PAPER • OPEN ACCESS

Psychosocial Risk Factors for Musculoskeletal Symptoms of Construction Workers

View the article online for updates and enhancements.

Psychosocial Risk Factors for Musculoskeletal Symptoms of Construction Workers

W Kusmasari[1] and Yassierli[1]

[1] Department of Industrial Engineering and Management, Bandung Institute of Technology

kusmasari.wyke@gmail.com

Abstract. Several previous studies have stated that there are several risk factors that affect musculoskeletal disorders on construction workers. Most of the studies have reported the existence of individual and physical risk factors, but only few studies have focused on psychosocial risk factors. The present study included 45 construction workers of a building construction project. A self-reported measurement questionnaire was used to determine the prevalence of musculoskeletal symptoms. The results showed that shoulder pain was most felt by workers during the last seven days and the last 12 months. Regarding to the prevalence felt during the last seven days, factor of reward was significantly associated with knee pain (OR: 0.09; 95% CI: 0.01-0.99). Regarding to the prevalence felt during the last 12 months, factor of weight was significantly associated with upper back (OR: 1.11; 95% CI: 1.01-1.22) and shoulder (OR: 1.09; 95% CI: 1.00-1.18). Body mass index was significantly associated with upper back (OR: 1.35; 95% CI: 1.01-1.22) and shoulder (OR: 1.31; 95% CI: 1.01-1.71). Results of this study indicated that psychosocial risk factors have significant roles in developing musculoskeletal disorders.

1. Introduction

During the last several years, Indonesian government has focused on infrastructure development program. As a result, number of construction workers have increased substantially. Therefore, ergonomics issues should also be considered since construction is among type of industries with high risk of musculoskeletal disorders. Building construction workers are involved in different types of work such as bricklayers, plumbers, electricians, carpenters, crane operators, plastering, and finishing, etc.

Several studies have suggested the influence of individual, physical, psychosocial, occupational, and environmental factors on musculoskeletal disorders in several other occupations. Age, gender, lack of time for personal care, body mass index (BMI), years of experience, monthly income are significantly associated with musculoskeletal symptoms on manufacture workers [1]-[3]. Also, age, gender, work experience, high psychological demand are significantly associated with musculoskeletal disorders in farm workers [4]-[7].

The risk of musculoskeletal disorders on construction workers may be affected individual, physical, psychosocial, occupational, and environmental factors. Individual and physical factors have been extensively investigated by previous studies [8]-[16]. However, the influence of psychosocial risk factors on musculoskeletal disorders in construction workers has not been comprehensively studied in previous studies [11],[13],[17]. Therefore, lack of conclusion is available regarding with the role of psychosocial risk factors on musculoskeletal symptoms for construction workers.

2. Methodology

2.1. Study design

This study is a cross-sectional study on 45 construction workers with some occupational groups like finishing bricklayer, carpenters, cast, roofers, electricians, and others. This research was conducted in December 2018. Data collection was carried out when the workers finished working. As compensation, participants were given a souvenir. Table 1 shows demographic data from the participants.

Table 1. Demographic data of participants

Variable	
Height	
Mean ± SD	164.7 ± 6.06
Weight	
Mean ± SD	57.45 ± 8.86
Marital status	
Single	36%
Married	59%
Divorced	2%
Widowed	3%
Educational level	
Elementary school	36%
Junior high school	59%
Senior high school	2%
Bachelor	3%
Smoking status	
Non-smoker	17%
Former smoker	17%
Current smoker	67%
Employment status	
Permanent employee	28%
Non-permanent employee	72%
Shift work	
No	62%
Yes, but without nightshift	8%
Yes, with nightshift	31%

2.2. Measures

Participants were asked to fill out a questionnaire. This questionnaire was adapted from a study of musculoskeletal symptoms in Indonesian miners, adapted from Job Content Questionnaire, Effort-Reward Imbalance (ERI) Questionnaire, and scale of occupational stress [18]. The questionnaire consisted of sociodemographic data, information about physical workload, information about psychosocial risk factors, and collects musculoskeletal symptoms. The sociodemographic section requested information about individual characteristics (age, gender, height, weight, educational status, marital status) and occupational information (years of work, the name of the current job, employment status, shift work).

2.3. Statistical analysis

Prevalence data was calculated by dividing the number of workers stating a complaint with the total number of samples. The prevalence consists of symptoms felt during the last seven days and the last 12 months. STATA / IC version 15.0 software was used to calculate logistic regression. From this calculation, the odds ratio for each relationship between worker characteristics, psychosocial risk factors, and musculoskeletal symptoms was obtained. Musculoskeletal symptoms were expressed in percentages.

3. Results

This section consists of data on the prevalence and relationships between psychosocial risk factors and musculoskeletal symptoms of construction workers.

3.1. Prevalence of musculoskeletal symptoms

Most of the participant reported complaints at shoulder (66%) during the last seven days, followed by ankles (63%), knees (61%), upper back (60%), and neck (59%). During the last 12 months, the complaints were reported at the shoulder (71%) and then followed by the neck (64%), ankles (62%), upper back (59%), and knees (59%). Both musculoskeletal symptoms in the past seven days and 12 months, showed that shoulder pain was the biggest complaint felt by construction workers (Table 2).

3.2. Associations between psychosocial and musculoskeletal symptoms

Table 3 shows the relationships between individual characteristics and psychosocial risk factors with musculoskeletal symptoms in the past seven days. There was no significant relationship between height, weight, BMI, educational level, employment status, shift work, over commitment, decision latitude, psychological demands, social support, job satisfaction, and work stress with the prevalence of musculoskeletal symptoms in the last seven days. On the other hand, marital status was significantly associated with shoulder symptoms ($p<0.1$). Effort was significantly associated with ankle symptoms ($p<0.1$). Reward was significantly associated with knee symptoms ($p<0.05$).

Table 4 shows the relationships between individual characteristics and psychosocial risk factors with musculoskeletal symptoms in the past 12 months. There was no significant relationship between height, educational level, employment status, shift work, rewards, decision latitude, psychological demands, social support, job satisfaction, and work stress with the prevalence of musculoskeletal symptoms in the last 12 months. On the other hand, weight was significantly associated with upper back and shoulder symptoms ($p<0.05$). Body mass index was significantly associated with upper back and shoulder symptoms ($p<0.05$). Marital status was significantly associated with shoulder symptoms ($p<0.1$). Over commitment was significantly associated with neck symptoms ($p<0.1$). Effort was significantly associated with knee symptoms ($p<0.1$).

Table 2. Prevalence of musculoskeletal symptoms

	Prevalence of musculoskeletal symptoms (7 days)	Prevalence of musculoskeletal symptoms (12 months)
Neck pain	59%	64%
Upper back pain	60%	59%
Shoulder pain	66%	71%
Knee pain	61%	59%
Ankle pain	63%	62%

Table 3. Associations between psychosocial and 7 days prevalence of musculoskeletal symptoms (OR; 95%CI**)**

	Neck	Upper back	Shoulder	Knee	Ankle
Height	8.64	2.46E+02	1.59E-03	2.7E-04	3.6E+00
	(2.14E-04-3.49E+05)	(3.2E-03-1.8E+07)	(1.7E-08-1.5E+02)	(2.0E-09-3.7E+01)	(9.2E-05-1.4E+05)
Weight	1.05	1.08	1.04	1.01	1.01
	(0.98-1.14)	(0.99-1.18)	(0.97-1.12)	(0.95-1.09)	(0.94-1.08)
BMI	1.18	1.24	1.24	1.14	1.02
	(0.94-1.48)	(0.96-1.59)	(0.97-1.58)	(0.91-1.42)	(0.83-1.25)
Marital status	1	1	0.34*	0.84	0.77
	(0.37-2.72)	(0.35-2.83)	(0.09-1.14)	(0.31-2.29)	(0.28-2.10)
Educational level	1.65	1.23	1.27	1.27	0.91
	(0.82-3.32)	(0.61-2.47)	(0.64-2.50)	(0.64-2.50)	(0.47-1.77)
Employment status	0.93	1.30	1.03	0.70	0.63
	(0.28-3.07)	(0.38-4.48)	(0.31-3.45)	(0.21-2.40)	(0.18-2.16)
Shift work	0.77	0.88	1.16	1.16	1.63
	(0.39-1.51)	(0.44-1.76)	(0.57-2.33)	(0.58-2.33)	(0.78-3.39)
Effort	0.49	0.88	0.43	0.37	0.26*
	(0.14-1.72)	(0.26-2.97)	(0.12-1.59)	(0.09-1.44)	(0.06-1.15)
Reward	1	1.48	0.18	0.09**	0.33
	(0.15-6.53)	(0.21-10.30)	(0.02-1.59)	(0.01-0.99)	(0.04-2.43)
Over commitment	0.52	0.87	1.32	1.73	0.38
	(0.13-2.13)	(0.22-3.50)	(0.35-4.94)	(0.46-6.55)	(0.08-1.67)
Decision latitude	0.71	1.13	0.86	1.09	1.28
	(0.12-4.27)	(0.18-7.00)	(0.14-5.18)	(0.18-6.49)	(0.22-7.45)
Psychological demands	0.5	1.05	2.91	1.32	1.27
	(0.09-2.51)	(0.22-5.12)	(0.58-14.52)	(0.28-6.12)	(0.27-5.79)
Social support	1.28	2.37	2.51	1.58	1.46
	(0.32-5.08)	(0.54-10.42)	(0.59-10.67)	(0.39-6.43)	(0.37-5.81)
Job satisfaction	0.78	0.75	1.17	1.02	0.68
	(0.18-3.31)	(0.17-3.32)	(0.27-5.09)	(0.23-4.38)	(0.16-2.91)
Work stress	1.67	1.82	1.86	1.86	1.67
	(0.63-4.41)	(0.65-5.14)	(0.68-5.09)	(0.68-5.09)	(0.63-4.41)

*p<0.1
**p<0.05

4. Discussion

This study aims to determine the relationship between psychosocial risk factors and musculoskeletal symptoms of construction workers in Indonesia. The 7-day prevalence and the last 12 months showed that shoulder symptoms were felt most by construction workers. This results seems in contrast to several previous studies which showed that lower back symptoms were most felt by construction workers [8],[14],[19],[20]. However, it should be noted that most participants of this study worked on finishing jobs. This work required overhead to work most of the time, that may lead to shoulder pain.

Some individual characteristics were significantly associated with musculoskeletal symptoms. Body weight and BMI were significantly associated with upper back and shoulder symptoms (p<0.05). This is in line with the results of previous studies [11],[16],[21], suggesting that body weight and BMI can increase the risk of musculoskeletal disorders (MSDs). On the other hand, marital status was significantly associated with shoulder symptoms (p<0.1).

Table 4. Associations between psychosocial and 12 months prevalence of musculoskeletal symptoms (OR; 95% CI)

	Neck	Upper back	Shoulder	Knee pain	Ankle
Height	128 (1.8E-03-9.1E+06)	1.0E+02 (1.3E-03-8.9E+06)	8.96E+00 (2.0E-04-4.0E+05)	1.07E-01 (2.4E-06-4.7E+03)	2.6E-01 (6.3E-06-1.08E+04)
Weight	1.04 (0.96-1.12)	1.11** (1.01-1.22)	1.09** (1.00-1.18)	1.05 (0.97-1.13)	1.05 (0.97-1.13)
BMI	1.09 (0.88-1.36)	1.35** (1.01-1.79)	1.31** (1.01-1.71)	1.19 (0.95-1.51)	1.21 (0.96-1.53)
Marital status	0.76 (0.27-2.13)	0.82 (0.28-2.35)	0.34* (0.09-1.14)	0.77 (0.28-2.10)	0.59 (0.21-1.67)
Educational level	1.09 (0.54-2.16)	1.21 (0.59-2.46)	1.12 (0.57-2.21)	1.45 (0.73-2.88)	1.45 (0.73-2.88)
Employment status	1.3 (0.38-4.48)	1.48 (0.42-5.21)	1.51 (0.45-5.04)	1.96 (0.58-6.58)	1.34 (0.41-4.43)
Shift work	1.14 (0.55-2.34)	1.05 (0.51-2.17)	1.16 (0.58-2.33)	1.63 (0.78-3.39)	1.25 (0.62-2.50)
Effort	0.52 (0.316-0.14)	1.04 (0.30-3.55)	0.83 (0.25-2.71)	0.811* (0.25-2.61)	0.63 (0.19-2.11)
Rewards	0.31 (0.04-2.56)	0.64 (0.08-4.88)	0.64 (0.09-4.38)	0.10 (0.01-1.01)	1.00 (0.15-6.53)
Over commitment	0.17* (0.02-1.06)	0.69 (0.16-2.95)	0.45 (0.10-1.95)	1.46 (0.39-5.42)	0.42 (0.09-1.81)
Decision latitude	0.52 (0.07-3.56)	1.23 (0.19-7.85)	0.59 (0.09-3.74)	1.28 (0.22-7.46)	1.45 (0.24-8.43)
Psychological demands	1.24 (0.26-5.95)	1.30 (0.26-6.38)	0.83 (0.17-3.96)	2.00 (0.43-9.39)	1.09 (0.24-5.002)
Social support	1.21 (0.28-5.03)	1.23 (0.29-5.28)	1.49 (0.37-6.03)	1.01 (0.25-3.98)	0.89 (0.23-3.52)
Job satisfaction	1 (0.22-4.48)	0.39 (0.08-1.89)	0.67 (0.16-2.89)	1.18 (0.27-5.04)	0.52 (0.12-2.26)
Work stress	1.82 (0.65-5.14)	1.56 (0.55-4.40)	1.45 (0.55-0.55)	2.16 (0.78-5.94)	0.84 (0.33-2.11)

*p<0.1
**p<0.05

This seems contradictory with the results of previous studies [11],[14]. We argue that marital status can increase the number of activities after work. This is related to taking care of children and other homework that requires physical workload. However, further research is needed to determine the effect of marital status on musculoskeletal symptoms.

Variables on psychosocial risk factors tested in this study include effort, reward, over commitment, decision latitude, psychological demands, social support, job satisfaction, and work stress. Based on the calculation of logistic regression, factor of reward was significantly associated with knee symptoms. The OR value (0.09) showed negative association, meaning that that less rewards could increase the possibility of knee symptoms of construction workers. No studies yet that show the existence of reward as a risk factor of musculoskeletal symptoms of construction workers. However, this is interesting because workers who get enough rewards can work normally without feeling that musculoskeletal symptoms disturb their activities.

5. Conclusion

In conclusion, most of our participants who work on finishing jobs reported musculoskeletal symptoms at the shoulder. In addition, body weight and BMI affect upper back and shoulder symptoms. Reward is significantly associated with knee symptoms. These results indicate that psychosocial risk factors have significant roles in developing musculoskeletal disorders. Since this study involved a relatively small number of participants, the results may not be generalized for construction workers in Indonesia. Further study is also needed to develop a comprehensive model of risk factors for musculoskeletal disorders of construction workers.

Acknowledgement

References
[1]　Lombardo S R, de Silva P V, Lipscomb H J and Østbye T 2012 *Int. J. Occup. Env. Heal.* **18** 210–9.
[2]　Shankar S, Kumar R N, Mohankumar P and Jayaraman S 2017 . *Work.* 1–10.
[3]　Thetkathuek A, Meepradit P and Jaidee P 2016 *Int. J. Occup. Saf. Ergo.* **22** 49–56.
[4]　Thekathuek A, Meepradit P and Sa-ngiamsak T A 2018 *Safety and Health at Work.* 192–202.
[5]　Jain R, Meena M L, Dangayach G S and Bhardwaj K 2017 *Int. J. Occup. Env. Heal.* 1–38.
[6]　Jain R, Meena M L, Dangayach G S 2018 *Int. J. Occup. Env. Heal.* 1–7.
[7]　Kang M, Lee M, Chung H, Shin D, Youn K and Im S 2016 *J. Agromedicine.* 1–41.
[8]　Merlino L A, Rosecrance J C, Anton D and Cook T M 2003 *Applied Occupational and Environmental Hygiene.* **18** 57–64.
[9]　Borstad J D, Buetow B, Deppe E, Kyllonen J and Liekhus M 2009 *Ergonomics.* **52** 232–44.
[10]　Dong X S, Wang X, Fujimoto A and Dobbin R 2012 *Int. J. Occup. Env. Heal.* 18 99–109.
[11]　Ekpenyong C E and Inyang U C 2014 *Int. J. Occup. Saf. Ergo.* **20** 447–62.
[12]　Hanklang S, Kaewbooncho O, Silpasuwan P and Munagrndee S S 2014 *Asia-Pac. J. Public. He.* **26** 196–202.
[13]　Neeraja T, Lal B I A S and Swarochish C 2014 *J Hum Ergol.* **43** 1–8.
[14]　Alghadir A and Anwer S 2015 *The Scientific World Journal.* 1–5.
[15]　Chakraborty T, Das S K, Pathak V and Mukhopadhyay S 2017 *Int. Journal of Construction Management.* 1–7.
[16]　Robroek S J W, Jarvholm B, Can der Beek A J, Proper K I, Wahlstrom J and Burdorf A 2017 *Occup. Environ. Med.* 1–7.
[17]　Salem O, Sobeih T M, Genaidy A, Shell R, Battacharya A and Succop P 2008 *Hum. Factor. Ergon. Man.* 18 230–52.
[18]　Widanarko B, Legg S, Devereux J and Stevenson M 2014 *Appl. Ergon.* **4** 1610–21.
[19]　Holmstrom E and Engholm G 2003 *Am. J. Ind. Med.* **44** 377–84.
[20]　Deros B M, Daruis D D I, Khamis N K, Mohamad D and Daud S F M 2014 *Iran. J. Public. Health.* **43** 53–7
[21]　Ajslev J Z N, Persson R andAndersen L L 2015 *Pain Research and Treatment.* 1–11.