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Factors Associated With Low Back Pain Complaints Among Well Service Workers At PT.X

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Abstract

Low back pain (LBP) is a musculoskeletal complaint that may affect workers' health and productivity. This study aimed to identify factors associated with LBP complaints among well service workers at PT.X. This study employed a quantitative approach with a cross-sectional design. A total of 60 respondents were selected using total sampling. Data were collected using the Pain and Distress Scale (PADS) questionnaire, Rapid Entire Body Assessment (REBA), Cardiovascular Load (CVL) measurements, a repetitive motion observation sheet, and a structured questionnaire. Data were analyzed using univariate and bivariate analyses. The results showed that 23 respondents (38.3%) experienced LBP complaints. Bivariate analysis revealed significant associations between repetitive motion (p = 0.039), length of employment (p = 0.008), and LBP complaints. However, work posture (p = 0.388), physical workload (p = 0.180), working duration (p = 0.146), and stretching (p = 0.500) were not significantly associated with LBP complaints. In conclusion, repetitive motion and length of employment were associated with LBP complaints among well service workers. Controlling repetitive movements and evaluating long-term occupational exposures should be considered in efforts to prevent LBP in the workplace.

Keywords: Low Back Pain, Work Posture, Physical Workload, Repetitive Motion, Length Of Employment.

INTRODUCTION

Low back pain (LBP) is a common musculoskeletal condition that affects workers' health, functional ability, and productivity. The Global Burden of Disease Study 2021 estimated that approximately 619 million people experienced LBP worldwide in 2020, and this number is projected to reach 843 million by 2050 (Ferreira et al., 2023). LBP is therefore an important public health concern, particularly among workers exposed to physical demands and occupational ergonomic hazards. Work-related factors, including awkward postures, physical workload, repetitive movements, and prolonged working hours, may contribute to the development of lower back complaints (Hartvigsen et al., 2018).

Workers in the oil and gas industry may face considerable ergonomic challenges because their duties involve physically demanding activities and the handling of heavy equipment. In well service operations, workers may repeatedly bend, lift, reach, and perform technical movements during well intervention and equipment handling. These activities may increase physical strain on the lower back, particularly when performed repeatedly or over extended periods. Previous studies have identified occupational and individual factors associated with LBP among workers in various sectors, including manufacturing, construction, agriculture, and other industrial settings (Aqlina et al., 2024; Gomes et al., 2023). However, findings may differ across occupational settings because work activities, exposure patterns, and working conditions are not uniform.

Research on LBP among workers in Indonesia has examined several occupational groups, including rubber factory workers, health service employees, and industrial workers. Rini et al. (2023), for example, investigated risk factors for LBP among rubber factory workers, while Ningsih et al. (2025) examined factors associated with LBP complaints among employees of a health insurance office in Jambi. Although these studies provide evidence regarding occupational factors related to LBP, research specifically examining well service workers in the upstream oil and gas industry remains limited. This occupational

group warrants particular attention because of the physical demands and repetitive technical activities involved in its daily operations.

Understanding the factors associated with LBP in this setting is important for identifying occupational exposures that may require preventive measures. Therefore, this study aimed to analyze the associations between work posture, physical workload, repetitive motion, working duration, length of employment, stretching habits, and LBP complaints among well service workers at PT. X. The findings are expected to provide evidence to support the development of appropriate occupational health and ergonomic interventions for workers in well service operations.

RESEARCH METHODS

This study employed a quantitative analytical observational design with a cross-sectional approach. The study population consisted of 60 active well service workers at PT.X. A total sampling technique was used, involving all 60 workers as research respondents. The dependent variable was low back pain (LBP) complaints, while the independent variables included work posture, physical workload, repetitive motion, working duration, length of employment, and stretching habits.

Data were collected through questionnaires, direct observation, and measurements using appropriate assessment instruments. Work posture was assessed using the Rapid Entire Body Assessment (REBA) method (Hignett & McAtamney, 2000), while physical workload was evaluated using the Cardiovascular Load (%CVL) method. Repetitive motion was assessed through structured observation and movement frequency recording. Data on working duration, length of employment, and stretching habits were obtained using questionnaires. Low back pain complaints were assessed using the Pain and Distress Scale (PADS) (Zung, 1983).

The study was conducted at PT.X from June to August 2026. Work posture was grouped as moderate–high or very high risk, physical workload as low (CVL ≤30%) or high (CVL >30%), and repetitive motion as non-repetitive (≤30 movements/minute) or repetitive (>30 movements/minute). Working duration was categorized as normal (≤8 hours/day) or extended (>8 hours/day), and length of employment as <5 years or ≥5 years, both verified against shift logbooks, attendance records, and company personnel data. Stretching was categorized as routine (at least once per working day) or not routine. LBP complaints were classified as present or absent based on the PADS score (complaints present: 36-80; absent: 0-35).

Data were analyzed using SPSS. Univariate analysis described the distribution of each variable, while bivariate analysis examined the association between each independent variable and LBP complaints using the chi-square test, or Fisher's exact test for repetitive motion and working duration. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

This study involved 60 well service workers, all of whom were male with a senior high school education. About seven in ten workers were aged 20–36 years, and slightly more than half had worked for five years or longer (Table 1).

Table 1. Respondent Characteristics Among Well Service Workers at PT.X

Respondent Characteristics	Frequency (n)	Percentage (%)
Sex		
Male	60	100.0
Age		
20–28 years	20	33.3
29–36 years	22	36.7
37–44 years	11	18.3
45–52 years	6	10.0
53–60 years	1	1.7
Highest Education		
Senior High School	60	100.0
Length of Employment		
<5 years	26	43.3
≥5 years	34	56.7
Total	**60**	**100.0**

Table 2. Distribution of LBP Complaints and Occupational Factors Among Well Service Workers

Variabel	(n)	(%)
LBP complaints		
Yes	23	38.3
No	37	61.7
Work posture		
Moderate–high risk	22	36.7
Very high risk	38	63.3
Physical workload		
Low	22	36.7
High	38	63.3
Repetitive motion		
No	11	18.3
Yes	49	81.7
Working duration		
≤8 hours/day	5	8.3
>8 hours/day	55	91.7
Length of employment		
<5 years	26	43.3
≥5 years	34	56.7
Stretching habits		
Routine	28	46.7
Infrequent/not routine	32	53.3
Total	60	100.0

Table 2 shows that about two in five workers had LBP complaints, and that most were exposed to very high postural risk, high physical workload, repetitive movement, and

extended working duration, which provides the occupational context for the association analysis below.

Table 3. Association between Occupational Factors and LBP Complaints

Variables	Category	LBP Complaints n (%)	No LBP Complaints n (%)	OR (95% CI)	p-value
Work posture	Moderate-to-high risk	12 (54.5)	10 (45.5)	0.624 (0.213–1.826)	0.388
	Very high risk	25 (65.8)	13 (34.2)		
Physical workload	Low (≤30%)	16 (72.7)	6 (27.3)	2.159 (0.694–6.719)	0.180
	High (>30%)	21 (55.3)	17 (44.7)		
Repetitive movements	Non-repetitive (≤30 movements/minute)	10 (90,9)	1 (9,1)	8,148 (0,967–68,656)	0.039
	Repetitive (>30 movements/minute)	27 (55,1)	22 (44,9)		
Working duration	Normal (≤8 hours/day)	5 (100.0)	0 (0.0)	0.865 (0.761–0.982)	0.146
	Extended (>8 hours/day)	32 (58.2)	23 (41.8)		
Length of employment	<5 years	21 (80.8)	5 (19.2)	4.725 (1.444–15.457)	0.008
	≥5 years	16 (47.1)	18 (52.9)		
Stretching habits	Routine	16 (57.1)	12 (42.9)	0.698 (0.246–1.986)	0.500
	Infrequent/rare	21 (65.6)	11 (34.4)		

Among the six factors examined, only repetitive motion and length of employment were associated with LBP complaints (Table 3).

Prevalence of LBP complaints

About two in five workers reported LBP complaints (Table 2), so LBP remains a notable occupational health problem in well service operations even though most workers were symptom-free. Each stage of well service work, from rig up and well intervention to rig down and demobilization, involves lifting, pulling, pushing, bending and twisting that repeatedly load the lumbar spine (Tarwaka et al., 2004). Nearly all workers were also exposed to elevated postural risk, repetitive movement and shifts longer than eight hours. The prevalence was lower than among batik workers (Trinita et al., 2026) and rubber factory workers (Rini et al., 2023). This may reflect the company's safety management, including mechanical lifting aids, documented safe work procedures, task rotation and periodic health examinations. Differences in the instruments used to measure complaints may also contribute. That most workers were exposed but only some had complaints fits the work capacity–job demand perspective, in which complaints arise when job demands exceed an individual's capacity (Tarwaka et al., 2004).

Factors significantly associated with LBP

Repetitive movement was associated with LBP complaints, which were far more common among workers performing more than 30 movements per minute (Table 3). This agrees with studies on health office employees, batik workers, female fish processors and manual porters (Aprilia et al., 2025; Maryono et al., 2025; Syamila et al., 2026; Trinita et al., 2026). Repeated movements without adequate recovery cause muscle fatigue and strain tendons, ligaments and other soft tissue (Tarwaka et al., 2004). Under the cumulative load theory, this strain builds up in the lower back over time. Movement frequency in this study ranged from 23 to 42 per minute, and most workers exceeded the threshold while repeatedly gripping, pulling, pushing and adjusting equipment. Because only 11 workers were in the non-repetitive group, the strength of this association should be interpreted cautiously.

Length of employment was also associated with LBP, with complaints more common among workers employed for five years or longer (Table 3). This is consistent with studies across farming, batik, health, power generation and bakery work, and with a literature review

(Aprilia et al., 2025; Aqlina et al., 2024; Ekawati, 2026; Putri et al., 2025; Trinita et al., 2026; Yusran et al., 2026). A longer tenure means a longer accumulation of exposure to physical and ergonomic demands, in line with the cumulative load theory (Tarwaka et al., 2004). Tenure in this study ranged from 1 to 27 years, so the exposure history of the workers differed considerably.

Factors not significantly associated with LBP

Work posture was not associated with LBP (Table 3). Several studies reported the opposite, including those on batik workers, laundry workers, health center staff, brick makers, power plant workers and oil palm loaders (Hardianto et al., 2026; Hidayati et al., 2023; Miyagi & Darnoto, 2025; Pratama et al., 2026; Putri et al., 2025; Trinita et al., 2026). Our result is consistent with studies on bakery workers and street sweepers (Dumais et al., 2024; Ekawati, 2026). Awkward postures do raise spinal load (Tarwaka et al., 2004), but all workers here fell into the moderate-to-very-high risk categories, leaving no low-risk group for comparison. Field observation also showed that workers alternated between bending, leaning forward and squatting depending on the task and equipment location, so exposure of specific body segments varied between workers. An aggregate posture score may therefore hide segment-specific effects (Mardianah et al., 2022).

Physical workload was likewise not associated with LBP (Table 3), in contrast to studies on rubber factory workers, batik workers and health center staff (Hardianto et al., 2026; Rini et al., 2023; Trinita et al., 2026), but in line with Ekawati (2026). Workload only becomes harmful when it exceeds the worker's capacity (Tarwaka et al., 2004). Well service tasks involve varied manual demands, and many are done jointly by several workers, so LBP probably results from several interacting factors rather than from workload alone. This remains the researchers' interpretation and needs further testing.

Working duration was not associated with LBP (Table 3), unlike findings in dentists and batik workers (Rini et al., 2025; Trinita et al., 2026). It agrees with studies on rice farmers, health workers and power plant workers (Aprilia et al., 2025; Hardianto et al., 2026; Hendriani et al., 2025; Putri et al., 2025). Only five workers were in the normal-duration group, which limited the comparison. Workers also had breaks and changes of activity during their 12-hour shifts, allowing some recovery. Even so, every worker with complaints belonged to the extended-duration group, so shift length should not be dismissed.

Stretching habits were not associated with LBP (Table 3). Experimental studies found that structured exercise or workplace stretching reduced LBP (Aswin et al., 2022; Gusma, 2022). The company already has a stretching program, but its implementation was inconsistent: sessions were brief, irregular and skipped by some workers. In a cross-sectional design, workers who already have pain may also stretch more, which obscures the relationship; indeed, complaints were slightly more common among workers who stretched routinely (Table 3). Stretching is most useful when done regularly and correctly, alongside other ergonomic controls (Entianopa et al., 2024).

Implications and limitations

The company should reduce repetitive exposure through task rotation and movement variation, monitor musculoskeletal health periodically (especially among workers with five or more years of service), schedule stretching consistently, review rest arrangements within 12-hour shifts, and keep mechanical aids and manual-handling training in place. The cross-sectional design cannot establish temporal order, the sample came from a single company with only 60 workers, and exposure to working duration, tenure and stretching relied on self-report. Generalization should therefore be cautious. Longitudinal designs, more varied samples, and more precise measures of posture and workload are needed to confirm these findings.

CONCLUSION

This study concludes that low back pain affects a considerable share of well service workers at PT.X, who are exposed to multiple ergonomic risks, including elevated postural risk, high physical workload, repetitive movement and extended working hours. Repetitive movement and length of employment were associated with LBP complaints, with workers who performed repetitive movements and those employed for five years or longer being more likely to report complaints. Work posture, physical workload, working duration and stretching habits were not associated with LBP complaints, although this may be partly explained by the limited variation in exposure among respondents, and these factors should still be managed as part of ergonomic prevention. The company is therefore advised to prioritise the control of repetitive movement through workflow redesign, short work breaks and task rotation, to include workers with longer service as a priority group in periodic musculoskeletal health surveillance, to improve compliance with the existing stretching programme, and to maintain ergonomic practices such as manual handling training and the consistent use of mechanical aids. Future studies should use longitudinal or intervention designs, more varied samples, more precise measures of posture and physical workload, and additional confounders such as body mass index and previous injury to confirm these findings.

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