



## Prevalence of Musculoskeletal Disorders and its associated Factors among Farmers and Workers: a cross-sectional study from Agh Ghala, Golestan, Iran

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**Background:** In today's world, Musculoskeletal Disorders (MSDs) with high prevalence in work settings are one of the most important occupational health issues. In addition, MSDs cause personal distress, decreased working capacity, and waste of time, work absenteeism, increased health care costs and economic losses. This study aimed to compare the prevalence rate of MSDs and their associated factors among farmers and workers in Agh Ghala.

**Methods and Materials:** This study was a cross-sectional study. The study population consisted of 300 patients (150 farmers and 150 workers) who were selected from Agh Ghala city in Golestan province. The data collection instrument was Nordic questionnaires. The data were analyzed using descriptive statistics and chi-square test in SPSS software version.

**Results:** In this study, about 72% of the farmers (N = 108) and 83.33% of the workers (N = 125) were suffering from MSDs during the preceding year. The most common disorders were Lower Back Pain (LBP) 36.7% (N = 55) and 55.3% (N = 83) in farmers and workers respectively, followed by knee pain 25.3% (N = 38) and 36.7% (N = 57) in farmers and workers respectively. The chi-square test showed a significant relationship between the MSDs and age, level of education, and training in ergonomic principles ( $P < 0.05$ ). The finding suggested that there was no significant relationship between MSDs and Body Mass Index (BMI) in both groups ( $P < 0.05$ ).

**Conclusion:** Regarding the high prevalence rate of MSDs, it is necessary to organize training courses about professional ergonomic interventions in order to raise farmers' and workers' awareness and skills. These programs can be used to improve the health behsubsequentubsequently healthworkers, duefarmers and workers due to preventing from the occurrence of musculoskeletal disorders.

**Keywords:** Musculoskeletal Disorders (MSDs), Prevalence, Farmers, Workers

### Introduction

In today's world, MSDs with high prevalence rate in work settings are one of the most important occupational health issues. In addition, MSDs cause personal

distress, decreased working capacity, waste of time, work absenteeism, increased health care costs and economic losses (Çalik et al., 2013). MSDs consist of injuries and disorders affecting one or more components of the musculoskeletal system, including a tendon or ligament in the neck; swelling; tearing; impingement of the nerves or blood vessels; and bone fracture (DAS & Gangopadhyay, 2015; Delshad, Tavafian, & Kazemnejad, 2017).

MSDs are mainly due to risk factors such as repetitive movements, use of excessive force, difficult position of the body in the line of work, bearing high pressure, the pressure on the body due

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to contact with objects, and not enough time to improve muscle for rapid movement (Çalik et al., 2013).

An important sector in producing countries is agricultural sector; in addition, this sector has a role in employment, considering all aspects of this section can lead to economic prosperity, independency and self-sufficiency of the country, and followed by food security in the country (Razavi et al., 2014). Another important part in a country is the group of workers who are at risk for MSDs and impose excessive expenses on families and workers community due to performing heavy physical activities like heavy lifting, carrying, pulling and pushing (Bolghanabadi & Pour, 2014). One of the important factors that can greatly increase the efficiency and productivity of farmers and workers and also reduce the costs of MSDs is the provision of their occupational safety and health.

In today's world, almost half of the workforce is employed in agricultural and labor sectors; however, the agricultural sector and workers are neglected because of the health professionals' concentration on the industry sector. Most of the victims are farmers and workers in developing countries (Omran et al., 2015).

Workers and farmers are known as people doing hard physical labors; therefore, they are more prone to musculoskeletal disorders. The results of the research indicate that back, shoulder, arm, hand pains, and Cumulative Trauma Disorder (CTD) are the most common causes of annoying farmers and workers. These injuries can lead to early disability, and consequently, have a negative impact on people's and national income (Razavi et al., 2014; Habibi et al., 2011). Various studies have reported the pain in knee, shoulder, waist, hips, thighs, wrists, forearms, and fractures as common MSDs among farmers (Omran et al., 2015; Jafari Roodbandi et al., 2015; Hartman et al., 2006).

Helmers and colleagues (2002) showed that the prevalence rate of MSDs among farmers was 50% higher than other people. In Izadi's study, only 13% of the participants were trained in ergonomic principles (Izadirad et al., 2016). In another study among Kansas farmers, the prevalence rate of skeletal MSDs was reported to be 60% (Rosecrance, Rodgers, & Merlino, 2006). Moreover, various studies have shown that MSDs are common in workers (Zamanian et al., 2014; Escorpizo, 2008; Alghadir & Anwer, 2015). The prevalence rate of MSDs among workers in a study

by Joshi was reported to be 59.4% (Joshi, Menon, & Kishore, 2001). Thus, according to the high prevalence rate of MSDs, it is necessary that more attention be paid to prevent and control such cases. Despite the employment of large number of people in agricultural and labor professions and also through considering the risks farmers and workers are faced with, limited studies have been carried out on farmers and workers in Iran (Razavi et al., 2014; Omran et al., 2015; Habibi et al., 2011; Jafari Roodbandi et al., 2015). Therefore, the necessity of such studies to be carried out in this domain is felt.

As Agh Ghala is one of the important agricultural cities in Golestan province with the variety of agricultural practices and workers' activities, doing these studies can help determine the prevalence rate of MSDs and their effective or related factors. In fact, based on the results of such studies, it would be possible to predict the magnitude and causes of such disorders and to take necessary steps to prevent the problems and disabilities caused by these disorders. The present study aimed to compare the prevalence rate of MSDs and their associated factors among farmers and workers of Agh Ghala city in Golestan province.

## Methods and Materials

In this cross-sectional study, the sample size was obtained based on the prevalence of MSDs in the pilot study. Therefore, by considering the MSDs prevalence of 80%, error 5% and Confidence Interval (CI 95%), the sample size of 128 individuals in each group was calculated. Finally, with considering attraction percent of 10%, a total of 150 samples was considered in each group of workers and farmers.

The studied target groups consisted of all the workers and farmers living in the villages of the central part of the Agh Ghala city. Sampling was done based on a two-stage sampling method. It means that from among 40 villages covering the central part of the Agh Ghala city, 15 villages were randomly selected, then from each village, 20 people (10 farmers and 10 workers) provided from a list containing the name of farmers and workers were randomly selected for the study. A total of 300 people (150 farmers and 150 workers) was randomly selected.

In order to calculate body mass index, body weight in kilograms was divided by the square of the height in meters. Participants were

classified in four groups; those who were less than 18.5kg were considered as thin, 18.5-24.5 kg as normal, 25-29.5 kg as overweight, and 30-40kg as obese. The inclusion criterion was being worker or farmer, and exclusion criteria were determined as follows: (1) workers and farmers with a history of incontinence and congenital spinal cord injury or accident, (2) workers and farmers with a history of spine surgery or orthopedic surgery in different areas of the body, (3) workers and farmers who have been engaged in other activities over the past three years. The data collection instrument was Nordic questionnaire. This questionnaire is a tool for screening MSDs and measuring the results of epidemiological studies on MSDs (Kourinka et al., 1987). The reliability and validity of Nordic questionnaire were confirmed in previous studies (Delshad, Hidarnia, & Niknam, 2014). Training in ergonomic principles such as training in MSDs prevention, including avoidance of bending, twisting, repeated body movements, especially in the waist; non-binding or undulating for the removal of the lumbar, taking rest breaks during work hours, simple exercises to reduce fatigue are provided by health professionals.

The participants were provided with a written consent form, ensuring that the information they provided was kept confidential and used only for the purposes of the research. Then the questionnaire was completed by the researchers through the interview. The data were analyzed

using descriptive statistics and chi-square test in SPSS software.

## Results

This study results showed that the mean age of the farmers and workers were  $42.43 \pm 8.5$  and  $39.49 \pm 8.96$  years, respectively. According to the results of the Nordic questionnaire, 77.66% (N = 233) of the participants had at least one of the 9 musculoskeletal pains and discomfort in the preceding year, from which 72% (N = 108) were farmer, and 83.33% (N = 125) were worker.

12 farmers (8%) and 16 workers (10.7%) were trained in ergonomic principles. The rest of demographic characteristics of the subjects are presented in Table 1. The frequency and percent of MSDs in subjects of both groups are shown in Table 2. According this table, the most common disorders were Lower Back Pain with 36.7% (N = 55) in farmers and 55.3% (N = 83) in workers followed by knee pain as 25.3% (N = 38) in farmer and 36.7% (N = 57) in workers.

The relationship between MSDs and demographic variables and ergonomic training among farmers and workers are shown in Table 3.

According this table, the results of the chi-square test showed that in the group of farmers, there was a meaningful relationship between MSDs and age, educational level during the last year and ergonomically education ( $p < .05$ )

In the workers' group, only a significant correlation was found between MSDs and ergonomically education (Table 3).

**Table 1. Demographic characteristics of the study sample as a whole and in terms of their job.**

| Variable                | Category           | Number (%) farmer | Number (%) worker | Total      |
|-------------------------|--------------------|-------------------|-------------------|------------|
| Age                     | 20-29              | 5 (3.33)          | 14 (9.33)         | 19 (6.3)   |
|                         | 30-39              | 44 (29.33)        | 62 (41.33)        | 106 (35.3) |
|                         | 40-49              | 70 (46.66)        | 57 (38)           | 127 (42.3) |
|                         | 50-59              | 24 (16)           | 11 (7.33)         | 35 (11.7)  |
|                         | 60 and above       | 7 (4.66)          | 6 (4)             | 13 (4.3)   |
| Education level         | Illiterate         | 32 (21.33)        | 38 (25.33)        | 70 (23.3)  |
|                         | Primary            | 39 (26)           | 47 (31.33)        | 86 (28.7)  |
|                         | Guidance           | 27 (18)           | 21 (14)           | 48 (16)    |
|                         | High school        | 40 (26.66)        | 38 (25.33)        | 78 (26)    |
|                         | Collegiate         | 12 (8)            | 6 (4)             | 18 (6)     |
| Ergonomically education | Yes                | 12 (8)            | 16 (10.66)        | 28 (9.3)   |
|                         | No                 | 138 (92)          | 134 (89.33)       | 272 (90.7) |
| BMI                     | 18.5 Thin          | 6 (4)             | 0 (0)             | 6 (2)      |
|                         | 18.5-24.5 Normal   | 84 (56)           | 41 (27.33)        | 125 (41.7) |
|                         | 25-29.5 Overweight | 54 (36)           | 109 (72.66)       | 163 (54.3) |
|                         | 30-40 Obese        | 6 (4)             | 0 (0)             | 6 (2)      |

**Table 2. Frequency and percent of MSDs in subjects in terms of job.**

| Occupation<br>Pain area | Farmer |      | Worker |      | Total  |      |
|-------------------------|--------|------|--------|------|--------|------|
|                         | Number | (%)  | Number | (%)  | Number | (%)  |
| Neck Pain               | 36     | 24   | 42     | 28   | 78     | 26   |
| Shoulder Pain           | 25     | 16.7 | 38     | 25.3 | 63     | 21   |
| Elbow Pain              | 13     | 8.7  | 22     | 14.7 | 35     | 11.7 |
| Wrist Pain              | 37     | 27.7 | 46     | 30.7 | 83     | 27.7 |
| Lower Back pain         | 55     | 36.7 | 83     | 55.3 | 138    | 46   |
| Upper Back Pain         | 27     | 18   | 31     | 20.7 | 58     | 19.3 |
| Thigh Pain              | 13     | 8.7  | 13     | 8.7  | 26     | 8.7  |
| Knee Pain               | 38     | 25.3 | 55     | 36.7 | 93     | 31   |
| Ankle Pain              | 24     | 16   | 43     | 28.7 | 67     | 22.3 |

MSDs: Musculoskeletal Disorders.

**Table 3. Relationship between MSDs and demographic variables and ergonomic training among farmers and workers**

| Variable                   | Category     | Farmer<br>Number<br>(%) |       | Worker<br>Number<br>(%) |      | Total<br>Number<br>(%) |       |
|----------------------------|--------------|-------------------------|-------|-------------------------|------|------------------------|-------|
| Age                        | 20-29        | 5 (4.62)                | 0.009 | 12 (9.6)                | 0.25 | 17 (7.29)              | 0.001 |
|                            | 30-39        | 30 (27.77)              |       | 51 (40.8)               |      | 81 (34.76)             |       |
|                            | 40-49        | 46 (42.59)              |       | 47 (37.6)               |      | 93 (39.9)              |       |
|                            | 50-59        | 22 (20.37)              |       | 10 (8)                  |      | 32 (13.73)             |       |
|                            | 60 and above | 5 (4.62)                |       | 5 (4)                   |      | 10 (4.29)              |       |
| Education level            | Illiterate   | 16 (14.81)              | 0.002 | 28 (24.4)               | 0.20 | 44 (18.88)             | 0.001 |
|                            | Primary      | 27 (25)                 |       | 38 (30.4)               |      | 65 (27.89)             |       |
|                            | Guidance     | 25 (23.14)              |       | 20 (16)                 |      | 45 (19.31)             |       |
|                            | High school  | 33 (30.55)              |       | 34 (27.2)               |      | 67 (28.75)             |       |
|                            | Collegiate   | 7 (6.48)                |       | 5 (4)                   |      | 12 (5.15)              |       |
| Ergonomically<br>Education | Yes          | 12 (11.11)              | 0.02  | 16 (12.8)               | 0.04 | 28 (12.01)             | 0.003 |
|                            | No           | 96 (86.89)              |       | 109 (87.2)              |      | 205 (87.98)            |       |
| BMI                        | □ 18.5 Thin  | 4 (3.70)                | 0.47  | 0 (0)                   | 0.12 | 4 (1.71)               | 0.18  |
|                            | 18.5-24.5    | 60 (55.55)              |       | 31 (24.8)               |      | 91 (39.05)             |       |
|                            | Normal       |                         |       |                         |      |                        |       |
|                            | 25-29.5      | 38 (35.18)              |       | 94 (75.2)               |      | 132 (56.65)            |       |
|                            | Overweight   |                         |       |                         |      |                        |       |
|                            | 30-40        | 6 (5.55)                |       | 0 (0)                   |      | 6 (2.57)               |       |

MSDs: Musculoskeletal Disorders.

## Discussion

The results of the present study showed that the prevalence rate of MSDs among workers and farmers was very high so that in the past 12 months, 72% of farmers and 83.33% of workers reported MSDs in one or more areas of their body. This result is consistent with the systematic review results of 24 studies conducted by Osborne, showing that the prevalence rate of MSDs of all types during a one-year period was 76.9% (Osborne et al., 2012).

The Pourhaji's study showed that the prevalence rate of MSDs after 3-month follow-up was about 90%. However, after the intervention, the participants' awareness, attitude, work-related health behaviors and MSDs rate were improved. (Pourhaji et al., 2016). The prevalence rate of MSDs in this study was 83.33%, while in the

study by Afsharnia, it was reported to be 77.9% (Afsharnia, Abdesahi, & Marzban, 2013). Moreover, the prevalence rate of MSDs in the study by Hwang et al. (2001) was 90%, which was a bit more than the present study result. This small difference can be attributed to the individual differences, age, work experience, high job diversity, type of activity, and training in ergonomic principles, as mentioned in another studies (Ahmadi et al., 2014). The differences in the level of workers' (construction, mining, industry, green space) and farmers' (traditional, mechanized, agriculture, horticulture) work should also be taken into account.

According to the results of this study, the pain in waist (lower back), knees, neck, wrists, and ankles become more damaged and painful than other musculoskeletal areas. These findings are consistent with the results of the research by

Razavi et al. 2014; Osborne et al. 2012; & Jafari Roodbandi et al. 2015).

These results have also been reported in other studies (Afsharnia, Abdeshahi, & Marzban, 2013; Hwang et al., 2001; Jyotsana, Singh, & Mehta, 2005; Hartman & Huirne, 2005), showing that the prevalence rate of disorders is higher in workers' waist, knee, wrists, and legs.

The findings of this study showed that MSDs in nine regions are more common among workers than farmers. Various studies have shown the high prevalence rate of MSDs in workers (Habibi et al., 2010; Escorpizo, 2008). It seems that doing hard work and lack of knowledge about the principles of ergonomics of the human body are the reasons for high levels of these disorders, as mentioned in another study (Jafari Roodbandi et al., 2015).

In this study, only 9.3% of the subjects were trained to observe ergonomic principles while performing agricultural and labor practices.

These findings suggest that no attention is paid to the workers' and farmers' training, occupational safety, and health, as mentioned in other studies (Omran et al., 2015).

In the present study, the prevalence rate of MSDs in the group of farmers as well as the total number of samples was affected by the participants' age; therefore, there was a significant difference between age and the prevalence rate of musculoskeletal disorders.

This issue was consistent with other studies' results (Jafari Roodbandi et al., 2015; Hwang et al. 2001; Park et al., 2010; Ahmadi et al., 2014). However, there was no relationship between the MSDs and age group, the level of education, and body mass index in the workers' group. It indicates the impact of environmental factors, type of work, and training in observing ergonomic principles while conducting activities on the prevalence of such disorders. Therefore, in the present study, there was a significant relationship between the education in ergonomic principles and the prevalence rate of musculoskeletal disorders. In the studies by Askaripoor, Widanarko and Haghi, the impact of environmental factors and the type of work on the prevalence of MSDs has also been mentioned (Askaripoor et al., 2013; Widanarko et al., 2011; Haghi et al., 2015). The present study showed that there was a statistically significant relationship between MSDs and educational level, which is consistent with the results of the study by Afsharnia (Afsharnia et al., 2013). In most of the previous studies, the prevalence rate of MSDs

among people with higher education levels was reported to be less than those with lower education level because those people are aware of the important role of physical exercises, daily activity management, lack of repetitive work, calcium intake, swimming, and cycling (Ramezani, et al., 2015; Kwon et al., 2006).

The results showed that there was no significant relationship between the prevalence rate of MSDs and BMI among farmers and workers. These results are consistent with the findings of the studies by Haghi and Alghadir (Haghi et al., 2015; Alghadir & Anwer, 2015). Based on the results of this study, there was a significant relationship between training in ergonomic principles and the prevalence rate of MSDs among farmers and workers. In Sadeghian's study, the role of education in preventing and reducing MSDs in the back pain has been emphasized (Sadeghian et al., 2006). It seems that organizing training courses focused on the correct ways of doing things and ergonomic principles, on supporting programs for nine musculoskeletal areas, on performing exercise programs before and during body work is the least costly way and a good solution to prevent and reduce MSDs (Thornton et al., 2004; Nadri et al., 2015; Parno et al., 2016). Accordingly, in many educational centers in the United States, specialized ergonomic techniques and work with tools in the academic curriculum are employed (Nadri, et al., 2015).

In addition to strong points, the limitations of this study were as follows: research units were limited to male sex that should be considered in future studies. This study has a cross sectional design so the causal relationship cannot be achieved, even though the relationships between variables were calculated. Furthermore, due to the self-reported nature of the data, the results should be compared with caution.

In summary, it should be noted that the prevalence rate of MSDs among farmers and workers was significantly different. In this study it was shown that MSDs in different ages, levels of education, and training in the principles of ergonomics were different. In other words, there was a significant difference in the prevalence rate of MSDs among these factors. Organizing training classes and giving information about the principles of ergonomics to the workers employed in the professions of agricultural and emergency operations are essential that can promote the health

of farmers and workers and prevent musculoskeletal disorders.

### Conclusion

Regarding the high prevalence rate of MSDs, it is necessary to organize training courses about professional ergonomic interventions in order to raise farmers' and workers' awareness and skills. These programs can be used to improve the health of farmers and workers due to preventing from the occurrence of musculoskeletal disorders.

### Conflict of Interest

There is no conflict of interest for this article.

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### Author contribution

HIR, FP, GHM, MHD and KHMJ: Conducting whole study and had full access to all of the data for analysis.

HIR, GHM, KHMJ and MHD: Involved in drafting the article

HIR: Responsible for conducting the study and the integrity of the data and the accuracy of the data collection.

HIR, FP, and MHD: Confirming the final version of the manuscript.

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