CHAPTER IV

RESULTS

Twenty two adolescent females with AIS voluntarily participated in this study. They were aged between 11 and 18 years. None of them had back pain history within three months prior to the study. Their thoracic Cobb angles were ranged from 13° to 68°. According to SRS guidelines, they were divided into three groups: mild (n=8), moderate (n=8), and severe (n=6) group. Within 22 subjects, five of them had Ccurve at thoracolumbar level and 14 of them had S-cure involving both thoracic and lumbar level or known as double major curve. Only three subjects had C-curve at thoracic level and their severity was stratified as moderate scoliosis (Table 1). There were no statistically significant differences on demographic data, cardiopulmonary variables, and 6 MWD among mild, moderate, and severe group.

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Table 1. Demographic data

		S	coliosis severit	у	
Variables	(N = 22)	Mild (n = 8)	Moderate (n = 8)	Severe (n = 6)	p-level
Age (yrs.)	14.05±1.62	14.00±2.20	13.75±1.17	14.50±1.38	0.71
Weight (kg.)	42.85±6.29	43.23±6.58	41.71±5.47	43.87±7.76	0.82
Height (cm.)	153.89±7.67	155.75±7.50	154.59±6.75	150.48±9.19	0.44
Cobb angle (°)	36.64±14.69	22.50±5.63	36.25±5.18	56.00±7.38	0.00*
Scoliosis Diagnosis cases					
Thoracic curve	3	0	3	0	
Thoracolumbar curve	5		1 4		
Note: Data ware presente	d as maan + CD				

Note: Data were presented as mean \pm SL

* = Significant at p < 0.05

The ventilatory pump was indicated by flow volume loop, maximal voluntary ventilation, and respiratory muscle strength (see Table 2). There were no statistically significant differences in the ventilatory pump among mild, moderate, and severe group. All subjects had no restrictive and obstructive lung disease. The mean of 12-sec MVV of all subjects was 98.59 ± 18.83 L/min. This variable tended to decrease as the severity of scoliosis was advanced (mild = 103.75 ± 21.38 , moderate = 99.63 ± 17.65 , and severe = 90.33 ± 16.93 L/min, p > 0.05).

[©] by Chiang Mai Universi ights reserve There were no statistically significant differences on MIP and MEP across the severity. The mean of MIP of all subjects was $71.86 \pm 15.80 \text{ cmH}_2\text{O}$. MIP tended to decrease as the severity was increased (mild = 73.75 ± 21.98 , moderate = 71.50 ± 9.87 , and severe = $69.83 \pm 15.00 \text{ cmH}_2\text{O}$, p > 0.05). However, MEP tended to increase when the AIS was advanced (mild = 82.38 ± 15.49 , moderate = 83.63 ± 16.73 , severe = $90.33 \pm 15.71 \text{ cmH}_2\text{O}$, p > 0.05).

			coliosis severit	У	
Variables	Total (N = 22)	Mild (n = 8)	Moderate (n = 8)	Severe (n = 6)	p-level
pred FVC (%)	88.77±11.15	92.75±9.41	83.88±12.44	90.00±10.77	0.28
pred FEV_1 (%)	77.36±8.67	81.50±7.41	73.75±8.51	76.67±9.34	0.20
FEV ₁ /FVC (%)	90.23±5.08	90.58±4.25	90.82±3.97	88.98±7.64	0.79
MVV (L/min)	98.59±18.83	103.75±21.38	99.63±17.65	90.33±16.93	0.43
MIP (cmH ₂ O)	71.86±15.80	73.75±21.98	71.50±9.87	69.83±15.00	0.91
MEP (cmH ₂ O)	85.00±15.61	82.38±15.49	83.63±16.73	90.33±15.71	0.63

Table 2. Pulmonary variables in adolescent females with AIS

Note: Data were presented as mean \pm SD.

pred FVC, predicted forced vital capacity; pred FEV₁, predicted forced expiratory volume in 1 sec; FEV₁/FVC, the ratio of forced expiratory volume in 1 sec and forced vital capacity; MVV, maximum voluntary ventilation; MIP, maximum inspiratory pressure; MEP, maximum expiratory pressure.

Table 3 presented HR and BP during the 6 MWT. No significant differences were found on the cardiovascular variables and 6 MWD among mild, moderate, and severe group. The preHR and postHR were 91.32 ± 12.35 and 129.77 ± 17.17 bpm, respectively. The end test HR was 63 percent of predicted maximum heart rate (HR_{max}). During the test, the SBP was changed from 102.27 \pm 11.42 to 121.55 \pm 14.39 mmHg. Also, the DBP was increased from 69.64 ± 6.46 to 74.36 ± 11.36 mmHg. There were 13 out of 22 subjects (59.09 %) had rising DBP immediately after the test. The 6 MWD was 561.16 ± 46.34 m.

Table 3. Cardiovascular responses during 6 MWT

			Scoliosis severity	y y	
Variables	Total (N = 22)	Mild (n = 8)	Moderate (n = 8)	Severe (n = 6)	p-level
preHR (bpm)	91.32±12.35	91.63±15.22	94.13±11.05	87.17±10.59	0.60
postHR (bpm)	129.77±17.17	125.75±21.08	132.50±16.34	131.50±16.73	0.74
preSBP (mmHg)	102.27±11.42	99.75±12.53	101.25±12.46	107.00±8.46	0.45
postSBP (mmHg)	121.55±14.39	121.75±11.78	115.50±17.13	129.33±11.57	0.21
preDBP (mmHg)	69.64±6.46	67.75±7.67	70.25±5.90	71.33±5.89	0.58
postDBP (mmHg)	74.36±11.36	76.75±15.42	71.25±8.35	75.33±9.27	0.63
6 MWD (m.)	561.16±46.34	570.12±29.19	547.67±43.41	567.21±68.74	0.61

Data were presented as mean \pm SD.

preHR, pre-test heart rate; postHR, post-test heart rate; preSBP, pre-test systolic blood pressure; postSBP, post-test systolic blood pressure; preDBP, pre-test diastolic blood pressure; postDBP, post-test diastolic blood pressure; 6 MWD, six minute walk distance.

The positive correlation between 6 MWD with MVV was found (r = 0.49, p < 0.05) (see Figure 3). Also, 6 MWD was negatively correlated with preDBP (r = -0.397, p < 0.05) (see Figure 4). There were no correlation among 6 MWD, demographic data (age, weight, and height), Cobb angle, the flow volume loop variables, and the respiratory muscle strength (Table 4).

Multiple linear regression was analyzed by using the demographic data, Cobb angle, pred FVC, pred FEV₁, FEV₁/ FVC, MVV, MIP, MEP, preHR, preSBP, and preDBP. There were four predicted equations for 6 MWD as following:

Equation 1:

$$(r=0.49, r^2=0.24, p<0.05, SEE = 41.3926)$$

Equation 2:

 $(r=0.688, r^2 = 0.473, p < 0.05, SEE = 35.3586)$

Equation 3:

6 MWD = 744.220 + 1.583 MVV - 3.186 preDBP - 1.284 preHR

 $(r=0.763, r^2=0.582, p < 0.05, SEE = 32.3673).$

Equation 4:

6 MWD = 734.762 + 1.889 MVV - 4.112 preDBP - 1.233 preHR +

1.067 Cobb angle

 $(r=0.818, r^2=0.669, p<0.05, SEE = 29.6328).$

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Table 4. The correlation between the Cobb angle, the cardiopulmonary variables and

the 6 MWD

EEV1/FVC, the ratio of forced expiratory volume in 1 see and forced vital capacity; MVV, maximum voluntary ventilation; MID; maximum inspiratory pressure; MEP; maximum expiratory pressure; preHR, pre-test heart rate; postERP, post-test heart rate; preSBP; pre-test systolic blood pressure; preDBP; pre-test diastolic blood pressure; postDBP, post-test diastolic blood pressure; 6 MWD, six minute walk distance.



Figure 3. Relationship between 6 –minute walk distance and maximum voluntary



ventilation in scoliosis subjects (N=22)

Pre-test dyastolic blood pressure (mmHg)

Figure 4. Relationship between 6-minute walk distance and pre-test diastolic blood pressure in scoliosis subjects (N=22)