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Correlation between Nutrition Status and Fitness among Elementary School Students in Bali Province

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Abstract

Lack of physical activity and excess energy consumption have an impact on increasing the prevalence of obesity in elementary school children. Furthermore, this condition is often associated with cardiorespiratory fitness. This condition certainly has an impact on increasing the risk of non-communicable diseases. It is necessary to know the nutritional status and physical fitness level in elementary school children so that early intervention can be done to prevent obesity among children. This study uses a cross-sectional study design. The population in this study were elementary school students aged 10-12 years in Bali Province. A total of 704 students were selected by purposive sampling. Data collected included the characteristics of respondents through interview methods, anthropometry measurements (BMI/Age), and fitness measurements. Fitness Tests are carried out using the single test method (a walk/run test as far as 1200 meters). Eligibility criteria are students aged 10-12 years, not in illness/disability, and willing to take a fitness test. Data were analyzed descriptively and analytically using the chi-square method. This study found that nutritional status for very thin, thin, normal, overweight, and obese were 3.6%, 19.5%, 46.1%, 29.6%, and 1.2%, respectively. Meanwhile fitness for less fit, quite fit and fit respectively were 64.1%, 22.7%, and 13.15%, respectively. There is a significant relationship obtained between age, sex, and nutritional status with fitness ($p < 0.05$). It is recommended to improve the nutritional status of overweight and obese students as well as increase physical activity among students to improve their fitness.

Keywords: Nutrition Status, Fitness, Elementary School

Abstrak

[Hubungan Status Gizi Dengan Kebugaran pada Siswa Sekolah Dasar di Provinsi Bali]

Kurangnya aktifitas fisik dan konsumsi energi berlebih berdampak pada peningkatan prevalensi obesitas pada siswa Sekolah Dasar (SD). Selanjutnya kondisi ini sering dikaitkan dengan tingkat kebugaran kardiorespirasi. Kondisi ini tentunya dapat berdampak pada meningkatnya risiko penyakit tidak menular, sehingga dirasakan perlu untuk mengetahui status gizi dan tingkat kebugaran jasmani pada siswa SD agar dapat dilakukan intervensi dini untuk mencegah peningkatan obesitas pada anak. Penelitian ini menggunakan rancangan cross sectional. Populasi dalam penelitian ini adalah siswa SD usia 10-12 tahun di Provinsi Bali. Sebanyak 704 siswa dipilih secara purposive sampling. Data yang dikumpulkan meliputi karakteristik responden melalui metode wawancara, pengukuran status gizi (IMT/U) dan pengukuran kebugaran. Tes Kebugaran dilakukan dengan metode single test (tes jalan/lari sejauh 1200 meter). Kriteria eligibilitas adalah siswa berusia 10-12 tahun, tidak dalam keadaan sakit/ cacat dan bersedia mengikuti tes kebugaran. Data dianalisis secara deskriptif dan analitik menggunakan metode chi square. Pada hasil penelitian ini didapatkan sebagai berikut, status gizi sangat kurus, kurus, normal, overweight dan obesitas masing-masing 3,6%, 19,5%, 46,1%, 29,6% dan 1,2%, sedangkan untuk kebugaran sebagai berikut kurang bugar, cukup bugar dan bugar masing-masing 64,1%, 22,7%, dan 13,15%. Didapatkan juga hubungan yang bermakna antara umur, jenis kelamin dan status gizi dengan kebugaran ($p < 0,05$). Disarankan perlu dilakukan perbaikan status gizi pada siswa overweight dan obesitas serta peningkatan aktivitas fisik pada siswa untuk meningkatkan kebugaran.

Kata Kunci: Status Gizi, Kebugaran, Siswa Sekolah Dasar

BACKGROUND

Cardiorespiratory fitness and obesity are often associated with reduced risk of death, cardiovascular risk factors^{1,2}, and academic achievement^{3,4}. But research showed that there has been a significant decrease in cardiorespiratory fitness among students. A longitudinal study conducted by Gerson et al (2013) showed a decrease in cardiorespiratory fitness among students in Brazil over the past 30 years^{6,5}.

Besides, the prevalence of obesity by a birth cohort was increasing from 1980-2015⁶. Increased prevalence of obesity is a major public health challenge worldwide⁸. The high prevalence of obesity does not only occur in developed countries but also developing countries⁹. According to the results of the Basic Health Research (Riskesdas), the prevalence of obesity in Indonesia was reported to increase from 10.5% in 2007, 14.8% in 2013 to 21.8% in 2018¹⁰. The prevalence of overweight and obesity in Bali Province is reported to have increased from 2013 to 2018. The prevalence of overweight and obesity in children aged 5-12 years was 12.8% and 8.8% in 2013, respectively. Whereas the prevalence of overweight and obesity increased to 13.0% and 10.6% in 2018, respectively¹⁰.

On the other hand, a decrease in physical activity was reported in the population aged ≥ 10 years. Riskesdas results revealed that the proportion of the Indonesian population with less physical activity was 26.1% in 2013 and was increasing to 33.5% in 2018. The proportion of the population with less activity was 14.2% in 2013 and increased to 20.6% in 2018 in Bali Province¹⁰.

Obesity and physical activity are often associated with cardiorespiratory fitness. Cardiorespiratory fitness measurement with maximal and submaximal methods is an indirect measurement often used to get a picture of cardiorespiratory fitness prevalence. Fitness measurement in Indonesia was carried out in 17 provinces by the Center for Physical Quality Development,

the Ministry of National Education in 2010 on 12,240 school children using the Indonesian Physical Fitness Test (TKJI). The measurement results showed 45% of students are not fit¹¹.

The correlation between obesity and fitness has been widely investigated but literature studies show inconclusive results^{12,13}. Given an increasing proportion of obesity and decreasing physical activity in Bali province, it is necessary to determine the cardiovascular fitness among elementary school students and its relation to nutritional status.

METHODS

A cross-sectional design was used in this study. Secondary data from fitness measurements conducted by the Bali Provincial Health Service in 2018 was analyzed. Nine schools were selected by the Department of Youth and Sports Education in 9 districts/cities. A total of 740 elementary school students were selected purposively.

Students with physical limitations and do not meet the PAR-Q and You test requirements were not included in the fitness measurements. All students who took part in the measurement were confirmed to be in good health, free from musculoskeletal dysfunction and cardiovascular diseases.

Fitness and anthropometric assessment were conducted on the same day. Cardiorespiratory fitness was measured by the submaximal method "Single test" (running or walking on 1,200 meters distance) following the ability of respondents and without being forced. Running time was recorded to determine students' fitness status. Fitness status is classified based on School Children Fitness Measurement Guidelines¹³.

Height and weight measurements were taken using a calibrated Scmic ZT 120 GEA to calculate BMI. Nutritional status was determined based on BMI/Age

(Ministry of Health, 2011). The data obtained were analyzed descriptively. Statistical significance between categorical variables was tested by the Chi-Square method using Statistical Package for the

Social Sciences (SPSS).

This study was approved by the ethics commission at the Faculty of Medicine of Udayana University (1638 / UN 14.2.2.VII.14 / LP / 2019).

RESULTS

Table 1. Characteristic (mean ± SD) of Elementary School Students in 2018

Parameters	Male (n=361)	Female (n= 379)	Total (n=740)
Age	10,6±0,6	10.5±0.5	10,6±0,5
Weight (kg)	36,7±9,7	36.5±3,2	36,6±9,3
Height (m)	1,4±0,1	1,4±0,1	1,4±0,1
BMI	18,5±3,6	18,1±3,2	18,3±3,4
Running time	7,0±1,3	7,6±1,4	7,3±1,4
Nutritional Status (BMI/Age)			
Very thin	14 (3,9%)	13 (3,4%)	27 (3,6%)
Thin	61 (16,9%)	83 (21,9%)	144 (19,5%)
Normal	156 (43,2%)	185 (48,8%)	341 (46,1%)
Overweight	123 (34,1%)	96 (25,3%)	219 (29,6%)
Obese	7(1,9%)	2 (0,5%)	9 (1,2%)
Fitness			
Less fit	246 (68,1%)	229 (60,4%)	475 (64,2%)
Quite fit	72 (20,0%)	96 (25,3%)	168 (22,7%)
Fit	43 (11,9%)	54 (14,3%)	97(13,1%)

Table 2. Relationship analysis of gender, age and nutrition status with fitness level

Parameters	Fitness Level			Total	p
	Less fit	Quite fit	Fit		
Gender					0,001
Male	246 (68,1%)	72 (19,9%)	43 (11,9%)	361 (100,0%)	
Female	229 (60,4%)	96 (25,3%)	54 (14,2%)	379 (100,0%)	
Age (year)					0,001
9-10	195 (57,5%)	85 (25,1%)	59 (17,4%)	339 (100,0%)	
11-12	280 (69,8%)	83 (20,7%)	38 (9,5%)	401 (100,0%)	
Nutritional status					0,000
Obese	9 (100%)	0 (0,0%)	0 (0,0%)	9 (100%)	
Overweight	177 (80,8%)	32 (14,6%)	10 (4,6%)	219 (100%)	
Normal	202 (59,2%)	83 (24,3%)	56 (16,4%)	341 (100%)	
Thin	72 (50,0%)	46 (31,9%)	26 (18,1%)	144 (100,0%)	
Very thin	15 (55,6%)	7 (25,9%)	5 (18,5%)	27 (100,0%)	
Total	475 (64,2%)	168 (22,7%)	97 (13,1%)	740 (100,0%)	

The results showed the average age of students was 10.6 ± 0.5 years and the average body weight was 36.6 ± 9.3 kg. In this study, no differences were found in the average age and weight of male and female students ($p > 0.05$). The average height of students was 1.4 ± 0.1 meters with a significant difference between male and female students' average height ($p < 0.05$).

An average BMI of students is 18.3 ± 3.4 kg/m² (Table 1.). The proportion of overweight and obesity in students was found to be 29.6% and 1.2%, respectively. This study also found the proportion of very thin and thin students was 3.6% and 19.5%, respectively. There was no significant difference between the average BMI in male and female students.

The average running time in fitness measurements was 7.3 ± 1.4 minutes. It was found that female students took significantly longer running time than men ($p < 0.05$). The level of students' fitness was then grouped based on running time and it was found that 64.2% of students had poor fitness levels, 22.7% of students had sufficient fitness levels, and 13.1% of students with good fitness levels.

There was a relationship between sex, age, and nutritional status with fitness for elementary students (Table 2.). The results found 100% of obese students and 80.8% of overweight students had less fitness level. The table also shows that thin and very thin students have less fitness. However, this study also found that 59.2% of students with normal nutritional status had fewer fitness levels.

DISCUSSION

This study found that 64.2% of elementary students were at a poor level of fitness and only 13.1% at a good level of fitness. Fitness measurements were carried out using the single test method which is a submaximal measurement method. The validity of a fitness test using the submaximal method is indeed less than the maximum method measurement such as the Multi-

stage Fitness Test (MFT), balke test, or cooper test. Individuals do the test longer when conducting maximum measurement so that physical performance will be more leverage. Whereas submaximal measurements are made with a certain distance benchmark but do not issue maximum power.

In this study, we also found that male students were less fit than female students. This result is in line with previous studies, which showed that more boys did not pass the fitness standard compared to girls (AOR = 1,710; 95% CI = 1,708-1,712)¹⁴. Before puberty, fitness in boys and girls is not much different. But after that, the average woman has a lower level of fitness than men. This might be caused by smaller muscle mass and greater fat mass in women than in men¹⁹.

It is found that there was a relationship between sex, age, and nutritional status marked by BMI/Age with fitness for elementary school students aged 10-12 years. This finding is in line with research conducted in Serbia in 2011 which stated a strong negative relationship between aerobic fitness and body fatness¹⁵.

A systematic review found that there is a relationship between being overweight and physical fitness¹². The relationship between body mass index and physical fitness is generally nonlinear (parabolic) in adolescents aged 10-17 years¹⁶.

From the results, it can be seen that poor physical fitness is not only observed in children with obesity and overweight but also those with normal nutritional status, thin and very thin children. These results are in line with research conducted in Brazil which found that the reduction in physical fitness was not only seen in overweight children but also those with normal weight¹⁷. It has occurred because nutritional status is not the only strong predictor to determine the level of fitness among school children. Physical activity is also another related factor to determine fitness level.

It is often assumed that physical

activity is causally related to the level of fitness. Regular activities reduce the workload of the hearth and have several direct effects on the hearth. A fit individual has a lower heart rate during physical activities, training/exercise, or rest¹⁸. The results showed that individuals who were more physically active tended to have a good level of fitness¹⁹. Another study also showed that fitness is positively related to physical activity. Therefore, it is suggested that increasing the level of physical activity can be an effective measure for increasing fitness levels among adolescents²⁰.

To achieve maximum academic and non-academic achievement, optimization of growth and development among school-age children needs to be done. One of the important things to note is the condition of physical fitness level¹¹. In its implementation, this study has several limitations. This study cannot explain the causal relationship. Selection bias might be occurred because of non-random sampling during the respondent selection for fitness measurements. The fitness measurement method used is an indirect measurement and the measurement results depend on the level of motivation of individuals in running 1200 meters distance. It is difficult to measure whether students apply maximum effort in conducting this test. This study also did not measure the level of physical activity which is a predictor of the fitness level.

CONCLUSION

It is concluded that there is a significant relationship between age, sex, and nutritional status with fitness in elementary school students. Less fit status is not only found in students with overweight and obese but also students with low nutritional status. It is recommended to improve the nutritional status of elementary school students to improve their fitness.

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