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Prevalence and Associated Factors of Low Back Pain (LBP) among Adolescents in Central, Thailand

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Abstract

Background: Low Back Pain (LBP) is one of the most common musculoskeletal disorders found from adolescent to the elderly. These affect the quality of life of adolescents due to the inability to fully perform any activity. The information concerning LBP in Thailand is still limited especially among adolescents. Most related studies were conducted among young adult. The present study was aimed to determine the prevalence and the associated factors of LBP among adolescents in Central Thailand.

Methods: A total of 4944 adolescents were included in the study. The Nordic Standard Questionnaire (NSQ) was used to screen LBP conditions among these adolescents. Standardized questionnaires were used to collect demographic data and associated factors.

Results: The prevalence of LBP among adolescents was 26.7%. Univariate and multivariate analysis showed that adolescents with LBP were associated with both behavioral and physical activity factors. These factors included sex, grade, using a smartphone, transportation to school, suitability of chairs and desks, history of back injury and low frequency of exercise

Conclusion: Our data emphasized that LBP was a problem among adolescent. Supportive exercise and physical activity should be provided for adolescents.

Keywords: Low Back Pain, LBP, prevalence, associated factors, adolescents, Thailand

1. Introduction

Low Back Pain (LBP) is one of the most common musculoskeletal disorders found from adolescents to the elderly. Most cases of LBP are due to nonspecific causes; however, the role these risk factors play remains controversial. The period prevalence at 12 months of LBP among adolescents was between 17.4 to 60.3% in differing demographic areas (Calvo, Gómez, & Sánchez, 2013); In Thailand, a related study among 684 healthy Thai university students was conducted in 2015; a total of 524 (77%) students were followed for 1 year. In all, 31% reported a new onset of LBP (Kanchanomai, Janwantanakul, Pensri, & Jiamjarasrangsi, 2015). Several personal-related factors including age, height, body mass index (BMI), were shown to be associated with LBP symptoms. Other factors such as daily and physical activity were also shown to be significantly associated with LBP (Louw, Morris, & Grimmer, 2007; Silva, Badaró & Dall'Agnol, 2014; Shan et al., 2013). Unresolved LBP of adolescents could lead to chronic back pain. This affects the quality of life of these adolescents (Wilson, Eriksson, D'Eon, Mikail, & Emery, 2002). For example, limiting movement of any part of body would result in the inability to fully perform any activity. Also, when these adolescents could not resolve or modify any risk factors, it could lead to long term problems (McGorry, BSPT, Snook, & Hsiang, 2000). Adolescence is the period in human growth and development occurring after childhood and before adulthood, from ages 10 to 19. Adolescents differ from both young children and adults regarding areas as growth and development, physical activity and behavior. The information on LBP in Thailand is still limited especially among adolescents. Most related studies were conducted among young adults. The aims of this study were to determine the prevalence and associated factors of LBP among

adolescents in central Thailand.

2. Method

The present study was conducted in a provincial secondary school in PhraNakhon Si Ayutthaya, central Thailand. A cross-sectional study identified the prevalence and associated factors of LBP among adolescents. A total survey was conducted among 4,944 students from November to December 2014.

2.1 Study populations

The present study was conducted in a provincial secondary school in PhraNakhon Si Ayutthaya, central Thailand.

2.2 Participant Characteristics

2.2.1 Inclusion criteria

- Adolescents who had 11 to 19 years old in provincial secondary school in PhraNakhon Si Ayutthaya in November 2014.

- Adolescents whose parents signed consent forms.

2.2.2 Exclusion criteria

- Adolescents reporting musculoskeletal problems such as fractures in the upper limbs, lower limbs and trunk, having a prosthesis and spinal disease were excluded.

Measures and Covariates

Primary outcomes

1. Prevalence of low back pain among adolescents
2. Associated factors of low back pain

2.3 Quantitative study

2.3.1 Sample Size Calculation

A related study on low back pain among adolescents in Shanghai (Shan et al., 2013), reported a prevalence of 33.1%. The sample size calculated with infinite population was

$$n = \frac{z^2(P)(1-P)}{d^2}$$

n = Sample size

Z = Z-value = 1.96

P = Percentage of population selecting a choice = 0.33

d = Confident interval = 5% of P = 0.0165

Alpha (α) = 0.05

Therefore, the sample size (n) was 3,120 participants

2.3.2 Sampling Procedures

Considering the large sample size, a total survey was conducted in the area. The Nordic Standard Questionnaire (NSQ) (Kuorinka et al., 1987) was used to screen LBP conditions among these adolescents. The NSQ consists of special questions to assess low back pain symptoms. These questionnaires cover the duration of the symptoms including entire life, last 12 months and previous 7 days. Adolescents reporting LBP symptoms, i.e., ache, pain or discomfort in the lower back area whether or not it extended from there or to one or both legs since 12 months ago would be identified as having LBP.

To determine the associated factors of LBP among these adolescents, face-to-face interviews using standardized questionnaires were conducted. The questionnaires covered demographic information, physical activity, smartphone and tablet use, exercise, the suitability of chairs and desks in the classroom and transportation to school.

Collected data were checked for accuracy and completeness. Then the data were coded and entered into the software packages for computer (SPSS for Window, version 23). Demographic data and prevalence was analyzed using descriptive statistics. Binary logistic regression analysis was used to determine the associated factors of LBP. The magnitude of association was presented as crude odds ratios (ORs) and adjusted odds ratios (AORs) was

presented as 95% confidence interval. A *p*-value of less than 0.05 was considered as statistically significant.

2.4 Ethical Considerations

This study was reviewed and approved by the Institutional Review Board, Phra Nakhon Sri Ayutthaya Hospital under the Ministry of Public Health. Informed consent was obtained from the main guardian of each adolescent.

2.5 Operational Definitions and Abbreviations

LBP = low back pain

BMI = body mass index

NSQ = Nordic standard questionnaire

3. Results

Of 4,944 adolescents, 4190 (84.8%) were included in this study and 4,162 (84.2%) were confirmed as meeting the criteria. Data analysis was based on the validated questionnaires. Demographic data of these adolescents are shown in Table 1. The participants had a higher proportion of males than females (58.8% vs. 41.2%, respectively). Most adolescents were 14 to 16 years old (54.8%). An estimated 44.2% of participants had a normal range of BMI (18.5 kg/m^2 - 24.9 kg/m^2).

Using the NSQs, the overall prevalence of LBP in this population was 26.7%; the prevalence of LBP in each subgroup is shown in Table 2. Univariate and multivariate analysis were performed to identify the associated factors of LBP. The associated factors of LBP included both behavioral and physical activity factors. Females had a significantly higher prevalence of LBP than males (OR=1.40, 95%CI 1.20-1.63). The prevalence of LBP among these adolescents tended to be higher with grade level (*p*-value <0.05). Among all participants, 94.4% (3,928 of 4,162) were smartphone users and 1,071 of 3,928 (27.3%) smartphone users had significant LBP (OR=1.66, 95%CI 1.17-2.36). Most adolescents went to school by bus, car and motorcycle, by rank. The adolescents using bus and motorcycle revealed a higher prevalence of LBP than those transported by car (OR=1.21, 95%CI 1.03-1.43 and OR=1.39, 95%CI 1.13-1.72). Uncomfortable seats and desks were associated with LBP among adolescents (OR=1.51, 95%CI 1.27-1.79 and OR=1.29, 95%CI 1.02-1.62). Adolescents reporting a history of back injury were significantly associated with LBP with OR=2.11, 95%CI 1.75-2.55. The frequency of exercise (two to seven times weekly) indicated the protective effect of LBP (*p*-value <0.05).

Table 1. Characteristics of the participants and prevalence of low back pain in adolescents

Characteristics	**Total**	**Low back pain**
	n (%)	**n (%)**
Gender		
Male	2445 (58.75)	571 (23.40)
Female	1717 (41.25)	542 (31.60)
Age (yrs.)	mean (SD) =14.86 (1.68), min-max=12-19	
11-13	1025 (24.63)	193 (18.80)
14-16	2280 (54.78)	617 (27.10)
17-19	857 (20.59)	303 (35.40)
Grade		
7th	785 (18.86)	131 (16.70)
8th	811 (19.49)	214 (26.40)
9th	868 (20.85)	198 (22.80)
10th	596 (14.32)	192 (32.20)
11th	549 (13.19)	187 (34.10)
12th	553 (13.30)	191 (34.50)

Height (cm)	mean (SD) =163.04 (8.40), min-max=110-189	
<141	23 (0.55)	8 (36.40)
141-150	227 (5.45)	55 (24.20)
151-160	1452 (34.89)	398 (27.40)
161-170	1667 (40.05)	427 (25.60)
>170	793 (19.06)	224 (28.20)
BMI (kg/m^2)	mean (SD) =20.89 (4.74), min-max=11.2-56.2	
<18.5	1642 (39.45)	441 (26.90)
18.5-22.9	364 (8.75)	118 (32.40)
23-24.9	1477 (35.49)	363 (24.60)
25-29.9	452 (10.86)	132 (29.20)
>30	227 (5.45)	58 (25.60)
Smartphone used		
No	234 (5.62)	42 (17.9)
Yes	3928 (94.38)	1071 (27.30)
Tablet used		
No	2856 (68.62)	754 (26.40)
Yes	1306 (31.38)	359 (27.50)
Transportation to school		
By car	1448 (34.79)	348 (24.00)
By bus	1904 (45.75)	520 (27.30)
By motorcycle	693 (16.65)	204 (29.40)
By bicycle	18 (0.43)	7 (38.90)
On foot	99 (2.38)	34 (34.30)

Table 2. Sociodemographic factors, physical activity and the associated factors of LBP in adolescents

Factors	**Total**	**LBP**	**Crude OR**	**(95%CI)**	***p*-value**
	n (%)	**n (%)**			
Gender					
Male	2445 (58.75)	571 (23.40)	1		
Female	1717 (41.25)	542 (31.60)	1.51	(1.32 - 1.74)	<0.001
Age (yrs.)					
11-13	1025 (24.63)	193 (18.80)	1		
14-16	2280 (54.78)	617 (27.10)	1.60	(1.33 - 1.92)	<0.001
17-19	857 (20.59)	303 (35.40)	2.36	(1.91 - 2.91)	<0.001
Grade					
7th	785 (18.86)	131 (16.70)	1		
8th	811 (19.49)	214 (26.40)	1.79	(1.40 - 2.28)	<0.001
9th	868 (20.85)	198 (22.80)	1.48	(1.15 - 1.89)	0.002
10th	596 (14.32)	192 (32.20)	2.37	(1.84 - 3.06)	<0.001
11th	549 (13.19)	187 (34.10)	2.58	(1.99 - 3.34)	<0.001
12th	553 (13.30)	191 (34.50)	2.63	(2.04 - 3.41)	<0.001

Height (cm)					
<141	23 (0.55)	8 (36.40)	1		
141-150	227 (5.45)	55 (24.20)	0.56	(0.22 - 1.40)	0.216
151-160	1452 (34.89)	398 (27.40)	0.66	(0.28 - 1.59)	0.357
161-170	1667 (40.05)	427 (25.60)	0.60	(0.25 - 1.45)	0.257
>170	793 (19.06)	224 (28.20)	0.69	(0.26 - 1.67)	0.408
BMI (kg/m^2)					
<18.5	1642 (39.45)	441 (26.90)	1		
18.5-22.9	364 (8.75)	118 (32.40)	1.13	(0.96 - 1.33)	0.002
23-24.9	1477 (35.49)	363 (24.60)	1.47	(1.15 - 1.89)	0.034
25-29.9	452 (10.86)	132 (29.20)	1.27	(1.00 - 1.60)	0.322
>30	227 (5.45)	58 (25.60)	1.05	(0.76 - 1.45)	0.076
Frequency of weekly exercise (times)					
≤1	386 (9.30)	145 (37.60)	1		
2-4	2729 (65.57)	715 (26.20)	0.59	(0.47 - 0.74)	0.14
5-7	714 (17.16)	163 (22.80)	0.49	(0.38 - 0.64)	0.746
>7	333 (8.00)	90 (27.00)	0.62	(0.45 - 0.85)	0.003
Average time of each exercise (hours)					
<0.5	1438 (34.55)	355 (24.70)	1		
0.5-1	2144 (51.51)	587 (27.40)	1.15	(0.99 - 1.34)	0.073
1-2	446 (10.72)	135 (30.30)	1.32	(1.05 - 1.68)	0.019
>2	134 (3.22)	36 (26.90)	1.12	(0.75 - 1.67)	0.577
Intensity of regular physical activities					
Light	1115 (26.79)	287 (25.70)	1		
Moderate	2672 (64.20)	721 (27.00)	1.07	(0.91 - 1.25)	0.430
Heavy	375 (9.01)	105 (28.00)	1.12	(0.86 - 1.46)	0.390

Table 3. Smartphone and tablet use and the associated factors of LBP in adolescents

Factors	**Total**	**LBP**	**Crude OR**	**(95%CI)**	***p*-value**
	n (%)	**n (%)**			
Smartphone used					
No	234 (5.62)	42 (17.90)	1		
Yes	3928 (94.38)	1071 (27.30)	1.71	(0.43 - 0.82)	0.002
Operating system of smartphone.					
ios Apple	1524 (38.86)	443 (29.10)	1		
Window	170 (4.34)	47 (27.60)	0.93	(0.66 - 1.33)	0.698
Android	2123 (54.16)	547 (25.80)	0.85	(0.73 - 0.99)	0.303
Blackberry	64 (1.63)	18 (28.10)	0.96	(0.55 - 1.67)	0.871
other	40 (1.03)	13 (32.50)	1.18	(0.60 - 2.30)	0.638
Size of the smartphone screen (inch)					
≤4.7	2754 (73.28)	771 (28.00)	1		
4.7-5.7	873 (23.23)	236 (27.00)	1.20	(0.80 - 1.81)	0.580
>5.7	131 (3.49)	32 (24.40)	1.15	(0.55 - 1.2)	0.374

Total time spent on smartphone (months)					
<6	928 (23.63)	221 (23.80)	1		
≥6	3000 (76.37)	850 (28.30)	1.27	(1.07 - 1.50)	0.007
Average time spent on smartphone daily (hours)					
<0.5	378 (9.65)	92 (24.30)	1		
0.5-1.5	1445 (36.88)	358 (24.80)	1.02	(0.79 - 1.33)	0.861
>1.5	2095 (53.47)	618 (29.50)	1.30	(1.01 - 1.68)	0.042
Eye-to-screen distance while using smartphone (cm)					
≤15	1968 (50.27)	534 (27.10)	1		
>15	1947 (49.73)	534 (27.40)	1.02	(0.88 - 1.17)	0.837
Tablet used					
No	2856 (68.62)	754 (26.40)	1		
Yes	1306 (31.38)	359 (27.50)	1.06	(0.91 - 1.22)	0.462
Total time spent on tablet (months)					
<6	928 (23.63)	221 (23.80)	1		
≥6	3000 (76.37)	850 (28.30)	1.13	(0.86 - 1.48)	0.382
Average time spent on tablet daily (hours)					
<0.5	297 (29.64)	82 (27.60)	1		
0.5-1.5	454 (45.31)	114 (25.10)	0.88	(0.63 - 1.22)	0.446
>1.5	369 (36.83)	118 (32.00)	1.23	(0.88 - 1.72)	0.222
Eye-to-screen distance while using tablet (cm)					
≤15	527 (47.10)	143 (27.10)	1		
>15	592 (52.90)	169 (28.50)	1.07	(0.83 - 1.39)	0.599

Table 4. Daily life activities and associated factors of LBP in adolescents

Factors	**Total**	**LBP**	**Crude OR**	**(95%CI)**	**p-value**
	n (%)	**n (%)**			
Transportation to school					
By car	1448 (34.79)	348 (24.00)	1		
By bus	1904 (45.75)	520 (27.30)	1.19	(1.02 - 1.39)	0.032
By motorcycle	693 (16.65)	204 (29.40)	1.32	(1.08 - 1.62)	0.008
By bicycle	18 (0.43)	7 (38.90)	2.01	(0.77 - 5.23)	0.152
On foot	99 (2.38)	34 (34.30)	1.65	(1.07 - 2.55)	0.023
Averager bag weight (kg)					
<2	2860 (68.72)	716 (25.00)	1		
≥2	1302 (31.28)	397 (30.5.0)	1.31	(1.14 - 1.52)	<0.001
Seat in class					
Convenient	3214 (77.22)	767 (23.90)	1		
Inconvenient	948 (22.78)	346 (36.50)	1.83	(1.57 - 2.14)	<0.001
Desk height					
Convenient	3746 (90.00)	956 (25.50)	1		
Inconvenient	416 (10.00)	157 (37.70)	1.77	(1.43 - 2.19)	<0.001

Chair back support					
Yes	4074 (97.89)	1086 (26.70)	1		
No	88 (2.11)	27 (30.70)	1.22	(0.77 - 1.93)	0.399
Time per class (hours)					
1	700 (16.82)	197 (28.10)	1		
2	117 (2.81)	32 (27.40)	0.96	(0.62 - 1.49)	0.86
3	1986 (47.71)	445 (22.40)	0.74	(0.61 - 0.90)	0.002
≥4	1359 (32.66)	439 (32.30)	1.22	(0.99 - 1.49)	0.053
Posture while watching TV					
Lying	1219 (29.29)	326 (26.70)	1		
Sitting	899 (21.60)	218 (24.20)	0.88	(0.72 - 1.07)	0.194
Semi reclining	2044 (49.11)	569 (27.80)	1.06	(0.90 - 1.24)	0.498
Average time spent on TV daily (hours)					
<1	1228 (31.27)	366 (29.80)	1		
1-4	1543 (39.29)	390 (25.30)	0.80	(0.67 - 0.94)	0.008
>4	1156 (29.44)	293 (25.30)	0.80	(0.67 - 0.96)	0.015
History of accident related LBP					
No	3564 (85.63)	878 (24.60)	1		
Yes	598 (14.37)	235 (39.30)	1.98	(1.65 - 2.37)	<0.001

Table 5. Multivariate analysis for factors associated with LBP in adolescents

Factors	**Total**	**LBP**	**Adjusted O.R.**	**(95% CI)**	***p*-value**
	n (%)	**n (%)**			
Gender					
Male	2445 (58.75)	571 (23.40)	1		
Female	1717 (41.25)	542 (31.60)	1.40	(1.20 - 1.63)	<0.001
Grade					
7^{th}	785 (18.86)	131 (16.70)	1		
8^{th}	811 (19.49)	214 (26.40)	1.77	(1.38 - 2.26)	<0.001
9^{th}	868 (20.85)	198 (22.80)	1.42	(1.11 - 1.83)	0.006
10^{th}	596 (14.32)	192 (32.20)	2.21	(1.70 - 2.86)	<0.001
11^{th}	549 (13.19)	187 (34.10)	2.30	(1.77 - 3.00)	<0.001
12^{th}	553 (13.30)	191 (34.50)	2.33	(1.78 - 3.04)	<0.001
Frequency of weekly exercise (times)					
≤1	386 (9.30)	145 (37.60)	1		
2-4	2729 (65.57)	715 (26.20)	0.67	(0.53 - 0.84)	0.001
5-7	714 (17.16)	163 (22.80)	0.62	(0.47 - 0.83)	0.001
>7	333 (8.00)	90 (27.00)	0.77	(0.55 - 1.08)	0.134
Smartphone used					
No	234 (5.62)	42 (17.9)	1		
Yes	3928 (94.38)	1071 (27.30)	1.66	(1.17 - 2.36)	0.005

Transportation to school					
By car	1448 (34.79)	348 (24.00)	1		
By bus	1904 (45.75)	520 (27.30)	1.21	(1.03 - 1.43)	0.021
By motorcycle	693 (16.65)	204 (29.40)	1.39	(1.13 - 1.72)	0.002
By bicycle	18 (0.43)	7 (38.90)	2.10	(0.78 - 5.67)	0.142
On foot	99 (2.38)	34 (34.30)	1.57	(1.00 - 2.47)	0.05
Seat in class					
Convenient	3214 (77.22)	767 (23.90)	1		
Inconvenient	948 (22.78)	346 (36.50)	1.51	(1.27 - 1.79)	<0.001
Desk height					
Convenient	3746 (90.00)	956 (25.50)	1		
Inconvenient	416 (10.00)	157 (37.70)	1.29	(1.02 - 1.62)	0.032
History of accident related LBP					
No	3564 (85.63)	878 (24.60)	1		
Yes	598 (14.37)	235 (39.30)	2.11	(1.75 - 2.55)	<0.001

Multivariate logistic regression (Backward wald) Adjusted for: Gender, Grade, Frequency of weekly exercise, Smartphone use, Transportation to school, Seat in class, Desk height, History of accident relate LBP.

4. Discussion

The prevalence of LBP in the present study was 26.7%, similar to a related study in Thailand (Kanchanomai et al., 2015). A recent study conducted among 684 healthy Thai university students to determine the prevalence of LBP among undergraduate students enrolled a total of 524 (77%) students and followed up for one year. A total of 31% reported a new onset of LBP. The prevalence of LBP in the present study was the same as a recent study from China that also showed the prevalence of LBP among adolescents living in Shanghai, was 33.1% (Shan et al., 2013). One of the limitations in this study was that only adolescents from one school were included. However, this school was a provincial secondary school, so these adolescents came from different districts. It constitutes the biggest secondary school in the province, in central Thailand, so the participants could be representative of adolescents throughout Thailand.

Most studies found that LBP was common among females (Shan et al., 2013; Fernandes et al., 2015; Troussier, Davoine, de Gaudemaris, Fauconnier & Phelip, 1994; Balagué et al., 1994; Diepenmaat, 2006). Our finding showed that the prevalence of LBP among females was significantly higher than males. LBP was common among females probably related to female hormonal change and the menstrual cycle (Balagué et al., 1994; Wedderkopp, Andersen, Froberg & Leboeuf-Yde, 2005). In addition, the physical strength of females was lower than males, putting females increasingly at risk of musculoskeletal overload (Fernandes et al., 2015). In addition, most females tended to have more mental stress than males, whereas stress has been found to correlate with musculoskeletal disease (Shan et al., 2013; Mikkelsson, Salminen & Kautiainen, 1997; Härmä, Kaltiala-Heino, Rimpelä & Rantanen, 2002) and male had higher pain thresholds than females (Shan et al., 2013; Torgén & Swerup, 2002).

One related study indicated that adolescents with LBP tended to be from upper grades and a few studies have revealed that LBP correlated with increased age (Shan et al., 2013; Fernandes et al., 2015; Sato et al., 2008; Olsen T et al., 1992; Salminen, Pentti, & Terho, 1992). Our study also revealed that the prevalence of LBP increased in upper grades in secondary school. This result might be related to adolescents having enhanced growth and consequent decreased flexibility, including that of the hamstring and the quadriceps muscles, causing functional failure of the lumbar muscles as a result of back pain (Fernandes et al., 2015; Poussa et al., 2005). In addition this result might be associated with the academic and psychological pressure placed on upper grade high school students due to frequent examinations such as the Ordinary National Education Test (O-net), and the university entrance examination. It may also the increase stress and sedentary states and reduce physical activity (Shan et al., 2013).

The adolescents who used smartphones were significantly associated with LBP. This associated factor could

possibly have been caused by adolescents using their smartphone to play games with their friends. The body posture adopted while they used the smartphone involved sitting on the floor and bending their backs forward, so this poor posture could have caused musculoskeletal overload and consequently, pain. One recent study from China also showed that high school students used mobile phone showed a significantly high prevalence of LBP. This was probably because mobile phone users establish a comfortable posture, and sometimes have to remain in static postures while using the phone (Shan et al., 2013). This static posture can increase bone and muscle stress around the waist and is closely related to LBP (Yue, Liu, & Li, 2012).

In the present study, the adolescents who went to school by bus and motorcycle tended to present a higher prevalence of LBP than adolescents who went by car. Most adolescents, who take the bus, might have to carry their baggage and stand for a long time. As a result, their lumbar and back muscles would become overloaded and cause muscle strain. A few adolescents went to school by motorcycle and sat on the saddle and carried their baggage. Those who bent their backs and leaned their lumbar muscles forward sometimes had to remain in a static posture resulting in LBP.

In our study, uncomfortable seating constituted a risk effect. Our study agreed with a reported study in Brazil (Onofrio, da Silva, Domingues, & Rombaldi, 2011), where uncomfortable seating was associated with a higher prevalence of LBP. Using seats, which are too narrow or too small, could result in limits to both the postural changes and relaxation parts of the extensor musculature, indicating increased back discomfort (Salewytsch & Callaghan, 1999). Using uncomfortable desks was associated with low back pain. Recent studies from Saudi Arabia also revealed that too low or too high table heights relative to a student's body dimensions increased the stress at the lumbosacral area resulting in discomfort (Ramadan, 2011).

In the present study, adolescents having a history of back injury were significantly associated with LBP as well as those in the study by (Troussier et al., 1994) with odds ratio of 5.50 (2.97- 0.98). Adolescence constitutes an age involving much physical activity, e.g., playing sports, driving, traveling and involving extreme or adventurous behaviors. This may result in accidents and injuries to the back. A recent study revealed that moderate or severe low back pain was common among patient who experienced motor vehicle collisions. These events might lead to sacroiliac and facet joint pain (Bortsov, 2015; DePalma, 2011).

The frequency of exercise was significantly associated with LBP among adolescents. This study also revealed that frequency of exercise, more than once weekly, created a protective effect of LBP as well as a related study conducted among adolescents aged 15 years. They found a correlation between low frequency of physical activity, less than or equal to twice weekly, and LBP (McGorry, 2000; Salminen, Oksanen, Mäki, Pentti & Kujala, 1993). This result might be described by low frequency of exercise or physical activity, resulting in decreased endurance of the abdominal and lumbar muscles (Salminen, Erkintalo, Laine, & Pentti, 1995). One recent study indicated that regular physical activity improved fitness and did not increase the risk of LBP (Ribaud; 2013). Consequently, teachers should provide and encourage exercise for students at least twice weekly to improve the strength of any musculature including the lumbar, abdominal and all extremity muscles.

In conclusion, we present a high prevalence of LBP among adolescents in central, Thailand. LBP among adolescents was associated with both behavioral and physical activity factors. Our information is crucial for schools and parents to decrease the risk of the LBP among adolescents.

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Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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