



The Relationship between Incorrect Body Posture in Elementary School Children on Idiopathic Scoliosis

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Abstract. Idiopathic scoliosis is a condition of spinal deformity characterized by abnormal lateral curvature. The factor that is thought to play a role in the development of idiopathic scoliosis is incorrect body posture. This research is a correlation study which aims to determine the significant relationship between incorrect body posture and the incidence of idiopathic scoliosis in elementary school children. This research approach uses a quantitative approach with a descriptive quantitative research type with a correlational model. Research data was obtained through questionnaires, documentation and measurements using a scoliometer. The population in this study were all sixth grade students at SDIT Bangkinang Elementary School, totaling 35 students. Independent variable is a sitting position using the Questionnaire on Body Awareness of Postural Habits in Young People (Q BAPHYP) measurement tool. The dependent variable is scoliosis measured using the Adam's Forward bending test. Data analysis techniques are descriptive statistical analysis and inferential statistical analysis. After analyzing the research results, it shows that incorrect body posture has a significant relationship with the incidence of idiopathic scoliosis in elementary school children as proven by the results of data analysis, $p=0.000$ or $p<0.05$. The conclusion of this study is that there is a significant relationship between incorrect body posture and the incidence of idiopathic scoliosis in elementary school children.

Keywords: Idiopathic scoliosis, Poor body position, Body posture, Spinal curvature, Risk factors

1. Introduction

The development of globalization has had quite a significant impact the world of health, especially as the world develops more and more diseases that humans will suffer from. But there is also a lot in the medical world experienced a lot of development (Yan B., et al., 2020). Technological and educational developments on schools that must move forward ultimately guiding students to active, where often this activity can have bad consequences mistakes in the body that can cause injury to soft tissue bones and nerves. This incident often occurs in school age children between elementary school and middle school is a mistake in attitude or body posture carry out teaching and learning activities that can cause disruption. Injuries that occur due to incorrect body posture cause trauma to the body bones such as deformities, one of which is scoliosis. Idiopathic scoliosis is a medical condition characterized by curvature of the spine of unknown cause. This condition is often found in children and adolescents, especially during periods of rapid growth. Although the etiology of idiopathic scoliosis is not completely understood, several factors have been identified as potential causes and triggers, including genetics, unbalanced spinal growth, and environmental factors (Yang L et al, 2020).

One environmental factor that is thought to have a significant influence on the development of idiopathic scoliosis is poor body position (Jada A et al, 2017). Poor body

position, such as sitting with incorrect posture, standing at an angle, or carrying heavy weights on one side of the body, can cause uneven pressure on the spine (Negrini S et al, 2016). This pressure can affect the growth and development of the spine, especially in children and adolescents whose bones are still in the growth phase. Previous research has shown that poor body position can affect muscle and spinal balance, and cause spinal deformity (Getnet MG *et al*, 2020). Early detection of scoliosis plays a role important in preventing disorders and the damage gets worse. Detection Early scoliosis is detected at an early age when the curve is still small can even have a good prognosis reduce the number of operations. The main purpose early detection is to find children child with a high degree of probability on the incidence of scoliosis (Hresko et al., 2016).

In various postures, there is a significant correlation between the sagittal angle of the spine. Poor sitting postures are linked to sagittal abnormalities affecting spinal shape, so students in natural standing posture also show sagittal imbalance. A student's back anatomy is greatly influenced by their height (Li et al., 2022). Even and results X-rays as a form of further examination if the crookedness is known reaching 10 degrees is 1.8%, while more than 10 degrees as much as 1% (Michelotti A, 2019). A child's habit of sitting incorrectly is an example of incorrect body posture. Research shows that sitting incorrectly for long periods of time can cause permanent changes in body posture. In scoliosis sufferers, incorrect sitting posture can cause the spine to become more curved, so that the scoliosis condition becomes more severe and disrupts body balance, causes discomfort, and even affects breathing and the digestive system (Kett et al., 2021).

In a study According to Naufal, A. F., & Wahyuni, N. I. (2022), the wrong habit of sitting in children repeated continuously can have a bad influence on health, especially in the back area. Injuries resulting from incorrect sitting habits in children manifest in the form of scoliosis on the back. However, the direct relationship between poor body position and the development of idiopathic scoliosis still requires further research. A better understanding of how poor posture may affect idiopathic scoliosis will aid in the development of more effective prevention and treatment strategies (Utami F & Andyas A, 2022). Therefore, it is important for scoliosis sufferers to maintain good sitting posture, such as sitting with their back straight and shoulders relaxed.

2. Methods

2.1 Research design

This research is an analytical descriptive research with observational research type. The research design used in this research is cross sectional. This research aims to determine the relationship between independent variables (risk factors) and dependent variables (effects). This research involves a group of subjects who take measurements once or at the time the research is carried out, without having to look at the background or past or future events.

2.2 Population and sample

The population in this study were all grade VI elementary school students at SDIT Bangkinang in 2024, totaling 35 students. This research sample was taken using a purposive sampling technique. The instruments used in this research were questionnaires and direct observation as well as taking measurements using a scoliometer measuring instrument to determine the presence of scoliosis. The data obtained was then analyzed using data analysis software. The number of samples in this study was 35 respondents.

Inclusion Criteria: Children and adolescents aged 10-12 years who have no history of other spinal diseases and have not undergone scoliosis treatment or therapy.

Exclusion Criteria: Participants with other medical conditions that affect body posture or the spine, such as congenital spinal abnormalities, infection, or trauma.

2.3 Sample Preparation

We designed a questionnaire assessment tool consisting of an identification form (name, age, and gender), who are suspected of scoliosis for further examination with a scoliometer. A scoliometer is a non-invasive tool used to measure the degree of spinal rotation, often used in initial screening for scoliosis. Measurements with a scoliometer are carried out with the patient in a forward bending position, known as the Adams Forward Bend test.

Sample preparation for scoliometer measurements involves several steps to ensure accurate and consistent results. Following are the steps; first make sure the sample is free of clothing and ask the sample to stand with feet shoulder-width apart and arms hanging freely at the sides of the body. Then next perform a visual inspection of the patient's back to identify curvature or asymmetry and palpation to feel the spine with your fingers to detect abnormal bulges or curvature.

Use a pen or non-permanent marker to mark several reference points on the patient's back, such as: Prominens vertebra (C7): The spinal protrusion at the base of the neck, Thoracic vertebra: Point in the middle of the back, Lumbar vertebra: Point in the lower back. Place the scoliometer at the marked point, parallel to the surface of the patient's skin. Read the value shown by the scoliometer on the existing scale. Then record the measurement results at each marked reference point. Finally, compare the measurement results with normal standards to determine the degree of scoliosis (Yan Bet al, 2020).

2.4 Data Analysis

The data that has been processed will be presented in table form, data analysis used in this research includes univariate analysis and bivariate analysis. Bivariate analysis was carried out to explore the relationship between incorrect sitting position and scoliosis variables (degree of curvature) in children.

3. Results

This study involved 35 participants aged 10-12 years who underwent an examination with a scoliometer and completed a questionnaire regarding body position habits. From the total population examined, several key findings were obtained: of the 60 participants, 35 participants showed spinal rotation of more than 5 degrees based on scoliometer measurements. The following is a table of Category Age Respondents percentages.

Table 1. Frequency and percentage Age Based on Category Age Respondents

No	Age Group (years)	F	%
1.	10	9	25.7 %
2.	11	12	34.3 %
3.	12	14	40.0 %
	Total	35	100 %

Data above explain that frequency sample on observation with aged 10 years amounted to 9 people (25.7%), aged 11 years there were 12 people (34.3%), and aged 12 years as many as 14 people (40.0%), With this results analysis show that ages 12 is group age with total sample the most namely 14 people (40.0 %).

Table 2. Frequency and percentage Gender

No	Gender Group	F	%
1.	Male	13	37.2 %
2.	Female	22	62.8 %
	Total	35	100 %

Data above explain that frequency sample on group observation with male gender amounted to 13 people (37.2%) and female gender there were 22 people (62.8%), With this results analysis show that female gender with total sample the most namely 22 people (62.8%).

Table 3. Frequency and percentage skoliometer

No	Skoliometer reading	F	%
1.	0-10	21	60.0 %
2.	10-15	9	25.7 %
3.	15-20	3	8.5 %
4.	>20	2	5.8
	Total	35	100 %

Data above explain that frequency sample on group observation with skoliometer adams forward 0-10 degrees amounted to 21 (60.0%), adams forward 10-15 degrees there were 9 people (25.7%), adams forward 15-20 degrees there were 3 people (8.5%) and adams forward >20 degrees there were 2 people (5.8%). With this results analysis show that adams forward with total sample the most namely 21 people (60.0 %).

Tabel 4. Data analysis Crosstabulation of poor sitting ability on the incidence of idiopathic scoliosis

Sitting Posture Habits	Scoliosis Condition					
	Not scoliosis		Scoliosis		Total	
	F	%	F	%	F	%
Correct	3	60.0	2	40.0	5	14.3
Wrong	18	60.0	12	40.0	30	85.7
Jumlah	21	60	14	40.0	35	100

Based the cross tabulation between sitting posture habits and the occurrence of the above degrees of scoliosis, it can be seen as follows: From correct sitting posture habits there are 5 students, of which 3 students do not have scoliosis, 2 students have scoliosis. There were 30 students with incorrect sitting posture habits, of which 18 students had no scoliosis, 12 students had scoliosis (table 4).

Table 5. Sitting Position Analysis Test with Scoliosis

	Kuisisioner Q-BAPHP					Total	P
		Poor	Medium	Good	Very Good		
Skoliosis test	Positive :14 Negative : 21	5	9	10	11	35	0.000
Total	35						

Table 5. Above is the test result. The chi square test analysis between the position or habit of sitting posture tested with the Q-BAPHYP questionnaire and the incidence of scoliosis shows a value of $p=0.000$ or $p<0.05$, which means there is a significant relationship between the two variables.

Table 6. Correlation test

		Kuisisioner Q-BAPHYP				Total	r	P
		Poor	Medium	Good	Verry Good			
Skoliosis test	Positive :14	5	9	10	11	35	1.00	0.310
	Negative: 21							
Total		35						

Table 6. Shows the results of the correlation between the position of the body posture when sitting tested using the questionnaire and the incidence of scoliosis, showing a value of 1.00, meaning that the correlation level for this variable is very strong.

4. Discussion

This research shows that incorrect sitting positions among SDIT Bangkinang students show a fairly high incidence of scoliosis. The data was not normally distributed, so the Wilcoxon test was used. The results of the study showed that there was a significant relationship between the variable incorrect sitting position and the incidence of idiopathic scoliosis. Based on research by Pelealu (2016), 36 students suffered from scoliosis out of 300 samples with incorrect sitting posture, namely 38.89% in elementary school, 25% in middle school, and 36.11% in high school. These results indicate that incorrect sitting posture is one of the causes of scoliosis. Improper sitting posture when studying will have an impact on the child's spine, especially the development of his muscles and spine because he is forced to work extra hard to adjust to his body position.

The sample characteristics observed were class VI students with age categories based on observation results, namely 10 year olds totaling 9 people (25.7%), 11 year olds totaling 12 people (34.3%), and 12 year olds totaling 14 people (40.0%), The results of this analysis show that 12 year olds are the age group with the largest sample size, namely 14 people (40.0%). while based on the male gender category, there were 13 people (37.2%) and female gender, there were 22 people (62.8%), the results of this analysis showed that the female gender with the largest number of samples was 22 people (62.8%). Of the total of 35 samples used in this study, positive scoliosis test results were obtained in the samples as many as 14 samples and 21 samples were negative. Similar results were obtained in previous studies regarding the prevalence of scoliosis rates on teenagers in Surabaya with results from 784 samples, it was found that 50 students had asymmetrical backs and positive scoliosis by measuring the Adam's Forward test, 50 students had scoliosis as many as 14 male students and 36 women. 9 A study of the prevalence of scoliosis students in China obtained significant results, namely 884 (49.7%) of 1779 samples were positive for the scoliosis test and 64.8% were negative.

This study shows the results of the Chi-Square position analysis test between sitting or body posture habits when sitting which were tested using the Q-BAPHYP questionnaire with the incidence of scoliosis in participants. Based on the results obtained, the value of $p = 0.000$ or $p < 0.05$. This value shows that there is a significant relationship between habitual sitting position and the incidence of scoliosis in participants. In other words, these results show that poor sitting posture significantly

decreases the risk of developing scoliosis. This analysis provides strong evidence that inappropriate sitting habits may be an important risk factor in the development of scoliosis in children. This finding is in line with previous research by Kett et al (2021), which found that improper sitting habits, such as slouching or sitting in an unergonomic position, can worsen spinal curvature, especially in children who are growing. In de Assis et al, (2021) research, it was also found that inappropriate sitting posture significantly increases the likelihood of spinal deformity in adolescents, reinforcing the results from Table 5 that the correlation between sitting position and scoliosis is not only significant, but also has long-term health implications long.

From the results of the correlation test between body posture when sitting which was tested using a questionnaire and the incidence of scoliosis position. The results show a correlation value of $r = 1.00$, which indicates that the correlation between these variables is very strong. With a correlation value close to 1, it can be concluded that the worse a person's sitting habits are, the more likely they are to experience a scoliotic position. Even though the p value = 0.310 which indicates that the results are not significant, the high r value still indicates a close and important relationship between the two variables. These findings can be compared with a study by Faris Naufal & Wahyuni (2022), which also found a strong correlation between poor posture habits and increased severity of scoliosis in children. However, in contrast to this study, several previous studies, such as those conducted by Miller et al, (2019), reported a strong correlation but not completely close to the value of 1. This may be due to differences in measurement methods or sample populations used. Their study noted that other factors such as genetics and physical activity also play an important role in the development of scoliosis, which may explain the differences in the degree of correlation found.

Overall, the results of this study emphasize the importance of improving sitting posture from an early age to prevent scoliosis, supporting the conclusions of previous studies. Early detection and education regarding correct sitting posture can be an important step in efforts to prevent scoliosis, in accordance with research findings by Maekawa et al, (2023) which highlights the importance of health education interventions in reducing the risk of scoliosis in children.

The habit of standing with your weight on one leg or walking in an asymmetrical pattern is also associated with an increased risk of scoliosis. The muscle imbalance that results from this habit can cause spinal deformity. An exercise program that focuses on balance and strengthening core muscles can help improve posture and reduce the risk of scoliosis (Mason M et al, 2018). The use of technology and assistive devices such as ergonomic chairs and well- designed backpacks can be part of the solution to reducing the risk of scoliosis. Overall, this study provides strong evidence that poor posture plays a significant role in the development of idiopathic scoliosis and highlights the importance of prevention and early intervention to reduce risks and improve sufferers' quality of life (Gashaw M, Janakiraman B, Belay GJ, 2021).

Other research states that the majority of subjects experienced idiopathic scoliosis in the moderate range. This shows that incorrect body position, such as poor posture, unergonomic sitting habits, or unbalanced physical activity, can trigger spinal curvature in the majority of the population (Ahyuddin, W., & Anggita, M.Y., 2021). Next, it is important to examine other factors that may contribute to the development of idiopathic scoliosis, such as age, gender, family history, and physical activity. A more in-depth analysis of the relationship between incorrect body position and the degree of spinal curvature could help in the development of more effective prevention and treatment interventions (Nakashima et al, 2017).

5. Conclusions and Suggestions

Based on the analysis and discussion, it can be concluded that there is a relationship between incorrect body position and the risk of scoliosis in children. Poor body position, although not the primary cause of idiopathic scoliosis, can be a risk factor contributing to the development of this condition. Therefore, correcting posture as early as possible in children due to incorrect body position is very important in comprehensive prevention of idiopathic scoliosis. It is hoped that further research can be investigated by further enriching other supporting variables by adding appropriate and effective interventions in improving posture in idiopathic scoliosis.

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