Original Article

Risk Factors of Musculoskeletal Disorders: Situational Analysis among Perioperative Nursing Staff

Songkham W, RN, PhD[1], Tangsathajaroenporn W, RN, MNS[2], Wisetborisut A, MD, MSc[3]

[1] Faculty of Nursing, Chiang Mai University, Chiang Mai, Thailand
[2] Maharaj Nakorn Chiang Mai Hospital, Chiang Mai, Thailand
[3] Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

Objective: Perioperative nursing staff is a high-risk group for musculoskeletal disorders (MSDs), so the risk factors should be explored.

Materials and Methods: A cross-sectional study was carried out between June and August 2015. The purposive sample comprised 186 perioperative nursing personnel working at a university hospital in Chiang Mai, Thailand. A self-reported questionnaire was used to measure physical and psychological workload, personal factors, and the occurrence of MSDs.

Results: The findings showed the rate of MSDs among perioperative nursing staff in at least one body part during the 12-month period was 83.9 percent and that during the 7-day period was 71.8 percent. The most common MSDs were lower back (60.6%), shoulder (60.0%), and knee (52.8%). There was a significant association between MSDs and physical workload (OR = 2.6, CI = 1.1 to 5.9), and psychosocial workload-i.e., demand of hiding emotions (OR = 3.9, CI = 1.2 to 9.7) and emotional demand (OR = 2.6, CI = 1.1 to 6.0).

Conclusions: There was a high reported occurrence of MSDs among perioperative nursing personnel, which seem to be associated with their high volume physical and psychosocial workload.

Keywords: Risk factors, Musculoskeletal disorders, Perioperative nursing staff

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Musculoskeletal disorders (MSDs) represent one of the most frequent problems among nursing personnel[1,2], which directly affects on their quality of life and quality of nursing care[3,4]. Perioperative nursing staff in the healthcare setting are exposed to numerous physical factors associated with increased risk of developing a MSD (e.g., lifting patients, handling heavy surgical instruments, prolonged standing, and repetitive movements)[5]. In addition, perioperative nursing staff may also suffer from work-related stress caused by on-call work, and other psychosocial, and organizational factors[6,7]. This situation may contribute to high rates of MSDs.

A review of the relevant literature revealed an association between MSDs and work-related factors including physical and psychosocial workloads that might cause musculoskeletal pain, leading to nurses leaving the profession[8,9]. As most studies have concentrated on general nurses, little is known about the occupational risk factors of MSDs and their occurrence among perioperative nursing staff at university hospitals providing treatment and surgery for complex diseases (i.e., tertiary or supra-tertiary hospitals). Being an educational institution for learning and research in medical sciences also results in this kind of hospital having a relatively greater workload (i.e., compared to primary or secondary hospitals).

The current study was, thus, conducted among perioperative nursing staff at a university hospital in Thailand. The objectives were to determine the occurrence rate of musculoskeletal disorders among perioperative nursing staff and to investigate the occupational risk factors associated with MSDs in the study population. The findings of the study could serve as a database for planning and implementing intervention programs for improving musculoskeletal health among nursing staff.

Materials and Methods

This was a cross-sectional research study. Data were collected between June and August 2015. The study population comprised 250 perioperative nursing personnel-including registered nurses, practical nurses, and nurse aides-employed in the operating departments of Maharaj Nakorn Chiang Mai Hospital, Thailand. The sample size of the study was determined according to Krejcie and Morgan's formula[10]. The alpha error was set at 0.05. The total sample size should not less than 152 subjects. The inclusion criteria were (a)

Correspondence to:
Songkham W.
Faculty of Nursing, Chiang Mai University, Chiang Mai 50300, Thailand.
Phone: +66-53-949033
E-mail: wsongkhu@hotmail.com

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over 18 years and (b) employed full-time in perioperative work for at least 1 year. Two hundred fifty questionnaires were distributed to workers in the targeted setting. Completed questionnaires were returned by 195 perioperative nursing staff (participation rate: 78%). We, however, excluded nine perioperative nurses because they had been employed in their current job for less than one year. The analysis was thus based on 186 subjects.

The study protocol was approved by the Institutional Review Board, Faculty of Medicine, Chiang Mai University (ref: No. FAC-MED-2558-03306), and written informed consent was obtained from all participants. The subjects completed a self-administered questionnaire, which covered 4 aspects, including: (a) demographic characteristics (i.e., sex, age, professional category, exercise, alcohol drinking, smoking, working experience, working hour per week, and number of patient transfer per day); (b) physical workload; (c) psychosocial workload; and, (d) musculoskeletal disorders.

The questionnaire for the perceived physical workload assessment was developed by the researcher based on a literature review, and followed the work tasks of perioperative nursing staff. The 18-item questionnaire, the rating scale with four response categories ranging from "very often" to "never", included questions about awkward posture, forceful exertion, repetitive work, and prolonged sitting/standing. The sum score from individual questions was grouped by mean score into two categories (high vs. low physical workload). A panel of 5 experts confirmed the questionnaire's content validity; it had a content validity index of 1. The reliability was tested and found to be acceptable. The Cronbach's alpha coefficient was 0.80.

The perceived psychosocial workload was measured by the psychosocial work environment questionnaire by Songkham et al[11] which was developed based on the Copenhagen Psychosocial Questionnaire (COPSOQ), and had good reliability and validity. The 57-item questionnaire covers three main scales of the psychosocial workload: 1) demand at work, 2) work organization, and 3) interpersonal relations at work. Demand at work has 4 sub-scales including quantitative demands, cognitive demands, emotional demands, and demands for hiding emotions. Work organization comprises 4 sub-scales including influence at work, possibilities for development, meaning of work, and commitment to the workplace. Meanwhile the interpersonal relations at work comprises 7 sub-scales including rewards, role clarity, role conflicts, quality of leadership, social support from supervisor, social support from colleagues, and social community at work. The scale was built on 1 to 5 items (questions). All items had 5 response categories. For all questions, the answer was transformed into a number between 0 and 100 (i.e., 0, 25, 50, 75, and 100) for the five response steps, and an overall scale score was computed as the mean score across questions contained in each of the 15 sub-scales. The respective direction of the scores followed the label of the scale (e.g., a high score on the emotional demand scale indicated high emotional demands, and a high score on the social support from supervisor scale indicated high social support from a supervisor. The perceived psychological workload of each scale was then grouped by mean score into two categories (high vs. low).

The questionnaire-modified from the Standardized Nordic Questionnaire[12]-was used to assess the perceived musculoskeletal disorders. This questionnaire requires the sample to identify 9 areas of the body causing musculoskeletal problems. Respondents were asked if they have had any musculoskeletal trouble (i.e., ache, pain, discomfort, or numbness) in at least one body part during a specified 7-day and a 12-month period.

Statistical analyses were performed using SPSS (version 11.5). The respective demographic characteristics of the study sample were obtained using the mean and standard deviation for continuous variables and the frequency and percentage for categorical variables. The Chi-square test was used to assess univariate associations between perceived occupational risk factors and reported MSDs.

Results

Most of the sample was female (81.2%). The mean age was 43.2 years (SD = 10.55), and 46.8% were over 45. Approximately half of the sample were registered nurses (51.1%). The sample reported work experience of between 1 and 40 years (mean = 19.22, SD = 10.33). Working hours ranged between 40 and 96 hours per week (mean = 50.9, SD = 11.6), and only 9.2 percent of the sample reported the task patient transfer over 10 per day. A minority exercised regularly (17.3%), and only 1.1% smoked, while nearly one-third drank alcohol (38.2%). Testing the association between all dichotomous variables and MSDs revealed that only no exercise or not regular exercise were significantly associated with reported musculoskeletal disorders (Table 1).

Table 2 shows a frequency of 71.8% of reported MSDs among perioperative nursing staff in at least 1 body part during a 7-day period vs. 83.9% during the 12-month period. The most commonly affected body parts during the 7-day period were shoulders (47.8%), lower back (44.4%), knees (38.2%), and neck (35.4%). While the most commonly affected body parts during the 12-month period were lower back (60.6%), shoulders (60.0%), knees (52.8%), and neck (49.4%).

Occupational risk factors with an influence on the occurrence of MSDs during the 12 months prior to study among the peri-operative nursing staff are presented in Table 3. The mean score of perceived physical workload was 46.9 (SD = 11.3), a score <46.9 was considered as a low physical workload and a score ≥46.9 as a high physical workload. Perioperative nursing staff that perceived they had a high physical workload were found at higher risk of MSDs than those with a perceived low physical workload (OR = 2.6, 95% CI = 1.1 to 5.9). Analysis of the psychosocial workload indicated that perioperative nursing staff who perceived they a high demand at work (i.e., emotional demand and demand for hiding emotion) were more likely to have MSDs than

Table 1. Characteristics of the study sample (n = 186)

Demographic data	Number	%
Sex		
Female	151	81.2
Male	35	18.8
Age (years); range = 23 to 61, $\bar{x}$ (SD) = 43.15 (10.55)		
≤25	20	10.8
26 to 45	79	42.4
>45	87	46.8
Professional category		
Nurse aide	48	25.8
Practical nurse	43	23.1
Registered nurse	95	51.1
Work experience (y); range = 1 to 40, $\bar{x}$ (SD) = 19.22 (10.73)		
≤5	28	15.7
6 to 10	13	7.3
11 to 20	51	28.7
>20	86	48.3
Working hours per week; Range = 40 to 96, $\bar{x}$ (SD) = 50.86 (11.55)		
≤40	67	36.2
>40	118	63.8
Number of patients transfers per day		
≤10	168	90.8
>10	17	9.2
Exercise[a]		
None/not regularly	153	82.7
Yes	32	17.3
Alcohol consumption		
No	115	61.8
Yes	71	38.2
Smoking habit		
No	184	98.9
Yes	2	1.1

[a] significantly associated with MSDs (p<0.05)

Table 2. Frequency of reported MSDs in different body parts during the 7-day and 12-month period (n = 186)

Body part	MSDs	
	7-day (%)	12-months (%)
Overall	71.1	83.9
Neck	35.4	49.4
Shoulders	47.8	60.0
Elbow	28.1	40.0
Wrists/hands	14.0	21.7
Upper back	27.5	42.2
Lower back	44.4	60.6
Hips/thighs	29.8	39.4
Knees	38.2	52.8
Ankles/feet	32.8	46.7

those who did not (OR >2).

Discussion

The results showed that perceived musculoskeletal disorders were common among perioperative nursing staff. Most of the sample had experienced some form of MSD during the last 12 months (83.9%). This result demonstrates that the occurrence MSDs is as high as was found in other studies among perioperative nursing staff or nurses who work in an operating room (OR)[9,13,14]. In the current study, the high occurrence of MSDs may be explained by the characteristics of the sample-including mostly female (81.2%), over 45 years of age (46.8%), working for more than 20 years (48.3%), and not exercising regularly (82.7%). We found that only no exercise or not regular exercise were significantly associated with reported musculoskeletal disorders. The results agree with a systematic review on the effects of regular and targeted exercise conducted in the workplace; where it was found that exercise could act like a prevention strategy for reducing the risk of pain in the shoulders, wrists, and back[15]. Lower back and shoulder symptoms were the most common problem among our sample and that agrees with what was generally and empirically found in other studies[9,13,14].

Data from the statistical analysis showed that perceived high physical workload was significantly associated with musculoskeletal disorders (OR = 2.6, CI = 1.1 to 5.9). Based on our situation, perceived physical workload originated from static posture (i.e., standing for long periods of time in one position); awkward posture (e.g., holding patient extremities or retractors during a surgical procedure); carrying heavy instruments and equipment (e.g., removing a sterilized tray of instruments); and, repetitive motion (e.g., passing instruments). These specific tasks in the operating room have been reported as risk factors for MSDs in several studies[9,14].

The statistical analysis showed that some respondents perceived high psychosocial workloads-including hiding emotion (OR = 3.9, CI = 1.2 to 9.7) and emotional demands (OR = 2.6, CI = 1.1 to 6.0)-were significantly associated with MSDs. These observations agree with Chanchai et al[16] who found that the factors significantly associated with musculoskeletal symptoms among hospital orderlies were high physical workload, high quantitative demands, and high emotional demands. The relationship between psychosocial workload and MSDs has been documented in numerous studies[17-19]. It is possible that psychosocial workload directly affects the physical load, as time pressures increase the occurrence of acceleration of movements and inappropriate posture. Psychosocial demand may (a) produce increased tension in muscles and exacerbate the biomechanic demand of tasks, (b) influence sensitivity to pain, and (c) increase attention to symptoms and the occurrence of MSDs[20]. Interestingly, Habibi et al[21] found no association between perceived psychological workloads and reported symptoms of MSDs among Iran hospital nurses; the reason for this difference is uncertain.

Table 3. Occupational risk factors influencing the occurrence of MSDs during the 12 months prior to the study (n = 186)

Occupational risk factor	$\bar{x}$ (SD)	OR	95% CI[a]
Physical workload	46.9 (11.3)	2.6	1.1 to 5.9
Psychosocial workload			
Demand at work			
Quantitative demands	51.8 (20.3)	2.3	0.9 to 5.4
Cognitive demands	66.0 (19.6)	1.8	0.8 to 4.1
Emotional demands	54.4 (19.2)	2.6	1.1 to 6.0
Demands for hiding emotions	56.6 (21.8)	3.9	1.6 to 9.7
Work organization			
Influence at work	34.8 (19.6)	1.5	0.7 to 3.4
Possibilities for development	62.9 (17.6)	1.3	0.6 to 3.0
Meaning of work	76.4 (16.3)	1.7	0.8 to 3.7
Commitment to the workplace	57.5 (14.8)	1.7	0.6 to 3.7
Interpersonal relations at work			
Rewards	51.6 (14.8)	2.1	0.9 to 4.8
Role clarity	66.8 (15.6)	0.9	0.4 to 2.2
Role conflicts	48.2 (16.0)	1.9	0.9 to 4.4
Quality of leadership	54.4 (19.0)	0.9	0.4 to 2.1
Social support from supervisor	53.8 (20.0)	0.9	0.4 to 2.2
Social support from colleagues	62.6 (14.3)	0.9	0.4 to 2.1
Social community at work	76.1 (14.1)	1.3	0.6 to 3.1

[a] Confidence interval

Overall, the current study revealed that when comparing low- and high-perceived workload, both physical and psychosocial workload can influence the occurrence rate of MSDs, indicating consistency in the statistical analyses presented in Tables 3.

A limitation of the current study might be in the data collection. Our results relied on a self-reported questionnaire, which would have a recall bias. Furthermore, respondents currently suffering might be avoiding stressful physical work and thus report pain more easily. The findings should be considered a pilot. Another source of bias is the subjective evaluation of workloads. In order to minimize this bias, it is suggested that future research determine MSDs according to a medical diagnosis, rather than a subjective personal evaluation. Additionally, a validated method for assessing physical workload (e.g., MAPO, REBA) is needed.

Conclusion

There was a high reported occurrence of MSDs among the perioperative nursing personnel, which trended to be associated with their perceived physical and psychosocial demands. As a result, hospital administrators might consider implementing some measures to reduce occupational risk factors such as ergonomic interventions and stress reduction planning. The findings from the current study could help to plan further research.

What is already known on this topic?

MSDs are a common health problem among perioperative nursing staff. Occupational risk factors such as physical and psychosocial demands are associated with MSDs. Regarding the psychosocial workload, only perioperative nursing staff who perceived a high demand at work were more likely to have MSDs than those who did not.

What this study adds?

The authors reported on the occurrence of MSDs among perioperative nursing staff, working at a university hospital, and the significant association between MSDs and occupational risk factors. The present study provides evidence that perioperative nursing staff are at extremely high risk of MSDs which appear to be related to their work.

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Potential conflicts of interest

The authors declare no conflicts of interests.

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