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Factors Affecting Low Back Pain (LBP) among Public Transportation Drivers

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ABSTRACT

Low back pain (LBP) is one of the most common health problems among public transportation drivers. On the average, public transportation drivers has 12 hours working time per day with prolonged static sitting position so that it can cause problems such as muscle and spine pain in the lower back area. This study was conducted to analyze what factors affect LBP the most among public transportation drivers in Palembang. This analytic observational reasearch is using cross sectional design and incidental sampling technique. Subject of the research is 60 public transportation drivers in Palembang. LBP is measured with Nordic Questionnaire and the other factors is measured with self identity questionnaire, Perceived Stress Scale and anthropometric measurement. Data is analysed with Chi-Square method and logistic regression analysis. Thirty seven drivers (61,7%) of 60 drivers complained about LBP. There is significant association of LBP with age (p=0.044), BMI (p=0.006), working period (p=0.037), working time (p=0.040), and smoking (p=0.016), but no significant association with waist circumference (p=0.111), pelvis height (p=0.066), psychosocial stress (p=0.229), and family history(p=0.443). Multivariate analysis with logistic regression showed that BMI is associated with LBP (p=0.002). There is significant association between LBP with age, BMI, working period, working time, and smoking. BMI has a greater association with LBP.

Keywords: *Low Back Pain, Driver*

1. Introduction

Low back pain (LBP) is a posterior trunk pain between the ribcage and the gluteal folds. It also includes lower extremity pain that results from a low back disolder.[1] LBP or is one of the most common health problems in society. World Health Organization (WHO) states that about 150 types of musculoskeletal disorders suffered by hundreds of millions of people, one of them is LBP, which causes a very long period of pain and inflammation as well as disability or functional limitations, causing psychological and social disorders.[2]

The reports in developed countries such as the United States show that there is a 15% incidence of frequent or persistent low back pain, with a lifetime prevalence of 65% to 80%.[3] Studies show that the annual prevalence of back pain in the United States varies considerably from 10% to 56%.[4] McGlynn, E.A. and Clark, K.A. (2000) stated that the costs incurred due to lost working hours and the cost of treatment per year in industrialized countries such as America could reach more than 200 billion dollars.[5]

Kelompok Studi Nyeri (Pokdi Nyeri) Persatuan Dokter Spesialis Saraf Indonesia (PERDOSSI) conducted a study in May 2002 at 14 teaching hospitals, with results showing that Three was 4456 (25% of total visits) people who suffer pain, 1598 persons (35, 86%) suffers headache, and 819 people (18.37%) suffers LBP. Although epidemiologic data on LBP in Indonesia is not present yet an estimated 40% of Central Java residents aged between 65 years have suffered from back pain and its prevalence in men is 18.2% and in women 13.6%.[6]

Risk factors for NPB include age, body mass index, pregnancy and psychological factors. An elderly person will experience LBP because of the decline in body functions, especially bone, so it is no longer elastic as in the young. While the posture is a factor supporting LBP. Posture errors such as shoulders arched forward, belly bulging forward and excessive lumbar lordosis can cause muscle spasms (muscle tension). This is the most common cause of LBP.[8] Other risk factors include lifting heavy loads or lifting weights beyond the body's capability and sitting for long periods such as sitting in a car, truck or sitting on a chair that does not hold the posture well.[8] The long smoking history had a significant association with lower back pain and lumbo-sacral radicular pain.[9]

One of the jobs that contribute to LBP is public transportation drivers. Transport means to move people or goods from one place to another, whereas public transport is a transportation for passenger with rent or pay system such as *angkot*, train, bus, water transport, and so forth. Some examples of public transportation that is common in the society is land transportation such as urban transportation or public transportation, buses, taxis, mini metro and so forth. The average public transport driver has a working period of approximately 12 hours each day with a high passenger load factor causing an increase in the workload of the driver. This condition is also compounded with a static sitting position because the driver's workspace is usually limited to the steering cabin that does not allow for the movement of the body freely. Prolonged static sitting conditions that can have negative health effects especially on musculoskeletal complaints such as muscle aches, spinal pain and cramps.[10]

Complaints of low back pain need to get a good treatment otherwise it can spread to the extremities, and increase the risk of falling in the patient in case of a sudden attack. This research was conducted to find out the risk factors that play a role in the occurrence of LBP incident in public transportation driver in Palembang. This study can be used to prevent LBP that can cause functional limitations, loss of productivity and working days, and require high medical costs.

2. Method

The research is an observational analytic study with cross sectional design. The research took place from October to November 2017 in Palembang.

The population of this research is public transportation driver in Palembang. The sample was 60 public transport drivers in Palembang who fulfilled the inclusion and exclusion criteria selected through incidental sampling technique. Inclusion criteria of this research are (1) public transportation driver in Palembang and (2) male. The study exclusion criteria were (1) the subjects were not willing to participate in the study and (2) the subjects had a history of spinal injury.

The variables studied were age, body mass index, waist circumference, pelvic height, length working period, working time, smoking, psychosocial stress, and family history. Low Back Pain (LBP) was identified from a Nordic questionnaire whereas other factors were measured using a self-data questionnaire, Perceived Stress Scale and anthropometric measurements. Data were analyzed using Chi-square method and logistic regression analysis.

3. Result

There were 37 (61.7%) subjects with low back pain of the 60 subjects. The proportion of subjects who did not experience low back pain was 38.3%. For the age category, there are 37 (61.7%) subjects aged ≥40 years. The proportion of subjects aged <40 years was 38.3%.

Table 1. Distribution of research subjects based on lower back pain (N = 60)

Low Back Pain	n	%
Yes	37	61,7
No	23	38,3
Total	**60**	**100**

Table 2. Distribution of research subjects based on age (N = 60)

Age	n	%
≥40 years old	37	61,7
<40 years old	23	38,3
Total	**60**	**100**

In anthropometric characteristics, there are 27 (45%) subjects with normal BMI range. The proportion of obese subjects I is 26.7%, obesity II is 15%, and at risk is 13.3%. Waist circumference is categorized into two groups: ≥90 cm and <90 cm. There were 40 (65%) subjects with a waist circumference of ≥90 cm of the 60 subjects. The proportion of subjects with waist circumference <90 cm is 35%. Pelvis height is categorized into two groups:> 9.5 cm and ≤9.5 cm. There were 41 (68.3%) subjects with a pelvic height of ≤9.5 cm of the 60 subjects. The proportion of subjects with a pelvic height of> 9.5 cm is 31.7%.

Table 3. Distribution of research subjects based on anthropometric characteristics (N = 60)

Anthropometric Characteristics	n	%
BMI		
Underweight (<18,5 kg/m^2)	0	0
Normal Range (18,5-22,9 kg/m^2)	27	45
Overweight:		
At Risk (23-24,9 kg/m^2)	8	13,3
Obese I (25-29,9 kg/m^2)	16	26,7
Obese II (≥30 kg/m^2)	9	15
Waist Circumference		
≥90 cm	40	66,7
<90 cm	20	33,3
Pelvis Height		
>9,5 cm	19	31,7
≤9,5 cm	41	68,3
Total	**60**	**100**

Table 4. shows the distribution of research subjects based on work history. There were 22 (36.7%) subjects with a working period of >10 years of the 60 subjects. The proportion of subjects with 6-10 years working period is 26.7%, and 1-5 years is 36.7%. Working time is categorized into two groups: >8 hours/ day and ≤8 hours/ day. There were 33 (55%) subjects with a working time ≤8 hours/ day of the 60 subjects,. The proportion of subjects with duration of work >8 hours/ day that is 45%.

Table 4. Distribution of research subjects based on work history (N = 60)

Work History	N	%
Working Period		
>10 years	22	36,7
6-10 years	16	26,7
1-5 years	22	36,7
Working Time		
>8 hours/ day	27	45
≤8 hours/ day	33	55
Total	**60**	**100**

Table 5. shows the distribution of research subjects based on smoking. There were 41 (68.3%) subjects who smoked of the 60 subjects,. The proportion of non-smoking subjects was 31.7%.

Table 6. shows the distribution of research subjects based on psychosocial stress. Only 2 (3.3%) subjects were under severe stress of the 60 subjects,. The proportion of subjects experiencing moderate stress is quite high at 70%, and those with mild stress is 26.7%.

Table 7. shows the distribution of research subjects based on family history of low back pain. There were 45 (75%) subjects with no family history of the 60 subjects,. The proportion of subjects with a family history is 25%.

Table 5. Distribution of research subjects based on smoking (N = 60)

Smoking	n	%
Yes	41	68,3
No	19	31,7
Total	**60**	**100**

Table 6. Distribution of research subjects based on psychosocial stress (N = 60)

Psychosocial Stress	n	%
Severe stress	2	3,3
Moderate stress	42	70,0
Mild stress	16	26,7
Total	**60**	**100**

Table 7. Distribution of research subjects based on family history of LBP (N = 60)

Family History	n	%
Yes	15	25
No	45	75
Total	**60**	**100**

From the result of bivariate analysis with chi square method, 2x2 table showed significant relationship between age with LBP (p = 0,044; PR = 1,678), BMI with LBP (p = 0,006; PR = 1,934), working time with LBP (p = 0.040; PR = 1.604), and smoking with LBP (p = 0.016; PR = 1.986). In table 3x2, there was a significant relationship between working period and LBP (p = 0,037, PR = 1,889 for working periode >10 years, and PR = 1,680 for the working period of 6-10 years).

Table 8. Relationships of several factors with low back pain

Variable	**LBP (+)**		**LBP (-)**		***PR***	***p***
	n	**%**	**n**	**%**		
Age						
≥40 years old	27	73	10	27	1,68	0,044*
<40 years old	10	43,5	13	56,5		
BMI						
At risk (≥23,0 kg/m²)	26	78,8	7	21,2	1,93	0,006*
No Risk (<23,0 kg/m²)	11	40,7	16	59,3		
Waist Circumference						
At Risk (≥90 cm)	28	70	12	30	1,56	0,111
No Risk (<90 cm)	9	45	11	55		
Pelvis Height						
>9,5 cm	8	42,1	11	57,9	0,59	0,066
≤9,5 cm	29	70,7	12	29,3		
Working Period						
>10 years	17	77,3	5	22,7	1,89	0,037*
6-10 years	11	68,8	5	31,2	1,68	
1-5 years	9	40,9	13	59,1		
Working Time						
>8 hours/ day	21	77,8	6	22,2	1,60	0,040*
≤8 hours/ day	16	48,5	17	51,5		
Smoking						
Yes	30	73,2	11	26,8	1,99	0,016*
No	7	36,8	12	63,2		
Psychosocial Stress						
Severe stress	2	100	0	0	2,00	0,229
Moderate stress	27	64,3	15	35,7	1,29	
Mild stress	8	50	8	50		
Family History						
Yes	11	73,3	4	26,7	1,27	0,443
No	26	57,8	19	42,2		
Total	37	61,7	23	38,3		

*Chi-square test

From the results of multivariate analysis using logistic regression, it is proven that BMI is the most affecting factor on low back pain (p = 0,002).

Table 9. Multivariate logistic regression analysis by Enter method

Variable	B	*P*	Exp (B)
BMI (1)	1,842	0,002*	6,306
Family History (1)	1,055	0,147	2,873
Constant	-0,701	0,131	0,096

*Logistic Regression Test with Enter method final stage

4. Discussion

Association between Age and Low Back Pain

In this study age was categorized into two groups: ≥40 years and <40 years. The incidence of lower back pain increases with age, and its prevalence in the elderly population ages 40 and up is 20-40% higher.[11] This study showed a significant association between age and NPB with p = 0.044. This is in accordance with research conducted by Widjaya, Aswar, and Pala'langan (2014) that the results of the study of 100 samples showed that 43 workers experienced LBP, the incidence in the <25 years age group was 3 (6.98%), aged 25-35 years as many as 14 people (32.55%), age group 36-45 years as many as 16 people (37.21%) and groups> 45 years as many as 10 people (23.26%). Based on the results of chi square statistical analysis, obtained value (p = 0.004) which can be concluded that there is a significant relationship between age with the incidence of low back pain.[12]

At the age of 30 years degeneration occurs in the form of tissue damage, tissue replaced by scar tissue, and fluid reduction. This causes the stability of the bones and muscles to be reduced. So the older a person, the higher the risk the person is experiencing a decrease in bone elasticity, which triggers the onset of symptoms musculoskeletal disorders. Skeletal muscle complaints begin to be felt at the working age of 25-65 years.[13] Muscle strength decreases as the number of muscle fibers decreases since the age of 25.[14]

Association between BMI and Low Back Pain

In this study, BMI was divided into two groups: at risk (≥23.00 kg/m2) and not at risk (<23.00 kg/m2).[15] The results showed a significant association between BMI with lower back pain (p = 0.006). The result of this research is in line with the research of Negara, Wibawa, and Purnawati (2013) on the relationship of IMT and LBP complaints to Udayana University, Faculty of Medicine students. The result is obtained p value of 0.01 (p <0,05) which means there is a significant relationship between body mass index overweight and obesity category with low back pain complaints on Udayana University Faculty of Medicine students.[16]

Excessive weight causes abdominal muscle tone to weaken, so that the center of gravity will be pushed to the front of the body and cause lumbar lordosis to increase, which then causes fatigue in paravertebral muscle. As weight gain, the spine will be pressed to receive the load, resulting in mechanical stress on the lower back. This long-term mechanical stress causes a reaction to the muscle tissue to support an increased load, resulting in changes in cell shape, cell membrane, ion concentration and the emergence of integrins in the tissue.[17]

Association between Waist Circumference and Low Back Pain

In this study, waist circumference was divided into two groups: risk (≥90 cm) and not at risk (<90 cm). The results showed no significant relationship between waist circumference and low back pain (p = 0.111). This result is inconsistent with Wicaksono's (2014) study of factors related to LBP in midwife who stated those who have waist circumference >80 cm (80%) experienced LBP more than group with waist circumference <80 cm (52,94%) with strong relationship C = 0.261 (weak). The size of the waist circumference can affect the static and kinetic balance of the spine especially those with large waist circumference so that it can lead to LBP.[18]

However, this study is in accordance with Han's research, et.al. (1997) which states that there is no significant relationship between waist circumference and low back pain in both men and women with p> 0,5.19 This is because waist circumference is not the main cause of low back pain. LBP can be also caused by other causes such as age and smoking. There is a change in the proportion of visceral and subcutaneous fat at a certain age.[20] The relationship between waist circumference and NPB is influenced by smoking because smokers tend to have higher waistlines and smaller hips than nonsmokers.[21]

Association between Pelvis Height and Low Back Pain

In this study high pelvis divided into 2 based on cut-off point that is >9,5 cm and ≤9,5 cm. The results showed no significant association between the height of the pelvis with low back pain (p = 0.066). This is not in line with the research of Merriam et al. (1983) who stated that the subjects with low back pain had a high pelvic level of about 8.05 ± 2.19 cm and the control subjects had a 6.45 ± 2.72 cm pelvic height meaning that subjects with low back pain complaints had a high pelvis which is larger than a subject that has no lower back pain complaints. The results of this study have a value of p <0.05 which means significantly related. A relatively tall pelvis is, in general, a characteristic of people with low back pain. The pelvis will intersect forward and back with the hip joint during the gait. If it is assumed that there is no movement in the sacro-illiac joints, the pelvis will intersect with the vertebrae in the lower lumbar region forming an angle of contact. In the high pelvis, the resulting angle is greater resulting in heavy pressure or stress when movement occurs.[22]

In this study, high pelvis was not significantly associated with LBP probably due to measurement error. Most subjects did not follow the correct sitting height measurement rules required as a criterion for measuring the height of the pelvis. When measuring sitting height, the subject's back and buttocks do not touch the wall or the backrest to the fullest so as to make the measurement of sitting height less accurate.

Association between Working Period and Low Back Pain

In this study, the working period was divided into three groups: >10 years, 6-10 years, and 1-5 years.[23] The results showed a significant association between working period and low back pain (p = 0.037). This result is supported by Koesyanto (2013) research. In this study it is known that there is a relationship between the working period with subjective complaints on the back of sarong weaving workers. With p value = 0.02 which means there is a significant relationship between risky working period and LBP.[24]

A low back pain complaint is a chronic symptom that takes a long time to develop, so the longer a person works who is exposed to musculoskeletal risk, the greater the risk of low-back pain. Workers who have a long working period will perform the same movement and repeated, so this trigger the occurrence of tissue fatigue, the muscle tissue that can cause overuse, so it can cause muscle spasm. In addition, long working periods will also make the disc cavity narrow permanently and will lead to degeneration of the spine that will cause lower back pain.[25]

Association between Working Time and Low Back Pain

In this study, working time is divided into two groups namely >8 hours/ day and ≤8 hours/ day. This division is based on UU No. 22 Tahun 2009 tentang lalu lintas dan angkutan jalan that the working time for drivers of public motor vehicles is at most 8 hours a day.[26] The analysis results show a significant associatin between working time with LBP (p = 0.040). Kurniawan's research (2017) supports the results of this study. In the research, it can be seen that respondents who have a working duration

>8 hours tend to have back pain complaints with p-value of 0,000.[27]

Makmuriyah (2013) suggests the muscles of the back contracts in the long term become tense and eventually arise pain. Muscle work will increase with poor posture, micro and macro trauma. The result is a phase of compression and tension become longer than relaxation, the occurrence of a state of overload (critical load) and also the muscle experiencing rapid fatigue. Trauma at the tissues, both acute and chronic will lead to sequential events of hyperalgesia, skeletal muscle spasms and capillary vasoconstriction. As a result, the myofascial tissue builds up the nutrients and oxygen to the tissues, leaving untreated tissue fibers and causing ischemia in the myofascial tissue. The ischemic state causes the circulation to decrease, resulting in a lack of nutrients and oxygen and the accumulation of metabolic waste resulting in an inflammatory process. The inflammatory process may also induce a neuromuscular response of muscle tension around the affected area and viscous circles arise. A chronic inflammation stimulates the substance of P to produce algogens in the form of prostaglandins, bradykinin and serotonin which can cause pain sensation.[28]

Association between Smoking and Low Back Pain

The results showed a significant association between smoking with low back pain (p = 0.016). The results of this study are in line with the Septadina and Legiran (2014) study which states that there is a smoking relationship with LBP with p value = 0.04.[5]

There is one theory that said the content of nicotine in cigarettes causes vasoconstriction of blood vessels that supply nutrients to intervertebral disc cells, when the supply of nutrients disrupted cells become malnourised so it's more susceptible to damage. The content of nicotine in cigarettes also leads to thickening of blood vessel walls that disrupt the blood supply and nutrients to the tissues. In addition, nicotine has a negative effect on osteoblast cells, which affects the proliferation and also cellular metabolism osteoblas and collagen synthesis, so that bone mineral density is reduced. Furthermore, one of the end products of cigarettes is toxic carbon monoxide gas. The carbon monoxide produced from cigarette burning will bind to hemoglobin (hb), thereby inhibiting and also reducing the release of oxygen (which should bind to hemoglobin) to the tissues, especially the tissues of deficient intervertebral disc cells.[29]

Association between Psychosocial Stress and Low Back Pain

In this study, stress levels were divided into three groups: severe, moderate, and mild stress based on the interpretation of the Perceived Stress Scale-10 questionnaire. The results showed no significant relationship between psychosocial stress and low back pain (p = 0.229). The results of this study are in line with Yip's (2004) study of lower back pain in nurses, found that less satisfied nurses with their colleagues' relationship had a slightly higher NPB incidence than those who expressed satisfaction but this difference did not have a significant association with statistic p = 0,09.[30]

Some factors causing the results of this study are not significantly related, for example in cases of NPB incidence is not due to stress but vice versa, LBP that occurs can cause the perception of stress on the subject. Furthermore, in this study the identified NPB is a subjective complaint. In addition, there is also the possibility of research subjects taken less representative of the results because subjects who only suffered from severe stress only 2 people, 58 people the rest of mild and moderate stress.

Association between Family History and Low Back Pain

The results showed no significant association between family history and low back pain (p = 0.443). The results of this study are not in line with the Leboeuf-Yde (2004) study which states that the heritability analysis between twin pairs aged 12-22 years shows that the genetic component affects the prevalence of LBP.[31]

The results of this study were not significantly probably because the family history in this study was subjective and did not have diagnostic information. Genetic factors that can affect NPB are certain spinal disorders such as scoliosis, spondylolisthesis, ankylosing spondylitis and possibly also disc prolapse. However, this factor is irrelevant to non-specific back pain.[32] In this study, NPB was found to be non-specific only obtained from questionnaires based on subject complaints.

5. Conclusion

Based on the research that has been done about the factors affecting low back pain in public transportation driver in Palembang, it can be concluded that:

1. This study found 37 (61.7%) cases of low back pain from 60 research subjects.
2. Most of the subjects were ≥40 years, 37 (61,7%), normal range BMI 27 (45%), waist circumference ≥90 cm 40 (65%), height of pelvis ≤9,5 cm 41 (68.3%), working period of 10 years and 1-5 years as many as 22 (36.7%), working time ≤8 hours / day as many as 33 (55%), smoking 41 (68.3%), moderate stress (42%), and no family history of low back pain 45 (75%).
3. Age, BMI, working period, working time, and smoking have a significant association with LBP.
4. Factors that have the greatest association to the incidence of low back pain is BMI.

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