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Nutritional status of adolescent girls determined by upper arm circumference and nutrition consumption habits

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Abstract: The nutritional status of adolescents, especially adolescent girls, is one of the indicators of reproductive health status. This status is an important issue because it is closely related to the quality of the next generation. The size of the upper arm circumference and nutritional consumption habits are some of the indicators of nutritional status assessment. The purpose of this study was to assess the nutritional status of adolescent girls based on body mass index in terms of upper arm circumference and 2 x 24-hour recall of nutritional consumption habits based on the contents of my plate. An observational study with a cross-sectional design was applied to this study involving 380 randomly selected Metro City adolescent girls. Based on nutritional status, 43.43% of adolescent girls have poor nutritional status, underweight nutritional status is more dominant in adolescent girls (31.86%) compared to overweight and obese nutritional status, 30.26% of adolescents have MUAC less than 23.5 cm. As many as 55.79% of adolescent girls have poor nutritional habits. Efforts are needed to assist and increase awareness of adolescent girls in implementing balanced nutritional consumption.
Keywords: Adolescents; Nutritional Status; MUAC; Nutrient Consumption

INTRODUCTION

Problems with nutritional status are one of the contributors to the emergence of reproductive health problems in adolescents. The triple burden of nutrition problems (triple burden) is stunting, wasting, and obesity as well as micronutrient deficiencies such as anemia. All three conditions are found in adolescents. Based on the 2018 Riskesdas, the prevalence of anemia in adolescents reached 32%, stunting reached 26.92%, chronic energy deficiency (CED) at 36.3% and obesity reached 4% (Ministry of Health, 2019). Another problem found in adolescents is that the teenage pregnancy rate (15-19 years) reached 26.64/1000 KH and 19.6% were unwanted pregnancies (BPS, 2023).

These adolescent nutrition problems, if not resolved immediately, will have an impact on the next generation. A 27.3% reduction in pregnancy rates among obese women was reported (Kupka et al., 2011). Women who are obese before pregnancy have lower concentrations of micronutrients. This condition is certainly very dangerous for the mother and fetus if pregnancy occurs (Yang et al., 2021). Women with obesity conditions cause an increased risk of infertility (Zhu, L., et al, 2022) as well as complications during pregnancy and childbirth such as cases of gestational diabetes and gestational hypertension (Broughton & Moley, 2017). Another threatening impact is the incidence of abortion (Gualdani, E., et al, 2021), and the increased incidence of macrosomia in the resulting fetus (Pereda, J., et al, 2020).

On the other hand, when women are underweight (thin), it triggers the occurrence of CED and is associated with the incidence of anemia (Lipoeto et al., 2020). Women who experience CED produce more anemic children, have the opportunity to give birth to premature babies,

produce low birth weight babies and even stunting (BKKBN, 2021; Kulasekaran, 2012). Meanwhile, pregnant women with anemia will increase the incidence of premature birth, prolonged labor, and cesarean section (Tian et al., 2022).

Efforts to eradicate nutritional problems such as obesity, CED, and anemia in adolescents include confirming the underlying causes of these problems and understanding the early symptoms that arise. It was reported that MUAC is one of the indicators to determine nutritional status in children and adults but has not been applied to adolescents (Jeyakumar et al., 2013). In addition, if the measurement is done correctly and thoroughly, it will provide accurate results (Musa, I. R., et al, 2023). Another condition states that nutrient consumption is one of the causes of problems in nutritional status. Malnutrition includes a range of conditions related to deficiency, excess, or imbalance of nutrient intake including poor diet and anemia (Paramastri et al., 2021; WHO, 2024). Based on these facts, it is necessary to ask whether MUAC can be used as an early marker of nutritional status problems and whether nutritional consumption is the cause of malnutrition in adolescents. Therefore, this study aims to analyze MUAC and nutrient consumption as indicators of the causes of nutritional status in adolescents.

METHODS

This study is an observational study by applying a cross-sectional design. Activities were carried out from May to November 2023. Several points of youth activity centers in Metro City were determined as sampling locations. This research was approved by the Research Ethics Committee of the Poltekkes Kemenkes Tanjung Karang number 304/KEPK-TJK/V/2023 dated May 4, 2023, and permission to conduct research from the Metro City Health Office numbered 074/5553/D-02/05/2023 retrieved from June 23, 2023.

Population and Sample

The study population was adolescent girls aged 15-19 years. The sample size calculation is determined based on the population estimation formula in a limited population (Murti Bhisma, 2018). Based on the results of these calculations, the number of samples involved was 380 adolescent girls in Metro City. Randomly selected and participated voluntarily.

Variables

The variables in this study are nutritional status based on BMI assessment, upper arm circumference size, and nutritional consumption assessed based on the last 2 x 24–hour recall. Based on the results of previous studies, it was reported that MUAC and nutritional consumption have a positive correlation with nutritional status (Sisay et al., 2020; Lillie et al., 2019; Aljuraiban et al., 2015).

Procedure

Interviews were used to obtain primary data on nutritional consumption and an anthropometry examination to obtain MUAC, and BMI data. An interview guide was developed to obtain information on nutrient consumption which focused on recalling 2x in 24 hours all foods consumed and rated based on the standard contents of my plate. Anthropometry data from the examination were recorded in an observation sheet. This data consisted of height, weight, MUAC and BMI calculation.

Statistical analysis

The results of the study in the form of data sets obtained were then analyzed using the help of Excel window program computer software.

RESULTS AND DISCUSSION

Respondent Characteristics

Table 1 is a description of the characteristics of respondents who participated in the research, a total of 380 adolescent girls in Metro City.

Table 1. Characteristics of Respondents Based on Physical Condition

No.	Item pengamatan	*Mean*	Minimum	Maximum	Standard Deviation
1.	Age	16,9	15	19	1,52
2.	Weight	50,59	32	92	9,62
3.	Height	156,15	135	179	5,63
4.	BMI	20,72	13,67	37,94	3,61
5.	MUAC	25,16	17	34	3,17

Source: Primary Research Data

The results of the analysis describing the characteristics of Metro City teenagers who participated showed that the average age of participating teenagers was 16.9 years. Apart from that, it is also known that there are teenagers who have a height of 135 cm, a BMI value of 13.67 kg/m2, MUAC of 17 cm. According to developments, adolescent girls aged 15 years have at least a BMI of 20.2 kg/m2, the minimum is 14.5 kg/m2 (Kemenkes RI, 2020). Body weight is 40.6 kg and height is 149.8 cm (Kemendikbud, 2020). Based on standards, if analyzed globally, adolescent girls aged 15 years, all of these values are below normal values.

Mid – Upper - Arm Circumference (MUAC)

The MUAC variable is assessed based on the standard, namely 23.5 cm. If MUAC <23.5 cm is found then it is grouped in the deficient category. The Figure 1 are the results of MUAC measurements grouped based on normal limit values.

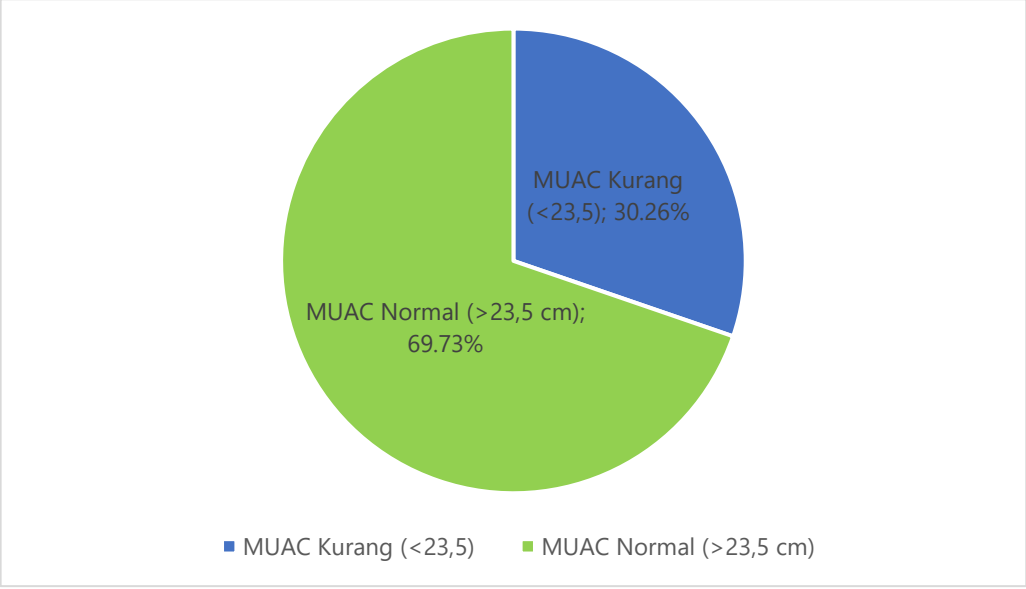

Figure 1. Distribution of Adolescent MUAC measures

The results of this study reported that 30.26% (115 adolescents) had a MUAC <23.5 cm. One measure that describes healthy physical condition and focuses on nutritional status is MUAC. This size is an indicator of malnutrition, especially for individuals whose weight and height are unknown in epidemiological and clinical studies (Chaudhry et al., 2023; Mishra, K. G., et la, 2020; Benítez Brito et al., 2016).

MUAC in women of childbearing age, including adolescents, is used as a measure to identify the risk of CED cases. This is a condition where women suffer from a lack of energy for a long time (Fibrila Firda. F, et al, 2023). If a woman suffering from CED becomes pregnant, she will have a big chance of giving birth to a baby with premature birth, low birth weight and even stunting (BKKBN, 2021). Of course, if this condition is not handled properly it will have an impact on the quality of the next generation.

MUAC is a simple non-invasive measurement method. This measure has been used to screen cases of malnutrition in children and adults but has not been applied to adolescents (Jeyakumar et al., 2013). MUAC is an anthropometric measurement that can be carried out by anyone, has good accuracy results, and can be adapted for community-based screening of underweight adolescents (Musa, I. R., et al, 2023). Compared with other methods, using MUAC as a screening tool to assess malnutrition has the advantages of using simple equipment, being easy to carry to field locations, even to locations that are geographically difficult to reach, being insensitive to changes during pregnancy, and being effective in assessing nutritional status. If the measurements are carried out carefully and precisely. Another advantage is that it is easy to socialize and does not require special training or calculations. This can help health workers at the primary level who are in environments with limited resources to obtain fast data (Mishra, K. G., et al, 2020; Thorup et al., 2020).

Based on the literature and the results of this research, MUAC can be used as an initial marker to predict early and quickly an individual's nutritional status. Apart from being easy, MUAC is very effective to implement. It is important to agree on this because by using MUAC as an initial indicator in determining nutritional status, we can empower teenagers to carry out initial screening independently to assess nutritional status through MUAC measurements.

Nutrient consumption

The nutritional consumption variable is assessed based on the teenager's daily food consumption habits based on the contents of my plate. The analysis results were grouped into good and bad categories based on the mean value in the group. The following analysis results are presented in Table 2.

Table 2. Distribution of Nutrition Consumption Status for Young Women in Metro Cities in 2023

No.	Category	Frequency	Percentage
1.	Good	168	44,21
2.	Not Good	212	55,79
	Total	380	100

Source: Primary Research Data

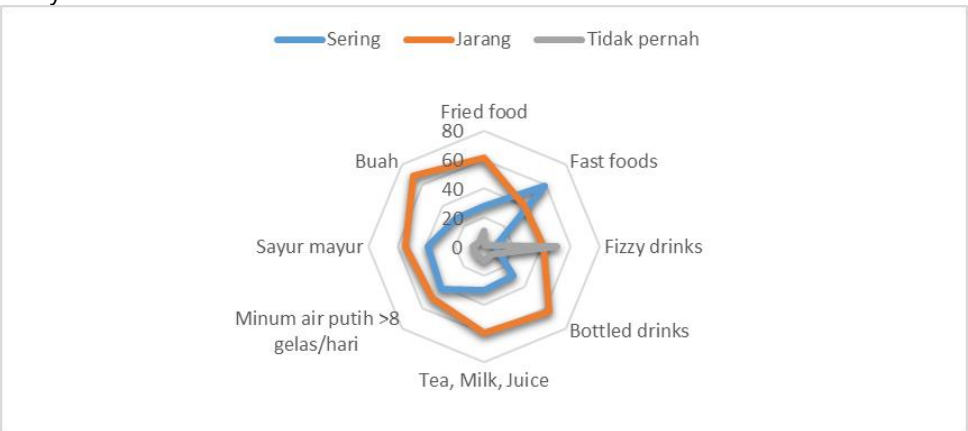

Figure 2. Distribution of Adolescent MUAC measures

The results of the analysis reported that 55.79% of young women had a history of poor nutritional consumption as assessed based on the composition of the contents of my plate. This habit is exacerbated by the behavior of adolescents who have unhealthy eating and drinking habits. The Figure 2 are the types of food and drinks consumed by teenagers.

The results of this study reported that 55.79% of adolescents had a history of consuming poor nutrition. This condition is supported by consumption behavior such as poor eating patterns and not paying attention to the nutritional content of what is consumed. A total of 58.94% (224 respondents) consumed fast food/junk food more often, 28.94% (110 respondents) consumed packaged drinks and 44.21% (168 respondents) stated that they did not drink enough water a day (<6 glasses currently per day). If this bad nutritional consumption behavior is not corrected, it can certainly have an impact on the health status of young women.

Currently, the teenage generation is growing up in a time of changes in the food environment, where nutritional problems in the form of micronutrient deficiencies and food insecurity continue to occur. The problem of undernutrition and overnutrition is increasing. It is important for women, especially adolescent girls, to have good nutritional status at all stages of their growth. This is because the risk of malnutrition in women occurs throughout their life cycle, including across generations (Das et al., 2018). Based on this study, it is very important to provide education to adolescents about the importance of having good nutritional status in preparation for pre-conception.

Nutritional status

Nutritional status is grouped based on the results of BMI calculations. The nutritional status grouping is based on the following criteria; Thin category = BMI <18.4 > 27, Normal = BMI 18.5 – 25 kg/m2, overweight = BMI 25.1 – 27 kg/m2, obesity = BMI > 27 kg/m2 (RI Ministry of Health, 2019). Figure 3 are the results of calculating the nutritional status of 380 adolescent girls in Metro City.

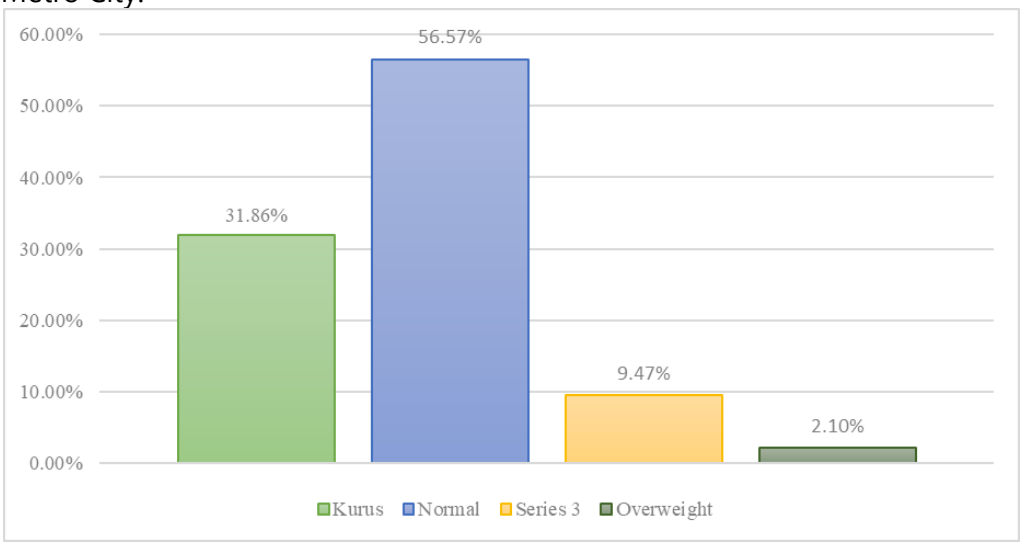

Figure 3. Distribution of nutritional status of adolescent girls

The results of the analysis show that underweight nutritional status is more dominant in adolescents (31.86%) compared to overweight and obese nutritional status. In adolescents, physical growth and mental, cognitive, and psychological development are still ongoing. When nutrition in this phase is not met, it can cause disruption and obstacles in adolescent growth (Purtiantini, 2023). Body mass index (BMI) is an important indicator for assessing human body metabolism including nutritional status (Nainggolan et al., 2022).

Obesity is a body condition with a BMI of more than 30 kg/m2. This condition is associated with an increased risk of miscarriage and obstetrics including neonatal complications (Aviram et al., 2011). Women who are obese before pregnancy tend to have lower micronutrient concentrations and are more likely to experience micronutrient deficiencies during pregnancy which are dangerous for the mother and baby (Yang et al., 2021). Previous research reports that obesity increases the risk of complications during pregnancy such as gestational hypertension and gestational diabetes (Broughton & Moley, 2017), as well as having effects that require attention on the fetus being born (Zhu, L., et al, 2022; Gualdani, E., et al, 2021; Otero-N, et al, 2021; (Vats H, et al, 2021; Pereda, J, et al, 2020). Low BMI and limited calorie and protein intake can cause a decrease in Gonadotropin-releasing hormone (GnRH) (GnRH), a hormone that plays an important role in reproductive health. If it continues, this detrimental condition will not only impact adult women but also adolescents (Hoffman et al., 2011). Previous research has proven that BMI is significantly correlated with MUAC (Mishra, K. G., et al, 2020), and nutritional intake has an impact on nutritional status (Rachmayani S.A, et al, 2018).

CONCLUSION

Cases of malnutrition among adolescent girls in Metro City who participated in this research are still high. This information is supported by the large number of adolescents who have MUAC that is less than standard and most of them have nutritional consumption habits that do not match the standard contents of my plate. MUAC and nutritional consumption can be used as initial indicators to detect cases of nutritional status. Therefore, it is necessary to increase socialization of the contents of my plate as a prevention effort and teach adolescents how to measure MUAC so they can carry out early detection independently.

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