

Musculoskeletal disorders and related risk factors among Iranian farmers: applying Protection Motivation Theory

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ABSTRACT

Introduction: Musculoskeletal disorders (MSDs) are one of the main occupational health problems worldwide. Among different careers, the farming profession is highly prone to MSDs. A variety of factors to prevent MSDs can be named such as preventive behaviors. Protection motivation theory (PMT) is widely accepted as a framework to determine the factors in health-related behaviors. Therefore, the present study was an attempt to determine the MSD preventive factors using PMT in farmers in rural areas of Tuyserkan County.

Methods: This was a cross-sectional study among 285 farmers living in Tuyserkan County in 2021. The farmers were selected through cluster random sampling from 54 health houses affiliated with the health center of the county. In the next stage, the participants were selected through simple random sampling. Data was gathered online using a questionnaire of the PMT and Nordic questionnaire. The collected data were analyzed in SPSS 24 using linear and binary regression tests.

Results: The mean work experience of the farmers was 22.11 years and the activity in 81.8% of the participants was in standing and sitting positions. In addition, 55.4% of the participants had at least one of the MSD symptoms and the most common symptoms were back pain (67%) and pain in the knee area (35.5%). Most farmers did not observe MSD alleviation behaviors. The variables perceived susceptibility, fear, self-efficacy, and behavior had protective effects against MSDs in the farmers; while, monthly income, age, work hours per day, and type of activity had intensifying effects on MSDs.

Conclusion: Farming is recognized as a high-risk job for health and several evidences show a relationship between failure to perform preventive behaviors and the prevalence of MSDs. Given the paucity of studies using health education theories and models to examine the factors in MSDs, the present study employed the PMT framework to examine MSD factors in farmers.

Keywords: Behavior, Farmers, Musculoskeletal Disorders, Protection Motivation Theory, Rural Area

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Introduction

Musculoskeletal disorders (MSDs) are part of the major occupational health problems in the world with a high prevalence in almost all jobs.¹ Therefore, MSDs are one of the main causes of physical problems and debilities caused by jobs.

The disorders are formed due to repetitive impacts or a sudden strong impact.¹ The MSDs as a group of conditions that involves nerves, tendons, muscles, and supportive structures like intervertebral discs. The conditions represent a

wide range of disorders with different severity ranging from trivial periodic symptoms to chronic and debilitating conditions.^{2,3} According to the International Labour Organization (ILO) estimate, MSDs are responsible for the highest economic loss (40%) among other labor-related damages and diseases.⁴ According to Woolf and Pflieger, MSDs are the main cause of disability-adjusted life years (DALYs) in all countries.⁵

Musculoskeletal diseases are the most prevalent type of disease and also the main cause of lost working days in individuals.⁶ The diseases are the fourth cause of general debility.¹ The MSDs are multi-factor phenomena and in general the risk factors can be categorized into four categories, genetic, morphology (non-interventional factors), psychosocial and biomechanical factors (interventional factors) that can be used to prevent damage.⁷ Accumulated trauma lesions happen when a work is done repetitively by inducing force where a specific member is involved. This mostly happens in tasks done by tools.⁸

Among different jobs, farming is prone to MSDs as it is considered one of the most dangerous works in which 63% of the world population is involved.^{9,10} The MSDs are prevalent among farmers and almost all farmers suffer from MSDs.¹¹ Much of the MSDs, side effects, and joint pain in farmers (the most common complication in farmers) are due to harmful ergonomic factors or a mutual lack of farmer/worker harmony.¹² In addition, excessive activity was responsible for 25% and higher injuries in the farmers.¹³ Since, farming requires undertaking unhealthy, repetitious, and highly stressful physical activities such as bending, kneeling, and crawling to collect crops, MSDs in farmers are inevitable.¹⁰ In addition, more exposure to vibration and sitting/standing on vibrating tools like tractors and threshing machines and using the hands to induce force onto tools increase the potential risk factors of MSDs.¹⁰ About 60% of farmers are exposed to unhealthy body postures in about half of their working hours, which creates pain and discomfort. In addition, about 50% of farmers have to carry heavy loads and do repetitious movements in about half of their working hours.¹⁰

A variety of factors are available to prevent MSDs, and preventive behaviors are one of them.⁸ An efficient model in health education is the Protection Motivation Theory (PMT), which is widely used as a framework to predict health-related behaviors in individuals. The protection motivation model was introduced by Rodgers in 1975, based on the assumption that acceptance of

a recommended protective behavior against health risks is a direct consequence of one's motivation to protect oneself. Rodgers states that fear affects the intention to do a protective behavior against a health risk via five constructs and protection motivation arouses, eventually, as a protective behavior. The five constructs are self-efficacy (one's belief in the success of the protective behavior); perceived response efficiency (one's expectation that the compatible response of the protective behavior against health risk can eliminate the risk); perceived susceptibility (one's belief in their vulnerability to a health risk); perceived severity (one's belief in the seriousness of the risk); and perceived costs (one's estimate of any form of cost such as money, time, and effort to perform the protective behavior).^{14,15}

The majority of studies on MSDs in farmers have focused on the prevalence and the demographical factors in the prevalence and type of the disorders. Preventive and protective behaviors by the individuals and non-demographical and background factors have been rarely studied. Many of the studies on MSDs in farmers have been conducted without a specific theoretical framework and in many cases, the provided explanations lack a reliable and clear theoretical framework. As our literature review shows, there have been a few studies based on renowned theoretical frameworks in the health field to detect the preventive factors of MSDs and the factors in the preventive behaviors in farmers. In light of this, the present study is an attempt to determine MSD preventive factors using PMT in farmers living in Tuyserkan County.

Methods

The study was carried out as a cross-sectional study on the farmers visiting health houses affiliated with the Health Center of Tuyserkan Country between April and June 2021. In this study, participants were chosen using a two-step process. Initially, 18 out of 54 health houses were selected through cluster sampling. Then, individuals were randomly selected from these health houses' files using simple random sampling. This method ensured a fair and efficient selection of participants from a large, geographically dispersed population.

Iran's Health Houses, established in 1980, are fundamental to rural healthcare. They provide basic health services to local communities, serving about 1,000 rural people each. They are staffed by Behvarzes and carry out various responsibilities including family health, census taking, public

education, disease control, environmental health, and health data reporting. There are over 17,000 Health Houses in Iran. Each village or group of villages has a Rural Health House, forming the basic building blocks of Iran's health network.

The sample size was determined by assuming the maximum standard deviation of fear in PMT as to the way of protection against skin cancer equal to 5.4, acceptable error equal to 0.9, confidence level of 95%, and power of 80%.¹⁶ Through this, the minimum sample size was obtained equal to 285.

The required information about the individuals who worked as farmers was collected from the Integrated Health System (SIB) and Farmers Health Program in the health houses. Sampling was done with the help of health assistants working in the health houses. The inclusion criteria were elementary literacy, age > 18 years, and having a smartphone and the ability to use it.

Data gathering was done online: two e-questionnaires were sent to the participants who met the inclusion criteria. The study questionnaire contained two sections; one was an about background and demographical information (age, sex, marital status, education, work record, monthly income, farming hours per day, and type of activity). Section two contained questions that measured the constructs of PMT. Perceived susceptibility and perceived severity were each assessed using four questions designed with five alternatives (completely disagree=1 until completely agree=5). Perceived response efficiency and self-efficacy were each examined using two and three questions with the same five alternatives. In addition, perceived cost was measured using four questions (never, rarely, to some extent, mostly). A perceived reward was measured with three questions with five alternatives (completely disagree=1 until completely agree=5). The fear construct was assessed by three questions. To answer these questions, 4 answers were considered: at all, a little, to some extent, a lot; for the answers, a score of 1 to 4 was given, respectively. Protection motivation was measured using five questions with four alternatives (never, rarely, to some extent, mostly). The MSDs preventive behavior was measured using eight questions designed based on four alternatives (never=1, sometime=2, mostly=3, and always=4).

To examine the validity of the questionnaire, the content validity ratio (CVR) and content validity index (CVI) were used. To measure CVR, the tool was provided to 10 health education and health promotion professionals to check items in terms of

necessity. To determine CVI, the relevance, simplicity, and clarity of the items were examined and the items' scores were obtained higher than 79% so that the content validity of the tool was supported. Afterward, face validity of the tool was determined by providing the tool to five farmers to determine any ambiguity or complicated item. To measure the reliability of the tool, Cronbach's alpha was used so that the tool was provided to a pilot group of 30 farmers from five health houses who were selected through convenient sampling. Cronbach's alpha for perceived susceptibility, perceived severity, fear, perceived costs, perceived reward, self-efficacy, perceived response efficiency, perceived protection motivation, and behavior was equal to 0.71, 0.75, 0.78, 0.81, 0.73, 0.87, 0.75, 0.82, and 0.76 respectively.

The second questionnaire used was a standard Nordic questionnaire to determine the prevalence of MSDs in the limbs. The tool is one of the most commonly used questionnaires to determine MSD symptoms, which was designed by Korinka et al. in 1987 and soon became a standard for determining MSD symptoms.¹⁷

To respect ethical concerns, the participants were informed about the objectives of the study by telephone and after giving their informed consent, a link to the questionnaires was sent to them. An ethics code was assigned to the study by Hamadan University of Medical Sciences (IR.UMSHA.REC.1399.202).

The collected data was analyzed in SPSS 24 with a significance level of 0.5 using dual regression and linear regression to determine the relationship between the variables.

Results

In total, 285 farmers participated in the study and 100% of the participants answered the questionnaire. The mean and SD of the farmers' age was 43.94±0.92 years and the mean working hours per day was 4 hr.

Out of the farmers surveyed, 255 were men, which constitutes 89.5% of the total and 98 of these farmers had an elementary level of education, making up 34.4% of the total. A significant majority, 248 farmers, were married, accounting for 87% of the total. Furthermore, 165 farmers fell into the moderate-income level category (based on farmers' self-report), representing 57.9% of the total. The work position for 81.8% of the participants (233 individuals) involved both standing and sitting. Additionally, the primary source of information for 106 participants (37.2% of the total) was radio and television (Table 1).

Table 1. Demographic characteristics of the participants (n=285)

| Characteristics | n (%) |
|---|------------|
| Sex | |
| Male | 255 (89.5) |
| Female | 30 (10.5) |
| Level of education | |
| Elementary school | 98 (34.4) |
| Middle school and High school | 52 (18.2) |
| Diploma | 77 (27.0) |
| ≥College | 58 (20.4) |
| Marital status | |
| Married | 248 (87.0) |
| Single | 33 (11.6) |
| Divorced or widowed | 4 (1.4) |
| Monthly income | |
| Excellent | 0 (0.0) |
| Good | 41 (14.4) |
| Average | 165 (57.9) |
| Bad | 79 (27.7) |
| Type of work activity | |
| Permanent sitting | 15 (5.3) |
| Standing permanently | 37 (13.0) |
| Standing and sitting together | 233 (81.7) |
| Sources of information about musculoskeletal disorders | |
| Radio/ TV | 106 (37.2) |
| Journals and publications | 0 (0.0) |
| Books and booklets | 33 (11.5) |
| Poster and pamphlet | 27 (9.5) |
| Family and friends | 61 (21.4) |
| Physician and health staff | 43 (15.1) |
| None | 15 (5.3) |

Moreover, 55.4% of the farmers had at least one of the MSD symptoms and the most prevalent symptoms were pain, discomfort, burn, and limb numbness over the past 12 months in the back area (67%) and knee area (35.5%). Moreover, the majority of pain, burns, and numbness symptoms over the past seven days were in the back region (55.4%) and knee region (28.8%). In addition, the majority of the symptoms that made the participants rest, cut work hours, leave the workplace, or be unable to continue work were pain and discomfort over the past 12 months in the back (57.5%) and knee areas (32.6%) (Table 2).

As the results show, the majority of farmers did

not observe MSD alleviation behaviors so the percentage of those observing such behaviors was not desirable. Sometimes, the following actions are taken to ensure safety: avoiding the lifting of loads and bending (47.7%), using a wheelbarrow or hand luggage to move objects (45.6%), sitting in a squat position to lift objects (48.8%), asking for help when lifting heavy objects or objects of improper shape (41.8%), bending the knee while lifting the load (43.2%), getting as close to the load as possible when lifting objects (34.4%), using the palm to correctly handle the load (23.5%), and reducing the weight of the load to lift (41.4%) (Table 3).

Table 1. Distribution of symptoms of musculoskeletal disorders in farmers (n=285)

| Characteristics | Musculoskeletal disorders | |
|--|---------------------------|--------------|
| | No n (%) | Yes n (%) |
| Total | 127 (44.6) | 158 (55.4) |
| Existence of pain, discomfort, burning, and numbness in the limbs in the last 12 months | | |
| Neck | 228 (80.0) | 57 (20.0) |
| Right shoulder | 239 (83.9) | 46 (16.1) |
| Left shoulder | 252 (88.4) | 33 (11.6) |
| Right elbow | 271 (95.1) | 14 (4.9) |
| Left elbow | 273 (95.8) | 12 (4.2) |
| Right wrist | 251 (88.1) | 34 (11.9) |
| Left wrist | 250 (87.7) | 35 (12.3) |
| Upper back | 256 (89.8) | 29 (10.2) |
| Lumbar | 94 (33.0) | 191 (67.0) |
| Buttocks and thighs | 240 (84.2) | 45 (15.8) |
| Knee | 184 (64.4) | 101 (35.4) |
| Ankle | 253 (88.8) | 32 (11.2) |
| Existence of pain, discomfort, burning and numbness in the limbs in the last 7 days | | |
| Neck | 240 (84.2) | 45 (15.8) |
| Right shoulder | 259 (90.9) | 26 (9.1) |
| Left shoulder | 260 (91.2) | 25 (8.8) |
| Right elbow | 275 (96.5) | 10 (3.5) |
| Left elbow | 275 (96.5) | 10 (3.5) |
| Right wrist | 259 (90.9) | 26 (9.1) |
| Left wrist | 258 (90.5) | 27 (9.5) |
| Upper back | 258 (90.5) | 27 (9.5) |
| Lumbar | 127 (44.6) | 158 (55.4) |
| Buttocks and thighs | 248 (87.0) | 37 (13.0) |
| Knee | 203 (71.2) | 82 (28.8) |
| Ankle | 252 (88.4) | 33 (11.6) |
| Forced to rest, reduce work activity, leave work or inability to work at work or home due to pain or discomfort in the last 12 months | | |
| Neck | 228 (80.0) | 57 (20.0) |
| Right shoulder | 245 (86.0) | 40 (14.0) |
| Left shoulder | 260 (91.2) | 25 (8.8) |
| Right elbow | 275 (96.5) | 10 (3.5) |
| Left elbow | 275 (96.5) | 10 (3.5) |
| Right wrist | 267 (93.7) | 18 (6.3) |
| Left wrist | 271 (95.1) | 14 (4.9) |
| Upper back | 258 (90.5) | 27 (9.5) |
| Lumbar | 121 (42.5) | 164 (57.5) |
| Buttocks and thighs | 253 (88.8) | 32 (11.2) |
| Knee | 192 (67.4) | 93 (32.6) |
| Ankle | 242 (84.9) | 43 (15.1) |

Note: n=Number and %= Percent

Table 3. Participants' responses to questions about the prevention behavior of musculoskeletal disorders in farmers (n=285)

| Questions | Always n (%) | Mostly n (%) | Sometimes n (%) | Rarely n (%) | Never n (%) |
|---|-----------------|-----------------|--------------------|-----------------|----------------|
| Avoiding lifting loads and bending | 47 (16.5) | 82 (28.8) | 135 (47.7) | 15 (5.3) | 6 (1.2) |
| Use a wheelbarrow or hand luggage to move objects | 36 (12.6) | 52 (18.2) | 130 (45.6) | 61 (21.4) | 6 (1.2) |
| Sit in a squat to lift objects | 34 (11.9) | 71 (24.9) | 139 (48.8) | 33 (11.6) | 8 (2.8) |
| Ask for help lifting heavy objects or objects of improper shape | 69 (24.2) | 71 (24.9) | 119 (41.8) | 16 (5.6) | 10 (3.5) |
| Bend the knee while lifting the load | 41 (14.4) | 94 (33.0) | 123 (43.2) | 21 (7.4) | 6 (1.2) |
| Get as close to the load as possible to lift objects | 89 (31.2) | 78 (27.4) | 98 (34.4) | 10 (3.5) | 10 (3.5) |
| Use the palm to get the load right | 94 (33.0) | 100 (35.1) | 67 (23.5) | 16 (5.6) | 8 (2.8) |
| Reduce the weight of the load to lift | 56 (19.6) | 85 (29.8) | 118 (41.4) | 20 (7.0) | 6 (1.2) |

Note: n=Number and %= Percent

Table 4. Predicting prevention behavior of musculoskeletal disorders in farmers (Adjusted R²=0.530)

| Constructs | β | B | SE | 95% CI | | P-value |
|-------------------------------|---------|-------|------|--------|-------|---------|
| | | | | Lower | Upper | |
| Perceived susceptibility | 0.05 | 0.10 | 0.08 | -0.06 | 0.27 | 0.200 |
| Perceived severity | -0.07 | -0.16 | 0.10 | -0.37 | 0.05 | 0.137 |
| Fear | 0.15 | 0.35 | 0.11 | 0.13 | 0.57 | 0.002 |
| Self-efficacy | 0.19 | 0.40 | 0.11 | 0.17 | 0.62 | 0.001 |
| Perceived costs | -0.10 | -0.16 | 0.08 | -0.32 | -0.01 | 0.036 |
| Perceived response efficiency | 0.15 | 0.46 | 0.15 | 0.15 | 0.78 | 0.004 |
| Perceived rewards | 0.06 | 0.11 | 0.08 | -0.05 | 0.27 | 0.178 |
| Protection motivation | 0.65 | 0.82 | 0.06 | 0.70 | 0.94 | 0.001 |
| Constant | -- | 4.62 | 1.74 | 1.20 | 8.05 | 0.008 |

Note: β = Beta, B = unstandardized regression coefficient, SE= Standard Error

Table 4 shows that one unit increase in fear, self-efficacy, perceived response efficiency, and perceived protection motivation scores increased behavior scores. In addition, one unit increase in the perceived costs score decreases the mean behavior score.

In table 5, a unit increase in moderate monthly income to good monthly income increases the odds ratio (OR) of developing MSDs to the OR of no MSDs by 1.13 times. In addition, one unit increase in age score (26-35) compared to the 15-25 age group increases the OR of developing MSD to the OR of no MSD by 2.75 times. One unit increase in age score (36-45 years) to the 15-25 age group increases the OR of developing MSDs to the OR no MSDs by 1.96 times. One unit increase in farming work hours per day (2-4hrs) to 5-6 hrs increases the OR of developing MSDs to the OR of no MSDs by 1.24 times. One unit increase in farming work hours per day (5-6 hrs) to less than 2 hrs per day, increases the OR of MSDs to the OR of no MSDs by 1.43 times. One unit increase in farming work

hours per day (more than 7hrs) to less than 2hrs, increases the OR of MSDs to the OR of no MSDs by 1.77 times. Work position (standing and sitting) increases the OR of MSDs to the OR of no MSDs by 1.36 compared to the sitting work position. One unit increase in the score of perceived susceptibility increases the OR of MSDs to the OR of no MSDs by 0.21 times. In addition, one unit increase in fear score increases the OR of MSDs to the OR of no MSDs by 0.23 times. One unit increase in self-efficacy score increases the OR of MSDs to no MSDs by 0.26 times. One unit increase in behavior score increases the OR of MSDs to no MSDs by 0.20 times. Therefore, variables perceived susceptibility, fear, self-efficacy, and behavior had a protective effect on developing MSDs in the farmers; while monthly income (moderate and low), age (26-35 and 36-45 years), farming work hours per day (2-4, 5-6, and 7< hours), and type of activity (permanently standing and standing and sitting) increased the OR of MSDs.

Table 2. Associations between demographics variables, work-related factors, PMT constructs and musculoskeletal disorders in farmers (n = 285)

| Musculoskeletal disorders | Coefficient | Odds ratio | SD | 95% CI | | p-value |
|---|-------------|------------|------|--------|--------|---------|
| | | | | Lower | Upper | |
| Sex | | | | | | |
| Male | | Ref* | | | | |
| Female | 0.66 | -0.41 | 0.54 | 0.23 | 1.92 | 0.450 |
| Marital status | | | | | | |
| Married | | Ref* | | | | |
| Single | 2.15 | 0.77 | 1.40 | 0.14 | 33.64 | 0.583 |
| Divorced or widowed | 6.44 | 1.86 | 1.62 | 0.26 | 156.37 | 0.252 |
| Level of education | | | | | | |
| Elementary school | | Ref* | | | | |
| Middle school and High school | 0.99 | -0.01 | 0.55 | 0.33 | 2.92 | 0.981 |
| Diploma | 3.11 | 1.13 | 0.55 | 0.89 | 8.37 | 0.077 |
| ≥College | 0.92 | 0.08 | 0.49 | 0.35 | 2.39 | 0.861 |
| Age (year) | | | | | | |
| 18-25 | | Ref* | | | | |
| 26-35 | 0.06 | 2.78 | 1.00 | 1.21 | 3.44 | 0.005 |
| 36-45 | 0.14 | 1.96 | 0.78 | 1.03 | 2.65 | 0.012 |
| 46-55 | 0.36 | -1.02 | 0.74 | 0.08 | 1.52 | 0.165 |
| 56-65 | 0.59 | -0.52 | 0.74 | 0.14 | 2.54 | 0.483 |
| ≥66 | 0.90 | -0.10 | 0.64 | 0.26 | 3.16 | 0.876 |
| Monthly income | | | | | | |
| Good | | Ref* | | | | |
| Average | 0.33 | 1.13 | 0.54 | 1.11 | 1.98 | 0.045 |
| Bad | 0.24 | 1.43 | 0.44 | 1.18 | 1.86 | 0.001 |
| Type of work activity | | | | | | |
| Permanent sitting | | Ref* | | | | |
| Standing permanently | 0.14 | 1.91 | 0.85 | 1.03 | 2.77 | 0.024 |
| Standing and sitting together | 3.90 | 1.36 | 0.57 | 1.28 | 11.89 | 0.017 |
| Farming years | | | | | | |
| 1-10 | | Ref* | | | | |
| 11-20 | 1.42 | 0.35 | 0.74 | 0.33 | 6.07 | 0.633 |
| 21-30 | 3.51 | 1.26 | 0.73 | 0.83 | 14.84 | 0.088 |
| 31-40 | 1.29 | 0.26 | 0.77 | 0.28 | 5.95 | 0.738 |
| ≥41 | 2.83 | 1.04 | 0.72 | 0.68 | 11.68 | 0.150 |
| Duration of farming (Hour per day) | | | | | | |
| <2 | | Ref* | | | | |
| 2-4 | 3.48 | 1.24 | 0.54 | 1.19 | 10.15 | 0.022 |
| 5-6 | 4.14 | 1.43 | 0.53 | 1.48 | 11.80 | 0.007 |
| ≥7 | 5.91 | 1.77 | 0.63 | 1.73 | 20.18 | 0.005 |
| Number of family members (person) | 1.00 | 0.01 | 0.33 | 0.52 | 1.92 | 0.994 |
| Perceived susceptibility | 1.24 | 0.21 | 0.07 | 1.07 | 1.42 | 0.002 |
| Perceived severity | 0.78 | -0.08 | 0.08 | 0.78 | 1.08 | 0.305 |
| Fear | 1.25 | 0.23 | 0.08 | 1.05 | 1.49 | 0.009 |
| Self-efficacy | 0.77 | 0.26 | 0.10 | 0.62 | 0.94 | 0.014 |
| Perceived costs | 0.89 | 0.11 | 0.07 | 0.77 | 1.03 | 0.133 |
| Perceived response efficiency | 1.04 | 0.04 | 0.14 | 0.79 | 1.37 | 0.776 |
| Perceived rewards | 1.01 | 0.01 | 0.06 | 0.88 | 1.13 | 0.942 |
| Protection motivation | 0.97 | -0.03 | 0.06 | 0.85 | 1.09 | 0.635 |
| Prevention behavior | 0.81 | 0.20 | 0.05 | 0.73 | 0.91 | 0.001 |
| Constant | 84.87 | 4.05 | 2.58 | - | - | 0.116 |

* Reference

Discussion

The pain of MSDs is a multi-factor phenomenon and depending on the body's motion and type of work activity, affects all parts of the body. Here, out of 258 farmers, 158 (55.4%) had one of the symptoms of MSDs, which is consistent with the findings of other studies in this field.^{18,19} The majority of studies reviewed by the author showed that the majority of participants had one or several MSDs.¹⁰ The most prevalent MSD symptoms were back and knee pains, which is consistent with similar studies.^{18,20,21} The results also indicated lower limb MSDs, while Kim et al. reported at least one MSD in the upper limbs.²² One probable reason for the difference in the results is the type of work done by the participants in this study and many similar ones, the farmers worked in farms and orchards, while in the studies with inconsistent results, the participants were only orchardists.

The MSD preventive behaviors in this study were not at a desirable level so given the negligence in observing MSD preventive behavior, the prevalence of the disorders is expected to grow. A systematic study showed that changes in MSD preventive behaviors can decrease the prevalence of the disorders in individuals.²³ Still, farmers' behaviors to manage risk of MSDs in a proper way are highly important.

Income was one of the factors in the prevalence of MSDs so the lower the income level, the higher the prevalence of MSDs. Osborne et al. reported results consistent with the present study. To explain the findings, individuals with lower income levels tend to work longer and carry out more heavy tasks to gain more income. In addition, they cannot seek timely and proper medical attention if they develop health problems. In addition, age was another factor in increasing MSDs so the prevalence of MSDs in younger farmers was higher than that in older individuals. Similar studies have also shown that age is one of the factors in the prevalence of MSDs.²⁴ Our results are not consistent with it and to explain the finding, the reason for the higher prevalence of MSDs in younger farmers could be the lower perceived risk, sensitivity and severity of MSDs in these individuals so that many of them might think that the disorder is temporary.²⁵ On the other hand, older individuals who have a higher perceived risk, tend to have more protective behaviors.

Farming work hours was another factor with incremental effect on MSDs so that the disorders

would increase when the work hours increase higher than 2hrs. This finding is consistent with similar studies.^{25,26} The higher the work hours of farmers, given the prolonged engagement of musculoskeletal system and pressure on the body, the more intensified bodily disorders. In addition, farmers who work in standing and sitting positions had more MSDs, which is due to the pressure on their body anatomy system. The majority of farmers complained about backache and knee pain due to their physical activity at work. Our findings in this regard are consistent with the findings of similar studies.²⁶

Fear is one of the constructs of PMT with a protective effect on MSDs. Fear had a significant relationship with preventive behaviors in farmers. Farmers who had more fear of disease and MSDs tended to be more concerned about preventive behaviors. Similar studies in this field have reported similar results.^{27,28} That is, the perception of risk of the outcomes of negative or positive behaviors can lead to a decrease in MSDs in farmers. Probably, farmers who have a stronger perception of developing such disorders have more preventive behaviors to prevent such disorders in the future.

Moreover, self-efficacy and the perceived response efficiency had a positive effect on preventive behavior and the prevalence of MSDs in the farmers. That is, self-efficacy and the perceived response efficiency increase preventive behaviors, which have a preventive effect on the prevalence of MSDs. Our results are consistent with similar studies on farmers' behaviors for the prevention of diseases.²⁹ Self-efficacy is a determinant factor in doing safe behaviors.³⁰ A high sense of self-efficacy in doing tasks results in better performance in terms of safety behavior.³¹

Perceived susceptibility had a protective effect on the prevalence of MSDs so the higher the perceived susceptibility in farmers, the lower the prevalence of disorders in them. Therefore, perceived susceptibility is a prerequisite for choosing strategies to deal with the risk of diseases and disorders. The point is that an uninformed farmer of the risks cannot manage them.³¹ A study showed that individuals who feel the risk of developing a specific health problem, try to decrease the risk by adopting more efficient solutions in the future.³²

Perceived cost had an inverse effect on preventive behavior in the farmers so an increase in the

perceived costs was a perceived obstacle for farmers to prevent MSDs. This finding is consistent with Afshari et al.²⁸ The higher the costs of performing preventive behaviors (e.g. time, energy, money, complicity), the farmers feel less tendency to perform the preventive behaviors. On the other hand, the fewer the perceived obstacles, the higher the chance of demonstrating MSD preventive behaviors. The perceived protection motivation had a significant relationship with the behavior so the higher the motivation, the higher the chance of doing MSD preventive behaviors. Our results are consistent with the results of a similar study that used the same theory on farmers.²⁹

Limitations

The results should be used taking into account the

limitations including biased self-report of the participants.

Conclusions

Several factors affect the prevalence of MSDs and by examining these factors, we can prevent the disorders by introducing proper interventions. Given the paucity of studies based on health education theories and models to examine the factors in the prevalence of MSDs, the present study confirmed the feasibility of using such theories and models to examine the factors.

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