Prevalence of Idiopathic Scoliosis in Thai Female Students Aged 11-13 Years

Sombat Kunakornsawat MD*, Nut Popan MD**, Chaiwat Piyaskulkaew MD*, Pritsanai Pruttikul MD*, Tinnakorn Pluemvitayaporn MD*, Piyabuth Kittithamvongs MD*

** Center of Excellence in Orthopedic, Lerdsin General Hospital, Bangkok, Thailand*
*** Ranong Hospital, 11 Kamlang Sap, Khao Niwet, Mueang Ranong District, Ranong, Thailand*

Background: *Idiopathic scoliosis is the most common cause of abnormal curvature of the spine. Adolescent idiopathic scoliosis is the most common subcategory of idiopathic scoliosis. Prevalence rates of idiopathic scoliosis vary from 0.35% to 13%, depending on the defined Cobb angles, screening age, sex, regional and ethnic variations. Several professional organizations recommend screening for scoliosis in schools. The screening age is 11-13 years for girls, which corresponds to the ages of peak skeletal growth.*
Objective: *To study the prevalence of idiopathic scoliosis in Thai female students aged 11-13 years.*
Material and Method: *Screening for scoliosis was performed in 1,818 Thai female students aged 11-13 years. Adam's forward bending test was performed. The scoliometer was used for measurement of curves noting the highest degree of angle of trunk rotation (ATR). Those who exhibited ATR of 6 degrees or greater, would then be referred to Lerdsin General Hospital for a standing whole spine radiographics. Idiopathic scoliosis in the present study was defined as students who have a Cobb angle of greater than 10 degrees from whole spine radiographs and have no cause of scoliosis.*
Results: *eighty four girls had scoliosis (4.62%). The cause of scoliosis was found in 3 girls. Right thoracic curve was the most common curve pattern.*
Conclusion: *The prevalence of idiopathic scoliosis in Thai female students aged 11-13 years was 4.46%.*

Keywords: *adolescent idiopathic scoliosis, AIS, prevalence, female*

J Med Assoc Thai 2017; 100 (5): 533-38
Full text. e-Journal: *http://www.jmatonline.com*

Idiopathic scoliosis is the most common cause of abnormal curvature of the spine. Adolescent idiopathic scoliosis occurs between the onset of puberty and skeletal maturity[1]. Adolescent idiopathic scoliosis is the most common subcategory of idiopathic scoliosis[2] and is the primary subject of the present study.

When scoliosis is not treated, the spine may undergo progressive axial rotation, increasing the clinical deformity[1]. This progressive axial rotation can lead to an increased incidence and severity of back pain[3], progressive cosmetic deformities, social and psychological problems, and financial costs[4]. With severe curvatures, there can be cardiopulmonary compromise as well as subsequent morbidity and early mortality[1].

Correspondence to:
Kunakornsawat S, Center of Excellence in Orthopedic, 9th floor, Lerdsin General Hospital, 190 Silom Rd. Bangrak, Bangkok 10500, Thailand.
Phone: +66-2-3539799
E-mail: batkunakornsawat@gmail.com

Prevalence rates of idiopathic scoliosis vary from 0.35% to 13%, depending on the defined Cobb angles, screening age and sex[5]. There are also regional[6] and ethnic[7] differences in the prevalence rate. One risk factor for scoliosis is being female. Most studies agree that girls have a higher prevalence of scoliosis than boys[3, 5,8-15].

Chatchatee et al[15]. studied the prevalence of idiopathic scoliosis among Thai students aged between 10-16 years. The diagnostic criteria for scoliosis was the presence of lateral spinal curve more than 10 degrees by Cobb angle. The prevalence from the study was 0.91% and ratio females to male was 5:1.

Several professional organizations recommend screening for scoliosis in schools. The screening age is 11-13 years for girls, which corresponds to the ages of peak skeletal growth[16].

Objectives

To study the prevalence of idiopathic scoliosis

in Thai female students aged 11-13 years.

Material and Method

Study design

Descriptive study.

Target and study population

We randomly selected 10 out of 37 primary schools located in the Bangkok primary education area. Thai female students aged 11-13 years, studying in these schools, were included in the present study.

The exclusion criteria in the present study were: 1) known cause of scoliosis (e.g. congenital scoliosis, pelvic tilt scoliosis), 2) previous history of spinal trauma or infection, and 3) who had been treated with a brace or surgery for scoliosis.

Methodology

Informed letters were sent to parents of the children to be screened. We used the class rosters to identify female students and record the demographic data (age, height, weight, leg length). During screening the students were asked to stand erect, with their feet 2 to 3 inches apart with their back towards the screener. The students were then asked to bend forward 90 degrees at the waist keeping their knees straight with arms hanging and palms slightly together, keeping in mind to have the head down (Fig 1). The screeners then moved the scoliometer along the vertebral column and observed the scoliometer for changes in curve measurements. The highest degree of angle of trunk rotation (ATR) as measured by scoliometer was noted (Fig 2). The girls with ATR >6 degrees were sent to Lerdsin general hospital for obtaining standing whole spine radiographs (Fig 3) and working up for cause of scoliosis. Idiopathic scoliosis in the present study was defined as students who had a Cobb angle of greater than 10 degrees from whole spine radiographs and had no cause of scoliosis.

Fig. 1 Adam's forward bending test.

Fig. 2 Angle of trunk rotation (ATR).

Fig. 3 Whole spine radiograph.

Statistical analysis

Prevalence (%) of idiopathic scoliosis patient.

Results

Of the 1,818 girls totally screened, 162 girls had ATR >6 degrees, of which 84 girls had Cobb angle >10 degrees (Table 1). Three of the 84 girls had identifiable causes of scoliosis that we excluded from our study. First, congenital scoliosis with hemivertebra (Fig 4). The other causes were DDH and spinal tuberculous infection. Therefore 81 girls were identified with idiopathic scoliosis which amounted to 4.46%.

Table 1. Scoliosis screening result

No	School	District	Screened	ATR >6 (%)	Cobb >10 (%)
1	Rachawinit	Dusit	305	24 (7.87)	16 (5.25)
2	Samsen kindergarden	Phaya Thai	149	19 (12.75)	13 (8.72)
3	Sainamtip	Khlong Toei	178	21 (11.8)	9 (5.06)
4	Phyathai	Ratcha Thewi	216	17 (7.87)	7 (3.24)
5	Anuban Phibunwes	Watthana	187	19 (10.16)	9 (4.81)
6	Bangbua	Chatuchak	116	6 (5.17)	2 (1.72)
7	Prayaprasertsuntrasai	Wang Thonglang	226	18 (7.96)	9 (3.98)
8	Watamarintraram	Bangkok Noi	174	15 (8.62)	10 (5.74)
9	Rajavinit Prathom Bangkae	Phasi Charoen	117	8 (6.84)	2 (1.71)
10	Anuban Watnangnong	Chom Thong	150	15 (10.00)	7 (4.67)
			1,818	162 (8.91)	84 (4.62)

Fig. 4 Congenital scoliosis with hemivertebra.

In these 81 girls diagnosed with idiopathic scoliosis, we tried to look at the curve distribution and severity of the curve (Table 2). We found that most of the girls had less degree of curve. Curve >30 degrees were observed only in about 8% (6/81) of them. We also found that most of them had thoracic and thoracolumbar curves. Right thoracic curve was the most prevalent curve of all about 35% (28/81).

Table 2. Scoliosis curve distribution and severity of the curve

Curve Cobb	Thoracic		Thoracolumbar		Lumbar		
	Right	Left	Right	Left	Right	Left	
10-19	19	2	7	13	5	15	61
20-29	5	2	1	6	0	0	14
30-39	4	0	2	0	0	0	6
	28	4	10	19	5	15	81

Discussion

Although radiography is the gold standard for diagnosis of scoliosis, it is expensive and patients need to expose to radiation. Screening the child with forward bending test combined with scoliometer has only slightly lower sensitivity and specificity compared to radiography, but is inexpensive and has no radiation exposure (Table 3).

Compared to previous study, our study revealed a higher prevalence rate of idiopathic scoliosis. The reason may be because of the narrower age range selected for the present study, 11-13 years, which is the peak age group for adolescent idiopathic scoliosis, and also may be because only females were included in the present study (Table 4).

Table 3. Scoliosis Diagnostic Tools (Modified from "Adolescent School Screening for Scoliosis in Minnesota". Minnesota Department of Health 2008.)[16]

	Sensitivity	Specificity	
Radiography	Gold standard		Expensive Radiation Exposure
Forward Bending Test (FBT)	84%	93%	Inexpensive No radiation exposure
FBT with Scoliometer	83-91%	90-99%	Innexpensive No radiation exposure

Table 4. Compare to previous study

	Sex	Aged	Number	Prevalence
Chatchatree [15]	Male & Female	10-16 years	656	0.91%
This study	Female	11-13 years	1,818	4.46%

Conclusion

The prevalence of idiopathic scoliosis in Thai female students aged 11-13 years was 4.46% and right thoracic curve was the most common curve pattern.

What is already known on this topic?

Previous study in Thai population demonstrated prevalence of 0.91% regarding adolescent idiopathic scoliosis.

What this study adds?

Our study was conducted to improve greater number of participants and up-to-date data. Moreover, as the fact that adolescent idiopathic scoliosis is more prevalent in female population, hence it is appropriate in evaluation the prevalence in female population separately.

Potential conflict of interest

None.

References

1. Gunnoe BA. Adolescent idiopathic scoliosis. Orthop Rev 1990; 19: 35-43.
2. Rooney RC, Akbarnia BA. Idiopathic scoliosis in children: an update on screening and bracing. J Musculoskelet Med 2004; 21: 268-75.
3. Bunnell WP. Selective screening for scoliosis. Clin Orthop Relat Res 2005; 40-5.
4. Bunnell WP. An objective criterion for scoliosis screening. J Bone Joint Surg Am 1984; 66: 1381-7.
5. Wong HK, Hui JH, Rajan U, Chia HP. Idiopathic scoliosis in Singapore schoolchildren: a prevalence study 15 years into the screening program. Spine (Phila Pa 1976) 2005; 30: 1188-96.
6. Ohtsuka Y, Yamagata M, Arai S, Kitahara H, Minami S. School screening for scoliosis by the Chiba University Medical School screening program. Results of 1.24 million students over an 8-year period. Spine (Phila Pa 1976) 1988; 13: 1251-7.
7. Soucacos PN, Soucacos PK, Zacharis KC, Beris AE, Xenakis TA. School-screening for scoliosis. A prospective epidemiological study in northwestern and central Greece. J Bone Joint Surg Am 1997; 79: 1498-503.
8. Pruijs JE, van der Meer R, Hageman MA, Keessen W, van Wieringen JC. The benefits of school screening for scoliosis in the central part of The Netherlands. Eur Spine J 1996; 5: 374-9.
9. Nussinovitch M, Finkelstein Y, Amir J, Greenbaum E, Volovitz B. Adolescent screening for orthopedic problems in high school. Public Health 2002; 116: 30-2.
10. Rogala EJ, Drummond DS, Gurr J. Scoliosis: incidence and natural history. A prospective epidemiological study. J Bone Joint Surg Am 1978; 60: 173-6.
11. Willner S, Uden A. A prospective prevalence study of scoliosis in Southern Sweden. Acta Orthop Scand 1982; 53: 233-7.
12. Mirtz TA, Thompson MA, Greene L, Wyatt LA, Akagi CG. Adolescent idiopathic scoliosis screening for school, community, and clinical health promotion practice utilizing the PRECEDE-PROCEED model. Chiropr Osteopat 2005; 13: 25.
13. Soucacos PN, Zacharis K, Soultanis K, Gelalis J, Xenakis T, Beris AE. Risk factors for idiopathic scoliosis: review of a 6-year prospective study. Orthopedics 2000; 23: 833-8.
14. Gore DR, Passehl R, Sepic S, Dalton A. Scoliosis screening: results of a community project. Pediatrics 1981; 67: 196-200.
15. Chatchatree J, Harnphadungkij K, Tosayanonda O. Prevalence of idiopathic scoliosis in Thai students age 10-16 years. J Thai Rehabil 1996; 6: 43-6.
16. Minnesota Department of Health. Adolescent school screening for scoliosis in Minnesota. St. Paul, MN: Community & Family Health Division, Maternal-Child Health Section Minnesota Department of Health; 2008

ความชุกของภาวะกระดูกสันหลังคดชนิดไม่ทราบสาเหตุในนักเรียนหญิงไทยอายุ 11-13 ปี

สมบัติ คุณากรสวัสดิ์, ณัฐ โพธิ์ปาน,ชัยวัฒน์ ปิยะสกุลแก้ว, ปฤศนัย พฤฒิกุล, ทินกร ปลื้มวิทยาภรณ์, ปิยบุตร กิตติธรรมวงศ์

ภูมิหลัง: *ภาวะกระดูกสันหลังคดชนิดไม่ทราบสาเหตุเป็นสาเหตุที่พบบ่อยที่สุดของผู้ที่มีกระดูกสันหลังคดทั้งหมด โดยวัยรุ่นเป็นช่วงอายุที่พบภาวะนี้ได้บ่อยที่สุด ความชุกของภาวะกระดูกสันหลังคดชนิดไม่ทราบสาเหตุ พบได้ตั้งแต่ร้อยละ 0.35 ถึง 13 ของประชากรทั่วไป ขึ้นกับกลุ่มประชากรที่นำมาศึกษาและเกณฑ์ในการวินิจฉัยภาวะนี้ องค์กรหลายแห่งที่ศึกษาเกี่ยวกับภาวะกระดูกสันหลังคด แนะนำให้มีการตรวจคัดกรองในโรงเรียน โดยเด็กนักเรียนหญิง ช่วงอายุ 11-13 ปี ควรให้ความสนใจมากที่สุด เนื่องจากเป็นระยะที่กระดูกกำลังเจริญเติบโตอย่างรวดเร็ว ทำให้มีโอกาสเสี่ยงที่กระดูกสันหลังจะคดมากขึ้นเมื่อเทียบกับช่วงอายุอื่น*

วัตถุประสงค์: *เพื่อศึกษาหาความชุกของภาวะกระดูกสันหลังคดชนิดไม่ทราบสาเหตุในนักเรียนหญิงไทยอายุ 11-13 ปี*

วัสดุและวิธีการ: *มีนักเรียนหญิงเข้าร่วมโครงการจำนวน 1,818 คน อายุระหว่าง 11-13 ปี ได้รับการตรวจร่างกายด้วยวิธี Adams forward bending test, วัดค่า Angle of trunk rotation (ATR) โดยเครื่อง Scoliometer และนำผู้ที่มีค่า ATR มากกว่าหรือเท่ากับ 6 องศา เข้ารับการถ่ายภาพรังสีของกระดูกสันหลัง ผู้ที่ได้รับการวินิจฉัยว่ามีกระดูกสันหลังคดในการศึกษาครั้งนี้ คือ ผู้ที่มีค่า Cobb angle มากกว่า 10 องศา และตรวจไม่พบสาเหตุ*

ผลการศึกษา: *นักเรียนหญิง 84 คน ตรวจพบว่ามีภาวะกระดูกสันหลังคด (ร้อยละ 4.62) โดยตรวจพบสาเหตุ 3 คน และกระดูกสันหลังระดับหน้าอกคดไปทางขวาเป็นลักษณะการคดที่พบบ่อยที่สุด*

สรุป: *ความชุกของภาวะกระดูกสันหลังคด ชนิดไม่ทราบสาเหตุในนักเรียนหญิงไทย อายุ 11-13 ปี ในกรุงเทพมหานคร มีค่าเท่ากับร้อยละ 4.46*