ORIGINAL ARTICLE

Correlation between Body Mass Index and Physical Activity with Scoliosis in Young Adult

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ABSTRACT

Background: Scoliosis is a deformity of spine that has excessive lateral curve. The deformity could be caused by postural adaptation to an imbalance of local trunk muscles or by another risk factors. There are two risk factors, that are obesity and physical activity, which have not been studied in Indonesia yet about their correlation with scoliosis The aim of this study was to analyze the relationship between body mass index and physical activity with scoliosis in young adults.

Method: Study design was cross sectional. The subjects were High School students in Depok, recruited by consecutive non-random sampling. The body mass index (BMI) was measured by body weight (Kg)/body height (m^2). The intensity of physical activity measured subjectively by International Physical Activity Questionnaires (IPAQ). Detection of postural scoliosis was by inspection and palpation and the deviation measured by scoliometer. The data were presence in univariate and bivariate, analyzed by the Pearsen Chi-square.

Results: This study conducted in 165 subjects, the mean of age was 16-17 years old. There was no correlation between BMI and scoliosis (p=0,11). However the higher intensity of physical activity has correlated with the lower frequency of scoliosis (p=0.00).

Conclusions: The lower intensity of physical activity increase the frequency of the postural scoliosis, in the other hand there was no correlation between BMI and scoliosis in young adults.

Keywords : Scoliosis, Obesity, Physical activity

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INTRODUCTION

Scoliosis is a deformity of spine that has excessive lateral curve or side-to-side spinal curves. The imagination of scoliosis by X-Ray are "S" or "C" formation. Adolescent idiopathic scoliosis is a common disease with an overall prevalence of 0.47–5.2 % in the current literature. The female to male ratio ranges from 1.5:1 to 3:1 and increases substantially with increasing age. That are two classification of scoliosis, can be determined by physical examination, as functional/postural scoliosis and structural scoliosis.[1] Furthermore, a subject with scoliosis often unaware about the abnormality. However some patients complain about pain on the back, even spread out to the legs, besides be aware that there are several changes of the body shape, such as asymmetry on shoulder and hip.[2] Furthermore, there are many adverse effects may occur as a result of abnormalities of the posture, for examples impaired on mobility, stability and balance, as well as severe deformity of the thoracic, and deterioration of the cardiopulmonary function. Moreover, the increased of body curvature in scoliosis may rise the pain of the back, thus interfere the daily activities, and as a consequences is the degradation of quality of life. [1,3,4-6] In fact, many subjects with scoliosis still ignore those symptom, and do not realize about the risk factors.

There are various factors can affect the occurrence of scoliosis, i.e.; obesity, low physical activity, congenital abnormalities, and some bone diseases (achondroplasia, spondylolisthesis, osteoporosis, discitis, arthritis, spinal tumors).[7] Subjects with lower physical activity tend to have poor sitting position, as a result of the weakness of the postural muscles. The pattern of sitting position are bend forward accompanied by lateral deviation of the back, and then increase the risk of scoliosis. Some research proves that respondents who do regular physical activities, such as yoga, soccer, and volleyball have a better posture than who have less physical activity. Furthermore, the lower physical activity is the important risk factor for increase the obesity.[9,10,11] The studies have shown that higher BMI will aggravate the scoliosis curve and prolong post-surgical recovery of scoliosis.[12,13] Low intensity of physical activity causes weakness of the back muscles and increases obesity in young adult. The aim of this study was to analyze a relationship between body mass index and physical activity with scoliosis in young adults.

METHOD

Study design was cross sectional. The subjects were the students of High School in Depok, and recruited by consecutive non-random sampling. The study was conducted on November 2014.

The inclusion criteria were healthy students, able to communication, walking without any assistance, and sign the informed consent. The exclusion criteria were students who had any injury of the lower extremities and vertebrae, had lower extremity pain, or back pain.

The body mass index (BMI) was measured by; body weight (Kg)/body height (m^2). The category of BMI were; underweight (<18-20 Kg/ m^2), normoweight (>20-24,9 Kg/ m^2), overweight (>25-29,9 Kg/ m^2), and obesse (>30 Kg/ m^2).[12] The intensity of physical activity measured subjectively by IPAQ, that was classified in to; lower (≤ 600-1300 Mets), moderate (>1300-1500 Mets) , and high physical activity (>1500 Mets).[13]

Detection of postural scoliosis was by examiner's inspection from back of subjects on upright and forwarding bend posture. Examiner palpated both the illiac crist to determine the level, it mean scoliosis if the iliac crest was asymmetrically.[14] Inspection of forwarding bend posture will show the asymmetry of the back muscle, describe the deviation of spine. The degree of deviation was measured by the scoliometer.[15] The data were presence in univariate and bivariate, analyzed by the Spearman-rho test.

RESULTS

The study on 165 subjects with the male were 98 (59,4%). The range of age was 14 – 17 years old, with the mean age was 16,5 years old.

Characteristics of Subjects

Characteristics of the subjects were listed in Table 1.

Table 1. Characteristics of The Subjects

	n	(%)
Male	98	59,4
Female	67	40,6
Age		
14 - 15 years ol	73	44,2
16 - 17 years ol	89	54,0
Body Mass Index		
Underweight	66	40,0
Normal	78	47,3
Overweight	12	7,2
Obesity	9	5,5

Data in Table 1 revealed majority of the subjects was male (59.4%). The most age distribution was 16-17 years old (54%). The most prevalence of body mass index (BMI) was the normal weight category (47.3%).

Intensity of Physical activity. Almost all of the subjects have regular 90 minutes three days a week.

Table 2. The Intensity of Physical Activity

Intensity	n	%
Low	5	3,0
Moderate	115	69,7
High	45	27,3

Table 2 has shown the most subjects had moderate intensity in physical activity (69,7%).

The Frequency of Scoliosis

Table 3. The Frequency of Scoliosis

Scoliosis Examination	n	Percentage (%)
No	117	70,9
Yes	48	29,1
Total	165	100

Table 3 has shown the subjects who have scoliosis was 48 (29%).

The Relationship among BMI and Physical Activity with Scoliosis

Table 4. Correlation between BMI and Frequency of Scoliosis

BMI	Scoliosis		
	Yes (n)	No (n)	
underweight	25 5	1	
Normalweight	19 5	8	=0 ,11*
Overweight	0	6	
O$_L$esse	0	6	
Total	44 1	21	

*pearson chi-square

Based on table 4, there was no correlation between BMI and scoliosis with p= 0.11. The correlation between physical activity and scoliosis

Table 5. Physical activity and scoliosis

Intensity	Scoliosis		
	Yes (n)	No (n)	
Low	14	0	
Moderate	30	71	P=0, 0*
High	0	50	

*pearson chi-square

List of the data in Table 5 describe the distribution of frequency of scoliosis according intensity of the physical activity. The data has shown positive correlation between physical activity and scoliosis. The higher of physical activity has correlated with the lower frequency of scoliosis (p=0.00).

DISCUSSION

Scoliosis affects 2–3% of the United States population, which is equivalent to about 5 to 9 million cases. The age of onset is usually between 10 years and 15 years in children and adolescents, making up to 85% of those diagnosed.[17] Result of this study found the scoliosis incidence was 48 (29.1%). Subjects age was range between 16-17 years old. The data from this study has shown that was 12 subjects who had high BMI (overweight and obese), and no one has any scoliosis. The test found no correlation between BMW and scoliosis. Result of data obtained in this study do not support the previous studies, ie higher BMI will worsen the scoliosis curve. [12] In fact, in in this study found only a few subjects who experienced underweight 12 (7,2%) and obese 9 (5,5%), so have not get a more careful analysis of the correlation between BMI and scoliosis. On the other hand, in this study was found 14 subjects with low intensity of physical activity, and all of them have the scoliosis. Besides, on the fifty subjects who have high intensity of physical activity, there were no subject who have scoliosis. As a result, the correlation test found the correlation between lower intensity of physical activity and increased of frequency in scoliosis. This study agreed with the some research found that subjects who have physically active, have better posture.[9-11] Subjects who performed regular physical activity will have good muscle strength and balance to support the spine. Furthermore, subjects with lower physical activity, will spending many time for sitting, that may interfere the muscle mass, including the muscle supported the spine, loose of ligaments supports vertebra, and create scoliosis.[15,17-19]

CONCLUSION

The higher BMI and the lower intensity of physical activity increase the frequency of scoliosis. Further study is necessary to analyze effect of physical activity on the BMI and the scoliosis on longitudinal study.

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