal obesity and metabolic syndrome.[1,4,37] In line with primarily low educational attainment, slums residents are associated with unhealthy behavior due to a lack of health knowledge. Unhealthy diet and prone to buy ready-to-eat foods led to higher sugar, fat, and salt consumption, sedentary lifestyles, smoking, and drinking are more likely in urban slum dwellers than in better socio-economic groups in urban.[38,39]

The survey study, however, has limitations. The survey conducted in the slum neighborhood of Pejagalan village cannot provide a causality because completed at one time. The end also resulted in lower consumption of fats and sugary foods in the centrally obese population because there was no precise follow-up time.

Conclusion

The prevalence of central obesity in an urban slum in North Jakarta is 68.1%. This figure is higher than the overall national prevalence. The working-age group and elderly, not consuming fruit and vegetables daily, and having irregular physical activity are the associated determinants for central obesity in the area. Central obesity is one of the noncommunicable diseases that deserves attention, especially in low-income urban populations. The high prevalence should receive special attention in designing promotional and preventive measures relevant to the risk factors of central obesity incidence in a particular community. To provide prevention strategy and health literacy at a younger age about a balanced nutritional diet with affordable substitutes, the slum community needs the collaboration of community leaders and public health centers. Moreover, physical activity modifications without excessive tools or equipment, especially for homemakers and the elderly, also highlight the attention.

Acknowledgment

The study was part of the Community Health Program conducted by the School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia. Author(s) would like to thank the neighborhood leader, health cadres, the head of Pejagalan Public Health Center, and the head of Pejagalan Village for their cooperation in providing study permission and support during the survey.

Funding

Community Health Program funded the study as part of Atma Jaya Catholic University's community empowerment grant.

Conflict of Interest

This study's author(s) has confirmed no conflict of interest regarding this study and publication.

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