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EVALUATION OF MUSCULOSKELETAL COMPLAINTS OF HEALTH WORKERS IN TRAINING AND RESEARCH HOSPITAL SAMPLE

Sağlık çalışanlarının kas iskelet sistemi rahatsızlıklarının değerlendirilmesi: Bir üniversite hastanesi örneği

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Abstract

The aim of this study was to evaluate the musculoskeletal disorders and their related factors among health workers who face many ergonomic risks due to their working conditions. The research was a cross-sectional study and conducted between April and August 2017. The dependent variables of the research were Cornell Musculoskeletal Discomfort Questionnaire points. It was determined that left knee, waist, and left thigh pain were the most disruptive in the work of the workers with a percentage of 23.1%, 16.8%, and 11.5% respectively. According to multivariate linear regression model, the significant variables were ergonomic risk factors, working time, off-duty work, more than eight hours of work, and the significance persisted also on the degraded final model ($p<0.05$). A moderate correlation was detected only between the left forearm pain score and ergonomic exposure (Rho=0.445). Back and low back pain scores were the highest score. Making ergonomic arrangements, using assistive equipment for transporting patients, using electric patient beds with adjustable height, and providing training on ergonomics principles to employees is crucial for preventing these problems.

Keywords: Musculoskeletal complaints, health workers, health promotion.

Özet

Bu çalışmanın amacı, çalışma koşulları nedeniyle pek çok ergonomik riskle karşı karşıya olan hekim dışı sağlık çalışanlarında kas iskelet sistemi rahatsızlıklarını ve ilişkili faktörleri değerlendirmektir. Araştırma kesitsel bir çalışmadır ve Nisan-Ağustos 2017 tarihleri arasında yürütülmüştür. Araştırmanın bağımlı değişkeni Cornell Kas İskelet Rahatsızlık puanıdır. Çalışanların işlerinde sırasıyla sol diz, bel ve sol uyluk ağrısının %23,1, %16,8 ve %11,5 en rahatsız edici olduğu belirlendi. Çok değişkenli doğrusal regresyon modeline göre, önemli değişkenler ergonomik risk faktörleri, çalışma süresi, görev dışı çalışma, sekiz saatten fazla çalışma idi ve anlamlılık indirgenmiş son modelde de devam etti ($p<0,05$). Sadece sol ön kol ağrı skoru ile ergonomik maruziyet arasında orta derecede bir korelasyon tespit edildi (Rho=0,445). Sırt ve bel ağrısı skorları en yüksek skordu. Bu sorunları önlemek için ergonomik düzenlemeler yapmak, hastaları taşımak için yardımcı ekipman kullanmak, yüksekliği ayarlanabilir elektrikli hasta yatakları kullanmak ve çalışanlara ergonomi ilkeleri konusunda eğitim vermek çok önemlidir.

Anahtar kelimeler: Kas-iskelet rahatsızlıkları, sağlık çalışanları, sağlığı geliştirme.

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Introduction

A vast majority of musculoskeletal disorders (MSDs) are partially or completely related to working life. However, it is often difficult to assess the impact of occupational factors in these cases. Bernardino Ramazzini, was the first person to point to the occupational MSDs in his book which was written in 1700, referring to the effects of unnatural movements or compelling postures. Thus, it is crucial to learn the individual's working history in detail. Neck, shoulder and low back pain are the most common conditions among occupational MSDs (1). Especially in developed countries, 70-80% of adults have experienced MSDs at least once in their lives (2). According to the US Bureau of Labor Statistics, health care workers are at greater risk in terms of MSDs compared to industry, construction and mining (3). The majority of health workers cumulative traumas to the musculoskeletal system due to activities such as positioning, lifting and assisting the patient (4). According to the National Institute for Occupational Health and Safety in the United States, the cost of musculoskeletal problems is $ 7.4 billion (5). It is stated that these cumulative traumas affecting the musculoskeletal system are mainly due to the aging of the health workforce and the increasing number of heavy patients resulting from the outbreak of obesity (3). It was reported that intensive care nurses lift an average of 3 tons of weight per day; the incidence of low back pain is 52% and 18% of them leave the profession or change their jobs according to American Nurses Association (6). Professional associations have developed application guidelines for health workers performing manual transport and lifting works where the use of ancillary equipment is necessary. In cases where the limits are exceeded and patient safety programs requiring the use of technology in lifting should be developed and expanded in the field of health care (3). In this respect it is important to determine the presence of MSDs and their determinants in order to prevent burden of work related MSDs in the workplace.

The target audience of the study is healthcare professionals (midwives, nurses, health officers, health technicians) and other professionals who work in this field and who have an original duty within the framework of health service delivery, although they are not healthcare professionals; in other words, it consists of non-physician health workers. Working life, transport of patients, repetitive, often the forced movement often exposed to non-physician health workers, especially university hospitals that relatively few staff as significantly musculoskeletal system in an environment where there is too much workload is faced with the disease. Physicians are out of the scope of this research, since non-physician health workers are more concerned with patient care than physicians. Due to limited number of studies in this area in our country, it was thought that such a study was needed.

The aim of this study was to evaluate the MSDs and their related factors among non-physician health workers who face many ergonomic risks due to their working conditions.

Material-Method

This cross-sectional study was conducted between April and August 2017 in Balikesir University Training and Research Hospital. Ethics committee approvalwas obtained from the Ethics Committee of Izmir Katip Celebi University. (date:2/22/2017, number:34) The population of the study consists of non-physician health workers (nurse, health officer, midwife) (n=206) working at Balikesir University Training and Research Hospital. The sample size of the study was not calculated, we aimed to reach the entire universe. In total 183 workers (94%) agreed to participate in the study and individuals were interviewed at the hospital. Research data were collected by face to face interviews. Interviewers tried to increase participation rates in the study by visiting the unreachable people twice at different time periods.

The dependent variable of the research was; Cornell Musculoskeletal Discomfort Questionnaire (CMDQ)(7) points. The independent variables of the study were socio-demographic characteristics (age, gender, chronic illness, etc.), lifestyle variables (smoking status, sleep patterns, physical activity, etc.) Swedish Demand-Control-Support Questionnaire (8) and working conditions (working time, night working, working unit, etc.).

Data were collected using a 19-item socio-demographic questionnaire, 17-item Swedish Demand-Control-Support Questionnaire and Cornell Musculoskeletal Discomfort Questionnaire. In addition to the socio-demographic questionnaire, the Swedish Demand-Control-Support Questionnaire consisted of 17 questions including a 4-point Likert-type response scale. The survey measures the individual's workload, decision-making (control) and social support dimensions, respectively. The value obtained from the freedom of decision part of the workload includes a summary score called work strain, score above 1 indicates increased work strain. The Turkish version of the CMDQ was used to evaluate the participants' MSDs (9). The questionnaire investigates the frequency and severity of MSDs in various parts of the human body as well as whether it interferes with the ability to work. A high result indicates an increase in MSDs. Participants were asked to mark the different pain region or regions shown on the body in the questionnaire. Frequency of the pain in the last week was investigated with a 5-point Likert scale (1-I never felt, 2-I felt twice, 3-I felt three or four times, 4-I felt once, 5-I felt many times), pain severity was investigated with 3-point Likert scale (1-Mild, 2-Moderate, 3-Severe) and its interference with the work was investigated with the 3-point Likert scale (1-No hindrance, 2-Slight hindrance, 3-Hindrance at a high level). According to the scoring system, 0-90 points were obtained for each region. The ergonomic risks of the participants were evaluated in three parts. In the first part, 20 questions (positioning the patient, giving sliders, taking them to the toilet-bath, compelling movements which were exposed while giving care, posture disorders, etc.) including a 4-point Likert scale (1)None, 2) 1-2 times, 3)3-4 times and 4)5 or more) were used to evaluate the physically challenging activities. The second part consisted of 5 questions (standing, sitting, walking, lifting/carrying, pushing/pulling) including a 4-point Likert scale (1-none or less than half of the working time, 2-about half of the working time, 3-More than half of the working time, 4-In the whole working period) which were used to evaluate the exposures during work time. In the third part, the use of assistive tools or personnel in lifting, caring and transporting the patient were evaluated with 6 questions which included a 4-point Likert scale (1-None, 2-Sometimes, 3-Mostly, 4-Always).

Statistical analysis: The mean value of the data are presented with standard deviations or percentages. The compatibility of the data with normal distribution was tested with Shapiro Wilk test. Non-parametric tests (Mann Whitney-U, Kruskal Wallis) were used for comparison between groups when continuous variables did not fit the normal distribution. Chi-Square test was used to compare categorical variables. Spearman The correlation of continuous variables with Cornell dimensions was evaluated with Spearman correlation since the assumption of normality was not met. In the multivariate analysis, simple linear regression enter method was used. IBM SPSS v25 package program was used for analysis. Statistical significance level was accepted as $p<0.05$.

Results

Of the participants 71.0% were female, 29.0% were male, and the mean age was 31.4±6.3 years. 63.9% of the participants were married; 42.1% had no

children, 29.0% had two children and 21.3% had only one child. The education level of the participants was 64.4% for associate degree-bachelor's-master's degree, 31.1% for high school and 4.4% for primary education. The rate of smokers was 29.0% and the rate of quitting was found to be 15.3%; the age of onset of smoking was 19.0 ±2.7 (13-27) and the daily consumption of smokers was 13.6±7.0 cigarettes. The presence of at least one chronic disease was 5.5%, disability was 1.6%, flatfoot 3.3% and spine problem was 12.6%. The average time allocated for daily household chores was 2.2±1.2 (1-8) hours, the time allocated for childcare was 2.4±1.1 (1-6) hours, the median working time was 9 hours, the rate of working period longer than eight hours was 83.1% and night duty rate at weekends was 78.7%. The working status of participants was as follows; 71.6% of them were civil servants, 10.9% were contracted civil servants and 17.4% of them were workers. The average working time of the employees was 8.2±6.3 (1-30) years and 20.2% of them did additional work outside the working hours. Of the participants 9.3% stated that they did not do any physical activity, 57.9% did 1-2 times, 26.8% did 3-4 times; 53.6% of them stated that they were walking regularly, 20.8% of them were running as a sportive activity, 13.7% of them stated that they played team games. Sleep patterns of the employees were 4.4% very bad, 17.5% bad, 38.9% moderate, 39.3%, respectively; regarding general health status 77.6% of them reported good-very good-excellent, 22.4% of them stated that their status was moderate-bad. Participants had experienced %13.1 of for work accidents in the last year, all individuals who experienced work accidents reported cutting tool wounds except one; 15 participants reported that they had one, 4 had two, 2 had three and 2 had four accidents. 3.8% of employees reported herniated disc when the work related diseases were questioned. 71.6% of the employees were normal weight and 27.9% were overweight and obese. Some descriptive characteristics of the workers are presented in Table 1. Off-duty work and average working hours are statistically significantly higher for men than for women and the distribution of other descriptive variables is indistinguishable by gender.

Table 1: Descriptive characteristics of participants.

Variables	Male		Female		Total		p
	n	%	n	%	n	%	
Age group(Mean±SD)	32.6	6.8	30.9	6.0	31.5	6.3	0.096*
Education							
Primary and middle school	5	2.3	3	9.3	8	4.4	
High school	16	31.5	41	30.2	57	31.1	0.100**
University	32	66.1	86	58.5	118	64.5	
Marital status							
Married	39	73.6	78	60.0	117	63.9	0.097**
Single-widow-divorced	14	26.4	52	40.0	66	36.1	
Task							
Health worker	44	83.0	119	91.5	163	89.1	0.093**
Support worker-attendant	9	17.0	11	8.5	20	10.9	
Working status							
Public servant	42	79.2	109	83.8	151	82.5	0.457**
Worker	11	20.8	21	16.2	32	17.5	

Average working time							
8 hours	4	7.5	27	20.8	31	16.9	**0.030****
Over 8 hours	49	92.5	103	79.2	152	83.1	
Night-weekend working							
Yes	45	84.9	99	76.2	144	78.7	0.190**
No	8	15.1	31	23.8	39	21.3	
Off-duty working							
Yes	21	39.6	16	12.3	37	20.2	**<0.001****
No	32	60.4	114	87.7	146	79.8	
Physical disability, spine problem or flatfoot							
Yes	7	13.2	21	16.2	28	15.3	0.615**
No	46	86.8	109	83.8	145	79.2	
Chronic diseases							
Yes	4	7.5	6	4.6	10	5.5	0.428**
No	49	92.5	124	95.4	173	94.5	
Smoking status							
Current smoker	20	37.7	33	25.4	53	29.0	0.094**
Never or ex-smoker	33	62.3	97	74.6	130	71.0	
Physical activity							
Any time	8	15.1	9	6.9	17	9.3	
1-2 times weekly	24	45.3	82	63.1	106	57.9	0.054**
3-4 or more times weekly	21	39.6	39	30.0	60	32.8	
Health status							
Bad-moderate	14	35.9	27	20.7	41	22.4	0.406**
Good-very good-excellent	39	64.1	103	79.3	142	77.6	
Sleep quality							
Very bad-bad	16	30.2	24	18.4	40	21.9	
Moderate	20	37.7	53	40.8	73	39.9	0.201**
Good	17	32.1	53	40.8	70	38.3	

**Student's t test, **Chi-Square test, SD:Standard deviation*

Univariate analysis: Univariate analysis revealed that, there was no statistically significant difference in terms of Cornell regional and total pain scores by gender. Patients with spine problems had higher back pain (p<0.001) and total pain scores (p=0.030) than those without. Left upper arm (p=0.020), waist (p=0.040), hip pain scores (p=0.020) and Cornell total pain scores (p=0.030) were significantly lower in the pediatric care group. Left shoulder (p=0.020), left upper arm (p<0.001), right and left wrist (p<0.001), hip (p<0.001), right and left thigh (p<0.001), right knee (p=0.030) and Cornell total pain scores (p<0.001) of the employees who worked at night and weekends were statistically significantly lower than those who did not work. There was no significant relationship between chronic diseases and pain scores. Employees with a working duration longer than eight hours had statistically significantly lower pain scores when compared to the eight-hour employees except neck, shoulder, right upper arm, right and left lower leg scores. Neck pain (p=0.010),

right and left shoulder (p<0.001), back (p<0.001), right and left upper arm (p<0.001), right and left forearm (p<0.001), right and left wrist (p<0.001), hip (p<0.001), right and left thigh (p<0.001), right (p=0.010) and left (p<0.001) knee, right and left lower leg (p<0.001) and Cornell total pain scores (p<0.001) of the employees who worked off-duty were significantly higher than those who did not.Univariate comparison of Cornell Musculoskeletal Problems Scale and independent variables in Table 2. Rho coefficients calculated by Spearman Correlation analysis and p values which showed statistical significance are shown in Table 3 which is performed between the independent variables and the Cornell Pain Scores. According to this, neither positive nor negative, neither strong nor very strong, the correlation did not exist between pain scores and independent variables. A moderate correlation was only detected between the left forearm pain score and ergonomic exposure (Rho=0.445). The distribution of mean and 95% Confidence Intervals of pain scores' (according to body regions) is shown in Figure 1. Accordingly, the average of back and low back pain scores were seen as the highest scores.

Table 2: Comparison of Cornell Musculoskeletal Problems Scale scores and independent variables.

	Sex (female-male)		Having child (yes-no)		Having chronic disease (yes-no)		Spine problem (yes-no)		Working more than eight hours (yes-no)		Working night or weekend shift (yes-no)		Working Overtime (yes-no)	
	Mean rank differences	p	Mean rank differences	p	Mean rank differences	p	Mean rank differences	p	Mean rank differences	p	Mean rank differences	p	Mean rank differences	p
Neck	12.8	0.098	-5	0.487	34.6	**0.025**	13.5	0.205	-0.5	0.960	0.1	0.992	21.0	**0.017**
Right shoulder	-4.5	0.559	-2.8	0.699	-20.4	0.187	17.7	0.096	-9.4	0.315	-8.1	0.348	52.6	**<.001**
Left shoulder	3.3	0.675	-6.3	0.380	-27.8	0.073	19.9	0.061	-18.8	**0.045**	-19.1	0.026	56.7	**<.001**
Back	1.7	0.832	-13.5	0.073	-0.9	0.956	30.8	**0.006**	-20.9	**0.035**	-17.7	0.052	50.1	**<.001**
Right upper arm	-7.5	0.321	-0.7	0.918	-24.4	0.103	14.8	0.148	-12.2	0.178	-7.7	0.352	56.0	**<.001**
Left upper arm	12.1	0.084	-14.7	**0.022**	-9.4	0.503	-5.7	0.552	-35.2	**<.001**	-27.4	**<.001**	24.5	**0.002**
Waist	13.6	0.099	-15.3	**0.042**	22.8	0.163	8.6	0.447	-25.0	**0.012**	-13.6	0.136	10.0	**0.281**
Right forearm	6.5	0.326	-9.4	0.125	-25.4	0.057	-4.8	0.599	-20.7	**<.001**	-12.4	0.092	25.4	**<.001**
Left forearm	7.0	0.285	-9.6	0.110	-23.8	0.067	-3.0	0.738	-26.7	**<.001**	-12.9	0.075	26.9	**<.001**
Right wrist	4.4	0.536	-12.5	0.055	-1.2	0.934	-10.3	0.286	-29.9	**<.001**	-27.7	**<.001**	25.9	**<.001**
Left wrist	6.5	0.336	-7.4	0.230	-15.4	0.251	-6.1	0.510	-36.5	**<.001**	-27.4	**<.001**	31.4	**<.001**
Hip	13.8	0.061	-15	**0.027**	-13.0	0.377	0.3	0.972	-28.4	**<.001**	-25.0	**0.002**	20.7	**0.013**
Right thigh	12	0.093	-10.5	0.109	-9.5	0.505	-0.4	0.969	-38.7	**<.001**	-29.1	**<.001**	26.3	**<.001**
Left thigh	8.2	0.233	-9.0	0.153	-18.0	0.189	-3.7	0.691	-33.9	**<.001**	-24.9	**<.001**	28.5	**<.001**
Right knee	5.1	0.512	-12.7	0.073	-4.2	0.783	-7.6	0.471	-24.2	**0.009**	-17.8	0.037	22.1	**0.011**
Left knee	-0.4	0.957	-4.5	0.514	-20.9	0.159	-4.5	0.660	-18.6	**0.039**	-12.9	0.119	36.6	**<.001**
Right lower leg	3.7	0.605	-5.8	0.377	-15.8	0.267	6.5	0.502	-4.2	0.626	-3.2	0.686	32.6	**<.001**
Left lower leg	4.7	0.498	-4.6	0.474	-13.4	0.333	-2.7	0.776	-14.9	0.076	-12.7	0.098	26.3	**<.001**
Cornell total score	4.2	0.622	-16.6	**0.036**	1.7	0.919	24.4	**0.038**	-30.4	**0.004**	-25.5	**0.008**	50.4	**<.001**

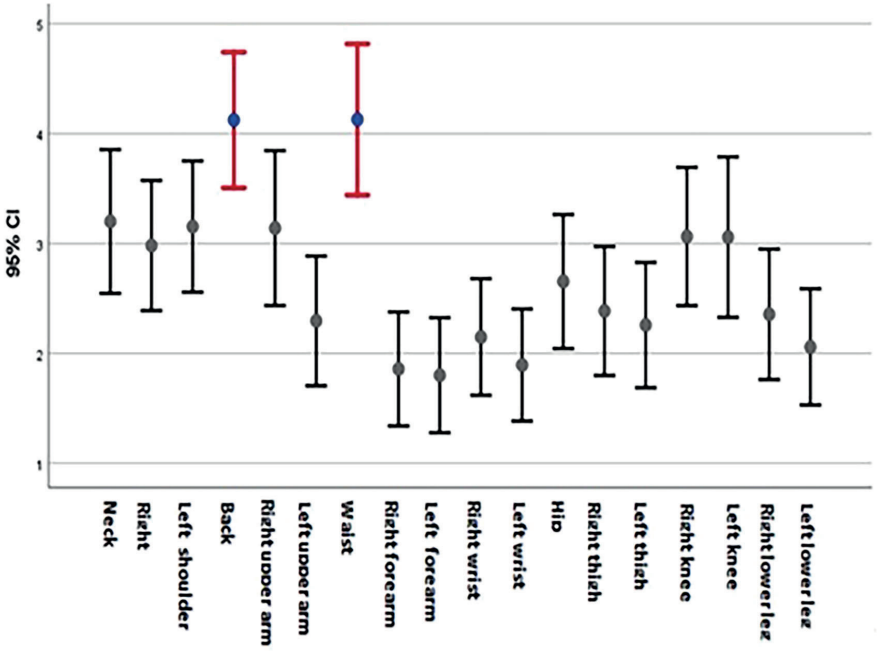

Figure 1: Distribution of mean and 95% CI of Cornell Pain Score by body region.

Table 2: Comparison of Cornell Musculoskeletal Problems Scale scores and independent variables.

Variables	Neck	Right shoulder	Left shoulder	Back	Right upper arm	Left upper arm	Waist	Right forearm	Left forearm	Right wrist	Left wrist	Hip	Right thigh	Left thigh	Right knee	Left knee	Right lower leg	Left lower leg	Cornell total score
Job demand (0-100)	0.07	0.20**	**0.17***	**0.18***	**0.19****	0.02	-0.07	-0.02	0.05	-0.05	-0.01	-0.04	0.03	0.07	-0.10	0.01	0.06	0.01	0.09
Skill (0-100)	0.01	0.05	-0.005	0.06	0.09	**-0.24****	-0.06	**-0.16***	**-0.17***	**-0.17***	**-0.15***	**-0.21****	**-0.14***	-0.09	**-0.15***	-0.14	**-0.16***	-0.11	-0.08
Decision latitude (0-100)	-0.05	-0.11	**-0.21****	**-0.27****	**-0.22****	-0.03	-0.03	-0.03	0.07	-0.02	-0.01	-0.04	-0.07	-0.03	-0.05	-0.02	-0.03	-0.07	**-0.24****
Control (0-100)	-0.01	-0.05	**-0.16***	**-0.17***	-0.13	**-0.15***	-0.08	-0.06	-0.03	-0.09	-0.08	**-0.15***	**-0.14**	-0.05	-0.11	-0.07	-0.10	-0.09	**-0.25****
Strain [job demand / control]	0.04	**0.14***	**0.23****	**0.25****	**0.21****	0.14	-0.01	0.05	0.04	0.08	0.06	0.09	0.14*	0.10	0.04	0.07	0.10	0.06	**0.23****
Social support (0-100)	0.20**	0.01	-0.03	0.002	**-0.17***	-0.02	0.06	0.02	0.05	-0.007	0.05	-0.07	-0.08	0.04	-0.02	0.02	-0.06	-0.01	-0.14
Patient care	0.02	-0.02	-0.06	-0.12	-0.03	0.10	-0.13	**0.15***	**0.16***	0.07	0.13	0.02	0.08	0.05	-0.01	0.06	0.16*	0.10	**-0.16***
Movement	-0.07	0.11	0.10	0.09	**0.15***	0.06	**-0.25****	0.05	0.09	-0.01	0.05	-0.07	-0.04	0.03	-0.14	-0.04	0.02	0.01	-0.10
Exposure	0.11	**0.23****	**0.23****	0.13	**0.14***	**0.39****	0.08	**0.33****	**0.44****	**0.31****	**0.37****	**0.20****	**0.35****	**0.31****	**0.22****	**0.38****	**0.35****	**0.32****	**0.16***
Use of equipment or/and staff	**0.26****	**0.22****	**0.16***	0.11	0.13	**0.26****	0.14	**0.28****	**0.31****	**0.19****	**0.27****	0.12	**0.22****	**0.28****	**0.19****	**0.29****	**0.29****	**0.23****	**0.16***
Age	-0.01	0.07	0.07	0.04	0.12	-0.05	-0.08	-0.04	-0.04	-0.07	-0.02	-0.07	-0.06	-0.05	-0.03	0.01	-0.01	-0.01	0.04
Work duration	**0.18***	**0.19****	**0.17***	**0.21****	**0.28****	0.05	0.01	0.09	0.07	0.04	-0.04	0.10	0.03	0.06	0.05	**0.18***	0.18*	**0.16***	**0.20****
Seniority	0.07	-0.04	-0.07	-0.09	-0.01	-0.05	-0.01	-0.07	-0.04	-0.09	-0.01	-0.09	-0.05	-0.07	-0.02	0.03	-0.02	-0.04	-0.05
Weight	0.03	**0.18***	0.13	0.11	**0.26****	0.04	-0.01	0.10	0.11	0.09	0.13	0.03	0.001	0.07	0.14	**0.15***	0.08	0.09	0.11
Height	-0.05	**0.24****	**0.24****	**0.21****	**0.36****	**0.15***	0.01	**0.19****	**0.17***	**0.27****	**0.20****	**0.15***	0.13	0.12	**0.14***	**0.15***	0.13	0.13	**0.26****
Body mass index	0.07	0.06	0.01	-0.02	0.07	-0.03	-0.04	0.01	0.03	-0.07	0.01	-0.06	**-0.07**	0.01	0.08	0.08	0.01	0.01	-0.05

**Spearman Rank Correlation, *p<0.05, **p<0.001*

Multivarite logistic regression model: We used multivariate linear regression with enter method and the result regarding final degraded model is presented in Table 4. Significant variables were ergonomic exposure (p=0.002), working time (p=0.001), off-duty work (p=0.002), more than eight hours of work (p=0.005), and the significance persisted also on the degraded final model.

Table 4: Multivariate analysis of factors associated with Cornell Total Pain Score by linear regression.

Variable	Standardized Beta	t	p
(Constant)		-1.150	0.252
Strain [Job demand / control]	0.027	0.409	0.683
Patient care	-0.023	-0.291	0.772
Exposure	0.274	3.125	**0.002**
Use of equipment or/and staff	0.039	0.495	0.621
Working duration	0.250	3.362	**<0.001**
Height	0.030	0.440	0.661
Off duty work	-0.226	-3.075	**0.002**
To work at night shift or/and weekend shift	0.079	0.963	0.337
To work more than eight hours	0.252	2.857	**0.005**
Have a spine problem	-0.025	-0.375	0.708
Baby small childcare	0.076	1.167	0.245

Evaluation of the effect of employee's complaint levels on their working capacities according to Cornell pain scores. When the most common problems are evaluated; the rate of those who experienced back, waist, neck and shoulder pain was 55.7%, 55.2%, and 42.7%, respectively. The percentage of patients complaining of the right upper arm, left knee and low back pain many times each day was 12.0%, 11.5% and 8.7% respectively. When evaluating to what extent of musculoskeletal complaints of employees effect their work; it was determined that left knee, waist and left thigh pain were the most disruptive in the work of the workers with a percentage of 23.1%, 16.8%, and 11.5% respectively.

Discussion

Studies show that MSDs are common among healthcare workers, particularly among non-physician healthcare workers (10-12). Our results confirm that MSDs occur frequently in hospital workers. In the last work week, 89.1% of the patients complained of pain at least once, at least in one body region. When the most common problems are evaluated; the rate of those who experienced back, waist, neck and shoulder pain (right-left) were 55.7%, 55.2%, and 42.7%, respectively. Back pain was reported to be 36.9% in nurses (4) 64.7% in intensive care nurses (13), 54.6% in operating room nurses (14), 69.6% (15) and 66.3% (16) in computer workers. The prevalence of low back pain in hospital workers was reported between 43% and 76% (4, 14, 17-20). Neck and shoulder pain (38.1% and 29.0%) (20) and (39.0% and

19.6%) are among the most frequently reported regions (18). Neck pain is reported to be more frequent (51.9%) among operating room workers (14). The frequency of neck pain was reported to be 23.4%, 38.1% and 67.3% respectively in different studies conducted in hospital workers (11, 20, 21). Age, working time, hand-lifting, working posture, level of control over work, work organization and patient care requirements in regard to MSDs of the hospital employees are stated. Female gender, smoking, and inappropriate working positions are counted as individual factors (14, 17, 19, 20), except smoking (4). Musculoskeletal complaints were significantly higher in patients with spine problems and off-duty workers in univariate analysis; and were significantly lower than expected in the employees working in small childcare, working longer than eight hours, working at night and at the weekend. There was no statistically significant relationship between gender and the presence of chronic disease and pain scores. In the multivariate linear regression analysis, the significant variables were ergonomic risk factors working time off-duty work and working for more than eight hours in the last reduced model, significance continues.

In our study, no significant relationship was found between sex and musculoskeletal pain scores. Similarly, in a study where radiologists were enrolled (22), occupational therapy students (23), in medical students, it was reported that female participants had higher complaint rates, but this difference was not significant (24). In a study about MSDs among hospital workers (20), among nurses (4) in Tunisia, among office workers (2), with physiotherapy and rehabilitation students in our country, musculoskeletal complaints in women were found to be statistically higher than in men (25). The relative physical disadvantages of women, as they have less muscle mass than men, suggest that this may have an effect on the occurrence of musculoskeletal complaints more frequently. On the other hand, considering the fact that there are studies indicating that men lift heavier weights compared to women who are doing the same job (10, 26) and also considering the fact that men are proportionally fewer in number than the female nurses; this may make it difficult to determine the impact of gender differences. Age as being one of the individual variables, did not correlate with pain scores in our study. As there are studies which reported a relation between increasing age and MSDs (4, 20), there are also other studies of which's results are found non-related (22). This may be due to the fact that the working group is relatively young. Body Mass Index, another individual feature, also did not correlate with pain scores. Similarly, there are studies showing that body mass index is unrelated to MSDs (14, 17-20); and as well there are ones which only found related to back pain (14). As well as the risk for both low back and neck pain compared to those who have normal weight, a 1.64-fold increase in weight, 1.47 times in obesity has been reported to increase (10, 11). It may be difficult to determine the difference because the weight and the neck are determined on the basis of the notification rather than the measurement, and the proportion of overweight and obese is lower in the research group. Among the habits, there are conflicting results in the literature regarding smoking in terms of its effect on MSDs. In the study of hospital workers in Tunisia, musculoskeletal complaints were significantly higher among male smokers who still smoked and quitted (20). In our study, there was no significant relationship between smokers and non-smokers in terms of complaints. For the reason of the study group was relatively young and the number of participants was not large, it is thought that the fact that this may cause an insufficient situation in determining the effect of smoking. In our study, there was no significant relationship found between physical activity (at least 3 days a week for 30 minutes) and musculoskeletal complaints. In a study performed on radiology students, a high level of relationship was found between physical activity level and MSDs (27); as well in an another study, a high level of relationship was observed between physical activity level and low back pain and it was stated that insufficient physical activity could lead to musculoskeletal and low back

pain problems. In a study conducted in Turkey where physiotherapy students were enrolled, Cornell total pain scores were found to be significantly lower in those who performed regular physical activity (25). In a study conducted with medical students in China, similar to our results it was stated that there were no relationship between regular physical activity habits and musculoskeletal complaints (24). This may be because the definition of "physical activity" used in the research is not clear enough.

In our study, in the analysis made by taking the cut-off point of 6 years which is the occupational seniority median, the Cornell pain scores were not significantly correlated. In the studies conducted in Tunisian hospital workers and nurses respectively, pain scores of senior employees were found to be significantly higher (4, 20). In a study conducted with computer workers, it was reported that musculoskeletal complaints were expected to increase with seniority, however It has been reported that the frequency of complaints decreased among users over 10 years working of experience (28). In a study where the subject area was neck pain in computer users (29) and also in another study where its relationship with MSDs was investigated, it was stated that the increased working years did not create any risk (15). The lack of a relationship between the work years and MSDs suggests that, as the years passed, individuals developed adaptation to protection or workload decreases with seniority and learned to protect themselves.

Considering the factors related to the execution of the work; strain, patient care, use of ancillary devices were not associated with MSDs. In the study of hospital workers in Tunisia, repetitive movements, inappropriate posture, heavy lifting, night duty and strain were found to be unrelated to MSDs (20). In our study, exposure, defined by standing, sitting, walking, lifting / carrying, pushing / pulling, was significantly correlated with CSR. In a study conducted in the operating room nurses in Iran, where the exposures those can be evaluated in this context were also examined, pushing and pulling heavy objects increased neck and back pain possibility; lifting and lowering objects to shoulder height increased the likelihood of shoulder and elbow pain; carrying-lifting heavy objects increased the possibility of knee pain; lifting and removing objects from the ground increased the likelihood of foot-ankle pain (14). In a study conducted at a university hospital in Switzerland to evaluate low back and neck pain, prolonged standing in the same position with an inadequately arranged workstation increased the risk, while lifting and patient-material handling was found to be unrelated (11); night or weekend working was found to be unrelated too (11, 20). Off-duty working was found to be related to musculoskeletal complaints in univariate analysis; likewise, a similar relation was reported in a study conducted with hospital staff (19). Psychosocial risk factors are expected to facilitate the occurrence of MSDs. In a study of hospital workers, there was no relationship between physical and mental stress and MSDs (20). In another study, working under time pressure increases back pain by 2.25 and hip-thigh pain by 1.85 times and perceived psychological workload is associated with musculoskeletal complaints in all body regions except neck (14).

Strengths and limitations of the study

Limitations of the study are, opposite of the literature information; lack of the relationship about sex, physical exercises, chronic diseases and strain (job demand/control). Because of the fact that our study is cross-sectional, affects could have not been put forth realistic. Greater sample sizes and prospective study design should result in revealing more clear relationship.

Conclusion

MSDs are common among healthcare workers, particularly non-physician healthcare workers. MSDs, which are mainly arise from individual and environmental factors. The complaints of non-physician health workers are most commonly steam from the back, waist, neck, and shoulder areas. Making ergonomic arrangements, using assistive equipment for transporting patients, using electric patient beds with adjustable height, and providing training on ergonomics principles to employees are important for preventing these problems. In the medium term, offical health workers should also receive services from the Workplace Health and Safety Units, and particapatory ergonomics practices should be integrated into these services and systematized. In the long term, by making ergonomic improvements, the health of the employees will be protected and work efficiency will be increased.

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References

1. Bilir N. İş Sağlığı ve Güvenliği (Occupational health and Safety). 1. Baskı ed. N B, editor. Ankara: Güneş Medical Bookstores; 2016. pp.480.
2. Shariata A, Clelandc J, Danaeed M, Kargarfarde M, Sangelajif B, Tamrina S. Effects of stretching exercise training and ergonomic modifications on musculoskeletal discomforts of office workers: a randomized controlled trial. Brazilian Journal of Physical Therapy. 2018;22(2):144-53. doi: https://doi.org/10.1515/amb-2016-0007
3. Safe patient handling & lifting standards for a safer American workforce, (2010).
4. Ouni M, Elghali M, Abid N, Aroui H, Dabebbi F. Prevalence and Risk Factors of Musculoskeletal Disorders Among Tunisian Nurses. La Tunisie medicale. 2020;98(3):225-31. doi:
5. Waehrer G, Leigh JP, Miller TR. Costs of occupational injury and illness within the health services sector. Int J Health Serv. 2005;35(2):343-59. doi: https://doi.org/10.2190/rnq3-0c13-u09m-tenp
6. Bell JL, Collins JW, Tiesman HM, Ridenour M, Konda S, Wolf L, et al. Slip, trip, and fall injuries among nursing care facility workers. Workplace health & safety. 2013;61(4):147-52. doi: https://doi.org/10.3928/21650799-20130318-28
7. Cornell University Ergonomics Web. Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) 2020 [Available from: http://www.ergo.human.cornell.edu/ahmsquest.html.
8. Sanne B, Torp S, Mykletun A, Dahl AA. The Swedish Demand—Control—Support Questionnaire (DCSQ): Factor structure, item analyses, and internal consistency in a large population. Scandinavian journal of public health. 2005;33(3):166-74. doi: https://doi.org/10.1080/14034940410019217
9. Erdinc O, Hot K, Ozkaya M. Turkish version of the Cornell Musculoskeletal Discomfort Questionnaire: Cross-cultural adaptation and validation. Work. 2011;39:251-60. doi: https://doi.org/10.3233/wor-2011-1173
10. Long MH, Johnston V, Bogossian F. Work-related upper quadrant musculoskeletal disorders in midwives, nurses and physicians: A systematic review of risk factors and functional consequences. Appl Ergon. 2012;43(3):455-67. doi: https://doi.org/10.1016/j.apergo.2011.07.002
11. Genevay S, Cedraschi C, Courvoisier DS, Perneger TV, Grandjean R, Griesser AC, et al. Work related characteristics of back and neck pain among employees of a Swiss University Hospital. Joint Bone Spine. 2011;78(4):392-7. doi: https://doi.org/10.1016/j.jbspin.2010.09.022
12. D'Agostin F, Negro C. [Musculoskeletal disorders and work-related injuries among hospital day- and shift workers]. Med Lav. 2014;105(5):346-56. doi:
13. İlçe A. Yoğun Bakım Ünitesi Hemşirelerinde İşle İlişkili Kas İskelet Sistemi Hastalıklarının Belirlenmesi (Determination of Work-Related Musculoskeletal Diseases in Intensive Care Unit Nurses). Anatolian Journal of Clinical Investigation 2014;8(2):68-76.
14. Choobineh A, Movahed M, Tabatabaie SH, Kumashiro M. Perceived demands and musculoskeletal disorders in operating room nurses of Shiraz city hospitals. Ind Health. 2010;48(1):74-84. doi: https://doi.org/10.2486/indhealth.48.74
15. Çalık B, Atalay O, Başkan E, Gökçe B.

Bilgisayar Kullanan Masa Başı Çalışanlarında Kas İskelet Sistemi Rahatsızlıkları, İşin Engellenmesi ve Risk Faktörlerinin İncelenmesi (Investigation of Musculoskeletal System Disorders, Work Blocking and Risk Factors in Computer-Using Desk Workers). Marmara Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi. 2013;3(4):208-14. doi: https://doi.org/10.5455/musbed.20131215111048

16. *Ardahan M, Simsek H. Analyzing musculoskeletal system discomforts and risk factors in computer-using office workers Pak J Med Sci. 2016;32(6):1425-9. doi: https://doi.org/10.12669/pjms.326.11436*
17. *Kromark K, Dulon M, Beck BB, Nienhaus A. Back disorders and lumbar load in nursing staff in geriatric care: a comparison of home-based care and nursing homes. J Occup Med Toxicol. 2009;4:33. doi: https://doi.org/10.1186/1745-6673-4-33*
18. *Maumet S, De Gaudemaris R, Caroly S, Balducci F. Risk factors related to musculo skeletal disorders in health care workers. Elements to take into consideration of risk assessment procedures. Archives des Maladies Professionnelles et de L'Environnement. 2005;66:236-43. doi: https://oshwiki.eu/wiki/Risk_factors_for_musculoskeletal_disorders_in_manual_handling_of_loads*
19. *Bejia I, Younes M, Jamila HB, Khalfallah T, Ben Salem K, Touzi M, et al. Prevalence and factors associated to low back pain among hospital staff. Joint Bone Spine. 2005;72(3):254-9. doi: https://doi.org/10.1016/j.jbspin.2004.06.001*
20. *Jellad A, Lajili H, Boudokhane S, Migaou H, Maatallah S, Frih Z. Musculoskeletal disorders among Tunisian hospital staff:Prevalence and risk factors. The Egyptian Rheumatologist. 2013;35:59-63. doi: http://dx.doi.org/10.1016/j.ejr.2013.01.002*
21. *Daraiseh N, Cronin S, Davis L, Shell R, Karwowski W. Low Back Symptoms among Hospital Nurses Associations to Induvidial Factors and Pain in Multiple Body Regions International Journal of Industrial Ergonomics 2010;40:19-24. doi: https://doi.org/10.1016/j.ergon.2009.11.004*
22. *Irurhe N, Okafor U, Adekola O, Odebiyi D, Habeebu M, Sowunmi A. Work Related Musculoskeletal Discomforts (WRMD) in Ultrasonologists: Prevalence and Risk Factors. World Journal of Medical Sciences 2013;8(3). doi: https://www.idosi.org/wjms/8(3)13/6.pdf*
23. *Leggat PA, Smith DR, Clark MJ. Prevalence and correlates of low back pain among occupational therapy students in Northern Queensland. Can J Occup Ther. 2008;75(1):35-41. doi: https://doi.org/10.2182/cjot.07.014*
24. *Smith DR, Wei N, Ishitake T, Wang RS. Musculoskeletal disorders among Chinese medical students. Kurume Med J. 2005;52(4):139-46. doi: https://doi.org/10.2739/kurumemedj.52.139*
25. *Taşpınar F, Taşpınar B, Aksoy C. Determination of Work-Related Musculoskeletal Diseases in Intensive Care Unit Nurses. Journal of Exercise Therapy and Rehabilitation. 2014;1(2):55-60. doi: https://dergipark.org.tr/tr/download/article-file/210343*
26. *Messing K. Ergonomic studies provide information about occupational exposure differences between women and men. J Am Med Womens Assoc (1972). 2000;55(2):72-5. doi: https://pubmed.ncbi.nlm.nih.gov/10808655/*
27. *Lorusso A, Vimercati L, L'Abbate N. Musculoskeletal complaints among Italian Xray technology students: a*

cross-sectional questionnaire survey. BMC Research Notes. 2010;3:114-7. doi: https://doi.org/10.1186/1756-0500-3-114

28. *Erdinc O. Upper extremity musculoskeletal discomfort among occupational notebook personal computer users: work interference, associations with risk factors and the use of notebook computer stand and docking station. Work. 2011;39(4):455-63. doi: https://doi.org/10.3233/wor-2011-1195*
29. *Yıldırım Y, Gelecek N, Özcan A, Altın Ö, Kılıç M. Bilgisayar kullananlarda boyun ağrısına etki eden risk faktörleri (Risk factors affecting neck pain in computer users). Türk Fizyoterapi ve Rehabilitasyon Dergisi. 2004;15(3):114-9.*