



## Prevalence of Work Related Musculoskeletal Disorders Symptoms among Construction Workers: a Case Study in Malaysia

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### Abstract

**Background:** The nature of work in the construction industry is closely associated with many human factor hazards. Manual construction workers are exposed to hand-arm vibration, repetitive movements, holding of heavy loads and tools, and frequent manual materials handling hazards in their daily tasks. Work related musculoskeletal disorders are major problems faced by construction workers, which involve the nerves, tendons, muscles and other supporting structures of the body. Two main objectives of this study were firstly, to determine the risk factors and the prevalence and secondly, to identify the association of the risks with muscular musculoskeletal disorders symptoms among construction workers.

**Methods:** Evaluation was done through survey questionnaire which also involved the standardized Nordic questionnaire. Sixty male construction workers aged between 17 to 50 years old took part in the study. Their main daily tasks are bricklaying, skim coating, housekeeping and plastering.

**Results:** 66.7% of the workers who took part in the study had high prevalence of musculoskeletal disorders symptoms at their elbows, wrists or hands and ankles or feet.

**Conclusion:** Manual construction workers are highly exposed to the risks of getting work related musculoskeletal disorders and there are significant associations ( $P = 0.023$ ) between working duration with MSDs symptom among construction workers with respect to the workers lower limb.

**Keywords:** Musculoskeletal disorders, Manual construction workers, Risk factors

### Introduction

The term musculoskeletal disorders (MSDs) refer to conditions that involve the nerves, tendons, muscles and supporting structure of the human body. MSD is one of the major problems faced by construction workers. Workers who are performing heavy physical work have a significantly higher prevalence of MSDs in different regions of the body. In many types of occupational groups,

MSDs are major causes of work related disability and lost time due to illness. The nature of construction work is closely associated with human factor hazards, and these hazards exist in their routine job tasks (1).

Leung et al. (2) conducted a study among 105 construction workers in Taiwan. Their study showed a high majority (76.2%) of construction

workers reported that they are experiencing MSDs symptoms. Meanwhile, 47% of the construction workers reported that the most prevalent work-related symptoms are shoulder symptoms, followed by neck symptoms with 43.8%, and low back symptoms at 38.1%. Construction worksites have long been recognized as having stressful and high-risk workers whose stress levels and injury incident rates always exceeded those workers in other industries.

Where one works (workplace) and the nature of work (carrying heavy load) are factors that have significant relationship with back pain due to the perception that the load carried at work is too heavy (3). Prevalence of back pain was high among workers performing work activities such as drilling, which involves body twisting, especially bending or walking and working activities (4).

Work related activities, working in static position and awkward posture are the most frequently reported worker-related activities that caused musculoskeletal symptoms among building construction workers (5). Working in the same position for long periods was the job factor identified as most problematic, where most respondents rated it as a major problem contributing to musculoskeletal symptoms (6). In addition, certain postures can be assumed safe if they occur for a short period, provided the worker does not repeat that posture numerous times and classify such postures as unsafe when a time threshold has been met (7). It was observed that stone cutters worked continuously in awkward postures during stone cutting and setting (8). Additionally, extreme postures were identified to contribute towards muscular skeletal disorders symptoms among construction electricians (9).

Two main objectives of this study were firstly, to determine the risk factors and the prevalences and secondly, to identify the association of the risks with muscular musculoskeletal disorders symptoms among construction workers.

## **Materials and Methods**

This study used a cross-sectional survey as the research design to determine the prevalence of

musculoskeletal symptoms and factors that influence MSDs among construction workers. A construction site located at Ulu Kelang, Selangor was selected as the location for data collection. The respondents in this research were given a questionnaire solely constructed for this study. The questionnaire consists of two sections: Section A (i.e. socio demographic data and working details) and Section B (i.e. self-reported MSDs symptoms). The socio demographic section requested information on job factors with respect to current job tasks, duration of work, age, height, weight and body mass index (BMI). Questionnaire for self-reported MSDs symptoms section was adapted from the standardized Nordic questionnaire (10). The questionnaire asked the following three questions for nine different anatomic body regions (neck, shoulder, elbows, wrist/hands, upper back, lower back, hip/thigh, knee, ankle/feet): "Have you at any time during the last 12 months had trouble (ache, pain, discomfort, numbness)?", "Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble?", and "Have you had trouble at any time during the last 7 days?". The average time for respondents to complete the survey is about 10 minutes.

About 60 manual construction workers were selected randomly to be recruited as respondents for this research. The respondents consist of Indonesian and Bangladeshi workers, who are the main workers in construction industry in Malaysia, aged between 17 - 50 years old. The selected respondents were categorized into four types of job task, which comprised of bricklaying, skim coating, housekeeping, and plastering. Bricklaying tasks involve the manual construction workers to lay bricks for constructing the brickwork. Skim coating is the process of applying a layer of muddy plaster compound to rough or damaged ceilings and walls to either smooth or repair them. Plastering work refers to construction done with plaster, such as putting a layer of plaster on an interior wall or plaster decorative moldings on ceilings or walls. Housekeeping works are workers that clean their construction site area, doing tasks such as

lifting and carrying cement, brick and iron rod. The selected respondents were confirmed by their employers to have the criteria for the four job tasks, actively involved in manual handling at construction site, have never been involved in any type of accidents and, they have no known disability or injury especially at their back muscle and spine.

## Results

Prevalence of MSDs for each of the nine body regions were determined by dividing the number of “yes” responses to questions regarding the MSDs symptoms by the total number of participants. Data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 17.

Descriptive analysis of test data was done to determine the prevalence of MSDs symptoms and demographic factors among employees. Chi-Square tests were used in determining the association between the MSDs symptoms to the factors studied. Table 1 shows the prevalence of musculoskeletal symptoms with respect to the nine body parts. The prevalence of musculoskeletal symptoms in terms of percentages of complaints from the respondents are at the: lower back (45%), followed by shoulder (28.3%), neck (16.7%), wrist or hand (15%), upper back (13.3%), knees (13.3%), elbow (10%), hip/thigh (8.3%) and ankles or feet (5%) respectively. Table 2 shows the prevalence of musculoskeletal symptoms based on types of job tasks of a construction company.

**Table 1:** Prevalence of musculoskeletal symptom

Specific Body Parts	n	%	Specific Body Parts	n	%
Neck	10	16.7	Lower back	27	45.0
Shoulder	17	28.3	Hip/Thigh	5	8.3
Elbow	6	10.0	Knees	8	13.3
Wrist/Hand	9	15.0	Ankles/Feet	3	5.0
Upper Back	8	13.3			

**Table 2:** Prevalence of musculoskeletal symptoms by types of job task

Body Parts	Types of Job Task			
	Brick Laying n(%)	Skim Coat n(%)	House keeping n(%)	Plastering n(%)
Neck	2(20.0)	3(30.0)	2(20.0)	3(30.0)
Elbow	2(33.3)	-	4(66.7)	-
Shoulder	2(11.7)	2(11.7)	9(52.9)	4(23.5)
Wrist/hand	-	-	6(66.7)	3(33.3)
Upper Back	-	1(12.5)	3(37.5)	4(50.0)
Lower Back	5(18.5)	7(25.9)	9(33.3)	6(22.2)
Hip/Thigh	1(20.0)	-	2(40.0)	2(40.0)
Knee	1(12.5)	2(25.0)	5(62.5)	-
Ankles/Feet	1(33.3)	-	2(66.7)	-

## Discussion

From the survey conducted at the construction site, it was revealed that the majority of the respondents (i.e. manual construction workers) are

experiencing musculoskeletal symptoms. This result is in-line with previous research studies in other countries. It was reported In Taiwan that 76.2% of building construction workers are experiencing musculoskeletal symptoms (5). In Swe-

den, Holmstrom et al. (11) reported that 92% of manual construction workers experience musculoskeletal symptoms during the past 12 months. Work factors have incorporated such as: repetitive task, awkward posture, heavy physical work and vibration as risk factors for musculoskeletal disorders in the workforce (12).

Housekeeping activities are the most significant contributor to musculoskeletal problems compared to other job types. Musculoskeletal problems at the elbow, wrist or hand and ankles or feet (66.7%) are clearly the most prevalent MSD experienced by the respondents (i.e. manual construction workers). Manual construction tasks require extensive use of hands and feet in the form of gripping, awkward posture, heavy lifting, frequent bending, kneeling and repetitive motion. The prevalence of MSD is lowest at the shoulder (11.7%). Table 2 also shows that 50% of the respondents performing plastering activities are suffering from pain in the upper back; meanwhile 33.3% of the respondents performing housekeeping activities are suffering from severe pain at the lower back.

This study revealed that the upper body is the most frequently reported body part with musculoskeletal symptoms (50%). Plastering activities normally involve many body parts and this can be seen in job tasks such as hand gripping tools, awkward postures during application of wet mortar, heavy lifting of wet mortar onto working platform, frequent bending, kneeling and repetitive motions surrounding the working area. In addition, prolonged working hours in these awkward situations could result in MSDs problems. This result is also in-line with Yang et al. (5) where their study showed that the shoulder is the most frequently reported body region with musculoskeletal symptom (47.6%). However, this result is not quite consistent with results of other research studies that revealed low back symptoms as the most prevalent musculoskeletal complaints among construction workers. Gangopadhyay et al. (8) mentioned that manual construction workers suffer from discomfort mostly in the lower back. Meanwhile, Deros et al. (13) agreed that lower back pain (LBP) is more prob-

lematic than upper back pain (UBP).

For the second objective of this research, it was found that there were significant associations ( $P = 0.023$ ) between working duration with MSDs symptom among construction workers with respect to ankles or feet. Widanarko et al. (14) stated that there are no statistically significant differences in prevalence of MSDs among age groups. They also mentioned that heavy workload has significant impact towards the existence of MSDs symptoms than light physical workload. Thus, it can be concluded that there is evidence of association between MSDs symptom that is related to the ankle or feet and duration of work. In addition to this situation, most of the working activities were conducted in the standing position beyond normal working period. In this industry, manual construction workers normally work between 10 - 12 hours daily. Therefore, prevalence of MSDs symptom is significant with duration of work.

## Conclusions

The prevalence of musculoskeletal symptoms are 16.7% for neck, 28.3% for shoulder, 10% for elbow, 15% for wrist or hand, 13.3 for upper back, 45% for lower back, 8.3% for hip or thigh, 13.3% for knee and 5% for ankle or feet. From the results discussed, some control measures should be implemented to improve ergonomics implementation in the workplace, such as communication, management control, ergonomic design factors, training and education, as well as written ergonomics program. The control measures that can be implemented at these construction sites are training and education; redesigning the workstation; introducing mechanical aids and providing personal protective equipment (PPE) for the manual construction workers. Other than that, the risk of musculoskeletal disorders can be reduced by redesigning the workstation. This can be done by designing the work system to prevent overloading of the muscular system, avoid sharp or hard edges where hands contact tools and incorporate changes in position or short breaks into the job to avoid static work situations. The man-

agement can also provide mechanical aids such as wheelbarrow and PPE such as back support belt.

## Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## References

1. Chang FL, Sun YM, Chuang KH, Hsu DJ (2009). Work fatigue and physiological symptoms in different occupations of high-elevation construction workers. *Appl Ergon*, 40: 591-596.
2. Leung MY, Chan IYS, Yu J (2012). Preventing construction worker injury incidents through the management of personal stress and organizational stressors, *Accid Anal and Prev*, 48: 156-166.
3. Rahmah MA, Rozy IHJ, Jamiah M, Shamsu AS (2008). Prevalence of Back Pain Among Nurses Working in Government Health Clinics and Hospital in Port Dickson, Malaysia. *J Comm Health*, 14(2): 1-8.
4. Anuar I, Nurulakhmar AS, Mazrura S, Azhar AH (2010). Study On Backpain And The Contributing Factors Among Workers In Automotive Industry. *J Comm Health*, 6(2): 1-7.
5. Yang YS, Goldsheyder D, Kau LJ (2002). Survey of Musculoskeletal Symptoms among Building Construction Workers in Southern Taiwan. *J Occup Therapy Assoc*, R.O.C., 20:12-20.
6. Medino LA, John CR, Dan A, Thomas MC (2003). Symptoms of Musculoskeletal Disorders among Apprentice Construction Workers. *Appl Occup and Environ Hygiene*, 18(1): 57-64.
7. Ray SJ, Teizer J (2012). Real-time construction worker posture analysis for ergonomics training. *Adv Eng Inform*, 26: 439- 455.
8. Gangopadhyay S, Das B, Das T, Ghoshal G, Ghosh T (2010). An Ergonomics Study on Posture-Related Discomfort and Occupational-Related Disorders Among Stonecutters of West Bengal, India. *Int J Occup Safety and Ergon*, 16: 69 -79.
9. Moriguchi CS, Carnaz L, Veiersted KB, Hanvold TN, Hceg LV, Hansson GA, Gil CHJC (2013). Occupational posture exposure among construction electricians. *Appl Ergon*, 44: 86-92.
10. Kourinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sorensen F, Andersson G, Jorgensen K (1987). Standardised nordic questionnaires for the analysis of musculoskeletal symptoms. *Appl Ergon*, 18: 233-237.
11. Holmström EB, Lindell J, Moritz U (1992). Low Back and Neck/Shoulder Pain in Construction Workers: Occupational Workload and Psychosocial Risk Factors. *Spine*, 17(6): 617-730.
12. Choi WJ, Kang YJ, Kim JY, Han SH (2009). Symptom Prevalence of Musculoskeletal Disorders and the Effects of prior Acute Injury among Aging Male Steelworkers. *J Occup Health*, 51(3): 273-282.
13. Deros BM, Daruis DDI, Ismail AR, Rahim ARA (2010). Work Posture and Back Pain Evaluation in a Malaysian Food Manufacturing Company. *Am J Appl Sci*, 7(4): 473-479.
14. Widanarko B, Legg S, Stevenson M, Devereux J, Eng A, Mannetje A, Cheng S, Douwes J, Loschmann LE, McLean D, Pearce N (2011). Prevalence of Musculoskeletal Symptoms in Relation To Gender, Age, and Occupational/Industrial Group. *Int J Ind Ergon*, 41: 561 – 572.