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Indonesian Children and Adolescents' Body Mass Index:

WHO and Asia-Pacific Classification

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***Abstract*— The present of this study was to assess the World Health Organization (WHO) and Asia-Pacific Body Mass Index (BMI) classification differences in Indonesia Children's. The research method used is cross-sectional study. A total of 2936 Indonesian children's and adolescents between 7 and 17 years of age (1598 male; 1338 female) in West Java Province participated in this study. 108 volunteers of SP3OR, involved in measuring weight and height at 18 county town at West Java Province. The results showed that there were no differences in BMI between boys and girls. There are differences in BMI when using WHO and Asia-Pacific classification on Indonesia children's and adolescents. When referring to the Asia-Pacific classification of BMI, more than twelve percent's of children's and adolescents categorized overweight and obese. While when using WHO classification, 5,4 percent's of Indonesia children's and adolescents categorized overweight and obese. This results can be one of the reference in Indonesia about BMI categorization uses when making an intervention program.**

Keywords: adolescents, Asia-pacific, BMI classification, children's, WHO

I. INTRODUCTION

Overweight and obesity are closely related to the risk of various non-communicable diseases (NCD), such as diabetes, high blood pressure, high cholesterol, asthma, arthritis, and low health status [1]. While the low Body Mass Index (BMI) is closely related to the increase in mortality of the chronic obstructive pulmonary disease [2,3]. Low body weight is also associated with low quality of life related to health [4,5].

The problem of obesity is currently a problem in various countries including Indonesia. In 2018, 31% of the Indonesian population aged over 15 years suffer from obesity with a BMI classification > 27 [6]. There was a significant increase from the previous measurement results in 2013 which was only 26.6%. However, regarding the condition of BMI of children aged <15 years in Indonesia is still not reported. The case of obesity in children in Indonesia is currently an alarming crisis. The most widely discussed cases of obesity are those that occur in children aged 13 years and 7 years from Karawang, where one of them died due to shortness of breath.

The increasing prevalence of obesity that occurs in Asia, especially Indonesia, makes BMI play an important role in predicting diseases related to obesity. At present, there are two commonly used BMI classifications, the WHO classification, and the Asia-Pacific classification. There is debate among WHO consultants about the classification of BMI that is appropriate for Asian populations, especially to determine overweight and obesity. They examined the existence of scientific evidence showing that Asian populations have a different relationship between BMI, body fat percentage, and health risks compared to European populations [7].

There is still controversy when determining obesity using international criteria in Asian populations, so the effort to categorize BMI that is suitable for the Asia Pacific population needs to be reviewed again [8]. The relationship of body fat percentage with BMI in Asian populations which is different from European populations is very at risk of developing cardiovascular disease and diabetes when using international criteria which are the WHO cut-off point [7]. Therefore this study aims to examine the differences in the BMI of Indonesian children and adolescents, especially West Java Province based on gender, according to the WHO and Asia-Pacific classification.

II. METHODS

A. Participants and Method

Participants of this study were 2938 Indonesian childrens and adolescents in West Java province, ages between 7 to 17 years old (1598 male; 1338 female). The study also involved 108 data collectors as volunteers, namely SP3OR, West Java Province, spread in 27 cities and districts. We used a cross-sectional study, which examined how differences in BMI based on gender variations used the WHO and Asia-Pacific classification.

B. Data Collection

108 SP3OR personnel as activators on physical activity and sports spread out in 108 districts in West Java Province took measurements and collected data on the target sample. Measurement and data collection were carried out related to anthropometrics (height and body weight).

C. Data Analysis

The Metric BMI formula was used to measure body fat. Height and weight were measured by trained SP3OR using a stadiometer (height) and electronic scale (weight) according to standardized protocols.

$$\text{BMI} = \frac{\text{Weight (Kg)}}{\text{Height (m)} \times \text{Height (m)}} \quad (1)$$

Participants measured with no shoes and standing on the flat floor surface. Measurements were done in twice: if they differed by 0.5 cm or more, or by 0.2 kg or more, a third measurement was taken [9]. The average of the two data closest measurements was used for analysis.

III. RESULTS AND DISCUSSION

A. Results

Based on the data obtained, the average BMI in children and adolescent boys is 19.45; SD 3.36 with the lowest score of 8.59 and the highest score of 38.28. While among female children and adolescents the average BMI is 19.63; SD 3.01 with the lowest score of 5.98 and the highest score of 36.48 (Tabel 1).

TABLE I. DESCRIPTIVE STATISTICS OF BMI

Gender	N	Mean	SD	Min	Max
Male	1598	19,45	3,36	8,59	38,28
Female	1338	19,63	3,01	5,98	36,48

According to the WHO BMI classification (table 2), it is known that 38.8% of children and adolescents are included in the underweight category, 55.8% are the normal category, 4.8% are the overweight category and 0.6% are in the obese category. Children and adolescent boys 41% included in the underweight category, 53.4% normal category, 4.9% overweight category and 0.7% obese category. Meanwhile in children and adolescent girls, 36.2% included in the underweight category, 58.7% normal, 4.6% overweight and 0.5% obese category.

TABLE II. BMI CATEGORY BY GENDER ACCORDING TO WHO CLASSIFICATION (GENDER * WHO CROSSTABULATION)

			Underweight	Normal	Overweight	Obese	
Gender	Male	Count	655	853	79	11	1598
		% within Gender	41,0%	53,4%	4,9%	0,7%	100,0%
	Female	Count	485	785	61	7	1338
		% within Gender	36,2%	58,7%	4,6%	0,5%	100,0%
Total		Count	1140	1638	140	18	2936
		% within Gender	38,8%	55,8%	4,8%	0,6%	100,0%

Meanwhile, when referring to the Asia-Pacific classification (table 3), it is known that 38.8% of children and adolescents are included in the underweight category; 49.0% in the normal category; 7.1% in the overweight category; and 5.1% are in the obese category. Children and adolescent boys 41% included in the underweight category; 46.4% in the normal category; 7.3% in the overweight category, and 5.3% in the obese category. Meanwhile, 36.2% of children and adolescent girls are categorized as underweight; 52.2% are normal; 6.8% are overweight, and 4.8% are obese.

TABLE III. BMI CLASSIFICATION ACCORDING TO ASIA-PACIFIC (GENDER * ASIA-PACIFIC CROSSTABULATION)

			Underweight	Normal	Overweight	Obese	Total
Gender	Male	Count	655	742	116	85	1598
		% within Gender	41,0%	46,4%	7,3%	5,3%	100,0%
	Female	Count	485	698	91	64	1338
		% within Gender	36,2%	52,2%	6,8%	4,8%	100,0%
Total		Count	1140	1440	207	149	2936
		% within Gender	38,8%	49,0%	7,1%	5,1%	100,0%

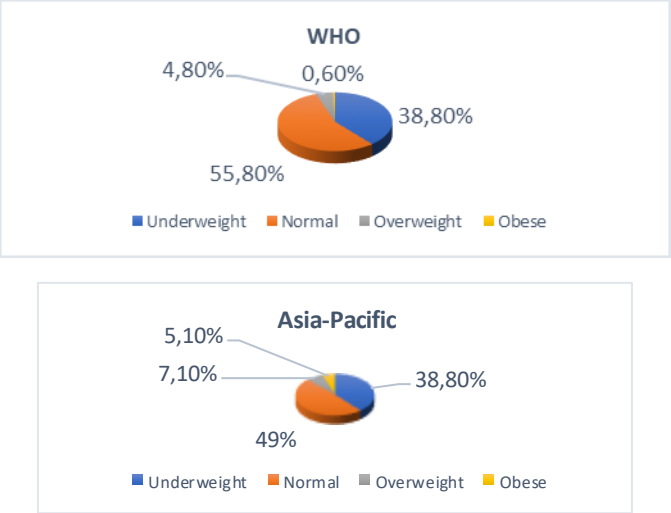

Fig. 1. Percentage of BMI Based on WHO and Asia-Pacific classification

TABLE IV. BMI COMPARATION BY GENDER

t	df	Sig.
1,499	2934	,134

BMI test results found no significant differences between boys and girls P > .05 (table 5). Both adolescent boys and girls have an average BMI score of 19, which is in the normal category when referring to the WHO or Asia-Pacific classification.

B. Discussion

This study aims to examine two main problems, namely assessing differences in BMI of children and adolescents (7-17 years) based on gender, and assessing BMI based on WHO and the Asia-Pacific classification. Based on the results of data processing, there is no significant difference between the BMI of children and adolescents between men and women. In general, children and adolescents in West Java, Indonesia are in the normal category.

Previous research states that the number of students between men and women who have a normal BMI category is almost the same, while more men are overweight and more women are underweight [10]. In terms of weight gain, the proportion of weight gain is more found in male students, and 25% of male and female students gain weight in the first 8 weeks of the lecture [11]. This means that the transition of educational activities (from high school to university) affects the increase in body weight.

Judging from the number of percentages, the BMI category refers to the WHO and Asia Pacific classification there are differences, especially in the overweight and obesity categories. When referring to the WHO classification, the number of children and adolescents, including overweight and obesity is less (4.8% & 0.6%). Meanwhile, when referring to the Asia-Pacific classification, the number of children and adolescents that are categorized as overweight and obese is higher (7.1% & 5.1%). This proves that the BMI classification between WHO and Asia-Pacific will be different when used in Asian populations, in this case, Indonesia populations.

The Hong Kong meeting produced a suggestion that in Asia when people are categorized as overweight when body mass index (BMI) exceeds 23.0 and obesity is considered when BMI exceeds 25.0 [8]. The Asia-Pacific BMI classification is more suitable for Asia for various reasons. The prevalence of metabolic diseases and cardiovascular disease is much higher when the WHO classification is applied compared to when applying the Asia-Pacific classification [12].

However, the main concern is related to the increase in overweight and obesity in children and adolescents throughout the world [13]. One predictor is BMI, which is known to be a risk factor that has a significant impact on chronic kidney disease (CKD) in women, and gender affects the relationship of BMI with CKD [14]. Obesity has a bad impact on functional disorders [15], diabetes [16], heart disease [17,18], cancer [19,20] and death [21].

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