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EVALUATION OF MUSCULOSKELETAL DISORDERS IN HEALTHCARE WORKERS OF A TERTIARY HOSPITAL

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ABSTRACT

Aim: Work-related musculoskeletal disorders (MSD) are an important factor that impairs the quality of life of heatlhcare workers. The aim of this study was to determine the MSD level and related conditions in healthcare workers in a tertiary hospital and to determine the risks of health workers in terms of MSD.

Methods: This cross-sectional study was conducted at İstanbul Kartal Dr. Lütfi Kırdar City Hospital February-June 2019, and included 400 healthcare workers. A sociodemographic form and the Turkish version of the Cornell Musculoskeletal Discomfort Questionnaire (T-CMDQ) were used as data collection tools. The questions were asked to the participants using face-to-face interviews.

Results: The rate of MSD in any body region among all participants was determined as 92.8%. MSD was most common in the back (68.8%), waist (66.5%) and neck (65.5%). It was found that the risk of MSD increased in women, surgical department workers, nurses and standing workers (p=0.000, p=0.012, p=0.000, p=0.000). Age, Body Mass Index (BMI), regular physical exercise status, working year, transportation preference and weekly working hours were not directly related to MSD.

Conclusions: Hospitals are environments with increased risk factors for work related MSD in healthcare workers due to the non-ergonomic conditions and intense work tempo. Efforts to reduce these risk factors will increase the quality of life and work efficiency of healthcare workers.

Keywords: Cornell score, T-CMDQ, healthcare workers, musculoskeletal disorders, occupational diseases

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INTRODUCTION

Healthcare workers face biological, chemical, physical, ergonomic and psychosocial health risks in work life [1]. Among these, many physical, biomechanical, organizational, psychosocial and personal factors can play a role alone or in various combinations in the development of Musculoskeletal Disorders (MSD) [2]. MSD are a wide spectrum of inflammatory and degenerative conditions that can occur due to single or cumulative trauma and affect muscles, ligaments, tendons, nerves, bones and joints. MSD, which is one of the leading causes of pain and loss of function, causes deterioration in quality of life at different levels. It causes economic losses by decreasing productivity due to reasons such as sick leave, absenteeism and early retirement [3,4]. The aim of this study was to determine the MSD level and related conditions in healthcare workers in a tertiary care hospital in İstanbul and to determine the risks of health workers in terms of occupational musculoskeletal diseases.

METHODS

This cross-sectional study was conducted at Istanbul Kartal Dr. Lütfi Kırdar City Hospital February-June 2019. During this period approximately 2250 healthcare workers were working in the hospital. The sample size of the study was calculated as 329 with 5% margin of error, 95% confidence interval and 80% estimated response rate in the known universe. It was aimed to invite to the study 412 health workers aged 18 and over who had been working at the hospital for more than a year with a margin of excess. The study was terminated when the number of participants reached 400. Those who took a break for a long time, those with neuro-muscular, rheumatological, or musculoskeletal diseases, pregnant women and those with communication disabilities were excluded. Data were collected by conducting a questionnaire using a face-to-face interview technique. The questionnaire was composed of two parts. The first part included age, gender, height, weight, Body Mass Index (BMI), occupation, working department, working year, regular physical exercise status, weekly working hours, working posture and transportation to the workplace. In the second part the Turkish version of the Cornell Musculoskeletal Discomfort Questionnaire (T-CMDQ) was used to assess participants' MSD. The Cornell Musculoskeletal Discomfort Questionnaire was developed by Cornell University professor Alan Hedge and ergonomics graduate students to assess MSD in workers. The Turkish reliability-validity study was conducted by Erdinç et al. in 2008 [5]. T-CMDQ is designed separately for men and women. 11 different parts of the body (neck, shoulder, back, upper arm, waist, forearm, wrist, hip, upper leg, knee and lower leg) for men and 12 different parts of the body (in addition feet) for women are evaluated. It is asked whether pain, ache or discomfort has been felt in these areas in the last week, and if so, the level of severity and whether this prevents them from working. The frequency of feeling pain is obtained by multiplying the answers "never, 1-2 times a week, 3-4 times a week, at least once a day, many times a day" by 0, 1.5, 3.5, 5 and 10, respectively. The pain intensity was calculated by multiplying the answers as "mildly severe, severe, very severe" and "no obstacle at all, some obstacle, a lot of hindrance" by 1, 2, 3, respectively. 'Total Cornell Score', which ranges from 0-990 for men and 0-1080 for women, is calculated by

summing the scores calculated separately for each region.5 In this study, the highest score for the shoulder, upper arm, forearm, wrist, upper leg, knee, lower leg and foot regions calculated separately for the right and left sides was accepted as the score of that region.

Statistical Analysis: Categorical variables were analyzed as frequencies and percentages. Mean, standard deviation, median, minimum and maximum values of continuous variables were analyzed. Normal distribution of data was analyzed with the Kolmogorov-Smirnov test. Student's t-test and the Pearson Chi-Square test were used to compare the groups. In comparisons of independent groups Mann-Whitney U and Kruskal-Wallis tests were used and $p<0.05$ was considered significant. SPSS 22.0 (Statistical Package for thr Social Sciences - IBM®) was used for statistical analysis.

Ethical approval: Ethics committee approval numbered 2019/514/146/20 was obtained from the local Clinical Research Ethics Committee for the study. All participants gave informed consent.

RESULTS

66.3 percent (n=265) of participants were female and 33.7 percent (n=135) were male, the mean age was 32.3 ± 8.7 years, and half of the participants (52.3%; n=209) were married. Occupational distribution: 46.0% (n=184) were nurses, 30.5% (n=122) were doctors, and 23.5% (n=94) were other health personnel (physiotherapist, radiology technician, anesthesia tecnician, etc.). The majority of the participants (43.0%; n=172) were working in internal medicine deparments (including pediatrics), and the majority of them had worked 1-5 years (52.5%; n=210). General characteristics are given in Table1. About half of the participants worked between 46-90 hours per week (55.3%; n=221). There was a significant difference between genders (p=0.228) and also between occupational groups in terms of weekly working hours, and these difference were due to the nurses (p=0.000). Most of the participants were standing while working (73.3%; n=293) and most of the standing workers were women (68.3%; n=200) (p=0.189). The majority of this group were also nurses (56.7%; n=166) (p=0.000). Most of the participants (42.8%; n=178) used public transportation to go to work.

Most of participants were not doing regular physical exercise (57.5%; n=230). There was no significant difference between women and men in terms of physical exercise status (p=0.159), and there was no significant difference between occupational groups (p=0.762).

The mean BMI of the participants was 24.3±3.8 kg/m2. While the mean BMI was 23.6±3.5 kg/m2 in women, it was 25.7±3.8 kg/m2 in men (p=0.000). The relationship between socio-demographic and occupational characteristics of the participants and BMI is given in Table2. A significant relationship was found between BMI and age (BMI increased with age), gender (BMI was higher in men) and marital status (BMI was higher for married people). The median T-CMDQ score of the participants was 44.5 (min:0-max:1200). It was 13.7 (min:0-max:290.5) for men and 86.0 (min:0-max1200) for women (p=0.000). There was a weak, non-significant negative correlation between T-CMDQ scores and age (r=-0.024; p=0.629). Also, no significant relationship was found between BMI and T-CMDQ scores (r=-0.038; p=0.445).

Table1. General characterics of participants

		All Participants %, (n=400)	Men %, (n=135)	Women %, (n=265)	p-value
Age		32.30±8.70	32.09±9.10	32.40±8.50	0.736
Marital status	Married	52,25 (209)	29.18 (61)	70.81 (148)	0.043
	Single	47.75 (191)	38.74 (74)	61.25 (117)	
Occupation	Physician	30.50 (122)	44.26 (54)	55.73 (68)	0.000
	Nurse	46.00 (184)	22.28 (41)	77.71 (143)	
	Other Health Workers	23.50 (94)	42.55 (40)	57.44 (54)	
Department	Internal departments	43.00 (172)	33.13 (57)	66.86 (115)	0.903
	Surgical departments	30.25 (121)	33.05 (40)	66.94 (81)	
	Preclinical departments	26.75 (107)	35.51 (38)	64.48 (69)	
Working year	1-5	52.50 (210)	35.71 (75)	64.28 (135)	0.228
	6-10	14.25 (57)	42.10 (24)	57.89 (33)	
	11-15	11.25 (45)	31.11 (14)	68.88 (31)	
	16-20	8.25 (33)	21.21 (7)	78.78 (26)	
	21+	13.75 (55)	27.27 (15)	72.72 (40)	

The occupational group with the lowest median T-CMDQ score was other health personnel with a score of 22.5 (min:0-max670.5). The T-CMDQ score of physicians was 28.0 (min:0-max:1200) and of nurses 78.25 (min:0-max:973.5) (p=0.000). Also T-CMDQ scores varied significantly according to occupational departments (p=0.012); the lowest scores were in preclinical departments such as pathology, radiology and laboratory (32.5; min:0-max:764.0), the highest scores were in surgical departments (73.5; min:0-max:973.5).

There was no significant relationship between working year and T-CMDQ scores (p=0.450). However, with the increase in weekly working hours, the T-CMDQ scores gradually increased and reached a maximum level for those who worked 91 hours or more (p=0.368).

Table2. Relationship between socio-demographic and occupational characteristics and BMI

		Under weight %, (n=42)	Normal weight %, (n=202)	Over weight % (n=128)	Obese % (n=28)	p-value
Gender	Men	3.70 (5)	42.96 (58)	42.22 (57)	11.11 (15)	0.000
	Woman	13.96 (37)	54.33 (144)	26.79 (71)	4.90 (13)	
Occupation	Physician	9.01 (11)	51.63 (63)	35.24 (43)	4.09 (5)	0.370
	Nurse	13.04 (24)	46.73 (86)	32.06 (59)	8.15 (15)	
	Other Health Workers	7.46 (7)	56.38 (53)	27.65 (26)	8.51 (8)	
Age		29.4±6.7	30.5±7.5	34.9±9.6	37.1±9.3	0.000
Marital status	Married	6.69 (14)	43.06 (90)	40.19 (84)	10.04 (21)	0.000
	Single	14.65 (28)	58.63 (112)	23.03 (44)	3.66 (7)	
Working posture	Standing	10.68 (31)	53.10 (154)	30.00 (87)	7.24 (21)	0.425
	Sitting	10.00 (11)	43.63 (48)	37.27 (41)	6.36 (7)	
Transport	Public transport	10.52 (18)	55.55 (95)	29.23 (50)	4.67 (8)	0.406
	Car	10.14 (14)	42.02 (58)	37.68 (52)	10.14 (14)	
	Walking	11.11 (10)	53.33 (48)	28.88 (26)	6.66 (6)	
Weekly working hour	45	7.65 (17)	50.45 (112)	33.33 (74)	8.55 (19)	0.334
	46-90	13.24 (20)	51.65 (78)	29.80 (45)	5.29 (8)	
	91	18.51 (5)	44.44 (12)	33.33 (9)	3.70 (1)	
Exercise status	Regular exerciser	8.18 (9)	51.81 (57)	33.63 (37)	6.36 (7)	0.910
	Not exercising regularly	11.07(32)	50.17(145)	31.48 (91)	7.26 (21)	

The median T-CMDQ score of the standing workers was 65.5 (min:0-max:1200), while for the sitting workers it was 18.7 (min:0-max:342.5) (p=0.000). There was no significant relationship between regular physical exercise status and T- CMDQ scores, and also for transportation preferences (respectively p=0.092; p=0.172).

It was determined that 92.8% of all participants indicated MSD in any body region. This rate was 97% for women and 84.4% for men. MSD status and gender distribution are given in Table3. The body regions most affected by MSD were back (68.8%), waist (66.5%) and neck (65.5%), while the least affected were forearm (20.5%), hips (27.5%) and upper arm (30.8%).

Table3. Body regions affected by MSD by gender

	Men % (n)	Women % (n)	Total % (n)	p-value
Neck	25.95 (68)	74.04 (194)	65.50 (262)	0.000
Shoulder	17.72 (39)	82.27 (181)	55.00 (220)	0.000
Back	25.09 (69)	74.90 (206)	68.75 (275)	0.000
Upper arm	15.44 (19)	84.55 (104)	30.75 (123)	0.000
Waist	28.19 (75)	71.8 (191)	66.50 (266)	0.001
Forearm	15.85 (13)	84.14 (69)	20.50 (82)	0.000
Wrist	18.89 (24)	81.10 (103)	31.75 (127)	0.000
Hip	21.81 (24)	78.18 (86)	27.50 (110)	0.002
Upper leg	16.66 (23)	83.33 (115)	34.50 (138)	0.000
Knee	22.89 (38)	77.10 (128)	41.50 (166)	0.000
Lower leg	25.42 (45)	74.57 (132)	44.25 (177)	0.002
Foot*		56.60 (150)		

*Only in women

MSD were more common in women than men. No significant relationship was found between occupation, working hours, working posture, physical exercise status, and BMI in women, and the presence of MDS in the neck, back, waist and hips. In women, there was a significant relationship between shoulder discomfort and working posture; shoulder discomfort was significantly higher in sitting workers (79.6% and 20.4%) (p=0.023). In women, upper leg, lower leg and foot discomfort was associated with working posture and occupation, while knee discomfort was associated only with occupation. Most of the women with upper leg complaints were working standing up (82.6, n=95) (p=0.018) and were nurses (66.1, n=76) (p=0.002). Similarly, lower leg and foot complaints were significantly higher in standing workers and nurses (p=0.000, p=0.000 for lower leg, p=0.000 for foot, p=0.000, respectively). Of those with knee complaints, 64.1% (n=82) were nurses, 25.8% (n=33) were physicians, and 10.2% (n=13) were other health personnel (p=0.000).

There was no significant relationship between occupation, working hours, working posture, physical exercise status and BMI categories in men and MSD of neck, shoulder, waist, upper arm, forearm, wrist, hip and lower leg. However, there was a significant relationship between back discomfort and physical exercise status in men. Back complaints were significantly less in men who exercised (p=0.011). In men, upper leg complaints were associated with posture and occupation; knee complaints were anly associated with occupation. Most of the men with upper leg complaints were standing (91.3%, n=21)

(p=0.012) and were nurses (65.2%, n=15) (p=0.000). Of the men with knee complaints, 44.7% (n=17) were nurses, 21.1% (n=8) were physicians, and 34.2% (n=13) were other health personnel (p= 0.013).

Relationships between occupations and MSD are given in Table4. MSD was most commonly associated with the waist, shoulder and hips in physicians, it was predominantly associated with the feet, upper and lower legs in nurses, and was associated with the shoulder, neck and back in other health personnels.

There was a significant relationship between the working hours of the physicians and shoulder complaints. 66.1% (n=41) of those with shoulder complaints worked between 45-90 hours a week, 19.4% (n=12) 91 hours and more, and 14.5% (n=9) 45 hours or less (0.019). 60% (n=18) of female physicians with any MSD complaints were working standing up, 40% (n=12) were working sitting down (p=0.034).

MSD was more common in nurses than physicians and other health personel. There was no significant relationship between working hours, working posture, physical exercise status and BMI in nurses and the presence of MSD in the neck, shoulder, upper arm, waist, forearm, wrist, hips, knee and foot. Of the nurses with back complaints, 31.3% (n=42) were overweight, 49.3% (n=66) were normal, and 14.9% (n=20) were underweight (p=0.017). Complaints related to the upper leg were associated with standing work (p=0.015). Complaints of the lower leg were associated with working posture (p=0.028), BMI (p=0.001), and exercise status (p=0.001).

In other health personnel there was no significant relationship between working hours, working posture, physical exercise status and BMI categories and MSD presence of neck, back, upper arm, waist, forearm, hip, knee, upper leg, lower leg, and foot. There were significant correlations between MSD of shoulder and transportation preferences (p=0.027) and working postures (p=0.048). The rate of wrist discomfort in obese participants was 25% (n=6) (p=0.009).

Table4. MSD distribution by occupational groups

	Physician % (n)	Nurse % (n)	Other % (n)	p-value
Neck	30.53 (80)	49.23 (129)	20.22 (53)	0.075
Shoulder	28.18 (62)	50.90 (112)	20.90 (46)	0.090
Back	31.27 (86)	48.72 (134)	20.00 (55)	0.045
Upper arm	26.82 (33)	55.28 (68)	17.88 (22)	0.039
Waist	31.20 (83)	48.87 (130)	19.92 (53)	0.053
Forearm	28.04 (23)	57.31 (47)	14.63 (12)	0.038
Wrist	27.55 (35)	53.54 (68)	18.89 (24)	0.105
Hip	28.18 (31)	52.72 (58)	19.09 (21)	0.221
Upper leg	20.28 (28)	65.94 (91)	13.76 (19)	0.000
Knee	24.69 (41)	59.63 (99)	15.66 (26)	0.000
Lower leg	23.72 (42)	59.88 (106)	16.38 (29)	0.000
Foot*	20.00 (30)	67.33 (101)	12.66 (19)	0.000

DISCUSSION

The rate of MSD in any body region among all the participants was determined as 92.8% in this study. Inappropriate ergonomic conditions and misuse of body mechanics cause MSD in healthcare workers [6-8]. In a study conducted in Istanbul, the rate of MSD in any body region of healthcare workers was found to be 79.7% [9]. Similarly, in a study conducted with secretaries in a hospital in Izmir, the rate of MSD in any part of the body was found to be 91.4% [10]. These data show that healthcare workers are at a significant risk for MSD.

It has been reported in the literature that the most common symptom related to the musculoskeletal system is low back pain [11,12]. In a study evaluating musculoskeletal symptoms in nurses, it was found that the complaints were mostly in the lower back, back and shoulder regions [13]. In another study investigating work- related upper extremity problems in hospital workers, it was found that pain complaints were most common in the neck, back, shoulder, wrist, and elbow regions, respectively [14]. In a cross-sectional study conducted in office workers, it was found that 89% of the participants had MSD signs and symptoms in the last 1 year, and these were mostly neck (69.2%), waist (58.2%), knee (41.8%), shoulder (35.2%) and back complaints (34.2%) [15]. In another study investigating MSD in office workers and the factors affecting it, it was found that MSD was most common in the neck (60.16%), waist (57.1%) and shoulder (54.03%) [16]. It has been reported that MSD is most common in the shoulder, waist, neck and upper back regions in Japanese nurses, and among the risk factors in the workplace were manual procedures used to treat patients and physically demanding work [17]. In a study conducted in India, it was determined that the most risky group for MSD among healthcare workers was nurses. Nearly half of all healthcare workers had symptoms of MSD in at least one part of their body in the last 12 months, and the most common symptoms were in nurses, physiotherapists, dentists, laboratory technicians and doctors, respectively. Among the symptoms were included pain of the lower back (45.7%), neck (28.5%), shoulder (23.5%), hip/thigh (7.1%) and elbow (7.1%) [18]. In this study, similar to the literature, the incidence of MSD was listed as back (68.8%), waist (66.5%), neck (65.5%) and shoulder (55.0%). It is seen that MSD is especially concentrated in the spine region. Among the reasons for this, we think that increasing computer use in the hospital environment, working in an inappropriate posture for a long time, heavy lifting while helping patients, and inappropriate ergonomic conditions in the hospital environment are all factors, as in many lines of business [19].

Although age is thought to increase the risk of MSD, studies have not been able to clearly demonstrate this risk. Koyuncu et al. reported that MSD increased significantly with age [9]. Cımbız et al. determined that an increase of one unit in age increased the risk of pain in the musculoskeletal system by 3.2% [20]. In the study of Gül A. et al. with nurses, it was reported that age had no effect on MSD pain [21]. Similarly, in a study conducted in a hospital in Izmir, no significant relationship was found between the ages of the secretaries and their T-CMDQ scores [10]. In this study, there was a weak, insignificant negative correlation between T-CMDQ scores and age. A limitation of the study was that the volunteers

participating in the researh were not homogeneously distributed according to age groups and were mainly concentrated in the 25-35 age group. Conducting the research with participants in a wider age range would be useful for determining risk factors.

In this study, similar to the literature, it was observed that MSD was higher in women. Koyuncu et al. reported that MSD was significantly higher in women than men among health personnel [9]. In the study of Mahmud et al. evaluating MSD in the upper extremities and neck region, it was revealed that women (72%) are more prone to MSD than men (52%) [22]. In the study of Hou and Shiao, it was determined that the main reason for obtaining a rest report for female hospital workers was MSD, and they determined that 28% of them needed medical treatment [23]. In a study in Denmark by Madeleine et al., MSD pain, severity, duration and the number of painful areas were found to be statistically higher in women working at a computer compared to men [24]. In this study, we found that the T-CMDQ score, which is determined by the severity and frequency of the pain and its interference with work, was higher in women than in men, and the MSD was statistically significantly higher in women (97%) than men (84.4%). Sirzai et al. thought that this difference might be due to anthropometry, and that the study areas might have been designed more appropriately for men [14].

In this study, the upper leg, lower leg and foot related disorders of female participants were related to the working posture (posture) and occupation of the participant. The vast majorities of women with upper leg complaints was working standing up and were nurses. Similarly, complaints about lower legs and feet were significantly higher in ambulatory workers and nurses. We think that this is due to the fact that female participants are more often nurses and that nurses work mostly standing up. It has been reported in the literature that lower leg, foot and ankle pain are caused by standing for a long time and lifting weights every day [23]. It has been reported that being female and advanced age are associated with an increased risk of pain in the foot, and as a result, quality of life decreases [25]. In another study, it was determined that heavy lifting, long standing and bending are the main causes of musculoskeletal disorders [26].

Del Pozo-Cruz et al. found that the complaints of low back pain were higher in office workers, sedentary people and those with high BMI [27]. Cımbız et al. determined that while other variables were constant, the risk of pain was higher in women than in men, and BMI was the most important risk factor for increasing pain [20]. In this study, however, no direct relationship was found between BMI and MSD, and it was found that only nurses' complaints about the lower leg were associated with BMI and exercise status. We think that this is due to the very low rate of obesity (7%) among the participants in this study, the fact that the sample was not homogeneous in terms of BMI, and contrary to the literature, the BMI of male participants was higher than the BMI of females.

Koyuncu et. al. observed that the highest rate of occupational MSD was in emergency department workers, then surgical departments, and finally internal medicine departments [9]. In this study, it was observed that the highest rate of MSD was in the surgical departments, then in the internal medicine

departments, and finally in the preclinical department workers (we included the emergency department in the surgical departments).

Altinel et al. reported that the frequency of low back pain in nurses was approximately twice that of physicians [28]. Omokhodion et al. reported that low back pain was most common in nurses (69%), followed by secretaries (55%) and cleaning personnel (47%) among hospital workers [29]. In a study on occupational-related low back pain in healthcare workers, it was seen that the highest rate of low back pain was in nurses with 77.1%, the lowest rate in secretaries with 54.1%, and assistant support personnel with 53.5%. Physicians were not included in this study [30].

In a systematic review, while the prevalence of MSD in nurses was 40%-75%, this rate was found in the range of 38%-68% in doctors [31]. In this study, we found that all MSDs were higher in nurses than physicians and other health personnel (Table4). We found that MSD associated with the back, waist, shoulders and hips was most common in physicians, while MSD associated with the feet, upper legs and lower legs was prominent in nurses. In other healthcare professionals, MSD associated with the shoulder, neck and back was more common.

It will be beneficial for healthcare workers to protect their body mechanics and to know risk factors and symptoms, in terms of prevention and early diagnosis of MSD. It may also be beneficial to recommend and implement physicial exercise programs that will strengthen the muscles of the waist, back and neck regions. Hospitals are environments with increased risk factors for occupational MSD in healthcare workers due to the non-ergonomic conditions and intense work tempo. Efforts to reduce these risk factors will increase the quality of life and work efficiency of healthcare workers.

Limitations: The fact that the study was conducted in a single center, the participants were not questioned in terms of psycho-social risk factors that pose a risk for MSD, the physical exercise status could not be questioned in detail (such as the type of physical exercise), and that the data of the participants such as age and BMI were not homogeneously distributed were limitations. It was also a limitation that important deparments such as the emergency department and the intensive care unit were included in this study, not independently, but within the internal or surgical departments, and the partipicants were limited to certain occupational groups (some occupations were not evaluated, such as dentist, physiotherapist, and midwife). We think that the fact that the T-CMDQ questionnaire only inquired about complaints in the last week may also constitute a limitation of the study.

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