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ORIGINAL ARTICLE

Relationship Between Medical Leaves Due to Musculoskeletal Disorders and Physical Activity Level in Workers at Cement Industry-Iran 2019

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ABSTRACT

Introduction: Musculoskeletal disorders are the most common debilitating causes in workers and the main reason for medical leaves. Medial leave brings health, social, and economic consequences for individuals and society. The relationship between medical leaves due to pain and discomfort in different parts of the body and physical activity level at work, practice of sport, and leisure time in workers in cement industry in 2019 was examined. **Methods:** A descriptive-analytical study was conducted on 150 workers of a cement factory. The participants were selected randomly. Data gathering tools were demographics form, Nordic Musculoskeletal Questionnaire, and Baecke Physical Activity Questionnaire and the collected data was analyzed using SPSS (v.22). **Results:** The participants noted that the main painful areas over the past year were the waist, knee, ankle, and neck. There was a significant relationship between medical leave due to pain in the neck and overtime work. There was a significant relationship between the type of work activity and medical leave due to a pain in knee and ankle. **Conclusion:** The workers who used such medical leaves had a higher PAL at work. PAL at work increased the requests of medical leaves due to the pain in knee and waist. The PAL at sport practice decreased the rate of request for medical leave due to a pain in the Waist and Knee.

Keywords: Musculoskeletal disorders (MSDs), Physical activity level, Work activity, Medical leaves

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INTRODUCTION

Absence from work is a serious problem in industries and controlling it a big challenge. Medical leave of absence represents two-third of total absence in some industries. The number of days of absence due to diseases or injuries is growing and this issue is more serious in large companies (1). Leave of absence due to pain is a serious health problem in industries that results in loss of production and direct/indirect costs to the society (2).Musculoskeletal disorders (MSDs) are one of the common causes of occupational injuries and disabilities in the developing and developed countries. Despite the development of mechanized and automated processes, work related MSDs are still the main causes of lost work hours, higher costs, and injuries. As recommended by studies, feeling a pain and discomfort in different parts of the musculoskeletal system is one of the main issues at work (3). It is not easy to fine a workshop or a factory where the workers are not complaining of physical discomfort and pain and the situation is worse when the physical condition of the workers does not fit the work load and pressure (4). Medical leave is a major general health problem with social and economic consequences for individuals and society (5).Physical activity (PA) and readiness improve and preserve general health condition. Physical activity is effective in keeping physical readiness, controlling the weight, preserving and improving bone density, muscle, and joint maneuverability, improving physiological health, and improving the immunity system. Thereby, physical activity is effective in preventing MSDs (6). The expansion of technology and machine life has led to less physical activity for man; while, about 70% of diseases are the outcomes of lack of physical activity (7). Regular physical activity is essential and lack of it is a global health issue and one of the ten main causes of mortality in the world. Lack of physical activity doubles the risk of cardiovascular diseases, diabetes type II, and obesity.

In addition, the risks of breast and colorectal cancers, hypertension, fat disorders, osteoporosis, depression, and anxiety are higher in individuals with lack of physical activity (8). Regular physical activity is one of the ways to add to the strength of the immunity system and prevent noncontagious diseases. It also has positive mental effects through lowering depression and anxiety levels. In addition, physical activity brings specific economic benefits through lowering the costs of medical cares and improving productivity (9). Several studies have been conducted on the role of physical activity in lowering the prevalence of physical and mental disease and improving physical performance. Regular physical activity improves physical readiness of workers and decreases the rate of MSDs (10). Occupational MSDs are usually multi-cause and affected by different factors. Among studies in this field, Harman et al. (2005) titled "exposure to physical risk factors in the Netherlands' agriculture sector and medical leaves due to MSDs" (11), Bataller-Cervero et al. (206) titled "assessing MSDs and medical leaves in a manufacturing firm in Spain" (12), and Yassierlie t al. (20117) titled "implementation of ergonomic programs to attenuate medical leaves due to pain in the waist in Nickle minders" are notable (13). While there have been several studies on MSDs and physical activity, there is a paucity of studies on the relationship between MSDs caused medical leaves and physical activity level (PAL) at work, sport practice, and leisure time. Therefore, the present study is an attempt to survey the relationship between medical leave due to pain in different body limbs and demographics and PAL at work, sport practice, and leisure time in workers in cement industry in 2019.

MATERIALS AND METHODS

The study was carried out as a descriptive-analytical study in a cement factory in Ardabil-Iran in 2019. Totally, 245 workers worked in the factory in different departments like production line, control room, and administrative ward. Based on Cochran's formula, 150 participants were selected through cluster sampling. To this end, 32, 53, and 65 participants were selected from administrative, technical, and service wards respectively. The inclusion criteria were workers in the factory and desire to participate. The exclusion criterion was physical impairment. The information needed was gleaned using a demographical form, Nordic Musculoskeletal Questionnaire, and Baecke Physical Activity Questionnaire. The participants were selected in April 2019 and hard copies of the tools were administered to 150 workers and recollected in two weeks. The participants were informed about how to fill out the questionnaire along with administration of the questionnaires. The participants expressed their consent to participate verbally. The authors informed the participants that the study was merely a research work and brings no benefits or negative consequences to them and that the collected information will remain confidential. Ethical approval was obtained from Ardabil University of Medical Sciences Research Ethics Committee (IR.ARUMS.REC.1397.156).

Demographics form

The demographics form covered age, work record, gender, marital status, education, job title, overtime work, and type of work.

Nordic Musculoskeletal Questionnaire (NMQ)

The NMQ was used to measure the prevalence of MSDs and the consequences. The questionnaire contains questions about personal and occupational information, prevalence of discomfort at different body limbs, severity and time period of pain, and medical leaves if any due to MSDs. Validity and reliability of the tool were supported by Pough (2015) (14). The tool measures pains in nine areas of the body (neck, shoulder, elbow, wrists, upper back, waist, hips, knee, and ankle). The pain over the past year is recorded in two categories of "with medical leave" and "without medical leave."

Baecke Physical Activity Questionnaire

The questionnaire was used to examine the level of physical activity in the workers. It is comprised for three main dimensions namely PAL at work, PAL at sport practice, and PAL at leisure time. The questions are designed based on quasi-Likert's five-point scale (1= never, 2= rarely, 3= occasionally, 4= mostly, and 5=never). The sum of scores in the three dimensions represents PAL at low, moderate, or intense levels. Internal reliability of the tool was measured using Cronbach's alpha (α= 0.79) and internal correlation was supported (15-18).

Data analyses were done using SPSS (v.22) so that independent samples T-test, Mann–Whitney, Chi Square, ANOVA, and Kruskal Wallis were used to compare the mean scores of MSDs, demographics, and physical activity. In addition, univariate regression model was used to examine the effect of the PAL on MSDs.

RESULTS

The mean age of the workers was 38±7 and the mean work record was 12±6 years. In addition, 97.2% were men and 92.3% were married. Individuals with a high school diploma or lower constituted 66.2% of the study group and 43.1% were operators and worker. In addition, 30.1% worked overtime and 61.1% worked in standing or sitting positions (Table I).

Findings about MSDs

The participants noted that the main painful areas over the past year were the waist, knee, ankle, and neck. In addition, the main reasons for requesting a medical leave were pain in the waist and knee areas (Figure 1). There was a significant relationship between age and feeling pain in the neck (p=0.048) and waist

Figure 1: The Implementation of OHSMS

(p=0.039) without asking for a medical leave. There was a significant relationship between medical leave due to pain in the neck (p=0.035) and overtime work. There was a significant relationship between the type of work activity and medical leave due to a pain in knee (p=0.035) and ankle (p=0.012). Work record, gender, marital status, education level, and job title were not significantly related to MSDs in different areas of the body.

TABLE I : Sample characteristics (n = 150)

Variable	No (%)
Age(y)	
Mean	38
Median	38
Std. Deviation	7.59
Minimum	22
Maximum	62
Work record (y)	
Mean	12.38
Median	12
Std. Deviation	6.14
Minimum	1
Maximum	27
Gender	
Male	146(97.2)
female	4(2.8)
Marital status	
yes	138(92.3)
no	12(7.7)
Education	
High school diploma or lower	99(66.2)
Associate and Bachelor	42(27.9)
Master and Doctoral	9(5.9)
Job title	
Administrative employee	32(21.5)
Technical wards	53(35.4)
service wards	65(43.1)
Overtime work	
yes	45(30.1)
no	105(69.9)
Type of work	
Sitting	15(10)
standing	43(28.9)
Standing and sitting together	92(61.1)

Findings about PAL

The PAL at work, sport practice, and leisure time were 3.18, 2.53, and 2.62 respectively and the total score of PAL was 2.277. There was a significant relationship between overtime work and PAL at leisure time (p=0.038). Moreover, there was a significant relationship between the type of work and PAL at work (p=0.001) and sport practice (p=0.029). Age, work record, gender, marital status, and job title were not significantly related to the aspects of PAL.

Pain in the nine areas of body without medical leave and the aspect of PAL

There was a significant relationship between PAL at work and pain in the elbow, hip, and knee over the past year. There was a significant relationship between PAL at sport practice and feeling pain in the knee. There was a significant relationship between PAL at leisure time and feeling pain in waist, hip, and knee. Eventually, total PAL and pain in the Neck were significantly related (Table II).

According to univariate regression model, overtime work increased pain in the neck. The PAL at work increased pain in the elbow and knee. On the other hand, PAL at sport practice lowered pain in the knee. Finally, PAL at leisure time decreased pain in the waist and knee (Table III).

Pain in the nine areas of body with medical leave and the aspect of PAL

There was a significant relationship between PAL at work and medical leaves due to a pain in the waist and knee over the past year. There was a significant relationship between PAL at sport practice and medical leave due to a pain in the knee and waist (Table IV).

Based on univariate regression model, PAL at work increased the requests of medical leaves due to the pain

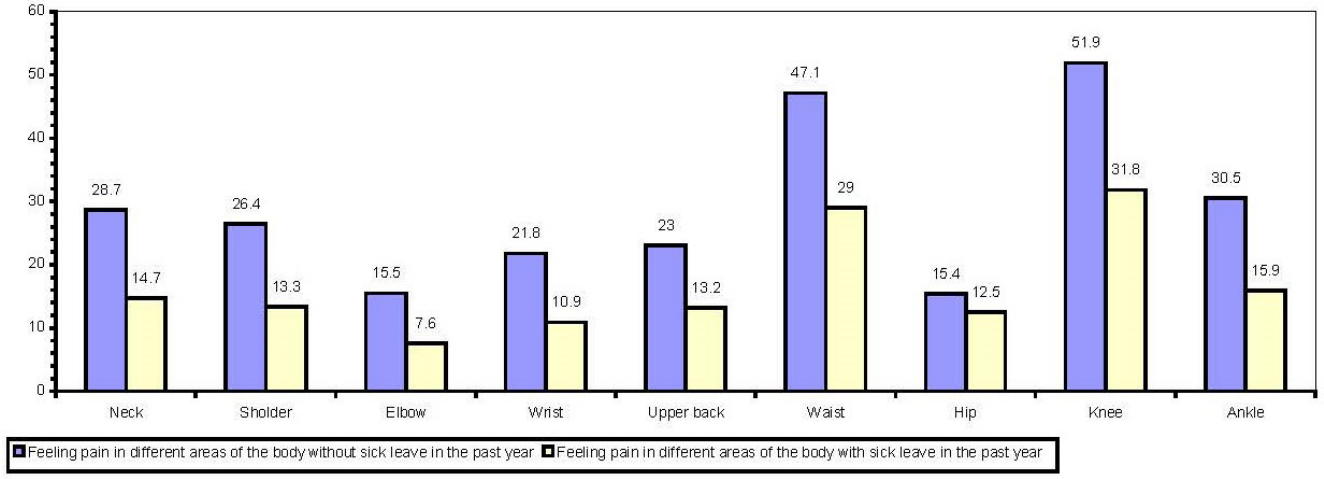

Figure 1: Musculoskeletal disorders in different area of the body

TABLE II: Relationship between the MSDs without medical leave and PAL over the past year

activity Body Area		No	work activity		sports activity		leisure activity		Total activity	
			μ)SD)	P-value	μ)SD)	P-value	μ)SD)	P-value	μ)SD)	P-value
Neck	yes	34	3.29(0.51)	0.186*	2.56(0.83)	0.609*	2.53(0.84)	0.199*	2.78(0.57)	0.008*
	no	90	3.13(0.50)		2.55(0.67)		2.74(0.68)		2.80(0.37)	
Shoulder	yes	31	3.21(0.40)	0.368*	2.46(0.8)	0.627*	2.62(0.81)	0.941**	2.74(0.45)	0.884**
	no	88	3.12(0.53)		2.55(0.69)		2.63(0.67)		2.76(0.40)	
Elbow	yes	16	3.39(0.39)	0.045*	2.50(0.55)	0.959*	2.90(0.92)	0.350*	2.91(0.44)	0.233**
	no	97	3.12(0.52)		2.54(0.74)		2.68(0.69)		2.77(0.43)	
Wrist	yes	25	3.25(0.43)	0.413*	2.39(0.73)	0.377*	2.80(0.87)	0.409*	2.81(0.5)	0.788**
	no	92	3.13(0.52)		2.56(0.7)		2.68(0.67)		2.78(0.39)	
Upper back	yes	27	3.31(0.52)	0.118*	2.53 (0.73)	0.800*	2.46(0.77)	0.102*	2.74(0.45)	0.796**
	no	93	3.09(0.50)		2.53(0.70)		2.70(0.69)		2.77(0.39)	
Waist	yes	60	3.26(0.45)	0.296**	2.48(0.73)	0.497**	2.48(0.74)	0.010**	2.72(0.47)	0.134**
	no	71	3.09(0.55)		2.62(0.71)		2.81(0.69)		2.83(0.39)	
Hip	yes	18	3.42(0.47)	0.016*	2.55(0.87)	0.997*	2.31(0.51)	0.046*	2.75(0.49)	0.973**
	no	98	3.08(0.49)		2.52(0.70)		2.68(0.71)		2.75(0.40)	
Knee	yes	67	3.30(0.46)	0.015**	2.39(0.75)	0.042**	2.51(0.79)	0.019**	2.72(0.49)	0.109**
	no	64	3.08(0.55)		2.65(0.66)		2.82(0.67)		2.84(0.37)	
Ankle	yes	38	3.29(0.44)	0.067*	2.33(0.63)	0.126*	2.53(0.86)	0.091*	2.71(0.42)	0.418*
	no	88	3.10(0.53)		2.58(0.75)		2.68(0.68)		2.78(0.44)	

* Mann-Whitney Test ** Independent Samples T-Test

TABLE III: MSDs without medical leave and PAL based on univariate regression model

Item Body Area	Age	Overtime work	Type of work	Work record	Work activity	Sports activity	Leisure activity	Total activity
Neck	NS	β=1.51 (0.45) p=0.025	NS	NS	NS	NS	NS	NS
Shoulder	NS	NS	NS	NS	NS	NS	NS	NS
Elbow	NS	NS	NS	NS	β= 1.16 (0.59) p=0.04	NS	NS	NS
Wrist	NS	NS	NS	NS	NS	NS	NS	NS
Upper back	NS	NS	NS	NS	NS	NS	NS	NS
Waist	NS	NS	NS	NS	NS	NS	β= - 0.64 (0.25) p=0.01	NS
Hip	NS	NS	NS	NS	NS	NS	NS	NS
Knee	NS	NS	NS	NS	β= 0.86 (0.36) p=0.01	β= - 0.5 (0.25) p=0.04	β= - 0.56 (0.24) p=0.02	NS
Ankle	NS	NS	NS	NS	NS	NS	NS	NS

NS: non-significant

TABLE IV: Relationship between the MSDs with medical leave and PAL

activity Body Area		No	work activity		sports activity		leisure activity		Total activity	
			μ)SD)	P-value	μ)SD)	P-value	μ)SD)	P-value	μ)SD)	P-value
Neck	yes	18	3.14(.53)	0.705	2.29(0.73)	0.121	2.93(0.74)	0.199	2.81(0.57)	0.239
	no	110	3.16(0.51)		2.57(0.69)		2.84(0.68)		2.83(0.37)	
Shoulder	yes	15	3.29(0.4)	0.221	2.6(0.79)	0.662	2.62(0.71)	0.941	2.72(0.45)	0.884
	no	104	3.12(0.52)		2.51(0.7)		2.73(0.64)		2.75(0.40)	
Elbow	yes	8	3.36(0.39)	0.238	2.62(0.42)	0.69	2.80(0.93)	0.350	2.81(0.44)	0.233
	no	109	3.12(0.51)		2.52(0.71)		2.98(0.65)		2.79(0.43)	
Wrists	yes	12	3.47(0.43)	0.057	2.37(0.56)	0.44	2.70(0.82)	0.409	2.82(0.5)	0.788
	no	106	3.12(0.51)		2.53(0.71)		2.61(0.61)		2.85(0.39)	
Upper back	yes	15	3.19(0.41)	0.877	2.56(0.74)	0.91	2.66(0.71)	0.102*	2.73(0.45)	0.796
	no	105	3.14(0.52)		2.54(0.7)		2.75(0.62)		2.75(0.39)	
Waist	yes	37	3.36(0.47)	**0.033**	2.39(0.76)	**0.044**	2.51(0.72)	0.210	2.78(0.47)	0.134
	no	93	3.11(0.52)		2.69(0.7)		2.59(0.63)		2.81(0.39)	
Hip	yes	14	3.35(0.53)	0.19	2.46(0.75)	0.70	2.41(0.58)	0.146	2.74(0.49)	0.973
	no	105	3.11(0.5)		2.53(0.69)		2.88(0.66)		2.76(0.40)	
Knee	yes	39	3.29(.47)	**0.047**	2.33(0.71)	**0.045**	2.74(0.74)	0.119	2.78(0.49)	0.109
	no	88	3.11(0.53)		2.88(0.7)		2.72(0.62)		2.83(0.37)	
Ankle	yes	19	3.37(0.47)	0.056	2.35(0.76)	0.35	2.63(0.82)	0.091	2.75(0.42)	0.418
	no	106	3.1(0.51)		2.52(0.7)		2.78(0.61)		2.76(0.44)	

All test Mann-Whitney

TABLE V: MSDs with medical leave and PAL based on univariate regression model

Item Body Area	Age	Overtime work	Type of work	Work record	Work activity	Sports activity	Leisure activity	Total activity
Neck	NS	NS	NS	NS	NS	NS	NS	NS
Shoulder	NS	NS	NS	NS	NS	NS	NS	NS
Elbow	NS	NS	NS	NS	NS	NS	NS	NS
Wrists	NS	NS	NS	NS	NS	NS	NS	NS
Upper back								
Waist	NS	NS	NS	NS	β= 0.76 (0.33) p=0.01	β= - 0.52 (0.22) p=0.04	NS	NS
Hip	NS	NS	NS	NS	NS	NS	NS	NS
Knee	NS	NS	NS	NS	β= 0.76 (0.39) p=0.01	β= - 0.61 (0.21) p=0.04	NS	NS
Ankle	NS	NS	NS	NS	NS	NS	NS	NS

in knee and waist. The PAL at sport practice decreased the rate of request for medical leave due to a pain in the Waist and Knee (Table V).

DISCUSSION

The majority of the workers had a very high total PAL and PAL at work and the PAL at sport practice or leisure time was at moderate level. Some of the workers tended to do overtime work due to financial needs and to have more income, which was a cause of pain in the neck. This indicates the need for ergonomic interventions and modification of work stations.

The workers felt pain and discomfort in the waist, knee, ankle, and neck, which is consistent with Hafner (2018), Saidu (2011), Dianat (2015), Choi (2009), and Das (2018) (19-23). The main cause of asking for medical leave was pain in the waist and knee and similar results were reported by Brage et al. so that among MDSs, pain in the waist was the main reason for requesting medical leave and debilitation (24). A high percentage of medical leaves were due to MSDs in the waist and knee. This gives us a good reason to supervise and analyze the indices of medical leave, program health measure at work, manage ergonomic risk factors, and attenuate medical leaves. More studies on identifying the type of main activities responsible for MSDs in industrial worker is recommended.

Physical activity at work increased pain in the hip, elbow, and knee. In addition, the workers who asked for medical leave due to pain in waist and knee had a higher PAL at work. This is consistent with Bugajska et al. (2011) who showed that occupational stress lead to MSDs when they are happen along with physical load factors (25). In addition, this finding is consistent with Picavet and Salaffi who showed that workers with MSDs tended to have a less physical activity comparing with the colleagues who had no MSD (26-27). Heneweer et al. (2011) showed that low back pain (LBP) was rooted in the nature and intensity of physical activity (28). Physical activity at practice of sport attenuated pain in the knee and the chance of requesting medical leave due to pain in the waist and knee. The results showed a significant relationship between exercising and MSDs. That is, regular physical activity improved physical readiness in individuals and alleviated MSDs. A study on the role of physical activity in prevention of MSDs in dentists showed that those who exercised regularly had less MSDs comparing with other subjects (29, 30). Regular exercising increases the muscles capability, power, and performance. In fact, chemical changes in muscles caused by doing sport is a cause of the higher performance. Therefore, the level of muscles fatigue is lower in the workers who do regular exercise comparing with those who do not exercise regularly (31).

Physical activity during leisure time decreased pain in the waist, hip, and knee. A review study by Hildebrandt et al. on the effects of physical activity on MSDs in workers showed that physical activity is one of the ways to control MSDs (32).

There was a significant relationship between the type of work with medical leave and pain in the knee and ankle. Therefore, modifications at work stations are needed to control the rate of requests for medical leave due to different work activities. By avoiding long-term standing position, the knee and ankle sustain less pressure. A study by Mussi et al. (2008) on the prevention of MSDs showed that proper layout, equipment, and work equipment, work environment, work organization, and improvement of work station design were highly important (33). Consistent with Samaei (2017), many industrial workers experienced MSDs as an outcome of occupational risks. Therefore, identifying the occupation risk factors, work pace standards, and ergonomic interventions are highly recommended (34).

As to the limitations of the study, the small study population is notable and studies with larger study

populations in different industries are recommended.

CONCLUSION

The workers who felt pain in the elbow, hip, and knee had more PAL at work. There was a significant relationship between PAL at sport practice and feeling pain in the knee so that those who felt pain in the knee had a lower PAL at sport practice. The workers who felt pain in the waist, hip, and knee had a lower PAL at leisure time. Workers who felt pain in the neck had a lower total PAL. Overtime work increased pain in the neck. The PAL at work increased pain in the elbow and knee. On the other hand, PAL at sport practice lowered pain in the knee. Finally, PAL at leisure time decreased pain in the waist and knee.

The workers who used such medical leaves had a higher PAL at work. There was a significant relationship between PAL at sport practice and medical leave due to a pain in the knee and waist so that those who applied for the leave had a lower PAL at sport practice. PAL at work increased the requests of medical leaves due to the pain in knee and waist. The PAL at sport practice decreased the rate of request for medical leave due to a pain in the Waist and Knee.

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