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Central Obesity Screening in Adolescents at SMA Dr. Soetomo, Surabaya

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A B S T R A C T

Adolescents are vulnerable to unhealthy lifestyle behaviors, including the consumption of foods high in sugar and fat and inadequate physical activity. These behaviors may contribute to central obesity, which is associated with an increased risk of noncommunicable diseases. This community service program aimed to screen for central obesity and assess nutritional status among adolescents. Anthropometric measurements included waist circumference, body weight, and height. The program involved 70 students from Dr. Soetomo Senior High School in Surabaya, Indonesia. Central obesity was defined as a waist circumference at or above the age and sex specific 90th percentile (P90). The results showed that 7.1% of students were classified as obese and 20.0% as overweight, while 8.6% met the criteria for central obesity. Early screening can help identify adolescents at risk of central obesity and provide a basis for appropriate preventive measures. This program highlights the potential role of school-based health promotion in supporting early identification of central obesity and raising awareness of healthy lifestyle behaviors among adolescents.

INTRODUCTION

Obesity is one of the most challenging global health problems, particularly among adolescents. One form of obesity that has received increasing attention is central obesity, which is characterized by the accumulation of fat around the abdominal region. Central obesity may increase the risk of various non-communicable diseases, including type 2 diabetes mellitus, hypertension, and cardiovascular disorders (Hanć et al., 2025).

Adolescents are particularly vulnerable to central obesity due to lifestyle changes during this developmental stage. These changes include increased consumption of fast food, insufficient physical activity, irregular sleep patterns, and excessive gadget use. Recent studies have indicated that screen time exceeding three hours per day is significantly associated with an increased risk of central obesity. Furthermore, sleeping for less than 6–7 hours per night has been associated with metabolic disturbances and increased appetite (2).

Central obesity can be assessed using several anthropometric parameters, including waist circumference and body mass index (BMI). Central obesity was defined as a waist circumference at or above the age and sex specific 90th percentile (3). Waist circumference is an important indicator for assessing health risks associated with abdominal fat accumulation, which may contribute to the development of metabolic syndrome (4). Meanwhile, BMI is commonly used to evaluate overall nutritional status. Assessment of nutritional status among adolescents was based on body mass index for age (BMI for age), using the WHO growth reference adopted in the Indonesian Ministry of Health Regulation No. 2 of 2020 on Child Anthropometric Standards (5). The use of these two anthropometric parameters provides a more comprehensive assessment of adolescents nutritional status and potential health risks.

A preliminary study conducted among 10 students at SMA Dr. Soetomo found that 2 students had central obesity, 3 were classified as overweight based on BMI, and 1 was classified as obese. In response to this issue, the Undergraduate Nutrition Study Program at Universitas Nahdlatul Ulama Surabaya conducted a community service activity at SMA Dr. Soetomo Surabaya, involving 70 tenth grade students. The activity aimed to screen for central obesity among adolescents. Through this screening, students were expected to gain a better understanding of their central obesity status and its potential health consequences. Furthermore, the activity was intended to raise awareness of the importance of adopting healthy lifestyle behaviors in daily life, thereby helping to reduce the risk of central obesity from adolescence. Introduction Section contains an explanation why the issues need to be researched (research significance) and all supporting data or scientific evidence based on personal observations, the results of other researcher studies, or problems from the community engagement in society. The formulation of this research problem is always based on real conditions and objectively scientifically.

METHOD

This community service activity used a descriptive cross-sectional screening approach. Anthropometric data were collected during a single assessment period, including body weight, height, and waist circumference, to assess the nutritional status of the students and identify central obesity. The measurements were conducted by undergraduate Nutrition students who had completed coursework and practical training in nutritional status assessment. The implementation of the activity is described as follows.

A. Time and Location

Anthropometric screening for central obesity was conducted as part of a community service program at SMA Dr. Soetomo Surabaya on June 25, 2025.

B. Participants

The target participants were 70 adolescent students enrolled at SMA Dr. Soetomo Surabaya. Participants were selected using consecutive sampling based on the following inclusion and exclusion criteria:

1. Inclusion criteria:

a. Students who were enrolled in classes X5 and X6 (Classes X5 and X6 were selected based on the school's recommendation).

b. Students who agreed to participate in the study.

c. Students who agreed to have their anthropometric measurements taken.

2. Exclusion criteria:

a. Students who were unable to stand upright during anthropometric measurements.

b. Students with special needs (disabilities)

All selected participants completed the anthropometric measurements, and no participants withdrew from the study

C. Implementation Stages

1. Planning Stage

The planning stage consisted of the following activities:

a. Coordinating with the school principal and the vice principal responsible for student affairs regarding the implementation of the community service program.

b. Developing the community service program based on the situational analysis conducted prior to the activity.

2. Preparation of Facilities and Equipment

At this stage, the facilities and equipment required to support the community service activity were prepared. These included the designated area for anthropometric examinations and the necessary measurement instruments, with their availability and suitability determined according to the needs of the activity.

3. Implementation Stage

The implementation stage consisted of the following activities:

a. Nutritional status assessment: Body weight and height were measured using a weighing scale and a microtoise stadiometer, respectively.

1. Height Measurement

a. Use a flat vertical surface, such as a wall, for the measurement.

b. Install the microtoise correctly and ensure that it is securely positioned.

c. Ask participants to remove their footwear and stand upright with their heads facing forward.

d. Ensure that the head, back, buttocks, calves, and heels are in contact with the wall, as appropriate for body posture.

e. Lower the measuring headpiece until it touches the top of the head without applying pressure.

f. Record the measurement in centimeters (cm).

2. Body Weight Measurement

a. Use a calibrated digital or mechanical weighing scale.

b. Place the weighing scale on a flat and stable surface.

c. Ask participants to remove their footwear and heavy items, such as jackets, watches, belts, and other accessories.

d. Ask participants to stand upright in the center of the scale, with both feet positioned evenly.

e. Ensure that participants remain still until the measurement is displayed.

f. Record the result in kilograms (kg).

3. Assessment of Nutritional Status Using Body Mass Index (BMI)

Body weight and height measurements were used to calculate the Body Mass Index (BMI), which serves as an indicator of nutritional status. BMI was calculated by dividing body weight (kg) by the square of height (m^2). Since the participants were adolescents, nutritional status was classified using BMI for age based on age and sex specific Z-scores, according to the Indonesian Ministry of Health Regulation No. 2 of 2020.

b. Waist circumference measurement procedure:

1. Preparation: Prepare an anthropometric measuring tape. Ask the participant to stand upright in a relaxed position and remove or lift any clothing covering the abdominal area.

2. Identify the measurement site: Locate the midpoint between the lower edge of the last palpable rib and the top of the iliac crest (hip bone).

3. Position the measuring tape: Wrap the tape horizontally around the abdomen, passing through the identified midpoint. Ensure that the tape is parallel to the floor, fits snugly against the skin, and does not compress the underlying tissue.

4. Take the measurement: Ask the participant to breathe normally. Read the measurement at the end of a normal expiration (after breathing out naturally).

5. Record the result: Record the measurement in centimeters (cm). Repeat the measurement twice to ensure accuracy and consistency.

6. Participants were classified as having central obesity if their waist circumference was equal to or greater than the age and sex specific 90th percentile (P90), based on the following cut-off values:

Table 1. Waist Circumference Cut off Values for Central Obesity

Age (Years)	Male (cm)	Female (cm)
15	≥ 78.8	≥ 76.5
16	≥ 80.3	≥ 77.2
17	≥ 81.8	≥ 77.8

Source: Xi et al., 2020

c. Estimation of central obesity prevalence: The results of the anthropometric measurements were used to identify and estimation of the prevalence of central obesity among the participating students.

RESULTS AND DISCUSSION

A. Characteristics of the Participants

The participants in this community service activity were 70 tenth grade students at SMA Dr. Soetomo Surabaya. Their characteristics are presented in Table 2.

Table 2. Characteristics of the Participants

Variable	Students (n)	Percentage (%)
Gender		
Male	32	45.7
Female	38	54.3
Total	70	100
Age		
15	5	7.1
16	48	68.6
17	17	24.3
Total	70	100
Class		
X5	35	50
X6	35	50
Total	70	100

Source: Primary Data, 2025

The study involved 70 tenth grade students from SMA Dr. Soetomo Surabaya. Of the participants, 38 (54.3%) were female and 32 (45.7%) were male. Most participants were 16 years old (68.6%), followed

by those aged 17 years (24.3%) and 15 years (7.1%). The participants were equally distributed between classes X5 and X6, with 35 students (50.0%) from each class. These findings indicate that the participants were predominantly 16-year-old adolescents, with a slightly higher proportion of female students. Understanding the characteristics of the target population before conducting an intervention is essential, as it provides an overview of the participants' characteristics and baseline conditions relevant to the objectives of the activity.

B. Nutritional Status and Central Obesity Screening

Efforts to mitigate central obesity began with measuring body weight and height of the student to assess their nutritional status, followed by waist circumference measurements to identify central obesity among adolescents. The results of these anthropometric assessments are presented in Table 3.

Table 3. Frequency Distribution of Nutritional Status and Central Obesity

Variable	Students (n)	Percentage (%)
Nutritional Status		
Thinness	3	4.3
Normal	48	68.6
Overweight	14	20
Obesitas	5	7.1
Total	70	100
Central Obesity Status		
Central Obesity	6	8.6
No Central Obesity	64	91.4
Total	70	100

Source: Primary Data, 2025

Table 3 presents the distribution of nutritional status and central obesity among the 70 students assessed. Regarding nutritional status, the majority of students had normal nutritional status (68.6%). Meanwhile, 14 students (20.0%) were classified as overweight, five (7.1%) as obese, and three (4.3%) as underweight. Overall, 27.1% of the students were classified as overweight or obese, indicating that excess body weight remains an important nutritional concern among adolescents in the assessed school population.

Furthermore, central obesity was identified in 6 students (8.6%), indicating that a proportion of adolescents had excessive abdominal adiposity. This finding is important because abdominal fat accumulation has been associated with cardiometabolic risk factors, including insulin resistance and metabolic abnormalities, which may contribute to the development of type 2 diabetes mellitus and cardiovascular disease (Gesteiro et al., 2021). Similarly, Ntimana et al. (7), in their systematic review,

reported associations between central obesity and cardiovascular risk factors as well as other adverse health outcomes among children and adolescents. Supporting these findings, Widjaja et al. (8) found a significant association between waist-to-hip ratio (WHR) and metabolic syndrome among obese adolescents aged 13–18 years in East Java.

Therefore, the identification of central obesity among the students emphasizes the importance of early nutritional screening during adolescence. However, since this program involved anthropometric measurements only and did not include assessments of blood glucose levels, lipid profiles, or blood pressure, the presence of metabolic abnormalities among the students cannot be determined. Further clinical and biochemical assessments are necessary to evaluate their metabolic health status more comprehensively.

Early detection of central obesity can be an important first step in promoting preventive efforts among adolescents. Based on the screening findings, schools can develop health promotion programs that include education on balanced dietary practices, increased consumption of fruits and vegetables, and reduced intake of foods high in saturated fat and added sugars (9), In addition, students should be encouraged to be more physically active through regular exercise and other physical activities at school. Men et al. (10), in a systematic review and meta-analysis, showed that exercise can help improve anthropometric indicators, such as body mass index and waist circumference, among children and adolescents with overweight or obesity. Schools can also conduct regular nutritional status monitoring, accompanied by nutrition counseling and referral to healthcare facilities when necessary. Education on the importance of adequate sleep and stress management should also be included as part of efforts to prevent central obesity (11,12). These measures could serve as a basis for developing future school-based health programs.

CONCLUSION

Based on the screening results among students at SMA Dr. Soetomo Surabaya, 6 out of 70 students (8.6%) were identified as having central obesity, with waist circumference above the age- and sex-specific 90th percentile (P90). In this activity, students participated directly by undergoing measurements of body weight, height, and waist circumference. The school also supported the activity by facilitating student participation and helping coordinate the screening process. The findings can provide preliminary information for the school to identify students at risk of central obesity and plan appropriate follow-up actions, such as nutrition education, regular nutritional status monitoring, and referral to healthcare facilities when necessary.

Nevertheless, these findings should be interpreted in light of the limitations of the activity, particularly the small number of participants, which included only 70 students from one school. Therefore, the results may

not represent the prevalence of central obesity among all adolescents in Surabaya. In addition, the assessment was limited to anthropometric measurements, so other metabolic risk factors, such as blood glucose levels, lipid profiles, and blood pressure, could not be assessed. A broader screening program involving more schools and participants, along with assessments of other metabolic risk factors, is needed to provide a more comprehensive picture of adolescent health.

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