

ORIGINAL ARTICLE

Prevalence and risk factors for low back pain among oil field workers in Minhla Township, Magway Region, Myanmar

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Abstract

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Low back pain is the most common health problem among oil field workers and the leading cause of disability. A cross-sectional study was conducted to assess prevalence and risk factors for low back pain among oil field workers in Minhla Township, Magway Region, Myanmar. A multi-stage cluster random sampling was used to draw a sample of 280 workers. The data collection was conducted at the Nga Naung Mone small-scale oil field from April to May 2019. Chi-square test and multiple logistic regression were used to examine risk factors for low back pain.

The prevalence of low back pain among workers was high (83.6%). Only 20.4% of participants had good safety practices. The significant risk factors detected by the Chi-square tests were knowledge about occupational health hazards and exposure to lifting heavy materials. However, the socio-demographic factors and other risk factors were not statistically significantly associated with low back pain. Multiple logistic regression results showed that the following factors remained significantly associated with having low back pain: knowledge about occupational health hazards and exposure to lifting heavy materials. After adjusting for other factors, workers who had fair to poor knowledge about occupational health hazards were 2.32 times more likely to have low back pain than those who had good knowledge (Adj. OR = 2.32, 95% CI = 1.01 - 4.99).

Prevalence of low back pain was high among small-scale oil field workers, as well as exposure to biomechanical hazards, especially lifting heavy objects. Most of the workers had inadequate knowledge, attitude and practice. Educational programs about occupational health and safety should be provided for workers. Moreover, the owners should supply lifting tools. The Government could play an important role by putting more regulations and controls.

Keywords: occupational health hazards, low back pain, workers, small-scale oil field

ความชุกและปัจจัยเสี่ยงต่ออาการปวดหลังของแรงงาน ในแหล่งน้ำมันในเมืองเมนละ แมกเกว ประเทศพม่า

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บทคัดย่อ

ลายเหมียว ตรู จิราพร ชมพิกุล บังอร เทพเทียน และ ฉัฐญาณ วงศ์รัฐนันท์ ความชุกและปัจจัยเสี่ยงต่ออาการปวดหลังของแรงงานในแหล่งน้ำมันในเมืองเมนละ แมกเกว ประเทศพม่า ว. สาธารณสุขและการพัฒนา 2562;17(2):63-75

อาการปวดหลังส่วนล่าง (ปวดหลัง) เป็นปัญหาสุขภาพที่พบได้บ่อยในกลุ่มคนทำงานในแหล่งน้ำมัน และเป็นสาเหตุหลักของความพิการ การศึกษาแบบตัดขวางนี้มีวัตถุประสงค์เพื่อประเมินความชุกและปัจจัยเสี่ยงต่อการปวดหลังของแรงงานในแหล่งน้ำมันขนาดเล็ก ในเขตเมืองเมนละ แมกเกว ประเทศพม่า โดยใช้การสุ่มตัวอย่างแบบกลุ่มหลายขั้นตอนเพื่อสุ่มตัวอย่างแรงงาน 280 คน การเก็บรวบรวมข้อมูลได้ดำเนินการที่แหล่งน้ำมันขนาดเล็กซึ่งจะนำโมโนในช่วงเดือนเมษายนถึงพฤษภาคม 2562 วิเคราะห์ข้อมูลด้วยการทดสอบไคสแควร์และการถดถอยโลจิสติกพหุคูณเพื่อทดสอบหาปัจจัยเสี่ยงสำหรับอาการปวดหลัง

ความชุกของอาการปวดหลังมีค่าสูง (83.6%) มีผู้เข้าร่วมวิจัยเพียง 20.4% เท่านั้นที่มีวิธีปฏิบัติด้านความปลอดภัยที่ดี ปัจจัยเสี่ยงของอาการปวดหลังที่สำคัญที่ตรวจสอบพบโดยการทดสอบไคสแควร์ ได้แก่ ความรู้เกี่ยวกับสิ่งคุกคามสุขภาพจากการประกอบอาชีพ และการยกวัสดุที่หนัก อย่างไรก็ตามไม่พบว่าปัจจัยทางสังคมและประชากร และปัจจัยเสี่ยงที่เกี่ยวข้องอื่นๆ มีความสัมพันธ์กับอาการปวดหลังอย่างมีนัยสำคัญทางสถิติ ผลของการวิเคราะห์การถดถอยโลจิสติกพหุคูณพบว่า ความรู้เกี่ยวกับสิ่งคุกคามสุขภาพจากการประกอบอาชีพ และการยกของหนักยังคงมีความสัมพันธ์อย่างมีนัยสำคัญกับการมีอาการปวดหลัง หลังจากปรับอิทธิพลของปัจจัยอื่นๆ แล้ว คนงานที่มีความรู้ในระดับต่ำถึงระดับปานกลางเกี่ยวกับสิ่งคุกคามสุขภาพจากการประกอบอาชีพ มีโอกาส 2.32 เท่าที่จะมีอาการปวดหลังเมื่อเทียบกับผู้ที่มีความรู้ดี (Adj. OR = 2.32, 95% CI = 1.01 - 4.99)

ความชุกของอาการปวดหลังพบได้สูงในคนงานที่แหล่งน้ำมัน เช่นเดียวกับสิ่งคุกคาม โดยเฉพาะการยกของหนัก คนงานส่วนใหญ่มีความรู้ที่สนใจ และพฤติกรรมที่ไม่ดีพอ นายจ้างควรจัดการอบรมด้านอาชีวอนามัยและความปลอดภัยแก่คนงาน

คำสำคัญ: สิ่งคุกคามสุขภาพจากการประกอบอาชีพ อาการปวดหลัง คนงาน แหล่งน้ำมันขนาดเล็ก

Introduction

Low back pain (LBP) is the most common global health problem¹. The global prevalence of LBP has been increasing in all ages of population. LBP is the leading cause of disability which has increased 54% from 1990 to 2015. Most of the effects are in the working age group worldwide and the consequences are absence from work, reoccurrence and limited productivity. There were many work-related factors which caused LBP, particularly in low- and middle-income countries (LMICs)². The oil and gas industry processes included oil exploration, crude oil producing (extraction to surface), transport, storage, and refining process (getting petroleum products from crude oil). Every process has different exposures and effects on human health³. The oil extraction like small-scale oil field leads to high magnitude of accidents and work-related disorders, due to exposure to the risk factors. Many people in high-income countries, e.g. Canada and Finland, were disabled because of the musculoskeletal disorders, more than other disease groups⁴. Occupational fatalities and work-related problems were prevalent among informal workers, especially in the LMICs, more than 85% of total occurrences⁵.

Musculoskeletal disorders are related to workplace setting and work types: manual handling, repetitive movements and prolonged sitting or standing⁶. Strong associated factors of adverse effects on workers' health were workload, awkward posture, lifting heavy objects, and not using suitable tools/equipment⁷. They also had associations with these risk factors: forceful exertion, excessive mechanical force concentration and exposure to vibration tools in the workplace⁸. Occupational health services were limited and they

had been severely impacted because of the lack of obligations to apply the internationally standardized occupational health and safety procedures, and an absence of worker protection⁹. Falls, and accidents resulted in severe injuries and might even lead to death¹⁰, and they were most common and severe hazards in workplaces¹¹. The occupational accidents are preventable but still remain under-recognized¹². Furthermore, comparing to other sectors, the occupational health issues were neglected, especially in developing countries¹³.

Small-scale oil fields had many health hazards: unsafe workplace practices, lack of personal protective equipment (PPE), using the traditional old method, and exposures to other work-related risk factors¹⁴. Most hazards could be avoidable and controllable by various ways¹⁵. Oil industries are highly dangerous work setting and can cause fatality cases¹⁶. Small-scale oil fields were lack of hazard controls; therefore, workers had high risk of occupational hazards¹⁷. Among these hazards the biomechanical hazards were the most common¹⁸. There are two types of oil field, onshore and offshore, in Myanmar. Onshore is more popular and small-scale units are private owned businesses. They have been carrying out for almost a decade throughout the country. The study area was Nga Naung Mone small-scale oil field as it was the largest unregulated small-scale oil field in Myanmar. In this working sector, LBP and other health problems were found to be high¹⁹.

There have been very limited evidences about musculoskeletal health problems, especially LBP, among onshore oil field workers in Myanmar. Therefore, this study aimed to determine the prevalence and risk factors for LBP among oil field workers in

Minhla township, Magway region, in the southern central part of Myanmar.

Methods

This analytical cross-sectional study was conducted to determine the prevalence and risk factors for LBP among oil field workers in Minhla Township, Magway Region, Myanmar. The data collection was conducted from April to May 2019 at the Nga Naung Mone small-scale oil field which was an unregulated and disregarded area after getting the approval from the Institution of Population and Social Research, Mahidol University, Institutional Review Board, with the certificate of approval number 2019/03-062.

Target population

The target population was workers who were working in study area as drillers, oil-collectors. Some workers were also owners. The inclusion criteria to recruit workers were Myanmar who was 18 years and above, and had at least one year of working experience. They were willing to participate in the study. However, the researchers excluded persons who did not work regularly, for instance workers' wives.

Sample size and sampling technique

The sample size was calculated using the confidence interval of 95%, error accepted by the researchers was 5% and the prevalence of occupational health hazards was 0.76 in Nigeria, 2016¹¹. The sample size was 280. Multi-stage cluster sampling was used to draw a sample of 280. Small-scale oil fields are homogeneous with similar health hazards. Moreover, Nga Naung Mone small-scale oil field was selected as it was the largest unregulated one

out of 10 small-scale oil fields in Minhla township, Magway Region, Myanmar. On stage one, researchers purposively selected Nga Naung Mone. Then, on stage two, researchers selected oil wells by using systematic random sampling in the selected oil field. The researchers selected an oil well and skipped to the next one. Finally, on stage three, researchers interviewed one worker who is the head of the selected oil well.

Operational definition of low back pain

Low back pain was defined as subjective perception of pain in the low back which may include the buttocks or legs²⁰⁻²¹. It was measured by one closed-ended question "Have you suffered from low back pain in the past six months?"

Research instrument

The structured questionnaire was used to interview the workers. The questionnaire was consisted of eight parts: (1) socio-demographic factors of workers, (2) knowledge on occupational health hazards, (3) attitude towards using PPE, (4) safety practices, (5) exposure to occupational health hazards, (6) availability of occupational health and safety service, (7) workers' health habits, and (8) experience of LBP in the past six months.

Characteristics of workers included gender, age, residency status, education, work experience in oil field setting and in study area, type of work, work hours per day and health insurance. The health habits during working hours included two close-ended questions: smoking tobacco or cigarettes, and drinking alcoholic beverages.

For knowledge, there were four main categories (physical, chemical, biomechanical and psychosocial hazards) and 15 closed-ended questions (6, 3, 3, and 3 questions for each category accordingly). The scores range was from zero to 15. Bloom's cut off point²² was used to categorized the level as high (>80% or >12 points), moderate and low ($\leq$ 80% or $\leq$ 12 points).

Attitude towards using PPE part had eight questions with five-point Likert's scale²³ (score): strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1). The total score ranged from eight to 40, and the attitude was classified as: good (> 75th percentile), fair (25th – 75th percentile) and poor (less than 25th percentile).

Safety practices part included 10 statements with five options: always, usually, sometimes, rare, and never. The total score range was from 10 to 50, and classified as three level by Kralam²⁴: good (> 75th percentile), fair (25th – 75th percentile), and poor (< 25th percentile).

Exposure to different occupational health hazards were asked with 12 closed-ended questions. Four questions about biomechanical hazards included using vibration tools or machineries, lifting heavy objects without help, performing repetitive movements, and prolonged sitting or standing.

Availability of occupational health and safety equipment and training consisted of 14 closed-ended questions. Ten questions involved different types of safety equipment and controls, including PPE, and one question involved training.

Finally, experiences of having LBP were asked with the closed-ended question if the participants experienced LBP at least once within the last six

months. The subjective severity was categorized into three levels: mild, moderate and severe.

The reliability test was done in another oil field with similar working conditions, named Tha Pyay Nyo, Myaing Township in Magway Region. Only 17 workers participated due to limitations of cooperation and transportation. The Cronbach's Alpha was 0.52 for knowledge, 0.72 for attitude towards using PPE, and 0.68 for safety practice.

Data analysis

Data management and analysis were carried out using IBM-SPSS version 23.0. Descriptive statistics were used to describe all variables. The Chi-square test and multiple logistic regression were used to examine risk factors of low back pain.

Results

There were 280 oil field workers participated in this study. The characteristics of the participants are shown in Table 1. Most of them were males (78.6%) and migrants (60.4%). The median age was 35 years old. Almost half had primary school education (44.3%). Even though they had worked in oil field setting for a longer time, seven years as median, the experience in this particular oil field was relatively shorter, three years as median. In terms of types of work, oil collectors were approximately a half (48.9%), followed by drillers and owners, 30.7% and 20.4% accordingly. Regarding health, one-fourth reported smoking during working hours and one-third reported drinking alcoholic beverages. Very few had health insurance (4.3%).

Table 1 Distribution of participants by the socio-demographic factors and health habits

Socio-demographic factors	Number (n=280)	Percent
Gender		
Male	220	78.6
Female	60	21.4
Age (years)		
18 - 27	61	21.8
28 - 37	122	43.6
38 - 47	78	27.9
48 - 57	15	5.4
> 57	4	1.4
Median = 35, QD 5.5, Min = 18, Max = 70		
Residency status		
Local	111	39.6
Migrant	169	60.4
Education levels		
Monastery	36	12.9
Primary School	124	44.3
Middle School	78	27.9
High School	34	12.1
College level or higher	8	2.9
Work experience in oil field setting (years)		
1 - 5	118	42.1
6 - 10	110	39.3
11 - 15	43	15.4
16 and above	9	3.2
Median = 7, QD = 3.5, Min = 1, Max = 20		
Work experience in study area (years)		
1 - 5	227	81.1
6 - 10	47	16.8
11 and above	6	2.1
Median = 3, QD = 2, Min = 1, Max = 13		
Type of work		
Drillers	86	30.7
Oil collectors	137	48.9
Owners	57	20.4
Working duration (hours/day)		
Less than 8	146	52.1
8 and above	134	47.9
Health Insurance		
Yes	12	4.3
No	268	95.7
Health habits during working hours		
Smoking	70	25.0
Drinking	88	31.4

Occupational health related factors are listed in Table 2. Majority of the workers had fair-to-poor knowledge (61.4%), fair-to-poor attitude towards using PPE (77.5%) and fair-to-poor safety practice (79.6%). Only 11.1% received occupational health and safety training. Exposure to biomechanical hazards, including vibration, lifting, repetition and prolonged static postures were common (60.0 – 81.4%).

Table 2 Distribution of participants by the occupational health related factors

Occupational health related factors	Number (n=280)	Percent (%)
Knowledge levels		
Good	108	38.6
Fair to poor	172	61.4
Median = 12, QD = 3, Min = 1, Max = 15		
Attitude towards using PPE		
Good	63	22.5
Fair to poor	217	77.5
Median = 30, QD = 4, Min = 10, Max = 40		
Safety practice levels		
Good	57	20.4
Fair to poor	223	79.6
Median = 26.5, QD = 4, Min = 10, Max = 50		
Received occupational health and safety training		
Yes	31	11.1
No	249	88.9
Exposure to biomechanical hazards		
Using vibration tools or machineries	222	79.3
Lifting heavy objects without help	168	60.0
Performing repetitive movements	172	61.4
Prolonged sitting or standing	228	81.4

Table 3 presents the prevalence of LBP was high (83.6%). Its subjective severity was classified into mild (17.9%), moderate (54.3%) and severe (11.4%) level. Among the participants, 30.7% of drillers participated in the study, and LBP occurred the most in this group, 93%.

Table 3 Prevalence of low back pain and its severity among participants within the last six months

Low back pain	Number	Percent
Yes	234	83.6
Severe	32	11.4
Moderate	152	54.3
Mild	50	17.9
No	46	16.4

Table 4 presents the association between the variables found to be significantly associated with workers' socio-demographic characteristics and LBP. LBP. The results indicated that none of the independent

Table 4 Association between socio-demographic factors and low back pain

Socio-demographic factors	n	Low back pain		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
Age groups					
≤ 35	153	86.3	13.7	1.54 (0.82 – 2.91)	0.182
> 35	127	80.3	19.7	1	
Gender					
Male	220	84.5	15.4	1.37 (0.66 – 2.84)	0.401
Female	60	80.0	20.0	1	
Education					
Less than Middle School	160	83.1	16.9	1	0.816
Middle School or Higher	120	84.2	15.8	1.08 (0.57 – 2.05)	
Residency status					
Local	111	83.8	16.2	1.03 (0.54 – 1.96)	0.938
Migrant	169	83.4	16.6	1	
Types of work					
Driller and Oil-collectors	223	85.2	14.8	1.70 (0.83 – 3.49)	0.149
Owners	57	77.2	22.8	1	
Working duration (hours/day)					
< 8	146	81.5	18.5	1	0.332
≥ 8	134	85.8	14.2	1.37 (0.72 – 2.61)	
Work experience in oil field setting (years)					
≤ 7	157	82.8	17.2	1	0.695
> 7	123	84.6	15.4	1.14 (0.59 – 2.16)	
Work experience in study area (years)					
< 3	123	81.3	18.7	1	0.365
≥ 3	157	85.4	14.6	1.34 (0.71 – 2.52)	
Health insurance					
Yes	12	66.7	33.3	1	0.119
No	268	84.3	15.7	2.69 (0.78 – 9.34)	

Table 5 presents the significant predictors of low back pain among workers. The knowledge level of workers and exposure to lifting heavy materials were significantly associated with LBP. However, other independent variables were not significantly associated with LBP.

Table 5 Association between each independent variable and low back pain

Independent variables	n	Low back pain		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
Knowledge levels					
Good	108	79.1	20.9	1	
Fair to poor	172	90.7	9.3	2.59 (1.23 – 5.48)	0.012
Attitude levels					
Good	63	83.4	16.6	1	
Fair to poor	217	84.1	15.9	1.05 (0.49 – 2.16)	0.892
Safety practice levels					
Good	57	82.5	17.5	1	
Fair to poor	223	83.9	16.1	1.11 (0.51 – 2.39)	0.799
Exposure to lifting heavy materials					
Yes	168	88.7	11.3	2.75 (1.31 – 4.75)	0.006
No	112	75.9	24.1	1	
Repetitive movements					
Yes	172	86.6	13.4	1.75 (0.93 – 3.31)	0.084
No	108	78.7	21.3	1	
Prolonged static postures					
Yes	228	84.6	15.4	1.48 (0.69 – 3.15)	0.310
No	52	78.8	21.2	1	
Occupational health and safety training					
Yes	31	80.6	19.4	1	
No	149	83.9	16.1	1.25 (0.48 – 3.25)	0.642
Workers' health habits					
Smoking					
Yes	70	85.7	14.3	1.24 (0.58 – 2.65)	0.577
No	210	82.9	17.1	1	

The multiple logistic regression showed that knowledge levels of workers and exposure to lifting heavy materials were significantly associated with LBP. Table 6 presents adjusted odds ratios (Adj. OR) for working duration (hours/day), knowledge levels, safety practice levels, exposure to lifting heavy materials, and accessibility to occupational health and safety training. However, only knowledge levels and exposure to lifting heavy materials were significant risk factors. After adjusting for other factors, workers who had fair to poor knowledge were about 2.32 times more likely to get LBP than those who had good knowledge (Adj. OR = 2.32, 95% CI = 1.01 – 4.99). Workers who exposed to lifting heavy materials were 2.14 times more likely to get low back pain than those who did not (Adj. OR = 2.14, 95% CI = 1.10 – 4.14).

Table 6 Multiple logistic regression for risk factors of having low back pain

Independent variables	Adj. OR	95% CI	P-value
Working duration (hours/day)			
< 8	1		
≥ 8	1.42	0.73 – 2.75	0.298
Knowledge levels			
Good	1		
Fair to poor	2.32	1.01 – 4.99	0.032
Safety practice levels			
Good	1		
Fair to poor	1.13	0.51 – 2.54	0.761
Exposure to lifting heavy materials			
Yes	2.14	1.10 – 4.14	0.024
No	1		
Occupational health and safety training			
Yes	1		
No	1.19	0.44 – 3.21	0.735

Discussion

In this study, the prevalence of LBP was 83.6% among the workers. This finding was much higher than 42.9% from the study of oil drilling workers in India²⁵. The majority of studied workers were male (78.6%). This could result from exclusion of workers who did not work regularly, mostly the workers' wives. Most of the participants were oil collectors and drillers; however, many owners were also included in the study (20.4%). Only 4.3% reported that they had health insurance. Therefore, even among business owners, most did not have health insurance. Similarly, only 11.1% received occupational health and safety training. Thus, many workers and owners did not receive the training.

Some risk factors for LBP in this study were concordant with previous studies. Exposure to lifting heavy objects significantly associated with LBP (Adj. OR = 2.14, 95% CI = 1.10 - 4.14), similar to studies in India²⁶ and Thailand²⁷. Moreover, moderate-to-

low level of knowledge was significantly associated with LBP (Adj. OR = 2.32, 95% CI = 1.01 - 4.99). This outcome was consistent with the study done by Henson²⁸.

However, some of the present study findings were different from others. This study revealed that workers who were 35 years old and under had insignificant higher rate of LBP. This was opposite with the study in India²⁵ and another study of Chinese coal mine workers²⁹. Younger workers in this setting might work harder and had less experience to protect themselves; therefore, they were more likely to suffer from LBP. In addition, we did not find association between working hours and LBP, while working ≥ 8 hours per day increased risk of LBP in the study conducted by Soe in Thailand²⁷. Other biomechanical hazards, such as repetitive movements and prolonged sitting or standing, had been found to associate with LBP in studies in food³⁰ and hotel industries³¹ but not in the present study. Finally, studies by Mohamed³²

and Martinovich³³ showed that occupational health and safety training associated with decreased health problems; whereas, this study did not find association between training and LBP.

The present cross-sectional study using face-to-face interview aimed to assess the prevalence and risk factors for LBP among oil field workers in Minhla Township, Magway Region, Myanmar. Therefore, this study could not propose causal relationship between LBP and other factors. This study relied on subjective self-report of LBP symptom and exposures to occupational hazards; therefore, there could be misleading information on the interviewers' side and misunderstandings on the interviewees' side. For the knowledge, attitude, and safety practice, the author combined the low level with the moderate one due to insufficient sample size.

Conclusion

The prevalence of LBP was high among small-scale oil field workers. Most of the workers had inadequate knowledge on occupational health and safety, attitude toward using PPE and safety practice. Moreover, their exposures to biomechanical hazards, especially lifting heavy objects, were substantial. Factors significantly associated with LBP were moderate-to-low level of knowledge and exposure to lifting heavy objects without any help.

Recommendations

Based on the research findings, educational programs about occupational health and safety should be provided for workers, including owners. Moreover, owners should supply lifting tools or machineries. They should also prohibit smoking in the oil field for

the safety of their workers. The Government could play an important role by putting more regulations and controls on small-scale onshore oil fields.

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