The prevalence and risk factors of musculoskeletal disorders among subcontracted hospital cleaners in Thailand

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Abstract

Purpose – This research aimed to explore the prevalence of musculoskeletal disorders (MSDs) and related factors among subcontracted cleaners in a teaching hospital in Thailand.

Design/methodology/approach – A cross-sectional study was conducted of 393 subcontracted cleaners in a teaching hospital, from May to June 2020. Face-to-face interviews were carried out using a standard questionnaire, consisting of four parts: (1) participant characteristics, (2) stress test, (3) work characteristics and (4) standardized Nordic questionnaire, Thai version, for MSDs outcome. Multiple logistic regression analyses were performed to determine the association between MSDs and related factors.

Findings – The prevalence of MSDs was 81.9%, involving mostly the lower back (57.7%), followed by the shoulder (52.6%). Factors significantly associated with MSDs were as follows: male gender (OR = 3.06, 95% CI [1.19, 7.87]), severe stress (OR = 2.72, 95% CI [1.13, 6.54]), history of injuries (OR = 4.37, 95% CI [1.27, 15.11]), mopping posture (OR = 2.81, 95% CI [1.43, 5.50]) and task duration (OR = 1.90, 95% CI [1.01, 3.57] for 2–4 h and OR = 3.39, 95% CI [1.17, 9.86] for more than 4 h). Sick leave due to MSDs was associated with history of injuries, Thai nationality and having another part-time job.

Originality/value – The study findings about MSDs in terms of prevalence and related factors contributed to limited pool of the knowledge among subcontracted hospital cleaners in Thailand and middle-income country settings. With growing popularity in outsourcing cleaning services among hospitals in these countries, the study findings could raise a concern and inform policymakers and hospital administrators the importance of the magnitude and risk factors for MSDs necessitating design of preventive strategies.

Keywords Occupational health, Subcontracted cleaners, Musculoskeletal disorders, Hospital setting

Paper type Research paper

Introduction

Previous international studies have shown that cleaning workers have a high risk of developing musculoskeletal problems [1–3]. Thirty to forty percent of work-related diseases in cleaning staff were musculoskeletal disorders (MSDs) [1]. The prevalence of MSDs among cleaning workers is high, ranging from 68.3% to 89.9% [2, 4–6]. Current evidence states that the risk factors are as follows: individual factors, such as age, gender and stress [2–4, 7]; and work-related factors, such as bending forward incorrectly and lifting heavy pieces of work equipment [5, 8, 9]. Cleaners often have to work with poor ergonomic characteristics of cleaning equipment and the work environment. Among sectors with high absence rates, the cleaning sector was ranked fourth [1].

Cleaning works in hospital settings are different from office buildings in many ways. First, hospitals need a high cleaning frequency to comply with the regulations in force to ensure hygienic conditions and avoid the presence of infectious microorganisms that put patients' and workers' health at risk [10, 11]. Second, hospitals operate on a 24-h basis, and each hospital needs to prepare cleaners for working over a 24-h period, both during the day and at night. Finally, hospitals can be stressful and crowded environments, with many patients moving to various places. Nurses, doctors and healthcare teams rush to undertake their duties. Therefore, hospital cleaners are in more challenging situations than other cleaning workers, which leads to a higher prevalence of MSDs. For example, in a study from Las Vegas, USA, the prevalence of MSDs among hotel cleaners was 78% [6], while among hospital cleaners, it was 82% [11].

Subcontracting for cleaning work is becoming common in Thai hospitals [12]. The pressure of cutting costs is shifted on to the cleaning companies that are faced with the hospital's high expectations regarding work quality, working hours and costs [1]. Subcontracting can influence the occupational health, safety and well-being of the workforce in many ways, for example, economic pressure, disorganization, inadequate regulatory controls and the ability of workers to organize themselves [13]. Although both hospitals and cleaning companies are obliged to ensure the health and safety of subcontracted workers under some international laws, such as those in EU countries [14], Thai laws state that only the cleaning companies are responsible [15]. However, the law is not effectively enforced in many industries, partly due to lack of mechanisms to inspect and ensure compliance [13]. Studies on subcontracted cleaners in Taiwan and Thailand showed that MSDs were very common, 89.9% and 88%, respectively [2, 16]. However, evidence about the prevalence and risk factors of MSDs among hospital subcontracted cleaners in middle-income countries such as Thailand is very limited. Therefore, assessing MSDs and risk factors to better understand the extent of the physical burden that hospital cleaners endure is essential to raising concerns and informing policymakers and hospital administrators in those countries.

A 1,300-bed teaching hospital with more than 20 buildings built on an area of 79,000 square meters in Bangkok was selected for this study. The hospital hires a large number of subcontracted cleaning workers. The hospital's Department of Occupational Health, Safety and Environment and the subcontracted company had a plan to explore the problem of MSDs and risk factors. This study aimed to determine the prevalence of MSDs and associated risk factors among subcontract cleaners.

Methods

Study design and participants

This cross-sectional study was conducted of 393 subcontracted cleaners in a teaching hospital, from May to June 2020. Cleaners who had worked at least 12 months and could communicate in Thai were included in this study. The exclusion criteria were as follows: (1) cleaners who did not perform routine cleaning tasks, for example, the heads or supervisors, (2) those who were absent during data collection and (3) cleaners who declined to participate.

The sample size was calculated using the formula for estimating a population prevalence [17] with the expected nonresponse rate of 14%; the calculated sample size was 382. Thus, all cleaners were invited and given informed consent.

Data collection
The overall data about cleaners' work were collected from an interview with the company manager, along with a review of the Terms of Reference (TOR). Moreover, direct job observation was undertaken to categorize cleaners into different work groups.

The individual data were collected from face-to-face interviews conducted by two well-trained occupational health personnel using a standard questionnaire. It consisted of four parts: (1) the participant characteristics, (2) the stress test questionnaire (ST-5), (3) the work characteristics questionnaire, and (4) the standardized Nordic questionnaire. First, the participant characteristics included the following: age, gender, nationality, education, income, weight, height, smoking status, underlying disease and a history of injuries in the past year. Second, the ST-5 asked about five symptoms of stress over the past two to four weeks [18]: sleep problems, decreased concentration, irritability, boredom and social isolation. The symptoms were rated on a four-point Likert scale (zero to three). The cutoff scores divided respondents into mild stress (zero to four), moderate stress (five to six) and severe stress (seven or more). Third, work characteristics included two subparts: 1) overall work information, including work subgroup, shift, working duration, second part-time job and mopping posture; and 2) the Quick Exposure Check (QEC) tool, Thai version [19], only relevant items (A–H, J–L, N and P). The QEC assesses biomechanical hazard exposure during performing the tasks. The items included the following: back position and movement, hand and wrist position, shoulder/arm/hand movement and frequency, maximum weight handled manually, maximum force exerted by one hand, vibrating tools use, head/neck bending or twisting, task duration, visual demand and difficulty keeping up with the tasks. Finally, the standardized Nordic questionnaire, Thai version [20], was used to measure the MSDs outcome variables. The questionnaire asked about the pain or discomfort felt at any of the nine body regions (neck, shoulder, upper back, elbow, lower back, wrist/hand, hips/thighs, knee and ankle/feet) during the last seven days and the last 12 months. It also asked about sick leave due to those symptoms.

Statistical analysis
Descriptive statistics were frequencies with percentages for categorical variables and means with standard deviations (SD) and median with interquartile range (IQR) for continuous variables.

The 12-month MSD prevalence and sick leave due to MSDs were used to determine the association with the risk factors, because they could better represent the accumulative MSDs. The association between 12-month MSDs and the risk factors was evaluated at a significance level of 0.05. The Chi-squared tests and Fisher's exact tests were performed to identify potential risk factors. Age, gender, as well as other risk factor variables with p value < 0.05 were selected for the multiple logistic regression analysis. All included variables were tested for multicollinearity by the variance inflation factor (VIF), with the cutoff point at 10. None had VIF value of more than 10. The final adjusted model was derived using backward stepwise strategy. The adjusted odds ratio and 95% confidence interval were reported. All data analyses were done using IBM SPSS software (Version 16).

Ethical issue
The study protocol was approved by the Ethics Review Committee for Research Involving Human Research Subjects, with the certified code COA. MURA2020/669 Ref.440.

Results

Overall cleaners' work data

All cleaners worked 12 h per shift for six days a week. The day shift started from 7:00 to 19:00 or 6:00 to 18:00. The night shift started from 19:00 to 7:00. They usually worked in the same shift every day; however, if many workers were absent at the same time, some had to substitute in the other shift. The overtime work was 3 h extended from the usual work hours. The break time was not defined. Workers were provided with adequate general and special cleaning equipment, for example, adjustable mops, vacuum cleaners, carts and polishing machines.

From job observation, cleaners' work was categorized into five subgroups: in-patient department (IPD), out-patient department (OPD), cleaning at height, office/dormitory and garbage disposal/logistics. The majority of cleaners conducted dusting, sweeping/mopping floors, polishing floors, cleaning chairs and cleaning toilets. Nevertheless, there were some major differences: (1) the IPD subgroup cleaned patients' beds, lifted bags of used clothes/sheets/blankets and washed sanitary wares; (2) the cleaning at height subgroup cleaned the ceilings, louvers, curtains, air conditioners and windows; and (3) the garbage disposal/logistics subgroup lifted waste bags into garbage carts and dumped the bags into the garbage disposal area, three rounds a day. The logistics team also had the responsibility to move furniture or objects when needed.

Participant characteristics

A total of 331 subcontracted cleaners participated in the study. The majority were female, 272 (82.2%), and Thai natives, 223 (67.4%). The median age was 39 (IQR = 28–49). The mean BMI was 23.9 (SD = 4.1) kg/m^2. Most, (286, 86.4%), had no history of injuries last year. Almost half of the subcontracted cleaners reported moderate to severe stress (42.9%). (Table 1).

Work characteristics

One-fifth of the cleaners (22.1%) worked in the night shift (Table 2). Almost all (95.8%) of the participants had no other part-time jobs. Approximately, one-third worked in the IPD (33.8%) and another almost one-third in the office and dormitory group (31.4%). Regarding working posture of forward bending during mopping, the degree of bending included almost neutral (30.2%), moderate (49.2%) and excessive (20.6%). The detailed floor mopping workflow is shown in Figure 1. Most of the cleaners (93.6%) reported moderate to excessive flexed or twisted or side bent back positions during working. The majority (66.3%) had to spend time continuously on task for 2 h or more each day.

The prevalence of MSDs

The prevalence of MSDs observed was higher in the last 12-month period than in the last seven-day period, 81.9% and 73.7%, respectively. This was true for all regions of the body. For both time periods, MSDs of the lower back were the most reported, followed by the shoulder and the wrist/hand. One-fifth of the participants had sick leave due to MSDs last year (Table 3).

The association between risk factors and MSDs

The multiple binary logistic regression analyses showed that risk factors related to 12-month MSDs were as follows: male gender, history of injuries, stress, mopping posture and task duration. Males were more likely to develop 12-month MSDs than females (OR = 3.06, 95% CI [1.19, 7.87]). The participants who reported having history of injuries last year and severe stress were more likely to develop MSDs, OR = 4.37, 95% CI [1.27, 15.11] and OR = 2.72,

Participant characteristics	Total (n = 331) n (%)	MSDs[1] (n = 271) n (%)	p value	Sick leave (n = 71), n (%)	p value
Age (year)			0.72		<0.01*
Median 39 (IQR = 28–49), Min = 20, Max = 63					
20–39	167 (50.5)	138 (50.9)		25 (35.2)	
40–63	164 (49.5)	133 (49.1)		46 (64.8)	
Gender			0.80		0.82
Female	272 (82.2)	218 (80.4)		59 (83.1)	
Male	59 (17.8)	6 (19.6)		12 (16.9)	
Nationality			0.86		<0.01*
Thai	223 (67.4)	182 (67.2)		58 (81.7)	
Laos	108 (32.6)	89 (32.8)		13 (18.3)	
Education			0.59		0.83
Never	42 (12.7)	36 (13.3)		7 (9.9)	
Primary	158 (47.7)	132 (48.7)		36 (50.7)	
Secondary	79 (23.9)	61 (22.5)		16 (22.5)	
High school or higher	52 (15.7)	42 (15.5)		12 (16.9)	
Income (Thai baht)			0.93		0.91
<10,000	20 (6.0)	17 (6.3)		4 (5.6)	
10,000–15,000	279 (84.3)	228 (84.1)		61 (85.9)	
>15,000	32 (9.7)	26 (9.6)		6 (8.5)	
BMI (kg/m^2)			0.71		0.27
Mean ± SD = 23.9 ± 4.1, min = 14.5, max = 37.5					
<18.50	25 (7.6)	21 (7.7)		3 (4.2)	
18.50–22.99	126 (38.1)	101 (37.3)		23 (32.4)	
23.00–24.99	71 (21.5)	60 (22.1)		19 (26.8)	
25.00–29.99	81 (24.5)	64 (23.6)		17 (23.9)	
≥30	28 (8.5)	25 (9.2)		9 (12.7)	
Smoking status			0.68		0.65
Nonsmoker	281 (84.9)	230 (84.9)		61 (85.9)	
Former smoker	16 (4.8)	12 (4.4)		2 (2.8)	
Current smoker	34 (10.3)	29 (10.7)		8 (11.3)	
Underlying disease			0.43		<0.01*
No	246 (74.3)	199 (73.4)		42 (59.2)	
Yes	85 (25.7)	72 (26.6)		29 (40.8)	
History of injuries last year			0.03*		<0.01*
No	286 (86.4)	229 (84.5)		53 (74.6)	
Yes	45 (13.6)	42 (15.5)		18 (25.4)	
Stress			0.02*		0.07
Mild	189 (57.1)	145 (53.5)		32 (45.1)	
Moderate	72 (21.8)	63 (23.2)		19 (26.8)	
Severe	70 (21.1)	63 (23.2)		20 (28.2)	

Note(s): [1]MSDs in 12 months, *p value < 0.05

Table 1.
The participant characteristics

95% CI [1.13, 6.54] respectively. Moderate forward bending of the back during mopping increased the risk of MSDs (OR = 2.81, 95% CI [1.43, 5.50]). Moreover, performing tasks continuously for 2 h or more was another risk factor for MSDs: OR = 1.90, 95% CI [1.01, 3.57] for 2–4 h, and OR = 3.39, 95% CI [1.17, 9.86] for more than 4 h (Table 4).

Similar to 12-month MSDs, sick leave was significantly associated with a history of injuries (OR = 2.27, 95% CI [1.12, 4.67]), Thai nationality (OR = 2.03, 95% CI [1.04, 3.98]) and having another part-time job (OR = 4.31, 95% CI [1.37, 13.57]) (Table 5).

| Work characteristics	Total (n = 331) n (%)	MSDs[1] (n = 271) n (%)	p value	Sick leave (n = 71) n (%)	p value
Work shift – Night shift	73 (22.1)	62 (22.9)	0.44	12 (16.9)	0.24
Part-time jobs – Yes	14 (4.2)	13 (4.8)	0.28	8 (11.3)	<0.01*
Work subgroups			0.05		0.17
IPD	112 (33.8)	97 (35.8)		21 (29.6)	
OPD	48 (14.5)	35 (12.9)		8 (11.3)	
Cleaning at height	44 (13.3)	39 (14.4)		6 (8.5)	
Office/dormitory	104 (31.4)	79 (29.2)		30 (42.3)	
Garbage disposal/logistics	23 (6.9)	21 (7.7)		6 (8.5)	
Mopping posture (forward bend)			0.02*		0.78
Almost neutral	100 (30.2)	73 (26.9)		19 (26.8)	
Moderate	163 (49.2)	141 (52.0)		37 (52.1)	
Excessive	68 (20.6)	57 (21.0)		15 (21.1)	
Back position (flex/twist/side bend) – excessive	100 (30.2)	82 (30.3)	0.89	19 (26.8)	0.77
Back movement (flex/twist/side bend)–very frequent	38 (11.5)	31 (11.4)	0.98	9 (12.7)	0.85
Hand position – at or above shoulder height	31 (9.4)	27 (10.0)	0.60	5 (8.5)	0.49
Hand movement (times per minute) – >20	34 (10.3)	29 (10.7)	0.70	9 (12.7)	0.58
Shoulder/arm movement – very frequent	38 (11.4)	29 (10.7)	0.49	3 (4.2)	0.05
Maximum weight handled manually –heavy (≥11 kg)	77 (23.3)	59 (21.8)	0.11	20 (28.2)	0.21
Maximum force exerted by one hand – high (>4 kg)	51 (15.4)	41 (15.1)	0.95	13 (18.3)	0.73
Vibrating tools use (hours per day) – >4	11 (3.3)	11 (4.1)	0.27	3 (4.2)	0.44
Head/neck bent or twisted – continuously	50 (15.1)	42 (15.5)	0.67	8 (11.3)	0.31
Task duration			0.02*		0.19
<2 h	105 (31.7)	77 (28.4)		19 (26.8)	
2–4 h	179 (54.1)	152 (56.1)		45 (63.4)	
>4 h	47 (14.2)	42 (15.5)		7 (9.9)	
Visual demand – high	224 (67.7)	185 (68.3)	0.63	52 (73.2)	0.26
Difficulty keeping up with tasks – often	16 (4.8)	15 (5.5)	0.36	5 (7.0)	0.05

Note(s): [1]MSDs in 12 months, *p value < 0.05

Table 2.
The work
characteristics

Discussion

The prevalence of seven-day and 12-month MSDs among subcontracted hospital cleaners
was very high, 73.9% and 81.9%, respectively. This is similar to the findings from a study in
the USA (82.0%) [11], but much higher than the one in Bangalore, India (68.3%) [4]. The
Indian study excluded workers with a past history of trauma or accidents; therefore, resulting
in lower prevalence. Another study from Chennai, India [21], showed MSDs prevalence of
50.7% in other types of healthcare workers, for example, physicians, nurses, dentists, much
lower than this study. Generally, cleaning work is more physically demanding than other
professionals in hospitals.

MSDs of the lower back were the most frequently reported in a 12-month period, followed
by the shoulder, 57.7% and 52.6%, respectively. This finding is also similar to other studies
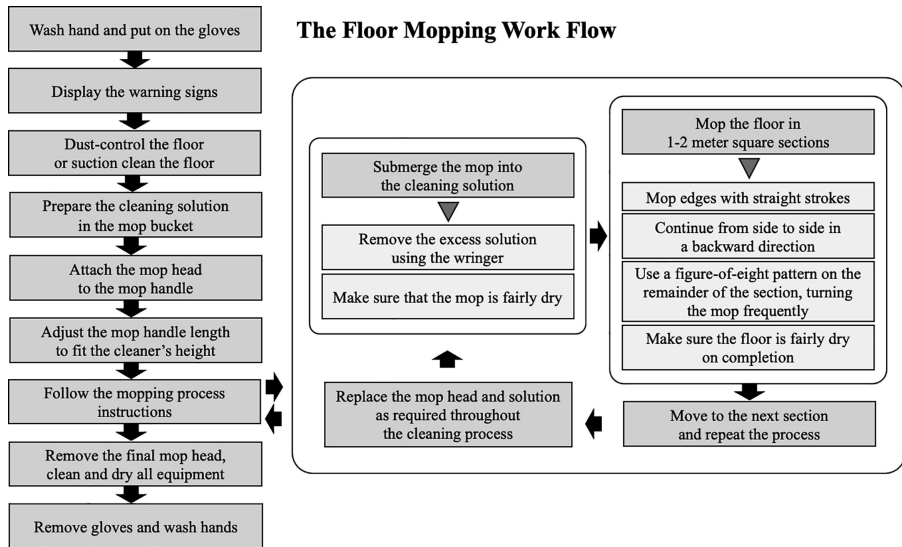
The Floor Mopping Work Flow

	7-day prevalence ($n = 331$) n (%)	12-month prevalence ($n = 331$) n (%)	Sick leave ($n = 331$) n (%)
Overall	244 (73.7)	271 (81.9)	71 (21.5)
Neck	102 (30.8)	143 (43.2)	16 (4.8)
Shoulder	141 (42.6)	174 (52.6)	10 (3.0)
Upper back	80 (24.2)	135 (40.8)	11 (3.3)
Elbow	58 (17.5)	82 (24.8)	4 (1.2)
Lower back	147 (44.4)	191 (57.7)	20 (6.0)
Wrist/Hand	113 (34.1)	162 (48.9)	11 (3.3)
Hip/Thigh	75 (22.7)	111 (33.5)	11 (3.3)
Knee	99 (29.9)	123 (37.2)	21 (6.3)
Calf/ Foot	90 (27.2)	126 (38.1)	21 (6.3)

[11, 19]. Major cleaning tasks heavily involve the lower back and shoulders, for example, mopping and wiping [1, 9]. Mopping tasks require a bending forward posture, which can put a strain on the back muscles, especially if the length of the mops cannot be adjusted, while wiping requires repetitive and strenuous shoulder and arm movement.

Our study shows that individual factors associated with 12-month MSDs were male, with severe stress and a history of injuries within the last year. However, no significant association between age and MSDs was detected. This is different from a study by Joseph *et al.* [4], which found that cleaners, aged 45 years or older, were more likely to have MSDs than younger cleaners. The median age of our study participants was 39 years old; as a result, smaller numbers of older cleaners could reduce the statistical power. Regarding gender, the result shows the opposite of a previous study by Wami *et al.*, which found that female cleaners had a higher risk of developing MSDs than male cleaners [3]. A possible explanation could be the difference in work organization between female and male cleaners. Some studies reported

Risk factors	Adjusted OR	95% CI	p value
Gender			
Female	1		
Male	3.06	1.19–7.87	0.02*
History of injuries last year			
No	1		
Yes	4.37	1.27–15.11	0.02*
Stress			
Mild	1		
Moderate	2.26	0.98–5.05	0.06
Severe	2.72	1.13–6.54	0.03*
Mopping posture (forward bend)			
Almost neutral	1		
Moderate	2.81	1.43–5.50	<0.01*
Excessive	2.06	0.89–4.75	0.09
Task duration			
<2 h	1		
2–4 h	1.90	1.01–3.57	0.05
>4 h	3.39	1.17–9.86	0.03*
Note(s): *p value < 0.05			

Table 4.
Adjusted odds ratios
for factors associated
with 12-month MSDs
(adjusted by age)

Risk factors	Adjusted OR	95% CI	p value
Nationality			
Laos	1		
Thai	2.03	1.04–3.98	0.04*
Underlying disease			
No	1		
Yes	0.56	0.31–1.03	0.06
History of injuries last year			
No	1		
Yes	2.27	1.12–4.67	0.02*
Part-time jobs			
No	1		
Yes	4.31	1.37–13.57	0.01*
Note(s): *p value < 0.05			

Table 5.
Adjusted odds ratios
for factors associated
with sick leave due to
MSDs (adjusted by age
and underlying
disease)

that females often perform "light" tasks, such as cleaning toilets and dusting, while males often perform "heavy" tasks, such as mopping or heavy lifting [22, 23]. Furthermore, subcontracted cleaners who had severe stress were more likely to suffer from MSDs, compared to those with mild stress. The association between stress and MSDs is consistent with studies conducted among cleaners in other countries [2, 7]. Chronic stress can increase muscle tone, thus increasing the biomechanical loads imposed on the muscles and tendons. Stress is associated with a decrease in the microcirculation that contributes to muscle fatigue; therefore, it promotes the occurrence of myalgia and delays healing [24]. Finally, history of injuries within the last year is associated with MSDs, which is consistent with a previous

report [25]. An acute trauma may cause degenerative problems, even after a long asymptomatic period, such as severe knee injury, and can induce the development of osteoarthritis [26].

Our finding that 12-month MSDs associated with mopping posture and task duration are congruent with previous studies reporting forward bending posture as a risk of MSDs [27]. The floor mopping workflow demonstrated a highly repetitive and physically demanding process. The adjustment of the mop handle was needed to avoid a forward bending posture. In addition, task duration of 2 h or more increases the risk of MSDs. This finding is similar to a study in tertiary care hospital cleaners in India [4]. Frequent breaks during the working day can promote healing and recovery; therefore, reducing the incidence of MSDs [3].

The factors significantly associated with sick leave are as follows: nationality, history of injuries within the last year and having second part-time job. An explanation for the history of injuries is similar to 12-month MSDs, because severe injuries that cause chronic and severe diseases could lead to a higher number of sick leave [26]. Regarding nationality, Thai cleaners were more likely to take sick leave. This result is similar to Soler-GonZalez et al. in Spain, which found that sick leave was more frequent among native workers than immigrants [28]. Immigrants might have difficulties in changing jobs; therefore, they have to go to work despite feeling sick to avoid losing their jobs [29]. In addition, having part-time jobs has a significant association with sick leave. Performing part-time jobs tends to require a higher physical workload and longer working hours. Thus, reduced healing and recovery time could increase the severity of MSDs and lead to sick leave.

This is the first study of the prevalence and related factors of MSDs among subcontracted cleaners in a Thai hospital. All eligible subjects were included in this study; therefore, selection bias could be avoided. The results provide an understanding of the burden and the risk factors of MSDs among subcontracted cleaners in a hospital setting. Nevertheless, the cross-sectional study design could not determine the causal relationship, and the recall bias could occur. Also, the study data were collected from only one hospital; therefore, generalizability is limited to similar contexts.

There are some recommendations that could help in reducing the risk of MSDs among cleaners. Return-to-work assessments could determine work limitations and prevent further injuries. In addition, cleaners' training about the proper use of equipment could be beneficial, for example, adjusting the mop length to fit their height. Moreover, break times should be clearly defined for each department. Finally, a further study about the causes of stress is recommended.

Conclusion

Based on the study, the prevalence of MSDs among subcontracted cleaners in the hospital was high. MSDs of the lower back were the most prevalent, followed by the shoulder. MSDs were strongly associated with male gender, severe stress, history of injuries, mopping posture and task duration. To enhance productivity and minimize the health burden, policymakers and hospital administrators should find the present study useful in designing preventive measures.

Conflicts of Interest: None

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