PREVALENCE AND RISK FACTORS ASSOCIATED WITH MUSCULOSKELETAL DISCOMFORT AMONG STREET SWEEPERS IN CHIANG RAI PROVINCE, THAILAND

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ABSTRACT:

Background: High prevalence of work related musculoskeletal discomfort among street sweepers is reported worldwide. Risk factors of musculoskeletal discomfort in street sweepers include repetitive movement, prolonged duration and poor posture. This study aimed to determine the prevalence of musculoskeletal discomfort and to find the risk factors association with musculoskeletal discomfort among street sweepers.

Methods: A cross-sectional study was conducted in Chiang Rai province, Thailand. Four sub-districts in Chiang Rai municipality were selected, including Wiang, Robe Wiang, Rimkok and Sansai. The study used the Standardized Nordic questionnaires with 75 male and female street sweepers who volunteered to participate in the study. They were full-time workers between 18 – 60 years old.

Results: The overall prevalence rates of musculoskeletal discomfort among street sweepers, in the past 12 month and in the past 7 days, were 88% and 85.3%, respectively. The top three prevalence rates of musculoskeletal discomfort in the past 12 months were 86.7% in the wrists/hands, 84% in shoulders and 76% in neck. The top three prevalence rate of musculoskeletal discomfort in the past 7 days were 84% in the wrists/hands, 81.3% in shoulders and 69% in the neck. Musculoskeletal discomfort was positively associated with personal factors including age, cigarette smoking, alcohol drinking and Body Mass Index (BMI). Working factors positively associated with musculoskeletal discomfort included working experience, street sweeping distance, weight and length of broom, and weight of broom and dustpan (p<0.05 in multiple logistic regression).

Conclusions: Street sweepers have high potential for musculoskeletal discomfort, which can be associated with repetitive movements and awkward postures. The relevant authorities should consider providing practical programs to improve health of their employees and reduce musculoskeletal discomfort. These programs might include training courses, stretching exercises and posture adjustment.

Keywords: Prevalence, Risk factors, Musculoskeletal discomfort, Street sweepers, Thailand

INTRODUCTION

Occupational street sweepers exposed to hazards directly and indirectly which can affect their health [1]. The musculoskeletal discomfort correlated positively with work shift [2]. The causes of risk factors related musculoskeletal discomfort among street sweepers are used upper limb frequently sweeping, prolonged duration sweeping, removed garbage of awkward bending back posture, and longed street sweeping distance in daily work. According to Amick [3] approximately one million workers had musculoskeletal discomfort related to repetitive movement and over exertion. Prevalence rate of musculoskeletal discomfort among street sweepers were 65.00% from Mansoura, Egypt [4], 49.20% from Brazil [5]. Moreover, the musculoskeletal discomfort in – Thailand reported

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Table 1 Personal factors (n=75)

Characteristics	Frequency	%
Gender		
Male	15	20.0
Female	60	80.0
Age (years)		
21-30	1	1.3
31-40	17	22.7
41-50	34	45.3
51-60	23	30.7
Mean (SD) 46.08 (7.66), Max = 60 Min=27		
Educational background		
Primary school	60	80.0
Secondary school	15	20.0
Marital status		
Single	18	24.00
Married	53	70.7
Divorced/Separated	4	5.3
Cigarette smoking		
Smoker	12	16.0
Nonsmoker	63	84.0
Alcohol drinking		
Never	67	89.3
Sometime	8	10.7
BMI(kg/m^2)		
<23.00	28	37.3
23.00-24.99	19	25.3
$\geq$ 25	28	37.3
Mean (SD) 24.11(4.67), Max = 33.78 Min=15.60		

that 79% from Hatyai municipal, Songkhla province [6], 79.1% of 7 day and 85.7% of 12 months from Bangkok [7]. High prevalence rate of musculoskeletal discomfort can lead to acute and chronic musculoskeletal disorders in street sweepers. In Thailand, there were only a few conducted prevalence and risk factor associated with musculoskeletal discomfort among street sweepers [6, 7]. Also, in Chiang Rai province was not investigating musculoskeletal discomfort among street sweepers. According to preliminary study of occupational health hazard among street sweepers showed majority of them were ergonomics. Therefore, this study aimed to determine the prevalence rate of musculoskeletal discomfort and to find the factors affecting musculoskeletal discomfort among street sweepers in Chiang Rai province, Thailand. The result will be used to implement management guidelines for controlling and preventing of musculoskeletal discomfort in street sweepers.

METHODOLOGY

Participant and procedure

A cross-sectional study was conducted in Chiang Rai province, Thailand. Four sub-districts including Wiang, Robe Wiang, Rimkok and Sansai were selected into study. There were three key reasons to select Chiang Rai municipality to be the study site: firstly, the municipality is the biggest in size in Chiang Rai province; secondly, there are highest number of street sweepers who receive income from the municipality. Thirdly, there are a high number of sweepers who have musculoskeletal discomfort. All participated 75 street sweepers were full time workers in Chiang Rai municipality. Participants were male and female who are those the age between 18-60 years old. Seventy- five street sweepers volunteered for the study. The study was ethically approved by the Ethics Review Committee for Research Involving Human Research Subjects, Chulalongkorn University, Thailand. The certificate of approval number was COA No. 135/2557.

Research tools

Seventy- five volunteered street sweepers were conducted face to face interview using the questionnaires including demographic characteristics; it divided into two parts: personal factors and working factors, and the Standardized Nordic questionnaires. The personal factor questions included gender, age, educational background, marital status, cigarette smoking, alcohol drinking. Questions included

Table 2 Working factors (n=75)

Characteristics	Frequency	%
Working experience (years)		
1-5	4	5.3
6-10	23	30.7
11-15	22	29.3
16-20	10	13.3
21-25	15	20.0
26-29	0	0.0
≥30	1	1.3
Mean (SD) 13.43 (6.35), Max. = 33 Min. =1		
Take a short break		
No	62	82.7
Yes	13	17.3
Street sweeping distance (kilometers/day)		
<2	54	72.0
≥ 2	21	28.0
Mean (SD) 2.12 (0.66), Max. = 3 Min. =1		
Number of broom changing per month		
<2	57	76.0
≥2	18	24.0
Mean (SD) 1.99 (0.71), Max. = 3 Min. =1		
Length of the broom (centimeters)		
<160	43	57.3
≥160	32	42.7
Mean (SD) 161.84 (11.08), Max. = 200 Min. = 140		
Weight of broom (grams)		
< 800	36	48.0
≥ 800	39	52.0
Mean (SD) 811.33 (148.55), Max. = 1000 Min. = 450		
Weight of broom and dustpan (grams)		
< 1700	38	50.7
≥ 1700	37	49.3
Mean (SD) 1718.67 (211.29), Max. = 2000 Min. = 1100		

working experience, take a short break, street sweeping distance, number of broom changing per month, length of broom, weight of broom, and weight of broom and dustpan. The Standardized Nordic questionnaires was used to assess musculoskeletal discomfort; it is divided into 9 bodies region including neck, shoulders, upper back, elbows, low back, wrists and hands, hip and thighs, knees, and ankles and feet in past 12 months, and past 7 days [8].

Statistics analysis

The data were analyzed using SPSS v.22 (Chulalongkorn University license). The descriptive statistic and inferential statistic were analyzed and interpreted as frequencies and percentage, mean, standard deviation, 95% confidence interval (CI), and odds ratio (OR). Binary logistic regressions were used to explore associations between musculoskeletal discomfort among street sweepers with personal factors and working factor.

RESULTS

Personal factors

The Table 1 showed personal factors of 75 eligible street sweepers. Both participant groups were male and female, percentage of female (80%) was higher than male (20%). Average age group was 46.08 years old (SD=7.66), most of age ranged was between 41-50 years old. Majority of educational background was primary school (80%) and marital status was married (70.7%). Number of nonsmokers (84%) was higher than smoker (16%). Moreover, most of them never drink alcohol (89.3%), with 10.67% of drinking sometimes. Mean average of body mass index among street sweepers was 24.11(SD=4.67) kg/m2, 33.78 kg/m2 of maximum and 15.60 of minimum.

Working factors

Table 2, working experience among street sweepers were ranged from 6-25 years, with mean average of 13.43 (SD=6.35) years. Most of them did
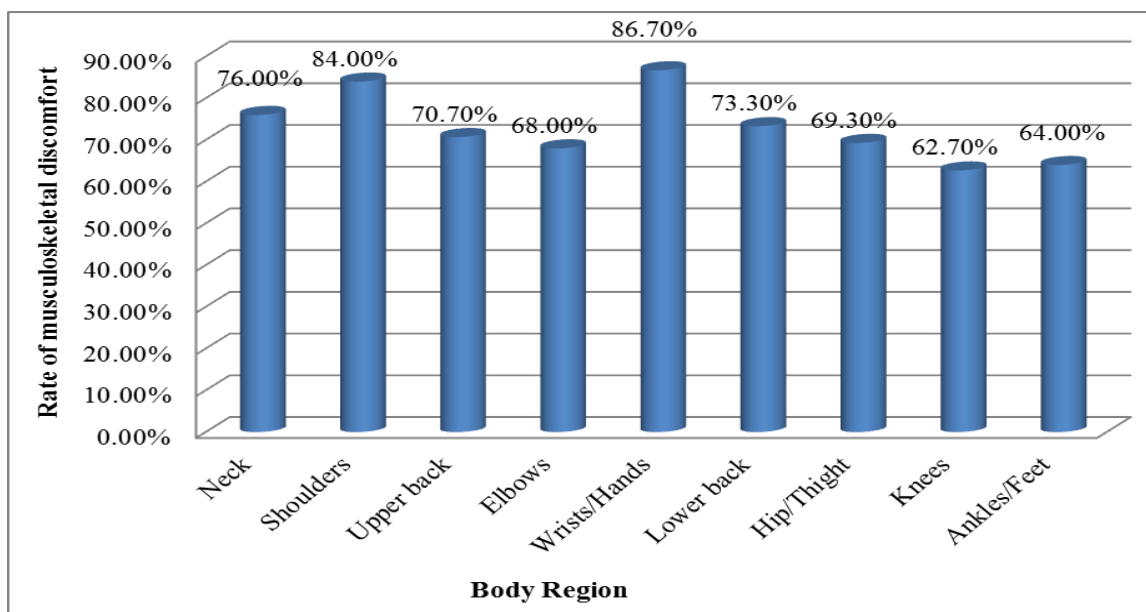
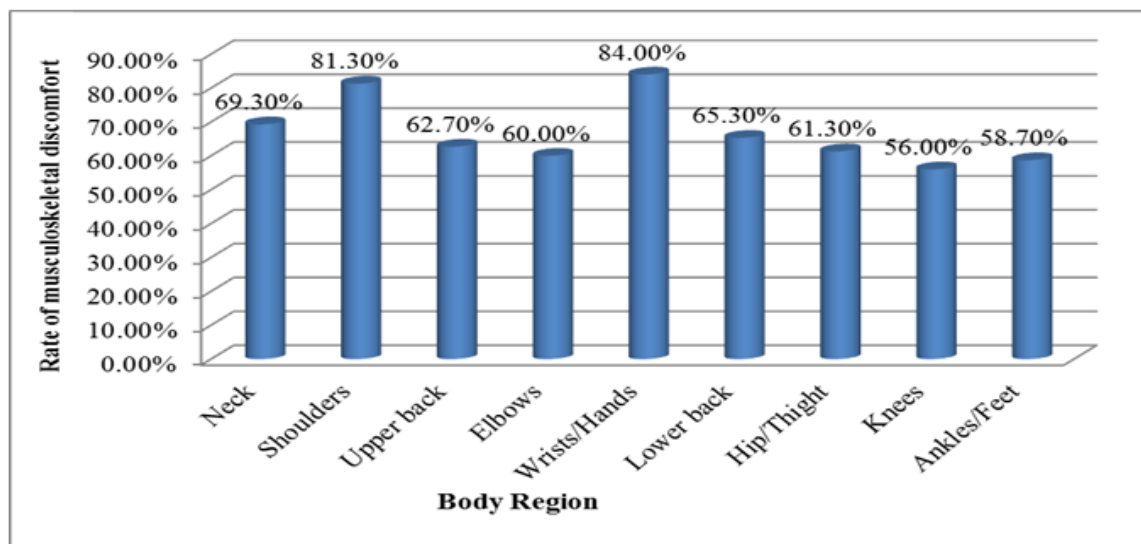**Figure 1** Prevalence rate of musculoskeletal discomfort in the past 12 months among street sweepers

Figure 2 Prevalence rate of musculoskeletal discomfort in the past 7 days among street sweepers

not take a short break (82.7%). Majority of street sweeping distance ranged from 1-3 kilometers per day, with mean average was 2.12 (SD=0.66). The number of broom changing per month was ranged from 1-3 times per month, the mean average was 1.99 (SD=0.71). The mean average length of the broom was 161.84 (SD=11.08) centimeters, ranged from 140 -200 centimeters. Moreover, the mean average of weight of the broom was 811.33 (SD=148.55) grams, ranged from 450- 1000 grams. The mean average weight of broom and dustpan was 1718.67 (SD=211.29) grams, ranged between 1100- 2000 grams.

Prevalence rate of musculoskeletal discomfort

Overall the prevalence rate of musculoskeletal discomfort was 88% of street sweepers in the past 12 month, 85.3% of street sweepers in the past 7 days. The prevalence rate of musculoskeletal discomfort divided into nine regions showed in the Figure 1 and 2. In the Figure 1 showed the top three of the prevalence rate of musculoskeletal discomfort were wrists/hands, shoulders and neck with 86.7%, 84%, and 76% respectively. In Figure 2 showed the top three of the prevalence rate of musculoskeletal discomfort were wrists/hands, shoulders and neck with 84%, 81%, and 69% respectively.

Table 3 The association between personal factors and musculoskeletal discomfort among street sweepers; binary logistic regression

Characteristics	MSD n (%)	OR$_{adj}$	95%CI$_{adj}$	p-value
Gender				
Male	12 (21.8)	1.61	0.37-6.96	0.524
Female	43 (78.2)			
Age (years)				
<40	9 (16.4)	1.11	1.03-1.19	0.006*
≥40	46 (83.6)			
Educational background				
Primary school	43 (78.2)	5.43	0.84-35.26	0.076
Secondary school	12 (21.8)			
Marital status				
Single	43 (78.2)	1.68	0.29-9.60	0.559
married	12 (21.8)			
Cigarette smoking				
Smoker	6 (10.9)	0.14	0.03-0.67	0.014*
Nonsmoker	49 (89.1)			
Alcohol drinking				
Never	52 (94.5)	0.18	0.04-0.83	0.028*
Sometime	3 (5.5)			
BMI (kg/m^2)				
<23.00	16(29.1)	1.18	1.03-1.35	0.013*
≥ 23	39(70.9)			

Note: OR-odds ratio, 95% CI - 95% confidence intervals (CI), Chi-square test ($\chi2$) and binary logistic regression (adj)
*Significant at *p-value* < 0.05

Table 4 The association between working factors and musculoskeletal discomfort among street sweepers; binary logistic regression

Characteristics	MSD n (%)	OR$_{adj}$	95%CI$_{adj}$	p-value
Working experience (years)				
<13	27 (49.1)	1.12	1.10-12.40	0.024*
≥13	28 (50.9)			
Take a short break				
No	46 (83.6)	0.47	0.12-2.02	0.308
Yes	9 (16.4)			
Street sweeping distance (kilometers/day)				
< 2	4 (7.3)	25.91	2.87-23.36	0.004*
≥ 2	51 (92.7)			
Number of broom changing per month				
< 2	42 (76.4)	1.07	0.29-4.00	0.915
≥ 2	13 (23.6)			
Length of the broom (centimeters)				
< 160	27 (49.1)	10.01	1.72-58.37	0.010*
≥ 160	28 (50.9)			
Weight of the broom (grams)				
< 800	22 (40.0)	4.64	1.02-21.08	0.047*
≥ 800	33(60.0)			
Weight of broom and dustpan (grams)				
< 1700	23 (41.8)	2.64	1.073-6.48	0.035*
≥1700	32 (58.2)			

Note. OR-odds ratio, 95% CI - 95% confidence intervals (CI), Chi-square test ($\chi2$) and binary logistics regression (adj)
*Significant at *p-value* < 0.05

The association between personal factors and musculoskeletal discomfort among street sweepers

Binary logistic regression selected control factors were age and BMI, there was a negative association with cigarette smoking, alcohol drinking (p<0.05) in the Table 3

The association between working factors and musculoskeletal discomfort among street sweepers

Binary logistic regression selected control factors were street sweeping distance and length of the broom, there was a positive association with working experience, weight of broom, and total weight of broom and dustpan (p<0.05) in the Table 4.

DISCUSSION

Findings indicated that the prevalence of overall musculoskeletal discomfort were 88% of street sweepers in the past 12 month and 85.3% of street sweepers in the past 7 days, the most occurrence of body region indicated that wrist/hands and shoulders among street sweepers in Chiang Rai province. Theerawanichtrakul and Sithisarankul [6] investigated the prevalence and related factors of musculoskeletal discomfort among road sweepers in Bangkok showed that 85.7% of 12 months and 79.1% of 7 day, most of them body region was shoulders and knees. The musculoskeletal discomfort in body region among street sweepers related to work condition such as used upper limb frequently sweeping and prolonged duration of sweeping. According to Chaffin et al., musculoskeletal disorders are often involved wrist, elbow, shoulder and back in occurring to expose over time such as repetitive movement, awkward postures and forceful exertions [9].

In term of personal factors, the study found that there were significant association between prevalence of musculoskeletal discomfort and age, cigarette smoking, alcohol drinking and BMI. Buckwalter et al. [10] indicated that musculoskeletal impairments associated with middle and old aged. The musculoskeletal discomfort was significantly associated with age but was not significant to alcohol consumption and smoking [11]. The cigarette smoking factor was strongly associated with neck pain and low back pain in the Saskatchewan Population [12]. According to Palmer et al, the higher association was between smoker and musculoskeletal pain in all region of body except age and BMI [13, 14]. Moreover, significant musculoskeletal discomfort related to working factors included working experience, street sweeping distance, length of the broom, weight of broom, and weight of broom and dustpan. Another researcher indicated that significant association between musculoskeletal discomfort and working experience [15, 16]. According to Theerawanichtrakul and Sithisarankul found that there was a positive relation of MSD and street sweeping distance, length of the broom, weight of broom, and weight of broom and dustpan [7]. Musculoskeletal discomfort is a complicated problem which affects health status and contributes to lost work-time among street sweepers. Street sweeping work involves repetitive movements and awkward postures leading to musculoskeletal discomfort. According to Ghasemkhani, Mahmudi, and Jabbari, the hazards of musculoskeletal related to discomfort postures and repetitive movements can be reduced or controlled with engineering, administrative and stretching exercises [14]. The Intervention program was providing to manage and reduce musculoskeletal discomfort in the workplace [17]. The relevant authorities should be concerned on health of these employees and considered providing practical programs for reducing musculoskeletal discomfort such as training course, stretching exercises and posture adjustment.

ACKNOWLEDGEMENTS

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