



Musculoskeletal complaints among central sterile supply technicians in relation to physical and psychosocial factors at work

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ABSTRACT

Objective: The objective was to examine the prevalence of musculoskeletal complaints (MSCs) among central sterile supply technicians (CSSTs) in relation to their physical workload and psychosocial factors at work. **Material and Methods:** A cross-sectional study was conducted in 2013 among 64 CSSTs working in the central sterile supply department of a tertiary care hospital in Saudi Arabia. A questionnaire was used to collect data on demographic characteristics, physical workload, and psychosocial factors at work. Furthermore, a Nordic Questionnaire was used to examine the prevalence of MSCs among the participants. **Results:** The study showed that the overall 1-year prevalence of MSCs at anybody site of the participants was 43.8%. The reported MSCs were mostly related to the low back (28.1%), followed by wrists/hands (23.4%) and shoulders (21.9%). Age, gender, and BMI were not associated with MSCs. Work requiring exertion of arms/hands, and working in awkward postures were the only physical work factors that were significantly ($P < 0.05$) higher among CSSTs who had MSCs (89.3%, 57.1%, respectively) compared to CSSTs who had not (69.4%, 30.6%, respectively). Psychosocial factors at work did not show a significant difference between CSSTs who had MSCs and those who had not. **Conclusion:** 43.8% of the CSSTs reported 1-year prevalence of MSCs affecting mostly low back, wrists/hands, and shoulders. Ergonomic assessment and preventive intervention should be conducted to prevent the incidence of MSCs among CSSTs through controlling both physical and psychosocial risk factors at their workplace.

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INTRODUCTION

Work-related musculoskeletal disorders are defined as musculoskeletal disorders that are caused or aggravated by work and characterized by discomfort, impairment, disability or persistent pain in joints, muscles, tendons, and other soft tissues, with or without physical manifestations [1-4]. The musculoskeletal disorders are considered a leading cause of occupational injury and disability in the developed and industrially developing countries [5,6], accounting for a high proportion of sickness absence from work [7].

While the work-related musculoskeletal disorders have been extensively investigated among healthcare workers (HCWs)

such as nurses and direct patient care occupations [2,5,8-14], little is known about indirect patient care occupations such as central sterile supply technicians (CSSTs) [15]. CSSTs have various responsibilities, depending on which area of a central sterile supply department they are tasked to work in; but, since they often rotate through different areas, most of them share some common duties. CSSTs are responsible for the cleaning and reprocessing of instruments and equipment; and they are doing the following tasks: (a) Order, restock and decontaminate sterilization equipment and instruments, (b) collect dirty equipment and instruments, (c) sort, load, unload and decontaminate equipment and instruments according to procedures, (d) clean, repackage, and sterilize instruments, (e) assemble trays, basin sets, packages,

instruments and equipment and prepare items for sterilization, (f) decontaminate, restock and assemble case carts and surgical trays, (g) Ensure specialty carts are stocked and ready for immediate use, (h) perform quality control through routine testing and cleaning to assure sterilization equipment and instruments are functioning properly, (i) inspect equipment, instruments, and packaging for cleanliness, defects and/or malfunctions, (j) document sterilization cycle, label products with sterilization date and perform other duties as assigned or required [16,17]. CSSTs are exposed to ergonomic hazards due to repetitive motions of instrument assembly, wrapping items for sterilization, prolonged periods of standing or bending which could lead to work-related musculoskeletal disorders [16,18]. Hence, the objective of the current study was to study the prevalence of musculoskeletal complaints (MSCs) among CSSTs in relation to their physical workload and psychosocial factors at work.

MATERIALS AND METHODS

A cross-sectional study was conducted during the period from March to December 2013 among 75 CSSTs who were working at the central sterile supply department of King Abdulaziz Medical City, Riyadh, Saudi Arabia. Of the 75 CSSTs, only 64 accepted to participate in the study which was initially reviewed and ethically approved by King Abdulla International Medical Research Center (KAIMRC) in Saudi Arabia.

A self-reported questionnaire was used including five parts. The first part included questions to collect information on demographic characteristics such as gender, age, height, weight, and smoking. The second part was concerned with the occupational health practice among CSSTs to collect information on years of practice as CSST, job description, work-place environment, and work schedule. The third part was based on the standardized Nordic Questionnaire [19] including questions on MSCs in 1 year prior to the survey, for 9 body areas including neck, shoulders, upper back, elbows, wrists/hands, low back, hips/thighs, knees, and ankles/feet. We chose a recall period of 1 year prior to the survey according to other studies [2,8,13] and to detect an acceptable number of cases as it was difficult to be detected if we chose 1 week or 7 months periods. The fourth part assessed the physical workload among CSSTs using the Dutch Musculoskeletal Questionnaire (DMQ) [20] for the analysis of musculoskeletal workload and associated potential hazardous working conditions such application of force, dynamic and static load, repetitive load, standing, sitting, walking, uncomfortable postures, vibration, computer workstation, and other ergonomic factors. Answers to questions were mostly dichotomous (yes/no). The fifth part assessed the psychosocial exposure among CSSTs according to Devereux *et al.* at 1999 [21] using ordinal scales including questions to measure the psychosocial work factors such as mental demand, job control, and social support from management and co-workers. They set the exposure for each psychosocial work factor according to selected markers on the scale for each item forming the factor. Five items formed the mental demand factor, six items formed the job control factor,

and six items formed the social support factor as described in Table 1. To be classified as highly exposed to a psychosocial factor, the response to each item forming the factor had to correspond to the selected markers for that particular ordinal scale. Otherwise, a low exposure classification was given [21].

Devereux *et al.* 1999 [21] explained that to be exposed to high mental demands, items a-c had to be answered on the scale as 1-strongly agree and items d and e had to be answered on the mental demands scale as 4 strongly disagree. If item d was answered as 1, 2, or 3, then it was ignored. Participants who were not classified as being exposed to high mental demands were classified as being exposed to low mental demands. To be exposed to low job control, items a-f had to be answered on the job control scale as 1, 2, or 3. Participants not meeting the criteria were classified as being exposed to high job control. A participant had to have experienced low support from either the supervisor or coworkers to be considered exposed to low social support. To be exposed to low supervisor support, items a, c, and e had to be answered on the support scale as 2, 3, 4, or 5. Participants not meeting this criterion were classified as exposed to high supervisor support. To be exposed to low coworker support items b, d, and f had to be answered on the support

Table 1: Item and scales used for mental demands, job control, and social support; according to Devereux *et al.* at 1999 [21]

Mental demands (5 questions)
1=Strongly agree, 2=Slightly agree, 3=Slightly disagree, 4=Strongly disagree
a. My job requires a great deal of concentrations
b. My job requires me to remember many different things
c. I must keep my mind on my work at all times
d. I can take it easy and still get my work done
e. I can let my mind wander and still do the work
Job control (6 questions)
1=Very little, 2=Little, 3=A moderate amount, 4=Much, 5=Very much
a. How much influence do you have over the variety of tasks you perform?
b. How much influence do you have over the order in which you perform tasks at work?
c. How much influence do you have over the pace of your work, that is how fast or slow do you work?
d. How much influence do you have over the decisions concerning which individuals in your work unit do which tasks?
e. How much influence do you have over the decisions as to when things will be done in your work unit?
f. How much do you influence the policies, procedures and performance in your work unit?
Social support (6 questions)
1=Very much, 2=Somewhat, 3=A little, 4=Not at all, 5=Don't have any such person
a. How much do each of these people go out of their way to do things to make your work life easier for you? Your immediate supervisor
b. How much do each of these people go out of their way to do things to make your work life easier for you? Other people at work
c. How easy is it to talk with each of the following people? Your immediate supervisor
d. How easy is it to talk with each of the following people? Other people at work
e. How much can each of these people be relied on when things get tough at work? Your immediate supervisor
f. How much can each of these people be relied on when things get tough at work? Other people at work

Source: Devereux *et al.*, 1999 [21]

scale as 2, 3, 4, or 5 also. Participants not meeting this criterion were classified as exposed to high coworker support [21].

Data were analyzed using SPSS software (version 17.0 for Windows; SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated for all variables that were presented as mean and standard deviations for quantitative variables and frequencies and percentages for qualitative variables. Chi-square test or Fisher’s exact test (for categorical data), and Student’s *t*-test (for continuous data) were used for univariate analysis to assess relationships between physical and psychological factors at work and work-related MSCs at anybody site among CSSTs. Multivariate analysis using logistic regression was carried out for independent variables that had a significant association ($P \leq 0.05$) with the presence of MSCs at anybody site. The statistical significance level was set at 0.05.

RESULTS

About two-thirds of the total 64 studied CSSTs were males (62.5%) and 37.5% of them were females. The mean age, height, weight, body mass index (BMI), and years of experience as CSSTs of the respondents were 42.1 ± 7.8 years, 167.3 ± 6.3 cm and 71.3 ± 9.8 Kg, 25.6 ± 3.8 kg/m² and 12.8 ± 7.6 years; respectively. Moreover, 26.6% of them were current smokers and 73.4% were non-smokers (data were not tabulated).

The study showed that the overall 1-year prevalence of MSCs at anybody site of the CSSTs was 43.8%. The reported MSCs were mostly related to the low back (28.1%), followed by wrists/hands (23.4%) and shoulders (21.9%) [Table 2]. CSSTs who had MSCs did not differ significantly from CSSTs who had not MSCs concerning their personal factors including age, gender, weight, height, BMI, years of experience as CSSTs and smoking [Table 3]

Work requiring exertion of arms/hands, and working in awkward postures were the only physical work factors that were significantly ($P < 0.05$) higher among CSSTs who had MSCs (89.3%, 57.1%, respectively) compared to CSSTs who had not (69.4%, 30.6%, respectively). Moreover, MSCs among CSSTs were higher (60.7%) among those who frequently moved heavy loads (more than 20 kg) compared to those who did not (38.9%) ($P = 0.08$). Standing for long periods, doing repetitive tasks many times per minutes and working with vibration tools were higher among CSSTs who had MSCs (82.1%, 75.0%, and 39.3%, respectively) compared to those who had not (75.0%, 58.3%, and 30.6%, respectively), but the differences were insignificant. Moreover, working with computers was not associated with MSCs among CSSTs [Table 4].

Psychosocial factors at work including mental demand, job control, and social support did not show significant difference between CSSTs who had MSCs and those who had not. However, exposure to high mental demand among CSSTs who had MSCs was double (32.1%) that of those who had not (16.7%), ($P > 0.05$). Most of CSSTs were exposed to high job control and social support [Table 5].

Multivariate analysis of the presence of MSCs at any body site in association with significant independent variables on univariate analysis (work requiring exertion of arms/hands, and working in awkward postures) revealed insignificant results (data were not tabulated).

DISCUSSION

The objective of the present work was to study the prevalence of MSCs among CSSTs in relation to physical workload and psychosocial factors at work that have been reported as risk factors for developing work-related musculoskeletal disorders among other HCWs. Up to our knowledge, this is the first study to investigate the prevalence and risk factors of MSCs among CSSTs; so it is difficult to infer our results for the same job category, however, these results could be compared to that of other healthcare job categories. The present study did not show a significant association between the presence of MSCs and the personal factors of the CSSTs such as age, gender, BMI, years of experience as CSSTs and smoking.

The overall 1 year prevalence of MSCs among the studied CSSTs at anybody site was 43.8%, which was lower than that

Table 2: MSCs in 1 year among 64 CSSTs*; using the standardized Nordic Questionnaire [19]

Body site	1 year MSCs prevalence	
	n	%
Low back	18	28.1
Wrists/hands	15	23.4
Shoulders	14	21.9
Ankle/feet	12	18.8
Neck	11	17.2
knees	10	15.6
Upper back	8	12.5
Hips/thighs	6	9.4
Elbows	4	6.2
Anybody site	28	43.8

*CSSTs: Central sterile supply technicians, MSCs: Musculoskeletal complaints

Table 3: Association between MSCs in 1 year and personal factors of 64 CSSTs*

Personal factors	MSCs (mean±SD)		P
	Absent (n=36)	Present (n=28)	
Age (years)	41.9±7.8	42.4±7.8	0.79
Weight (kg)	71.8±10.4	70.6±9.1	0.63
Height (cm)	167±7.1	168±5.2	0.46
BMI (kg/m ²)	25.9±4.2	25.0±3.2	0.35
Years of experience as CSSTs (years)	12.2±6.6	13.6±8.8	0.46
	n (%)		
Gender			
Female	14 (38.9)	10 (35.7)	0.79
Male	22 (61.1)	18 (64.3)	
Smoking			
Non-smoker	26 (72.2)	21 (75.0)	0.80
Current smoking	10 (27.8)	7 (25.0)	

*CSSTs: Central sterile supply technicians, MSCs: Musculoskeletal complaints, SD: Standard deviation

Table 4: Association between MSCs in 1 year and physical factors at work among 64 CSSTs*; using the DMQ [20]

Physical factors at work	MSCs in 1 year (n (%))		P
	Absent (n=36)	Present (n=28)	
Does your work require standing for long periods?			
No	9 (25.0)	5 (17.9)	0.56 ^a
Yes	27 (75.0)	23 (82.1)	
Does your work require sitting for long periods?			
No	32 (88.9)	24 (85.7)	0.72 ^b
Yes	4 (11.1)	4 (14.3)	
Does your work require squatting/kneeling for long periods?			
No	35 (97.2)	25 (89.3)	0.31 ^b
Yes	1 (2.8)	3 (10.7)	
Do you work in uncomfortable bending or awkward postures?			
No	25 (69.4)	12 (42.9)	0.03 ^a
Yes	11 (30.6)	16 (57.1)	
Does your work require exertion of arms/hands?			
No	11 (30.6)	3 (10.7)	0.05 ^b
Yes	25 (69.4)	25 (89.3)	
Does your work require doing repetitive tasks many times per minute?			
No	15 (41.7)	7 (25.0)	0.16 ^a
Yes	21 (58.3)	21 (75.0)	
Does your work require working with vibration tools?			
No	25 (69.4)	17 (60.7)	0.47 ^a
Yes	11 (30.6)	11 (39.3)	
Do you in your work often move loads (more than 5 kg)?			
No	10 (27.8)	4 (14.3)	0.24 ^b
Yes	26 (72.2)	24 (85.7)	
Do you in your work often move heavy loads (more than 20 kg)?			
No	22 (61.1)	11 (39.3)	0.08 ^a
Yes	14 (38.9)	17 (60.7)	
Do you often use mechanical lifting assists when manual lifting is required?			
No	24 (66.7)	17 (60.7)	0.62 ^a
Yes	12 (33.3)	11 (39.3)	
Are tools and instruments shaped, positioned and handled so that tasks are performed with minimal strain on your body?			
No	14 (38.9)	12 (42.9)	0.75 ^a
Yes	22 (61.1)	16 (57.1)	
Are work materials, machines and equipment ergonomically positioned?			
No	6 (16.7)	6 (21.4)	0.63 ^a
Yes	30 (83.3)	22 (78.6)	
Do you work with computers for a long period?			
No	30 (83.3)	25 (89.3)	0.72 ^b
Yes	6 (16.7)	3 (10.7)	
Is Computer workstation properly designed to minimize strain on your body?			
No	13 (36.1)	9 (32.1)	0.74 ^a
Yes	23 (63.9)	19 (67.9)	
Do you have sufficient rest breaks?			
No	5 (13.9)	8 (28.6)	0.15 ^a
Yes	31 (86.1)	20 (71.4)	

*CSSTs: Central sterile supply technicians, ^aChi-square test, ^bFisher's exact test (for expected frequencies <5), DMQ: Dutch Musculoskeletal Questionnaire, MSCs: Musculoskeletal complaints

of nurses (from 60% to 93%) [2,8,22,23], dentists (91.6%) [13] and X-ray technicians (67%) [24]; but near to that of physical therapists (from 47.6% to 53.5%) [25,26]. Moreover, low back was the most affected body site (28.1%) among CSSTs; which is in concordance with other studies reported that low back pain (LBP) was the most common complaint among HCWs with annual prevalence of 40-65.7% among nurses [2,8]; 32-56.5% among physical therapist [25,26] and 59.6% among X-ray technologists [24]; and was associated with patient handling and job strain [15]. In case of CSSTs, there was no patient handling, however working in awkward postures was significantly more frequent among CSSTs who had MSCs (57.1%) compared to CSSTs who had not (30.6%). This could be explained by other studies reported that awkward postures is a leading cause of musculoskeletal injuries [15,26] and associated with LBP [27]. Moreover, the present study showed that other physical factors such as standing for long periods ($P = 0.56$) and moving heavy loads more than 20 kg ($P = 0.08$) were associated with higher prevalence of MSCs among CSSTs. On the other hand, the current study did not show a significant association between MSCs among CSSTs and their personal factors including age, gender, weight, height, BMI, years of experience as CSSTs and smoking.

The present work showed that wrists/hands were the second affected body sites (23.4%) followed by shoulders (21.9%). These results were similar to other studies among dentists [28,29] and physical therapists [30,31]. In their daily working life in the central sterile supply department, CSSTs usually perform tasks which could cause forcible exertion of arms and hands such as repetitive motions of cleaning, assembling, repackaging, and wrapping of surgical instruments, and equipment [17]. In concordance with this, the current study revealed that CSSTs who had MSCs were more frequently doing tasks requiring exertion of arms/hands (89.3%) compared to those who had not MSCs (69.4%) with statistically significant difference. Furthermore, other factors such as doing repetitive tasks many times per minutes and working with vibration tools might have a role of developing upper extremity work-related musculoskeletal disorders among CSSTs such as carpal tunnel syndrome (CTS).

Psychosocial factors at work including mental demand, job control, and social support did not show significant difference between CSSTs who had MSCs and those who had not. This is in disagreement with other studies that reported that different psychosocial factors at work were risk factors for developing work-related musculoskeletal disorders among other HCWs such as nurses, physicians, dentists, physical therapists, X-ray technologist [15,32,33]. This could be explained by that most of the current study participants were exposed to high job control and social support [Table 5].

The present study has some limitations such as small sample size and using cross-sectional analytic design depending on self-reported data which is subjected to recall bias or exaggeration of symptoms. However, MSCs and related physical and psychosocial work factors have been assessed among CSSTs using the standardized Nordic Questionnaire [19] and DMQ [20] as

Table 5: Association between MSCs and psychosocial factors at work among 64 CSSTs*; using the ordinal scale developed by Devereux *et al.*, 1999 [21]

Psychosocial factors at work	MSCs (n (%))		P
	Absent (n=36)	Present (n=28)	
Exposure to high mental demand	6 (16.7)	9 (32.1)	1.0 ^a
Exposure to low mental demand	30 (83.3)	19 (67.9)	
Exposure to high job control	33 (91.7)	26 (92.9)	0.62 ^b
Exposure to low job control	3 (8.3)	2 (7.1)	
Exposure to high social support	34 (94.4)	26 (92.9)	1.0 ^b
Exposure to low social support	2 (5.6)	2 (7.1)	

*CSSTs: central sterile supply technicians, ^aChi-square test, ^bFisher’s exact test (for expected frequencies <5), MSCs: Musculoskeletal complaints

both of them have been validated and used by many authors studied the prevalence of musculoskeletal disorders among HCWs [8,24]; but we did not check the reliability and validity of the questionnaire constructed by Devereux *et al.* at 1999 [21]. It has been reported that the workplace environment of the central sterile supply department is stressful, exposing CSSTs to different physical and psychosocial hazards which could affect their health and performance increasing the risk of accidents, injuries, and disabilities [17,34]. Hence, the importance of prevention and control measures to protect and promote the health of CSSTs, such as: (a) Risk assessment of the workplace environment of the central sterile supply department [18], including ergonomic assessment of both machines, instruments, and tools used for cleaning and disinfecting instruments and equipment; (b) training of CSSTs on the proper use of tools and the importance of ergonomics to prevent occurrence of work-related musculoskeletal disorders among them [35,36]; (c) periodic occupational examination for CSSTs for early diagnosis of any of MSDs such as LBP or CTS.

CONCLUSION

The present study showed that 43.8% of the studied CSSTs reported 1-year prevalence of MSCs related mostly to low back, wrists/hands, and shoulders. Ergonomic assessment and preventive intervention should be conducted to prevent the incidence of work-related musculoskeletal disorders among CSSTs through controlling both physical and psychosocial risk factors at their workplace. Moreover, further studies should be conducted for further assessment of the prevalence and risk factors of musculoskeletal disorders among this job category.

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