Chulalongkorn Medical Journal

Volume 68 | Issue 4 Article 3

October 2024

Prevalence and Factors Associated with Work-Related Musculoskeletal Disorder among Central Sterile Supply Technicians in Nakhon Si Thammarat Province, Thailand

Withaya Chanchai Dr
Department of Occupational Health and Safety, Faculty of Medicine, Siam University, Bangkok, 10160, Thailand, withaya.cha@siam.edu

Ratree Nacglud Ms
Department of Central Sterile Supply Unit, Sichon Hospital, Nakhon Si Thammarat, 80120, Thailand, sichoncssd45@gmail.com

Keatkongkrai Bunnum Mr.
Department of Central Sterile Supply Unit, Chawang Crown Prince Hospital, Nakhon Si Thammarat, 80150, Thailand, keatkongkrai@gmail.com

Nureeya Promsorn Mrs.
Department of Central Sterile Supply Unit, Maharaj Nakhon Si Thammarat Hospital, Nakhon Si Thammarat, 80000, Thailand, nureeya.p22@gmail.com

Laddawan Duangmusik Mrs.
Department of Central Sterile Supply Unit, Thasala Hospital, Nakhon Si Thammarat, Nakhon Si Thammarat, 80160, Thailand, sladawana10@gmail.com

Recommended Citation
Chanchai, Withaya Dr; Nacglud, Ratree Ms; Bunnum, Keatkongkrai Mr.; Promsorn, Nureeya Mrs.; Duangmusik, Laddawan Mrs.; Thuwanrat, Warunee Mrs.; Chantasin, Wichuda; and Thonnan, Kritsana Ms. (2024) "Prevalence and Factors Associated with Work-Related Musculoskeletal Disorder among Central Sterile Supply Technicians in Nakhon Si Thammarat Province, Thailand," *Chulalongkorn Medical Journal*: Vol. 68: Iss. 4, Article 3.
DOI: https://doi.org/10.56808/2673-060X.5398
Available at: https://digital.car.chula.ac.th/clmjournal/vol68/iss4/3

Prevalence and Factors Associated with Work-Related Musculoskeletal Disorder among Central Sterile Supply Technicians in Nakhon Si Thammarat Province, Thailand

Abstract

Background: Central Sterile Supply Technicians (CSSTs) face an elevated risk of work-related musculoskeletal disorders (WMSDs), notably affecting the back.

Objective: This study aimed to examine the prevalence and factors associated with work-related musculoskeletal disorders among CSSTs in Nakhon Si Thammarat Province, Thailand.

Methods: A cross-sectional study in Nakhon Si Thammarat, Thailand, assessed WMSDs among CSSTs using self-administered questionnaires on demographics and symptoms. Out of 188 distributed, 179 were completed, evaluating disorder presence and severity during sterilization in 33 hospitals.

Results: The prevalence rate of work-related musculoskeletal disorders (WMSDs) in various body regions, particularly the upper back, at the time of questioning (88.2%), during the past week (79.3%), and over the past year (77.7%). Technicians with over 30 years of experience showed a significantly higher risk of musculoskeletal disorders (OR 8.71, 95% CI 1.44 - 6.29). CSSTs with over ten years of employment showed significant associations (OR 7.86, 95% CI 1.30 - 5.01). Other factors included working day shifts (OR 19.17, 95% CI 10.22 - 120.46), heavy load handling (OR 20.01, 95% CI 10.76 - 153.55), lifting of instruments (OR 2.01, 95% CI 1.40 - 5.52), transporting equipment or carts (OR 2.99, 95% CI 1.89 - 7.27), pushing equipment or carts (OR 9.19, 95% CI 1.40 - 5.52), carrying instruments (OR 5.58, 95% CI 1.13 - 4.27), and uncomfortable postures (OR 7.65, 95% CI 1.38 - 7.57).

Conclusion: These findings highlight the high prevalence of work-related musculoskeletal disorders among CSSTs, particularly impacting the upper back. Factors such as prolonged employment and physically demanding tasks significantly contribute to these disorders.

Keywords

Musculoskeletal disorders, Risk factors, Central Sterile Supply Technicians

Cover Page Footnote

This study was conducted by the Department of Occupational Health and Safety, Faculty of Medicine, Siam University, Bangkok, in collaboration with the Center for Biomedical Innovation, Healthmedic Innovation Academy (HMDA), Bangkok, Thailand. The research was made possible through the cooperation and participation of CSSTs across multiple centers within the Central Sterile Supply Departments (CSSD) of all surveyed hospitals. Special acknowledgment is extended to the respondents from the 32 hospitals in Nakhon Si Thammarat Province, Thailand, whose contributions were essential to the success of this study. This was supported by the fund of Siam University (Grant agreement No.004/11/2566 and 2131101-66030).

Authors

Withaya Chanchai Dr, Ratree Nacglud Ms, Keatkongkrai Bunnum Mr., Nureeya Promsorn Mrs., Laddawan Duangmusik Mrs., Warunee Suwanrat Mrs., Wichuda Chantasin, and Kritsana Thonnan Ms.

Chula Med J Vol. 68 No. 4 October - December 2024 ; 251 - 259 DOI : 10.56808/2673-060X.5398

Original article

Prevalence and factors associated with work-related musculoskeletal disorder among central sterile supply technicians in Nakhon Si Thammarat Province, Thailand

Withaya Chanchai [a, *], Ratree Nacglud [b], Keatkongkrai Bunnum[c], Nureeya Promsorn[d], Laddawan Duangmusik[e], Warunee Suwanrat[f], Wichuda Chantasin[g] Kritsana Thonnan[h]

[a]*Department of Public Health, Major in Occupational Health and Safety, Faculty of Medicine, Siam University, Bangkok, Thailand*
[b]*Department of Central Sterile Supply Unit, Sichon Hospital, Nakhon Si Thammarat, Thailand*
[c]*Department of Central Sterile Supply Unit, Chawang Crown Prince Hospital, Nakhon Si Thammarat, Thailand*
[d]*Department of Central Sterile Supply Unit, Maharaj Nakhon Si Thammmarat Hospital, Nakhon Si Thammarat, Thailand*
[e]*Department of Central Sterile Supply Unit, Thasala Hospital, Nakhon Si Thammarat, Nakhon Si Thammarat, Thailand*
[f]*Department of Central Sterile Supply Unit, Promkiri Hospital, Nakhon Si Thammarat, Thailand*
[g]*Faculty of Public Health, Valaya Alongkorn Rajabhat University under the Royal Patronage, Pathum Thani, Thailand*
[h]*Center for Biomedical Innovation, Healthmedic Innovation Academy, Bangkok, Thailand*

Abstract

Background: Central sterile supply technicians (CSSTs) have a high risk of work-related musculoskeletal disorders (WMSDs), notably affecting the back.
Objective: This study aimed to examine the prevalence and factors associated with WMSDs among CSSTs in Nakhon Si Thammarat Province, Thailand.
Methods: A cross-sectional study assessed WMSDs among CSSTs in Nakhon Si Thammarat using self-administered questionnaires on demographics and symptoms. Out of 188 distributed questionnaires, 179 were completed, which evaluated the presence and severity of the disorders during sterilization in 33 hospitals.
Results: The prevalence of WMSDs in various body regions, particularly the upper back, at the time of questioning, during the past week, and over the past year was 88.2%, 79.3%, and 77.7%, respectively. Technicians with >30 years of experience showed a significantly higher risk of WMSDs (odds ratio [OR] 8.7, 95% confidence interval [CI] 1.4–6.3). CSSTs with >10 years of employment showed significant associations with WMSDs (OR 7.9, 95% CI 1.3–5.0). Other factors included working day shifts (OR 19.2, 95% CI 10.2–120.5), heavy load handling (OR 20.0, 95% CI 10.8–153.6), lifting of instruments (OR 2.0, 95% CI 1.4–5.5), transporting equipment or carts (OR 3.0, 95% CI 1.9–7.3), pushing equipment or carts (OR 9.2, 95% CI 1.4–5.5), carrying instruments (OR 5.6, 95% CI 1.1–4.3), and uncomfortable postures (OR 7.7, 95% CI 1.4–7.6).
Conclusion: These findings highlight the high prevalence of WMSDs among CSSTs, particularly affecting the upper back. Factors such as prolonged employment and physically demanding tasks significantly contribute to these disorders.

Keywords: Central sterile supply technicians, musculoskeletal disorders, risk factors.

Work-related musculoskeletal disorders (WMSDs) are a significant issue among healthcare workers, primarily due to the nature of their jobs, which involve repetitive motions, heavy lifting, and prolonged periods of standing or awkward postures. [1] These disorders present pain, numbness, stiffness, swelling, weariness, irritability, general loss of control, etc. The National Institute for Occupational Safety and Health in the United States classifies these conditions as musculoskeletal disorders (MSDs), which affect the bones, nerves, tendons, ligaments, joints, cartilage, blood vessels, and spinal discs. [2]

***Correspondence to: Withaya Chanchai,** Department of Public Health, Major in Occupational Health and Safety, Faculty of Medicine, Siam University, Bangkok, 10160, Thailand.
E-mail: withaya.cha@siam.edu
Received: December 25, 2023
Revised: June 8, 2024
Accepted: July 12, 2024

WMSDs have a profound effect on healthcare workers, such as decreased productivity, increased absenteeism, and a higher incidence of disability. The Global Burden of Diseases 2017 report highlights that MSDs are the second most common cause of shortened lifespan globally, despite the decline in the number of years of life lost due to injury in Sub-Saharan Africa. [3, 4] This finding has also drawn attention from the European Agency for Safety and Health in the Workplace.

The high prevalence and significant consequences of WMSDs in healthcare settings underscore the urgent need for further research. Such research should consider physical and demographic factors, complexity of these disorders, and variations in working conditions across different regions, including developing countries. In addition, the growth of central sterilization techniques and accessibility of central sterile supply department (CSSD) facilities are critical areas for the development of effective prevention and management strategies for WMSDs. [5]

Central sterile supply technicians (CSSTs, also known as sterile processing technicians or sterile technicians) are crucial members of the healthcare team, who are responsible for ensuring the cleanliness, sterilization, and organization of medical instruments, equipment, and supplies. They are responsible for the sterilization and disinfection of medical instruments and equipment to prevent the spread of infections. [6] They must follow strict protocols and guidelines to ensure proper cleaning, decontamination, and sterilization. CSSTs inspect instruments and equipment for damage, functionality, and proper functioning. They identify any broken or malfunctioning instruments and take appropriate actions, such as repairing or replacing them, to ensure safe and effective use. They are responsible for assembling surgical instrument trays and sets and ensuring all necessary instruments and supplies are present and in proper working order. They follow specific guidelines to ensure appropriate packaging, labeling, and identification of sterilized instruments and equipment. [5 - 7]

CSSTs maintain inventory levels of sterile supplies and instruments, monitor usage, and reorder as necessary. They handle instruments and equipment, prepare items for sterilization, and decontaminate, restock, and assemble surgical trays and case carts. They ensure specialty carts are ready for immediate use; perform quality control to confirm the proper functioning of sterilization equipment and instruments; inspect for cleanliness, defects, and malfunctions; document sterilization cycles; label products with sterilization dates; and perform other related tasks. CSSTs are susceptible to ergonomic hazards because of repetitive motions during instrument assembly, wrapping of sterilization items, and prolonged periods of standing or bending. These activities can lead to WMSDs. Technicians perform routine maintenance and quality control checks on sterilization equipment, such as autoclaves, washers, and ultrasonic cleaners, to ensure that they are functioning properly. [8 - 10] They collaborate with other healthcare professionals, including surgeons, nurses, and operating room staff, to ensure the timely availability of sterilized instruments and supplies. One-third of all sick leaves by CSSTs are due to back, neck, and shoulder pain caused by MSDs. One main cause of these diseases is the increased exposure to the heavy physical demands involved in moving and transporting sterile medical equipment. The CSSD is among some of the riskiest places in the hospital to work. CSSTs put significant time and effort into all sterilization procedures. They are required to stand for long periods while maintaining one posture and possibly contorting their bodies to acquire access to the sterilization field. [11, 12] One in four CSST visits to the doctor is for lower back discomfort. WMSDs have been identified as a major contributor to lost workdays and sick leave among CSSTs. [12, 13] Multiple studies have found a significant prevalence of WMSDs among high-risk healthcare professionals. Numerous injuries resulted in early retirement and a pressing need for interventions despite inadequate support from the workplace. [13 - 15]

More studies on the prevalence and contributing factors of MSDs among CSSTs in Thailand are needed. Addressing this gap is crucial for the development of effective occupational health strategies. Therefore, this study aimed to assess the prevalence and factors associated with WMSDs among CSSTs in Nakhon Si Thammarat Province, Thailand. This focus on Nakhon Si Thammarat Province is important owing to the unique working conditions and demographics of the region, which may contribute to a higher incidence of WMSDs among CSSTs. Understanding these local factors is essential for tailoring interventions and improving the health and well-being of these crucial healthcare workers.

Materials and methods

This cross-sectional study was conducted between April 2023 and July 2023 at 33 hospitals in Nakhon Si Thammarat Province, Thailand. The study population included 188 CSSTs, who are typically crucial members of the healthcare team responsible for ensuring the cleanliness, sterilization, and organization of medical instruments, equipment, and supplies. This study focused exclusively on CSSTs employed by the CSSD during the study period and who met the established inclusion criteria. Specifically, the research encompassed full-time CSSTs with a minimum of 1 year of experience as CSSTs in the CSSD. Participants with extremity injuries were excluded from the study because these injuries may cause long-term disability, significantly impair health-related quality of life, and result in prolonged work absences. This exclusion criterion ensures the accuracy of findings related to MSDs directly associated with occupational factors within the CSSD. The participating hospitals, chosen by purposive sampling, were asked to encourage CSSTs to fill out a questionnaire to complete at their own time. Nine participants were excluded because they did not qualify or did not finish the questionnaire. All CSSTs at this facility took part in a self-evaluation by filling out a questionnaire. CSSTs with shift schedules between 8.00 a.m. and 4.00 p.m. work in the morning shift; 4.00 p.m., and 12.00 a.m., afternoon shift; and 12.00 a.m. and 8.00 a.m., night shift.

This study was approved by the Nakhon Si Thammarat Provincial Public Health Office Review Board in Thailand (NSTPH no. 020/2023). Before the evaluation, every participant signed an informed consent form stating their desire to participate in the study.

Data collection

Self-report questionnaires were used to collect the data. Data on participants' demographics, employment, and musculoskeletal symptoms were collected using standard questionnaires. Kuorinka L, *et al.* [16] validated the Nordic musculoskeletal questionnaire (NMQ) to assess MSD prevalence. The NMQ has been translated into Thai [17, 18] and has satisfactory reliability. The research instruments were validated for accuracy by three specialized experts: central supply specialists, ergonomists, and physicians.

Furthermore, the reliability of these instruments was evaluated among 30 CSSTs located in neighboring provinces, resulting in a Cronbach's alpha coefficient of 0.90. The survey encompassed personal demographic data and MSD assessments. The characteristics included age, educational level, income, working hours, and tenure in the same position. The participants were asked to indicate on a body diagram chart any MSD symptoms they had experienced over the preceding body region during the last 12 months, during the past week, and at present during the answering of the questionnaire. The entire body was examined, which included the head, neck, shoulders, elbows, lower back, hands, hips, thighs, buttocks, knees, and feet. Musculoskeletal pain (including aches, pains, discomfort, and numbness) was described in the survey as "preventing them from carrying out everyday activities (such as work, housework, and hobbies)". The research involved assigning binary scores to determine final rankings. Upon hiring, the hospital considered previous experience in CSSD tasks, which include lifting, transporting, pulling, pushing, carrying, and gripping. Participants were presented with several activities and asked to indicate their frequency of engagement by selecting from options such as "sometimes", "often", "always", or "never". The frequency of these activities varies depending on specific roles within the CSSD. Responses indicating "sometimes" or "never" were categorized as "rare", whereas those indicating "often" or "always" were categorized as "frequent".

Statistical analysis

Data were analyzed using IBM SPSS Statistics for Windows version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequency and percentages) summarized the data. Demographic and work-related information were presented as means and standard deviations. Logistic regression was used to calculate the odds ratio (OR) of factors related to the musculoskeletal condition. Statistical analysis was performed at a 95% confidence interval (CI) with significance set at $P < 0.05$.

Results

The response rate from the 179 CSSTs who were asked to participate in the study was 95.2%. According to the data collected, most participants were female

(84.9%), with a mean age of 42.2 ± 10.9 years. With a mean body mass index of 26.0 ± 9.5 kg/m², the participants' body weights were within the healthy range. Respondents' average duration working at their current CSST position was 10.7 ± 9.5 years. In terms of educational level, 55.9% held a bachelor's degree, and 82.1% earned <15,000 Baht monthly. **Table 1** shows that more than half (63.7%) of the respondents worked the morning shift from 07:00 a.m. to 03:00 p.m. In addition, 75.9% of the CSSTs had a perceived health status that was fair or poor.

Table 2 presents the prevalence rates of musculoskeletal symptoms by body area among CSSTs, as determined by the NMQ results. The data show the frequency of musculoskeletal complaints in various body regions among CSSTs at present, during the past week, and over the past year.

Currently, 86.0% of the CSSTs reported musculoskeletal problems. Upper back discomfort is the most common, reported by 158 technicians (86.6%), followed by lower back pain by 155 technicians (83.3%). Other areas of discomfort

Table 1. Central sterile supply technicians' demographic characteristics (n = 179).

Characteristic	n (%)
Age (years), mean ± SD	42.2 ± 10.9
Body mass index (BMI) (kg/m²), mean ± SD	26.0 ± 9.5
Years of working (years), mean ± SD	10.7 ± 9.5
Gender	
Male	27 (15.1)
Female	152 (84.9)
Education level	
Lower Bachelor's Degree	100 (55.9)
Bachelor's Degree or higher	79 (44.1)
Marital status	
Single	53 (29.6)
Married	109 (60.9)
Divorced/separated	17 (9.5)
Income (Thai Baht, THB*)	
≤ 15,000	147 (82.1)
> 15,001	32 (17.9)
Exercise	
< 3 times/week	99 (53.3)
≥ 3 times/week	80 (44.7)
Current alcohol consumption	
No	146 (81.6)
Yes	33 (18.4)
Smoking	
No	158 (88.3)
Yes	21 (11.7)
Perceived health status	
Good-very good	45 (25.1)
Poor-fair	134 (74.9)
Performed shift work	
Morning shift	114 (63.7)
Afternoon	63 (35.2)
Night shift	2 (1.1)

*1 USD, 35 Thai Baht

Table 2. The prevalence rate of the reported WRMSDs in different body regions among the studied technicians (n = 179).

Body region	During the last 12 months n (%)	During the past week n (%)	At present n (%)
Neck	16 (8.9)	39 (21.8)	33 (18.4)
Shoulders	20 (11.2)	23 (12.8)	36 (20.1)
Elbows	10 (5.6)	15 (8.4)	20 (11.2)
Wrists/hands	22 (12.3)	28 (15.6)	63 (35.2)
Upper back	139 (77.7)	142 (79.3)	158 (88.2)
Lower back	138 (71.7)	140 (78.2)	155 (86.6)
Thighs	18 (10.1)	25 (14.0)	31 (17.3)
Knees	21 (11.7)	20 (11.2)	67 (37.5)
Ankles/feet	36 (20.1)	21 (11.7)	68 (38.0)
WRMSDs in at least one body region	106 (59.2)	115 (64.2)	154 (86.0)

include ankles/feet (n = 68, 38.0%), knees (n = 67, 37.5%), wrists/hands (n = 63, 35.2%), neck (n = 33, 21.8%), shoulders (n = 36, 20.1%), thighs (n = 31, 17.3%), and elbows (n = 20, 11.2%).

Over the past week, 64.2% of the CSSTs reported musculoskeletal problems, with 142 (79.2%) technicians reporting lower back discomfort and 142 (79.3%) complaining of upper back discomfort. Other reported areas include wrists/hands (n = 28, 15.6%), thighs (n = 25, 14.0%), shoulders (n = 23, 12.8%), ankles/feet (n = 21, 11.7%), neck (n = 39, 8.9%), and elbows (n = 15, 8.4%).

Over the past year, 59.2% of CSSTs reported musculoskeletal problems, including 139 technicians (77.7%) reporting upper back discomfort, and 138 (71.1%) complaining of lower back pain. Additional areas of discomfort include ankles/feet (n = 36 individuals, 20.1%), wrists/hands (n = 22, 12.3%), knees (n = 21, 11.7%), shoulders (n = 20, 11.2%), thighs (n = 18, 10.1%), neck (n = 16, 8.9%), and elbows (n = 10, 5.6%).

These findings highlight the significant prevalence of MSDs among CSSTs, particularly in the upper and lower back regions.

The results of the multiple logistic regression analysis are presented in **Table 3.** Significant increases in the prevalence of MSD symptoms were observed among CSSTs aged >30 years (OR 8.7, 95% CI 1.4–6.3). In addition, MSD symptoms were significantly associated with >10 years of employment (OR 7.9, 95% CI 1.3–5.0). Other significant factors included working dayshifts (OR 19.2, 95% CI 10.2–120.5), heavy load handling (OR 20.1, 95% CI 10.8–153.6), lifting instruments (OR 2.0, 95% CI 1.4–5.5), transporting equipment or carts (OR 3.0, 95% CI 1.9–7.3), pushing equipment or carts (OR 9.19, 95% CI 1.4–5.5), carrying instruments (OR 5.6, 95% CI 1.1–4.3), and maintaining uncomfortable postures (OR 7.7, 95% CI 1.4–7.6). These factors were significantly associated with the occurrence of MSDs.

Discussion

This study, which was conducted in Nakhon Si Thammarat Province, Thailand, identified a significant prevalence of MSDs among CSSTs. The most commonly reported MSD was upper back pain, followed closely by lower back pain. Other frequently reported MSDs included discomfort in the ankle/foot, wrist/hand issues, knee problems, shoulder pain, thigh discomfort, neck pain, and elbow issues.

The nature of CSSTs' tasks, which involve heavy load handling, instrument lifting, equipment transportation, cart pushing, instrument carrying, and prolonged periods in uncomfortable postures, contributes significantly to their high risk of developing MSDs. Compared with other healthcare professionals such as cytotechnologists (58.5%), physiotherapists (58.0%), and dentists (53.0%) [19], CSSTs exhibited a markedly higher prevalence of MSDs >12 months, underscoring the severity of the issue in this occupational group. A possible explanation for this discrepancy is that while CSSTs and healthcare professionals are responsible for the operation of medical equipment or carts and lifting and moving them, the tasks of each group are different. [20, 21] The findings of this study may be inconsistent with those

Table 3. Multivariate logistic regression analysis of risk factors of self-reported 12-month prevalence of MSDs among technicians (n = 179).

12-month prevalence of MSDs	n (%)	Multivariate		
		OR	95% CI	*P* - value
Age (year)				
Less than 30	38 (32.5)	reference		
30 or older	141 (67.5)	8.7	1.4 - 6.3	0.003*
Marital Status				
Single or divorce	70 (39.1)	reference		
Married	109 (60.9)	0.3	0.5 - 1.6	0.573
Monthly income (Bath*)				
≤ 15,000	100 (55.9)	reference		
>15,001	79 (44.1)	0.3	0.5 - 1.6	0.605
Education level				
Lower Bachelor's Degree	100 (55.9)	reference		
Bachelor's Degree or higher	79 (44.1)	0.6	0.2 - 3.3	0.511
Nutritional status				
Healthy weight (BMI ≤ 24.9 kg/m^2)	96 (53.6)	reference		
Overweight (BMI > 24.9 kg/m^2)	83 (46.4)	0.8	0.7 - 2.5	0.386
Current alcohol consumption				
Yes	146 (81.6)	reference		
No	33 (18.4)	3.4	0.9 - 5.5	0.064
Smoking				
Yes	158 (88.3)	reference		
No	21 (11.7)	1.3	0.6 - 5.2	0.254
Years of employed (year)				
10 or less	71 (39.7)	reference		
More than 10	108 (60.3)	7.9	1.3 - 5.0	0.004*
Work schedule				
Day work	114 (63.7)	reference		
Afternoon shift work	65 (36.3)	19.2	10.2 - 120.5	< 0.001*
Lifting of instruments				
Rare	70 (39.1)	reference		
Frequent	109 (60.9)	2.0	1.4 - 5.5	0.002*
Heavy load handling equipment or carts				
Rare	74 (41.3)	reference		
Frequent	105 (58.7)	20.1	10.8 - 153.6	< 0.001*
Transporting of equipment or carts				
Rare	93 (48.0)	reference		
Frequent	86 (52.0)	3.0	1.9 - 7.3	0.041*
Pulling of equipment or carts				
Rare	87 (48.6)	reference		
Frequent	92 (51.4)	0.3	0.5 - 1.5	0.558
Pushing of equipment or carts				
Rare	70 (39.1)	reference		
Frequent	109 (60.9)	9.2	1.4 - 5.5	0.002*

Table 3. (Cont.) Multivariate logistic regression analysis of risk factors of self-reported 12-month prevalence of MSDs among technicians (n = 179).

12-month prevalence of MSDs	n (%)	Multivariate		
		OR	95% CI	*P* - value
Carrying of instruments				
Rare	70 (39.1)	reference		
Frequent	109 (60.9)	5.6	1.1 - 4.3	0.018*
Griping of instruments				
Rare	94 (52.5)	reference		
Frequent	85 (47.5)	0.0	0.5 - 1.8	0.861
Repetitive movement				
Rare	74 (58.7)	reference		
Frequent	105 (41.3)	4.6	1.1 - 3.9	0.033*
Uncomfortable postures				
Rare	73 (42.9)	reference		
Frequent	106 (39.3)	7.7	1.4 - 7.6	0.020*
Prolonged standing				
Rare	108 (60.3)	reference		
Frequent	71 (39.7)	0.2	0.2 - 1.2	0.651
Physical and mental stress				
Yes	51 (71.5)	reference		
No	128 (28.5)	2.2	0.9 - 2.9	0.135

*$P < 0.05$

of other studies because of differences in research methodologies, protocols, and sample strategies. Over 85% of the participants said they have experienced pain in both their upper and lower backs. Cheung K, *et al.* [1] and Chanchai W, *et al.* [17] also observed that 74.5% of hospital-based healthcare workers experienced MSDs, with upper and lower back pains being the most common symptoms. [1 - 3, 17] MSDs are deemed to be present in 43%–76% of workers. [18 - 21] CSSTs with >10 years of hospital experience had a higher prevalence of musculoskeletal illnesses. This may be because they perform various tasks, including heavy load handling instruments during manual cleaning, lifting instruments for manual cleaning and auto washer cleaning machine, transporting equipment or carts from department to wards, pushing equipment or carts during sterilization, carrying instruments from preparation to packing, and uncomfortable postures all days in the department. [19, 20]

Furthermore, the prevalence of musculoskeletal ailments was higher among CSSTs with >10 years of experience in hospital settings. This demographic likely experiences heightened exposure to physically demanding tasks, including handling heavy loads during manual and machine-based instrument cleaning, transporting equipment, pushing carts during sterilization, and enduring prolonged uncomfortable postures throughout their shifts. Previous studies have linked MSDs to activities such as prolonged standing, uncomfortable postures, and physical and mental stress [18, 19], as well as positions that are too awkward or exhausting [22], awkward grasping and hand movements [18, 20], repetitive movements [18], and lengthy shifts. In addition, 250 (80.0%) of the nurses who reported lower back discomfort were engaged in patient care and heavy load handling, although all nurses are exposed to these situations at some point in their employment. Constantly standing and poor posture when providing patient care, as well as lifting and transferring patients, may contribute to this discomfort. [1,18 - 22] This agrees with earlier studies revealing that bending, twisting, and lifting heavy objects are among the leading causes of lower back discomfort. [1 - 3, 18] Sterilization procedures, repetitive motions, carrying large loads, and frequent lifting were identified as important risk factors for MSDs.

Repetitive activities such as twisting an arm or wrist, overworking a muscle, or standing awkwardly can lead to sore muscles and unpleasant emotions. Because of the constant need for repetitive motions in caring for, lifting, and moving equipment, it is not shocking that the CSSTs suffered from MSDs. This conclusion lends credence to the findings of Cheung K, *et al.*[1], who discovered a link between high levels of repetitive motions and MSDs. Daily sterilization procedures and transfer of equipment or carts by people who are overweight or obese also increased the likelihood of MSDs occurring among CSSTs. These tasks exert excessive strain on the upper vertebrae, leading to poor posture and clumsy motions. This finding is consistent with the data of Holtermann A, *et al*. [23], who linked MSDs to the heavy lifting involved in sterilization procedures from various departments to all centers in hospitals.

According to a review of workstations, technicians who were responsible for heavy load handling equipment or carts, lifting, and transferring equipment or carts from one workstation to another, have a significantly higher risk of developing MSDs. This result agrees with the findings of other studies. The incidence of MSDs among CSSTs was much higher if they carried heavy loads, handled equipment or carts, handled heavy loads, lifted instruments, transported equipment or carts, pushed equipment or carts, carried instruments, and stood in uncomfortable postures. [24, 25] Therefore, the workstation should be modified according to engineering principles to have ergonomic reprocessing sinks in medical clean stations, ergonomic height-adjustable tables for wrapping medical equipment, antifatigue mats, suitable chair, short break adjustments, and policy changes from the organization, which will help reduce the incidence of fatigue. [26]

However, statistical analysis of the current data did not reveal significant association between MSDs and activities of pulling equipment or carts, gripping instruments, prolonged standing, physical and mental stress, uncomfortable postures, patient transfer activities, and work shift durations. Although medical care, spontaneous healing, and psychotherapeutic interventions can assist CSSTs in recovering from work-related injuries, several limitations constrained the scope of this study. All participants were from a single province in one geographic area, and no appropriate scale was used to evaluate the pain or discomfort experienced by the study participants.

Conclusion

Upper back discomfort is the most common work-related injury among Thai CSSTs in Nakhon Si Thammarat Province, Thailand. Thus, instituting educational initiatives to promote knowledge of these risk factors may lessen the prevalence of WMSDs among CSSTs and boost productivity. We propose implementing effective and participatory intervention programs to decrease occupational exposure among Thai CSSTs.

Acknowledgments

This study was conducted by the Department of Occupational Health and Safety, Faculty of Medicine, Siam University, Bangkok, in collaboration with the Center for Biomedical Innovation, Healthmedic Innovation Academy (HMDA), Bangkok, Thailand. The research was made possible through the cooperation and participation of CSSTs across multiple centers within the Central Sterile Supply Departments (CSSD) of all surveyed hospitals. Special acknowledgment is extended to the respondents from the 32 hospitals in Nakhon Si Thammarat Province, Thailand, whose contributions were essential to the success of this study. This was supported by the fund of Siam University (Grant agreement no. 004/11/2566 and 2131101-66030).

Conflict of interest statement

Each of the authors has completed an ICMJE disclosure form. None of the authors declare any potential or actual relationship, activity, or interest related to the content of this article.

Data sharing statement

All data generated or analyzed during the present study are included in this published article. Further details are available for noncommercial purposes from the corresponding author on reasonable request.

References

1. Cheung K, Szeto G, Lai GKB, Ching SSY. Prevalence of and factors associated with work-related musculoskeletal symptoms in nursing assistants working in nursing homes. Int J Environ Res Public Health 2018;15:265.
2. Yizengaw MA, Mustofa SY, Ashagrie HE, Zeleke TG. Prevalence and factors associated with work-related

musculoskeletal disorder among health care providers working in the operation room. Ann Med Surg (Lond) 2021;72:102989.
3. Buruck G, Tomaschek A, Wendsche J, Ochsmann E, Dörfel D. Psychosocial areas of worklife and chronic low back pain: a systematic review and meta-analysis. BMC Musculoskelet Disord 2019;20:480.
4. GBD 2015 Disease and injury incidence and prevalence collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global burden of disease study 2015. Lancet 2016;388:1545-602.
5. Xavier RS, Vigário PDS, Faria ACD, Dusek PM, Lopes AJ. The perception of nursing professionals working in a central sterile supplies department regarding health conditions, workload, ergonomic risks, and functional readaptation. Adv Prev Med 2022;2022:1023728.
6. Damrongkhunawut P, Chanchai W. Effectiveness of personal protective equipment in preventing coronavirus infection and emerging infectious diseases among central service technicians in Thailand. Int J Nurs Health Care Res 2023;6:1-6.
7. Hämmig O. Work- and stress-related musculoskeletal and sleep disorders among health professionals: a cross-sectional study in a hospital setting in Switzerland. BMC Musculoskelet Disord 2020;21:319.
8. Mai HB, Kim J. The role of job resources in the relationship between job demands and work-related musculoskeletal disorders among hospital nurses in Thua Thien Hue Province, Vietnam. Int J Environ Res Public Health 2022;19:4774.
9. Yasobant S, Rajkumar P. Work-related musculoskeletal disorders among health care professionals: A cross-sectional assessment of risk factors in a tertiary hospital, India. Indian J Occup Environ Med 2014;18:75-81.
10. Clari M, Godono A, Garzaro G, Voglino G, Gualano MR, Migliaretti G, et al. Prevalence of musculoskeletal disorders among perioperative nurses: a systematic review and META-analysis. BMC Musculoskelet Disord 2021;22:226.
11. Jacquier-Bret J, Gorce P. Prevalence of body area work-related musculoskeletal disorders among healthcare professionals: A systematic review. Int J Environ Res Public Health 2023 ;20:841.
12. Rego GMV, Rolim ILTP, D'Eça Júnior A, Sardinha AHL, Lopes GSG, Coutinho NPS. Quality of life at work in a central sterile processing department. Rev Bras Enferm 2020;73:e20180792.
13. Dong H, Zhang Q, Liu G, Shao T, Xu Y. Prevalence and associated factors of musculoskeletal disorders among Chinese healthcare professionals working in tertiary hospitals: a cross-sectional study. BMC Musculoskelet Disord 2019;20:175.
14. Clari M, Garzaro G, Di Maso M, Donato F, Godono A, et al. Upper limb work-related musculoskeletal disorders in operating room nurses: A multicenter cross-sectional study. Int J Environ Res Public Health 2019;16:2844.
15. Akodu AK, Ashalejo ZO. Work-related musculoskeletal disorders and work ability among hospital nurses. J Taibah Univ Med Sci 2019;14:252-61.
16. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon 1987;18:233-7.
17. Chanchai W, Songkham W, Ketsomporn P, Sappakitchanchai P, Siriwong W. Prevalence and factors associated with musculoskeletal disorders among Thai hospital orderlies. Int J Occup Hyg 2015; **7**:132-8.
18. Chanchai W, Songkham W, Ketsomporn P, Sappakitchanchai P, Siriwong W, Robson MG. The impact of an ergonomics intervention on psychosocial factors and musculoskeletal symptoms among Thai hospital orderlies. Int J Environ Res Public Health 2016;13:464.
19. Jacquier-Bret J, Gorce P. Prevalence of body area work-related musculoskeletal disorders among healthcare professionals: a systematic review. Int J Environ Res Public Health 2023;20:841.
20. Chenna D, Pentapati KC, Kumar M, Madi M, Siddiq H. Prevalence of musculoskeletal disorders among dental healthcare providers: A systematic review and meta-analysis. F1000Res 2022;11:1062.
21. Nino L, Marchak F, Claudio D. Physical and mental workload interactions in a sterile processing department. Int J Ind Ergon 2020;76:102937.
22. Nemera A, Eliyas M, Likassa T, Teshome M, Tadesse B, Dugasa YG, et al. Magnitude of work-related musculoskeletal disorders and its associated factors among Ethiopian nurses: a facility based cross-sectional study. BMC Musculoskelet Disord 2024; 25:452.
23. Holtermann A, Clausen T, Jørgensen MB, Burdorf A, Andersen LL. Patient handling and risk for developing persistent low-back pain among female healthcare workers. Scand J Work Environ Health 2013;39:164-9.
24. Xavier RS, Vigário PDS, Faria ACD, Dusek PM, Lopes AJ. the perception of nursing professionals working in a central sterile supplies department regarding health conditions, workload, ergonomic risks, and functional readaptation. Adv Prev Med 2022;2022:1023728.
25. Moreira da-Silva V, Pontes DO, Pereira PPDS, Monteiro JC, Cruz MN. Evaluation of working conditions at a central sterile services department in northern Brazil. Rev Bras Med Trab 2021;19:472-81.
26. Nguyen TT, Nguyen TH, Hoang DL, Hoang TG, Pham MK. Effectiveness of interventions to prevent musculoskeletal disorders among district hospital nurses in Vietnam. Biomed Res Int 2022;2022:1539063.