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RISK FACTOR ANALYSIS OF LOW BACK PAIN IN EMPLOYEES OF DRINKING WATER STORE IN MEDAN SELAYANG SUB-DISTRICT

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Abstract. ***Background.*** *Low back pain (LBP) is defined as feeling of pain and discomfort in the area between the costal margin and inferior gluteal fold, with or without radiating pain. In Indonesia, LBP was fifth ranks in term of disability-adjusted life years (DALYs).* ***Aim.*** *This study aims to determine risk factors for LBP in employees of drinking water store in Medan Selayang sub-District, Medan.* ***Method.*** *This research is an observational analytic study with cross-sectional design. This study used consecutive sampling method. Minimum sample size in this study was 97 samples. Subjects in this study were employees of drinking water store in Medan Selayang sub-District. Data used in this study was primary data from samples through filling out questionnaires. Analysis used in this study was univariate analysis, bivariate with chi-square, and multivariate with logistic regression.* ***Result.*** *From 100 samples, 39 respondents (39%) experienced LBP. Based on bivariate analysis, p value ≤ 0.05 was found for age, body mass index, and duration of work. P value ≥ 0.05 was obtained for years of work and lifting frequency. Based on multivariate analysis with regression logistic, p value ≤ 0.05 was obtained for body mass index (p = 0.089) and work duration (p = 0.011) which indicated that work duration was the most dominant risk factor.* ***Conclusion****. There's a relationship between age, body mass index, and work duration with the work duration being the most dominant risk factor for the incidence of low back pain in water gallon worker. .*

Keyword: ***low back pain, risk factor, manual material handling***

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1 Introduction

Occupational disease is defined as a disease caused by work and or the work environment. One of the diseases is low back pain [1]. LBP is a symptom of pain that is localized between the costal margin and inferior gluteal fold, with or without radiating pain. In general, LBP is divided into two, non-specific if the pain is of unknown origin or there is no pathological abnormality, and specific if the symptoms are caused by a clear pathological condition.[2].

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The prevalence of LBP increases with increasing age and reaches its peak at the age of 80-89 years. Almost everyone will experience at least one LBP in their lifetime. The average prevalence of LBP in high-income countries is greater than in middle- and low-income countries (32.9%; 25.4%; 16.7%). Latin America has the highest prevalence of low back pain (13.47%), while the lowest prevalence is in East Asia (3.92%). Based on data from the Global Burden of Disease Study (GBD) 2017, globally and in Southeast Asia, low back pain ranks first in terms of years lived with disability (YLDs).[3], [4].

In 2016, a study was conducted to see the prevalence of LBP in workers with a total sample of 13,924 and the prevalence of LBP was found to be 25.7% [1]. Similar research was conducted on manual material handling workers. Of the total 1929 sample, 483 (25%) respondents experienced low back pain for at least one week during the study period.[5]. In 2020, a study was conducted to see the prevalence of musculoskeletal disorders (MSDs) in porters. Out of 398 samples, 214 (53%) of them had experienced at least one episode of MSDs with the most symptoms was low back pain (29.6%)[6].

Employees of drinking water stores work by lifting and moving gallons of water. This work requires repeated back flexion and extension movements which it becomes a risk factor for LBP.

2 Method

This research design is an observational analytic study with a cross sectional study design. This research was conducted from June-November 2021. Based on the calculation of Lemeshow formula, the minimum sample size in this study was 97 samples The sample in this study were employees of drinking water stores in Medan Selayang Sub-district. The inclusion criteria was the employee who had worked for at least one year and would like to be the research subject, while the exclusion criteria was the employee who had a history of spinal disease before working. as a drinking water depot employee who was confirmed using a questionnaire and did not fill out the questionnaire completely. Data collection was carried out by filling out questionnaires directly which had been tested for validity and reliability. The collected data would be analyzed using the SPSS application with univariate analysis, bivariate with chi-square, and multivariate with logistic regression.

3 Result

One hundred respondents joined in this study. According to **Table 1**, the frequency distribution of the sample characteristics according to age, respondents with age less than 25 years were 35 respondents and aged 25 years or more were 65 respondents. Based on body mass index, 53 respondents were normal weight, 8 respondents were underweight, 34 respondents were overweight, 5 respondents were obese. Based on years of service, 41 respondents had a tenure of less than 2 years and 59 respondents had a service period of 2 years or more. Based on the duration of work, 46 respondents had a work duration of less than 8 hours and 54 respondents had a work

duration of 8 hours or more. Based on the frequency of lifting, less than 30 times as many as 32 respondents and more than equal to 30 times as many as 68 people. Thirty nine respondents had LBP and 61 respondents had no LBP.

Table 1 Distribution of sample characteristics

Variable	Frequency (n)	Percentage (%)
Age		
< 25 Years	35	35
≥ 25 Years	65	65
Body mass index		
Normal weight	53	53
Underweight	8	8
Overweight	34	34
Obese	5	5
Working Mass		
< 2 Years	41	41
≥ 2 Years	59	59
Working Duration		
< 8 Hours	46	46
≥ 8 Hours	54	54
Lift Frequency		
< 30 Times	32	32
≥ 30 Times	68	68
Low Back Pain		
Low Back Pain	39	39

Not Low Back Pain	61	61
TOTAL	100	100

According to **Table 2**, the group of respondents aged 25 years or older who experienced LBP was 30 people (76.9%). The prevalence ratio of age to LBP is 2.476, which means age is a risk factor for LBP. The results of statistical tests showed the value of p = 0.046, which means that age is associated with the occurrence of LBP.

Table 2 Bivariate analysis of age with low back pain

Variable	**Low Back Pain**				**P value**	**PR**	**95% CI**	
	Yes		No				Lower limit	Upper limit
	N	%	N	%				
Age								
≥ 25 Years	30	76.9	35	57.4	0.046	2,476	1.005	6,099
< 25 Years	9	23.1	26	42.6				
Total	39		61					

According to **Table 3**, from 39 respondents who experienced LBP. 19 (48.7%) Respondents were overweight, 15 (38.5%) respondents were normal weight, 4 (10.2%) respondents were obese, and 1 (2.6%) respondents were underweight. Based on the results of statistical tests obtained p value = 0.003 which means body mass index is associated with the occurrence of LBP.

Table 3 Bivariate analysis of body mass index with low back pain

Variable	**Low Back Pain**				**p value**
	Yes		No		
	n	%	n	%	
Body mass index					
Normal weight	15	38.5	38	62.3	0.003
Underweight	1	2.6	7	11.5	
Overweight	19	48.7	15	24.6	
Obese	4	10.2	1	1.6	
Total	39		61		

According to **Table 4**, from 39 respondents who experienced LBP, 27 (69.2%) respondents had a working period of 2 years or more, while 12 (30.8%) other respondents had a working period of less than 2 years. Prevalence ratio of working period for LBP is 2.039 which means that tenure is a risk factor for LBP. Statistical test results show p value = 0.096 so it is interpreted that working period is not related to the occurrence of LBP.

Table 4 Bivariate analysis of years of service with low back pain

Variable	Low Back Pain				P value	PR	95% CI	
	Yes		No				Lower limit	Upper limit
	N	%	N	%				
Years of service								
≥ 2 Years	27	69.2	32	52.5	0.096	2.039	0.875	4.749
< 2 Years	12	30.8	29	47.5				
Total	39		61					

According to **Table 5**, of 39 respondents who experienced LBP, 30 (76.9%) respondents had a work duration of 8 hours or more a day, while 9 (23.1%) other respondents had a work duration of less than 8 hours in a day. The prevalence ratio of work duration to LBP is 5.139, which means that work duration is a risk factor for LBP. Statistical test results show p value = 0.000 so it is interpreted that the duration of work is related to the occurrence of LBP

Table 5 Bivariate analysis of work duration with low back pain

Variable	Low Back Pain				P value	PR	95% CI	
	Yes		No				Lower limit	Upper limit
	n	%	N	%				
Working Duration								
≥ 8 Hours	30	76.9	24	39.3	0.000	5.139	2.079	12.701
< 8 Hours	9	23.1	37	60.7				
Total	39		61					

Based on the data shown in **Table 6**, of 39 respondents who experienced LBP, 28 (71.8) Respondents had a lifting frequency of more than 30 times a day, while 11 (28.2%) other respondents had lifting frequency less than 30 days in a day. The prevalence ratio of lifting frequency to LBP is 1.336, which means that lifting frequency is a risk factor for LBP. Statistical test results show p value = 0.515 so it is interpreted that lifting frequency is not related to the occurrence of LBP

Table 6 Bivariate analysis of lifting frequency with low back pain

Variable			P value	PR	95% CI

	Lower Back Pain							
	Yes		Not				Lower limit	Upper limit
	n	%		%				
Lift Frequency								
≥30 times	28	71.8	40	65.6	0.515	1.336	0.557	3.205
<30 times	11	28.2	21	34.4				
Amount	39		61					

Based on the result of the multivariate logistic regression analysis test on all independent variables with p value < 0,25 which is presented in **Table 7**, the most significant related variable is duration of work with p value = 0,011 and OR = 4,709

Table 7 Multivariate logistic regression analysis

Variable	**Low Back Pain**				**Total**	**P value**	**OR**	**95% CI**	
	Yes		**No**					**Lower limit**	**Upper limit**
	n	%	n	%					
Age									
25 Years	30	76.9	35	57.4	65	0.286	1.812	0.609	5.391
<25 Years	9	23.1	26	42.6	35				
Body mass index									
Normal weight	15	38.5	38	62.3	53	0.089	1.477	0.943	2.314
under weight	1	2.6	7	11.5	8				
Overweight	19	48.7	15	24.6	34				
Obese	4	10.2	1	1.6	5				
Years of service									
2 Years	27	69.2	32	52.5	59	0.344	0.543	0.153	1.922
<2 Years	12	30.8	29	47.5	41				
Working Duration									
8 Hours	30	76.9	24	39.3	54	0.011	4.709	1.418	15.643
<8 Hours	9	23.1	37	60.7	46				

4 Discussion

From a total of 100 samples, 39 (39%) respondents experienced low back pain. This result is quite different from the research conducted by Muslim and Nussbaum in 2015 with a prevalence of LBP of 72.2%. What might be the difference, in this study, the weight lifted was constant at 20 kg, while in the study of Muslim and Nussbaum, the load lifted was around 30-100 kilograms [7]. The maximum lifting load recommended by the National Institute for Occupational Safety and Health (NIOSH) is 51 pounds or about 23 kilograms [8].

Main cause of LBP is muscle tension. Problems in the muscles generally appear at the age of 35 years and will increase with age due to the degeneration process. It is necessary to recognize LBP early so that modifications can be made to related risk factors because the LBP recurrence rate reaches 33% in a year.[9], [10].

The relationship between body mass index and LBP according to research by Nabilah et al., on project workers with p value = 0.029 [11]. When body weight increases, the load received by the spine, especially the lumbar will increase, making it easier for damage to the spinal structure so that pain occurs [12].

The results of work experience are not associated with LBP in contrast to the study by Raya *et al*., which states that there is a relationship between tenure and LBP with a p value = 0.017. This difference may occur because the number of research samples is not large enough. LBP is a chronic symptom that takes time to develop. The longer the working period, it will trigger overuse due to repetitive movements, triggering muscle spasm and spinal degeneration which will trigger inflammatory mediators causing pain.[13]. Researchers suspect that at this time complaints have not appeared, but as the working period increases, LBP will arise.

The relationship between work duration and LBP is in line with the study of Chinichian et al., which showed p value = 0.000 [6]. Workers with a duration of 40-50 hours per week can work well, but their productivity will decrease and cause health problems if forced to work longer hours [10]. Feeling dissatisfied or uncomfortable with work is a risk factor for LBP [14]. Researchers suspect that a longer work duration accompanied by dissatisfaction with work will increase stress on workers, thereby increasing the risk of LBP

The absence of a relationship between lifting frequency and LBP in this study was not in line with Limbong and Widajati's research which stated that there was a relationship between lifting frequency and LBP with a score of r = 0.415. Which becomes the difference, in this study, the frequency of lifting was around 30 times a day so that there was a pause between repetitions of movements for relaxed muscles. Meanwhile, in Limbong and Widajati's study, the lifting frequency reached 100 times so there was only a slight pause between repetitions of the movement. Repeated movements will cause fatigue and tension in the tendons, causing pain. The impact of repetition of movements will increase if accompanied by improper posture[12]

5 Conclusion

Based on the results of the study, the variables associated with LBP in this study were age, body mass index, and duration of work, with work duration as the most dominant risk factor resulting in a 4.7 times increase in LBP compared to other variables. It is hoped that risk factor modification will occur to reduce the possibility of LBP accompanied by education regarding the proper way to lift and move objects. Further investigation are needed to identify another factor which can affect low back pain or do similar study to other workers to see if there are differences in risk factors that lead to low back pain.

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