

Original Article

Obesity and academic performances in adolescents

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Abstract

Background Adolescence is a phase of dynamic development in human life, marked by rapid physical growth, in addition to mental, emotional, and social development. Adolescent obesity has been related to metabolic disease, in addition to psychological disorders, which may lead to a negative impact on academic performances.

Objective To assess academic performances in adolescents with obesity

Methods A cross-sectional study was conducted in Junior High School No. 14 in Bandung from December 2010 to July 2011. Subjects were aged 12 to 14 years, and were divided into two groups: obese or good nutritional status. Statistical analysis using Fisher's exact test was performed to assess the association of obesity and academic performances. T-test was used to compare subjects' mean mathematics and English performances in the two groups.

Results There were 240 students who met the inclusion criteria. Since there were 40 obese subjects in the first group, we randomized the remaining students to obtain 40 subjects with good nutritional status for the second group. Best academic performances in mathematics and English was obtained mostly by subjects in the good nutrition group (38/40 and 39/40, respectively). Statistical analysis revealed a significant association of lower performances in mathematics (mean difference -2.8; 95%CI -5 to -0.6; $P=0.043$) and English (mean difference -1.9; 95%CI -3.5 to -0.2; $P=0.001$) to obesity. We also found a significant association of better mathematics ($P=0.001$) and English performances ($P=0.004$) to the father's occupation. Additional English lessons were not associated with higher English performances in the obese group (mean difference 0.2; 95%CI -2.9 to 3.2; $P=0.885$).

Conclusion Obese adolescents tend to have poorer academic performances compared to those with good nutritional status. [Paediatr Indones. 2013;53:12-5.]

Keywords: *academic performances, adolescent, obesity*

In Indonesia in recent years, multiple nutritional problems in children have been observed. Although malnutrition is still widely found, obesity in adolescence has started to appear, especially in urban areas. Obesity may be caused by a complex relationship between genetic, physiological, metabolic, socioeconomic, lifestyle, and cultural factors.^{1,2} The National Basic Health Research (RISKESDASNAS) reports that the national prevalence of obesity in school children aged 6 to 14 years (school-aged) increased from 9.5% for boys and 6.45% for girls in 2007,³ to 10.7% for boys and 7.7% for girls in 2010.⁴

Obesity in childhood has been shown to be associated with several immediate health risk factors, such as degenerative heart disease, diabetes mellitus, and other degenerative diseases that may occur before or during adulthood. Obese children may show symptoms similar to those in obese adults, such as metabolic disorders of hyperinsulinemia, hyperlipidemia, and hypertension.¹ Obesity has adverse effects on adolescent development, especially psychosocial development.^{1,2} Obesity also affects children's psychosocial outcomes, such as low

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self-esteem and depression, which may affect other aspects of children's lives, such as academic performances.²

In adolescents, a negative association between excess weight and academic performances has been shown in several previous studies conducted in Korea,⁵ Portugal,⁶ and the US.⁷ These studies used different methods of assessment, such as open questionnaire,^{5,6} or mathematics and reading test scores.⁷ Although these studies had similar results on the association between obesity and academic performances,⁵⁻⁷ in developing countries such as Indonesia, obesity may occur for different reasons and educational methods may differ. Therefore, the aim of this study was to assess academic performances among Indonesian adolescents with obesity.

Methods

This cross-sectional study was conducted in Junior High School No. 14 in Bandung, West of Java, from December 2010 to July 2011. A previous study reported high obesity prevalence in adolescents at this school,⁸ so we performed this study on these students. Subjects were aged 12–14 years with obese or good nutritional status. This study was approved by the Health Research Ethics Committee of the Padjadjaran University Medical School in Bandung.

Anthropometric data collected were weight, height, and body mass index (BMI). Obesity and good nutritional status were determined using growth curve indicators developed by the World Health Organization Multicentre Growth Reference Study (WHO-MGRS) in 2007. Height was measured to the nearest of 0.1 cm using a portable stadiometer with subjects standing without shoes and facing the field worker. Weight was measured to 0.1 kg using a balance scale. Body mass index was calculated by dividing weight in kilograms by height-squared in meters (kg/m^2). Obesity was defined as BMI for age $> +3$ SD, while good nutritional status was defined as between $+2$ SD and -2 SD, according to WHO-MGRS 2007.⁹

Academic performances were determined from the mathematics and English scores in subjects' school report cards. Academic performances outcomes were classified as very good (score > 80), good (score $70-80$), sufficient (score $65-69$), and failed (score

< 65).¹⁰ Socioeconomic factors, such as parental education and occupation, family income, as well as additional mathematics and English lessons taken were collected by questionnaires filled by parents.

Fisher's exact test was used to determine the relationship between obesity and academic performances. T-test was used to compare the difference in means between the two groups. Results were considered to be statistically significant test for P values < 0.05 . Statistical analyses were done with statistical software SPSS version 17.0 for Windows (SPSS, Inc., Chicago, Illinois, USA).

Results

During the study period, 240 students were eligible for enrollment. There were 40 obese subjects, so we selected randomly the remaining students to get 40 subjects with good nutritional status. Characteristics of subjects are shown in **Table 1**. The obese group consisted of 26 boys and 14 girls, while the good nutritional status group consisted of 14 boys and 26 girls. Twelve subjects of obese group and 14 subjects of good nutritional status group were assigned to additional English lessons, while no subjects of either group were assigned to take additional mathematics lessons.

Table 2 shows nutritional status as well as taking additional English lessons as they related to mathematics and English performances. Fisher's exact test revealed a significant association between obesity and lower academic performances in mathematics

Table 1. Characteristics of subjects

Characteristics	Groups	
	Obese n=40	Good nutritional status n=40
Sex, n (%)		
males	26 (65)	14 (35)
females	14 (35)	26 (65)
Age, n (%)		
12 years	1 (3)	4 (10)
13 years	31 (77)	28 (70)
14 years	8 (20)	8 (20)
Additional lessons, n (%)		
Mathematics	0	0
English	12 (30)	14 (35)

Good nutritional status: BMI between -2 SD and $+2$ SD; Obese: BMI $> +3$ SD

Table 2. Nutritional status and additional lessons as they relate to mathematics and English performances

Groups	Mathematics				English			
	Very good	Good	Mean difference (95%CI)	P value	Very good	Good	Mean difference (95%CI)	P value
Obese, n (%)	32 (80)	8 (20)	-2.9 (-5.0 to -0.6)	0.043*	27 (68)	13 (32)	-1.9 (-3.5 to -0.2)	0.001*
Good nutrition, n (%)	38 (95)	2 (5)		0.011**	39 (98)	1 (2)		0.025**
Additional lesson								
Obese, n (%)	-	-	-	-	11 (91.7)	1 (8.3)	0.2 (-2.8 to 3.2)	0.461*
Good nutrition, n (%)	-	-	-	-	14 (100)	0		0.885**

Note: * Fisher's exact test; ** t-test

(mean difference -2.9; 95%CI -5 to 0.6; $P=0.043$) and in English (mean difference -1.9; 95%CI -3.5 to 0.2; $P=0.001$). Using t-test, there was not a significant difference in English performances between the two groups among those who took additional English lessons (mean difference 0.2; 95%CI -2.8 to 3.2; $P=0.885$).

Discussion

We found that obese adolescents had lower performances in mathematics and English than adolescents with good nutritional status. Socio-economic factors and additional English lessons were not significantly associated with academic performances.

Similar results by a different study method, Datar *et al.*⁷ reported that overweight children had lower grades than children of normal weight in mathematics and language achievement. However, they used math and reading test scores to measure children's cognitive skills. In our study, we used mathematics and English performances scores, because these parameters better reflect intellectual ability.¹¹

Although previous studies reported similar results on the association between obesity and lower academic performances,⁵⁻⁸ children's heights and weights were based on parent reports. Children's heights and weights change rapidly, hence, parent reports could introduce a high measurement error, such that even a substantial effect could be rendered statistically insignificant.

Our study, however, had several limitations that may be addressed in future study. The primary

limitation was the cross-sectional nature of the analyses. Although we controlled for a number of factors thought to confound and mediate the relationship between weight and academic performances, it was possible that the direction of causation was reversed or that some unmeasured variable caused both weight gain and poor performances. Also, learning achievement scores in this study were only taken from school report cards. Other factors that may also play a role in causing lower academic performances in the obese group were the level of school absenteeism and psychosocial problems. An assessment of psychological disorders in childhood obesity is needed.

In conclusion, adolescents with obesity have lower academic performances than those with good nutritional status. Further study is needed to evaluate other factors that might affect academic performances, such as the level of school absenteeism, as well as psychological problems faced by obese children.

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