Association between depression, anxiety, and insomnia with musculoskeletal pain source: a multi-center study

Elham Zarean¹, Asma Azadeh², Habib Pirali², Behzad Doroushi³, Atieh Edrisi⁴, Ali Ahmadi⁵, Alireza Baharizadeh⁶ and Samaneh Torkian⁷∗

Abstract

Background: Musculoskeletal pain syndrome (MPS) is one of the modern diseases. Musculoskeletal pain (MP) may develop at any age and impact physical and mental health. This study aimed to evaluate the association between anxiety, depression, and insomnia with musculoskeletal pain source. This cross-sectional study was conducted on 450 patients with musculoskeletal pain. Goldberg depression (GB), Beck Anxiety Inventory (BAI), and Morin Insomnia Severity Index (ISI) questionnaires were used to collect data. Participants have divided into two groups: individuals with unknown musculoskeletal pain sources and individuals with known musculoskeletal pain sources. Anxiety, depression, and insomnia scores were compared between the two groups. For statistical analysis of data mean (SD), frequency (%), Chi-square, Mann-Whitney test, and Logistic regression models were used. All analysis was performed using SPSS 26.

Results: In this study, 39.4% of the participants were in severe depression, 31.1% in severe anxiety, 34.7% in the no clinically significant, and 32.9% in the sub-threshold insomnia group. There was a significant difference between the severity of anxiety and insomnia in the two groups with the known and unknown pain sources (p < 0.05). However, the score of depression (OR = 1.00, 95% CI 0.99–1.01), anxiety (OR = 1.00, 95% CI 0.99–1.02), and insomnia (OR = 1.01, 95% CI 0.98–1.03) was not related to the pain source.

Conclusion: There was a statistically significant relationship between anxiety and insomnia severity with musculoskeletal pain source. According to the high prevalence of depression, anxiety, and depression in both groups with known and unknown musculoskeletal pain sources, the cooperation of orthopedists, rheumatologists, and physical therapists with psychiatrist can be useful in improving the condition of patients.

Keywords: Anxiety, Depression, Insomnia, Musculoskeletal, Pain

Background

Musculoskeletal pain syndrome (MPSs) is one of the most common disorders of modern and developing countries, which may cause dysfunction and disability [1]. This syndrome majorly consists of a wide range of degenerative inflammatory conditions, affecting the muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels [1]. The musculoskeletal pain (MP) is a wide-spread problem, which accounts for the third part of all acute and chronic pain syndromes [2]. The MP may have a known or unknown source. The prevalence of MP with an unknown source in the community is 15 to 30%. It includes musculoskeletal pains that there is no structural or inflammatory cause for them after careful evaluation [3].
Table 1 The situation of depression, anxiety, and insomnia in the demographic subgroups (n = 450)

| Variables            | N (%) | Depression | Anxiety | Insomnia |
|----------------------|-------|------------|---------|----------|
|                      | No    | Mild       | Borderline | Mild-moderate | Moderate-severe | Severe | p value | No | Mild | Moderate | Severe | p value |
| Overall              | 450   | 53 (11.8)  | 25 (5.6) | 28 (6.2) | 94 (20.9) | 80 (17.8) | 157 (34.9) | – | 89 | (19.8) | 102 (22.7) | 119 (26.4) | 140 (31.1) | – | 156 | (34.7) | 148 (32.9) | 99 (22.0) | 46 | – |
| Gender               |       |            |          |          |          |          |          |          |          |          |          |          |
| Male                 | 213   | 23 (10.8)  | 23 (10.8) | 15 (7.0) | 44 (20.7) | 43 (20.2) | 65 (30.5) | 0.240 | 49 | (23.0) | 43 (20.2) | 67 (31.4) | 54 (25.4) | 0.010 | 81 | (38.1) | 65 (30.5) | 51 (23.9) | 16 | 0.153 |
| Female               | 237   | 23 (10.2)  | 30 (12.7) | 10 (4.2) | 50 (21.1) | 37 (15.6) | 92 (38.8) | 0.590 | 40 | (16.9) | 59 (24.9) | 52 (21.9) | 86 (36.3) | 0.016 | 76 | (32.1) | 83 (35.0) | 48 (20.3) | 30 | 0.127 |
| Having car           |       |            |          |          |          |          |          |          |          |          |          |          |          |
| No                   | 237   | 22 (9.5)   | 29 (12.2) | 12 (5.1) | 47 (19.8) | 41 (17.3) | 85 (35.9) | 0.956 | 47 | (21.1) | 45 (20.2) | 57 (26.8) | 64 (30.0) | 0.007 | 85 | (35.9) | 91 (38.4) | 40 (16.9) | 21 | 0.009 |
| Yes                  | 213   | 24 (11.3)  | 13 (6.1)  | 47 (22.1) | 39 (18.3) | 125 (57.5) | 39 (17.8) | 0.667 | 72 | (32.6) | 82 (36.4) | 76 (32.1) | 0.029 | 72 | (33.8) | 57 (26.8) | 59 (27.7) | 25 | 0.117 |
| Home                 |       |            |          |          |          |          |          |          |          |          |          |          |          |
| Rental               | 231   | 19 (8.2)   | 29 (12.6) | 15 (6.5) | 36 (15.6) | 41 (17.7) | 91 (39.4) | 0.006 | 38 | (16.5) | 53 (22.9) | 61 (26.4) | 79 (34.2) | 0.248 | 78 | (33.8) | 84 (36.3) | 43 (18.6) | 26 | 0.220 |
| Private              | 219   | 24 (11.0)  | 10 (4.6)  | 58 (26.5) | 39 (17.8) | 66 (30.1) | 51 (23.2) | 0.370 | 53 | (23.1) | 59 (26.5) | 61 (27.9) | 0.272 | 78 | (35.6) | 65 (29.7) | 56 (26.5) | 20 | 0.091 |
| Having personal Internet | 244  | 31 (12.7)  | 10 (4.1)  | 54 (22.1) | 40 (16.4) | 86 (35.2) | 46 (22.3) | 0.063 | 50 | (24.3) | 59 (28.6) | 51 (24.8) | 0.063 | 83 | (34.0) | 86 (35.2) | 45 (18.4) | 30 | 0.099 |
| Yes                  | 206   | 18 (8.7)   | 22 (10.7) | 15 (7.3) | 40 (19.4) | 40 (19.4) | 71 (34.5) | 0.430 | 48 | (23.1) | 60 (24.6) | 89 (36.5) | 0.368 | 74 | (35.9) | 62 (30.1) | 54 (26.2) | 16 | 0.078 |
| Income (million toman) |     |            |          |          |          |          |          |          |          |          |          |          |          |
| < 1                  | 211   | 21 (10.0)  | 24 (11.4) | 14 (6.6) | 37 (17.5) | 36 (17.1) | 79 (37.4) | 0.777 | 40 | (15.0) | 33 (15.0) | 69 (32.7) | 69 (32.7) | 0.001 | 78 | (37.0) | 59 (28.0) | 45 (21.3) | 29 | 0.118 |
| 1-3                  | 196   | 17 (8.7)   | 25 (12.8) | 8 (4.1)  | 44 (22.4) | 37 (18.9) | 35 (33.2) | 0.577 | 33 | (16.8) | 57 (29.1) | 43 (21.9) | 63 (32.1) | 0.004 | 62 | (31.6) | 76 (38.8) | 43 (21.9) | 15 | 0.077 |
| > 3                  | 43    | 4 (9.6)    | 10 (2.3)  | 3 (7.0)  | 13 (30.2) | 7 (16.3)  | 13 (30.2) | 0.430 | 16 | (37.2) | 12 (27.9) | 7 (16.3)  | 8 (18.6)  | 0.179 | 17 | (39.5) | 13 (30.2) | 11 (25.6) | 2 (4.7) |
| Job                  |       |            |          |          |          |          |          |          |          |          |          |          |          |
| Unemployed/ Housewife| 185   | 15 (8.1)   | 24 (13.0) | 6 (3.2)  | 43 (23.2) | 29 (15.7) | 68 (36.8) | < 0.001 | 35 | (18.9) | 39 (24.9) | 46 (24.9) | 65 (35.1) | 0.360 | 57 | (30.8) | 70 (37.8) | 37 (20.0) | 21 | 0.109 |
| Freelance job        | 43    | 2 (9.6)    | 44 (68.8) | 4 (9.3)  | 7 (16.3)  | 5 (11.6)  | 25 (58.1) | 0.004 | 5 (11.6) | 8 (18.6)  | 17 (39.5) | 13 (30.3) | 13 (30.2) | 0.010 | 13 | (30.2) | 11 (25.6) | 13 (30.2) | 6 | 0.140 |
| Employee             | 58    | 9 (15.5)   | 7 (12.1)  | 4 (6.9)  | 6 (10.3)  | 10 (17.2) | 22 (37.9) | 0.001 | 10 | (17.2) | 14 (24.1) | 15 (25.9) | 19 (32.8) | 0.001 | 18 | (31.0) | 17 (29.3) | 14 (24.1) | 9 | 0.155 |
Table 1  The situation of depression, anxiety, and insomnia in the demographic subgroups (n = 450)  (Continued)

| Variables | N (%) | Depression | Anxiety | Insomnia |
|-----------|-------|-------------|---------|----------|
|           | No    | Mild | Borderline | Mild-moderate | Moderate-severe | Severe | p value | No | Mild | Moderate | Severe | p value |
| Manual worker | 42 (9.3) | 2 (4.8) | 4 (9.5) | 3 (7.1) | 11 (26.2) | 10 (23.8) | 12 (28.6) | 10 (23.8) | 9 (21.4) | 14 (33.3) | 10 (23.8) | 16 (38.1) | 13 (31.0) | 3 (7.1) |
| Farmer | 47 (10.4) | 7 (14.9) | 7 (14.9) | 5 (10.6) | 8 (17.0) | 11 (23.4) | 9 (19.1) | 9 (19.1) | 9 (19.1) | 17 (36.2) | 12 (25.6) | 24 (51.0) | 13 (27.7) | 7 (14.9) | 3 (6.4) |
| Others | 75 (16.4) | 7 (9.3) | 10 (13.3) | 3 (4.0) | 19 (25.3) | 15 (20.0) | 21 (28.0) | 20 (26.7) | 23 (30.7) | 15 (20.0) | 17 (22.6) | 35 (46.7) | 21 (28.0) | 15 (20.0) | 4 (5.3) |

* Value <0.001 indicates a p-value equal to 0.000, which is highly significant
MP may develop at any age and result in considerable limitations in a motor activity and a remarkable decrease in the quality of life. Thus, MSP remains a pressing medical and social problem [2]. MP impacts on physical and mental health [4]. The link between chronic pain and mental health has been recognized for a long time [5]. Their association can acknowledge at a biological, psychological, and social level, as they thought to share common neural mechanisms interact in their development over time and have a bidirectional relationship with environmental factors (e.g., social support, work-related factors) [6, 7].

Psycho-social factors such as emotional and behavioral disorders have also been reported to be associated with MP [8, 9]. The mechanisms underlying the association appear to be complex and multi-factorial [4]. Negative affect, anxiety, and depression are associated with lower pain thresholds in healthy individuals and exacerbated in chronic pain states, including musculoskeletal disorders [10, 11]. Negative affect is major cause of disability and chronic musculoskeletal pain [12].

Pain and depressive disorders often present together. About half of pain patients fulfill the criteria for depression [13]. When depression and pain co-occur, both disorders can have an additive adverse effect on health and its management. The pain can increase the complexity in the treatment of depression and interferes with recovery, while depression has a similar impact on the therapeutic response for the pain [14]. Anxiety or depression seems to be associated with the development and maintenance of chronic musculoskeletal pain. They can also harm the outcomes of surgery or rehabilitation programs [5].

Musculoskeletal pain and insomnia have a reciprocal relationship. Each of these conditions increases the risk of the other, which may augment the burden on health and well-being [15]. Musculoskeletal pain may result in sleep disruption. Pain can induce micro-arousal and increase wakefulness [4]. Insomnia frequently occurs in patients with chronic pain. The prevalence of this co-occurrence ranges between 50% and 88% [16]. This study aimed to evaluate the association between anxiety, depression, and insomnia with musculoskeletal pain source (unknown pain source versus known pain source) in patients referred to orthopedic, rheumatology, and physical medicine clinics in Shahrekord.

### Methods

This cross-sectional study includes patients with pain referred to Shahrekord orthopedic, rheumatology, and physical medicine clinics during 2019. In total, 450 patients (150 cases from each clinic) recruited using a non-probability sampling method. The sample size was calculated before the start of the study. With considered prevalence of mental health factors 50%, confidence level (95%) = 0.05 and maximum error (d) = 0.05, the samples size required was 385. 15% of this sample size was added to it due to increased precision. In total, the minimum sample size required was 443. Before the assessment, all patients gave written their informed consent. Patients filled questionnaires anonymously. Inclusion criteria

### Table 2 Comparison of depression, anxiety, and insomnia severity with the pain source

| Variables | Unknown musculoskeletal pain source (n = 286) | Known musculoskeletal pain source (n = 168) | P value* |
|-----------|--------------------------------------------|--------------------------------------------|----------|
|           | N (%) Mean (SD)                            | N (%) Mean (SD)                            |          |
| **Depression** |                                              |                                            |          |
| No         | 25 (8.7) 39.99 ± 22.00                      | 16 (9.8) 42.75 ± 25.08                    | 0.116    |
| Mild       | 30 (10.5)                                   | 23 (14.0)                                 |          |
| Borderline | 19 (6.6)                                    | 6 (3.7)                                   |          |
| Mild-moderate | 62 (21.7)                              | 32 (19.5)                                 |          |
| Moderate-severe | 59 (20.6)                      | 21 (12.8)                                 |          |
| Severe     | 91 (31.8)                                   | 66 (40.2)                                 |          |
| **Anxiety** |                                              |                                            |          |
| No         | 58 (20.2) 19.02 ± 12.98                     | 31 (18.9) 20.87 ± 14.31                   | 0.028    |
| Mild       | 60 (21.0)                                   | 42 (25.6)                                 |          |
| Moderate   | 88 (30.8)                                   | 31 (18.9)                                 |          |
| Severe     | 80 (28.0)                                   | 60 (36.6)                                 |          |
| **Insomnia** |                                             |                                            |          |
| No clinically | 103 (36.0) 11.19 ± 6.94                      | 53 (32.3) 11.75 ± 7.52                    | 0.002    |
| Sub threshold | 87 (30.4)                               | 61 (37.2)                                 |          |
| Moderate severity | 75 (26.2)                         | 24 (14.6)                                 |          |
| Severe     | 21 (7.3)                                    | 25 (15.2)                                 |          |

*Pearson chi-square
were age over 20 years, musculoskeletal pain, and consent to participate in the study.

Goldberg’s depression scale (GB), Beck Anxiety Inventory (BAI), and Morin Insomnia Severity Index (ISI) were used to collect data. The validity and reliability of all questionnaires have already been confirmed in Iran [17, 18]. The Cronbach’s alpha of the GB, BAI, and ISI questionnaires in this study was 0.91, 0.93, and 0.92, respectively. Demographic variables were included age, gender (male, female), job, have personal Internet, financial situation, and home type of the participants.

The GD questionnaire has 18 items which are assessed on a 6-grade Likert scale (very much = 5, quite a lot = 4, moderately = 3, somewhat = 2, just a little = 1, not at all = 0). The total score of the questionnaire ranges from 0 to 90, the range 0–9 shows no depression likely, 10–17 shows possibly mildly depressed, 18–21 shows borderline depression, 22–35 shows mild-moderate depression, 36–53 shows moderate-severe depression, and 54 and up shows severely depressed. The more total scores are, the higher depression level will be [18].

The BAI is a self-report measure of anxiety with 21 items. The Likert scale is “Not at all = 0, “Mildly, but it didn’t bother me much = 1,” “Moderately – it wasn’t pleasant at times = 2,” and “Severely – it bothered me a lot = 3.” The total score is calculated by finding the sum of the 21 items. Scores range from 0 to 63; higher scores reflect greater levels of anxiety. A score of 0–7

| Variables                              | Pain source | Univariable OR (95% CI) | p value | Multivariable AOR (95% CI) | p value |
|----------------------------------------|-------------|-------------------------|---------|---------------------------|---------|
| Gender                                 |             |                         |         |                           |         |
| Male                                   | 0.543 (0.367, 0.804) | 0.002                  |         | 0.524 (0.320, 0.858)      | 0.010   |
| Female                                 | 1           | 1                       |         | 1                         |         |
| Having car                             |             |                         |         |                           |         |
| Yes                                    | 0.939 (0.639, 1.380) | 0.750                  |         | –                         | –       |
| No                                     | 1           | 1                       |         | –                         | –       |
| Home                                   |             |                         |         |                           |         |
| Private                                | 0.831 (0.566, 1.221) | 0.346                  |         | –                         | –       |
| Rental                                 | 1           | 1                       |         | –                         | –       |
| Having personal Internet               |             |                         |         |                           |         |
| Yes                                    | 0.959 (0.652, 1.411) | 0.833                  |         | –                         | –       |
| No                                     | 1           | 1                       |         | –                         | –       |
| Income (million toman)                 |             |                         |         |                           |         |
| 1–3                                    | 0.838 (0.560, 1.253) | 0.389                  |         | 0.958 (0.608, 1.511)      | 0.855   |
| > 3                                    | 0.597 (0.290, 1.228) | 0.161                  |         | 0.719 (0.324, 1.594)      | 0.417   |
| < 1                                    | 1           | 1                       |         | 1                         | 1       |
| Job                                    |             |                         |         |                           |         |
| Farmer                                 | 1.018 (0.530, 1.955) | 0.958                  |         | 1.430 (0.674, 3.030)      | 0.351   |
| Freelance job                          | 0.889 (0.448, 1.763) | 0.736                  |         | 1.205 (0.562, 2.583)      | 0.632   |
| Employee                               | 1.059 (0.392, 1.016) | 0.852                  |         | 1.546 (0.778, 3.072)      | 0.214   |
| Others                                 | 0.750 (0.427, 1.317) | 0.317                  |         | 1.069 (0.556, 2.054)      | 0.842   |
| Manual worker                          | 0.250 (0.100, 0.623) | 0.003                  |         | 0.427 (0.157, 1.160)      | 0.095   |
| Unemployed/housewife                   | 1           | 1                       |         | 1                         | 1       |
| Age                                    | 0.977 (0.964, 0.990) | < 0.001                |         | 0.978 (0.964, 0.992)      | 0.003   |
| Depression                             | 1.005 (0.997, 1.014) | 0.225                  |         | –                         | –       |
| Anxiety                                | 1.010 (0.996, 1.025) | 0.163                  |         | 1.007 (0.992, 1.022)      | 0.373   |
| Insomnia                               | 1.011 (0.984, 1.038) | 0.429                  |         | –                         | –       |
represents no anxiety, 8–15 mild, 16–25 moderate, and
a score of 36 and above represents potentially concern-
ing levels of anxiety [19].

The ISI consists of 25 items, which are evaluated on a
two-point Likert scale ranging from 0 to 4. The mini-
num and maximum scores of this questionnaire are 0
and 100, and a higher score indicates a serious risk and
need for clinical support. Patient with a score of 0–7
was regarded as no clinically significant insomnia, 8–14
as sub-threshold insomnia, 15–21 as clinical insomnia
(moderate severity), and 22–28 as clinical insomnia (se-
vere) [17, 20].

After collecting data, patients were divided into two
groups: individuals with unknown musculoskeletal pain
sources and individuals with known musculoskeletal
pain sources. Anxiety, depression, and insomnia scores
were compared between the two groups. For this, we
used the Mann-Whitney test because the data distribu-
tion was not normal. Logistic regression models were
used to determine the demographic variables and mental
health factors that were related to pain source. All inde-
dependent variables were entered into the univariable
model and variables with a \( p \) value less than 0.2 were en-
tered into the multivariable model. Odds ratio (OR), ad-
justed odds ratio (AOR), and 95% confidence intervals
(95% CI) were reported. \( p \) values of < .05 were consid-
ered statistically significant. All analysis was conducted
with SPSS 26.

Ethical approval for this study was obtained from the
Shahrekord University of Medical Sciences. The ethical
code IR.SKUMS.REC.1397.232 was assigned to this study.

Results
In this study, most participants were female (52.7%),
were unemployed or housewife (41.1%), had no car
(52.7%), had income less than one million toman
(47.9%), had a rental house (51.5%), and had no personal
Internet (54.2%). The mean (±SD) age of participants
was 41.90 (± 15.49) years. The mean (SD) of depression,
anxiety, and insomnia in participants was 41.00 (± 23.18),
19.69 (± 13.49), and 11.40 (± 7.15), respectively.

Most people were severely depressed (39.4%), and the
rest had no depression (9.1%), mild depression (11.8%),
borderline depression (5.6%), mild-moderate depression
(20.9%), and moderate-severe depression (17.8%). De-
pression was only dependent on the job variable and in-
dependent of other demographic variables (Table 1).
The situation of depression in demographic subgroups is
shown in Table 1. In each clinic, 150 patients were ex-
amined. Fifty-one patients in the physical medicine, 55
in the rheumatology, and 58 in the orthopedic clinic had
MP with an unknown origin. There was no significant
difference between the scores of depression in the two
groups with the known and unknown pain source (OR =
1.00, 95% CI 0.99–1.01) (Table 3). Also, depression se-
verity was not associated with the pain source (\( p < 0.05 \))
(Table 2).

In this survey, 31.1% of participants were in the severe
anxiety, 26.4% in the moderate, 22.7% in mild, and
19.8% in the no anxiety group. Anxiety was dependent
on gender and income (\( p < 0.05 \)) (Table 1). According to
multivariable regression, anxiety scores were not related
to the pain source (OR = 1.00, 95% CI 0.99–1.02) (Table
3). However, anxiety severity was significantly higher in
the unknown pain source group (\( p < 0.05 \)) (Table 2).

In this study, 34.7% of participants were in the no clin-
cically significant, 32.9% in the subthreshold, 22.00% in
the moderate-severe clinical, and 10.2% in the severe
clinical insomnia group. Insomnia was independent of
all demographic variables except for having a car. In-
sonnia in univariable regression was not significantly as-
associated with pain source (OR = 1.01, 95% CI 0.98–1.03)
and was not included in multivariable regression. How-
ever, insomnia severity was significantly higher in the
unknown pain source group (\( p < 0.05 \)) (Table 2).

In multivariable regression, demographic variables of
gender (OR = 0.52, 95% CI 0.32–0.85) and age (OR =
0.97, 95% CI 0.96–0.99) were significantly associated
with decrease the known source of pain. Men and older
age were less OR to have an unknown source of pain
than women and younger age, respectively.

Discussion
In the study, most patients were severely depressed, with
severe anxiety and no clinically significant insomnia.
Also, the prevalence of depression, anxiety, and moder-
te to severe insomnia in both groups of patients with
known and unknown pain origins was approximately
more than two thirds and one third, respectively. De-
pression severity was not associated with the pain
source. But anxiety and insomnia severity was higher in
the unknown pain source group. Younger age and fe-
males were associated with an unknown pain source.
We could not find studies comparing psychological vari-
ables in pain groups of known and unknown origin.
Most studies compared the pain group with healthy
people.

A study in North Carolina showed that depression was
associated with significantly higher odds of reporting
neck-shoulder pain or wrist/hand pain [21]. In a study
conducted during 2015 in Turkey, there was a statisti-
cally positive significant relationship between the degree
of pain and depressive symptoms [22]. In Rio Grande do
Sul, from February to June 2014 in elderly females, the
score of depression symptoms in participants with
chronic musculoskeletal pain was significantly higher as
compared to participants without chronic musculoskel-
etal pain [23]. Another study in Indianapolis from
December 2005 until June 2007 reported, the “Pain only” group had the least pain severity, the “Pain, depression, and anxiety” group had the greatest severity, and the “Pain and depression” and “Pain and anxiety” groups had intermediate severity [24]. Another study in Sweden and Australasia showed that pain catastrophizing and heightened depressed mood and have an additive and adverse effect on the impact of pain, relative to either alone [25]. Depression is linked to pain strongly. There is little understanding of how this link works or how it might be utilized in clinical settings. It is not clear whether one of the symptoms precedes the other. Although, when both pain and depressive symptoms are present prognosis of the patient is significantly affected [26]. Linton and Bergbom suggested two likely mechanisms that can help to explain the link between depression and pain. First, catastrophizing plays a central role in models of both pain and depression and hence might form a meaningful association between them. Second, emotion regulation is necessary for both depression and pain since both of them can be viewed as significant emotional stressors [26].

A study in Indianapolis, between December 2005 and June 2007, reported that the patients with both musculoskeletal pain and depression had greater psychosocial stress and anxiety than those without depression [27]. Pain have associated with anxiety in several ways: (a) muscle tension is included as a part of the diagnostic criteria for generalized anxiety disorder, (b) pain can be a common symptom and a good indicator of an anxiety disorder, (c) anxiety is an independent predictor of the quality of life in patients with chronic MP, (d) anxiety leads to higher levels of pain chronicity, and (e) fear, anxiety, and avoidance are related to MP [28].

A study on a sample of Brazilian workers showed that musculoskeletal symptoms in the last 12 months were predictors for insomnia [29]. A longitudinal study in the Netherlands that baseline data collection took place between 2004 and 2007, with follow-up assessments of 2, 4, and 6 years later, showed insomnia is a risk factor for developing chronic pain. Depressive symptoms partially mediate the effect of insomnia with developing chronic pain [30]. Another study that conducted in the USA between June 2010 and December 2011 showed that the prevalence of no clinically significant insomnia, subthreshold insomnia, moderate clinical insomnia, and severe clinical insomnia were 5.5%, 21.2%, 39.6%, and 33.7% in the chronic musculoskeletal pain participants with disability population, respectively. After controlling for depression, the correlation between pain and insomnia was weak that indicated that insomnia is only a modest part of pain and depression constructs [31]. Insomnia can originate from a painful medical condition but, in times, may evolve into its disorder related to, but separate from, the precipitating condition [32]. Dysfunctional sleep and sleep habits can become primary factors that perpetuate and maintain insomnia. Therefore, sleep disturbance is no longer directly caused by pain intensity [31]. When this happens, insomnia can evolve from a secondary symptom of chronic pain to a primary comorbid condition with similar characteristics to primary insomnia [33].

One of the limitations of this study is the cross-sectional nature and lack of causal inference and inverse causality. Another limitation of this study is the use of non-probability sampling and the inclusion of only volunteers in the study.

Conclusion
There was a statistically significant relationship between anxiety and insomnia severity with the unknown musculoskeletal pain source. According to the high prevalence of depression, anxiety, and depression in both groups with known and unknown musculoskeletal pain sources, the cooperation of orthopedists, rheumatologists, and physical therapists with psychiatrist can be useful in improving the condition of patients.

Acknowledgements
We would like to acknowledge Shahrekord University of Medical Sciences for financially supporting this project.

Authors’ contributions
EZ and ST wrote the first draft, and the statistical analysis was conducted by AA. All authors contributed to the data collection, interpreting the results, and commenting on the initial manuscripts. The author(s) read and approved the final manuscript.

Funding
The Shahrekord University of Medical Science supported this work.

Availability of data and materials
The datasets generated during and/or analyzed during the current study are available from the corresponding author (ST) on reasonable request.

Ethics approval and consent to participate
Ethics approval was obtained from the Shahrekord University of Medical Sciences with the ethical code IR.SKUMS.REC.1397.232. All patients have written their informed consent

Consent for publication
Not applicable.

Competing interests
The authors declare that there is no conflict of interest.

Author details
1Clinical Research Development Unit, Hajar Hospital, Department of Psychiatry, School of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran. 2Department of Orthopedics, School of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran. 3Clinical Research Development Unit, Hajar Hospital, Department of Internal Medicine, Iran.

Abbreviations
MSP: Musculoskeletal pain syndrome; MP: Musculoskeletal pain; GB: Goldberg’s Depression Scale; BAI: Beck Anxiety Inventory; ISI: Morin Insomnia Severity Index; OR: Odds ratio; AOR: Adjusted odds ratio; CI: Confidence intervals; SD: Standard deviation

Acknowledgements
We would like to acknowledge Shahrekord University of Medical Sciences for financially supporting this project.

Authors’ contributions
EZ and ST wrote the first draft, and the statistical analysis was conducted by AA. All authors contributed to the data collection, interpreting the results, and commenting on the initial manuscripts. The author(s) read and approved the final manuscript.

Funding
The Shahrekord University of Medical Science supported this work.

Availability of data and materials
The datasets generated during and/or analyzed during the current study are available from the corresponding author (ST) on reasonable request.

Ethics approval and consent to participate
Ethics approval was obtained from the Shahrekord University of Medical Sciences with the ethical code IR.SKUMS.REC.1397.232. All patients have written their informed consent

Consent for publication
Not applicable.

Competing interests
The authors declare that there is no conflict of interest.

Author details
1Clinical Research Development Unit, Hajar Hospital, Department of Psychiatry, School of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran. 2Department of Orthopedics, School of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran. 3Clinical Research Development Unit, Hajar Hospital, Department of Internal Medicine, Iran.
School of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran. 2Clinical Research Development Unit, Hajar Hospital, Shahrekord University of Medical Sciences, Shahrekord, Iran. 3Modelling in Health Research Center and Department of Biostatistics, Shahrekord University of Medical Sciences, Shahrekord, Iran. 4Sana Technical and Vocational Training College, Islamic Azad University, Shahrekord Branch, Shahrekord, Iran. 5Department of Epidemiology, School of Public Health, Iran University of Medical Sciences, Shahid Hemmat Highway between Sheikh Fazl Al-Nouri and Shahid Chamran, Tehran, Iran.

Received: 21 November 2020 Accepted: 7 January 2021

Published online: 27 January 2021

References
1. Najafipour H, Sadeghpoghami M, Kordestani Z, Tahami AN, Ghavpisheh M (2017) Prevalence of the musculoskeletal pain syndrome and its associated factors in people between 15 and 80 years in kerman: a population-based study on 1700 individuals. Iran Red Crescent Med J 19:1–8
2. Marusichenko V (2019) Musculoskeletal pain syndrome: from pathogenetic features to rational therapeutic management. Int Neurol J 4(1):68–72
3. Morse BL, Solodiuk JC, Greco CD, Waskar S, Hauer J (2020) Initial validation of the GRASP: a differential diagnoses algorithm for children with medical complexity and an unknown source of pain. Hosp Pediatr 10(8):633–640
4. Baker S, McBeth J, Chew-Graham CA, Willie R (2017) Musculoskeletal pain and co-morbid insomnia in adults; a population study of the prevalence and impact on restricted social participation. BMC Fam Pract 18(1):17
5. Giusti EM, Bonkman A, Manzon GM, Castelnuovo G, Tenwee CB, Roorda LD et al (2019) Proposal for improvement of the hospital anxiety and depression scale for the assessment of emotional distress in patients with chronic musculoskeletal pain: a bifactor and item response theory analysis. J Pain 21(3–4):375–389
6. Bushnell M, Case L, Ceko M, Cotton V, Gracely J, Low L et al (2015) Effect of sleep on the environment of the long-term consequences of chronic pain. Pain 156(1):1–14
7. Dueñas M, Ojeda B, Salazar A, Mico JA, Failde I (2016) A review of chronic fibromyalgia syndrome: relationship to pain and depression. Arthritis Care Res 59(7):961
8. Jussila L, Paananen M, Näyhä S, Taimela S, Tammelin T, Auvinen J et al (2016) The role of catastrophic thinking and pain in patients with chronic musculoskeletal pain. Scand J Pain 2(2):47
9. Dueñas M, Ojeda B, Salazar A, Mico JA, Failde I (2016) A review of chronic musculoskeletal pain syndrome: relationship to pain and depression. Arthritis Care Res 59(7):961
10. Aminpoor H, Afshtarifar J, Mostafaei A, Ostovar S (2012) Validation of Goldberg’s Depression Scale in academic and non-academic peoples. Ann Biol Res 3(9):456–4573
11. Maust D, Cristancho M, Gray L, Rushing S, Tjoa C, Thase ME (2012) Chapter 13 - psychiatric rating scales. In Aminoff MJ, Binder F, Swaab DF (eds) Handbook of clinical neurology, vol 106. Elsevier, Philadelphia, pp 227–237
12. Poursadeghiyan A, Abbasi M, Mehti A, Hami R, Razi M, Ebrahimian MH (2016) Relationship between job stress and anxiety, depression and job satisfaction in nurses in Iran. Soc Sci Med 119:2349–2355
13. Tribele AG, Summers P, Chen H, Quandt SA, Arcury TA (2016) Musculoskeletal pain, depression, and stress among Latino manual laborers in North Carolina. Arch Environ Occup Health 71(6):309–316
14. Baskan E, Yaglii N, Telli Atalay O, Aslan Telci E (2016) Quality of life, depression and musculoskeletal pain experience among employed women: a controlled study. J Back Musculoskelet Rehabil 29(3):597–601
15. Sterchi S, Rodrigues AD, Bentor J, Portugal MW (2016) Quality of life and anxiety and depression symptoms in elderly females with and without chronic musculoskeletal pain. Revista Do 17(4):283–288
16. Bair MJ, Wu J, Damush TM, Sutherland IM, Koenke K (2008) Association of depression and anxiety alone and in combination with chronic musculoskeletal pain in primary care patients. Psychiatr Med 70(8):890
17. Linton SJ, Nicholas MK, MacDonald S, Boersma K, Bergbom S, Maher C et al (2011) The role of depression and catastrophizing in musculoskeletal pain. Eur J Pain 15(4):416–422
18. Linton SJ, Bergbom S (2011) Understanding the link between depression and pain. Scand J Pain 2(2):47–54
19. Poleshuck EL, Bair MJ, Koenke K, Damush TM, Tu W, Wu J et al (2009) Psychosocial stress and anxiety in musculoskeletal pain patients with and without depression. Gen Hosp Psychiatry 31(2):116–122
20. Lucchetti G, Oliveira AB, Mercante JPP, Peres MFP (2012) Anxiety and avoidance in musculoskeletal pain. Curr Pain Headache Rep 16(5):399–406
21. Moreno CR, Lowden A, Vasconcelos S, Marques EC (2016) Musculoskeletal pain and insomnia among workers with different occupations and working hours. Chronobiol Int 33(6):749–753
22. Geeraert E, Vogebsangs N, Penninx BWJH, Dekker J (2016) Insomnia, sleep duration, depressive symptoms, and the onset of chronic multisite musculoskeletal pain. Sleep 40(1):25–30
23. Ash J, Neblrett R, Mayer TG, Brede E, Gatchel RJ (2014) Insomnia in a chronic musculoskeletal pain with disability population is independent of pain and depression. Spine J 14(9):2000–2007
24. Currie SR, Wilson KG, Curran D (2002) Clinical significance and predictors of treatment response to cognitive-behavioral therapy for insomnia secondary to chronic pain. J Behav Med 25(2):135–153
25. Tang NK, Goodchild CE, Hester J, Saltviks K, PM (2012) Pain-related insomnia versus primary insomnia: a comparison study of sleep pattern, psychological characteristics, and cognitive-behavioral processes. Clin J Pain 28(5):428–436

Publisher's Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.