ORIGINAL ARTICLE

Factors associated with accidents among residential construction workers in Udon Thani Province, Thailand

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Abstract

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Construction work is rather hard and requires skilled labor and people who are trained to deal calmly and safely in possible dangerous environments. Construction workers are likely to have accidents and injuries more than many other occupations. Working without these safety measures in the workplace, result in taking risks of accidents and may cause health problems of workers. The objective of the study was to determine factors associated with accidents among residential construction workers in the city of Udon Thani province. The data were collected by interviews on 10 construction projects with 248 residential construction workers interviewed. The data were analyzed by multiple logistic regression with Generalized Estimating Equation (GEE) to examine factors associated with accidents.

The prevalence of accidents in residential construction was 36.7%. The result showed that after adjusting for other factors the workers who worked as main jobs were 2.56 times more likely to get an accident than those who did not (Adj OR=2.56, 95% CI=1.25-5.22). The workers who had the same posture repeatedly over 1 hour were 2.35 times more likely to get an accident than those whose posture was repeatedly less than 1 hour (Adj OR=2.35, 95% CI=1.17-4.71). Workers who drank alcohol were 2.72 more likely to get an accident than those who did not times (Adj OR=2.72, 95% CI=1.47-5.02).

For accident prevention in the construction sites, it should have signs to identify risk areas clearly to reduce risk and danger. Besides, the accident prevention should provide training on safety in working and use personal protective equipment (PPE) for production planning, control and safety management.

Keywords: construction workers, accidents, construction projects, residential building

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ปัจจัยที่มีความสัมพันธ์ต่อการเกิดอุบัติเหตุของคนงานก่อสร้างอาคารที่พักอาศัยในจังหวัดอุดรธานี ประเทศไทย

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บทคัดย่อ

ปิยพร แผ้วชำนาญ และกาญจนา นาถะพินธุ ปัจจัยที่มีผลต่อการเกิดอุบัติเหตุของคนงานก่อสร้างอาคารที่อยู่อาศัยในจังหวัดอุดรธานี ประเทศไทย ว. สาธารณสุขและการพัฒนา 2561;16(2):29-39

งานก่อสร้างถือว่าเป็นงานที่ค่อนข้างหนักและยังต้องใช้แรงงานที่มีทักษะและความเชี่ยวชาญ แรงงานก่อสร้างมีแนวโน้มที่จะเกิดอุบัติเหตุและเกิดการบาดเจ็บมากกว่าอาชีพอื่นๆ ในการประกอบอาชีพใดๆ ที่ปราศจากมาตรการด้านความปลอดภัย ก็จะมีความเสี่ยงที่จะเกิดอันตรายทั้งในด้านการเกิดอุบัติเหตุ และยังส่งผลต่อปัญหาด้านสุขภาพของผู้ปฏิบัติงานอีกด้วย การวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่มีความสัมพันธ์ต่อการเกิดอุบัติเหตุจากการทำงานก่อสร้างอาคารที่พักอาศัยในพื้นที่ อำเภอเมือง จังหวัดอุดรธานี เก็บรวบรวมข้อมูลด้วยการสัมภาษณ์แรงงานก่อสร้างอาคารที่พักอาศัยจาก 10 โครงการ จำนวน 248 คน วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนาและสถิติเชิงอนุมาน วิเคราะห์ปัจจัยที่มีความสัมพันธ์กับอุบัติเหตุของแรงงานก่อสร้างอาคารที่พักอาศัยด้วยการวิเคราะห์การถดถอยโลจิสติคพหุคูณแบบ Generalized Estimating Equation (GEE)

การเกิดอุบัติเหตุจากการทำงานของแรงงานก่อสร้างอาคารที่พักอาศัยมีความชุกเท่ากับ 36.7% ปัจจัยที่มีความสัมพันธ์ต่อการเกิดอุบัติเหตุจากการทำงานก่อสร้าง พบว่า แรงงานที่ทำงานก่อสร้างเป็นอาชีพหลักมีโอกาสเสี่ยงต่อการเกิดอุบัติเหตุจากการทำงานเป็น 2.56 เท่าของแรงงานที่ทำงานอื่นเป็นอาชีพหลัก (Adj OR=2.56, 95% CI=1.25-5.22) ระยะเวลาการทำงานด้วยท่าเดิมซ้ำๆ เกิน 1 ชั่วโมง มีโอกาสเสี่ยงต่อเกิดอุบัติเหตุมากเป็น 2.35 เท่าของแรงงานที่ทำงานด้วยท่าเดิมซ้ำๆ ไม่เกิน 1 ชั่วโมง (Adj OR=2.35, 95% CI=1.17-4.71) และแรงงานก่อสร้างที่ดื่มเครื่องดื่มแอลกอฮอล์ มีโอกาสเสี่ยงต่อการเกิดอุบัติเหตุจากการทำงานมากเป็น 2.72 เท่าของคนที่ไม่ดื่ม (Adj OR=2.72, 95% CI=1.47-5.02)

การป้องกันอุบัติเหตุในภาคการก่อสร้างควรจัดให้มีการฝึกอบรมเกี่ยวกับความปลอดภัยในการทำงานและการใช้อุปกรณ์ป้องกันส่วนอันตรายบุคคลเป็นประจำ มีการติดตั้งป้ายหรือสัญลักษณ์ความปลอดภัยอย่างชัดเจนเพื่อลดความเสี่ยงและอันตรายที่อาจจะเกิดขึ้น รวมทั้งการวางแผนงานเพื่อให้สามารถบริหารจัดการ การทำงานของแรงงานก่อสร้างได้อย่างปลอดภัย

คำสำคัญ: คนงานก่อสร้าง อุบัติเหตุ โครงการก่อสร้าง อาคารที่พักอาศัย

Introduction

The construction industry and real estate business are important for the development of infrastructure and utilities in various fields of the country. Most of the demands are for flats and condominiums. Because of the construction industry's growth, there are more new employment opportunities for workers who are involved, and it affects the productivity of the economy. The major obstacles of the current construction sector are the shortage of both general and skilled workers. Constructions in building have higher risks affecting their health, safety and sickness due to their lack of experience and skills. In Thailand, the highest risks from hazards are in the construction business (7.15%), food beverage production (5.69%) and electricity (5.38%) respectively[1]. The Ministry of Labor shows that the construction business has the most employees experiencing the greatest number of casualties and illnesses due to their work compared to other industries. There are a total number of 8,149 hazard cases per year and it tends to increase significantly. In 2016, 115 employees died, 3 were permanently disabled, 57 were permanently partially disabled, 2,169 were temporarily disabled > 3 days, and 5,805 were temporarily disabled ≤ 3 days[2]. In Udon Thani, the rates of occupational accidents and injury per 1,000 workers were 18.74 which is the 9th of Thailand. It is also the only province in the Northeast that has suffered highly from workplace occupational accidents and injuries[3]. Accidents occur every day on construction sites[4-5]. Accidents were the leading causes of injuries for the construction workers, especially health problems such as respiratory problems, dermatitis, musculoskeletal disorders (MSD) and gastrointestinal diseases[6]. These issues should raise the questions how the stakeholders prepare and implement health and safety measures. These measures should be well enough to identify any additional information of risks and hazards that might be helpful in reducing incidences for the construction workers in the future. Accident prevention could suggest ways to reduce injuries in the construction sector. These studies of incidents and accidents will increase workplace safety and are significant to understand how these accidents and injuries are occurred. Causes and effects of injuries to workers are useful for prevention and reduction of these accidents. The objective of this study was to determine factors associated with accidents among residential construction workers. The benefits of this study was the basis information for monitoring of occupational safety in construction which could be implemented for project planning and management of health and ergonomics for construction workers.

Methods

Study design and subjects

This was a cross-sectional study of construction workers in Udon Thani province, in the northeast of Thailand. A stratified random sampling was conducted to select the participants. The subjects were recruited from construction sites based on a probability proportion to size sampling method. The criteria for selecting the inclusion criteria are as follows: (1) construction workers aged 18 years and over; (2) Workers who have been working for at least 1 year; (3) Workers are willing to participate in this research study; (4) Workers who are able to communicate and understand Thai language. A total number of 248 workers was included in this investigation.

The sample size was determined by using proportion formula, by using prevalence of proportion of workplace hazards as 19.0% from previous study conducted in Thailand 7, 95% CI, and 10% nonresponse rate. Therefore, the sample size was 248. The sample was selected from all construction projects in Udon Thani including 15 residential projects, 5 projects were chosen. The 10 small and large dormitories, 4 of them were chosen, and a hotel construction project. A stratified random sampling was selected from a total of 10 construction projects under construction, including five residential projects, four small and large dormitories, and one hotel construction project. The interview developed by the researcher and passed the content validity of experts, and test reliability was 0.875.

The study protocol was approved by the Khon Kaen University Ethical Committee for human research (HE 592230). Participants willingly signed a consent form before enrolment into the study.

Data collection

Data collection was conducted by interview of residential construction workers in Mueang Udon Thani. The document for permission to collect this information was approved by The Faculty of Public Health, Khon Kaen University. Then, interviews with construction workers were based on demographic characteristics information on construction work, the risk of injury, use of the personal protective equipment (PPE), an accident from work, and health care of workers. Inquiries were made for injuries and accidents in construction work in the past 6 months.

Study variables

The primary outcome of this study was about accidents for construction workers in the past 6 months. The severity of the injury from accidents was minor and required only first aid, or the injury required medical treatment. In this study, the independent variables were sex, age, marital status, construction as a primary occupation, work experience, period of work per day and per week, working with the same posture repeatedly, drinking alcohol, and various kinds of pain.

Statistical analysis

All statistical analyses were performed using software Stata version 11.0 (Stata Corp, College Station, TX, USA). For baseline characteristics, the categorical variables were summarized in numbers, percentages and the continuous variables as means and standard deviations. Multiple logistic regression with Generalized Estimating Equation (GEE) was used to adjust or control the clustering effect of different occupational health standards for residential building projects. Statistical significance level in the multiple logistic regression was set at 0.05. The magnitude of association was shown in the form of adjusted odds ratio (Adj OR) with 95% Confidence Intervals (95% CI).

Results

Baseline characteristics of the sample are presented in Table 1. The percentage of males (51.6%) and females (48.4%) were not different with a mean age of 40.58 years (SD = 9.88). The construction workers

worked as a primary occupation (69.8%) and work experience less than 10 years. Construction workers had health problems which was the pain on the part of body (Table 2) such as shoulder pain (41.5%), lower back pain (31.0%) and hand and wrist pain (24.6%).

Table 1 Distribution of respondents by demographic characteristics

Demographic characteristics	Number	Percent
Sex		
Males	128	51.6
Females	120	48.4
Age (years)		
≤ 35	71	28.6
36-45	96	38.7
> 45	81	32.7
Mean = 40.58, SD = 9.88, Min = 18, Max = 63		
Marital status	47	18.9
Single/ divorce	201	81.1
Married		
Construction as a main occupation	75	30.2
No	173	69.8
Yes		
Work experience (years)		
≤ 10	155	62.5
11-20	62	25.0
> 20	31	12.5
Mean = 10.7, SD = 8.96, Min = 1, Max = 40		
Period of work (hours per day)		
≤ 8	231	93.2
> 8	17	6.8
Period of work (days per week)		
7	192	77.4
≤ 6	56	22.6
Working with the same posture repeatedly		
≤ 1 hour	193	77.8
> 1 hour	55	22.2
Drinking alcohol		
No	167	67.3
Yes	81	32.7

Table 2 Distribution of respondents by having pain on various parts

Pain on various parts	Number	Percent
Neck		
No	147	59.3
Yes	101	40.7
Shoulder		
No	145	58.5
Yes	103	41.5
Upper back		
No	196	79.0
Yes	52	21.0
Elbow		
No	209	84.3
Yes	39	15.7
Lower back		
No	171	69.0
Yes	77	31.0
Hand and wrist		
No	187	75.4
Yes	61	24.6
Hip		
No	199	80.2
Yes	49	19.8
Knee		
No	194	78.2
Yes	54	21.8
Foot		
No	221	89.1
Yes	27	10.9

Among a total of 248 residential construction workers, there were 36.7% accidents during 6 months. Workers who had a main occupation were 2.31 times more likely to accidents than others (Table 3). Work experience: workers who had 11-20 years of experience and at least 21 years old were 2.08 and 2.53 times less likely to have an accident than those with 10 years of experience and lower. Workers who had same posture repeatedly over 1 hour were 2.36 times more likely to have an accident than those who posture repeatedly less than 1 hour. Workers who drank alcohol were 2.22 times more likely to have an accident than those who did not. Workers who had hand and wrist pain were 2.87 times more likely to have an accident than those who did not. The following pain factors were not associated with accidents: neck, upper back, elbow, hip, knee and foot.

Table 3 The relationship between the study factors and work accidents in 6 months

Factors	% Accidents	% No accident	Crude OR	95%CI	P-value
Construction as a main occupation	24.0	76.0	1	1	
No	42.2	57.8	2.31	1.25-4.25	0.007
Yes					
Work experience (years)					
≤ 10	29.7	70.3	1	1	
11-20	46.8	53.2	2.08	1.14-3.82	0.018
> 20	51.6	48.4	2.53	1.15-5.54	0.020
Period of work (days per week)					
7	33.3	66.7	1	1	
≤ 6	48.2	51.8	1.86	1.02-3.41	0.044
Working with the same posture repeatedly					
≤ 1 hour	32.1	67.9	1	1	
> 1 hour	52.7	47.3	2.36	1.28-4.36	0.006
Drinking alcohol					
No	30.5	69.5	1	1	
Yes	49.4	50.6	2.22	1.29-3.83	0.004
Shoulder pain					
No	29.0	71.0	1	1	
Yes	47.6	52.4	2.23	1.31-3.77	0.003
Lower back pain					
No	32.8	67.2	1	1	
Yes	45.5	54.5	1.71	0.99-2.97	0.056
Hand and wrist pain					
No	30.5	69.5	1	1	
Yes	55.7	44.3	2.87	1.59-5.20	<0.001

In Table 4, the workers who had the main occupations were 2.56 times more likely to have accidents than others (95% CI= 1.25-5.22). Workers who worked six days a week were likely to have accidents 2.22 times (95% CI= 1.10-4.50) more than those who worked every day. Workers who worked the same posture repeatedly over 1 hour were 2.35 times more likely to have accidents than those whose posture were repeatedly less than 1 hour. Workers who had drunk alcohol were 2.72 times more likely to have accidents than those who did not. Workers who had hand and wrist pain were 2.24 times more likely to have accidents than those who had not had hand and wrist pain. Based on multiple logistic regression with GEE analysis, the relationship with various factors and work accidents in 6 months were all significant at 5%.

Table 4 The relationship between the study factors and work accidents of construction worker

Factors	Crude OR	Adjusted OR	95%CI	P-value
Construction as a main occupation				
No	1	1		
Yes	2.31	2.56	1.25-5.22	0.010
Work experience (years)				
< 10	1	1		
11-20	2.08	1.51	0.75-3.03	0.247
≥ 21	2.53	2.08	0.85-5.06	0.108
Period of work (days per week)				
7	1	1		
≤ 6	1.86	2.22	1.10-4.50	0.026
Working with the same posture repeatedly				
≤ 1 hour	1	1		
> 1 hour	2.36	2.35	1.17-4.71	0.016
Drinking alcohol				
No	1	1		
Yes	2.22	2.72	1.47-5.02	0.001
Shoulder pain				
No	1	1		
Yes	2.23	1.35	0.68-2.69	0.390
Lower back pain				
No	1	1		
Yes	1.71	1.12	0.57-2.19	0.736
Hand and wrist pain				
No	1	1		
Yes	2.87	2.24	1.09-4.59	0.028

Discussion

In this study, the percentage of work-related accidents was 36.7% which was similar to other studies[8-10]. As for construction as the main occupation, workers were at risk of having an accident (Adj OR=2.56). Fatigue has the potential to make it easier to malfunction. Similarly, weakness is a construction site danger as it affects the capacity to think clearly and respond correctly and as such has contributed to workplace injury[11-12]. Workers who worked six days a week were 2.22 time more likely to have an accident than those who worked every day.

Construction work 6 days a week is more likely to cause accidents than working every day because many workers in construction sites lack caution and experience in working. Therefore, working

with increased work hours has increased the risk of accidents[13]. Working with the same posture repeatedly over one hour was 2.35 times more likely to get an accident than those who worked in the same position for less than 1 hour. Repeated work with the same posture will cause fatigue, which can lead to an accident and decrease the effectiveness of the work[14]. The consequences of MSD have both direct and indirect effects on the health of workers. Direct physical injury cannot be treated immediately because one is still required to function in a repetitive manner, with a range of inadequate rest and treatment[15]. Workers should move and change their posture as often as possible to keep their muscles relaxed[16]. Construction workers who drank alcohol were 2.72 times more likely to get an accident while working. Drinking alcohol certainly results in memory loss, nervous system, blood pressure, and uncontrolled body conditions, which can cause accidents at work. Alcohol-related relationships have an impact on the cause of an accident, which is a main cause of serious injury to oneself and others[17]. Hand and wrist pain also results in the risk of an accident 2.24 times (Adj OR=2.24). MSD is the most serious cause of occupational injuries in the residential construction industry. The symptoms of MSD appeared in nearly 77% of the construction workers[18]. A considerable number of the bricklayers and their manager complain[19] and make a report on MSD (shoulder, upper arm, back, and knee). However, most accidents are not caused by workplace system failure but caused by human unsafe behaviors. 80% of the accidents were caused by human behaviors[20]. Furthermore, the World Health Organization (WHO) specifies that risk behavior acts caused accidents at work. These were due to a lack of awareness of the dangers[21]. Data from these tasks should be applied to develop the methods used and confirm the safety of the construction workers in the country. The unsafe acts and conditions can be managed by social and organizational supports such as safety training, and the number of accidents can be reduced by understanding and eliminating unsafe acts and unsafe conditions[22-24].

Recommendations

Working in construction sites as a main occupation always takes a risk of accidents so, construction workers must be careful. Workers should realize the importance of self-protection such as the use of PPE to reduce the risk of injuries at work. Therefore, workers should avoid doing the same posture repeatedly to prevent the occurrence of MSD. In addition, construction workers should avoid drinking alcohol both after work and on the weekends in order to have enough rest and enable to work effectively the next day. Furthermore, beverage with most alcohol can also cause dehydration which is a diuretic and your body gets worse while working[25], result in the increase the risk of accidents. Then, workers with hand and wrist pain who are at risk for work-related accidents should treat their pain well and return to work as usual. Finally, training or having morning talks to workers about safety in construction work will help them to be aware of accidents at work. The PPE and safety signs should be provided suitably to the hazards at the construction sites[26]. These measures include construction workers having a safe workplace and always wearing PPE at work to reduce the risk of injury or harm.

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