Analysis of Occupational Low Back Pain Complaints with Job Stress as Intervening in Online Ojek Riders in Makassar City

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KEYWORDS
age
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ABSTRACT:
Introduction: Low back pain is one of the work-related health disorders, risk factors for low back pain complaints are age, length of work, mental workload, nutritional status, and work posture. In addition, psychological factors, such as mental stress, can cause body tension that exacerbates pain in the head, shoulders, and lower back.
Objectives: This study aims to analyze the effect of age, length of work, mental workload, nutritional status, and work posture on low back pain through work stress in online motorcycle taxi drivers in Makassar City in 2024.
Methods: This study used a quantitative approach with a cross-sectional design. The study sample of 192 respondents was selected using accidental sampling technique. Data were collected through a questionnaire involving various variables such as age, length of work, mental workload, work stress, and low back pain and using a waist ruler tool for measuring nutritional status and REBA (Rapid Entire Body Assessment) sheets for measuring work posture. The test used is the chi square test using the SPSS application and path analysis using the smart pls application with a 95% confidence level ($\alpha = 0.05$).
Results: The results of the direct effect analysis show that the variables of age (0.005), length of work (0.022), and mental workload (0.018) have a significant effect on work stress and there is no significant effect on the variables of nutritional status (0.957) and work posture (0.799) on work stress. Furthermore, the variables of age (0.002), mental workload (0.001), nutritional status (0.049), work posture (0.001), and work stress (0.000) have a significant effect on low back pain complaints and there is no significant effect on the variable length of work (0.468) on low back pain complaints. The indirect effect in this study shows that there is an indirect effect on the variable age (0.016), length of work (0.042), mental workload (0.030) on low back pain through work stress and there is no indirect effect on the variable nutritional status (0.958) and work posture (0.810) on low back pain through work stress.
Conclusions: Age and length of work have a significant effect both directly and indirectly on low back pain through work stress as an intervening variable.

1. Introduction

Occupational Safety and Health (OSH) is a branch of science that focuses on protecting workers by preventing accidents and occupational diseases through the implementation of policies to create a safe, efficient, and productive work environment(1) . Occupational diseases are health problems caused by work or the work environment, such as low back pain due to persistent static positions, which can reduce work productivity. Low back pain is a disorder that occurs in the lower back area, which can originate from the spine, nerves, muscles, or surrounding structures, triggered by physical activities such as heavy lifting, prolonged sitting, or incorrect body positioning while working, with specific pain categories (known cause) or non-specific (unclear cause), and can be divided into acute (less than 12 weeks) and chronic (more than 12 weeks) . (2)

According to WHO, in 2020, low back pain affected 619 million people in the world and is expected to increase to 843 million cases by 2050 due to population growth and aging; about 70-80% of the population in developed countries and 80% in industrialized countries have experienced this pain, with 45-55% of adults feeling it every year(3) . Of the 291 health conditions surveyed in the 2010 Global Burden of Disease study, low back pain (LBP) was the leading cause of global disability with a prevalence of 9.4%, higher in men (10.1%) than women (8.7%), and highest in Western Europe (15%)

and North Africa/Middle East (14.8%). In Indonesia, the prevalence of LBP ranges from 7.6%-37%, with the 2002 PERDOSSI survey showing 45% cases of low back pain, and a study in 13 major cities recording the highest prevalence at 28.6%.

In South Sulawesi province, the prevalence rate of musculoskeletal disease in the population aged over 15 years is 6.39%. The prevalence of musculoskeletal disease for laborers reached 6.12%(4) . The incidence of Low Back Pain that occurred in public transportation drivers at Tamalate Malengkeri Terminal Makassar City was 59 respondents (72.8%) of which there were 55 respondents (67.9%) who experienced low back pain complaints, and 4 respondents (4.9%) who did not experience low back pain complaints. Another study also showed that out of 73 respondents, 61 respondents (84.6%) experienced complaints of lower back pain in online motorcycle taxi drivers in Makassar City. In fishermen that out of 85 respondents (100%) there were 14 respondents (16.5%) who did not have complaints of LBP or normal, 59 respondents (69.4%) who had mild complaints of LBP, and 12 respondents (14.1%) who had moderate complaints of LBP.

Heavy workload is influenced by factors such as lack of orders, hot weather, and poor physical, emotional and mental conditions, which in the long run can lead to stress, fatigue and burnout due to increased work demands. Driving involves extreme fluctuations in mental workload due to simultaneous interactions, such as the use of devices while driving, traffic variations, and deadline pressure, plus harsh working conditions such as long working hours, night shifts, limited rest, and unhealthy eating habits(5) . The length of working time affects the risk of low back pain (LBP), where work lasting more than 8 hours per day increases back muscle strain and the risk of injury. Previous research shows that 83.3% of workers with working time >8 hours experience LBP, compared to 16.7% in workers with working time ≤8 hours, so the longer the working time, the greater the likelihood of LBP .(6)

Unergonomic work postures, such as prolonged standing, sitting, squatting, or bending, can cause bodily discomfort and pain, including low back pain, especially in the back, arms, shoulders, hips, waist, and legs (7) . Working in a seated position can cause fatigue of the abdominal and lumbar muscles and increase pressure on the spine, which contributes to excessive lordosis and low back pain. Central obesity, characterized by fat accumulation in the abdomen, increases systemic inflammation and mechanical load on the spine, thereby increasing the risk of low back pain (LBP), with studies showing an association between obesity and LBP intensity and disability. Overweight and obesity are associated with an increased likelihood of LBP and vary by racial group and gender (8).

The WHO predicts occupational stress will become a major threat to health by 2020, with studies in France showing 10%-40% of workers experience stress, and 2% of them can affect the intensity of illness. Occupational stress leads to decreased work ability, impaired mental health, and impaired physical function. In Indonesia, occupational stress is still a problem although there is no comprehensive national data. Research in Medan showed 66.7% of Go-Jek riders experienced mild stress, while Khoirunnisa's research on online motorcycle taxi riders revealed 75% experienced severe stress. Occupational stress, as a psychological factor, can exacerbate low back, head, and shoulder pain, due to mental tension that affects posture and causes physical strain (9).

Online ojek, which uses a motorcycle with a booking application, is increasingly popular in Indonesia and competes with conventional ojek. Although it makes it easier for people to travel or order goods, this job is at risk of causing occupational stress and low back pain complaints due to limited movement and static body position while riding a motorcycle(10) . Low back pain in online motorcycle taxi drivers is caused by muscle tension due to static posture, work stress, smoking habits, age, and psychological pressure from work and customer demands. Based on the description previously presented, the purpose of this study is to analyze low back pain complaints due to work with work stress in online motorcycle taxi drivers in Makassar city.

2. Methods

This study uses a quantitative approach with a Cross Sectional research design. The study population was online motorcycle taxi drivers in Makassar City, with Accidental Sampling/incidental sampling technique, which resulted in 192 samples. Data were collected through several questionnaires that have been tested for validity and reliability, such as the Oswestry Low Back Pain Disability Questionnaire,

NASA-TLX Method Mental Workload Questionnaire, Depression Anxiety Stress Scales (DASS) 42, Waist Ruler, and REBA (Rapid Entire Body Assessment) Sheet. Data analysis was performed using SPSS (Statistical Package for Social Science) application with chi square test and path analysis.

3. Results

Of the 192 respondents, all were male. Most had a high school education (63%), followed by college (28.6%), junior high school (4.7%), elementary school (3.1%), and did not finish elementary school (0.5%). Most were married (76.6%), with ≥4 years of service (68.8%). 54.2% of respondents exercised at least once a week, and 65.5% smoked. A total of 64.1% of respondents work fully as online ojek, while 35.9% work on the side. In terms of disease history, 19.8% have a history of disease.

Table 1. Distribution of Respondents

Variables	Frequency
Age	
At Risk (>25 Years)	167
Not at Risk (<25 Years)	25
Length of Service	
Unqualified (>8 Hours)	162
Eligible (≤ 8 Hours)	30
Mental Workload	
High Risk	111
Medium Risk	71
Low Risk	10
Nutrition Status	
Central Obesity (≥ 90 cm)	90
Norrmal (<90 cm)	102
Work Posture	
High Risk	64
Medium Risk	124
Low Risk	4
Work Stress	
Severe Stress	30
Moderate Stress	84
Mild Stress	78
Low Back Pain	
Complaints	148
No Complaints	44

Most respondents were >25 years old (87%), worked more than 8 hours per day (84.4%), and experienced high mental workload (57.8%), which increases the risk of occupational health problems. In addition, 46.9% of respondents had central obesity nutritional status (waist circumference ≥90 cm), 33.3% experienced high-risk work postures, and 44% experienced moderate stress, all of which contributed significantly to the low back pain complaints experienced by 77.1% of respondents.

Table 2. Relationship between Variables and Job Stress

Variables	Work Stress			P-Value
	Weight	Medium	Lightweight	
Age				
At Risk (>25 Years)	28	77	62	0,038
Not at Risk (<25 Years)	2	7	16	
Length of Service				
Unqualified (>8 Hours)	24	77	61	0,048
Eligible (≤ 8 Hours)	6	7	17	
Mental Workload				
High Risk	23	51	37	
Medium Risk	7	30	34	0,040
Low Risk	0	3	7	
Nutrition Status				
Normal Obesity (≥90 Cm)	14	47	29	0,057
Normal (<90 Cm)	16	37	49	
Work Posture				
High Risk	7	32	25	
Medium Risk	23	52	49	0,086
Low Risk	0	0	4	

Age, length of work, and mental workload were significantly associated with job stress levels, with respondents who were older, worked more than 8 hours, and had a high mental workload tending to experience severe stress. In contrast, nutritional status and work posture showed no significant relationship to occupational stress.

Table 3. Relationship between variables and low back pain

Variables	Low Back Pain		P-Value
	Complaints	No Complaints	
Age			
At Risk (>25 Years)	137	30	0,000
Not at Risk (<25 Years)	11	14	
Length of Service			
Unqualified (>8 Hours)	130	32	0,015
Eligible (≤ 8 Hours)	18	12	
Mental Workload			
High Risk	95	16	
Medium Risk	50	21	0,000
Low Risk	3	7	
Nutrition Status			
Central Obesity (≥90 Cm)	80	10	0,000
Normal (<90 Cm)	68	34	
Work Posture			
High Risk	58	6	
Medium Risk	90	34	0,000
Low Risk	0	4	

All variables, including age, work duration, mental workload, nutritional status, and work posture, have a significant association with Low Back Pain (LBP) complaints, with factors such as age above

25 years, work duration of more than 8 hours, and high mental workload increasing the risk of LBP. Central obesity nutritional status and poor work posture also contribute to LBP complaints.

Table 4. Relationship between Work Stress and Low Back Pain

Work Stress	Low Back Pain		P-Value
	Complaints	No Complaints	
Severe Stress (Score ≥26)	25	5	
Moderate Stress (Score 15-25)	74	10	0.000"
Mild Stress (Score ≤14)	49	29	

The results of the analysis showed that the level of work stress was significantly associated with complaints of low back pain (p-value <0.05). Respondents with severe and moderate stress experienced more low back pain (83.3% and 88.1%) than those with mild stress (62.8%).

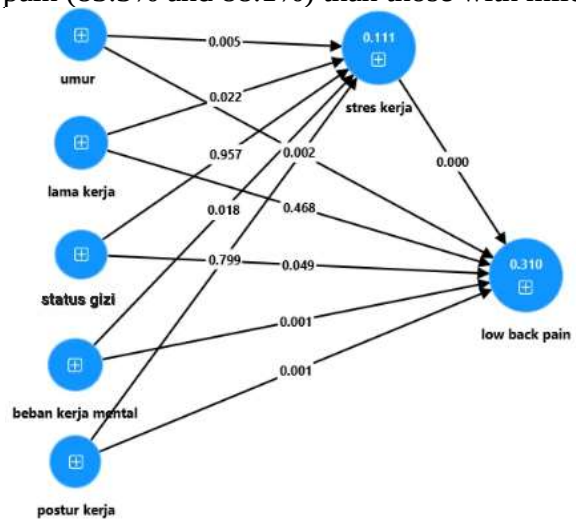

Figure 1. Model Construction in Smart Pls

Based on the picture of the path analysis model, that which does not have an influence on low back pain is the variable length of work with a p-value of 0.468. While the variables that do not have an influence on work stress are the nutritional status variable with a p-value of 0.957 and the work posture variable with a p-value of 0.799. the picture above can also be seen from the p-values in the table below.

Table 5. Results of Hypothesis Analysis of Direct Effect

Hypothesis	Path Coefficient	P Values	F-Square	Ket
Age→ Work Stress	0.212	0.005	0.047	Low
Age→ Low Back Pain	0.191	0.002	0.047	Low
Length of Service→ Work Stress	0.147	0.022	0.024	Low
Length of Service→ Low Back Pain	0.046	0.468	0.003	Low
Mental Workload→ Work Stress	0.168	0.018	0.030	Low
Mental Workload→ Low Back Pain	0.183	0.001	0.045	Low
Nutritional Status→ Work Stress	0.004	0.957	0.000	Low
Nutritional Status→ Low Back Pain	0.119	0.049	0.020	Low
Work posture→ Work Stress	0.019	0.799	0.000	Low
Work posture→ Low Back Pain	0.193	0.001	0.052	Low
Work Stress→ Low Back Pain	0.275	0.000	0.098	Low

*P-Value < 0.05: There is a significant effect

The analysis showed that work stress had the most significant direct influence on low back pain with a path coefficient of 0.275 (p = 0.000, F-square = 0.098), although the contribution remained low. In

addition, the variables of age, mental workload, and work posture also had a significant influence on low back pain, while work duration and nutritional status showed a weaker or insignificant influence.

Table 6. Results of Hypothesis Analysis of Indirect Influence

Hypothesis	Path Coefficient	P values	Z-Sobel	Ket
Age→ Job Stress→ Low Back Pain	0.058	0.016	2.393	Influential
Length of Service→ Job Stress→ Low Back Pain	0.040	0.042	2.060	Influential
Mental Workload→ Job Stress→ Low Back Pain	0.046	0.030	2.109	Influential
Nutritional Status→ Occupational Stress→ Low Back Pain	0.001	0.958	0.054	No Effect
Work Posture→ Work Stress→ Low Back Pain	0.005	0.810	0.252	No Effect

*Z-Sobel > 1.96: There is a significant effect

The results of the analysis showed that work stress significantly mediated the effects of age, length of service, and mental workload on low back pain, with p values <0.05 each and the Sobel test showing an influential relationship. In contrast, nutritional status and work posture showed no indirect effect through work stress on low back pain (p > 0.05 and low Z-Sobel).

4. Discussion

a. The Effect of Age on Work Stress and Low Back Pain

The relationship between age and job stress is positive and significant (p = 0.005), with increasing age, job stress tends to increase, although the effect is relatively small (F-square = 0.047). The confidence interval [0.065-0.364] supports this conclusion as it does not include zero. This is in line with research conducted by(11) that older age is a risk factor for work stress in online ojek drivers, related to decreased physical abilities, difficulty adapting to technology, and economic pressures that exacerbate their physical and mental stress(12) . Older online ojek drivers in Makassar City experience higher job stress than young drivers, mainly due to physical fatigue, back pain, and weather challenges and heavy traffic. In addition, large economic dependents and income uncertainty add to the pressure, while social pressure and feeling left behind by technology also worsen their mental health.

Older age has a positive and significant association with increased risk of low back pain (LBP), with a path coefficient value of 0.191 and P-value of 0.002. Decreased disc elasticity and osteoarthritis that often occur with age make older workers more susceptible to low back pain. Online ojek drivers in Makassar, especially older ones, are at higher risk of low back pain (LBP) due to long sitting duration, poor posture, and non-optimal road conditions. In addition to physical factors, psychosocial stresses such as financial uncertainty and fear of job loss also exacerbate LBP symptoms in older drivers .(13)

b. The Effect of Length of Service on Job Stress and Low Back Pain

Length of service is positively associated with job stress, although the effect is small, especially in online motorcycle taxi workers who often work long hours and unstructured time flexibility, which can trigger physical and psychological fatigue. The study by Mansoor mentions that individuals who have longer working hours, especially in high-intensity jobs, have a greater risk of job stress than those who work shorter hours(14) . Working more than 40-50 hours per week can lead to reduced work quality, fatigue, health problems, accidents, and dissatisfaction, as it is not accompanied by optimal efficiency and productivity.

Length of work does not have a significant influence on low back pain (LBP) complaints in online motorcycle taxi drivers in Makassar, although back pain often occurs, it is more influenced by unhealthy living habits and lack of ergonomic facilities. The results of this study are in line with research conducted by I Gusti Bagus Teguh Pramana in 2020 which states that there is no relationship between sitting duration and the occurrence of low back pain complaints with ρ value 0.566(15) . Research shows that long work duration does not necessarily increase the risk of low back pain (LBP)

in online motorcycle taxi drivers, as long as they maintain posture and stretch regularly. However, the lack of ergonomics education and healthy living habits can exacerbate LBP complaints, although flexible work patterns provide opportunities to rest and reduce the risk of LBP.

c. The Effect of Mental Workload on Job Stress and Low Back Pain

High mental workload among online ojek drivers in Makassar is positively associated with levels of job stress, triggered by factors such as long work duration, competition, and income uncertainty. Additional pressures from traffic jams, extreme weather, and the need to maintain safety exacerbate stress, which negatively affects the driver's life balance and health. Workload is often the most common contributing factor to the occurrence of work stress and is the main reason for complaints for workers in an organization(16) . Things like workload, pressure at work, and time constraints, which are related to the environment, the organization, and the individual can trigger job stress.

High mental workload is positively associated with increased risk of low back pain (LBP) in online motorcycle taxi drivers, as mental stress causes muscle tension that worsens low back conditions. Mental fatigue also reduces alertness, increases postural errors while driving, and exacerbates LBP. This research is in line with Riskiawan's findings which show that the level of frustration has a major effect on the mental workload of Gojek drivers, with the largest contribution to frustration (26.10%) compared to other indicators such as performance and physical needs. This frustration is related to feelings of insecurity and hopelessness, which affect the driver's satisfaction and comfort in meeting customer demands .(17)

d. The Effect of Nutritional Status on Work Stress and Low Back Pain

This study shows that nutritional status has no significant influence on occupational stress in online ojek drivers, although obesity is often associated with increased stress physiologically. Work and psychosocial factors, such as income uncertainty, long working hours, and target pressure, are more dominant in influencing their stress levels. Relevant studies support these findings, such as research by Fatturrahman which showed that psychosocial factors have a more significant influence on job stress in informal sector workers, including drivers and chauffeurs. The results of this study contradict Masri's study, which showed that stress increased the risk of visceral fat by 1.2% compared to individuals without stress symptoms .(18)

The study showed that centrally obese nutritional status has a significant influence on the incidence of low back pain (LBP), with centrally obese individuals having a higher risk of developing LBP due to increased pressure on the spine. Although this relationship is significant, the effect is relatively small with path coefficient 0.119 and F-square 0.020(19) . Research in Makassar shows that online motorcycle taxi drivers, especially those with central obesity, are at high risk of low back pain due to prolonged static sitting position and limited physical activity. Central obesity puts additional pressure on the spine, with 42% of centrally obese riders experiencing chronic LBP, and a significant association was found between waist circumference >90 cm in men and pain intensity(20)

e. The Effect of Work Posture on Work Stress and Low Back Pain

Research shows that the relationship between work posture and work stress is very weak and insignificant, with psychosocial factors and work environment more influencing the stress of online ojek drivers in Makassar. Their stress is more caused by the pressure of income targets, weather uncertainty, and conflict, compared to the effects of poor posture. Research conducted on online ojek drivers shows that work stress is more often influenced by external factors such as time pressure and interpersonal relationships compared to work posture. Work posture was not found to have a significant relationship with stress levels, but rather affected physical complaints such as musculoskeletal disorders (MSDs) .(21)

Research shows that poor work posture has a significant influence on low back pain, with non-ergonomic sitting position being the main risk factor. Although the effect is significant, the impact on low back pain is low. Research by Andhika revealed that 65% of online motorcycle taxi riders experience complaints of low back pain due to the long duration of driving, with body positions that

do not comply with ergonomic principles(22) . In addition, slouching postures in riders often occur due to less ergonomic vehicle designs, such as handlebar positions that are too low or seats that do not support the body properly. These conditions encourage riders to maintain a non-neutral posture while riding.

f. The Effect of Job Stress on Low Back Pain

Research shows that work stress has a significant influence on low back pain, with increased stress associated with a higher likelihood of experiencing low back pain. Although significant, the effect of work stress on low back pain is low. Research by Melkevik revealed that individuals with high levels of work stress have a 1.7 times greater risk of experiencing LBP than individuals with low levels of work stress. Physiologically, work stress increases the release of stress hormones such as cortisol that affect muscle tone, including the lower back muscles. Chronic muscle tension due to stress can lead to muscle fatigue and stiffness, increasing the risk of LBP. Studies by Sadeghi show that chronic stress aggravates musculoskeletal conditions by increasing mechanical stress on the lumbar spine .(23)

g. The Effect of Age on Low Back Pain Through Work Stress

This study shows that age has a significant effect on the incidence of low back pain (LBP) through occupational stress, with the older the driver, the greater the risk of occupational stress contributing to LBP. As we age, a decrease in tissue elasticity and strength of the spinal structures makes individuals more susceptible to LBP due to physical workload and poor posture. Increasing age is often accompanied by increased job responsibilities that trigger occupational stress, which can exacerbate the risk of low back pain (LBP). Online motorcycle taxi drivers over 45 years old tend to experience higher LBP complaints, especially when facing work stress, due to decreased psychological resilience and lower physical activity .(24)

h. The Effect of Length of Service on Low Back Pain Through Job Stress

Long work duration, especially more than 8 hours per day, is significantly associated with the risk of low back pain (LBP), with work stress as a mediator. Online motorcycle taxi drivers who work more than 8 hours experience LBP more often due to static sitting position, poor posture, and psychosocial pressures, such as income targets and congestion. Occupational stress, triggered by physical and mental fatigue, increases muscle tension and sensitivity to pain, exacerbating LBP conditions. The cumulative effect of long work duration, non-ergonomic posture, and occupational stress reduces the elasticity of body tissues, making drivers susceptible to low back pain. .(25)

i. The Effect of Mental Workload on Low Back Pain Through Job Stress

High mental workload affects low back pain through job stress as a mediator, with job pressure and time demands as the main triggers of stress. The results of the analysis showed that job stress significantly mediated the relationship between mental workload and low back pain, with chronic muscle tension as a physical response to the stress. The meta-analysis study by Lubis corroborates these findings, stating that excessive mental workload contributes significantly to an increased risk of low back pain through the mediator of occupational stress, especially in jobs that are highly demanding in mental aspects. Increased mental workload increases occupational stress, which adversely affects physical health, particularly low back pain due to muscle tension, especially in the lumbar region. Irregular work rhythms, minimal rest time, and poor posture exacerbate this condition, with time pressure (temporal demands) being the main factor that triggers work stress in online motorcycle taxi drivers .(26)

j. The Effect of Nutritional Status on Low Back Pain Through Work Stress

The results of the analysis show that work stress does not act as a significant mediating variable between nutritional status and low back pain, because the indirect relationship is not significant. Central obesity nutritional status directly affects low back pain through biomechanical impacts, such as increased pressure on the spine and changes in posture. This finding is in line with research by Molen, which states that occupational stress contributes more to psychosomatic disorders than direct physical disorders such as LBP. Although occupational stress does not mediate the relationship

between nutritional status and LBP, it can affect pain perception. Riders who felt emotionally distressed were more likely to report more severe back pain than those who were not stressed. This indicates that stress is more relevant in influencing perception than influencing the physical cause of LBP .(27)

k. The Effect of Work Posture on Low Back Pain Through Job Stress

The study showed that the indirect relationship between work posture and low back pain through work stress was not significant, due to the very small path coefficient and high p-value. Poor work posture directly affects the incidence of LBP, with physical and individual factors, such as age and body mass index, being more influential than work stress.(28) . The results showed that job stress does not act as a significant mediating variable between work posture and low back pain in online motorcycle taxi drivers in Makassar, because other factors such as work duration, motorcycle quality, and individual physical tolerance are more influential. Therefore, the treatment of low back pain needs to focus on improving vehicle ergonomics and reducing physical stress.

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