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ORIGINAL ARTICLE

ความชุกและปัจจัยเสี่ยงต่อภาวะหลังหลวมในคนขับรถโดยสารสองแถวที่มีอาการปวดหลังส่วนล่าง

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บทคัดย่อ

อาการปวดหลังส่วนล่างถือเป็นความผิดปกติทางระบบกล้ามเนื้อและกระดูกที่พบได้มากที่สุดในคนขับรถโดยสาร นอกจากนี้ยังพบว่า ภาวะความไม่มั่นคงของลำกระดูกสันหลังถือเป็นอีกหนึ่งสาเหตุของอาการปวดหลังส่วนล่างด้วยเช่นกัน งานวิจัยนี้จึงมีวัตถุประสงค์ในการศึกษา คือ เพื่อตรวจประเมินหาค่าความชุกและปัจจัยเสี่ยงที่อาจมีผลต่อภาวะความไม่มั่นคงของลำกระดูกสันหลังในคนขับรถโดยสารสองแถวที่มีอาการปวดหลังส่วนล่าง โดยทำการสำรวจในคนขับรถโดยสารสองแถวภายในจังหวัดสกลนคร 236 คน ในรูปแบบการศึกษาแบบภาคตัดขวาง (cross-sectional survey) โดยใช้การตรวจประเมินทางกายภาพบำบัดทั้งหมด 14 การทดสอบ คือ sit to stand test, aberrant movement pattern test, Beighton’s hypermobility scale, lumbar flexion test, total trunk extension, interspinous gap change test, posterior shear test, prone instability test, painful catch sign test, passive accessory intervertebral motions test, passive physiological intervertebral motions in trunk flexion test, passive physiological intervertebral motions in trunk extension test, passive lumbar extension test และ average SLR test และใช้แบบสอบถามในการหาปัจจัยเสี่ยงส่วนบุคคล จากผลการศึกษา พบความชุกของภาวะความไม่มั่นคงของลำกระดูกสันหลังในคนขับรถสองแถวคือ 75.42% (อายุเฉลี่ย 54 ± 11 ปี) และพบว่าในอาสาสมัครที่มีการออกกำลังกายมากกว่า 3 ครั้งต่อสัปดาห์ มีแนวโน้มของการเกิดภาวะความไม่มั่นคงของลำกระดูกสันหลังน้อยกว่าคนที่ไม่ออกกำลังกายที่ p=0.34 (OR 0.43, 95% CI 0.197-0.936, *p-value*<0.05)

คำสำคัญ: คนขับรถโดยสารสองแถว, ความชุก, ภาวะความไม่มั่นคงของลำกระดูกสันหลัง, การตรวจร่างกาย, อาการปวดหลังส่วนล่าง

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ORIGINAL ARTICLE

Prevalence and individual risk factors associated with clinical lumbar instability in minibus drivers with low back pain Development of live-attenuated dengue vaccine

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Abstract

Low back pain (LBP) is the most common musculoskeletal disorder in bus drivers. Lumbar instability is one of the causes of LBP. Therefore, the current study aimed to investigate the prevalence and risk factors associated with CLI in minibus drivers with LBP. This study design was a cross-sectional survey on 236 minibus drivers, conducted in Sakon Nakhon province, Thailand. The 14 physical examinations for lumbar instability containing sit to stand test, aberrant movement pattern test, Beighton's hypermobility scale, lumbar flexion test, total trunk extension, interspinous gap change test, posterior shear test, prone instability test, painful catch sign test, passive accessory intervertebral motions test, passive physiological intervertebral motions in trunk flexion test, passive physiological intervertebral motions in trunk extension test, passive lumbar extension test, and average SLR test, were performed. The method has used a questionnaire to answer of the risk factors associated. The prevalence of CLI in minibus drivers found in this study was 75.42% (age 54±11 years). The result of this study shows a significance of the drivers who had an exercise (p=0.034, p-*value* < 0.05).

Keywords: Minibus drivers, Prevalence, Lumbar instability, Physical examination, Low back pain

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Introduction

Prolonged driving can be one of various causing factors of low back pain. The University Kuala Lumpur Institute of Medical Science reported a high prevalence of LBP at 74% in bus drivers[1]. Prevalence of low back pain was also found to be the most common symptoms (62.19%) in van drivers in Hadyai, Songkhla province[2]. A minibus driver is one type of vehicle drivers for public transportation in rural areas of Thailand. The minibus is defined as a car which allows approximately 20 passengers sitting in 2 rows at the back of the car and usually driven for within 40 kilometers distance from the center area[3]. The minibus drivers usually spend more than 4 hours driving per day as their either full or part time job. The drivers are thus involved in the routine muscular effort while driving, being in awkward sitting postures, and exposing to whole-body vibration[3-4]. The minibus drivers may have associated individual factors for lumbar instability in term of wok related activity factors[4-6]. Therefore, low back pain could be common musculoskeletal symptoms in these drivers.

Lumbar instability can be one of mechanisms happening in drivers with low back pain. Lumbar instability is classified into two subgroups such as clinical lumbar instability (CLI) and non-clinical lumbar instability (NCLI)[7]. Lumbar instability leads to increase lumbar muscle pain, increase disability of motion, and decrease quality of life[7]. Without early detection and a proper treatment for lumbar instability, the problems could turn to lumbar spondylolisthesis or more severs pain in lumbar region. Patients suffering from severe cases of spondylolisthesis need high cost and consuming time for rehabilitation. This could lead to poor quality of life.

Radiographic film of lumbar spine is a gold standard and reliable method for diagnosing lumbar instability. However, radiography contains some limitations in the aspect of accessibility, cost and time consuming[8]. Several clinical objective examinations are therefore applied to assess lumbar instability comparing with flexion-extension radiographic films[9-13]. Also, the researchers invented the objective examination that can early detect lumbar instability. The objective examinations that researcher explore are about diagnosis accuracy study[9-,13], and reliability study[14-17]. The objective tests including sit to stand[9], PAIVMs[11], PPIVMs in flexion[10], PPIVMs in extension[10], Lumbar flexion[11], lumbar extension[11], average SLR[14], aberrant motion test[11], posterior shear test[11], Beighton hypermobility scale > 2 points[11], prone instability test[11], passive lumbar extension test[12], instability catch sign[12], painful catch sign[12], apprehension sign tests[12], and interspinous gap change during flexion-extension[13] were compared with flexion and extension radiograph in order to gain the accuracy of the diagnosis. The current study recruited 14 validity clinical tests to perform in the research methodology. The instability catch sign and apprehension are excluded because the instability catch sign is one component of the aberrant movement test and the apprehension sign test is relative with the subjective examination of the screening tool.

However, there was limited data on prevalence of lumbar instability in minibus drivers who have low back pain. Early detection of lumbar instability would help to reduce severity of low back pain and promote specific early treatment as much as possible for the drivers with low back pain. Therefore, the current study aimed to investigate the prevalence and individual risk factors associated with clinical lumbar instability in minibus drivers with low back pain.

Material and Methods

1. Study design

This cross-sectional study was conducted in Sakon Nakhon Province from April to July 2019. The study was approved by the Ethics Committee for Human Research at Khon Kaen University (HE612373) based on the Declaration of Helsinki.

2. Participants

Minibus drivers living in Muang district, Sakon Nakhon province were recruited as participants and were asked to give informed consent before participating in the study. Each participant who voluntarily responded to the announcements was interviewed and screened to determine whether they meet the following inclusion criteria: age from 20 to 80 years old, driving at least 4 hours per day, having complaints of sub-acute (from 6 to 12 weeks) to chronic low back pain (at least 12 weeks), and level of back pain ranges between 3-7 assessed by the visual analog scale (VAS). They were excluded if they had lumbar fracture, tumor, or infection, previous lumbar fusion surgery, limitation or incapability to actively move the spine in flexion and extension directions by pain or muscle spasm, and serious neurological diseases.

The sample size was calculated using the low back pain proportion (p = 62.19%) of the bus drivers from the previous study. Therefore, 0.62 was used to calculate the sample size in the current study. The significant level was 0.05 (*p-value* = 0.05) ($Z\alpha/2 = 1.96$) and precision of estimation (e) was assigned as 10% of the proportion (e = 0.1x0.62). Accordingly, the sample size was taken as 236 minibus drivers in the current study.

3. Diagnosis of CLI

The criteria for the diagnosis of the CLI was used that at least five out of fourteen objective examinations must be positive as a previous pilot study in patients with clinical LBP comparing between 14 examinations and radiography. The characteristic of participants in the previous studies were the participants aged between 20 – 60 years with prolonged sitting (Thiwaphon J et al., in press; Alisa L et al., in press). The 14 objective examinations used in the current study consist of the sit to stand test[9], aberrant movement pattern test[11], Beighton's hypermobility scale[11], lumbar flexion test[11], total trunk extension test[11], interspinous gap change test[13], posterior shear test[11], prone instability test[11], painful catch sign test[12], passive accessory intervertebral motions (PAIVMs) test[11], passive physiological intervertebral motions (PPIVMs) in trunk flexion test[10], passive physiological intervertebral motions (PPIVMs) in trunk extension test[10], passive lumbar extension test[12], and average SLR test[12].

The examiner in this study was a physical therapist with 6 years clinical experiences that practiced and performed the inter-rater reliability of these tests with an expert who had over 20 years of clinical experience in musculoskeletal disorders in 10 participants aged range 20 – 35 years. The order of the tests and participants were randomized within the same environment during 30 minutes testing time. The percent agreement of inter-raters and intra-rater were an 80-100 percent and 90-100 percent respectively.

4. Statistical analysis

The prevalence of lumbar instability was determined by frequency distributions. The variable including body weight, body stature, frequency, duration and distance of driving several days driving in a week and the number of hours or distance to driving in a day was analyzed and presented with mean and standard (SD). Multivariate logistic regression analyses were used to determine the associations between individual factors or work-related physical factors and LI condition. A significant level was less than 0.05. All analyses were carried out with the SPSS.

Table 1 The demographic characteristic of the 236 minibus drivers

Characteristic		n (%)	Mean ±SD	Min-Max
BMI (kg/m^2)	- <18.5 (thin)	6 (2.54%)		
	- 18.5 - 22 (normal)	59 (25.0%)		
	- 22.1-23 (overweight)	51 (21.61%)		
	- >23 (obesity)	120 (50.85%)		
Exercise	- Never	127 (53.81%)		
	- 1/week	24 (10.17%)		
	- 2-3/week	32 (13.56%)		
	- >3/week	53 (22.46%)		
Smoking	- No	167 (70.76%)		
	- Yes	69 (29.24%)		
Driving experience			22.10±15.30	1-61
Driving hour	- 1-2 hours	54 (22.88%)		
	- 2-4 hours	107 (45.34%)		
	- > 4 hours	75 (31.78%)		
Other jobs	- No	90 (38.14%)		
	- Yes	146 (61.86%)		

Table 2 The independent variables of the minibus drivers who had CLI; chi-square analysis (association between the prevalence of CLI with individual and occupational factors)

Variables	Normal		CLI		χ^2	*p-value*
	n	%	n	%		
Age (mean±SD)	55.91±12.10		53.69±11.13		-	-
Sex						
- female	0	0	15	100	5.219	0.02*
- male	58	26.2	163	73.76		
BMI (kg/m^2)						
- <18.5 (thin)	1	27.1	5	83.3	1.190	0.77
- 18.5 - 22 (normal)	16	16.7	43	72.9		
- 22.1-23 (overweight)	10	19.6	41	80.4		
- >23 (obesity)	31	25.8	89	74.2		
Exercise						
- Never	27	21.3	100	78.7	4.694	0.19*
- 1/week	5	20.8	19	79.2		
- 2-3/week	7	21.9	25	78.1		
- >3/week	19	35.8	34	64.2		
Smoking						
- No	41	24.6	126	75.4	0.000	0.99
- Yes	17	24.6	52	75.4		
Working experience (mean±SD)	22.10±15.30		18.75±12.64		-	-
Working hour						
- 1-2 hours	13	24.1	41	75.9	1.471	0.49
- 2-4 hours	23	21.5	84	78.5		
- > 4 hours	22	29.3	53	70.7		
Other job						
- No	24	26.7	66	73.3	0.343	0.59
- Yes	34	23.3	112	76.7		

Table 3 Prevalence and adjusted odds ratio (ORadj) with 95% confidence intervals (95%CI) of minibus drivers with CLI

Variables	OR_{adj}	95% CI		*p*-value
		Lower	Upper	
Age	1.005	0.968	1.043	0.790
Sex				
- Female	1.000			
- Male	0.000	0.000	-	0.990
BMI				
- 18.5 - 22 (normal)	1.000			
- <18.5 (thin)	1.922	0.172	21.533	0.596
- 22.1-23 (overweight)	1.726	0.666	4.477	0.262
- >23 (obesity)	1.032	0.490	2.172	0.934
Exercise				
Frequency (time/week)				
- Never	1.000			
- 1	0.965	0.320	2.91	0.950
- 2-3	0.984	0.362	2.677	0.975
- >3	0.43	0.197	0.936	0.034**
Smoking				
- No	1.000			
- Yes	1.117	0.542	2.299	0.765
Driving experience	0.990	0.962	1.019	0.479
Driving hour				
- 1-2	1.000			
- 2-4	1.047	0.458	2.393	0.913
- > 4	0.599	0.250	1.439	0.252
Other jobs				
- No	1.000			
- Yes	1.022	0.529	1.973	0.949

Note: *p*-value <0.05

Results

1. The demographic characteristics of the participants

Table 1 presents the demographic characteristic of all participants including the individual and the work-related factors. Two hundred and thirty-six minibus drivers with the age range of 20 to 78 years and the mean age of all participants was 54.2 ± 11.4. Most of the participants were male drivers (93.6%). Mean driving experiences was 22.1±15.3 years. According to the criteria of the current study, clinical lumbar instability was found in 178 (75.42%) in minibus drivers with low back pain. **Table 2** shows details between associated factors of minibus drivers and clinical lumbar instability in this study. More than half of the total participants were overweight. Most of the participants were a smoker (70.76 %) and never exercise (53.81 %). More than half of the total participants who had another job with driving. The results of multivariate logistic regression revealed that only individual factor as exercise habit (exercise more than 3 times per week) (OR 0.34, 95% CI 0.197-0.936) was a preventive associated factors with the occurrence of CLI in minibus drivers with low back pain as shown in **Table 3**.

DISCUSSION

This study investigated the prevalence, individual risk factors and work-related risk factors associated with clinical lumbar instability in minibus drivers with low back pain. This study found that prevalence of CLI was 75.42 percent. The demographic characteristic of participants in the current study such as BMI, frequency of driving, exercise, and smoking of participants of the current study were similar to the drivers who had low back pain in the previous studies[1, 2,6]. Previous studies in rice farmers with low back pains with lumbar instability[18] showed that most participants were female (13.11%) with the mean age of 44.20±9.51 years and the experience of farming was 24.29±12.38 years. Fifteen point forty eight percent of participants with clinical lumbar instability are overweight. The study of health problems was a high BMI of subjects. This, the effect of high BMI can be an injury of spinal loading while during lifting exertions[19].

Lumbar instability is one of the causes of LBP which can be classified as mechanic low back pain. Previous studies demonstrated that the prevalence of lumbar instability was 12% to 62% in patients with low back pain[9, 10, 12, 13, 14, 18]. However, the prevalence of CLI was had not presented specifically in minibus drivers or on a specific occupation. Although Sae-jern at el[2]., 2014 showed that the prevalence of low back pain in van drivers was 62.19%, this study has not reported the prevalence of lumbar instability in drivers. The current study is the very first study reporting a prevalence of CLI in minibus drivers who may have a different mechanism of injury from other occupations. Previous study of Puntumetakul[18] and co-workers reported of lumbar instability in rice farmers at 13.11%, they however used only three physical examinations to assess and used at least two positive out of three tests as criteria of the lumbar instability. The advantage of current study used 14 tests to assess in participants with clinical lumbar instability in minibus drivers. The current study found clinical lumbar instability in minibus drivers more than rice farmers may be all physical examination to assess and detect in passive and active subsystems.

Fifteen point sixty nine percent of participants with clinical lumbar instability are smokers. The previous studies showed that smoking was associated with LBP due to a reduction of oxygen supply to discs[20, 21, 22] and the prevalence of low back pain found that with smokers was 53.5%[2]. Thus the demographic data of participants in the current study were similar to the participants of participants who have lumbar instability and the participants in drivers in the previous study in terms of sex, age, BMI, and associated with working. This study showed the prevalence of clinical lumbar instability was 163 males (73.76%), and 15 females (100%). The prevalence of clinical lumbar instability in females higher than males may be due to males being stronger than females when they are working on the same task [29]. Also, the males have a muscle fiber size of the elector spinae muscles is larger than in females[30]. Some previous studies demonstrated that females are at greater risk of chronic LBP than males due to their anatomical structure and hormonal effects[31, 32].

The high prevalence of CLI leads to the high risk of the complication of injury in the spine and sitting a long time driving could reduce the passive stabilizing subsystem in lumbar instability[13]. The previous study showed the drivers were constrained to a very limited space behind the wheel, where drivers had to assume driving postures without too much backward inclination to give more room for passengers. The additional exposure to such biomechanical strains during prolonged driving may explain and they found in both crude and adjusted analyses a consistently significant association between LBP and bending/twisting activities while driving[20]. Total working hours have been found related to the occurrence of LBP due to the understanding of the effect of prolonged sitting. It is believed that when the drivers are passively sitting, the lumbar spine is poorly supported and may expose to any sudden injury[1]. It was also reported that postural stress is an important risk factor in getting low back pain[24]. Among the bus drivers, they usually maintain awkward body posture for a long period during their working hours include slumped sitting, leaning on one side, bending and twisting [25]. In theory, the erector spinae muscles remained inactive and the muscle becomes stiff limiting the trunk muscle movement and it may generate the pain[26]. The positive responses of three objective tests illustrate an impairment of the active stabilizing subsystem, the passive stabilizing subsystem, and the neural control subsystem. First, the active stabilizing subsystem was provided stabilizing the spinal column mechanical, a major dynamic and static stabilization to generate properly forces to support the lumbar motion segments[27]. Second, the passive stabilizing includes the intervertebral discs, ligaments (anterior longitudinal ligament, posterior longitudinal ligament, ligamentum flavum, intertransverse ligament, interspinous ligament, and supraspinous ligament), facets of the spinal column and vertebrae[7, 14]. Lastly, the neural control subsystem is a component of nerves and the central nervous system[7]. Although, the passive stabilizing subsystem can support less than an active stabilizing subsystem which plays a role in large-load carrying capacity and supporting body weight and additional loads, especially during trunk movements [10, 28]. Therefore, the minibus in this study may be a loss of the passive stabilizing subsystem to work of three subsystems. Therefore, the minibus drivers were forward trunk-bending triggers an anterior tilting of the pelvis while driving, causing accumulative stress on the passive stabilizing subsystem surrounding the lumbar spine This may lead to the imbalance of the passive stabilizing subsystem.

The examination for lumbar stability of response positive of the highest in 236 minibus drivers was PPIVM with flexion. Similarly, the previous pilot study reporting of examination of lumbar instability with non-radiological that PPIVM test was the highest positive test among all14 tests (Alisa L et al., in press). Meanwhile, another previous study of clinical lumbar instability reporting the all of the physical examinations in lumbar instability compared with the radiological films that the highest was interspinous gap change with during flexion and extension test (Thiwaphon J et al., in press). The current study was in line with Thiwaphons' study that the interspinous gap change during flexion and extension test was the highest positive test. The current study included participants both who had clinical lumbar instability with non-radiological and those with radiological films.

The high prevalence of lumbar instability was also related to Ornwipa et al. Study of WBV exposure in bus drivers[34]. The previous study showed WBV is the one cause of low back pain in bus drivers and maybe turn to lumbar instability in the future if it does not protect [34]. The drivers are involved in the routine muscular effort while driving, awkward sitting postures, and espousing to whole-body vibration (WBV). Likewise, Okunribido et al. showed the result of the combination of WBV and poor sitting posture is the risk factor lead to pain on lumbar LBP in drivers[35]. Also, the drivers have a high risk of injury with them-selves. The lumbar instability could turn to other injuries such as lumbar spondylolisthesis and injury of spinal cord or back muscles.

This study found that the prevalence of who had little experience in minibus drivers had higher CLI more than the drivers had a high experience. This relates to the previous study that showed younger drivers with LBP were significantly at p=0.4739. Moreover, the current study was presented of associated risk factors with clinical lumbar instability in minibus drivers with low back pain including sex, BMI, exercise, smoking, working experience, work hours per day and who had another job with CLI in minibus drivers. The result of this study shows a significant of the drivers who had an exercise (p=0.034, p-value < 0.05). Furthermore, the current study found the participants who had exercised more than three times per week could lower clinical lumbar instability than those who did not regularly do exercise. Similarly, in 2005, Koumantakis et al. show the benefit of exercises as to improve the stabilization of spinal muscles[33]. When multivariable logistic regression was tested, the results revealed that only individual factors as exercise habit (exercise more than 3 times per week) (OR 0.43, 95% CI 0.197-0.936) were a factor associated with the occurrence of CLI in minibus drivers with low back pain. Many studies suggest the frequency and duration of the interventions exercise were 2–5 times per week are clouding increase improve muscle strength, muscle power, and prevention of re-injury in a patient with low back pain[36]. The previous studies have shown that lumbar stabilization exercises performed by chronic low-back pain patients are effective at reducing low-back pain intensity and low back pain-related disability indexes, and this study also found significant decreases in low-back pain intensity and disability indexes (p<0.01) in each of the four subgroups, confirming that lumbar stabilization exercises are helpful for the treatment of low-back pain. The lumbar instability experimental group, that had higher levels of limitation of the hip range of motion, showed larger decreases than the lumbar stability group (p<0.01). Also, many previous studies suggest the result shows the therapeutic effects of exercise (stretching and core stabilization) on pain intensity of the instability catch sign, functional disability, and trunk muscle activation patterns of patients with clinical lumbar instability were wellness. The exercise may enhance the ability of segmental muscle in the lower back, reducing the pain intensity of instability catch sign and improved functional disability of patients with lumbar instability. Which, the instability catch sign is one of the major problems of clinical lumbar instability [11, 37, 38]. It has been proposed that instability catch sign is sudden sharp pain in mid-range of motion during the return from the affixed trunk position[11]. Thus, the previous study in exercise with core stabilization exercise provides a significantly better reduction of pain intensity[39]. Similarly, the previous study show exercise could improve muscle strength and performance in who had exercised. Also, who had not to exercise cloud be making dysfunction of an active and passive subsystem of lumbar instability. Also, general exercises could improvement of excessive lumbar vertebrae translation and rotation and a general exercise program could reduce disability in patients with recurrent low back pain[40].

Conclusion

According to the result, the current study demonstrated that minibus drivers with low back pain had a prevalence of clinical lumbar instability up to 75.42 percent. This means CLI is an important problem in low back pain. The current study also showed that an exercise habit (exercise more than 3 times per week) was a significantly associated factor with lumbar instability. The diagnosis of CLI in minibus drivers seems to very important to the physiotherapist in order to be able to detect CLI in an early stage. Furthermore, regular exercise in minibus driver would be one of a choice to prevent them from clinical lumbar instability condition.

Research limitation

The current study did not use radiography to diagnose clinical lumbar instability; further study should request the participants to undertake radiography to confirm a diagnosis of clinical lumbar instability. The participants in the current study were widely age range, therefore future studies should recruits minibus drivers in each age group to confirm whether age has an associated factor in clinical lumbar instability.

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