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Prototype of Health Education to Improve the Quality of Life of Students with Scoliosis

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ABSTRACT

Background: Adolescent idiopathic scoliosis (AIS) is a malalignment vertebra that occurs in adolescence and develops at 11 – 18 years old. This condition could worsen due to poor posture habits and heavy load on one side during daily activities. This study aims to examine whether the prototype health education impacted the quality of life of students with scoliosis.

Methods: This research used quasi-experimental with pre-test and post-test design. This study's population was all Public Junior High School students in 289 Jakarta. Moreover, a purposive sampling technique was used. Fifteen students participated and completed all the interventions. The participant conducted a posture assessment using a postural grid, and then the degree of the spine curve was measured using a scoliometer, and the pain was measured by the Visual Analog Scale (VAS). For evaluation, it will focus on knowledge about scoliosis, posture, pain level, and quality of life.

Results: The Wilcoxon test shows significant differences between before and after the intervention on the knowledge ($p<0.001$; $z = -3.535$), degree of scoliosis ($p<0.5$; $z = -2.264$), pain level ($p<0.5$; $z = -2.232$), and quality of life scores ($p<0.01$; $z = -2.848$). A pre-test and post-test correlation test was carried out using the *Spearman* test. There was a correlation between pain and the student's quality of life ($r=0.551$).

Conclusion: The prototype in this study could improve knowledge significantly but did not significantly improve students' quality of life. However, it showed that reducing pain could improve the quality of life for students with scoliosis.

Keywords: adolescent idiopathic scoliosis (AIS); health education; physical exercise; physiotherapy education; scoliosis.
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INTRODUCTION

Scoliosis is a three-dimensional spinal disorder developing in children and adolescents identified as vertebral curve deviation. Adolescent idiopathic scoliosis (AIS) commonly occurs in children between 11 and 18 years of age.[1] Based on the current report in Korea, the school population has a high probability of developing scoliosis at 10 to 19 years, affecting 234.446 children. Some cases were previously diagnosed through early screening of idiopathic scoliosis at the age of 10 to 14 years, affecting 155.332 children, as well as at the age of 15 to 19, affecting 199.114 children.[2]

The National Scoliosis Foundation USA revealed that nearly 4.5% of the global population suffers from scoliosis. The most common causes of this condition in 80 % of cases are idiopathic. Otherwise, specific reasons are still unknown. Scoliosis is the leading cause of deformity in the spine. The most significant number of people struggling with pain, in more severe cases (the curvature exceeding 60), might lead to cardiopulmonary condition.[3] The most common cause for the severity of scoliosis is habits that lead to poor posture, such as sitting position and lifting heavy loads in a student's backpack.[4]

Previous research on teenagers aged 11-16 showed that 39 respondents (100%) have problems with posture. Patient education on good posture is vital in preventing spine alignment deformity, especially for those experiencing problems due to severe scoliosis. Abnormal curvature potentially affects the spinal condition due to limited knowledge and understanding about good posture among school children while sitting in class and carrying a school bag.[4] Health education focusing on scoliosis problems (pain, lack of balance, lack of coordination, and poor quality of life) might reduce the severity and improve the activity of daily living. Identification and prevention of scoliosis will benefit in decreasing complaints due to the severity of curvature of the spine.[5] The environment could either be the factor that restricted or facilitated people with scoliosis in daily living activities.[6]

Patient education is a facilitation method to stimulate students through increasing awareness of further complications and dealing with scoliosis.[7] The treatment of scoliosis patients in Indonesia often results in delays due to a lack of awareness of patients and families. Poor sitting habits could provoke back pain and spasms in back muscles as the spine develops an outward curve to one side of the body.[7] The long-term cost of scoliosis care could burden the patient because of the high frequency of intervention.[8] Early screening for obtaining the prevalence of AIS has been conducted since 2010

in Surabaya, Indonesia. The research was conducted on 784 elementary and junior school students (40.2% were boys and 59.8% were girls). The result showed that 6.37% were positive for scoliosis using Adam's Forward Bending test. The prevalence of AIS in Surabaya was 2.93%; however, there was no data on scoliosis cases in teenagers in each city in Indonesia.[9]

Previous research showed a relationship between backpack loading and scoliosis risk in teenagers. However, there is no additional information about the weight of carrying the backpack and characteristic respondents.[10] Scoliosis education for maintaining body posture could inform the students about controlling posture, such as sitting and standing posture and proper weight in students' backpacks.[11,12] Performing core stabilization exercises were practical to improve posture in idiopathic scoliosis. Physiotherapy Scoliosis-Specific Exercises (PSSE) is a design program for scoliosis care, including educational material on scoliosis, observation or supervision, psychologist's support and intervention, bracing, and surgical.[13] Therefore, this study aims to examine whether the prototype health education impacted students' quality of life with scoliosis.

METHODS

A quasi-experimental (pre-post) design study was conducted on students at Public Junior High School 289 Jakarta who underwent. The research flow was shown in Figure 1. Participants with an indication of scoliosis were measured by scoliometer to assess the spine's curve degrees shown in Figures 2 and 3.[14,15] The inclusion criteria in this research were a study with a scoliosis curve greater than or equal to 5 degrees. Exclusion criteria included students with vertebra fractures, neurological disorders, medical conditions preventing them from exercising, and students with severe scoliosis. The participants who met the requirements will be provided information regarding the procedure and informed consent that needs approval from the student, parent, and class teacher.[16]

The participants completed a questionnaire to analyze their knowledge of scoliosis, consisting of 5 questions about scoliosis and a questionnaire on quality of life using Scoliosis Research Society-22 (SRS 22) translated to Indonesia[17,18] and measures the pain level using Visual Analogue Scale (VAS).[19] The outcome was evaluated after students received intervention in the prototype health education program. The prototype health education involves education about scoliosis and its prevention, stretching and balance exercises, and a home program focusing on postural correction in sitting, standing, and walking.[20] The exercise intervention was administered five times for two weeks, as shown in Figure 4.

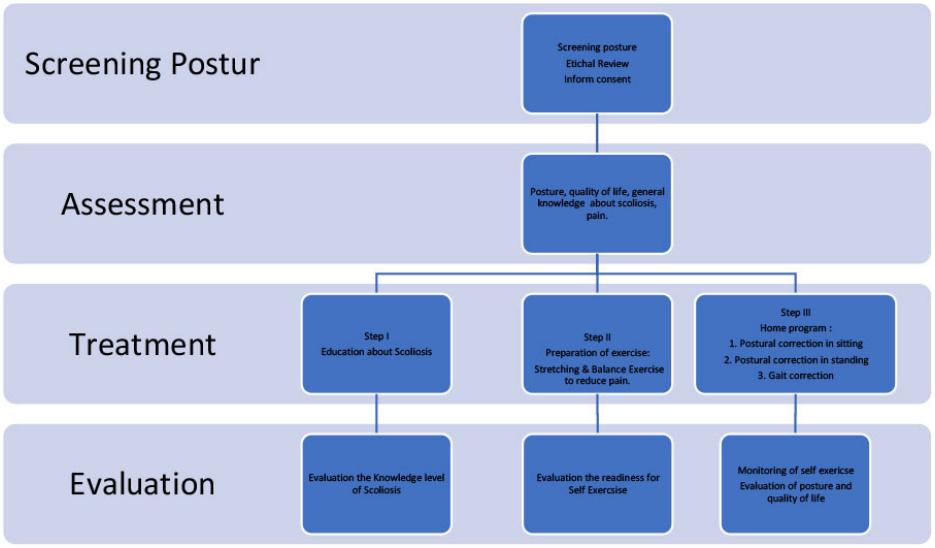

Figure 1. The research flow.

Figure 2. Posture Assessment.

RESULTS

The researcher initially screened all students and then only 18 students who met the criteria. However, only 15 students completed all interventions. There were six girls and nine boys ages 12-17 years (mean = 15.03). Data for pain level showed 1.40 (standard deviation (SD)=1.99), degrees of curvature between six to eighteen degrees (mean = 7.78, SD = 3.52), and

basic knowledge related to scoliosis has an average score of 3 (SD=0.9). Quality of life has an average score of 4.03 (80.67%) (SD=0.5), shown in Table 1.

This study used the *Wilcoxon;* the table below shows the result. Overall, the basic knowledge for all students was improving compared to the pre-test. Regarding the degree of scoliosis curve, 6 participants had a reduction in the scoliosis curve, and 9 participants had no improvement. In pain level, six participants reported good results in reducing pain; nine participants had no difference from the pre-test. The least 10 participants increased their quality of life score, and 5 participants had no change between the pre-test and post-test, with a mean score from 4.03 (80.67%) to 4.16 (83%) (p<.010) shown in Table 2.

Spearmen's correlation analysis was utilized to find the correlation between variables shown in Table 3. The result demonstrated that severe pain significantly correlated with poor quality of life (r=.551). On the other hand, mild pain would increase the quality of life.

Figure 3. Scoliosis Assessment.

Figure 4. Stretching, Balance Exercise, and Home Program.

Table 1. Characteristic respondents

Characteristic respondents	Frequency	Percentage
Age Group		
12-13 years	1	6.7%
14-15 years	12	80%
16-17 years	2	13.3%
Gender		
Girl	6	40%
Boy	9	60%
Basic Knowledge		
Limited	15	100%
Good	0	0%
Pain		
No pain (0-1)	8	53%
Mild (1-3)	3	20%
Moderate (3-5)	2	13%
Severe (5-7)	2	13%
Very severe (7-9)	0	0%
Worst pain possible (9-10)	0	0%
Quality of Life (Mean)		
4.03 (80.67%)	15	100%
Total	15	100%

DISCUSSION

Idiopathic scoliosis is the most common in children around ten years old and above. Idiopathic scoliosis is often ignored and unnoticed. Scoliosis has severe impacts on the physical and mental health of children and adolescents. Moreover, deformities in scoliosis may rise significantly, especially during periods of rapid growth and development in children.[2]

Various research showed that bad posture in adulthood might develop from childhood and be associated with the causes of scoliosis. Therefore, early detection of scoliosis through screening is essential to prevent further posture deformities and treatment outcomes.[21] The proper diagnostic test should have good sensitivity and specificity. A scoliometer is a suitable tool to assess scoliosis. According to the American Academy of Orthopedic Surgeons (AAOS), examining Adam's forward bend with a combined scoliometer is recommended for scoliosis screening. This method was carried out in this research.[2]

In this study, a cut-off score of 5 degrees was used. According to the score, there are 18 students with scoliosis curvature degrees above 5 degrees. Previous research in China reported that girls are more likely to develop scoliosis than boys.[22] Contrasting results showed in this study that boys had a significant proportion of high scoliosis, reaching 60%, compared to girls. Some risk factors that affect posture alteration include heredity, poor posture habits, low physical activity levels, overweight, obesity, and other factors. Moreover, the school environment can lead to posture alteration due to some factors, such as inadequate physical environments in class, long periods of sitting, asymmetries of school bag straps, an uneven load of school bags, inappropriate footwear, and many other factors.[23]

Idiopathic scoliosis usually shows no symptoms. However, the more significant deviation of scoliosis could lead to back pain, lung problems, and physical appearance change. Thus, issues might impact people with scoliosis's low quality of life.[24] In this research, the quality of life was measured using Scoliosis Research Society-22 (SRS 22), which assessed five domains with 22 questions, including

Table 2. ***Wilcoxon*** **test**

Category		N	Mean Rank	Z	*P*-value
Basic Knowledge	Negative ranks	0	0.00	-3.535	<0.001
	Positive Ranks	15	8.00		
	Ties	0			
	N	15			
Scoliosis Curve	Negative ranks	6	3.50	-2.264	>0.050
	Positive Ranks	0	0.00		
	Ties	9			
	N	15			
Pain level	Negative ranks	6	3.50	-2.232	>0.050
	Positive Ranks	0	0.00		
	Ties	9			
	N	15			
Quality of Life	Negative ranks	0	0.00	-2.848	<0.010
	Positive Ranks	10	5.50		
	Ties	5			
	N	15			

N, frequency; negative rank: declining conditions; positive rank: improvement condition

Table 3. ***Spearmen's*** **correlation**

Category	Scoliosis Curve	Knowledge	Pain level	Quality of life
Scoliosis Curve	1			
Knowledge	-.190	1		
Pain	.074	.737	1	
Quality of life	-.038	.298	-.551**	1

**P-value <0.001

pain, self-image/appearance, function/activity, mental health, and satisfaction with management. The pain level was measured using VAS. From a total of 15 participants, it was found that 53% did not experience any pain. This could be related to the degree of scoliosis; all participants were classified as having a low degree of scoliosis (<20°). Similar results also explain in Kaya et al. research that a more significant deformity in the vertebra could induce higher pain intensity in people with scoliosis, and the lower pain intensity is associated with a lower degree of Cobb angle.[25]

Additionally, Urrutia et al. research identifies that scoliosis pain is due to several factors, including age. Pain increases with aging in people with idiopathic scoliosis, and this may lead to prolonged periods of pain. This study found a significant correlation between pain and quality of life in participants with idiopathic scoliosis. This is related to the nature of scoliosis, which involves posture deviation in three-dimensional. Therefore, abnormal joint, intervertebral disc, and muscle loading could induce pain.[26]

Basic knowledge about scoliosis, prevention, and treatment can be the factors that influence improving the quality of life for people with scoliosis. This research found that all the participants had poor knowledge. By providing learning material using a structural educational prototype, at the end of the post-test, it was found that the knowledge significantly improved. This result showed a high awareness level of the importance of exercise to prevent scoliosis from getting worse, as the participant showed good adherence to home exercise based on the prototype.[26]

Idiopathic scoliosis is a complex condition in orthopedic pathology that must be treated during growth using a proper treatment plan to achieve optimal results. Conservative treatment should be initiated in scoliosis patients below 25 to avoid or delay surgical treatment. Exercises for mild scoliosis are the first line of treatment that significantly impacts strength, spinal mobility, balance, and pain for people with scoliosis.[27]

In this study, there are several research limitations. First, the number of samples was small. Second, this study employed a one-group design with no control group. Third, due to the short duration of treatment, which was only conducted five times in two weeks. Thus, it is suggested that further research be conducted with a long-term period and a larger sample size.

CONCLUSION

This prototype was not significantly improving the quality of life of students with scoliosis, but it's improving respondent's knowledge significantly. However, the reduction of pain score significantly improved the quality of life.

ETHICAL CLEARANCE

Description of ethical approval No. 121/KEPPKSTIKSC/IX/2023 released by the Ethics Commission of Health Research and Development sint Carolus School of Health Sciences and declared ethically appropriate.

CONFLICT OF INTEREST

The authors declare that they have no potential conflict of interest in the publication of this research output.

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AUTHOR CONTRIBUTIONS

AWS formatted the study designs, collected and analyzed the data, and wrote the manuscript; DFF, PKS, CFH, N, WOR, AF, DNF, and SR directed data collection and revision of the manuscript.

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