PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG REGISTERED NURSES IN SRINAGARIND HOSPITAL, THAILAND

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ABSTRACT: Work-related musculoskeletal disorders have a significant impact on registered nurses, but studies related to prevalence and risk factors for musculoskeletal disorders have not been extensively addressed in North-Eastern Thailand. This current cross-sectional study was conducted to assess the annual prevalence and job risk factors of musculoskeletal disorders among registered nurses in Srinagarind hospital, Thailand. A total of 248 (97.2% response rate) registered nurses completed a self-administered questionnaire, including a modified Musculoskeletal System Questionnaire and Karasek's Job Content Questionnaire. The results showed that the 12-month prevalence of work-related musculoskeletal disorders at any region was 91.7% (95% CI: 86.8%, 94.9%). The most common symptom in body regions was shoulders (64.4%) followed by low back (58.5%), and upper back (44.9%). The 12-month prevalence of musculoskeletal symptoms that prevented normal working activities was 53.7% (95% CI: 46.6%, 60.6%). Multivariate logistic regression analysis indicated that job control, as one of set psychosocial factors, had a significant association with the 12-month prevalence symptom of work-related musculoskeletal disorders that prevented normal working activities.

Keywords: musculoskeletal disorders, work-related, prevalence, registered nurses

INTRODUCTION

The term work-related musculoskeletal disorders (WMSDs) includes a wide range of inflammatory and degenerative discomforts and disorders that lead to pain or functional impairment of "*muscles, tendons ligaments, joints, peripheral nerves, and supporting blood vessels*", which develop when workers are exposed to risk factors from work activities and conditions and/or existing symptoms are exacerbated by the working environment [1]. Previous studies of physical therapists involved in care activities such as lifting and transferring patients and performing manual therapy have revealed high prevalence rates of WMSDs in the past 12-month period ranging from 50-91%, even though therapists have specialist knowledge of body mechanics and injury prevention [1-7].

Similarly, the practice of registered nurses requires the performance of many physical tasks related to direct patient care. Routine activities include lifting heavy loads, transferring patients, maintaining awkward postures and operating hazardous equipment [8-13]. Physical work-related risk factors have been reported to be associated with WMSDs symptoms in the lower back in recent studies [9, 14,

15]. Nurses are not only exposed to occupational physical risk factors but also exposed to psychosocial variables. Alexopoulos et al. [16] identified high job demands as a significant risk factor for back pain of musculoskeletal disorders among Dutch nurses. More recently, Mehrdad et al. [17] reported that musculoskeletal symptoms on neck, wrist/hand, upper back, and ankle/foot regions were statistically associated with high stress in Iranian nurses. The functional consequence of WMSDs includes taking sick leave, seeking medication, reduced productivity, burnout, increased turnover and claims for compensation [18-23]. Numerous studies have been undertaken to determine the prevalence of WMSDs in nurses from both the developed and the developing countries and these studies have revealed that prevalence ranged from 52% to 91.9% [10, 15-20, 22-27]. The evidence indicates that WMSDs are an important occupational health issue among nurses, but there is a dearth of information regarding WMSDs among registered nurses in North-east Thailand.

Therefore, the aims of this study were to investigate the annual prevalence of work-related musculoskeletal disorders and to indentify work-related risk factors associated with the prevalence of symptoms that restricted normal work activities, such as sick leave, among registered nurses at Srinagarind Hospital, (a teaching hospital affiliated with Faculty of Medicine, Khon Kaen University)

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MATERIAL AND METHOD

After gaining the ethical approval for this study from the ethical committee of Khon Kaen University, two hundred and forty-eight registered nurses working at 12 different wards/units were recruited for an investigation of the symptoms of musculoskeletal disorders. The sample was retrieved using the simple random method from the registered nurses list from the hospital.

This cross-sectional survey was conducted by self-administered questionnaire. The questionnaire was comprised of four sections including: demographic items, physical factors, psychosocial factors and symptom of work-related musculoskeletal disorders. Demographic characteristics included age, gender, marital status, height and weight, working wards/unit, working hours per day/week, overtime working, night shift interval, smoking, regular exercise and the accident that caused musculoskeletal problem. Physical factors that might contribute to the occurrence of the symptom of WMSDs comprised working postures and working activities. These factors were elicited using the questionnaires of Menzel et al. [11], Sinsongsok et al. [24] and Trinkoff et al. [23]. The psychosocial risk factors were identified using job content questionnaires to predict work-related symptoms, including fatigue and symptoms of MSDs as well. These questionnaires were based on the Demand-Control Model proposed by Karasek and Theorell [28] and Karasek et al. [29] and adapted from the empirical researches undertaken by Sinsongsook et al. [30] and Smith et al. [22]. Three aspects of psychosocial factors included job demand, job control, and social support. Six criteria were utilised to assess each aspect and each criterion was scored on a four-point scale. For instance with perceived job control, participants were asked "you can personally decide upon when your work is done" [29] and responses were scored on a four-point scale using the following options: 1= never, 2=seldom, 3= sometimes, and 4= frequently. Afterwards, perceived job control was then classified into low (1 to 2) and high (3-4) job control. A similar scale was applied to social support - referring to support from both supervisor and co-workers. The participants were asked whether the supervisor or co-workers concerned were helpful or otherwise [29, 30] based on the following options: 1=never to 4= often. Items scored from 1-3 indicated low social support while a score of 4 implied high social support.

The symptoms of work-related musculoskeletal disorders were surveyed using a modified version of Musculoskeletal Symptom Questionnaire (MSQ) [31] which is based on 'the Standardised Nordic Questionnaires' developed by Kuorinka et al. [32]. The MSQ was translated into Thai and adapted for use in both nursing personnel and construction workers previously [24, 33] and has been found to be valid and reliable. The symptoms were defined as *pain, numbness, tingling, aching, stiffness, or burning* in the nine body sites (3 upper limb regions including shoulder, elbow, and wrist/hands; 3 lower limb regions, including hips/thighs, knees, and feet /ankles; 3 body trunk, including neck, upper back, and low back). The questionnaires elicited information on these symptoms in the previous 12-month period and any disorder that restricted normal work activities during the same period.

In 2008, a total of 248 questionnaires together with an informed consent to participate attachment were distributed to registered nurses working in the twelve wards/units. The registered nurses who had an episode of musculoskeletal disorders caused by a non-work related accident or who had persistent musculoskeletal symptoms arising from an event before becoming a registered nurse were excluded from this study.

STATISTICAL ANALYSIS

Frequency, proportion, and percentage were used to describe qualitative variables. Minimum, maximum, mean and standard deviation were used to describe quantitative variables. Ninety-five percent confidence interval of proportion was used to extrapolate the event in the study population. Person chi-square test and/or Fisher's extract test was used to explore the association of prevalence of WMSDs with demographic characteristics and risk factors and Mann-Whitney U test was also undertaken to investigate the possible association between WMSDs and continuous variables, with results expressed as adjusted odds ratios (AOR). The 12-month period symptom of WMSDs and the symptom that limited daily working activities were categorised into dichotomous scale (yes or no). Variables with probability (p) value ≤ 0.10 from the crude analysis were selected and put into the statistical modelling process. In the final multivariable model only variables with a $p<0.05$ were retained. All the data analysis was executed using the SPSS 17.0 version for windows software package (SPSS Inc., Chicago, Illinois, USA).

RESULTS

The 241 completed questionnaires represented 33.8% of the total registered nurses in the teaching hospital, giving a response rate of 97.2%. Of all respondents, 36 (17.6%) reported musculoskeletal symptoms arising from an event before becoming a registered nurse or arising from a non-work related accident and so were excluded. Women and men accounted for 92.2 % and 7.8% of the sample population respectively. The mean (SD) age, height and weight of the respondents were 34.8±7.7 years, 158±5.2 cm and 53.7±7.4 kg respectively. Less than 50% of respondents were currently single and approximately half of them were married or divorced. Approximate

Table 1 Socio-Demographic Characteristics and Working Experience among Registered Nurses in Srinagarind hospital (n=205)

Variables	Mean ± SD	Number (%)
Age(yrs)	34.8±7.7	
Height (cm)	158.1±5.2	
Weight(kg)	53.7±7.4	
Duration of working experience(yrs)	12.1±7.9	
Hours per week(hours)	49.6±8.3	
Gender (Female)		189 (92.2)
Marital status		
Single		94 (45.9)
Married or divorced		111(54.1)
Smoking		3 (1.5)
Having regular exercise		162 (79.0)
Having administrative position in the working unit		43 (21.0)
Having shift work		178 (86.8)

Table 2 The Prevalence Rate of Work-Related Musculoskeletal Disorders among the Registered Nurses by body areas in Srinagarind Hospital (n=205)

Body Area Affected	Annual prevalence (%) 95% CI	Symptom Restricting Normal Working (%) 95% CI
Neck	20.0 (14.5-25.5)	12.2 (7.7-16.7)
Shoulders	64.4 (57.4-70.6)	25.9 (19.9-31.8)
Elbows	13.2 (8.4-17.6)	8.3 (4.5-12.1)
Wrists/Hands	36.1 (29.4-42.6)	10.7 (6.5-15.0)
Upper back	44.9 (37.2-50.8)	10.2 (6.1-14.4)
Low back	58.5 (51.2-64.8)	34.6 (28.1-41.1)
Hips/Thighs	40.0 (33.3-46.7)	5.9 (2.6-9.1)
Knees	40.0 (33.3-46.7)	7.8 (4.1-11.5)
Ankles/Feet	35.1 (28.5-41.5)	4.4 (1.6-7.2)
Total affected	91.7 (86.8-94.9)	53.7 (46.6-60.6)

one fifth of respondents had an administrative position in their working place and nearly 80% of registered nurses participating in the study had regular exercise. Only 1.5% of the registered nurses were smokers. The mean (SD) duration of employment was 12.1±7.9 years. Further details regarding baseline characteristics are shown in Table 1.

Approximately 92% of registered nurses reported WMSDs symptoms at any body region in the last 12 months and more than 54% of the respondents indicated that they took time off to visit a physician / physiotherapist due to WMSDs. The WMSDs that occurred commonly in the body regions for the 12-month period prevalence in descending order were shoulders (64.4%) low back (58.5%) upper back (44.9%) followed by hips/thighs and knees at 40%, wrists/hands (36.1%) and ankle /feet at 35.1%. However, the order of the top three prevalent areas that prevented normal work activities were low back (34.6%), shoulders (25.9%) and neck (12.2%) see Table 2.

Regarding the physical and psychosocial load perceived by registered nurses, the tasks of recording nursing document (96%), repositioning patients in bed (75.6%), preparing and distributing medication (73.7%) accounted for the top three performing activities out of 16 items. The physical risk factors related to working posture were perceived as follows: the neck/shoulder not in the neutral position was the most significant (60.5%) followed by bending and twisting the waist in an awkward way (55.1%). Among psychosocial aspects, more than 70 % of respondents had high job demand and social support while one-third of registered nurses reported low job control see Table 3.

In the bivariate analysis of the association between 12-month period of WMSDs symptoms that restricted normal work activities and socio-demographic characteristics (Table 4), no association was found between demographic variables and the 12-month period of WMSDs except for the cumulative time of employment which is marginally associated with the 12-month period prevalence of WMSDs (p=0.098). However, working task activities such as documenting patient computer records and making the bed with the patient in it are significantly associated with the occurrence of symptoms of WMSDs that prevented normal working activities during the 12-month period (*p*=0.026 and *p*=0.036 respectively). Among psychosocial load, low social support and low job control was significantly associated with the symptom of WSMDs that prevented normal working activities in the past 12- month period (p<0.05).

Table 3 Percentage Indicating Respondents Perception of Physical and Psychosocial load Performed Frequently by Registered Nurses within an 8-hour shift (n=205)

Variables	Percentage (%)
Physical load	
Recording nurses' document	96.1
Repositioning patient in bed	75.6
Preparing & distributing medication	75.1
Carrying, lifting, moving heavy equipment or machines	73.7
Lifting patients up into bed	70.3
Transferring patients by two persons	64.9
Transporting patient between bed and wheelchair	61.5
Bed bath	62.9
Making bed when patient in it	53.7
Assisting patient to toilet	48.8
Changing absorbent pad	47.3
Moving bed when patient in it	46.8
Transporting patient by wheelchair	38.0
Making bed when patient not in it	30.2
Feeding bed ridden patient	29.3
Transferring patients by one person	20.5
Working posture	
Neck/shoulder were not in the neutral position	60.5
Bending and twisting waist in an awkward way	55.1
Standing in the same position for long periods	53.2
Hyperextension of wrist and high strength demand	52.7
Hand and arm demand of high strength	45.4
Working near or at your physical limits	43.4
Working in awkward or cramped position	36.6
Lifting objects between 5-10kg	32.2
Working above shoulder height	28.3
Lifting objects more than 25kg	27.8
Sitting for long periods	23.4
Lifting objects 10-25kg	21.5
Keeping the same position over and over	21.0
Working with the help of computer	19.0
Bending over, kneeling for long periods	12.7
Psychosocial load	
Work demand (low)	73.2
Job control (low)	29.3
Social support (supervisor & co-worker)(high)	75.6

Table 4 Association between 12-Month Prevalence Symptoms of WMSDs that restricted Normal Work Activities and Socio-Demographic Characteristics among Registered Nurses in Srinagarind Hospital

Variables	Number	Prevalence of WMSDs (%)	*p*-value
Gender			
Male	16	62.5	0.460[†]
Female	189	52.9	0.786[‡]
Marital status			
Single	94	53.2	
Married	102	52.9	
Divorced/separated	9	66.7	
Cumulative of employment (years)			0.098[§]*
Age(years)	188 suffering symptom of WMSDs		0.122[§]
Weight(Kilograms)			0.614[§]
Height (centimeters)			0.728[§]
Working task activities			
Documenting patient records	Frequent= 197; rare=8		0.026[‡]*
Making the bed with patient in it	Frequent=96; rare=109		0.036[†]*
Preparation equipment	Frequent=151; rare=54		0.057[†]*
Psychosocial load			
Job control	Low= 50; High=155		0.092[†]*
Social support	Low=135; High=60		0.007[†]*

† Person chi-square test; ‡ Fisher's exact test; § Mann-Whitney U test;*$p \leq 0.10$

Table 5 Multivariate Analysis of Association between 12-Month Period Prevalence of WMSDs that Prevented Normal Working Activities and Potential Significant Risk Factors in Srinagarind Hospital

Potential significant factors	COR	AOR	95% CI	*p*-value
Job control				
High	1.00	1.00		
Low	2.38	2.22	1.13 -4.38	0.021*
Social support				
High	1.00	1.00		
Low	1.75	1.74	0.87 -3.49	0.116
Working activities				
Frequently Documenting patients' records via computer				
No	1.00	1.00		
Yes	8.67	5.15	0.60 -43.92	0.134
Frequent making bed when patient in it				
No	1.00	1.00		
Yes	1.81	1.49	0.82 -2.69	0.187
Frequent preparing equipment				
No	1.00	1.00	0.94 -3.58	0.076
Yes	1.83	1.83		
Demographic				
Cumulative during of employment (years)	na	0.99	0.95 -1.33	0.484

*p<0.05; na= not available

Table 5 presents the multivariate analysis of association between 12-month period prevalence of WMSDs that prevented normal working activities and potential significant risk factors. After adjusting for psychosocial aspects, such as low job control, low social support and aspects of physical workload including the frequency of preparing medical equipment, documenting nursing records, making the bed with the patient in it as well as adjusting for demographic variables like the years of cumulative duration of employment, the data reveal that only low job control is significantly associated with the 12-month period prevalence of work-related musculoskeletal disorders that prevented normal working activities (95% CI: 1.13-4.38*; P*=0.021).

DISCUSSION

Like physiotherapy, nursing is perceived as a profession with high physical and mental demands. Previous studies have reported a range in prevalence rates of WMSDs among nurses in terms of musculoskeletal symptoms. The objectives of this study were to identify the 12-month prevalence rates and risk factors of work-related musculoskeletal disorders among registered nurses at Srinagarind Hospital, Khon Kaen in North-eastern Thailand. The annual prevalence of WMSD at any body region among the registered nurses in the study was 91.7% (95% CI: 86.8%, 94.9%) this being consistent with a study by Smith et al. [20] which focused on nursing staff in rural Japan with 91.9% prevalence rate (95% CI: 87.8-94.7) and compatible with studies undertaken among nursing staff in Taiwan at 91.6% [19] and hospital nurses in Nigeria and New Zealand where Fabunmi et al. [34] and Harcombe et al. [18] reported a prevalence of 90.7% and 91%, respectively. Also, this study was in accord with the

findings of Mehrdad et al. [17] in which 95% of Iranian nurses reported experiencing musculoskeletal symptoms in at least one body area in previous 12 months. Conversely, the annual prevalence of WMSD among nurses was higher than that reported from several countries including Iran (85.7%) [15], Japan (85%) [25], United States of America (84%) [26], China (70%) [22], Greece and the Netherlands (75%, 62% respectively) [16], and Korea (56.8%) [10]. Notably, Singsongsook [24] reports an annual prevalence of WMSD at 97.6% among nursing personnel in Bangkok, Thailand. The range in outcomes may be due to several factors, firstly there may be different operational definitions of WMSDs, for example, using "work-related musculoskeletal pain, discomfort, injuries in any anatomical area of body in the previous 12 months that lasted more than 3 days" might yield higher outcomes than if the symptoms lasted more than 7 days or further, secondly there may be different working environments and finally different cultural perceptions of the symptoms might explain the variation in the prevalence rates in different studies worldwide [10, 32].

The WMSDs that occurred most commonly in the nine body regions for the 12-month period prevalence in descending order were shoulders (64.4%, 95% CI: 57.4%-70.6%) followed by low back (58.5%, 95%CI: 51.2%-64.8%) and upper back (44.9, 95%CI: 37.2%-50.8%). The significance of the shoulder region as the most commonly reported symptom is consistent with the results of studies on nursing personnel in Korea where a 12-month period prevalence of 27.2% was evident [10] whilst the prevalence was 71.9% in Japan [25]. The prevalence of low back symptoms at 58.5% in this study being consistent with studies

in China (56.7%) [22], New Zealand (57%) [18], Iran (60.6%) [15], the Netherlands (62%) [16], and Sweden 64% [26], which emphasises a serious occupational health concern in the nursing profession.

The 12-month prevalence of WMSDs that restricted normal work activities, such as sick leave and/or visiting a physician or physiotherapist in this study was 53.7% (95% CI: 46.6%, 60.6%) which was similar to the result from a nursing study in Korea conducted by Kee and Seo [10] with 45.7% prevalence rate but contrasted with a study conducted in New Zealand where only 18 % of respondents required taking time off as a result of WMSDs [18].

The bivariate analysis identified three risk factors associated with the annual prevalence of WMSDs that prevented normal working activities: social support (p=0.007), frequently documenting nursing records (p=0.026) and frequently making the bed with the patient in it (p=0.036). Preparation of equipment, job control and cumulative duration of employment were found to be marginally significant risk factors correlated with the annual prevalence of WMSDs that prevented normal working activities, presenting with p-values 0.057, 0.092 and 0.098 respectively. Multivariate logistic regression analysis reveals that only low job control is significantly associated with the 12-month period prevalence of work-related musculoskeletal disorders that prevented normal working activities (OR 2.22, 95 % CI: 1.13-4.38). However a previous study in central Thailand found physical load significant. Sinsongsook et al. [30] found lifting objects between 5-10 kg (OR 2.65, 95% CI: 1.07-6.54) associated with shoulder pain that prevented from working activities.

This survey did not show significant association with the occurrence of symptom of WMSDs that prevented normal work activities in the past 12 months was evident among other demographic characteristics such as age and employment years. Smith et al. [22] arrived at a similar conclusion from a study of nurses in mainland China, moreover logistic regression in this study identified period pain as a potential risk factor associated with WMSDs (OR 23.8, 95% CI: 4.3-189.1, p<0.008). Moreover, no association with the occurrence of symptoms of WMSDs that prevented normal work activities in the past 12 months was evident among physical work-load factors. Conversely, Hou and Shiao [19] found that physical postures such as waist-bending, associated with low back symptoms (OR 1.56, 95% CI: 1.29-1.89, P<0.001) and shoulders/neck symptoms (OR 1.14, 95% CI: 1.03-1.55, P<0.025). Another study conducted by Alexopoulos et al. [16] proposed that strenuous back postures were significantly associated with low back pain in the Netherlands (OR 1.91, 95% CI: 1.20-3.04, p<0.05) and Greece (OR 1.85, 95%

CI: 1.02-3.35, p<0.05) respectively.

Low job control, as one of the psychosocial loads, was identified as the most important risk factor for musculoskeletal disorders in this study. Previous studies regarding psychosocial aspects were undertaken to describe the relationship between job control and musculoskeletal disorders. Singsongsook et al. [30] found low job control statistically associated with persistent shoulder pain in nurses from central Thailand (95% CI: 1.18-5.17, p<0.05). However, this effect was not statistically significant after multiple logistic regression analysis. Alexopoulos et al. [16] did not find lack of job control statistically significant with the WMSDs symptoms in nurses from the Netherlands and Greece but did report that nurses in the Netherlands who experienced high job demand were 1.66 times more likely to suffer musculoskeletal symptom of back pain (95% CI: 1.10-2.50, p<0.05). Therefore, this controversy implies that more studies should focus on this area in the future.

In this study a high prevalence of work-related musculoskeletal disorders and musculoskeletal symptoms restricting normal working activities was evident when compared with other studies using similar methodology and this may be attributed to a shortage of nurses and consequent increased workload in the study area. In North-Eastern Thailand the nurse to population ratio is 1:1,278 compared with 1:289 in Bangkok and the minimum level recommended by WHO of 1:500 [35].

LIMITATION OF STUDY

Some limitations should be acknowledged in this study. Firstly, this study relied on self-reported data where respondents retrospectively recalled incidents of musculoskeletal complaints in the previous 12-month period. To some extent this might introduce bias from subjective overestimating or from attributing their injuries to the working context rather than outside the working environment. In addition, a simple random sampling was used to select the study group that was not stratified to reflect the wider population under study. Finally, it is difficult to draw causal inferences between the musculoskeletal symptoms and physical workload or psychosocial risk factors from cross-sectional design.

CONCLUSION

This cross-sectional survey indicated that work-related musculoskeletal disorders are prevalent among registered nurses and represent a significant burden for the nursing profession in North-eastern Thailand. The psychosocial risk factors should be taken into account when considering preventive measures. Apart from psychosocial strategies, a multidisciplinary approach including ergonomics design and ongoing education should be recommended as well.

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