

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

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Abstract

Background: Musculoskeletal pain syndromes (MSPSs) are of the most common disorders in modern societies. Lack of early diagnosis and treatment of this syndrome may lead to significant disabilities later in life.

Objectives: Due to shortage of information regarding the prevalence and related factors of MSPS in the south-east of Iran, this study aimed at determining MSPS and its relation to demographic variables and underlying diseases such as diabetes and hypertension in this area.

Methods: This across sectional population-based study was conducted on 1700 individuals (15 - 80 years), who participated in the second phase of Kerman coronary artery disease risk factor study (KERCADRs), in Kerman, Iran, in 2016. A questionnaire containing demographic information, opium use, smoking and MSPS was completed. Blood pressure, fasting blood glucose and lipid levels were also measured.

Results: From a total of 1700 participants, 41.6% were males and 58.4% were females. The mean age of the participants was 47.8 years. The overall prevalence of MSPS was 65.5% that was more prevalent in women and increased with advancing age approaching the highest prevalence in the group above 75 years (78.4%) (adjusted odds ratio, AOR > 1.6). The prevalence increased with diabetes (AOR 1.5), overweight and obesity (OR 1.6, 2.2), and depression and anxiety (AOR 1.5, 2.3). In multivariate analysis, MSPS had no relationship with smoking, opium consumption, hypertension, level of education and dyslipidemia.

Conclusions: Overall, more than 65% of the population over 15 years in Kerman suffer from MSPSs. If the rate of such complications is not reduced, this can exert heavy health-care costs on the Iranian health system given the existing trend of increase in the age and age-related diseases in the population.

Keywords: Musculoskeletal Pain, Prevalence, Association, Overweight and Obesity, Diabetes, Hypertension, Kerman

1. Background

Musculoskeletal pain syndrome (MSPS) is one of the most common disorders of modern and developing countries, which may cause dysfunction and disability. This syndrome majorly consists of a wide range of degenerative inflammatory conditions, affecting muscles, tendons, ligaments, joints, peripheral nerves and supporting blood vessels (1). Musculoskeletal pain syndromes are clinical conditions including tendonitis, bursitis, nerve compression disorders, intervertebral disc problems and the destruction of articular cartilage. The most well-known pain areas in MSPSs are low back, neck, knees, forearms and hands (2-4).

Features of physical work, sustained postures, repetitive motion patterns, doing activities at high speed, inadequate physical recovery time, heavy lifting, prolonged exposure to the cold and a combination of these factors as well as psychological adverse conditions in the workplace and personal factors like age are considered as risk factors of MSPSs (4-6). In developing countries, poverty, malnutrition, infectious diseases, and inadequate medical equipments may have a role in the occurrence of MSPSs (7, 8).

Various studies have assessed the prevalence of musculoskeletal problems in general population in the world. Few studies have been conducted in Iran, yet there is no solid statistics regarding the prevalence and incidence of

MSPSs in general population, especially in the southeast of the country. Because of geographical, cultural and ethnical differences, research results in other countries cannot be generalized to Iranian society. Therefore, evaluating the prevalence of these disorders is essential in Iran. According to the medical commission of the Social Security Organization of Tehran Province in 1999, musculoskeletal disorders account for 14.4% of various diseases causing disability (9).

Economic losses resulting from MSPSs not only affect individuals, but they also influence organizations and communities (10). Lack of early and proper diagnosis and treatment of MSPSs in childhood may lead to significant disabilities later in life. Research and awareness regarding MSPSs is still lacking even in the developed countries (11). Improving our awareness of MSPS can be useful in early diagnosis of the disease and reducing the rate of its progression. This leads to prevention of chronic and syndromic pain in the youth (12-14).

Due to the increasing prevalence of the problems and the costs that patients impose on health care system and the society, it is necessary to evaluate the prevalence and relevant factors of MSPSs, especially when Iranian population is aging and the load of these diseases increases with aging. As far as we know, no study has yet addressed this issue in Kerman general population. Therefore, the present study aimed to investigate the prevalence of MSPSs in urban population of Kerman, as the largest city of southeastern Iran, and its relationship with factors such as age, sex, occupation, body mass, and underlying diseases such as diabetes, hyperlipidemia and hypertension. The results of this study may help the officials to have proper planning with the goal of increasing people's awareness regarding the MSPS causes. This can decrease both MSPSs and the burden of these illnesses in future.

2. Methods

Kerman is the capital city of Kerman Province located in the southeast of Iran, about 1000 km from Tehran. It is populated by 720,000 inhabitants based on 2011 national census. The city has a semicold and semidry climate with about 200 mm annual rainfall. People are almost all Muslims and mostly busy with white-collar works at governmental sections, agriculture and marketing. This was a cross sectional and population-based study on 1700 individuals aged between 15 and 80 years, who resided at least 5 years in Kerman and participated in the second phase of Kerman coronary artery disease risk factor study (KERCADR). The main study protocol was approved by the ethics committee at Kerman University of Medical Sciences, Kerman, Iran (Permission No. 93/310KA).

2.1. Sample Size and Collection

To calculate the sample size, the following assumptions were set; the frequency of MSPSs, statistical power and the alpha error were 0.53, 0.9, and 0.05, respectively. Using these assumptions, a minimum sample size of 355 was calculated and a four-fold sample of 1700 people was enrolled.

The participants were selected by the cluster sampling method, based on the postal codes of four districts of the city and in proportion with the population of each district. The social mobilizers attended the participants' addresses and all eligible members of the family (15 - 80 years old) were invited to the study.

2.2. Study Protocol

People who agreed to participate and completed an informed consent form were included in the study. Those with a previous history of surgery on their spine or limbs, neurological diseases, cancer and cognitive problems were excluded from the study. For all the participants, a questionnaire containing questions about demographic information was completed by a face-to-face interview conducted by trained interviewers; weight and height were also measured. Medical history of diabetes and hypertension, family medical history, medication for the treatment of hypertension, diabetes, hyperlipidemia, and other risk factors (smoking and opium use) were asked by a general practitioner. He/she also took the blood pressure of the participants on two occasions. Beck anxiety inventory (BAI) and Beck depression inventory (BDI) were the questionnaires completed by the interviewers. The score ranges for the different levels of depression were as follows: scores from 0 to 15, without symptom; 16 - 30, mild; 31 - 46, moderate; and 47 - 63, severe depression. The score ranges for the different levels of anxiety were as follows: scores from 0 to 7, normal; 8 - 15, mild; 16 - 25, moderate; and 26 - 63, severe anxiety (15). A researcher-made questionnaire containing 12 questions regarding the existence of musculoskeletal pain in the patients over the last year was filled by the interviewers. The reliability of the questionnaire was measured through the Cronbach's alpha coefficient and was found to be 0.85, indicating the high reliability of the questionnaire.

2.3. Definition of Research Variables

Five mL blood of each patient was taken after 12 hours of fasting to measure blood glucose and the levels of lipids. Any participant who had already been diagnosed with diabetes, or received insulin or oral antidiabetic medication, or had fasting plasma glucose greater than or equal

to 126 mg per dL was considered as diabetic (16). Hypertension was defined as systolic pressure equal or higher than 140 mm Hg and diastolic blood pressure above or equal to 90 mm Hg (mean of two measurements within 30 minutes), or taking antihypertensive medication (16). The body mass index (BMI) was weight (in kilograms) divided by squared height (in meters). Hypercholesterolemia and hypertriglyceridemia were considered if serum levels of cholesterol and triglycerides had been above 200 mg/dL. High low-density lipoprotein (LDL) cholesterol was defined as serum LDL levels above 140mg/dL (17). Smoking was defined as smoking at least one cigarette per day.

In this study, pain was used as an indicator of the presence of musculoskeletal disorders because pain is the main manifestation of the disorder (4). Therefore, pain can be used as an acceptable indicator to determine the existence of MSPSs.

2.4. Statistical Analysis

Relative and absolute frequencies, mean and standard deviation were used to analyze the data.

All analyses were performed using the Stata statistical software, version 12 (StataCorp. 2011 College Station, TX, USA: StataCorp LP). Missing data was estimated using the multiple imputation method. The prevalence of MSPSs was reported based on the relative frequency with 95% confidence interval (95% CI). Univariate and multivariate logistic regression tests were used to predict the factors affecting musculoskeletal disorders. Furthermore, crude and adjusted odds ratio (AOR) were used to show the strength of the relationship. The prevalence of MSPSs was also reported in relation to the presence of comorbidities such as type II diabetes, hypertension, hypertriglyceridemia, overweight and obesity. P value less than 0.05 was considered statistically significant.

3. Results

One thousand and seven hundred people aged 15 to 80 years enrolled in the study. The mean age of the participants was 47.8 (SD = 16.1). Most of the participants were women (58.36%). The other demographic information of the cases and the age and sex-standardized prevalence of MSPSs have been shown in Table 1. The overall prevalence of MSPSs was 65.5%.

The sex-standardized prevalence of musculoskeletal pains in women was higher compared to men (71.9% vs. 56.6%). The standardized prevalence of MSPSs steadily increased with increase of age, and it started from the lowest value (37.8% in the age group 15 - 24) to the highest value (76.9% in the age group 65-80). In terms of the education

level, 78.1% of the illiterate participants had musculoskeletal pains. This was 53.1% for those with a university degree. Compared with nonsmokers, smokers had a lower prevalence of musculoskeletal disorders (66.8% vs. 52.8%). In addition, the prevalence of musculoskeletal disorders was slightly lower in people with no opium addiction compared to opium addicts (65.1% vs. 68.1%). It should be noted that based on the BMI, the lowest prevalence of musculoskeletal disorders was observed in people with normal BMI (55.2%), and the highest prevalence was observed in obese individuals (77.8%). The prevalence rates of musculoskeletal pains in patients with and without hypertriglyceridemia were 68.6% and 64.5%, respectively. In addition, the prevalence of musculoskeletal disorders was higher in the diabetic patients compared to the nondiabetic group (77.3% vs. 64.1%). In people with normal blood pressure, the incidence of MSPSs was 61.9%, while it was 62.3% in people with hypertension. In addition, the prevalence rates in the depressed and anxious patients were 79.0% and 80.7%, respectively (Table 1). In this study, the lowest incidence of musculoskeletal disorders was observed among the unemployed while housewives had the highest prevalence (34.2% vs. 76.9%).

3.1. Predictors of Musculoskeletal Pain Syndromes

In this study, after adjusting the confounding variables, the odds of MSPSs had a significant increase in the women compared to the men (AOR 1.7) (Table 2). In addition, the risk of exposure to musculoskeletal pains increased significantly after the age of 25 years (AOR > 1.6). It should be noted that it also increased due to diabetes (AOR 1.5), overweight and obesity (AOR 1.6,2.2), and depression and anxiety (AOR 1.5, 2.3). Self-employed people had the greatest chance of suffering from musculoskeletal pain (AOR 2.6). In this study, although, univariate analysis showed that smokers had a lower chance of developing musculoskeletal disorders, this odds ratio was not significant in multivariate analysis AOR = 0.7 (95% CI: 0.5 - 1.2). Univariate analysis showed that the chance of exposure increased when opium was used, but in the multivariate analysis, this odds ratio was not significant (AOR=1.2) (95% CI: 0.8 - 1.6). In addition, in multivariate analysis, blood pressure had no relationship with the emergence of musculoskeletal diseases (AOR = 1.0) (95% CI: 0.7 - 1.2). Regarding the education level, primary education, diploma and higher degrees reduced the chances of exposure to MSPSs, but after controlling other confounding variables, this relationship was not significant. Other cases such as dyslipidemia had no relationship with musculoskeletal disorders (Table 2). Also, in relation to the impact of the job, the highest prevalence of MSPSs among women belonged to housewives with a frequency of 76.92% (AOR = 2.5) (95%

CI, 1.4 - 4.8) ($P < 0.001$). The housewives were followed by the retired and self-employed participants in terms of prevalence. The least prevalence was observed in the unemployed participants.

4. Discussion

This study investigated the prevalence of MSPS and its associated factors in people between 15 and 80 in Kerman. Several studies have examined the prevalence of musculoskeletal pains associated with jobs in a particular group such as dentists, musicians and farmers, but few studies have addressed general population and extraction of demographic characteristics (18, 19). The results of this study showed that the prevalence of MSPSs in patients over 15 years old was 65%, which indicates the high prevalence of these disorders. Hogg-Johnson et al. in a systematic review reported that the self-reported neck pain in general population was 21.3% (20). Andersson et al. reported that the prevalence of chronic pains (more than 3 months) in their study population in Sweden was 55%. Ninety percent of these pains were related to musculoskeletal system (21). Walker-bone et al. reported that the prevalence of musculoskeletal disorders of upper extremities in the general population was 52% (22). Important parts of musculoskeletal system include muscles and joints whose healthy and proper interaction with nervous system can lead to natural and efficient movement patterns. Following musculoskeletal disorders, these structures become involved, and movement as the major output of motor system experiences disorder, and as a result, the individual suffers from pain and disability (4). Repetitive movements and long-term preservation of a special body position are the main causes of onset of nontraumatic musculoskeletal pains, which lead to minor cumulative damage in different structures of the musculoskeletal system (4). In injuries caused by a cumulative damage, which eventually ends in musculoskeletal pain, there are one or more symptoms such as pain, numbness, tingling, stiffness and limited movement of joints. These signs and evidences are acceptable if they are declared by the patient or if they can be proved through other means and signs such as treatment, medical consultation or abandoning daily activities (5).

This study showed a higher prevalence of musculoskeletal disorders in women than in men and also in housewives compared to other occupations. Several studies have reported similar results (23-25). Wijnhoven et al. demonstrated that the prevalence of musculoskeletal pains in the majority of anatomical body organs, especially thighs, ankles and hands are higher in females compared to males (23). Another study by Wijnhoven et al. showed

that gender cannot be considered as a factor affecting musculoskeletal disorders, but the complications of musculoskeletal disorders in men and women are different because women use more health care services while men have more job disability (24, 25).

Our study showed that with increasing age, the prevalence of musculoskeletal pains increases. Andersson et al. reported similar results. They stated the prevalence of musculoskeletal pains increased in both sexes until 50 - 59 years (26). As age increases, musculoskeletal system deteriorates; muscles as the key supporters of joints are weakened, and articular structures including articular cartilage are destroyed (26). Etiology of muscle loss is multifactorial and includes inflammation, abnormal mechanical stress, hormonal changes, poor movement, and avoiding activities due to pain and weight gain (27).

The results of this study showed that there was a significant positive association between diabetes and the prevalence of MSPSs. Changes in the metabolism of sugar and protein, damage to the small blood vessels, peripheral nerve injury, the accumulation of collagen in the skin and tissue around the joints are the mechanisms outlined in diabetes, which cause musculoskeletal pains (28). The prevalence of pain and limited movement of the shoulder 10% - 20% and carpal tunnel syndrome 12% - 30% have been reported in diabetic patients (29).

The results of this study showed that obesity was another factor associated with musculoskeletal disorders. De Sa Pinto et al. reported that obesity had a negative effect on the health of bones and joints, and it causes biomechanical changes in the spine and lower extremities (30). Wearing SC et al. reported that obesity can have a significant impact on body's soft tissues such as tendons, but its mechanism is not obvious. Structural and functional limitations caused by excessive weight lead to change in natural biomechanics during physical activities and movements, and this exerts abnormal stresses on connective tissues, followed by musculoskeletal damages (31). Grotle et al. recognized obesity as an important risk factor in the development of knee and hip osteoarthritis, which is considered as a musculoskeletal disorder (32).

Another result of this study was that those with depression and anxiety had a higher prevalence of musculoskeletal pains. This cannot reveal the cause-effect relationship between these factors and musculoskeletal pains, but it can be observed that the relationship is significant. It has been shown that people with pain are more at risk of depression and anxiety, and on the other hand, depressed and anxious people experience more pain. A quarter of patients suffering from pain also suffer from clinical depression. Pain intensity is higher in patients with depression; they also experience a higher degree of disability and dys-

function (33). Anxiety and depression are factors stimulating the sympathetic nervous system. Animal studies have shown that sympathetic nervous system has an important impact on the regulation of blood flow to the joints, which plays an important role in joint health. That is because both adrenergic receptors exist in blood vessels of these joints (34, 35).

We acknowledge the limitation of our study as a cross sectional survey lacking the incidence rate of MSPSs. The second limitation is that we used pain as an indicator of the existence of musculoskeletal disorders, because we did not have access to clinical examination tools and para-clinical confirmation in the research base. However, since the main manifestation of musculoskeletal disorders is pain (4), it can be used as a reasonable indication of the disorders. In future research, it is necessary to determine the prevalence and type of musculoskeletal disorders via clinical examinations by relevant specialists.

The main strength of the present study was that the participation rate was more than 95%. All the nonresponse households have been tracked twice and if the household did not find at the end, one neighborhood household was replaced.

The second strength was that all the biomedical assessments were performed free of charge for participants and the results of lab tests with a recommendation note based on the results returned back to the study participants by the local mail delivery system. Further consultancy and required services also provided accordingly. This approach has improved the participation rate and the acceptability of the study among the local communities and families.

4.1. Conclusions

Two-third of Kerman's urban population suffers from the MSPS. Given the aging of Iranian population and age-related nature of this syndrome and its relationship with many noncommunicable diseases such as diabetes, overweight and obesity, and anxiety and depression, which are highly prevalent in the Iranian society, it is necessary to provide people with the required instructions and awareness to better understand and prevent the relevant risk factors. Early diagnosis and effective treatment of these disorders and development of prevention and treatment programs should be a priority for Iranian health care system officials.

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Footnotes

Authors' Contribution: Hamid Najafipour participated in the design and coordination of the study, drafted and critically reviewed the manuscript; Mohammad Sadeghigohari participated in medical recording, drafting of the manuscript and interpretation of the data; Ahmad Naghibzadeh Tahamy performed the statistical analysis and helped in drafting the manuscript and interpretation of the data; Zeinab Kordestani and Marjan Ghavipisheh participated in data collection and drafting of the manuscript. All authors read and approved the final manuscript.

Conflict of Interests: The authors declare that they have no conflict of interests in this study.

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Table 1. The Age-Sex Standardized Prevalence of Musculoskeletal Pain Syndromes, Community-based Study (KERCADR-2nd round n = 1700), Kerman, Iran, 2016

Subgroups	No. (%)	Standardized ^a Prevalence (95% CI)	P value
Overall	1700 (100)	65.5 (63.1 - 67.9)	
Gender			< 0.001
Male	708 (41.65)	56.6 (52.7 - 60.6)	
Female	992 (58.35)	71.9 (68.9 - 74.8)	
Age group, y			< 0.001
15 - 24	157 (9.24)	37.8 (29.9 - 45.6)	
25 - 34	231 (13.59)	51.4 (44.6 - 58.2)	
35 - 44	323 (19.00)	65.7 (60.2 - 71.2)	
45 - 54	349 (20.53)	72.6 (67.7 - 77.6)	
55 - 64	372 (21.88)	72.1 (67.1 - 77.1)	
65 - 80	268 (15.76)	76.9 (71.6 - 82.2)	
Education			< 0.001
Illiterate	151 (8.88)	78.1 (71.1 - 85.0)	
Primary to high school	602 (35.41)	67.5 (64.6 - 70.4)	
Above high school	947 (55.71)	53.7 (48.2 - 59.2)	
Current cigarette smoker			0.002
No	1560 (91.76)	66.8 (64.2 - 69.2)	
Yes	140 (8.24)	52.8 (44.0 - 61.5)	
Opium consumption			0.35
No	1399 (82.29)	65.1 (62.4 - 67.7)	
Yes	301 (17.71)	68.1 (62.3 - 73.8)	
Obesity			< 0.001
Normal	612 (36.00)	55.2 (51.1 - 59.4)	
Overweight	682 (40.12)	67.4 (63.6 - 71.2)	
Obese	406 (23.88)	77.8 (73.5 - 82.0)	
Hyper TG			0.17
No	1338 (78.71)	64.5 (61.9 - 67.3)	
Yes	362 (21.29)	68.6 (63.5 - 73.8)	
Diabetes			0.002
No	1,080 (63.53)	64.1 (61.6 - 66.8)	
Yes	620 (36.47)	77.3 (70.3 - 84.2)	
Hypertension			< 0.001
No	978 (57.53)	61.9 (58.8 - 64.9)	
Yes	431 (25.35)	72.3 (68.5 - 76.1)	
Depression			< 0.001
No	1560 (91.76)	60.2 (57.2 - 63.1)	
Yes	140 (8.23)	79.0 (75.2 - 82.8)	
Anxiety			< 0.001
No	848 (49.88)	61.3 (58.2 - 64.1)	
Yes	846 (49.94)	80.7 (76.5 - 84.8)	
Job status			< 0.001
Unemployed	159 (9.35)	34.2 (26.3 - 42.1)	
Clerk	375 (22.06)	55.8 (47.4 - 64.2)	

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Table 2. Crude and Adjusted Odds Ratio for Different Predictors of Musculoskeletal Disorders, Community-based Study (KERCADRS2nd round, n = 1700), Kerman, Iran, 2014–2016^a

Subgroups	Crude OR (95% CI)	Adjusted OR (95% CI)
Gender		
Male	1	1
Female	2.0 (1.5 - 2.4)	1.7 (1.3 - 2.1)
Age group, y		
15 - 24	1	1
25 - 34	1.7 (1.2 - 2.67)	1.6 (1.1 - 2.0)
35 - 44	3.2 (2.1 - 4.7)	2.8 (1.9 - 4.5)
45 - 54	4.2 (2.9 - 6.6)	3.8 (2.4 - 6.0)
55 - 64	4.3 (2.8 - 6.4)	3.9 (2.3 - 5.8)
65 - 80	5.4 (3.5 - 8.5)	5.6 (3.4 - 2.9)
Education		
Illiterate	1	1
Primary to high school	0.6 (0.4 - 0.9)	0.7 (0.5 - 1.2)
Above high school	0.3 (0.2 - 0.5)	0.5 (0.4 - 1.3)
Current cigarette smoker		
No	1	1
Yes	0.6 (0.4 - 0.8)	0.7 (0.4 - 1.1)
Opium consumption		
No	1	1
Yes	1.1 (1.2 - 1.5)	1.2 (0.8 - 1.6)
Obesity		
Normal	1	1
Overweight	1.7 (1.3 - 2.1)	1.6 (1.2 - 2.0)
Obese	2.8 (2.1 - 3.8)	2.2 (1.6 - 2.9)
Hyper TG		
No	1	1
Yes	1.2 (0.9 - 1.5)	1.0 (0.7 - 1.3)
Diabetes		
No	1	1
Yes	1.9 (1.3 - 2.9)	1.5 (1.1 - 2.3)
Hypertension		
No	1	1
Yes	1.6 (1.3 - 2.0)	1.0 (0.7 - 1.2)
Depression		
No	1	1
Yes	2.2 (1.6 - 2.9)	1.5 (1.1 - 1.9)
Anxiety		
No	1	1
Yes	2.6 (2.0 - 3.5)	2.3 (1.7 - 3.2)
Job status		
Unemployed	1	1
Clerk	2.4 (1.5 - 3.9)	2.0 (1.1 - 4.0)
Self-employment	3.1 (2.0 - 4.3)	2.6 (1.4 - 5.0)
Retired	3.5 (2.3 - 5.4)	1.7 (0.8 - 3.5)
Housewife	6.3 (4.3 - 9.4)	2.5 (1.4 - 4.8)

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