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(Original article)

สถานการณ์สุขภาพและปัจจัยที่สัมพันธ์กับความรู้สึกไม่สบายบริเวณหลังส่วนล่าง ในกลุ่มพนักงานขนส่งสินค้า ในบริษัทขนส่ง กรุงเทพมหานคร

Health and factors related to low back discomfort among delivery truck drivers, delivery business, Bangkok

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บทคัดย่อ: *การวิจัยนี้เป็นการศึกษาภาคตัดขวาง มีวัตถุประสงค์เพื่อศึกษาสถานการณ์สุขภาพด้านความรู้สึกไม่สบายบริเวณหลังส่วนล่างและปัจจัยที่สัมพันธ์กับความรู้สึกไม่สบายบริเวณหลังส่วนล่างในบริษัทขนส่งแห่งหนึ่งในกรุงเทพมหานคร กลุ่มตัวอย่างเป็นพนักงานขับรถบรรทุกขนส่งสินค้าจำนวน 100 คน โดยสุ่มตัวอย่างแบบง่าย เครื่องมือที่ใช้ในงานวิจัยเป็นแบบสอบถามแบบตอบด้วยตนเอง ซึ่งประยุกต์จากแบบแนวทางการเฝ้าระวังทางสุขภาพในผู้ที่สัมผัสกับแรงสั่นสะเทือนทั้งร่างกาย ประกอบด้วย คำถามเกี่ยวกับพฤติกรรมการขับขี่, ส่วนประกอบของเบาะนั่งคนขับ, ท่าทางในการทำงานและการขับขี่, ความรู้สึกที่ได้สัมผัสกับแรงสั่นสะเทือน, ลักษณะการขับขี่ และสภาพแวดล้อมขณะขับขี่ ดำเนินการเก็บข้อมูลจากกลุ่มพนักงานที่ขับรถบรรทุกขนส่งสินค้าหกล้อ สถิติที่ใช้วิเคราะห์ข้อมูลด้านสุขภาพเกี่ยวกับความรู้สึกไม่สบายบริเวณหลังส่วนล่าง ได้แก่ ร้อยละความถี่, ค่าเฉลี่ย, ค่าเบี่ยงเบนมาตรฐาน ส่วนสถิติที่ใช้ในการวิเคราะห์หาความสัมพันธ์ระหว่างปัจจัยและความรู้สึกไม่สบายบริเวณหลังส่วนล่าง คือ Fisher's exact test ผลการวิจัยพบว่า ความรู้สึกไม่สบายที่หลังส่วนล่างในพนักงานขับรถขนส่งสินค้ามีอัตราร้อยละ 44 ปัจจัยที่มีความสัมพันธ์กับความรู้สึกไม่สบายบริเวณหลังส่วนล่างอย่างมีนัยสำคัญทางสถิติ ได้แก่ ท่าทางการยกของ, ความเร็วที่ใช้ในการขับขี่ และลักษณะของผิวถนนโดยมีค่า p-Value เท่ากับ 0.03, 0.01 และ 0.04 ตามลำดับ ผลการวิจัยนี้ยืนยันว่าท่าทางการขับขี่, พฤติกรรมการขับขี่ และสิ่งแวดล้อมในการขับขี่รถบรรทุกขนส่งสินค้าและบริการ มีความสัมพันธ์กับความรู้สึกไม่สบายบริเวณหลังส่วนล่างในกลุ่มพนักงานขับรถบรรทุกขนส่งสินค้า ดังนั้นความปลอดภัยในการขับขี่ของพนักงานขับรถบรรทุกขนส่งสินค้าไม่ได้มีสาเหตุจากปัจจัยของพนักงานขับรถเพียงหนึ่งเดียวแต่เกิดได้จากหลายปัจจัย ได้แก่ ความระมัดระวังในท่าทางการขับขี่ พฤติกรรมการขับขี่ และพื้นผิวถนน ความรู้สึกไม่สบายในส่วนต่าง ๆ ของร่างกายเป็นตัวบ่งชี้เชื่อมโยงให้เกิดอาการทางระบบกระดูกและกล้ามเนื้อ ความรู้สึกไม่สบายจึงเป็นหนึ่งในตัวแปรสำคัญของเครื่องมือด้านการยศาสตร์เพื่อใช้ในการป้องกันไม่ให้เกิดภาวะทางสุขภาพในกลุ่มพนักงานขับรถ*

ABSTRACT: *This cross-sectional study aimed to determine the health status focused on low back discomfort and the association between working factors and low back discomfort. One-hundred delivery truck drivers, who worked in a delivery business in Bangkok, Thailand, were selected using simple random sampling. The instrument of this research was a self-administrative questionnaire that was adapted from the whole-body vibration: health surveillance guideline and the information gained from the review literatures. This questionnaire consisted of questions on driving behavior, cockpit of seat, working posture, vibration exposure (feeling), behavior pattern and driving environment. The rate of low back discomfort was determined by frequency, mean, and SD while the relationship between factors and low back discomfort was determined by Fisher's exact test. The result showed 44 percent of low back discomfort in this group. The significantly relationship between working factors and low back discomfort were found from the posture when pushing and lifting weight, driving velocity and road surface at p-value 0.03, 0.01 and 0.04, respectively. This study noticeably confirmed that driving posture, driving behavior and driving environment related low back discomfort among delivery truck drivers, in this delivery business in Bangkok. Hence, the safety of driving among delivery truck drivers doesn't demonstrate only from drivers themself but also from several kinds of working factors such as being careful of driving posture, driving behavior and the road surface. This study recommended that an uncomfortable feeling of body parts can contribute to musculoskeletal conditions. Therefore, it could be one important and practical parameter of the prevention tools for ergonomic health surveillance for drivers.*

คำสำคัญ: *ความรู้สึกไม่สบายบริเวณหลังส่วนล่าง พนักงานขนส่งสินค้า ท่าทางการขับขี่*
Keywords: *Low back discomfort, Delivery truck drivers, Driving posture*

1. INTRODUCTION

Delivery drivers were one of important careers that promoted logistic systems in many parts of the world including Thailand. Data from the Thai E-Commerce business showed that the service of logistics and delivery increased by about 16.8 percent. Large number of new delivery drivers presented in the market competition. Occupation driver was one of occupation that exposed to the environment and several types of hazard. Several hazard factors aggravated illness and caused health problems to drivers especially, musculoskeletal problems [1].

Delivery driver was one kind of occupational driver who lived in a vehicle for a long time. Moreover, delivery drivers drove, delivered, lifted and carried items by themselves. Delivery small truck drivers had been a state enterprise that serviced people for delivering mails, objects and small till large materials. There might get an effect from travelling and working [2].

Past studies showed that individual factors, physical factors, and organizational factors had a relationship with triggering, developing, and maintaining musculoskeletal disorders in heavy trucks or bus drivers [2, 3]. Several studies found a prevalence of various musculoskeletal parts occurred at the low back, neck, upper back, and shoulder area. Musculoskeletal disorders were studied among many kinds of drivers such as bus drivers, long-haul and short-haul truck drivers, public minibus drivers, taxi drivers, forklift drivers, and chemical truck drivers [4-9]. However, there was rarely data that showed the relation between health factors and low back discomfort among small delivery truck driver. Whole-body vibration was a major factor that can aggravate disorder in drivers [7-9] but, there was not research study on the association between low back discomfort and the whole-body vibration (WBV) experience.

Up to now, there has not been the equipment to investigate the relationship of low back discomfort with WBV experience among delivery truck drivers. An adaptive questionnaire that concerned WBV experience and individual factors can help to investigate, find and update the amount of low back discomfort among delivery truck drivers who worked in Bangkok. In addition, the questionnaire could find the relationship between WBV experience and musculoskeletal discomfort. The information would be useful to set a baseline of physical health damage prevention and concern about work-related musculoskeletal discomfort especially in lower back among delivery truck drivers.

The objective of this study was to find the amount of low back discomfort among truck delivery drivers. The other aim of this study was to determine the association between individual factors, whole-body vibration experience, and low back discomfort among delivery truck drivers who work in the delivery business, Bangkok, Thailand.

2. METHODS

2.1 Participants

Occupational small delivery truck drivers who were a full-time driver in the department of transportation and delivery service. This department was in Bangkok. The drivers were selected

by using simple random sampling from Thai male delivery drivers who were aged between 20 to 60 years. Drivers drove small delivery trucks which were a size between six-wheel trucks and not over ten-wheel trucks. Drivers worked on driving duty at least 1 hour per day. They must have passed a full Thai driving license type 2 and intended to participate this study. They did not have a history of a violent accident of muscular and bone disease, history of accident in the spine and lower extremities area, history of fracture and operation and no history of taking drugs which gives effect to fatigue.

The sample size of this research was calculated by the calculation method of Krejcie and Morgan equation [10] as follows;

$$n = \frac{Z^2 NPQ}{(e^2 (N-1) + Z^2 PQ)}$$

2.2 Research tools

The self-report questionnaire was developed practically for delivery drivers who worked and drove small city trucks (the truck size being not bigger than a 10-wheel truck) among delivery service. This questionnaire was the Thai version that was divided contents into 3 parts. The first part consisted of questions about each factor. The second part consisted of questions about whole-body vibration (WBV) the experience that were adapted from the whole-body vibration: health surveillance guideline 2002 [11] and the information gained from the review of literature in musculoskeletal disorders among drivers [2-3, 12]. Questions were recruited and orders as the *behavior of driving, the sitting area, the posture of working, feeling of exposed to vibration, behavior pattern and driving environment,* respectively. The last part of the questionnaire contained with the body chart discomfort from Corlett and Bishop [13] and questions that were adapted from Standard Nordic questionnaire [14].

Researcher processed the test of reliability and content validity prior to the beginning of the survey by a group of 30 drivers. All questions in this questionnaire had Cronbach's alpha coefficient [15] ranges 0.7 to 0.9 and had Item-Objective Congruence (IOC) rate higher than 0.5 [16].

2.3 Data collection

This study was approved from the ethical committee, No. MUPH 2018-144. Drivers were selected by simple random sampling from small delivery truck drivers who work full time in the department of delivery service, Bangkok. The participants who passed the criterion of this study used 20-30 minutes to answer the questionnaire. They might answer the questionnaire by themselves only one time at the end of their workday. All completed questionnaires were kept and analysed by the researcher.

2.4 Statistical analysis

The data were analysed by using SPSS statistical software, version 18. The significant level was set at *p*-value<0.05. The amount of low back discomfort was analysed by frequency, mean, and SD while the relationship between factors and low back discomfort was determined by Chi-square test.

3. RESULTS AND DISCUSSION

3.1 Individual factors

One hundred small delivery truck drivers had the average age of 38 years. The average height and weight were 171 centimeters tall and 73.3 kilograms. The average value of body mass index (BMI) was 24.96 among drivers that were considered to be overweight. The results shows that 57% of the participants were married and 78% had lower than high school educational levels. The mean experience of the drivers was 9 years. Drivers exercised at least 3 times per week or from 0-30 minutes per time. In addition, 58% of small delivery truck drivers drank alcohol and 47% of them smoked. The results also showed that 58% of them had a period of sleeping less than 7 hours per day.

3.2 Factors of whole-body vibration experience

The result of this research was collected from a population of 100 delivery truck drivers in December 2018 to January 2019.

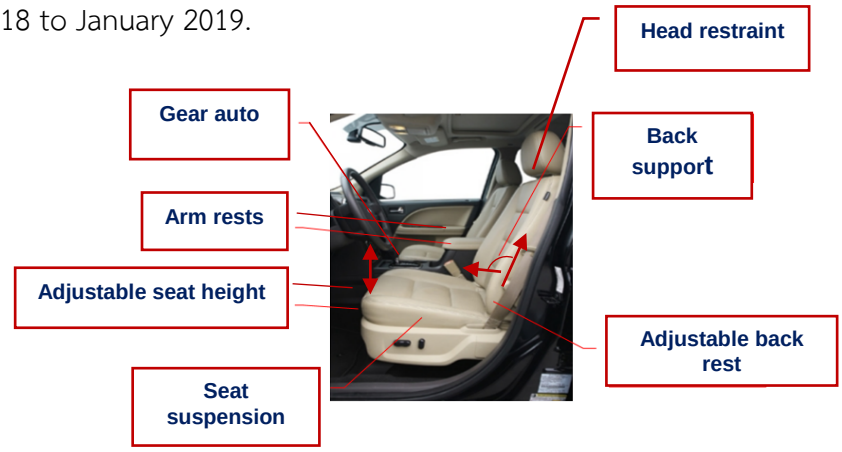

Figure 1: **Details of the seat pan**

One hundred drivers had driven small city delivery trucks that which over 210 horsepower. The work duration of drivers was 6 to 7 days per week and not over 8 hours per day. Moreover, they took about 32 minutes break during the driving period. The ergonomic of sitting area in the small delivery trucks had less seat-suspension, armrest and an adjustable seat height (Figure 1 and 2).

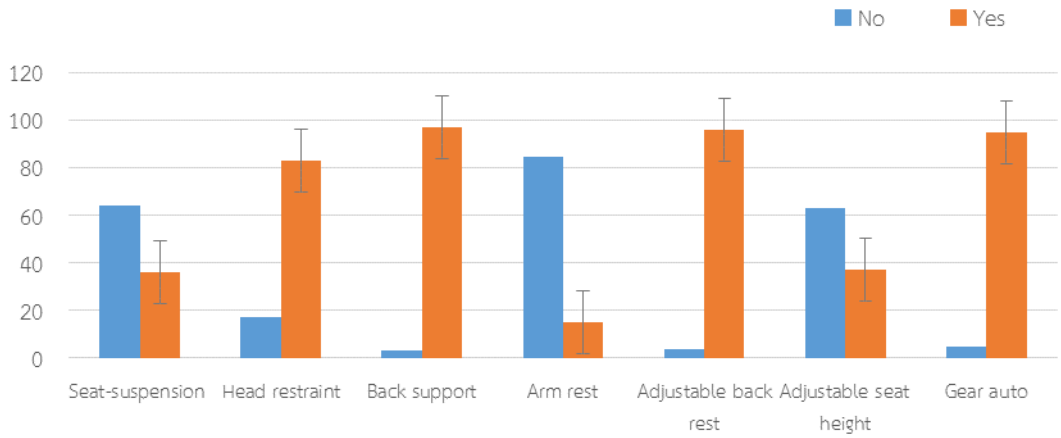

Figure 2: The cockpit of the seat pan

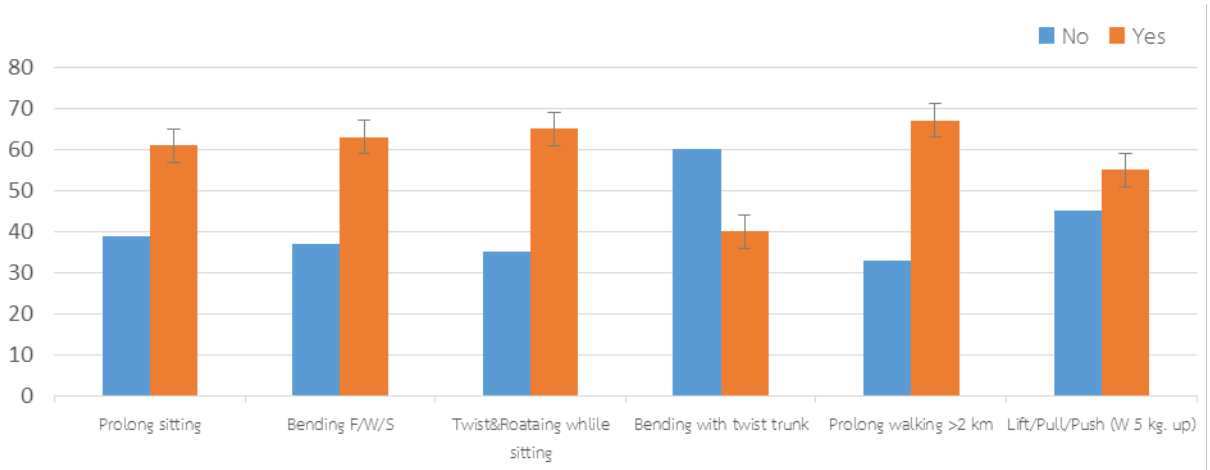

Figure 3: The amount of working posture among six-wheel delivery truck drivers

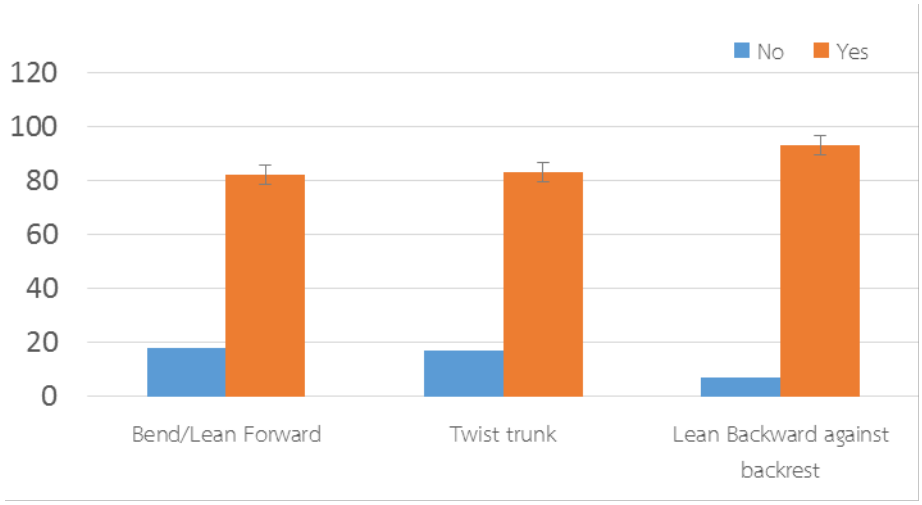

Figure 4: The amount of driving posture among six-wheel delivery truck drivers

The percentage of working problems from 100 subjects occurred mostly in most of the characters. Drivers were sitting for a long period of time, bending the body in several directions twisting and rotating their trunk while sitting, complicated bending and twisting trunk while sitting and carrying and transferring overweight objects (Figure 3). While they were driving, delivery drivers always had improper postures like bending and leaning forward while driving, twisting their trunk while driving vehicles and leaning trunk backward against the backrest while driving (Figure 4).

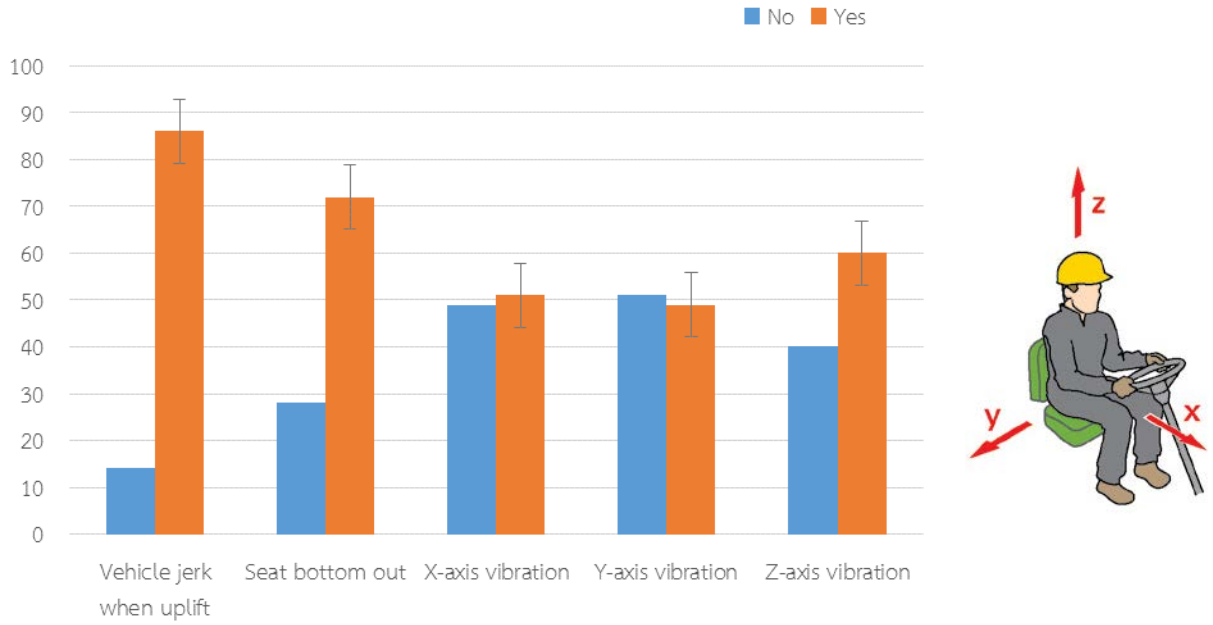

Figure 5: **The amount of exposure to whole-body vibration (feeling) among six-wheel delivery truck drivers**

Most of the six-wheel delivery drivers did not feel whole-body vibration while driving or using the truck. However, some of the delivery drivers answered that they had had vibration experiences in direction of forward-backward and lateral sliding direction. The vibration effects of this direction caused uncomfortable feeling after driving (Figure 5).

Table 1: **Discomfort score of lower back and rate of discomfort (n=100)**

	Score of Discomfort							Rate of discomfort		
	1	2	3	4	5	6	7	All drivers	During the last 12 Months	During the last 7 Days
Lower back	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
	20 (20.0)	6 (6.0)	12 (12.0)	19 (19.0)	25 (25.0)	13 (13.0)	5 (5.0)	44 (44.0)	49 (69.0)	26 (48.1)
	Mean = 3.82 SD = 1.84							Mean = 1.71, SD = 0.46		

Table 1 showed the score of discomfort at the lower back. The score from 1 to 4 was grouped to be 'comfort group' and score 5 to 7 were levelled to be 'discomfort group'. However, 100 drivers had had lower back discomfort of 44%. When calculated from the discomfort feeling, 69% of drivers had had troubles in the low back during the last 12 months and 48.1% of them had had troubles in the low back during the last 7 days.

Table 2: The association between whole-body vibration experience and low back discomfort

WBV experience	Lower back	
	Odds Ratio	*p*-value
Delivery driving duration (at least 8 hours/day)	1.29	0.66
Delivery driving period (at least 5 days/week)	1.05	1.00
Break or rest duration (at least 30 minutes)	1.23	0.68
Seat-suspension system	0.72	0.53
Head restraint	0.69	0.44
Back support	1.59	1.00
Arm rest	1.56	0.57
Adjustable back rest	0.25	0.32
Adjustable seat high	1.35	0.53
Gear system	3.31	0.38
Prolong sitting	2.07	0.10
Bending (forward/backward/sideward)	1.49	0.41
Twist and rotate while sitting	0.10	0.40
Bending with twist trunk	1.50	0.41
Prolong walking (at least 2 km/day)	1.94	0.14
Lifting/Pushing/Pulling (weight ≥ 5 kg)	2.66	0.03*
Bending forward while driving	1.29	0.79
Twist and rotating trunk while driving	1.55	0.59
Lean backward against back support	1.05	1.00
Vehicle jerk or joint when uplift from seat (at least 5 times)	2.62	0.15
Seat bottom out while driving (at least 5 times)	1.15	0.82
X-axis vibration while driving	1.52	0.32
Y-axis vibration while driving	1.75	0.23
Z-axis vibration while driving	1.56	0.31
Driving velocity (at least 80 km/hour)	0.19	0.02*
Driving's character (Drive with static speed)	1.15	0.82
Break or rest activities (at least 1 activity)	1.66	0.30
Road type (Driving more than 1 road type)	0.80	0.66
Asphalt surface	0.57	0.22
Concrete surface	0.42	0.04*

Fisher's Exact Test * *p*-value < 0.05

3.3 Association between whole-body vibration experience and low back discomfort

Table 2 showed the association between lifting, pushing or pulling weight over 5 kg and lower back discomfort (*p-value*=0.03). When the driver used their power to lift, pull or push the delivery things, the lumbar discs between the vertebras began to wear down and became damaged.

Tissues and muscles of the lumbar area could get micro or macro tears. Moreover, the trunk stabilizer muscle of the delivery truck drivers could be weak because the driver had no time to exercise. Trunk stabilizer muscles combined with extensor muscles, abdominal muscles (transversus abdominis) and pelvic floor. The spine extensor muscle is divided into superficial layer; erector spinae and deep layer; multifidus [17]. In the case of the drivers who had less exercised, deep tissue and deep muscle would be irritated and it caused aggravation uncomfortable feeling in the lower back.

There were statistically significant between velocity of driving at least 80 km/hour (*p*-value=0.02), concrete surface (*p*-value=0.04) and low back discomfort respectively. The relationship might be provoked from exposing with WBV in vehicle and friction force between truck wheels and road surface [18]. When the driver's feet were on the pedal brake and acceleration for a long time, the bodyweight could be shifted and transferred from the foot on the pedal through the spine [19]. In addition, the result of this research found that a six-wheel delivery truck had no seat suspension, adjustable seat height and arm rest. The recommendations for the safety of the seat design mentioned that suspension, seat height and armrest must be adjustable to promote correct ergonomic position and reduce high static load to the lumbar area [20]. Driving at high speed in tiny and unsuitable truck seats might accelerate exposure to WBV. These were the causes of discomfort in the low back area.

4. CONCLUSION

Low back discomfort was the major problem that occurred among six-wheel delivery truck drivers. Lifting/pushing/pulling weight over 5 kg, driving speed at least 80 km/hr. and concrete road surface showed significant association with low back discomfort. Adjustable and modified workstation in delivery truck cabins, driving behavior and driving and working postures such as adjusting dimension and length of the truck seat will prevent low back and musculoskeletal discomfort.

Teaching drivers stretching or strengthening exercises will prevent stress and tension in the musculoskeletal system especially lower back. The standard speed of driving should be set while using the basic knowledge of the delivery driver. Improving and repairing road surfaces could prevent whole-body vibration and prevent accidents on the way. The proper ergonomic training module should be developed for the group of six-wheel delivery truck drivers.

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