

MINISTRY OF EDUCATION AND TRAINING  
**THAI NGUYEN UNIVERSITY**

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**CURRENT SITUATION AND EFFECT OF PREVENTION'S  
INTERVENTIONS IN PRIMARY SCHOOL PUPILS**

**IN THAI NGUYEN**

**Major: Public Health**

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**SUMMARY OF THE DOCTORAL THESIS IN MEDICINE**

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## INTRODUCTION

Scoliosis (VCS) is a condition in which the curve of the spine deviates to the side of the body axis by 10 degrees and the rotation of the vertebral bodies follows the axis of the horizontal plane. The disease causes major anatomical deformations, affects the development of children, leads to circulatory, respiratory, motor conditions and especially deviates the pelvis in girls, making it difficult to give birth later.

In addition to clinical intervention in hospitals, early detection, rehabilitation intervention in the community/family through improving knowledge, attitudes and practices on rehabilitation prevention and guidance for students and caregivers is very important.

With the increasing trend of scoliosis in recent years, along with that Thai Nguyen is growing, the population is increasing, schools are increasing, the number of students is also increasing many times. Therefore, this thesis is conducted with the objectives of:

*1. Describe the situation of scoliosis and some related factors in primary school students in Thai Nguyen in 2017*

*2. Evaluate the knowledge, attitude, practice and rehabilitation of scoliosis of the student's parents.*

*3. Evaluate the effectiveness of some scoliosis intervention solutions for primary school students in Thai Nguyen.*

### NEW CONTRIBUTIONS OF THE THESIS

- This is one of a few intervention studies aimed to change knowledge, attitudes, practices and rehabilitation for children with scoliosis focusing entirely on primary school students and caregivers, this is the age when learning habits are formed and greatly affect later development.

- Research results have shown that the overall rate of scoliosis among primary school students is 9.2%, of which Thai Nguyen city has 9.3%, Dong Hy has 8.8% of VCS students, and VCS rates in Phu Binh and Phu Luong are 9.7% and 9.0% respectively.

- The Scoliometer index at severe level decreased from 1.8% to 1.2%, mild from 67.7% to 75.4%, moderate from 30.5% to 16.8%, 11 cases back to normal.

### **THESIS STRUCTURE**

The thesis consists of 130 pages (excluding references and appendices), 4 chapters (Introduction 2 pages, overview 33 pages, object and research methods 25 pages, research results 32 pages, discussion 35 pages, conclusion 2 pages, recommendation 1 page), results with 35 tables, 132 references (42 Vietnamese, 90 English), 5 appendices.

### **LIST OF ABBREVIATIONS**

<b>Abbreviations</b>	<b>Full text</b>
VCS	: Scoliosis
Middle School	: Middle School
KAP	: Knowledge – Attitude – Practice
PHCN	: Rehabilitation

## **CHAPTER I**

### **OVERVIEW**

#### **1.1. Current situation of scoliosis and some related factors.**

##### ***1.1.1. Current situation of scoliosis***

The study was conducted in Hanoi high school students, but according to Dao Thi Mui, the prevalence of scoliosis in high school students was 18.91%. In which, the VCS rate in grade 1 is the lowest (16.37%) and in grade 9 is the highest (22.16%). In Thai Nguyen, research results by Nong Thanh Son and colleagues in the year 2000 showed that 389 children had VCS. The VCS rate in Thai Nguyen city area is 9.3%, Dong Hy district is 14.1%, the overall rate is 11.9%.

By referring to the research results and related documents we found that the incidence of VCS in Vietnam is still high. The incidence increases with age and common in middle school age. There is no consensus in the results of studies on the incidence between men and women. The results of studies show that the C-shaped VCS morphology is the most common, in which the forward C-shaped VCS morphology is more common than the inverted C.

### ***1.1.2. Some factors related to scoliosis***

A literature review suggests that there are many factors that can influence VCS status in children. Factors such as learning conditions, bad posture have been identified relatively clearly through the literature review. However, factors such as age, gender, insurance, or some other factors (ethnicity, family income, etc.) are not consistent in results between studies.

In addition, in Vietnam, studies to identify relevant factors and influencing factors for VCS status in children are still limited. To design effective interventions or good policy criticisms to reduce VCS in children. Studies that clearly identify factors affecting VCS in children should continue to be carried out in Vietnam in general as well as Thai Nguyen in particular.

### **1.2. KAP status of students and caregivers**

According to author Dao Thi Mui research in Hanoi, the percentage of students who correctly describe the sitting posture only achieved (53.7%) and the correct sitting posture only achieved (2.7%). Parents knew the correct sitting posture (73.4%) but only achieved the correct posture (15.3%). In Nguyen Thi Hoa's research on Knowledge – Attitude – Practice of students in Kim Boi district, Hoa Binh, the proportion of students who did not know the cause of VCS (5.9%), did not know the harm of VCS (19.2%) and the percentage of students who did not implement VCS prevention (16.7%).

Recently, a study by Nguyen Thi Lan conducted in My Duc district, Hanoi in 2013 also commented that all three subjects investigated, students, parents, and teachers, still had limited understanding, concerned attitude towards school VCS, as well as not practicing VCS prevention in an active and effective way for students. In another study, parents of students said that to prevent scoliosis, it is necessary to adjust tables and chairs accordingly (53.6%), need to eat well (57.8), do not sit for a long time (55.7%), sit in the correct posture (35.9%).

The literature overview shows that the current state of Knowledge – Attitude – Practice of parents as well as caregivers is still limited. This shows that intervention studies to improve Knowledge – Attitude – Practice about VCS for parents as well as caregivers are very necessary.

### **1.3. Effectiveness of some interventions in scoliosis**

#### ***1.3.1. Instructions for correct posture***

When studying conservative treatments for children with scoliosis with exercises. Analysis on 556 patients, including 288 in the intervention group and 268 in the control group, showed that early detection of VCS risks and correct treatment through exercise not only limited the progression of spinal deformity (61%) but also reduced curvature (32%).

#### ***1.3.2. Rehabilitation***

A literature review shows that the exercises are effective in reducing of scoliosis.

Active exercise also helps stabilize hunchback and control idiopathic scoliosis (Caufriez study in 2011).

Research by Diab (2012) showed that in addition to training, a conventional rehabilitation program combined with forward head posture correction can also improve crookedness and functional levels in patients with juvenile idiopathic scoliosis.

Research by Liu et al. in 2013 aimed to determine the interventional impact of exercise therapy on idiopathic scoliosis. The results of the study showed significant differences for curvature reduction with  $P < 0.05$ .

## CHAPTER II

### OBJECTS AND METHODS

#### *2.2. Research methodology*

- **Objectives 1 and 2:** Descriptive research, cross-sectional design
- **Objective 3:** Qualitative combined quantitative combined research

#### *2.3. Sample size and sample selection method*

##### *2.3.1. Sample size*

##### **Objectives 1 and 2:**

- **Students:** To calculate the sample size of the study, we use the sample size calculation formula applied to the descriptive study. After calculating that the minimum sample size for the study was 1725 children, we actually collected 1813 students.

**Direct caregivers:** Select all 1813 direct caregivers of eligible children to participate in the study.

##### **Objective 3:**

- **Students:** Select all students diagnosed with scoliosis at the screening stage.
- **Caregivers:** Select all caregivers of children diagnosed with scoliosis at the screening stage and who meet the sampling criteria.

\* **Qualitative research:**

- In-depth interview:

+ Leaders of schools participating in the research: 04 people (interview 01 before and 01 after intervention)

+ Homeroom teacher: Interview until information saturation, expected 10 people (interview 01 before and 01 after intervention)

+ School health staff: 04 people (interview 01 before and 01 after intervention)

- Group discussion: 01 before and 01 after the intervention (40 caregivers of students with scoliosis at the screening stage divided into 4 discussion groups).

### **2.3.2. Sample selection method**

#### **\* Quantitative research**

##### **Objectives 1 and 2:**

- **Students:** The stratified selection method is applied to select samples for descriptive research.

- **Direct Caregivers:** Select all direct caregivers of participating students at the screening stage to be eligible to participate in the study.

##### **Objectives 3:**

**Selection of students and caregivers: The whole sampling method is applied to select all students and caregivers who meet the sampling selection criteria to participate in the study.**

#### **\* Qualitative research:**

**In-depth interviews:** Intentional sampling is applied to select in-depth interview subjects who are leaders of primary schools, class teachers and school health officials to participate in the study.

**Group discussion:** Single randomization applied to select 40 caregivers to participate in qualitative study



## **2.4. Contents of the intervention**

### **2.4.1. Health education communication**

The 6-month intervention program is delivered through health education communication sessions for students and their caregivers. Health education communication sessions are conducted every 1 month, the duration of each session is from 45 minutes to 60 minutes, held at the student's school and invited caregivers to attend, the time is held on Saturday or Sunday, planned in advance to inform the school, Students and caregivers work together

### **2.4.2. Exercises**

Exercises for students with VCS are used exercises published by the Ministry of Health in the book series Community-Based Rehabilitation, book 8 Rehabilitation for children with scoliosis published at Medical Publishing House, consisting of 6 exercises.

The core team deploys to students at the school under the supervision of the researcher at orientation sessions for students.

The research team coordinated with the core team to control students at home (every 2 weeks) and via telephone communication with students' parents.

## **2.5. Data collection tools and facilities**

### **2.5.1. Data collection tools**

**Demographic Tool:** Includes general information about the study subjects (students and caregivers), information related to the student's study habits developed by the researcher.

**Medical Information Tool:** Developed by the research team includes information related to indicators of scoliosis assessment in children according to current regulations of the Ministry of Health.

**School Sanitation Tool: School Condition Assessment Tool:**

Developed by researchers based on school hygiene criteria prescribed by current documents of the Ministry of Health, Ministry of Education and Training and Ministry of Science and Technology.

**KAP Scoliosis and Prophylaxis:** Developed by the research team, in which the knowledge consists of 8 questions assessing knowledge of the causes of scoliosis, the attitude consists of 5 assessment questions about the subjects' attitudes about scoliosis prevention and the practice consists of 5 assessment questions about the practice of the study subjects on prophylaxis of scoliosis.

**KAP Toolkit on Scoliosis Rehabilitation:** Developed by the research team, in which the knowledge consists of 7 questions assessing knowledge of scoliosis rehabilitation, the attitude consists of 4 questions assessing the attitudes of the study subjects about scoliosis rehabilitation, the practice on scoliosis rehabilitation consists of 6 questions.

### **2.5.2. Research facilities**

Spine rotation gauge, tape measure with millimeter, centimeter notes made in China, measuring artificial light illumination with Luxmetre graduated from 0-500 Lux.

### **2.5.3. Evaluation of intervention outcomes**

**2.5.3.1. Evaluation of pre-intervention and post-intervention KAP results by CVCS prevention communication after 3 months according to forms.** Assess the improvement of knowledge, attitude and practice of students and parents through interviews.

#### **\* Knowledge**

- For Students: Understand some of the possible school causes of VCS and its harmful effects

Total knowledge score: 14 points

Classification of knowledge: Pass: From 7 – 14 points and Fail: Less than 7 points.

- For parents: Total score of knowledge: 14 points

Classification of knowledge: Pass: From 7 – 14 points and Fail: Less than 7 points.

\* **Attitude** expressed by students and their parents:

+ Interested in school diseases and VCS?

+ Are you interested in measures to prevent VCS?

+ Is it actively disseminating knowledge about preventing VCS and school diseases?

- For students: Total attitude score: 10 points

Attitude classification: Pass: From 5 – 10 points and Fail: Less than 5 points.

- For parents: Total attitude score: 10 points

Attitude classification: Pass: From 5 – 10 points and Fail: Less than 5 points.

\* **Practice** expressed through tickets

+ What have students and parents done to prevent VCS?

- For students: Total practice score: 6 points

Practice classification: Pass: From 3 – 6 points and Fail: Less than 3 points.

- For parents: total practice score: 8 points

Practice classification: Pass: From 4 – 8 points and Fail: Less than 4 points

### **2.5.3.2. Criteria for evaluating the results of rehabilitation interventions**

- Children are assessed for scoliosis using a scoliometer.

0.1 < 3°: No VCS

3 < 5°: Mild VCS

5 < 10°: VCS medium level

> 10°: Severe VCS

- Assess improvement in CVCS by measuring shoulder difference with a tape measure from 0-2cm

- Assess improvement in CVCS by measuring pot spine differences

with a tape measure from 0 to 4cm

- Assess the improvement in CVCS by measuring the 2-foot length difference with a tape measure from 0 to 3cm
- Assess improvement in CVCS by assay of straight wire or deviation from the intergluteal groove
- Assess improvement in CVCS by Blending test for rib bumps or not

### 2.6. Data analysis and processing

Data is processed using SPSS 22.0 medical statistics software and medical statistical algorithms.

## CHAPTER III

### RESEARCH RESULTS

#### 3.1. Current situation of scoliosis and some related factors in primary school students in Thai Nguyen in 2017.

**Table 3.1. Prevalence of scoliosis by age, grade**

Class \ Scoliosis	Have		Not		Summary
	No.	%	No.	%	
Grade 1 (6 years old)	20	5,7	330	94,3	<b>350 (19,3%)</b>
Grade 2 (7 years old)	26	7,1	340	92,9	<b>366 (20,2%)</b>
Grade 3 (8 years old)	31	8,3	341	91,7	<b>372 (20,8%)</b>
Grade 4 (9 years old)	35	11,5	269	88,5	<b>304 (16,8%)</b>
Grade 5 (10 years old)	55	13,1	366	86,9	<b>421 (23,1%)</b>
<b>Summary</b>	<b>167</b>	<b>9,2</b>	<b>1646</b>	<b>90,8</b>	<b>1813 (100%)</b>

Among Year 5 students (13.1%) with VCS, while in Year 4 (11.5%), VCS rates among Year 3, Year 2 and Year 1 students were 8.3%, 7.1% and 5.7% respectively.

**Table 3.2. Prevalence of scoliosis by sex**

Gender \ Scoliosis	Have		Not		Summary
	No.	%	No.	%	
Trai	65	6,7	904	93,3	<b>969 (53,4)</b>
Girl	102	12,1	742	87,9	<b>844 (46,6%)</b>
<b>Summary</b>	<b>167</b>	<b>9,2</b>	<b>1646</b>	<b>90,8</b>	<b>1813 (100%)</b>

Among male students, 65 students accounted for 6.7% of scoliosis, compared to 12.1% of female students.

**Table 3.3. Morphology of scoliosis**

<b>Form</b>		<b>No.</b>	<b>%</b>
<b>Dorsal segment</b>	<b>Pros</b>	41	24,6
	<b>C Naughty</b>	37	22,2
	<b>S pros</b>	6	3,6
	<b>S inverse</b>	3	1,8
<b>Lumbar segment</b>	<b>Pros</b>	37	22,2
	<b>C Naughty</b>	34	20,4
	<b>S pros</b>	4	2,4
	<b>S inverse</b>	2	1,2
<b>Both paragraphs</b>		03	1,8
<b>Summary</b>		<b>167</b>	<b>100</b>

Among students with VCS, dorsal VCS accounted for 52.1%, lumbar VCS accounted for 46.1%.

**Table 3.4. The degree of scoliosis through the Scoliometer index**

<b>Classify</b>	<b>No.</b>	<b>%</b>
<b>3 - &lt; 5 (Mild)</b>	113	67,7
<b>5 - &lt; 10 (Moderate)</b>	51	30,5
<b>&gt; 10 (severe)</b>	03	1,8
<b>Summary</b>	<b>167</b>	<b>100</b>

The proportion of children with mild VCS accounted for 67.7%, 30.5% of moderate VCS, and the rate of severe VCS accounted for 1.8%.

**Table 3.5. General assessment of student KAP**

Overall Assessments		No.	%
Knowledge	Reach	1110	61,2
	Failed	703	38,8
Attitude	Reach	945	52,1
	Failed	868	47,9
Practise	Reach	620	34,2
	Failed	1193	65,8
Summary		<b>1813</b>	<b>100</b>

Students with knowledge of VCS room at the pass level accounted for 61.2%, 52.1% had attitudes at the pass level, practice achieved 34.2%.

**Table 3.6. General assessment of caregiver KAP**

Overall Assessments		No.	%
Knowledge	Passed	1291	71,2
	Failed	522	28,8
Attitude	Passed	1476	81,4
	Failed	337	18,6
Practise	Passed	783	43,2
	Failed	1030	56,8
Summary		<b>1813</b>	<b>100</b>

Caregivers of students with knowledge of VCS room at the attainment level accounted for 71.2%, 81.4% had attitudes at the pass level, while VCS prevention practices accounted for 43.2%.

### 3.2. Some factors related to scoliosis

**Table 3.7. Relation between age and gender with VCS**

Scoliosis Character		Have		Not		Summary	p
		No.	%	No.	%		
Gender	Us	65	6,7	904	93,3	<b>969</b>	< 0,05
	Female	102	12,1	742	87,9	<b>844</b>	
Class	Grade 1	20	5,7	330	94,3	<b>350</b>	< 0,05
	Grade 2	26	7,1	340	92,9	<b>366</b>	

	<b>Grade 3</b>	31	8,3	341	91,7	<b>372</b>	
	<b>Grade 4</b>	35	11,5	269	88,5	<b>304</b>	
	<b>Grade 5</b>	55	13,1	366	86,9	<b>421</b>	
<b>Summary</b>		<b>167</b>	<b>9,2</b>	<b>1646</b>	<b>90,8</b>	<b>1813</b>	

There was a statistically significant association between sex, age and scoliosis,  $p < 0.05$ .

**Table 3.8. Relation between study habits and VCS**

<b>Habit</b>		<b>Scoliosis</b>		<b>Have</b>		<b>Not</b>		<b>Summary</b>	<b>p</b>
		<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>				
<b>Continuous seat time</b>	$\geq$ 45 minutes	106	14,8	612	85,2	<b>718</b>	<b>&lt; 0,01</b>		
	< 45 minutes	61	5,6	1034	94,4	<b>1095</b>			
<b>Sitting posture</b>	<b>Incorrect</b>	128	10,8	1053	89,2	<b>1181</b>	<b>&lt; 0,01</b>		
	<b>Right</b>	39	6,2	593	93,8	<b>632</b>			
<b>Summary</b>		<b>167</b>	<b>9,2</b>	<b>1646</b>	<b>90,8</b>	<b>1813</b>			

There was a statistically significant association between continuous sitting time and school sitting posture with scoliosis,  $p < 0.05$ .

**Table 3.9. Relation of student KAP with VCS**

<b>KAP</b>		<b>Scoliosis</b>		<b>Have</b>		<b>Not</b>		<b>Summary</b>	<b>p</b>
		<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>				
<b>Knowledge</b>	<b>Failed</b>	94	13,4	609	86,6	<b>703</b>	<b>&lt; 0,05</b>		
	<b>Passed</b>	73	6,6	1037	93,4	<b>1110</b>			
<b>Attitude</b>	<b>Failed</b>	90	10,4	778	89,6	<b>868</b>	<b>&gt; 0,05</b>		
	<b>Passed</b>	77	8,1	868	91,9	<b>945</b>			
<b>Practice</b>	<b>Failed</b>	124	10,4	1069	89,6	<b>1193</b>	<b>&lt; 0,05</b>		
	<b>Passed</b>	43	6,9	577	93,1	<b>620</b>			
<b>Summary</b>		<b>167</b>	<b>9,2</b>	<b>1646</b>	<b>90,8</b>	<b>1813</b>			

There was a statistically significant association holding students' knowledge and practice with scoliosis ( $p < 0.05$ ), no association was found between students' attitudes and scoliosis.

**Table 3.10. Relation of caregiver KAP to VCS**

Scoliosis KAP		Have		Not		Summary	p
		No.	%	No.	%		
Knowledge	Failed	53	10,2	469	89,8	<b>522</b>	> 0,05
	Passed	114	8,8	1177	91,2	<b>1291</b>	
Attitude	Failed	28	8,3	309	91,7	<b>337</b>	> 0,05
	Passed	139	9,4	1337	90,6	<b>1476</b>	
Practice	Failed	125	12,1	905	87,9	<b>1030</b>	< <b>0,05</b>
	Passed	42	5,4	741	94,6	<b>783</b>	
<b>Summary</b>		<b>167</b>	<b>9,2</b>	<b>1646</b>	<b>90,8</b>	<b>1813</b>	

There was a statistically significant association between the incidence of scoliosis and caregiver scoliosis prevention practices with  $p < 0.05$ .

### 3.3. Effectiveness of intervention

#### 3.3.1. Effectiveness of KAP intervention in students and caregivers

**Table 3.11. Student KAP before and after intervention**

Stage KAP		TCT		SCT		P
		No.	%	No.	%	
Knowledge passed		<b>94</b>	<b>56,3</b>	<b>129</b>	<b>77,2</b>	<b>&lt; 0,05</b>
Attitude passed		<b>81</b>	<b>48,5</b>	<b>125</b>	<b>74,9</b>	<b>&lt; 0,05</b>
Practice passed		<b>41</b>	<b>24,6</b>	<b>86</b>	<b>51,5</b>	<b>&lt; 0,05</b>

There were statistically significant differences in students' knowledge, attitudes and practices at the pre- and post-intervention stages.

**Table 3.12. Pre- and post-intervention caregiver KAP**

Level KAP		TCT		SCT		P
		No.	%	No.	%	
Knowledge passed		<b>126</b>	<b>75,4</b>	<b>148</b>	<b>88,6</b>	<b>&lt; 0,05</b>
Attitude passed		<b>118</b>	<b>70,7</b>	<b>141</b>	<b>84,4</b>	<b>&lt; 0,05</b>
Practice passed		<b>68</b>	<b>40,7</b>	<b>105</b>	<b>62,9</b>	<b>&lt; 0,05</b>

There were statistically significant differences in the knowledge, attitudes and practices of student caregivers at the pre- and post-intervention stages with  $p < 0.05$ .



**Table 3.13. Pre- and post-intervention caregiver KAP on rehabilitation**

KAP \ Stage	TCT		SCT		P
	No.	%	No.	%	
Knowledge passed	72	43,1	121	72,5	< 0,05
Attitude passed	57	34,1	107	64,1	< 0,05
Practice passed	40	24,0	89	53,3	< 0,05

There were statistically significant differences in the knowledge, attitudes and practices of student caregivers at the pre- and post-intervention stages with  $p < 0.05$ .

### 3.3.2. Effect of intervention on reducing the degree of scoliosis in schoolchildren

**Table 3.14. Changes in shoulder differentials before and after intervention**

Acromion (cm) \ Stage	TCT		SCT		P
	No.	%	No.	%	
0	0	0	43	25,7	< 0,05
> 0 - 1	51	30,5	95	56,9	
> 1 - 1,5	106	63,5	25	15,0	
> 1,5	10	6,0	04	2,4	

There was a statistically significant change in the anterior and post-intervention Acromion differential with  $p < 0.05$ .

**Table 3.15. Changes in pre- and post-intervention pelvic spine differentials**

Pelvic spines (cm) \ Stage	TCT		SCT		P
	No.	%	No.	%	
0	0	0	32	19,2	< 0,05
> 0 - 1	52	31,1	92	55,1	
> 1 - 1,5	64	38,3	29	17,4	
> 1,5 - 2	48	28,7	13	7,8	
> 2	3	1,8	1	0,6	

There was a statistically significant change in the anterior and posterior pelvic spine differences that intervened with a  $p < 0.05$ .

**Table 3.16. Changes in the length difference between the legs before and after the intervention**

Stage Two legs (cm)	TCT		SCT		P
	No.	%	No.	%	
0	15	9,0	51	30,5	< 0,05
> 0 - 1	118	70,7	96	57,5	
> 1 - 2	30	18,0	19	11,4	
> 2	4	2,4	1	0,6	

There was a statistically significant change in the anterior and posterior leg length difference intervening with  $p < 0.05$ .

**Table 3.17. Changes in VCS levels via pre- and post-intervention scoliometers**

Stage Scoliometer	TCT		SCT		P
	No.	%	No.	%	
Normal	0	0	11	6,6	< 0,05
Light	113	67,7	126	75,4	
Average	51	30,5	28	16,8	
Heavy	03	1,8	02	1,2	

There was a statistically significant change in the Scoliometer index before and after the intervention with  $p < 0.05$ .

## CHAPTER IV DISCUSSION

### 4.1. Current situation of scoliosis and some related factors in primary students in Thai Nguyen province

#### 4.1.1. Current situation of scoliosis

Regarding the situation of scoliosis among primary school students, through a study of 1813 primary school students in 4 geographical areas, we found that the overall prevalence of scoliosis among primary school students was 9.2%. This result is different from some studies conducted earlier. We attribute the different results to the fact that the studies were conducted on different scopes and localities and

the limited generality at the study sites. It may also be due to different examinations and classifications, or because the way VCS is assessed is structured VCS without taking into account unstructured VCS.

As for the age of VCS, our study shows that the older the age, the higher the rate of VCS. VCS increased, particularly among students participating in the Year 5 study, 55 students (13.1%) had the highest VCS, while the proportion decreased gradually in smaller grades, Grade 4 (11.5%), the rate of VCS among students in Grade 3, Grade 2 and Grade 1 respectively 8.3%, 7.1% and 5.7%. This result is also consistent with some studies conducted earlier.

Document overview for There is no consensus on the results of sex studies on the incidence of VCS. Studies at different times and in different geographical regions still show differences in the ratio of men and women to the incidence of VCS. Our results indicate that among male students, 65 students have a 6.7% prevalence of scoliosis, while this rate is 12.1% in the female student group, so in our study the proportion of female students with VCS was higher than that of male students.

In terms of scoliosis morphology, we found that the "C" VCS morphology is most common, where the forward "C" VCS shape is more common than the inverted "C". The proportion of lumbar segment VCS accounted for 46.1%, of which the pro-C type accounted for the highest (22.2%), the inverse C type (20.4%), the pro-forward and inverse S types accounted for 2.4% and 1.2%, respectively, only 03 students accounted for 1.8% with VCS in both segments. Our research results are also consistent with studies conducted earlier.

Our results show that children with mild VCS account for the majority (67.7%), with 51 children accounting for 30.5% of

moderate VCS, and 1.8% of severe VCS. This result is also consistent with research by Nguyen Phuong Sinh and Vu Thi Tam in 2018.

#### **4.1.2. Some factors related to scoliosis in students**

Our results indicate that the prevalence of scoliosis seen in male students was 6.7% while the rate in the female group was almost twice as high (12.7%), with a statistically significant association between sex and scoliosis with  $p < 0.05$ . The association between gender and scoliosis: specifically female students are more likely than male students to be reported by many studies. A cross-sectional descriptive study of 212 students aged 7 to 17 years by Baroni et al. in 2015 found that the prevalence of scoliosis was 58.1% ( $n=123$ ) and was statistically significantly associated with female sex (PR 2.54; 95% CI, 1.33 – 4.86) and ages 13 to 15 (PR 5.35; 95% CI, 2.17 – 13.21). Studies conducted previously show that the incidence of scoliosis increases with age. The study by Daruwalla et al. found that the prevalence of scoliosis is more common in adolescents than in young children. In our study with similar results, children in small grades (ages) had a lower incidence of scoliosis than children in older grades.

Sitting for too long and prolonged improper sitting posture have been reported by Araújo et al. to have an effect on their spinal development *C Born*. Our results found a statistically significant association between prolonged sitting and improper sitting posture with numerical scoliosis *Ng*. In fact, sitting for too long and improper posture contribute to physiological changes that affect the development of the curve of the spine, during the period of

development of the body, thereby contributing to the development of scoliosisNg.

In our study, we found a statistically significant association between students' knowledge and practice and scoliosis. Students with unsatisfactory knowledge had a 13.4% higher rate of scoliosis than the group of students with achieved knowledge (6.6%). The prevalence of scoliosis in the group of students with no practice reached 10.4% higher than in the group of practicing students (6.95%). This result suggests that students with knowledge of scoliosis causes and limited scoliosis prevention practices have a higher risk of scoliosis than students with knowledge of scoliosis causes and scoliosis prevention practices.

We found a statistically significant association between scoliosis prevention practices for caregivers' students and having scoliosis in students. This result showed that the better students whose caregivers practiced scoliosis prophylaxis, the lower their risk of scoliosis. However, in our study we found no statistically significant association between caregiver knowledge and attitudes and the incidence of scoliosis in students with  $p > 0.05$ .

## ***4.2. Effectiveness of intervention***

### ***4.2.1. Effectiveness for Knowledge – Attitude – Practice***

#### ***4.2.1.1. Effectiveness of intervention with students***

The results of our study show that knowledge of the causes of scoliosis among primary school students with scoliosis increases in the post-intervention stages. This result is also consistent with Lam Thuy Mai's research when in this study the author reported that primary school students had a significant change in understanding with  $p < 0.05$  with causes leading to VCS such as improper posture, poor appetite,

etc tables and chairs are not suitable for HS height, wearing a lopsided briefcase, wearing a pair that is too heavy.

The results of several studies show that health education communication interventions help improve attitudes about scoliosis prevention in primary school students. A study conducted in Hanoi showed that all primary school students had a marked change in their attitude towards VCS prevention. For all VCS prevention measures, the proportion of students in the whole primary school who showed concern increased after the intervention with  $p < 0.05$ . Our study yielded similar results.

The key point found in our study was that the scoliosis prevention practices of students participating in the intervention improved at the time of post-intervention evaluation. One of the core issues for prevention as well as reducing disease severity is the need for students to follow preventive measures, through which we found that health education communication interventions are remarkably effective for students in improving scoliosis prevention practices.

#### **4.2.1.2. Effectiveness of intervention with caregivers**

In this study, although the percentage of correct knowledge of caregivers in the pre- and post-intervention stages varied, differences in correct posture, inappropriate tables and chairs, and sideways wearing pairs were not of uniform significance. In fact, the caregivers in our study were quite highly educated (60.5%) of caregivers are Intermediate or above educated, so caregivers also have relatively good knowledge of scoliosis, so despite the change, the change was not statistically significant. With the results in our study can be interpreted from the above point of view. Consistent with our knowledge, our results found that the proportion of caregivers who were concerned about posture and the use of

appropriate tables and chairs increased at the post-intervention stage, but this difference was not statistically significant. In fact, from changes in understanding that parents of students have changed their attitudes towards VCS. This can be explained by the fact that parents of students have certain concerns about their children's health from the beginning, so after the intervention we do not recognize the difference.

In our study, the practice of scoliosis prophylaxis for caregivers' pupils varied markedly at the post-intervention stage compared to the pre-intervention period. This result is also consistent with Lam Thuy Mai's research, which showed that the percentage of parents who practiced VCS prevention after the intervention increased markedly after the intervention.

#### **4.2.1.3. Effectiveness of intervention with Knowledge – Attitude – Practice on rehabilitation for children with scoliosis**

The results of our study show that after the intervention, the knowledge of the student caregiver related to the rehabilitation of children with scoliosis is enhanced. This result is also consistent with Trinh Quang Dung's research when in this study the percentage of parents who knew about scoliosis increased from 17.5% (before the intervention) to 100% (after the intervention). The proportion of parents who knew the effect of PHCN to prevent spinal deformities and reduce spinal curvature both increased and was statistically significant after the intervention ( $p=0.002$ ).

The effectiveness of the health education communication intervention on changing the attitudes of caregivers Participating in the study, which was reported by Trinh Quang Dung through the results of a study on 63 parents of students, showed that the proportion of parents with attitudes interested in finding materials on scoliosis rehabilitation increased from 19% (before the intervention) to 73%

(after the intervention). In this study we also found that attitudes about rehabilitation for students with scoliosis in caregivers increased after the intervention.

Not only does the intervention increase caregivers' knowledge and attitudes towards rehabilitation for students with scoliosis, our findings also show that the intervention is effective in improving the practice of rehabilitation for caregivers' students. In fact, knowledge and attitudes are the foundation for people to be aware of good deeds and actions for their health, if they have the right knowledge and the right attitude, it will lead to the right behavior and vice versa.

#### **4.2.2. Rehabilitation effect on reduced VCS levels in students**

For the index related to shoulder tip difference, we found that after the intervention there was an improvement in shoulder difference in students. Our results are also consistent with Nguyen Thanh Trung's research when the author of the study out of a total of 339 VCS students, before the intervention, there was a large difference in shoulder tip difference at 1.5 and 1cm, none of the children had 2 shoulder tips equally. After the 6-month intervention, the shoulder deviation was mostly 59 cm, and the number of children without shoulder deviation accounted for 23.3%. In addition, the intervention also showed efficacy for pelvic spine differential index and biley length difference. Our results are also consistent with the study of 6–15 year old students, when the authors reported the effectiveness of the VCS intervention on reducing pelvic spur differentials and bipedal length in VCS students

In fact, the intervention in our study involved community-based rehabilitation exercises designed and approved by the Ministry of Health consisting of different exercises. These exercises are aimed at: increasing the flexor range of motion of the dorsal spine;



stretching the extensor muscle group; stretching the concave lateral muscles of the curve; enhances the flexibility of the spine; Increases the intensity of expansion of the chest, thereby having a positive effect on reducing scoliosis in schoolchildren.

In addition, in our study also found changes in the pre- and post-intervention Scoliometer index, which reflected the level of VCS for children when applying rehabilitation exercises, This difference was statistically significant with  $p < 0.01$ . The results of the study by author Trinh Quang Dung showed that the average angle measurement according to Scoliometer also tended to decrease significantly after the 6-month and 12-month interventions, from 11.2 degrees before the intervention to 7.9 degrees after 6 months and to only 6 degrees after 12 months of intervention.

## CONCLUSION

### 1. Current situation of scoliosis and KAP

The overall prevalence of scoliosis among primary school students 9.2%,

Students with knowledge of VCS room at the passing level accounted for 61.2%, 52.1% had attitudes at the pass level, the proportion of students with VCS prevention practice reached 34.2%.

Caregivers of students with knowledge of VCS room at the level of achievement accounted for 71.2%, 81.4% had attitudes at the level of passing, the proportion of caregivers of students with VCS prevention practices reached 43.2%.

### 2. Intervention effectiveness.

**For students:** The effectiveness index of the intervention on knowledge reached 37.1%, attitude reached 54.4% and practice reached 109.3%.

**For caregivers:** The effectiveness of the knowledge intervention reached 17.5%, the attitude reached 19.4% and the practice reached 54.5%.

Research results show that the intervention is effective in improving knowledge, attitudes and practices in rehabilitation for caregiver VCS students:

### **Effectiveness of VCS reduction in students**

The shoulder blade differential index, pelvic spine difference, and bipedal length difference decreased at the post-intervention stage compared to the pre-intervention period with a  $p < 0.05$ .

The scoliometer index in severe severity decreased from 1.8% to 1.2%, mild from 67.7% to 75.4%, moderate from 30.5% to 16.8%, 11 cases to normal.

## **RECOMMENDATIONS**

1. Community-based rehabilitation interventions should be further considered for replication on a larger scale.

2. Equip parents, teachers, school health workers and students themselves with knowledge about the causes, harms, prevention of VCS and knowledge of VCS detection, the role of rehabilitation exercises in VCS treatment.

3. Families and schools need to pay more attention to sitting posture, tables and chairs, lighting, nutrition, labor regime, sports activities, etc. To ensure that students develop comprehensively and especially prevent school scoliosis.

4. Extensively implement annual screening programs for early detection and early intervention for children with VCS, especially in schools.

**LIST OF RESEARCH WORKS  
RELATED TO THE PUBLISHED THESIS**

1. Trinh Minh Phong, Nguyen Thanh Trung, Hoang Khai Lap (2023), "Current situation and some factors related to scoliosis in primary school students in Thai Nguyen province", *Vietnam Medical Journal*, 531 (October – No. 2). Page 396-400

2. Trinh Minh Phong, Nguyen Thanh Trung, Hoang Khai Lap (2023), "Effectiveness of scoliosis rehabilitation intervention in primary school students in Thai Nguyen province", *Vietnam Medical Journal*, 531 (October – No. 2). Page 406-411