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LEVEL OF DISABILITY AND ASSOCIATED FACTORS WITH MUSCULOSKELETAL DISORDERS AMONG SUPERMARKET CASHIERS

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Abstract
Objectives: This study aimed to determine the severity of symptoms and the level of disability or difficulty associated with MSDs in the neck, shoulders, upper limbs, lower back, and lower limbs as well as the factors associated with MSDs. **Material and Methods:** This investigation collected demographic, health (*36-Item Short Form Survey* [SF-36]), and occupational related-factors for supermarket cashiers through the administration of several questionnaires, including the *Oswestry Disability Index* (ODI), *Disabilities of the Arm, Shoulder and Hand* (DASH), *Neck Disability Index* (NDI), *Lower Extremity Functional Scale* (LEFS), and *Numeric Rating Scale* (NRS) for pain. **Results:** One hundred ninety-three supermarket cashiers participated in this study. The mean scores for disability levels included NDI (M±SD 18.62±14.57), ODI (M±SD 20.74±13.89), DASH (M±SD 15.08±13.90), and LEFS (M±SD 63.06±14.24). Regression analyses demonstrated the existence of significant relationships between the experience of MSDs and several other factors, including the number of working days per week, the preferred working position, marital status and the need for awkward positions. **Conclusions:** The results indicate MSDs that signified a mild disability level among young participants. The number of working days per week, the preferred working position, the need to assume awkward positions, and marital status were significantly associated with MSDs. The findings indicated the need for preventive to avoid or minimize the prevalence of MSDs among supermarket cashiers. Int J Occup Med Environ Health. 2022;35(4):407–23

Key words:
associated factors, occupational injuries, work-related disabilities, supermarkets, cashiers, musculoskeletal diseases

INTRODUCTION

Work-related musculoskeletal disorders (WMSDs) represent one of the most common types of occupational diseases [1]. The term "musculoskeletal disorders" (MSDs) refers to the occurrence of inflammatory and degenerative changes that affect the extremities or spine with symptoms of either known or unknown diagnoses. Musculoskeletal disorders have a negative impact on workers, as these disorders may lead to a worker's incapacity and inability to continue his/her job. Previous evidence has demonstrated that >50% of lost-time claims and disability days resulted from MSDs (60%) [2]. Consequently,

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the detrimental impact of these disorders may affect workers' health, self-respect, financial income, and community connections [3]. Moreover, MSDs constitute one of the main reasons for functional loss and activity limitations as well as short and long-term disability [4]. Such disorders may not only have problematic impacts on workers but also create challenges for employers, health care systems, and compensation structures.

Supermarket cashiers (SCs) spend long hours assuming relatively static postures in congested areas. These workers repeatedly handle grocery items of various weights and sizes as well as pass barcodes under laser scanners, handling anywhere 500–1000 items/h [5]. In addition to the physical demands, SCs face significant amounts of stress, time and mental pressure [6]. The job of a supermarket cashier therefore entails numerous job-related risk factors that may lead to MSDs.

The extent to which MSDs cause disability among cashiers, affecting their performance in professional and social aspects, remains sparsely addressed in the literature. Furthermore, no existing study has examined MSDs among SCs in Saudi Arabia (SA), with the exception of the prior study by these same authors [7]. Although research provides data on cashiers from other cultures, the results may fail to accurately describe SCs in SA, thus necessitating additional investigations to determine the impact of MSDs among Saudi Arabian SCs.

Although MSDs have a multifactorial etiology, specific factors can enhance the risk of MSDs among workers [8]. However, the literature provides a paucity of comparative information about the factors associated with MSDs or the severity of disability among cashiers in all body regions. This gap indicates the need to obtain information about the associated factors for MSDs and the disability levels among SCs in order to develop strategies for enhancing health and preventing MSDs among such workers. The results of these authors' prior study [7], which aimed to describe the prevalence of self-reported MSDs and quality of life among SCs in SA, revealed that 90% of cashiers in SA experienced MSD symptoms in the previous year. Specifically, the most affected areas involved the neck and lower back regions, while the least affected areas included the hip/thigh area and elbow. In addition, these authors discovered that participants who reported pain in all domains excluding physical functioning reported a diminished quality of life. Based on these findings, the present study aims to identify the level of disability and associated factors of MSDs among male and female SCs working in SA. Moreover, this work attempts to determine the level of disability or difficulty associated with the presence of MSDs in the body.

MATERIAL AND METHODS

The study methodology employed a descriptive cross-sectional design. The sample included 18–60-year-old males and females who can read and understand the Arabic language. Conversely, the study excluded cashiers with previous musculoskeletal (MSK) injuries or tumors. The ethical approval was received from the Research Ethics Committee at King Saud University, located in Riyadh, Saudi Arabia. In addition, the informed consent was collected from the participants who met the study criteria and demonstrated a willingness to participate in the study.

Sampling method and procedure

A previous pilot study was conducted and a group of cashiers similar to the targeted sample was involved for validating the method; ensuring the questionnaires' accuracy, reliability, and validity; and identifying any ambiguous or leading questions. Using a non-probability sampling technique, participants were recruited for the present study from supermarkets in various Saudi Arabian cities. Subsequently, a website was created to collect the required data from completed questionnaires. The participants were allowed to share the website link with other SCs for the same company or for another company both

inside and outside of Riyadh. In addition, social media influencers were contacted to promote the research and encourage SCs throughout SA to participate in the study. Lastly, supermarket management was contacted to circulate the questionnaire link among cashiers. Upon receiving and accessing the link, SCs were asked to complete the survey at a convenient time. This study was conducted in the period November 11, 2018–February 11, 2019. In order to estimate the sample size, a single proportion calculation and the confidence interval (CI) at 95%, with an α of 5% and an 80% power of study was used. Based on the 90% prevalence of MSDs in the previous study [7], the sample size of 180 was estimated.

Data collection tools

The data collection occurred through self-reported questionnaires. Specifically, these surveys asked participants to answer questions related to their demographics, health status, social habits, and occupational factors. The rest of the information comprised direct questions used to investigate the presence of MSDs among SCs. These items sought to determine the dependent variable, which included the presence of pain within the previous 12 months. This pain may have taken place in the neck, shoulders, upper back, lower back, elbows, hands, wrists, hips, thighs, knees, ankles, and feet. After participants confirmed the presence of pain, the survey prompted them to indicate the pain intensity using the Numeric Rating Scale (NRS) [9]. The study used questionnaires that previously underwent translation and adaption to the Arabic language and culture, including the *Oswestry Low Back Pain Disability Index* (ODI) [10], the *Disability of the Arm, Shoulder and Hand* (DASH) [11], the *Neck Disability Index* (NDI) [12], the *36-Item Short Form Survey* (SF-36) [13], and the *Lower Extremity Functional Scale* (LEFS) [14].

The ODI questionnaire assesses functional disability resulting from lower-back pain (LBP) [15]. This instrument involves a self-assessing questionnaire with 10 items. Each item consists of 6 levels of answers ranging 0–5 and falls under categories that include pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and travelling. The questionnaire's final score shows a percentage relating to the level of disability. The DASH questionnaire provides an outcome measure relating to the functioning and symptoms of patients with MSDs in their upper extremities [16]. As a self-report survey, DASH features sound psychometric characteristics. This outcome measure consists of 30 items, 21 of which illustrate the levels of difficulty that patients experience during their physical activities as a result of arm, shoulder, or hand disorders. Five items describe the severity of the following symptoms: pain, activity-related pain, tingling, stiffness, and weakness.

The NDI questionnaire constitutes the most common and validated instrument for measuring the effect of neck pain on the functional activities of patients. Medical clinics and research studies frequently employ this survey an outcome measure [17]. The NDI has undergone modification from the ODI questionnaire [17] to contain 10 questions relating to pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. The SF-36 instrument contains questions under 8 domains that provide information about several aspects of health: physical functioning, physical role functioning, social role functioning, vitality, mental health, emotional role functioning, general health perception and bodily pain.The final score of the SF-36 ranges 0–100, with higher scores indicating higher levels of functioning and/or better health [18]. Prior research has provided a specific method for scoring the SF-36 totals [19]. Finally, the LEFS questionnaire involves a specific outcome measure that evaluates activity limitations due to the presence of MSDs in the lower extremities [20]. The LEFS consists of 20 items, each scored on a Likert scale ranging 0–4, with the final score indicating the total scores from all items.

In addition to these tools, the present study obtained demographic and health-related data, such as health status, social habits, and occupation. The occupational information included data pertaining to work duration, such as number of work days per week, full-time or part-time employee status, daily work hours, years of work experience, and duration of shift breaks. Participants also answered information about their preferred work position of sitting or standing and the duration of time spent in this position. In addition, respondents indicated any training for other jobs in the supermarket and other concurrent jobs as well as work-related disability and pain, as shown in Table 1. Furthermore, direct questions in the Arabic language were used to inquire about the presence of MSD symptoms in the past 12 months. Other questions asked about specific areas affected by MSDs within the last 12 months, whether these MSDs related to the cashier occupation, if the MSDs occurred before this position, and, if so, whether the MSDs intensified with this job. Finally, respondents rated their work satisfaction levels. The results of prevalence of MSDs and the most affected areas have been published previously [7].

Data analysis

Data analysis was conducted using the Statistical Package for Social Studies (SPSS 22, IBM Corp., New York, NY, USA). It was used to compute descriptive statistics for all variables, summarizing the continuous variables as means (M) ± standard deviations (SD), and the categorical variables as frequencies and percentages. Further, the univariate and multivariate logistic regression was applied to analyze associations of the work-related and other factors with MSK pain or disorders, (the dichotomous dependent variable). The univariate analyses identified the factors significantly associated with musculoskeletal pain, while multiple logistic regression determined mutually adjusted effects (odds ratios) of these factors on existence of musculoskeletal pain. Based on the results of univariate analyses, independent variables that lacked significance at p-value 0.20, were excluded. Variables that were not statistically significant at p-value 0.05 underwent testing for a potential confounding effect prior to removal from the study.

The final model included the following explanatory variables:

– job satisfaction (whether the cashier feels satisfied about his/her job);
– number of breaks during a work shift (how many breaks the cashier can have during a work shift);
– working days per week (number of days cashier works per week);
– preferred position for work (whether the cashier prefers the standing or sitting position during the work);
– use of comfortable shoes while working (whether the cashier uses comfortable shoes or not);
– prior training to avoid WMSDs (whether the cashier receives a training in how to avoid WMSDs prior the beginning of this job);
– the need to reach for items in the trolley (awkward position) (whether the cashier needs to be in an awkward position in order to reach items in the trolley);
– practice of sports (whether the cashier practices sport activities or not);
– marital status (type of marital status such as single, married or others-widowed, divorced, etc.);
– dominant hand (the hand that he/she are more likely to be used to do motor tasks);
– number of workers at the supermarket (whether the supermarket has <50, 50 or >50 workers);
– role limitations due to physical health (higher score indicates little or no problems with work or other activities due to physical health);
– role limitations due to emotional problems (higher score indicates little or no problems with social activities due to emotional problems);
– energy/fatigue (higher score indicates more vitality);

Table 1. Summary of the *36-item Short Form Survey* scores in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019

36-item Short Form Survey domain	*36-item Short Form Survey* score (M±SD)
Physical functioning	67.72±26.74
Role limitations due to physical health	62.31±37.86
Role limitations due to emotional problems	57.69±41.11
Energy/fatigue	57.85±21.37
Emotional well-being	64.52±21.36
Social functioning	63.67±27.52
Pain	67.36±25.71
General health	63.73±15.32

– emotional well-being (higher score indicates little or no feelings of depression or nervousness);
– social functioning (higher score indicates better social functioning);
– pain (higher score indicates little or no pain or limitations due to pain);
– general health (higher score indicates positive perceptions of general health).

Lastly, the Hosmer-Lemeshow Test was used to assess the goodness of fit of the final model.

RESULTS

A total of 213 SCs initially participated in this study. However, 20 participants failed to meet the inclusion criteria and were subsequently excluded. As shown in Table 2, 193 SCs with a mean age of M±SD 27±6.4 years successfully completed the questionnaires. A total of 162 (84%) cashiers had no history of chronic diseases or medical conditions, while 104 (54%) cashiers reported a sedentary lifestyle that excluded exercises or sport activities.

A total of 87 (45%) cashiers reported work experience of 1 year, whereas 81 (42%) employees reported work experience of 1–4 years. Among all participants, 163 (85%)

Table 2. Summary statistics of the demographic, health-related, and work-related factors in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019

Variable	Participants (N = 193)
Demographic factors	
age [years] (M±SD)	27.18±6.44
height [cm] (M±SD)	
weight [kg] (M±SD)	73.99±21.22
body mass index [kg/m^2] (M±SD)	27.30±7.88
sex [n (%)]	
male	140 (72.5)
female	53 (27.5)
marital status [n (%)]	
single	123 (63.7)
married	55 (28.5)
other (widowed, separated, and divorced)	15 (7.7)
taking care of children during a work shift [n (%)]	
babysitter	7 (13.5)
grandfather or grandmother	8 (15.4)
wife	27 (51.9)
husband	7 (13.5)
nationality [n (%)]	
Saudi	184 (95.3)
non-Saudi	9 (4.7)
dominant hand [n (%)]	
right	170 (88.1)
left	23 (11.9)
educational level [n (%)]	
intermediate school or lower	23 (12)
high school	123 (63.7)
diploma/bachelor	47 (24.3)
workplace [n (%)]	
inside Riyadh	157 (81.3)
outside Riyadh	36 (18.7)
smoking status [n (%)]	
smoker	66 (34.2)
non-smoker	117 (60.6)
ex-smoker	10 (5.2)

Table 2. Summary statistics of the demographic, health-related, and work-related factors in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019 – cont.

Variable	Participants (N = 193)
Demographic factors – cont.	
practice of sports [n (%)]	
no practice	104 (53.9)
1–3 times/week	68 (35.2)
≥4 times/week	21 (10.9)
history of disease (chronic disease or medical conditions) [n (%)]	
yes	31 (16.1)
no	162 (83.9)
taking medications (any medication) [n (%)]	
yes	36 (18.7)
no	157 (81.3)
Work-related factors	
working time [days/week] (M±SD)	5.08±0.70
breaks during shift work [n] (M±SD)	1.70±1.16
working in a sitting posture [h] (M±SD)	2.69±2.23
working in a standing posture [h] (M±SD)	5.68±2.41
working time [n (%)]	
>8 h/day	109 (56.5)
≤8 h/day	84 (43.5)
work experience [n (%)]	
1 year	87 (45)
>1–4 years	81 (41.9)
≥5 years	25 (12.9)
employment type [n (%)]	
full-time	163 (84.5)
part-time	30 (15.5)
job satisfaction [n (%)]	
satisfied	131 (67.9)
not satisfied	62 (32.1)
use of a laser scanner (barcode scanner) [n (%)]	
yes	176 (91.2)
no	17 (8.8)
use of a bi-optic scanner (vertical and horizontal) [n (%)]	
yes	168 (87.0)
no	25 (13.0)
direction of receiving groceries from the conveyor belt [n (%)]	
right	148 (76.7)
left	45 (23.3)
the need to reach for items placed in the shopping trolley (awkward position) [n (%)]	
yes	149 (77.2)
no	44 (22.8)
the need to unload groceries from carts for scanning [n (%)]	
yes	83 (43.0)
no	110 (57.0)
the need to pack grocery items into bags after scanning [n (%)]	
yes	157 (81.3)
no	36 (18.7)
preferred position for working [n (%)]	
standing	137 (71.0)
sitting	56 (29.0)
training for other tasks in the supermarket (job rotation) [n (%)]	
yes	41 (21.2)
no	152 (78.8)
existence of another job outside of the supermarket [n (%)]	
yes	8 (4.1)
no	185 (95.9)
prior training for avoiding WMSDs [n (%)]	
yes	85 (44.0)
no	108 (56.0)
presence of a chair at work station [n (%)]	
yes	161 (83.4)
no	32 (16.6)

Table 2. Summary statistics of the demographic, health-related, and work-related factors in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019 – cont.

Variable	Participants (N = 193)
Work-related factors – cont.	
use of comfortable shoes while working [n (%)]	
yes	121 (62.7)
no	72 (37.3)
presence of a foot rest cushion while standing [n (%)]	
yes	7 (3.6)
no	186 (96.4)
workers at the same supermarket [n (%)]	
≥50	79 (40.9)
<50	114 (59.1)

cashiers worked on a full-time basis, and 109 (57%) SCs worked for >8 h/day. A total of 83 (43%) cashiers unloaded groceries from shopping trollies for scanning, whereas 157 (81%) cashiers packed grocery items in bags after scanning. Finally, 149 (77%) employees reported the assumption of awkward positions in order to reach items in the shopping trolley. Table 2 presents all occupational-related characteristics.

According to the direct questions and self-reported questionnaires, 174 (90%) of the participants had experienced MSK pain in at least 1 body area over the past 12 months. Musculoskeletal disorders were reported in all body areas with different prevalence. The neck and lower back constituted the 2 most affected areas among participants, with 129 (66.8%) and 127 (65.8%) SCs reporting pain in these respective areas. The next 2 body areas, upper back and shoulders, caused pain for 111 (57.5%) and 107 (55.4%) SCs respectively. Moreover, 78 (40.41%) cashiers reported pain or discomfort in the hand/wrist, while 71 (36.79%) and 75 (38.86%) of cashiers experienced pain in the knee and ankle/foot respectively.

As measured by the NRS, the pain intensity in all body regions ranged 5.1–6.0. The highest level of pain occurred in the ankle/foot (M±SD 6.0±2.6), while the lowest levels occurred in the neck (M±SD 5.1±2.2) and hand/wrist (M±SD 5.1±2.5). Moreover, participants reported that working as SCs aggravated prior MSK pain that occurred before applying for this job. For each body region, participants indicated the level of disability or difficulty associated with MSDs. Mean and standard deviation scores for each tool included a DASH score of M±SD 15.1±13.9 (range of 0–66.7), a LEFS score of M±SD 63.0±14.2, an NDI score of M±SD 18.6%±14.6% (range of 0–62), and an ODI score of M±SD 20.7%±13.9% (range of 0–68). Specifically, the NDI indicated that 54 (41.86%) and 27 (20.93%) of the cashiers who reported neck pain respectively experienced mild and moderate disability, whereas the ODI found moderate disability among 44 (34.6%) cashiers.

Furthermore, the SF-36 scores appear in Table 2. Table 3 shows the results of the univariate logistic regression analyses for factors associated with MSDs. Participants who reported dissatisfaction with their jobs, lacked prior training on avoiding WMSDs, assumed awkward positions to reach items in the trolley, and indicated a dominant right hand had a greater chance of experiencing MSDs. Moreover, cashiers working in supermarket locations with <50 employees and those practicing a sedentary lifestyle had a greater likelihood of experiencing MSDs. Conversely, participants who worked in stores that provided a greater number of breaks had a lower chance of experiencing MSDs.

The multivariate logistic regression in Table 4 reveals the variables significantly associated with the dichotomous outcome of MSDs. Results show that a 1-day increase in the number of workdays per week increased the odds of experiencing MSDs by 4 times. Participants who preferred working in a standing position were 9 times more likely to experience MSDs than those who preferred working in a sitting position. Similarly, participants who assumed awkward positions to reach items in

Table 3. Crude associations of demographic, life-style and work-related factors with MSDs, determined by univariate logistic regression models in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019

Variable	OR	95% CI	p
Age	0.99	0.92–1.06	0.776
Sex			0.512
male**	1.00		
female	0.68	0.21–2.15	
Job satisfaction			0.029*
no	9.71	1.26–74.55	
yes**	1.00		
Breaks during a work shift [n]	0.58	0.37–0.91	0.018*
work type			0.529
full-time**	0.61	0.13–2.80	
part-time	1.00		
Working time			0.896
>8 h/day	1.06	0.40–2.78	
≤8 h/day**	1.00		
Working days per week	1.55	0.89–2.72	0.120
Training for other supermarket jobs (job rotation)			0.983
yes	1.01	0.31–3.23	
no**	1.00		
Existence of another job outside of the supermarket			0.797
yes	0.75	0.08–6.48	
no**	1.00		
Preferred position for work			0.070
standing	2.43	0.93–6.35	
sitting**	1.00		
Time spent standing [h]	0.96	0.78–1.17	0.687
Time spent sitting [h]	1.08	0.85–1.38	0.504
Use of comfortable shoes while working			0.053
yes	0.28	0.08–1.01	
no**	1.00		
Use of a laser scanner (barcode scanner)			0.268
yes	2.14	0.55–8.25	
no**	1.00		
Prior training for avoiding WMSDs			0.003*
yes**	1.00		
no	5.57	1.77–17.48	

Table 3. Crude associations of demographic, life-style and work-related factors with MSDs, determined by univariate logistic regression models in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019 – cont.

Variable	OR	95% CI	p
The need to reach for items in the shopping trolley (awkward position)			<0.001*
yes	5.87	2.19–15.75	
no**	1.00		
The need to unload groceries from a cart for scanning			0.569
yes	1.32	0.49–3.53	
no**	1.00		
The need to pack grocery items after scanning			0.370
yes	1.64	0.55–4.91	
no**	1.00		
History of fracture, dislocation, or surgery in limbs and spine			0.896
yes	0.86	0.10–7.33	
no**	1.00		
Smoking status			0.812
yes	1.12	0.42–3.00	
no**	1.00		
Practicing sport(s)			
no practice	5.54	1.63–18.74	0.006*
1–3 times/week	4.13	1.16–14.63	0.028*
≥4 times/week**	1		
Height	0.98	0.93–1.02	0.419
Weight	0.99	0.97–1.01	0.722
Body mass index	0.99	0.93–1.05	0.926
Marital status			
single	5.65	1.61–19.78	0.007*
married	6.37	1.45–27.98	0.014*
other**	1.00		
Nationality			0.896
Saudi	1.15	0.13–9.74	
non-Saudi**	1.00		
Dominant hand			0.001*
right	5.76	1.98–16.70	
left**	1.00		
Educational level			
intermediate school or less**	1.00		
high school	1.16	0.30–4.43	0.820
diploma and above	3.37	0.52–21.79	0.201

Table 3. Crude associations of demographic, life-style and work-related factors with MSDs, determined by univariate logistic regression models in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019 – cont.

Variable	OR	95% CI	p
City of work			0.348
inside Riyadh	0.48	0.10–2.19	
outside Riyadh**	1.00		
Job experience			
≤1 year	2.17	0.58–8.14	0.248
1–4 years	1.73	0.47–6.34	0.403
≥5 years**	1.00		
Use of a bi-optic scanner (vertical and horizontal) to make work easier			0.741
yes	0.77	0.16–3.56	
no**	1.00		
Direction of receiving groceries from the conveyor belt			0.806
right	0.86	0.27–2.75	
left	1.00		
Number of workers at the same supermarket			
>50 workers**	1.00		
<50 workers	2.73	1.02–7.30	0.044*
Physical functioning	1.00	0.98–1.02	0.844
Role limitations due to physical health	0.98	0.96–0.99	0.036*
Role limitations due to emotional problems	0.96	0.95–0.98	0.002*
Energy/fatigue	0.94	0.91–0.97	<0.001*
Emotional well-being	0.94	0.91–0.97	<0.001*
Social functioning	0.95	0.92–0.98	0.001*
Pain	0.95	0.92–0.98	0.001*
General health	0.93	0.89–0.97	0.001*

* Significant p-value when p<0.05.
** Used as a reference.

Table 4. Mutually adjusted effects of selected factors associated with MSDs, determined by multiple logistic regression in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019

Variable	OR	95% CI	p
Job satisfaction			0.300
no	4.26	0.27–66.38	
yes**	1.00		
Breaks during a work shift [n]	0.81	0.33–2.01	0.652
Working time [days/week]	4.16	1.06–16.36	0.041*

Table 4. Mutually adjusted effects of selected factors associated with MSDs, determined by multiple logistic regression in 193 supermarket cashiers, Saudi Arabia, November 11, 2018–February 11, 2019 – cont.

Variable	OR	95% CI	p
Preferred position for work			0.034*
standing	9.03	1.18–69.02	
sitting**	1.00		
Use of comfortable shoes while working			0.509
yes	0.46	0.04–4.67	
no**	1.00		
Prior training to avoid WMSDs			0.220
yes**	1.00		
no	3.53	0.47–26.44	
The need to reach for items in the trolley (awkward position)			0.027*
yes	11.22	1.31–95.97	
no**	1.00		
Practice of sports			
no practice**	1.00		
1–3 times/week	1.46	0.19–10.97	0.714
≥4 times/week	0.14	0.01–1.79	0.130
Marital status			
single**	1.00		
married	3.81	0.42–34.27	0.233
other	0.05	0.00–0.81	0.035*
Dominant hand			0.088
right	6.03	0.76–47.74	
left**	1.00		
Workers at the supermarket [n]			0.646
≥50**	1.00		
<50	1.56	0.23–10.51	
Role limitations due to physical health	1.03	0.99–1.07	0.125
Role limitations due to emotional problems	0.97	0.93–1.01	0.113
Energy/fatigue	0.96	0.90–1.02	0.197
Emotional well-being	1.01	0.94–1.08	0.838
Social functioning	1.00	0.94–1.06	0.981
Pain	0.95	0.88–1.03	0.194
General health	0.99	0.91–1.07	0.767

WMSDs – work-related musculoskeletal disorders.
* Significant p-value when $p < 0.05$.
** Used as reference.
The logistic regression model demonstrated a better goodness of fit when assessed by the Hosmer-Lemeshow test (χ^2 (8) = 6.8, p-value is 0.56).

the trolley were almost eleven times more likely to experience MSDs than those who avoided such awkward positions. Lastly, the final model had satisfactory goodness of fit when assessed by the Hosmer-Lemeshow test.

DISCUSSION

The present study aimed to identify factors associated with MSDs and to determine the level of disability or pain related to MSDs in the neck, shoulders, upper limbs, lower back, and lower limbs. Overall, this study found that 90% of the SCs in SA have experienced MSDs in the previous 12 months. These employees reported various levels of disability, which ranged from mild to moderate. Furthermore, the study identified several factors associated with MSDs among SCs, including number of workdays per week, the preference for sitting or standing while working, the need to assume an awkward position for reaching items in the trolley, and marital status.

This investigation constitutes the first study conducted on SCs working in any Arabic country, including SA. The findings revealed similarities to the results from previous research [21–24], indicating the common prevalence of MSDs among SCs. According to the results of these authors' previous publication from the same project [7], the sample of SCs working in SA demonstrated a very high level of prevalence for MSDs. Approximately 90% of the participants reported experiencing pain at least in 1 body region over the last 12 months. This percentage represents the overall prevalence of MSDs in all body regions rather than the prevalence of MSDs in one specific body region for cashiers [23,25–27]. The results of this study compare favorably to the findings of Sirge et al. [22], who reported that approx. 86.6% of SCs experienced pain in at least one body region over the last 6 months.

Research that solely ascertains the prevalence of MSDs among SCs may fail to provide sufficient or meaningful information for understanding MSD severity based on SCs' work-related activities and lifestyle. In order to address this literature gap, the current study examined the extent to which MSDs can affect the participants' performance of daily activities. The Arabic versions of the DASH, LEFS, NDI, and ODI assisted in determining the level of disability and/or difficulties. To the best of the authors' knowledge, no previous studies conducted on SCs have investigated the disability level associated with MSDs.

The results of the current study found a mean DASH score of M±SD 15±14, which differed from those of a German study. That previous research investigated 226 young employees, who reported a mean DASH score of M±SD 5±8 [28]. This differential likely resulted from the younger age of the German participants. However, the DASH score reported in the present investigation followed the computing procedures in accordance with the normative data for DASH among the general population in Norway, which resulted in a mean DASH score of 13 [29]. Since this study found that SCs reported a mean DASH score of 15, which resembled the results of the Norwegian study, the participants in this research demonstrated a fairly low level of disability, which reflects the relatively young age and minimal work experience of the employees.

Contrary to DASH, a lower LEFS score indicates a worse disability level [20]. In the present study, the SCs indicated a mean disability level of 63. This result falls below the score of healthy young Saudi adults aged 18–29 years, who reported a LEFS mean of 74 [30]. Thus, in comparison to healthy young adults in SA, the cashiers in this study appear to exhibit a lower level of functional activity in their lower limbs. However, further investigations are needed to confirm this result.

The NDI score in the study indicated a mean disability level of 18.6% associated with neck pain. Approximately 41.86% of the study participants experienced mild disability due to neck pain. According to the previously pub-

lished results by the same authors [7], neck pain and LBP represented the highest frequency of disability among all body areas, with 66.84% and 65.80% of participants respectively reporting problems in these areas. Additionally, the ODI, which indicates the disability level associated with LBP, revealed that slightly more than half (56.7%) of the sample in the present study reported minimal LBP disability. However, the presence of even a minor disability from MSDs in the spine area may worsen over time among younger age groups.

The cumulative results of the questionnaires indicated that the participants of this study experienced relatively mild disability levels. However, the high percentage of cashiers experiencing mild disability at a young age and with minimal work experience raises concerns for the future development of MSDs at a later age. Jobs with higher levels of manual labour, such as cashiers, may appeal to people that lack a high level of education and seek part-time rather than full-time jobs. Therefore, these results indicate the need for more prospective studies and the possible requirement for additional preventive procedures.

The results of the univariate logistic regression analyses revealed that MSDs demonstrated significant associations with numerous factors, as shown in Table 4. A previous systematic review concluded that low job satisfaction represents a risk factor for back pain [31]. In the current study, SCs that reported job dissatisfaction were almost 10 times more likely to experience MSDs than those who were satisfied with their job. In contrast, a previous study found that low job satisfaction failed to constitute a risk factor for shoulder disorders among SCs [32]. These conflicting results warrant further investigations to confirm the relationship between job satisfaction and MSDs.

The current study reported that an increase in the number of breaks during a work shift may decrease the likelihood of experiencing MSDs. This finding concurs with the results of a previous study, which recommended rest breaks for cashiers in order to reduce potential muscle injuries [33]. In fact, prior research suggested that the constant contraction of hand muscles and fewer rest breaks may increase the risk of developing carpel tunnel syndrome (CTS) among SCs [25].

The absence of proper training on ways in which to avoid WMSDs constituted a significant risk factor based on the results of univariate regression analysis. Specifically, participants who lacked proper training on ways to avoid WMSDs before beginning their work as SCs were 5.5 times more likely to experience MSDs than cashiers that received this training. Previous evidence found that training can assist workers in avoiding or at least minimizing the risk of occupational injuries [34]. In the present study, 108 (56%) participants lacked previous training on how to avoid WMSDs. This result implies the need for companies to provide SCs with training about ergonomics in order to minimize the prevalence of MSDs among this group of workers.

Furthermore, one of the significant factors associated with MSDs involved a sedentary lifestyle. In comparison to cashiers that participated in sports at least 4 times a week, cashiers that neglected to participate in sports or exercise were 5.5 times more likely to experience MSDs. This result demonstrates consistency with that of a previous study reporting that the practice of sports or active leisure activities may help to prevent or minimize MSDs among the general working population [35].

In contrast to left-handed SCs, right-handed employees were nearly 6 times more likely to experience MSDs. This finding may result from the fact that 148 (76.7%) the participants in this study received groceries from the conveyor belt on the right side, which required more muscle activation of the right upper limbs. Another study similarly reported this trend, finding that fast cashiers may scan ≤1442 items/h using their dominant hand [36]. This significant figure indicates a substantial amount of repetition, thus increasing the risk of MSK injuries.

In comparison to cashiers who worked at supermarkets with >50 employees, cashiers who worked at supermarkets with <50 workers were nearly 3 times more likely to experience MSDs. This discrepancy may result from the heavier workload and reduced rest breaks assigned to cashiers that work in companies with employee shortages. Since this finding lacks support from previous literature, additional studies are needed to examine the association or causality between company size and MSDs among cashiers, especially the role of company size as a risk factor for pain or disability.

Logistic regression analyses demonstrated that the need to work in awkward positions for reaching items in the shopping trolley represented a significant risk factor for MSDs among SCs (Tables 4 and 5). This result concurs with that of a previous study, which reported that working activities involving frequent arm movements above the shoulder and frequent stooping constituted significant factors associated with MSDs in the shoulder region [32]. Moreover, the repetitive assumption of awkward postures comprises an ergonomic risk factor that can lead to the development of MSDs among cashiers [37]. This awkward position requires more range of motion (ROM) and higher levels of muscle activation. Therefore, the repetition of this position over time may negatively affect the musculoskeletal system, thus resulting in pain and disability.

In this present study, the number of workdays per week constituted a significant association with MSDs. Specifically, participants reported that an increase in working days enhances the likelihood of developing MSDs. This result agrees with the findings of Sirge et al. [22], who reported that longer working hours maylead to a higher prevalence of MSDs in SCs. Moreover, the present study found a significant association between the preferred position of cashiers during work and MSDs. In comparison to cashiers that worked in a sitting position, cashiers who preferred working in a standing position were 9 times more likely to experience MSDs. This result appears inconsistent with the body of literature. For instance, 1 study found that working in a standing rather than a sitting position with a bi-optic scanner constituted the ideal ergonomic position. Conversely, cashiers that worked in a sitting position with a single-window scanner reported a higher risk of MSDs [38]. The conflicting results between these investigations indicate the need for further research that considers specific types of scanning devices in addition to bodily positions.

Limitations

The cross-sectional design constituted a limitation of this study because this methodology lacks the ability to determine causal relationships. Further investigations should assess the cause-and-effect relationships dictating the development of MSDs among cashiers, as the present study lacked the ability to determine such relationships. In addition, the current study took place before the ongoing SARS-CoV-2 (COVID-19) pandemic; therefore, the interpretation of these results should consider the differences between pre-COVID and post-COVID conditions.

Since the survey relied upon self-report measures investigating MSDs and their effects on daily activities over a period of 12 months, the overestimation or underestimation of past symptoms and their effects on activities may have occurred. Consequently, future research should conduct longitudinal studies that investigate the long-term effects of MSDs. Finally, the current study features a lack of data on non-occupational activity, which, in conjunction with professional work and sport, likely affects the musculoskeletal system. Future studies can overcome this limitation by including more information about activity outside of work and recreation.

CONCLUSIONS

The study found a significant association between MSDs and several risk factors, including working days per week, preferred position while working, and adoption of awkward positions to reach items in the shopping cart. The high levels of disability associated with these MSDs,

along with the multiple risk factors, suggest the need to carefully examine this aspect of the occupation. Proper training and work organization might constitute an effective method for preventing or minimizing the prevalence of MSDs among SCs in SA.

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