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Physical Activities and Incidence of Obesity among Adolescent in Medan, Indonesia

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Abstract

BACKGROUND: Obesity is a common problem among adolescents. The incidence of obesity is related to daily living activities.

AIM: The aim of this study was to determine the correlation between physical activity and obesity among adolescents.

METHODS: This research was a cross-sectional study. The study was conducted in September 2017 until June 2018 at Junior High School in Medan, Indonesia. The sample of this study consisted of 114 adolescents with consecutive sampling. The study instruments measured four things in obesity indicators that are: Weight scales, microtoise for body height, body mass index, and physical activity questionnaire for older children. The value validity test value of content validity index 1. Cronbach's alpha reliability tested to value 0.88. The data areanalyzed using the Chi-square statistical test.

RESULTS: The result showed that the adolescents whodid a moderate physical activity as many as 71 respondents (62.30%), mild physical activity as many as 35 respondents (30.70%), and heavy physical activity as many as eightrespondents (7.00%). The incidence of obesity in this study showed that 80 (70.20%) of respondents were not qualified as obese and 34 (29.80%) respondents were obese. There was a correlation between physical activity and obesity among adolescents withp = 0.00 (p <0.05).

CONCLUSION: It is concluded that the importanceof physical activityassessmentsby the students for the early detection of obesity risk in the future. In addition, it is need to provide health education to adolescents about the importance of daily physical activity with routine activities, such as exercises and sports.

Introduction

Obesity is one problem that often occurs in adolescents. About 34% of adolescents aged 12–19 years are obese and more than 32% of them will still be obese into adulthood. Around 340 million obese children are aged 5–19 years in the world [1]. According to Eurostat, the incidence of obesity in Europe was around 51.6% of the population [2]. Meanwhile, in Germany, there are 17% of adolescents aged 14–17 years overweight and [3] about 31% of adolescents aged 15 years were obese in the United Stated. Obesity threatens adolescents in Indonesia. This was shown from the number of overweight or obesity among adolescentsin Indonesia continues to increase. In Indonesia, the incidence of obesity is around 5.7% of the population [4]. Based on Basic Health Research data 2018, the number of obesity has increased from 26.6% to 31% for 5 years adolescents aged 15 years in Indonesia [5].

Obesity among adolescents becomes important to note because adolescents with 80% of obesity have a chance to become obese in adulthood [6]. Adolescents often experience vulnerable nutrition for various reasons such as adolescents needing more nutrition because of increased physical growth and changes in lifestyle and eating habits. The main cause of obesity in adolescents is because they have poor eating habits, low physical activity, and sedentary behavior. This imbalance can be caused by an increase in energy intake with high-fat content and a decrease in physical activity due to an increase in the sedentary lifestyle of various forms of work, changes in transportation modes, and increased urbanization [7]. Female hasa higher risk of obesity than male. It was relevant with increasing the hormonal function in the body. Weight gain in female is indirectly related to estrogen [8].

The impact of obesity on adolescents can cause impaired metabolic functions such as Type 2 diabetes mellitus, insulin resistance, kidney disease hypertension, liver, reproductive dysfunction, and hyperlipidemia [9] (Kyrou *et al*., 2019). According to the US Preventive Services Task Force (2017), obesity in adolescents can cause problems such as (1) mental and psychological health, (2) asthma, (3) obstructive sleep apnea, (4) orthopedic problems, (5) cardiovascular, and (6) metabolism [10]. In addition, obesity in adolescents can increase the risk of degenerative diseases during adulthood [3]. Several factors influence obesity in adolescence such as genetics, ethnic differences, pregnancy factors and intrauterine conditions,

socioeconomic status, diet, physical activity, sleep, and the role of parents [11]. Various factors that influence the occurrence of obesity are behavior, and diet and family factors [12].

Adolescent obesity can be prevented by regulating healthy eating patterns, modifying eating behavior, engaging in physical activity, and monitoring growth. To overcome obesity, perform routine physical activities, such as brisk walking, running, and swimming. Physical activity is a variable for energy expenditure; therefore, physical activity is one of the behaviors to lose weight [6]. PA practice leads to increased body composition, fitness, muscle strength, proprioceptive, calorie expenditure, metabolism, increasing tolerance to the use of glucose as an energy substrate, insulin sensitivity, lipid metabolism, and reducing inflammatory status [13].

A combination of exercise and diet regulation are effective approaches to affect various aspects of self-control, decrease body mass index (BMI), and increase maximum grip strength among obese adolescents [14]. Mild PA such as sitting or lying down, talking, reading, playing games, and watching television more often causes the risk of heart disease and blood vessels [7]. Based on research conducted by Zamzani *et al*. found that children who do moderate-heavy activities ≤1 h/day have a 5 times greater chance of being obese than children with moderate-heavy activities >1 h/day [15]. Research conducted by Zhu *et al*. states that students who do mild PA were 6.5 times increase obese than students who do moderate activities [16]. The WHO recommends that physical activity carried out among adolescents in the moderate-severe range for at least 60 minevery day can decrease the obesity incidence among adolescents [17].

Some of the research that has been done only focuses on the views of overweight adolescents about the experiences of participants'physical activity in internet-based interventions[8]; physical activity, screen watch time, and overweight/obesity among Chinese children and adolescents [16], and obesity in adolescents and risk factors [18]. Therefore, obesity in adolescents will have an impact on adolescent hormones that are not balanced. This imbalance can cause puberty to start earlier than expected. While the psychological effects of obesity on adolescents cause low self-esteem and bullying, they tend to be more anxious and insecure, and being depressed can lose interest in normal activities, such as sleeping more than usual or crying a lot.

There is still limited research to examine the correlationof physical activity withobesity among adolescents in Indonesia. The health-care team as a health service provider provides its role and function in detecting and preventing obesity in adolescents which will adversely affect health into adulthood. The aim of this study was to describethe correlation of physical activity with obesity among adolescents. Based on this, it was important to know how correlation physical activity with obesity incidents among adolescents in Medan.

Methods

Research design

The research was across-sectional study which was to describe the relationship between variables not to infer the causes and effects of relationships [19]. This design aimed to describe the correlation between physical activity and obesity among adolescents.

Sample

The research sample consisted of 114 students with consecutive sampling. Inclusion criteria: (1) Junior high school at II and III levels, (2) obesity and norm weight, and (3) willing to be respondents. Exclusion criteria: Not present during the study and underweight. The Slovin's formula was used in determination the sample size. When it is not possible to take the entire population as a sample, smaller samples can be used by consecutive sampling.

Instrument

Obesity was measured using anthropometry based on BMI obtained by comparing body weight (kg) and height (cm). Weight and height data were obtained by taking direct measurements. Bodyweight was measured using a stampede scale, while height was measured using microtoise. After the student's body weight and height data are obtained, each BMI can be calculated. If BMI is ≥25, it was categorized as obese, whereas if BMI was 18.5–24.9, it was categorized as not obese.

Measurement of physical activity using questionnaire obtained from the results of adaptation from the physical activity questionnaire for older children and physical activity questionnaire for adolescents (PAQ-A) manual with some modifications because it was adapted to the conditions and habits of doing physical activity in Indonesia. The physical activity questionnaire was an instrument carried out by remembering the activities carried out on the previous 7 days. The form of questions in the PAQ-A questionnaire is included in the scaled response questions, namely, the form of questions that used a scale to measure and know the summary of general physical activity of the respondent to the questions provided in the questionnaire.

In this questionnaire, the statement of the response scale is eightquestions and one question is to identify students who have had an unusual activity

done the previous week, but this is not used in the score measurement section on the summary activity. The measuring scale used as an assessment of answers in the questionnaire is a Likert scale. The score of each question has been determined according to the PAQ-A with the following conditions: Question 1: The average score of all activities in the checklist is taken on questions (1) Questions 2-7: Score is determined according to the points for each selected answer (the activity with the lowest respondent is given a score of 1 and the activity with the highest respondent is given a score of 5). Question 8: Take the average score from the score every day of the week. Question 9: Used to identify students who have had unusual activities in the past week. This question is not given a score and is not used in calculating the level of physical activity. To calculate the final score of the PAQ-A questionnaire, which is by taking an average of 8 questions where scores 1–2.3 are categorized as mild physical activity, scores 2.4–3.7 are categorized as moderate physical activity and scores 3.8–5 categorized heavy physical activity. There wasthe score in this instrument: Score I (never), Score II (rarely), Score III (seldom), Score IV (sometimes), and Score III (always).

PAQ-Ahasbeen translated into Indonesian, then this questionnaire has been tested for the validity of three experts for children, then the CVI value = 1 was obtained, and the questionnaire was declared valid. The reliability test was conducted on 30 junior high school students in Grade VII and VIII who had the same inclusion criteria as the sample. Measuring instruments are declared reliable when a reliability test is performed and a Cronbach's alpha value ≥0.70 (Polit andBeck, 2012) is obtained. The reliability test results obtained Cronbach's alpha value of 0.88, then the instrument was declared reliable.

Data collection

Data collection was carried out by researchers and assisted by fourresearch assistants. The data collection methods used were questionnaires. Data collection began after researchers received permission to conduct research from an educational institution, the Faculty of Nursing, University of North Sumatra and permission from the research location, namely junior high school in Medan.

The researcher is assisted by the picket teacher who gathers all students, then explains the purpose, benefits, and procedures of conducting research. After that, body weight and height measurements were carried out by researchers assisted by research assistants. Respondents who fit the study inclusion criteria were asked to be willing to become respondents and distributed questionnaires. If the respondent is willing to become a research respondent, the researcher asks to sign an informed consent letter.

Before filling out the questionnaire the researcher first explains how to fill the questionnaire to the respondent and reminds the respondent to fill out the questionnaire carefully and accurately and there are no statements that are not answered, then the respondent is given the opportunity to ask if there are questions that are not understood. After the respondent completes the questionnaire, the questionnaire is collected again by the researcher and checked for completeness, if any is incomplete completed immediately. Then, the data that havebeen collected areanalyzed.

Data analysis

Bivariate data analysis uses the Chi-square statistical test. The significance value was set $p<0.05$. Bivariate analysis was carried out to determine the relationship between physical activity and obesity in adolescents.

Ethical consideration

This study was approved by the Health Research Ethics Commission of the Faculty of Nursing, Universitas Sumatera Utara No. 1453/V/SP/2018 and the informed consent wasobtained in this study.

Results

Characteristics of patients

Based on Table 1, the proportion of male was higher thanfemale 53.50%, respondentsof 13 years old were 48.20%, respondents at VIII classwere 7.00%, respondents had 44–53 kg body weight (41.20%), body high of respondentsat 151–156 cm(28.90%), and BMI of the respondent was no obesity (70.20%).

Table 1: Characteristics of patients in the study (n=114)

Characteristic	Absolut frequency (n)	Relative frequency (%)
Gender		
Male	61	53.50
Female	53	46.50
Age (years old)		
12	14	12.30
13	55	48.20
14	42	36.80
15	3	2.60
Class		
VII	49	43.00
VIII	65	57.00
Body weight (kilogram)		
34–43	19	16.70
44–53	47	41.20
54–63	28	24.60
64–73	16	14.00
74–83	1	0.90
84–93	2	1.80
94–103	1	0.90
Body height (cm)		
133–138	1	0.90
139–144	6	5.30
145–150	25	21.90
151–156	33	28.90
157–162	32	28.10
163–163	13	11.40
169–173	4	3.50
Body mass index		
No obesity (18.5–24.9)	80	70.20
Obesity (≥ 25)	34	29.80

Physical activities of adolescent

Based on Table 2 showed that at PAQ-A1 items, activities that were always (Score V) carried out by teenagers are bike 20 people (17.50%), football 13 people (11.40%), and walking 12 people (10.50%). The majority of the PAQ-A2 items, listening lessons (Score IV) were carried out by 47 people (41.20%). The proportion of PAQ-A3 items, activities during breaks, was never carried out by 61 people (53.50%). Activities after returning home (PAQ-A4), activities at night (PAQ-A5), and activities over the weekend (PAQ-A5) are sometimes carried out by teenagers by 48 people (42.10%), 37 (32.50%), and 45 (39.50%). The statement of activity statement has never been as many as 35 people (30.70%). In PAQ-A8 items, the majority of teenagers do many activities on Sundays and Fridays of 16 (14.00%) and 11 (9.60%).

Base on Table 3 showed that the physical activities of adolescents were moderate 62.30%.

Physical activities andobesity incident among adolescents

Based on Table 4 showed that there was a correlationbetween physical activities with obesity incident, p=0.00 (p<0.05).

Discussion

Every activity that makes our body active can be the right way to burn calories and increase energy. Physical activity has long-term benefits for adolescents and benefits, especially during growthso that their growth can be optimal [20]. The results showed that the respondents didmoderate physical activity. Similar to research conducted by Ahmed *et al*. date(2016)that physical activity undertaken is a moderate physical activity [21]. In this study, the majority of respondents did physical activities organized by the school, namely, during sports lessons with 2–3 times a week sports activity such as aerobics, dancing, or playing which were very effective after returning home at night on weekends. Regular physical activity such as aerobic exercise and muscle strength done 3 times a week for 3 months can reduce BMI, blood pressure, total fat, abdominal fat, and increase cardiorespiratory abilities in obese pre-puberty children [22].

There are 35 students doing light physical activity. This is because some students spend time off chatting with peers. Outside of school hours, most respondents spend time watching television, playing games, or studying. One child often performs a mild physical activity. Nowadays, students prefer to be picked up by their parents to use motorbikes or cars both when going to school or coming home rather than walking, which uses more energy for activities [23]. Adolescents who have less active physical activity during their breaks do activities such as eating or playing mobile phones, studying or reading in the library and watching television at home, and playing games on the computer [24].

The results showed that 114 respondents found 80 respondents (70.20%) were not obese and 34 respondents (29.80%) were obese and the fattest respondents were 22 girls (64.70%). Obesity is more often found in girls. According to several studies

Table 2: PAQ-A questionnaire for adolescence distribution (n=114)

PAQ-A questionnaire	Score I		Score II		Score III		Score IV		Score V	
	n	%	n	%	n	%	n	%	n	%
PAQ-A1										
Jumping string	46	40.40	51	44.70	14	12.30	1	0.90	2	1.80
Walking exercises	28	24.60	51	44.70	13	11.40	10	8.80	12	10.50
Bike	32	28.10	32	28.10	19	16.70	11	9.60	20	17.50
Running/jogging	18	15.80	53	46.50	28	24.60	6	5.30	9	7.90
Aerobic	36	31.60	51	44.70	8	7.00	9	7.90	10	8.80
Swimming	29	25.40	53	46.50	16	14.00	7	6.10	9	7.90
Dancing	61	53.50	35	30.70	8	7.00	1	0.90	9	7.90
Football	44	38.60	36	31.60	9	7.90	12	10.50	13	11.40
Badminton	32	28.10	44	38.60	25	21.90	6	5.30	7	6.10
Volleyball	64	56.10	35	30.70	6	5.30	5	4.40	4	3.50
Basketball	60	52.60	35	30.70	11	9.60	1	0.90	7	6.10
PAQ-A2										
Listening sport lesson	3	2.60	5	4.40	32	28.10	47	41.20	27	23.70
PAQ-A3										
Activities during take a rest	61	53.50	16	14.00	24	21.10	9	7.90	4	3.50
PAQ-A4										
Activities after back to home	12	10.50	30	26.30	48	42.10	14	12.30	10	8.80
PAQ-A5										
Activities at evening	26	22.80	29	25.40	37	32.50	16	14.00	6	5.30
PAQ-A6										
Activities during get weekend	17	14.90	25	21.90	45	39.50	17	14.90	10	8.80
PAQ-A7										
Statement state the activities	35	30.70	25	21.90	33	28.90	14	12.30	7	6.10
PAQ-A8										
Monday	34	29.80	21	18.40	47	41.20	4	3.50	8	7.00
Tuesday	25	21.90	23	20.20	44	38.60	20	17.50	2	1.80
Wednesday	32	28.10	19	16.70	42	36.80	15	13.20	6	5.30
Thursday	36	31.60	20	17.50	44	38.60	10	8.80	4	3.50
Friday	19	16.70	15	13.20	43	37.70	26	22.80	11	9.60
Saturday	21	18.40	16	14.00	45	39.50	25	21.90	7	6.10
Sunday	22	19.30	9	7.90	42	36.80	25	21.90	16	14.00

Table 3: Physical activities of adolescents (n=114)

Physical activities	Absolute frequency (n)	Relative frequency (%)
Mild	35	30.70
Moderate	71	62.30
Heavy	8	7.00

conducted, girls tend to have a higher risk of suffering from obesity than boys because female metabolism is slower than men, the basal metabolic rate of boys is 10% higher than girls. Due to this, women tend to convert more food into fat [25].

Table 4: Correlation physical activities with obesity incident among adolescents

Physical activities	Obesity				Total		p-value
	Yes		No				
	n	%	n	%	n	%	
Mild	24	70.60	11	13.80	35	30.70	0.00
Moderate	9	26.50	62	77.50	71	62.30	
Heavy	1	2.90	7	8.80	8	7.00	

Obesity is not only caused by eating mostly in terms of carbohydrates, fats, or proteins but also because of a lack of physical activity [26]. Obesity in adolescents is important to note because adolescents who are obese 80% have a chance to become obese as adults [6]. In addition, a high BMI in adolescents is predicted to increase the risk of death and cardiovascular disease. The results of previous studies conducted by Mikaelsson *et al*. [22] stated that adolescents who are obese can suffer from comorbidities such as Type 2 diabetes mellitus, liver, metabolic syndrome, and cardiovascular disease.

The results found that there was a relationship between physical activity and obesity among adolescents. This is in line with research conducted by Hong *et al*. date? That physical activity is negatively affected by obesity OR = 0.93. In this study, students who are obese tend to engage in mild physical activity. Childrenwho are less active in physical activity will become overweight [27]. Overweight children do not use the time off for physical activity. They spend time off at school with class activities. Some examples of physical activities that are more often carried out by obese adolescents include watching television, sleeping, playing mobile, playing station, hanging out with friends, sitting in the canteen, playing computer and internet, and reading novels. Watching television is the most activity often among all the sedentary activities mentioned above [23].

Obesity can affect physical activity. High body mass can trigger people to tend to be lazy to do activities and prefer to sleep, sit, eat, and rest [27]. The tendency of lack of physical activity decreases due to the modern lifestyle which causes the nutritional status of children above normal so that the child becomes overweight or obese. This is because children eat a lot, but lack of activity and the use of electronics make children lazy to move so that the energy that enters the body is far more than the energy used for activity and growth [28]. Limitation in this study, namely, the researchers did not randomize the sample. The implication of the study was for the health-care providers in the community to explain the benefitofphysical activity to prevent obesity.

Conclusions

The importance of this carried out assessment was to clarify the importance of physical activities among students for early detection of increased risk of obesity. In addition, providing education to adolescents about the importance of increasing daily physical activities with routine such as sport is very important.

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Personal Contribution

Dewi Elizadiani Suza conceived, reviewed the research process, design, and result analysis of research. Vina Miristia carried out the research. Hariati wrote manuscript.

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