

ORIGINAL ARTICLE

Short sleep and chronic neck and shoulder discomfort in nurses

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Abstract

Objective: Short sleep duration is common among nurses. Sleep restriction has been associated with musculoskeletal discomfort. However, studies on the effect of short sleep duration on chronic neck and shoulder discomfort in nurses have been lacking. The aim of this study was to determine whether short sleep duration is related to chronic neck and shoulder discomfort.

Methods: We conducted a cross-sectional survey of female nurses in secondary referral health centers in Taiwan. We applied stratified sampling based on region (north, central, south, and east) to select representative centers for this study. A self-administered structured questionnaire, including demographic data, the psychological working environment, and musculoskeletal symptoms, was administered to nurses. Multiple logistic regression and population attributable risk analyses were performed to assess the effect of average sleeping hours per working day on chronic neck and shoulder discomfort.

Results: A total of 1602 (78.9%) questionnaires were eligible for final analysis. The prevalence rates of chronic neck and shoulder discomfort were 33.9% and 34.7%, respectively. Population attributable risk estimation revealed that a sleep duration of <7 hours per working day was the most crucial factor for chronic neck and shoulder discomfort in the nurses, accounting for 8.8% of chronic neck discomfort and 8.6% of chronic shoulder discomfort respectively.

Conclusion: Our study found that sleep duration on working days was associated with chronic neck and shoulder discomfort in female nurses. Further interventions are warranted for maintaining nurses' sleep hygiene.

KEYWORDS

musculoskeletal discomfort, neck discomfort, nurses, short sleep duration, shoulder discomfort

1 | INTRODUCTION

The Global Burden of Disease Study (GBD) reported that musculoskeletal disorders (MDs) constitute the largest

contributor to global disability. In 2017, MDs contributed 16% (1.35 million) of global years lived with disabilities.¹ Neck pain and other musculoskeletal disorders were the second leading cause of MDs.¹ Neck and shoulder discomfort

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are common problems in the working population. In Taiwan, 47.3% of compensated occupational diseases are neck and upper extremity disorders.² Neck and shoulder discomfort not only impair personal physical health but also cause significant economic burdens.³

The nursing profession involves a high risk of neck and shoulder discomfort.⁴ Studies have reported that 12%-54%⁴⁻⁶ and 17%-71%^{4,6,7} of nurses have experienced neck and shoulder discomfort respectively. Occupational risks, smoking, and high body mass index result in >45% of cases of low back pain⁸; by contrast, no risks in the GBD are associated with neck and shoulder pain. Systematic reviews have suggested that old age, the female sex, physical inactivity, and poor psychological health are risk factors for neck and shoulder discomfort.^{9,10} Moreover, short sleep duration has been reported to be a risk factor for subsequent musculoskeletal discomfort.¹¹

Epidemiological studies have associated short sleep duration with low back pain¹² and lower extremities pain.¹³ However, studies on sleep duration and neck and shoulder discomfort had been few, and yielded equivocal results.^{13,14} Inadequate sleep have the potential to profoundly affect muscle health.¹⁵ Neck and shoulder discomfort are common problems in the working population and also are the second leading cause of MDs.¹ Short sleep duration is common among nurses.¹⁶ In spite of existing studies related to this issue are limited, population attributable risk approach to delineate the contribution of short sleep duration to neck/shoulder pain has not been used before. Therefore, the aim of the present study was to determine the association between sleep duration and reported chronic neck and shoulder discomfort and to delineate the contribution of short sleep to neck/shoulder discomfort in female nurses working in secondary referral hospitals in Taiwan.

2 | METHODS

2.1 | Participants

In 2009, we recruited female nurses working in secondary referral hospitals in Taiwan. Information was collected using a self-report questionnaire, and hospitals were selected through systematic random sampling. Due to the difference between rural and urban areas in terms of the severity and complexity of patient conditions, we stratified the sample by region. All secondary referral hospitals were stratified into northern, central, southern, and eastern regions. Systematic random sampling was applied to select approximately 10% of the hospitals from each region according to their number of beds. Excel's RANDBETWEEN function was applied to generate a random number between 1 and 10 for each region, and then every tenth hospital was

selected. When a hospital was selected, the hospital administration was contacted for the agreement for participation. After obtaining consent from selected hospitals, one contact person from that hospital was nominated for disseminating and collecting the questionnaire. This methodology has been reported in previous studies.^{17,18}

2.2 | Questionnaire

2.2.1 | Demographic and work characteristics

Individual demographic characteristics such as age, marital status, education level, and exercise frequency, and working conditions, such as current work tenures, rotating shift work, and other job details, were collected using a structured questionnaire.

2.2.2 | Sleep duration

We used the average sleeping hours per working day during the past week reported by the nurses to assess their sleep duration. This question was adapted from a national survey in Taiwan¹⁹ and has been used extensively in other studies.^{19,20}

2.2.3 | Job content questionnaire

Job control and psychological demand in the workplace were assessed using a modified Chinese version of the Job Content Questionnaire (C-JCQ),²¹ which was based on the C-JCQ and Karasek's control-demand model.²² Karasek's control-demand model proposes that a higher score of psychological demands and lower score of job control cause job strain. The dimensions of psychological demands consist of seven items (fast work, hard work, excessive work, insufficient time, concentrate on job for a long time, hectic work, and insufficient manpower), and those of job control consist of nine items (learning new things, nonrepetitive work, creative work, allowing own decision, high level of skills, freedom to make decision, various tasks, influential opinions, and developing one's abilities). Each item is rated on a 4-point scale, with anchors ranging from "1 ("strongly disagree") to 4 ("strongly agree")". In this study, participants whose scores were lower than median value of the job control score were defined as having low job control, and those whose scores were higher than median value of the psychological demand score were defined as experiencing high psychological demand. The cut-off points for job control and psychological demand were 55.56 and 61.90 respectively.

2.2.4 | Workplace justice

Fairness in the workplace was assessed using the Chinese version of workplace justice questionnaire, which was generated from the questionnaire originally developed by Moorman and Colquitt. It consists of distributive justice (three items), procedural justice (two items), informational justice (two items), and interpersonal justice (two items).²³ The response to each item is recorded on a 4-point Likert scale ranging from 1 (“strongly disagree”) to 4 (“strongly agree”). In this study, participants whose scores were lower than median value of the workplace justice score were defined as experiencing low workplace justice. The cut-off point for workplace justice was 59.26.

2.2.5 | Chronic neck and shoulder discomforts

We defined chronic neck and shoulder discomfort as the presence of any soreness, pain, numbness, redness and swelling, or difficulty in movement in the neck and shoulder region that persisted for at least 3 months during the 12 months before the start of the study. We assessed chronic neck and shoulder discomfort by using a modified Chinese version of the Nordic musculoskeletal questionnaire (NMQ).⁴ The NMQ is commonly used to determine the prevalence of musculoskeletal symptoms in the workplace.⁴ The reliability and validity of NMQ have been found to be acceptable.²⁴

2.3 | Ethical approval

This study was approved by the Research and Ethical Committee of the National Taiwan University Medical Center (protocol 200812011R).

2.4 | Statistical analysis

We used descriptive statistics to assess the distribution of individual demographic characteristics, working conditions, psychological working environments, and chronic neck and shoulder discomfort. Logistic regression was applied to examine the association between covariates and chronic neck and shoulder discomfort. We entered significant variables into multiple logistic regression models. Moreover, 95% confidence intervals (CIs) for odds ratios (ORs) were obtained from the aforementioned models, and variables with CIs that did not include 1.0 and with a *P* value of <.05 were considered statistically significant.

Population attributable risk (PAR) estimation was performed to determine the proportion of chronic neck and shoulder discomfort in the population that would be reduced if the risk factors were eliminated.²⁵ In this study, we adapted

adjusted risk ratios (aRRs) obtained from a mutually adjusted general linear model to calculate adjusted PARs (aPARs). The following equation was adopted for calculating aPARs: $\{(\text{proportion of cases exposed to a specific risk factor}) [(\text{aRR for a specific risk factor}-1)/\text{aRR for a specific risk factor}]\}$.²⁶ JMP 13.0 served as the overall statistical package for data analyses.

3 | RESULTS

According to the 2005-2008 accredited hospital lists,²⁷ Taiwan had 366 secondary referral hospitals. A total of 39 hospitals were selected using the stratified sampling scheme. These hospitals had 3292 full-time female nurses. After excluding nurses who were taking long leaves, on vocation, and refusals, there were 2268 nurses received the questionnaire and 2041 returned the completed questionnaires. Of these completed questionnaires, 1602 (78.9%) were eligible for the final analysis (Figure 1).

The personal characteristics, working condition, job strain, workplace justice, and chronic neck and shoulder discomfort of the participants are summarized in Table 1. The average participant age was 31.0 years [standard deviation (SD) = 7.2], and half of the participants were single. Approximately one-third of the participants were determined to hold a bachelor's degree or above (35.4%), and the average work tenure was 6.1 years for the current job. Approximately one-quarter of the participants worked only day shifts. The participants also reported that their sleep duration per working day in the past week was 6.7 hours, and nearly half of the participants slept <7 hours on working days. Furthermore, 35.6% of the participants had regular exercise habits. Approximately half of the participants had low control, more than 60% of them reported high psychological demand, and nearly three-fifths of them experienced lower workplace justice. Due to that there were seven questions related to psychological demands, and all questions were given equal scoring weight, the resulting scores of demands contained only 17 possible values. The median value 61.9 happened to represent 17.3% of all participants, causing unbalanced distribution of participants in high and low demand. Similar situation occurred in workplace justices. In addition, 33.9% and 34.7% of the participants reported experiencing discomfort in the neck and shoulder regions, respectively, that had persisted for ≥ 3 months.

As presented in Table 2, we assessed crude odds ratios. We observed elevated odds ratios for chronic neck and shoulder discomfort among nurses who were divorced or widowed, had worked for >5 years in the current job, did not perform rotating shift work, did not exercise regularly, slept <7 hours per day on working days, reported high psychological demand, and experienced low workplace justice.

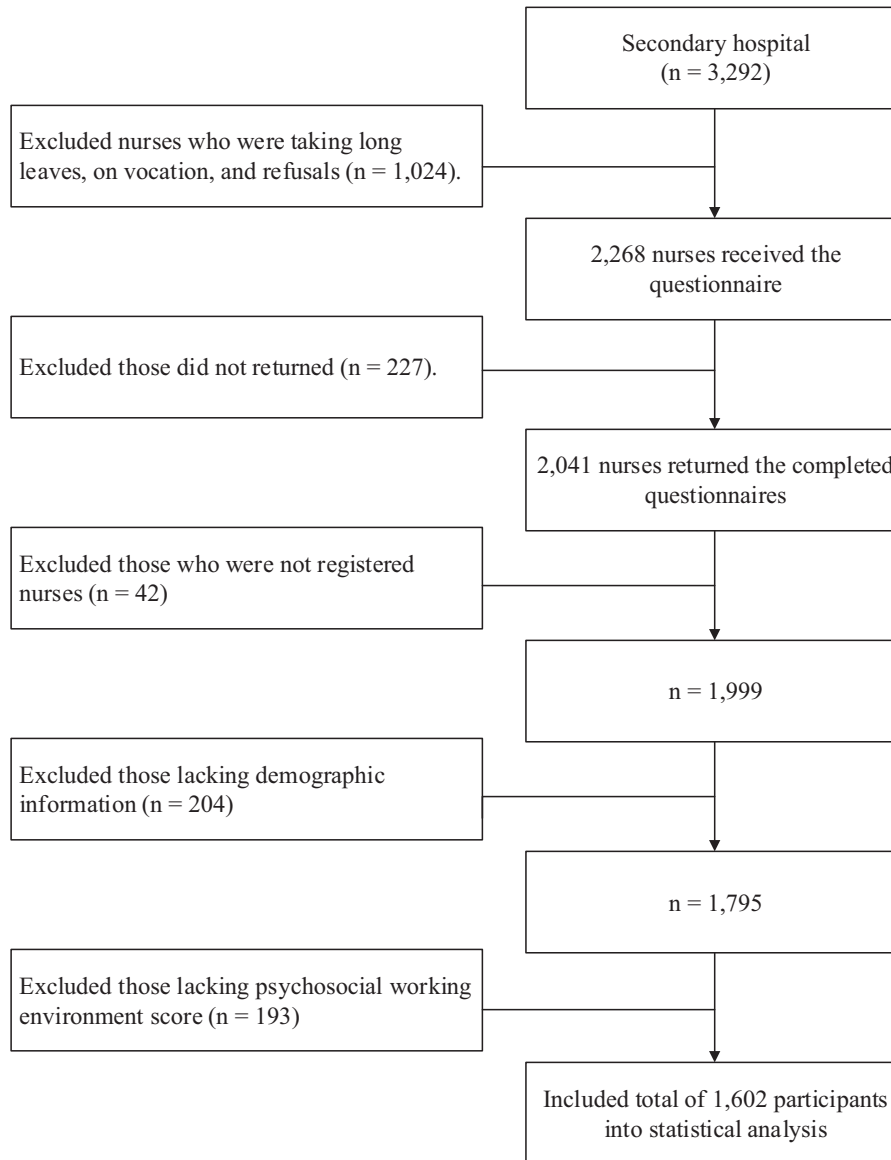


FIGURE 1 Flowchart of enrollment process

All significant variables presented in Table 2 were included in the mutually adjusted model to estimate aRRs and aPARs for chronic neck and shoulder discomfort (Table 3). After adjusting potential confounding factors such as marital status, current work tenure, rotating shift work, regular exercise, low workplace justice, and high psychological demand, we observed that the range of aRRs associated with an average sleep duration of <7 hours per working day during the past week was 1.21 to 1.22. The aPARs for chronic neck and shoulder discomfort associated with a sleep duration of <7 hours were 8.8 and 8.6 respectively.

4 | DISCUSSION

According to our review of the literature, this is the first study to use a nationwide representative sample to investigate the

influence of sleep duration on chronic neck and shoulder discomfort among female nurses and to calculate their PARs. Nearly half of our participants reported that their average sleep duration per working day was <7 hours, and 12% of them slept <6 hours during a working day. Furthermore, this study confirmed that compared with nurses who slept ≥ 7 hours per working day, those with a sleep duration of <7 hours per working day had a higher risk of chronic neck or shoulder discomfort.

In this study, the prevalence rates of chronic neck and shoulder discomfort during the past 12 months among the participants were 33.9% and 34.7% respectively. These results are slightly higher than those observed among Taiwanese workers in a previous nationwide survey (neck symptoms: 24.5%; shoulder symptoms: 26.9%).²⁸ Previous nursing studies have reported that the 12-month prevalence of neck and shoulder discomfort in nursing staff ranged from 12%-54%⁴⁻⁶

TABLE 1 Characteristics of study participants (N = 1602)

Variable	N (%)	Mean ± SD
Age		31.0 ± 7.2
≤30 year	930 (58.1)	
31-40 year	462 (28.8)	
>40 year	210 (13.1)	
Marital status		
Single	817 (51.0)	
Married	748 (46.7)	
Divorce or widow	37 (2.3)	
Educational level		
High school or professional school	89 (5.6)	
Junior college	946 (59.0)	
College or above	567 (35.4)	
Current work tenure		6.1 ± 6.0
≤5 years	1001 (62.5)	
>5 years	601 (37.5)	
Occupational category		
Administrator	137 (8.6)	
Practice nurse	1465 (91.4)	
Responsible for supervising at work		
Yes	361 (22.5)	
No	1241 (77.5)	
Employment contract		
Long-term	1098 (68.5)	
Temporary	433 (27.0)	
Unknown or others	71 (4.4)	
Salary payment		
Fixed salary	712 (44.4)	
Fixed salary and bonus	890 (55.6)	
Rotating shift work		
Any other shift	1190 (74.3)	
Only day shift	412 (25.7)	
Being a major earner of family		
Yes	757 (47.3)	
No	845 (52.7)	
Having children younger than 6 years		
Yes	392 (24.5)	
No	1210 (75.5)	
Exercising regularly		
Yes	570 (35.6)	
No	1032 (64.4)	
Sleeping hours per working day in last week		6.7 ± 1.0

(Continues)

TABLE 1 (Continued)

Variable	N (%)	Mean ± SD
<7	779 (48.6)	
≥7	823 (51.4)	
Low job control		
No (>55.56)	790 (49.3)	
Yes (≤55.56)	812 (50.7)	
High psychological demand		
No (<61.90)	621 (38.8)	
Yes (≥61.90)	981 (61.2)	
Low workplace justice		52.8 ± 15.1
No (>59.26)	678 (42.3)	
Yes (≤59.26)	924 (57.7)	
Chronic neck discomfort		
No	1059 (66.1)	
Yes	543 (33.9)	
Chronic shoulder discomfort		
No	1046 (65.3)	
Yes	556 (34.7)	

and 17%-71%^{4,6,7} respectively. The wide range of prevalence among nurses may be due to inconsistency in the definitions of neck and shoulder discomfort and the change of practice and policies in health care settings.²⁹

Although physical risk factors for musculoskeletal discomfort have received considerable attention, previous studies have suggested that psychosocial risk factors played a major role in the development of neck and shoulder discomfort.^{9,10,30} Consistent with previous studies,^{10,30} the current study confirmed that compared with nurses without high psychological demand, those with high psychological demand had a higher risk of chronic neck and shoulder discomfort. In the current study, low workplace justice was related to neck and shoulder discomfort among nurses but after mutual adjustment for psychological demand, low workplace justice did not show a significant association. This finding suggests that in the presence of psychological demand, low workplace justice appears to play no independent role among nurses.

Shift work has been known to affect sleep duration. In this study, we asked nurses' work shift type and their average sleep duration per working day during the past week. However, in this current study, sleep duration was not significantly different between nurses working fixed day shift and rotating shift. Since the main hypotheses are to examine the relationship between sleep duration and neck and shoulder pain, and since sleep duration was not different between shift patterns, we did not further examine shift patterns as a modifier to sleep duration's effects on neck and shoulder pain.

Previous meta-analysis study indicated that nurses who performed rotating shift work are more likely to experience

TABLE 2 Crude ORs of potential factors with chronic musculoskeletal discomfort

Variable	Neck discomfort	shoulder discomfort
	OR (95% CI)	OR (95% CI)
Age		
≤30 years	1.00	1.00
31-40 years	1.06 (0.90-1.24)	1.06 (0.90-1.25)
>40 years	1.19 (0.97-1.45)	1.17 (0.96-1.43)
Marital status		
Single	1.00	1.00
Married	0.84 (0.65-1.07)	0.85 (0.67-1.08)
Divorce or widow	1.64 (1.06-2.54)	1.60 (1.03-2.48)
Educational level		
High school or professional school	1.00	1.00
Junior college	1.03 (0.65-1.67)	1.06 (0.67-1.71)
College or above	1.29 (0.81-2.11)	1.37 (0.86-2.24)
Current work tenure		
≤5 years	1.00	1.00
>5 years	1.16 (1.01-1.33)	1.14 (1.00-1.31)
Occupational category		
Administrator	1.00	1.00
Practice nurse	0.92 (0.73-1.16)	0.91 (0.72-1.13)
Responsible for supervising at work		
No	1.00	1.00
Yes	1.04 (0.88-1.22)	1.08 (0.93-1.26)
Employment contract		
Long-term	1.00	1.00
Temporary	0.95 (0.75-1.20)	0.98 (0.77-1.23)
Unknown or others	0.86 (0.50-1.42)	0.89 (0.53-1.47)
Salary payment		
Fixed salary and bonus	1.00	1.00
Fixed salary	0.96 (0.83-1.10)	0.98 (0.86-1.13)
Rotating shift work		
Only day shift	1.00	1.00
Any other shift	0.83 (0.72-0.96)	0.83 (0.72-0.96)
Being a major earner of family		
No	1.00	1.00
Yes	1.14 (0.99-1.30)	1.11 (0.98-1.28)
Having children younger than 6 years		
No	1.00	1.00
Yes	1.12 (0.97-1.31)	1.15 (0.99-1.33)
Exercising regularly		
No	1.00	1.00
Yes	0.83 (0.72-0.97)	0.81 (0.70-0.94)

(Continues)

TABLE 2 (Continued)

Variable	Neck discomfort	shoulder discomfort
	OR (95% CI)	OR (95% CI)
Sleeping hours per working day in last week (hours)		
≥7	1.00	1.00
<7	1.35 (1.18-1.55)	1.34 (1.17-1.53)
Low job control		
No (>55.56)	1.00	1.00
Yes (≤55.56)	1.15 (0.94-1.42)	1.14 (0.93-1.41)
High psychological demand		
No (<61.90)	1.00	1.00
Yes (≥61.90)	1.67 (1.34-2.08)	1.68 (1.35-2.09)
Low workplace justice		
No (>59.26)	1.00	1.00
Yes (≤59.26)	1.33 (1.08-1.65)	1.32 (1.07-1.63)

low back pain than are those with fixed day shift.³¹ However, there was no such finding in neck or shoulder pain. In this study, we observed a protective effect of rotating shift work on neck/shoulder discomfort among nurses. This may probability due to nurses who performed rotating shift work were significantly younger than those fixed day time work (shift work vs day work: 29.88 vs 34.29 years old, $P < .0001$) which older age has been recognized as a crucial factor for musculoskeletal disorders.

Regarding neck and shoulder discomfort, several physical and psychological factors in the working environment have been reported to be associated with nurses' neck and shoulder symptoms.⁴ In addition to the aforementioned factors, in the current study, we found that after potential confounding factors had been controlled for, short sleep duration was a major predictor of chronic neck and shoulder discomfort. The aRRs for chronic neck and shoulder discomfort were 1.22 (95% CI = 1.10-1.36) and 1.21 (95% CI = 1.09-1.35) in 48.6% of participants who reported having a sleep duration of <7 hours per working day, compared with those who slept ≥7 hours per working day.

Sleep problems have been reported as a relevant factor for musculoskeletal problems.¹¹ Short sleep duration is common among nurses.¹⁶ Previously epidemiological studies have reported short sleep durations to associated with musculoskeletal pain. In a Northern Finland birth cohort, Paananen and colleagues indicated that girls who slept ≤7 hours per day had a higher risk for the persistence of multiple pains (adjusted OR [AOR] = 1.68, 95% CI = 1.05-2.68)³² than did those who slept 8-9 hours per day. In the United States, Yang and Haldeman explored behavior-related factors associated with low back pain in the US adult population. They found that women who slept 3-4 and 5-6 hours per day had a higher

TABLE 3 Association between musculoskeletal discomfort and sleep duration determined using binomial log-linear regression for aRRs and PARs

Variable	Prevalence ^b (%)	Neck discomfort		Shoulder discomfort	
		aRR	aPAR ^a	aRR	aPAR ^a
Sleeping hours per working day in last week (hours)					
≥7	51.37	1.00	—	1.00	—
<7	48.63	1.22 (1.10-1.36) **	8.8	1.21 (1.09-1.35) **	8.6

^aAdjusted marital status, current work tenure, rotating shift work, regular exercise, psychological demand, and workplace justice.

^b% of participants.

* $P < .05$.

** $P < .01$.

risk of low back pain (OR = 3.04, 95% CI: 2.68-3.46 and OR = 1.49, 95% CI = 1.42-1.57)¹² than did those who slept 7-8 hours per day. However, few studies have been conducted on the association of sleep duration with neck and shoulder discomfort, although a survey examined this association in adolescents. Aunive and colleagues conducted a survey in a subcohort of the Northern Finland birth cohort 1986. They followed 1773 adolescents aged 16 years and assessed their neck and shoulder pain up to the age of 18 years.¹⁴ They found that compared with girls with sufficient sleep quantity and quality, those who reported insufficient sleep quantity and quality at age 16 years had a higher risk of developing neck pain at 18 years (AOR = 3.2, 95% CI = 1.5-6.7). In addition, they revealed that girls who slept ≤7 hours a day had a higher risk of neck pain (OR = 1.58, 95% CI = 1.00-2.48) than did those who slept 8 hours a day. However, after adjusting for pain at 16 years old, they observed that the effect was nonsignificant. Thus, they did not detect any association between sleep and shoulder pain.

The mechanisms through which short sleep duration causes chronic neck and shoulder discomfort are unclear. However, research has suggested that short sleep duration may result in physical inactivity³³ and obesity.³⁴ Both these factors were reported as relevant factors for neck and shoulder discomfort.³⁵ Furthermore, exaggerated pain responses and increased pain-related biomarkers³⁶ caused by short sleep duration may be implicated in the development of chronic neck and shoulder pain. However, due to the known limitation in cross-sectional studies, despite the relationship between sleep duration and neck/shoulder discomfort, one should be cautious in making the causal relationship conclusion.

Our study has some major strengths. First, this study was a nationwide sampling survey; therefore, the results are highly representative of nurses working in secondary referral centers in Taiwan. Second, the PAR estimation clearly showed that the proportion of nurses who had chronic neck and shoulder discomfort would decrease if a risk factor was eliminated. Third, this study is the first to detect an association between sleep duration and chronic neck and shoulder discomfort in nurses in Taiwan. In practice, a strategy of taking night-shift napping had been reported to improve

musculoskeletal pain in arm and leg among home care workers.³⁷ Back massage intervention was reported improving health and sleep quality among intensive care unit patients.³⁸ Such interventions can potentially be used to enable nurses to have sufficient sleep quantity and good sleep quality to reduce the number of nurses who develop chronic neck and shoulder discomfort. Despite the strengths of this study, caution should be exercised when interpreting our findings due to the following limitations. First, the study design was cross-sectional and was therefore limited in its potential to assess causality. We can only conclude that an association exists between short sleep duration and chronic neck and shoulder discomfort. Second, all participants were from secondary referral hospitals, and the results cannot be generalized to represent nurses from other hospital categories and working areas. Third, we did not specifically ask our participants whether they were taking sleeping pills or have other sleep problems such as insomnia, which was reported to be associated with musculoskeletal discomfort. Therefore, this study may have underestimated the effect of short sleep on chronic neck and shoulder discomfort. Fourth, this study did not include male nurses because the percentage of male nurses in Taiwan is small (<3.6%).³⁹ Therefore, our results cannot be applied to male nurses. Fifth, unlike low back discomfort, previous studies have suggested that neck and shoulder problems were less likely to be associated with work-related physical factors.^{9,10} Thus, in this study, we did not include work-related physical factors into our models. However, we observed that the effect of short sleep duration on chronic neck and shoulder discomfort remained statistically significant when we controlled for high mechanical exposure such as repeated movement, heavy lifting, inappropriate working postures, manual handling of material, and relatively long duration of computer use (data not shown in tables). Sixth, nurses who had severe neck and shoulder discomfort may have been excluded from this study due to the healthy worker effect. Therefore, our study may have underestimated the effect of short sleep duration on chronic neck and shoulder discomfort. Seventh, this investigation was conducted in 2009, and the working condition and population have potentially

changed. However, despite the increase of nursing personnel in Taiwan (2009 RN:125 953; 2021: RN:179 091),³⁹ the increased utilization of healthcare among people under health insurance made the patient-nurse ratio essentially unchanged.⁴⁰ These implicate that work load per nursing staff might not have changed much. Furthermore, the percentage of elderly population is increasing in the past ten years. Therefore, the work load in nurses might even increases in the past 10 years, and thus the sleep duration as reported 10 years ago might have underestimated the insufficiency of sleep in more recent years.

5 | CONCLUSION

In conclusion, this study found that after adjustment for potential factors, <7 hours of sleep per working day was the main contributors to chronic neck and shoulder discomfort in Taiwanese female nurses. According to our findings, female nurses are advised to sleep for at least 7 hours per day and minimize psychological demand in order to avoid chronic neck and shoulder discomfort. Further research on the effect of increased sleep duration in nurses is warranted.

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DISCLOSURES

Approval of the research protocol: This study received ethics approval from the Research and Ethical Committee of the National Taiwan University Medical Center. *Informed consent:* All participants provided informed consent prior to participating in the survey. *Registry and the registration no. of the study/trial:* N/A. *Animal studies:* N/A. *Conflict of interests:* The authors declare no conflict of interests.

AUTHOR CONTRIBUTIONS

WS Chin participated in the design of the study, acquisition of data, carried out the initial analyses, drafted the initial manuscript, and approved the final manuscript as submitted. YC Chen participated in the design of the study, acquisition of data, critically reviewed the manuscript, and approved the final manuscript as submitted. TT Lin participated in the design of the study, acquisition of data, and approved the final manuscript as submitted. YLGuo supervised data analysis, critically reviewed the manuscript, and approved the final manuscript as submitted. SC Shiao conceptualized and designed the study, designed the data collection instruments,

critically reviewed the manuscript, and approved the final manuscript as submitted.

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