ORIGINAL ARTICLE

Evaluation of Musculoskeletal Disorders and Level of Work Activity in Staff of the Public Educational Hospital of Iran, 2019

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ABSTRACT

Introduction: Hospital staffs, particularly the one in direct contact with patients, have the highest rates of musculoskeletal disorders. Lack of physical activity and muscle weakness cause the complication. The purpose of the study is to evaluate the musculoskeletal disorders and the level of work activity in the staff of an educational hospital. **Methods:** A descriptive-analytic study was conducted on 312 staff in Ardebil Educational Hospital. The data collection methods were interviews, the Nordic Musculoskeletal Questionnaire, and Baecke Habitual Physical Activity Questionnaire. Statistical analyses were done using SPSS19. **Results:** The subjects had a moderate level of physical activity. The highest level of physical activity occurred during work activities. Hospital staff experienced the most severe pain in their low back, knee and neck region over the last year. It was found that MSDs in the low back, shoulder, upper back, and knee regions significantly correlated with one's physical activity. **Conclusion:** Work activity increases the risk of knee pain, shoulder pain, and LBP. Thus, hospital employee's especially female workers are recommended to have reformed workstations, moderated physical activity loads, and regular exercises.

Keywords: Work Activity, Musculoskeletal Disorders, Hospital

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INTRODUCTION

In recent years, musculoskeletal disorders (MSDs) of the upper extremities have been introduced as the most significant and common problems among industrial and office workers in America, as well as other developed and developing industrial countries(1). These disorders, like twists, tensions, muscle inflammatory diseases, and tendons, nerves, and blood vessels complications accounted for around 50% of workers' labor compensation claims and complaints in Canada during 1988-1989 (2). Hospital staffs, particularly those in direct contact with patients, have the highest rates of musculoskeletal complaints (3, 4). The prevalence of MSDs is remarkable in many professions, and it has a significant effect on occupations, businesses, governments, and the whole society. There are over 200 types of musculoskeletal conditions including all kinds of arthritis and the conditions affecting muscles, bones, soft tissues, joints, and spine (5, 6). The MSDs are prevalent in hospital staff. The prevalence ranges from 43% to 78% (6-8). Inconvenience is one of the risk indices that can be used for evaluating the risk of physical fitness, as discomfort is the result of complication of one of body systems and such complications can be used to detect potential problems (9). In other words, evaluating MSDs is a way to prevent MSDs (10, 11). As reported in many studies, such disorders cause temporary and permanent disabilities. Thus, research works to reduce the prevalence and prevent musculoskeletal problems is a top priority all around the world (12, 13). In a study by Murken et al. on occupational illnesses in Norway over 12 years (1992-2003), the MSDs accounted for one half of the occupational diseases (13). Standard questionnaires are used to analyze musculoskeletal symptoms. A standard questionnaire was introduced for the analysis of musculoskeletal symptoms in ergonomic and occupational health conditions. The statements focus on symptoms often suffered in a work environment and job stress is also reflected in the questionnaire (14). Nordic questionnaire was used by Smith et al. for evaluating musculoskeletal complaints and social risk factors in nurses of Chinese hospitals (15). Moreover, Choobineh et al. studied MSDs among the nurses at Shiraz University of Medical Sciences using Nordic questionnaire (16). In another study by Alexopoulos et al., the risk factors for MSDs in nursing staff in Greek hospitals were examined using this questionnaire (17). The lower level of physical activity and the increase in

muscle weakness cause MSDs and impairment, which affect productivity and may cause permanent injuries. It is possible to prevent such complications in social and sports settings (18). Failure to adhere to the principles of the musculoskeletal system causes exhaustion and loss of performance in the staff and consequently a decrease of health and treatment services. On the other hand, better performance and the efficiency of the staff lead to job satisfaction and mental health. However, studies on this subject have shown that hospital environments are affected by job stress and physical problems (19). There are many studies on MSDs and the level of physical activity; however, there are a few studies on the relationship between these two variables in the hospital staff. The purpose of the study is to evaluate MSDs and the level of work activity among the staff of the educational hospital of Ardabil University of Medical Sciences in 2019.

MATERIALS AND METHODS

The present study was conducted as a descriptive-analytic on a study population comprised of the staff (Administrative, medical, service) at the Ardebil Educational Hospital in 2018. The inclusion criteria were the staff in hospital units and tendency to participate in the study; and the exclusion criteria were MSDs and apparent mental physical disorders. The total number of staff was 1950 and based on Cochran's formula 312 subjects were selected using convenience sampling from different units. Data collection method was through interview and completing two questionnaires by professional health experts.

Demographic variables (gender, task title, BMI, education, type of work, individual) aspects of physical activity (work, sport, leisure) and MSDs were measured. Demographic variables and dimensions of physical activity were analyzed as independent variables and MSDs as dependent variables.

In addition to the demographic characteristics (age, gender, work experience, Body Mass Index (BMI), marital status, education, and occupation), the following questionnaires were used.

1- Nordic Musculoskeletal Questionnaire (NMQ)
The Nordic Musculoskeletal Questionnaire (NMQ) was used to determine the prevalence of MSDs and their consequences. The questionnaire contains questions about individual and occupation information, the prevalence of discomfort in different areas of the body, the intensity and duration of pain, and leaves due to these discomforts. Validity and reliability of the questionnaire are supported by other studies. The questionnaire examines the prevalence of pain, burning, or numbness in nine regions (neck, shoulder, upper back, elbow, wrist / hand, low back, hip / thigh, knee, ankle / feet) of the body that lead to rest, reduction in work activity, and leaves in the past week and one year ago (7).

2. Baecke Habitual Physical Activity Questionnaire (BHPAQ):
The questionnaire has 16 questions in three main areas of physical activity including work activity (eight questions), sports activity (four questions) and leisure activity (four questions). Individual physical activity is measured by calculating the total scores of work, sports, and recreational areas. The answer to each question is a quasi-Likert 5-point scale. The total score of all the three sections are calculated as the score for the level of physical activity. The acceptable level of interclass correlation coefficient (ICC) of work activity, sports activity, and leisure activity were 0.95, 0.93, and 0.77 for the Persian version of Baecke questionnaire. Cronbach's alpha test was used to determine the internal reliability of the questionnaires. The alpha value obtained for this questionnaire was 0.79 -i.e. the internal correlation of the questions is supported (8, 18, 20, 21). Statistical analysis was performed using SPSS19 software.

Independent t-test and one-way ANOVA were used for normal variables and Kruskal-Wallis test was used for abnormal variables to compare the mean of quantitative variables. To examine the relationship between quantitative variables, the Pearson correlation was applied. Chi-squared test was used to test the relationship between qualitative variables. The logistic regression was used to examine the independent variables on MSDs.

A consent form was completed by the participants and to prevent unrealistic response to the questions, it was emphasized that the project was purely for academic purposes and would not have any benefits or damage for the individual.

RESULTS

The study was conducted on 312 hospital staff. All staff selected in the study participated. The mean age of participants was 33 ± 8 years. The average work experience was 10 ± 7 years, and the mean BMI was 44 ± 3. Other information is provided in the table below. Most of the female workers were medical workers. The most common types of works were featured with mixture of standing and sitting positions and 61% of the staff had individual sports activities.

The highest level of physical activity was related to work activity (2.99) and the lowest level was related to sports activity(2.30). The average level of work activity, sports activity, and leisure activity were at moderate level. Finally, the total level of activity (2.55) was at moderate level.

According to the participants, the most severe pain in the last year was in the low back, knee, and neck.

Moreover, the most severe MSDs in the past year that led to sick leave were appeared in the same areas of the body (Fig. 1).

According to the results of Table I, BMI had a direct relationship with age (r = 0.400) and an inverse relationship with Leisure activity level (r = -0.130).

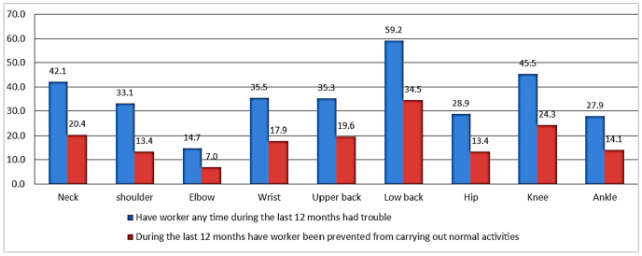

Figure 1: Percentage of MSDs in different areas of the body

Table I: The relationship between BMI, age and physical activity level

Title	Work activity	Sports activity	Leisure activity	BMI	Age
Work activity	1	0.241**	0.101	0.081	0.029
Sports activity	0.241**	1	0.372**	-0.098	-0.064
Leisure activity	0.101	0.372**	1	-0.130*	-0.005
BMI	0.081	-0.098	-0.130*	1	0.400**
Age	0.029	-0.064	-0.005	0.400**	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Work activity was higher in those who had a high school diploma, service jobs, and stand-up activity compared to other groups. Sport activities of men was more than those of women. In comparison with other participant, male staff with a high school diploma was higher (Table II).

Table III shows that women, participants at the age group 30-40 years, with moderate BMI, holders of associate and bachelors' degree, and those working in the medical part felt pain mostly in the neck area (Table III).

Table IV shows that people at age range 30-40 years, with work experience of 8-15 years, with moderate BMI and associate's and bachelor's degrees, and those working in the medical part had a leave for pain in the neck (Table IV).

According to Table V, the single-variable logistic regression model showed that work activity was a factor in knee pain. Those with work activity were 2.2 times more likely to have knee pain. Additionally, men and those who were active at leisure time were 2.3 and 1.62 times more likely to have knee pain respectively. Prevalence of neck pain increased with age and BMI. As the age increased by one year, the chance of developing neck pain increased up to 4% and with one-unit increase in BMI, the chance of developing neck pain increased up to 8%. Women were 3.8 times more at the risk of ankle pain.

According to Table VI, those with leisure activity and men were 1.53 and 2.04 times more likely to have pain in the upper back respectively. Work activity increased the chance of shoulder pain by 2.27 times and men were 2.04 times more likely to develop the shoulder pain. With one year increase at age and one-year increase at work experience, the chance of developing a low back pain (LBP) increased by 6% and 7% respectively. Eventually, those with work activity were 1.63 times more likely to develop LBP.

DISCUSSION

Musculoskeletal disorders of different body limbs are highly common in hospital staff. The advantage of the present study is that the effects of demographical and work activity variables (administrative, medical, service) on MSDs of different body limbs were determined. In addition, the effective factors were determined to

Table II: Relationship between demographic information and physical activity

category	Variable	Work activity				Sports activity				Leisure activity			
		N	Mean	Std.	P	N	Mean	Std.	P	N	Mean	Std.	P
gender	Man	82	2.98	0.62	0.840	82	2.47	0.68	0.004	82	2.61	0.72	0.006
	female	228	2.99	0.50		228	2.24	0.61		226	2.39	0.58	
Education	High school diploma	42	3.03	0.77	0.032	42	2.42	0.73	0.319	42	2.61	0.87	0.014
	Associate and Bachelor's degree	186	3.02	0.47		186	2.29	0.61		186	2.51	0.58	
	Master and Doctorates' degree	64	2.82	0.47		64	2.23	0.57		62	2.28	0.57	
Task	Administrative	32	2.75	0.36	0.0001*	32	2.20	0.78	0.757	32	2.45	0.45	0.392
	Medical	178	2.96	0.48		178	2.29	0.58		176	2.41	0.61	
	Services	22	3.37	0.62		22	2.25	0.66		22	2.66	0.85	
Type of work	Sitting	30	2.55	0.35	0.000	30	2.25	0.82	0.282	30	2.47	0.54	0.696
	Standing	82	3.21	0.59		82	2.40	0.68		82	2.41	0.62	
	Standing and sitting together	192	2.97	0.49		192	2.28	0.59		190	2.48	0.65	

*Nonparametric

Table III: Relationship between demographic information and MSDs (pain, discomfort, numbness during the last 12 months)

Variable	category	Neck		Shoulder		elbow		wrist		Upper back		low back		hip		knee		Ankle	
		yes	P	yes	P	yes	P	yes	P	yes	P	yes	P	yes	P	yes	P	Yes	P
gander	man	28 (34)*	0.001	22 (28)	0.001	12 (15)	0.001	12 (16)	0.001	18 (24)	0.023	36 (46)	0.010	20 (25)	0.001	24 (30)	0.002	16 (20)	0.001
	Female	98 (44)		68 (34)		28 (14)		88 (42)		80 (39)		136 (63)		62 (30)		108 (50)		60 (30)	
Age	30	40 (32)		24 (21)		4 (3)		36 (30)		40 (35)		62 (51)		22 (19)		44 (36)		20 (16)	
	30-40	54 (45)	0.017	36 (34)	0.001	18 (18)	0.001	40 (40)	0.001	38 (37)	0.001	76 (69)	0.027	40 (37)	0.010	58 (55)	0.016	38 (38)	0.001
	40	32 (53)		30 (53)		16 (28)		20 (35)		20 (35)		36 (60)		18 (31)		26 (43)		20 (24)	
Job experience	8	28 (35)		18 (24)		2 (2)		28 (36)		26 (37)		40 (51)		16 (21)		32 (43)		18 (23)	
	8-15	48 (51)	0.083	28 (35)	0.021	16 (20)	0.001	36 (41)	0.001	36 (42)	0.001	64 (69)	0.048	36 (41)	0.014	58 (63)	0.005	30 (38)	0.001
	15	34 (51)		30 (46)		18 (30)		20 (34.5)		18 (29)		36 (58.1)		16 (25)		24 (38)		20 (31)	
BMI	__18.5	0 (0)		0 (0)		0 (0)		0 (0)		2 (25)		4 (50)		0 (0)		2 (25)		0 (0)	
	18.5-24.9	68 (38)	0.004	52 (32)	0.001	20 (12)	0.001	54 (33)	0.030	58 (36)	0.001	94 (55)	0.001	40 (23)	0.003	74 (43)	0.001	38 (22)	0.002
	25	60 (51)		38 (36)		20 (20)		46 (42)		38 (35)		74 (66)		42 (40)		54 (50)		40 (40)	
Education	High school diploma	18 (42)		14 (35)		10 (25)		12 (31)		12 (30)		22 (55)		12 (30)		16 (40)		14 (35)	
	Associate and Bachelors' degree	84 (47)	0.008	56 (34)	0.001	26 (16)	0.040	68 (40)	0.001	60 (37)	0.001	104 (59)	0.001	50 (30)	0.001	86 (50)	0.001	50 (30)	0.001
	Master and Doctorates' degree	16 (25)		14 (25)		4 (6)		18 (30)		20 (33)		34 (56)		18 (30)		22 (36)		14 (23)	
Task	Administrative	18 (56)		10 (35)		10 (35)		14 (50)		14 (46)		16 (53)		4 (14)		10 (33)		6 (21)	
	Medical	64 (38)	0.001	48 (31)	0.001	12 (8)	0.001	50 (31)	0.001	46 (29)	0.001	88 (53)	0.001	40 (25)	0.001	66 (40)	0.009	40 (26)	0.001
	Services	8 (36)		8 (40)		6 (30)		10 (45)		6 (33)		12 (54)		8 (36)		16 (72)		8 (36)	

be used for introducing preventive programs. Such programs can decrease the rate of leaves due to MSDs during the employment term. The findings indicated that MSDs were more common in various body areas of female staff, medical staff, and the participants at the age range 30-40year, with 8-15 year work history, moderate BMI, and associate and bachelors' degree. Male staff incurred more shoulder pain with an increase of their work activity. Furthermore, they experienced more pain in the knees and upper back with an increase in leisure activity. The risk of neck pain was more prevalent in older staff with higher BMI. Female staff were more susceptible to wrist pain. The LBP was pervasive in older ages and in staff with higher work history. Finally, the higher the work activity load, the more the likelihood of LBP. The findings displayed that there was a significant relationship between the physical activity of hospital staff and MSDs in their low back, shoulder, upper back and knee regions. That is, the higher one's physical activity level, the higher their risk of MSDs, which is consistent with the findings of Picavet and Salafi et al. (22 & 23). An investigation into the impact of physical activity on reducing MSDs in dentists showed that dentists who exercised regularly had a lower risk of MSDs than those without regular exercising (24 & 25). Regular sports activities strengthen muscular power and endurance for work activity while enhancing muscle performance. That is why a the same physical activity may cause less muscular fatigue in people who do regular exercises (26). Hildebrandt et al. inspected the effect of physical activity on MSDs in workers; they found that physical activity was an effective way to reduce MSDs (27). The main reason for the sick-leave requests by the participants was their sufferance from LBP ; this is consistent with Hafner's et al. (28). This finding is a crucial basis for monitoring and assessing the indices of sick leaves. Proper plans should be devised to prevent MSDs in staff to achieve higher work continuity and lower absenteeism. A majority of medical staff suffered from MSDs in different areas of their body. Based on the findings, prolonged standing positions, inappropriate postures, and too many patients handled by each personnel per day were the most common occupational risk factors for MSDs. Among the subjects examined in this study, medical staff were more vulnerable to the risk of MSDs (29). Like other organizational staff, hospital staff seem to devote less time to sport activities due to lack of time, inaccessibility

Table IV: Relationship between demographic information and MSDs during the last 12 months (staff prevented from performing normal activities)

Variable	category	neck		shoulder		elbow		wrist		Upper back		low back		hip		knee		ankle	
		yes	P	yes	P	Yes	P	yes	P	yes	P	yes	P	yes	P	yes	P	yes	P
gander	man	10 (12)	0.071	10 (13)	0.070	4 (5)	0.0001	6 (8)	0.013	16 (20)	0.0001	20 (25)	0.071	10 (13)	0.0001	12 (15)	0.032	8 (10)	0.0001
	Female	48 (22)		26 (12)		16 (7)		44 (22)		38 (19)		78 (37)		28 (13)		58 (27)		30 (14)	
Age	30	14 (11)	0.005	6 (5)	0.002	4 (3)	0.028	16 (13)	0.0001	14 (12)	0.011	26 (22)	0.001	8 (6)	0.025	18 (15)	0.004	16 (13)	0.0001
	30-40	30 (26)		20 (18)		6 (5)		20 (20)		22 (22)		46 (43)		16 (15)		26 (24)		16 (15)	
	40	16 (27)		12 (20)		8 (13)		12 (20)		18 (31)		26 (43)		12 (20)		22 (37)		8 (13)	
Job experience	8	10 (13)	0.026	8 (10)	0.0001	4 (5)	0.0001	12 (16)	0.0001	12 (16)	0.0001	22 (28)	0.038	8 (10)	0.088	10 (13)	0.005	10 (13)	0.0001
	8-15	28 (30)		18 (20)		8 (9)		18 (20)		22 (26)		44 (47)		20 (22)		30 (32)		16 (18)	
	15	16 (26)		10 (16)		8 (12)		14 (23)		16 (25)		22 (35)		8 (12)		22 (35)		6 (9)	
BMI	18.5	0 (0)	0.0001	0 (0)	0.0001	0 (0)	0.093	0 (0)	0.011	2 (25)	0.0001	2 (25)	0.0001	0 (0)	0.037	2 (25)	0.061	0 (0)	0.038
	18.5-24.9	32 (18)		20 (12)		8 (4)		22 (13)		28 (17)		52 (30)		16 (9)		32 (19)		18 (10)	
	25	28 (25)		18 (16)		12 (11)		28 (26)		24 (22)		44 (40)		20 (19)		34 (31)		22 (20)	
Education	High school diploma	10 (23)	0.046	6 (15)	0.0001	2 (5)	0.0001	4 (10)	0.0001	10 (23)	0.0001	16 (38)	0.064	6 (15)	0.0001	12 (28)	0.0001	4 (10)	0.0001
	Associate and Bachelors' degree	40 (23)		26 (15)		16 (9)		36 (21)		34 (21)		64 (36)		22 (12)		42 (24)		26 (15)	
	Master and Doctorates' degree	6 (9)		4(6)		2 (3)		8 (13)		6 (10)		12 (20)		4 (6)		10 (17)		10 (17)	
Task	Administrative	12 (40)	0.004	8 (26)	0.016	6 (21)	0.0001	10 (35)	0.038	8 (26)	0.086	12 (42)	0.0001	2 (7)	0.0001	8 (26)	0.0001	4 (14)	0.0001
	Medical	26 (15)		14 (8)		2 (1)		24 (15)		20 (13)		50 (30)		14 (8)		30 (18)		26 (16)	
	Services	6 (30)		4 (20)		4 (18)		4 (18)		6 (27)		8 (36)		4 (18)		6 (27)		4 (18)	

Table VI: Relationship between physical activity level and musculoskeletal disorders based on single-variable logistic model

Variable		Upper Back		Shoulder		Low back	
		OR(95% CI)	P-value	OR(95% CI)	P-value	OR(95% CI)	P-value
	Age	0.98(0.96-1.017)	0.419	0.97(0.95-1.01)	0.098	1.06(1.03-1.09)	0.0001
	Job experience	1.01(0.96-1.04)	0.836	0.98(0.95-1.02)	0.384	1.07(1.04-1.12)	0.0001
	BMI	0.99(0.92-1.06)	0.846	0.93(0.87-1.01)	0.07	0.92(0.86-0.99)	0.36
	Work activity	0.87(0.55-1.37)	0.562	2.27(1.46-3.57)	**0.0001**	1.63(1.02-2.26)	0.042
	Sports activity	1.15(0.78-1.68)	0.469	1.04(0.73-1.5)	0.79	1.23(0.83-1.82)	0.288
	Leisure activity	1.53(1.03-2.28)	**0.035**	1.46(1.01-2.11)	0.042	1.04(0.7-1.54)	0.829
Gender	Male	1		1		1	
	Female	0.49(0.27-0.91)	**0.023**	0.49(0.29-0.83)	**0.008**	0.79(0.44-1.4)	0.424
Education	High school diploma	1		1		1	
	Associate and Bachelors' degree	0.7(0.3-1.48)	0.35	0.82(0.42-1.64)	0.581	1.03(0.50-2014)	0.919
	Master and Doctorates' degree	0.85(0.36-2.03)	0.726	0.93(0.42-2.09)	0.869	1.61(0.66-3.92)	0.919
Task	Sitting	1		1		1	
	Standing	1.28(0.53-3.1)	0.576	1.06(0.45-2.49)	0.889	0.73(0.28-1.9)	0.531
	Standing and sitting together	1.47(0.65-3.32)	0.351	1.05(0.48-2.33)	0.887	0.75(0.315-1.82)	0.538

of sport facilities, and more importantly unawareness of the benefits of physical activities. This was more evident in female staff for their higher work activity in both working and non-working (household) hours (30). The results also showed that men do more sports activity than women. The researcher believes that the low incidence

of MSDs in men is attributed to their high sports activity compared with women. As a consequence, appropriate sports activities should be planned for women.

CONCLUSION

The participants had a moderate physical activity. The highest level of physical activity occurred during work activities. Hospital staff experienced the most severe pain in their low back, knee and neck region during the last year. It was found that MSDs in the low back, shoulder, upper back and knee regions were significantly correlated with one's physical activity. Finally, MSDs were more common amongst female staff, medical staff, and the participants at age range 30-40-year, with 8-15-year work history, with moderate BMI, and with associate degree and bachelors' degree. Work activity increases the risk of knee pain, shoulder pain, and LBP. Moreover, LBP is more likely to occur in older ages and with higher work history. In order to increase work efficiency and prevent financial losses due to staff absenteeism because of MSDs, the hospital managers are recommended to introduce reformed work stations, moderated physical activity loads, and obligatory sport exercises.

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