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EXAMINATION OF WORK-RELATED MUSCULOSKELETAL DISORDERS AND THEIR RELATED FACTORS AMONG FARMERS OF ASADABAD CITY IN 2015

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ABSTRACT

Introduction: Farming has been rated as an extensive and dangerous occupational activity that requires tolerating inappropriate physical condition. This study investigated the prevalence of musculoskeletal disorders and their related factors among farmers of Asadabad city in 2015. Materials and Methods: This descriptive-analytical and cross-sectional study was conducted on 378 male farmers in Asadabad city of Hamadan. A nordic standard questionnaire was used for data collection in this research which was completed by trained personnel and was analyzed statistically. Findings: The musculoskeletal disorders prevalence rate of farmers was 6.9% in the neck, 6.6% in shoulders, 1.1% in the elbow, 4.5% in the wrist, 6.1% in the back, 19% in the waist, 10.1% in the hip and thigh, 2.1% in the knee and 5% in the leg. Based on the obtained results, there was a significant relationship between the prevalence of musculoskeletal disorders in the leg area with age and between the prevalence of musculoskeletal disorders in the back area and farmers' awareness level. There was a significant relationship between the prevalence of musculoskeletal disorders in the neck, shoulder, back and waist areas with the history of the disease ($P<0.05$). There was also a significant relationship between the prevalence of these disorders in the neck, shoulder, back, waist, knee, and leg with a history of occupational accidents ($P<0.05$). Conclusion: Ergonomic interventions, designing tools and performing exercise movements at defined time intervals and promoting farmers' level of knowledge in the form of educational programs of occupational health are recommended.

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Introduction

Work-related musculoskeletal disorders (WMSDs) are the common problem of occupational health issues in today's world and have almost a high prevalence in all occupations [1]. The definition of musculoskeletal disorders is injuries and complications in the muscles, nerves, tendons, ligaments, joints, cartilage and spinal cord [2]. The World Labor Organization

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has estimated that the annual losses from work-related injuries and illnesses account for 10 to 15 percent of gross national product [3]. Occupational injuries account for over 10 million and 8 percent of the total global damage [4]. Based on the World Labor Organization, WMSDs alone impose the greatest economic losses (40%) on countries among other work-related injuries and illnesses [5]. In Iran, musculoskeletal disorders are also ranked fourth in total permanent disabilities. These damages are more frequent in occupations with the manual carrying of loads and as a view of occupational health are one of the serious occupational problems; so that 19.1% of occupational injuries are due to heavy tasks and lifting loads by hand [6]. Work-related musculoskeletal disorders are known to be the major factor of losing the working time, increasing the costs and human labor injuries [7]. The feeling of pain and discomfort in various parts of the musculoskeletal system are the main reason for workers' absences. The reason for more than half of the absences in the workplace is musculoskeletal disorders [8]. The occurrence of WMSDs in industrial developing countries is more intense because the mechanization process in developed countries has reduced the level of physical activity pressure on individuals and eliminated or controlled the risk factors of WMSDs, but in the industrial developing countries where many activities are still carried out manually with the aid of using traditional workforce, workers are exposed to biomechanical risk factors and other factors that contribute to the prevalence of WMSDs [9]. Musculoskeletal disorders are a multifactorial phenomenon. In general, all risk factors arranged into four classes: genetic factors, anatomical factors, psychosocial factors, and biomechanical factors. Genetic and morphological factors (as non-interventional factors) and psychosocial and biomechanical factors (as modifiable factors) can be used to prevent the occurrence of damage [10]. Cumulative trauma lesions occur when the work is repeatedly carried out by applying force and in this case, a member of the body is involved. These disorders are common in tools using. A large part of muscular and bone complications, abnormalities and joint pain in farmers as the largest part of their discomfort, are caused by harmful ergonomic factors which defined as, the lack of two-way coordination of the farmer and his work [11]. Woolf and Pfleger defined WMSDs as the main cause of living with disabilities in all countries and continents [12]. Also, a study of the workers' compensation in California showed that 43 percent of the total injuries reported about the farmers of the country were related to WMSDs and 25% of injuries in farmers were caused by excessive activities [13]. In a study conducted by Sadeghi et al on the saffron farmers in Gonabad city, it was found that the postures of the majority of saffron pickers were ergonomically at a very high level of danger and the necessity of applying methods to promptly modify their body postures was suggested [11]. Farming is a popular and dangerous occupation that about 63% of the population of developing countries is engaged in it [7]. As agriculture requires tolerating inappropriate physical conditions such as bending, kneeling, crawling for harvest; repetitive and stressful tasks and musculoskeletal disorders will be an inseparable part of this occupation. In the present study, the risk level of the farmers' physical conditions are determined from the ergonomic viewpoint by evaluating the posture of these individuals during work, and the appropriate corrective actions to prevent musculoskeletal disorders were proposed. The city of Asadabad is one of the agricultural poles in Hamadan province. Agriculture is the main occupation of people who live in this city and according to the statistics of the health center; it has covered 6500 farmers within 100 villages with the resident. This study carried out to investigate the prevalence of musculoskeletal disorders and related occupational risk factors among the farmers of this city in 2015.

Method of Investigation:

In this cross-sectional study, 378 farmers of the agricultural area of Asadabad city were entered into the study and were examined. Nordic and Body maps were the data gathering tools in this research which were completed by trained personnel and were analyzed statistically. The prevalence rate was used to report musculoskeletal disorders. A chi-square test was used to examine the relationship between group variables with a musculoskeletal disorder. The significance level in all tests was determined to be less than 0.05. Data were analyzed using SPSS software.

Findings:

The number of farmers participating in this study was 378 people that 84.7% (320 individuals) were married and 15.3% (58) were single. 16.7% of the participants had an occupational accident and 83.3% had no experience of an occupational accident. 17.5% of the participants had a history of disease other than musculoskeletal disorders influencing these disorders and 82.5% of the participants did not have such disorders. The level of awareness of the participants about occupational health in agriculture was 21.7% with a low level of awareness, 59% with a moderate level and 19.3% had a high level of awareness. 7.9% of the participants were left-handed and 92.1% were right-handed (Table 1).
The mean age range of the participants in this study was around 44.4 years old and the mean BMI of the farmers participating in the study was 24.17. The mean weight of the participants was 70.9 kg and the mean height of them was 1.75cm, the mean work experience of the participants was 24.8 years old and the mean weight of daily loads carried by the participants was 12.3 kg (Table 2).

Table 1: Characteristics of subjects (qualitative)

variable	Variable levels	Frequency (%)
Marital status	Single	58(15.3)

	Married	320(84.7)
Occupational accident history	Has	63(16.7)
	Does not have	315(83.3)
History of disease	Has	66(17.5)
	Does not have	312(82.5)
Awareness level	Low	82(21.7)
	Moderate	223(59)
	High	73(19.3)
Using hands	Left-handed	30(7.9)
	Right-handed	348(92.1)

Table 2: Characteristics of subjects under study (quantitative):

Variable	Mean	Standard deviation
Age	44.4	10.5
BMI	24.17	3.3
Weight	70.9	1.02
Height	1.75	8.41
Work experience	24.8	11.8
Load-carrying capability	12.3	0.8

The rate of musculoskeletal disorders in the neck area was 6.9%, 6.6% in the shoulders, 1.1% in elbow, 4.5% in the wrist area, 6.1% in the back area, 19% in the waist area, 10.1% in the hip and thigh, 2.1% in the knee and 5% in the leg (Table 3).

Table 3: The prevalence of musculoskeletal disorders in farmers:

The area with musculoskeletal disorders	Frequency (%)
Neck	26(6.9)
Shoulder	25(6.6)
Elbow	4(1.1)
Wrist	17(4.5)
Back	23(6.1)
Waist	72(19)
Hip and thigh	38(10.1)
Knee	8(2.1)
Leg	19(5)

1. The most common musculoskeletal disorders in the waist area (65%) had happened among those who had a normal body mass index. Afterward, the second most common musculoskeletal disorders (47%) had occurred among those with musculoskeletal disorders in the shoulder region and with a body mass higher than normal. There was no significant relationship between the prevalence of musculoskeletal disorders and body mass index in farmers.
2. The most common musculoskeletal disorders were observed among farmers who were aged between 50-59 years old and in the waist area at a rate of 21%. There was no significant relationship between the prevalence of musculoskeletal disorders and the age group of farmers.
3. The highest rate of musculoskeletal disorders was among married farmers in the waist area (19.4%) and was also in the waist area for single farmers (17.2%). According to the obtained results, there was no significant relationship between the prevalence of musculoskeletal disorders and marital status in all parts under study (Pearson Chi-Square >0.05).
4. The results of the relationship between the prevalence of musculoskeletal disorders with an experience of occupational accidents in farmers indicated that there was a significant relationship between the prevalence of musculoskeletal disorders in various organs of neck, shoulder, back, waist, knee, and leg with an experience of occupational accidents in farmers (Pearson Chi-Square <0.05) and most of the farmers with musculoskeletal disorders had an experience of occupational accidents in their organs. The highest proportion of farmers (72%) had musculoskeletal disorders in their waist area and had an experience of occupational accidents.

5. According to the results, the highest rates of musculoskeletal disorders had been created in the waist area and the range of 20-29 years of work experience. There was no significant relationship between the prevalence of musculoskeletal disorders and the level of work experience among farmers.
6. Among the musculoskeletal disorders in different organs of the body with a history of the disease in farmers, the highest rate of disorders was related to farmers with musculoskeletal disorders in the waist area with a history of the disease (46%). The results indicated that there was a significant relationship between the musculoskeletal disorders in the neck, shoulder, back and waist area with the history of the disease in farmers.
7. The lowest level of knowledge about agricultural health was observed among farmers who had musculoskeletal disorders in the back area, in other words, 40% of them had a low level and 56% of them had a moderate level of knowledge. Afterward, the highest statistics were related to farmers with musculoskeletal disorders in the waist (63%) with a moderate level of knowledge. Based on the results, there was a relationship between the prevalence of musculoskeletal disorders in the back area of farmers with their level of knowledge (Pearson Chi-Square < 0.05).
8. According to the results, the highest rates of musculoskeletal disorders observed in the waist area and among those farmers who carried a load of about 10-19 kilograms each day. There was no significant relationship between the prevalence of musculoskeletal disorders and the average daily load carried by farmers.

Discussion

Results indicated that the highest rate of musculoskeletal disorders was in the lumbar area of the farmers. Since most of the farm work such as reaping or squat was done under bent posture, the pressure on the lumbar spine, especially the fifth lumbar vertebra was the main cause of the prevalence of musculoskeletal complications. Therefore, these findings were consistent with the results of Razavi et al. [14]. Also, Osborne et al. [15] conducted a study on Irish farmers and the results were the same as the present study. The findings of this study also showed no significant relationship between musculoskeletal disorders in farmers and demographic characteristics such as body mass index. The results were consistent with the research results of Abedini et al. [16], Rahimifard et al. [17], Choobineh et al. [18], Askaripoor et al. [19], and Assadi [20],

Based on the results of this study, a significant relationship between age and musculoskeletal disorders in the leg was found. The musculoskeletal problems in the leg area increase as people get elder, agricultural activities intensify this matter and these disorders become more obvious in the legs. Therefore, the results of this study were consistent with the research results of Nasl Saraji et al [21], Rahimifard et al. [17], Choobineh et al. [18], Bolghanabadi et al. [22], Nasiry Zarrin Ghabaee et al. [23], and Tayefe Rahimian et al. [24].

The results showed no significant relationship between musculoskeletal disorders and marital status. This result reflects the fact that marriage and bachelorhood cannot affect musculoskeletal disorders in the agricultural sector, which this result was consistent with the research results of Sharif Nia et al [25].

It was also found a significant relationship between musculoskeletal disorders in the neck, shoulder, back, waist, knee, and legs in farmers with an experience of occupational accidents. This result showed the impact of occupational accidents on the prevalence of musculoskeletal disorders in farmers. As a work accident can cause damage to any organ of the body, the injured member, in the case of recovery, is also prone to musculoskeletal disorders. This result was consistent with the results of Hajizadeh et al. [26] and Askaripoor et al. [19].

There was a significant relationship between the prevalence of musculoskeletal disorders in the neck, shoulder, back and waist areas in farmers and the history of the disease (other than diseases related to the prevalence of musculoskeletal disorders). Farmers with a history of the disease are somewhat prone to musculoskeletal disorders which the reason can be attributed to the negative impact of the disease on the farmer's body. The results of this study were consistent with the research results of Hajizadeh et al. [26], Hokmabadi et al [27], Solhi et al [28], and Bolghanabadi et al. [22].

There was a significant relationship between the musculoskeletal disorders in the back area of the farmers and their level of knowledge about ergonomics and occupational health issues which showed the direct impact of education on the prevalence rate of musculoskeletal disorders. Based on the obtained results, 40% of farmers suffered from musculoskeletal disorders in their back area had a low level of knowledge about occupational health, 56% of them had a moderate level of knowledge and only 4% of farmers suffered from musculoskeletal disorders in their back area had a high level of knowledge about occupational health. Therefore, farmers who had a high level of knowledge or were somehow involved in occupational health educations were less likely to suffer from musculoskeletal disorders by applying occupational health principles in their work, compared to others who had a lower level of knowledge about occupational health. The results were consistent with the research results of Zakerian et al. [29] and Rokni et al. [30]. According to the results, there was no significant relationship between musculoskeletal disorders which were induced by farm work and the average daily load carried by farmers. The results were consistent with the research results of Habibi et al. [31] and Eskandari et al. [32]. Since agriculture jobs have high repetitive motions, maintaining the sitting position with bent knees and carrying heavy loads due to their working nature, therefore knees, legs, ankles and lower parts of farmers' back and waist are prone to musculoskeletal disorders. Maybe it can be said that the prevalence of musculoskeletal disorders in developing countries such as Iran is more intensive because, in advanced countries, the process of automation and mechanization has partly reduced the pressures of

physical activities on individual and has removed or controlled the risk of effective factors on these disorders. But in developing countries where still many activities are carried out manually and with the aid of farmer's physical strength in the traditional manner, farmers are exposed to the risks of biomechanical factors and other factors that contribute to the prevalence of musculoskeletal disorders. Hence, in such a condition, it is normal for these disorders to be more frequent and severe.

Conclusion

Considering that the farmers in the field of agriculture do most of their activities in a sitting position and bending at their waist, high rates of work-related musculoskeletal disorders, especially in the lumbar area, are justifiable compared to other body areas. Working with bending at the waist or sitting on the knee or standing for a long time will also cause pain in the joints of the knees, varicose veins on the legs and back pain. Therefore, to prevent these complications, they shall occasionally rest between shifts and do various types of movements at the workplace such as waist swing exercise, rubbing the calf muscles, sitting and getting up continuously. Farmers who have to stand for a long time should put one of their feet on a short staircase with a height of at least 35 centimeters.

It is also necessary to carry out ergonomic interventions to correct the work-related physical conditions, designing tools and performing exercise movements at certain time intervals, promoting the farmers' level of knowledge through educational programs of occupational health. Considering that training has a significant role in reducing musculoskeletal disorders among farmers, providing necessary educations on how to carry out the farm works properly, lifting and carrying loads and also, using the work and rest periods, the correct design of work tools and agricultural machinery standardization can reduce the prevalence rate of musculoskeletal disorders. As the agricultural health program in the health sector of the universities of the country is currently running to promote farmers' health level, giving more attention to farmers' training about occupational health and safety issues in the working environment, especially ergonomic topics is recommended.

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