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## Original Research

## Shoulder pain prevalence and risk factors in middle-aged women: A cross-sectional study



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## ABSTRACT

**Purpose:** The aim of the current study was to investigate the prevalence of shoulder pain and to explore the possible associated risk factors in middle-aged women.

**Methods:** A total of 500 middle-aged women, aged 45–65 years, participated in this cross-sectional study. The point and lifetime prevalence of shoulder pain were calculated. Linear and logistic regressions were used to determine the possible associations between the risk factors and present shoulder pain.

**Results:** The point and lifetime prevalence of shoulder pain were 18.6% and 27.6%, respectively. The logistic regression analysis demonstrated a significant association between present shoulder pain and history of shoulder pain and trauma, osteoporosis, trapezius muscle pain, and cervical radiculopathy ( $p < 0.05$ ). However, there was no significant association between present shoulder pain and diabetes mellitus or postural deviation ( $p > 0.05$ ).

**Conclusion:** The results indicated that shoulder pain has considerable prevalence in middle-aged women. In addition, a history of shoulder pain and trauma, osteoporosis, trapezius muscle pain, and cervical radiculopathy were found to be associated with present shoulder pain. Future research should concentrate on longitudinal designs that explore preventive strategies and risk factors for shoulder pain.

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## 1. Introduction

Shoulder pain is the third most common musculoskeletal disorder experienced by the general population and accounts for approximately 16% of all musculoskeletal complaints (Van der Windt et al., 1995; Jonasson et al., 2011). Shoulder pain is believed to have a multifactorial etiology, as several risk factors contribute to its development. Most studies have demonstrated that age is a considerable risk factor for shoulder pain (Miranda et al., 2001; Luime et al., 2004; Vincent et al., 2017). It is believed

that the physiological characteristics that accompany aging, which include degenerating joints, declining tissue healing, and thinning of the joint cartilage, may lead to a high risk of musculoskeletal disorders (Musumeci et al., 2015; Squires et al., 2003). Evidence shows that individuals over 40 years old are predisposed to shoulder joint problems, including tendinopathy, rotator cuff tear, adhesive capsulitis, and glenohumeral osteoarthritis (Iannotti and Kwon, 2005; Murrell and Walton, 2001; Woodward and Best, 2000).

Some studies have reported that there is a significant positive association between women and an increased prevalence of shoulder pain (Mitchell et al., 2005; Andersen et al., 2003; Straker et al., 2009). For example, the prevalence of shoulder pain was reported to be substantially higher in females than in males in Ullensaker, Sweden (Natvig et al., 1994). Alipour et al. (2008) studied the prevalence of shoulder pain in 14,348 employees of

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the largest Iranian car manufacturing company and showed that there was a higher prevalence of neck and shoulder pain in women than in men. On average, women have a smaller body size, lower muscle strength, and lower aerobic capacity than men (Van der beek et al., 2000; Lindbeck and Kjellberg, 2001). In addition, joint laxity seems to be influenced by sex hormones (Shultz, 2017) and thus, women may be more susceptible to musculoskeletal disorders (Baghi et al., 2017), including shoulder pain.

However, most surveys have been focused on the epidemiology, burden, and management of shoulder pain in elderly women (Vogt et al., 2003; Oh et al., 2011). Yet, not enough evidence is available to indicate the prevalence of shoulder problems in middle-aged women. An association between physical disability and social deprivation was seen only in middle-aged women (Urwin et al., 1998). During middle age and menopause, women have been viewed as being vulnerable to musculoskeletal pain (Symmons et al., 1991; Rustøen et al., 2005). Miranda et al. (2005) reported the prevalence of shoulder pain in the women was highest in the age group 40–49 years and slightly declined thereafter. Understanding the prevalence of shoulder pain in middle-aged women would facilitate the prevention of complicated shoulder problems, such as tendon or capsular tears, and make it possible for patients to receive medical services at early stages (Miranda et al., 2005). To our knowledge, little if any data, have been published about the prevalence of shoulder pain in middle-aged women. Additionally, there is insufficient evidence regarding the risk factors that are associated with shoulder disorders. An investigation into the related risk factors presents a unique opportunity to improve community health and to reduce health care costs. Therefore, the aims of this study were 1) to estimate the prevalence of shoulder pain in middle-aged women; and, 2) to determine the possible associated risk factors of shoulder pain.

## 2. Materials and methods

### 2.1. Participants

This cross-sectional study focused on Tehran as the target city because it was the largest and most populated city in Iran. A total of 511 women were selected through a cluster-sampling method, which involved dividing Tehran into four parts: north, south, east, and west. The target areas for collecting samples were local city parks, cultural centers, and communities. The examiners approached possible candidates and spoke to them in person. After explaining the procedures and aims of the study, women who signed the written consent form were included if they were 45–65 years old and they were able to cooperate physically and mentally in the interview and clinical examination. Individuals were excluded from the study if they had rheumatoid arthritis or other inflammatory arthropathies and a positive history of neurological disorders, such as stroke, spinal cord injury, Parkinson's disease, multiple sclerosis, or brain injury. In total, 511 women agreed to participate in the study, although 11 participants were excluded based on the exclusion criteria. The study protocol received ethical approval numbered IR.USWR.95.1432 from the Board of Ethics, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran, The data collection was performed over 4 months from June to September 2017.

### 2.2. Data collection

Demographic data, including age, weight, height, menopausal status, level of education, and occupation, were collected for each participant. The presence (yes or no) of shoulder pain was derived from the following question: Have you ever had a present or long-

lasting disorder in the shoulders? Shoulder pain was defined as pain lasting for more than a week and localized to the proximal anterolateral shoulder region. We collected further information about the health-seeking behavior of the individuals who reported shoulder pain. The participants were asked if they had undergone medical treatment, physiotherapy, or a surgical procedure for their shoulder pain. They were then asked about their history with the possible risk factors, including diabetes mellitus, osteoporosis, postural deviations, cervical radiculopathy, and trapezius muscle tightness and pain. A participant was considered to have diabetes mellitus or osteoporosis if she was receiving prescribed medications. Postural deviations, at the time of the survey, were detected through observing the participants. We were not able to undress the participants due to cultural sensibilities. A diagnosis of cervical radiculopathy was made if there was marked cervical pain radiating into the arm. Trapezius muscle pain was identified as pain localized in the region of the upper trapezius muscle.

### 2.3. Range of motion measurement

The range of motion (ROM) was measured using universal goniometers (Kolber and Hanney, 2012). The measurements included the active and passive ranges of shoulder flexion, extension, and abduction, and the internal and external rotation of a participants' right upper limb.

### 2.4. Statistical analyses

Data analyses were performed using IBM SPSS statistics for Windows version 21. To investigate the possible risk factors, single and multiple logistic regressions were used. At the first step, a complete univariate analysis was performed to determine significant variables one by one then, all significant variables (with the significance level of  $p < 0.2$ ) were included to the analysis at once. At the next step, the best model given by SPSS was chosen for data interpretation. The analysis was adjusted by including covariates in the model. A linear regression was conducted in order to evaluate the association between present shoulder pain and shoulder ROM. The results were expressed as odds ratios (ORs) with a 95% confidence interval (CI). The shoulder pain data were used as the dependent factor in the data analyses.

## 3. Results

A total of 500 women, with an average age of  $54.57 \pm 8.09$  years, were included in the study. The demographic data are summarized in Table 1. The majority of the participants were housewives (81%) who were menopausal (71.9%) (Table 2). The data analyses revealed that the point and lifetime prevalence rates of shoulder pain in middle-aged Iranian women were 18.6% and 27.6%, respectively. A history of shoulder trauma was recorded in 4.8% of the participants. Of the women with lifetime shoulder pain, 4.6% reported seeking medical treatment, 6.6% had received physiotherapy, and 0.4% had undergone a surgical procedure for their shoulder pain.

The results of the logistic regression revealed positive

**Table 1**  
Participants' demographic information.

Variables	Mean $\pm$ SD	Range
Age, y	54.57 $\pm$ 8.09	45–65
Weight, kg	72.31 $\pm$ 11.67	43–110
Height, cm	159.64 $\pm$ 8.90	120–183
BMI, kg/m <sup>2</sup>	37.07 $\pm$ 145.70	16.42–46.94

SD = standard deviation, BMI = body mass index.

**Table 2**  
Participants' educational, occupational and menstrual status classifications.

Variables	Conditions	Frequency	Percentage
Education	Illiterate	97	19.4
	High school diploma	320	64.8
	Undergraduate	66	13.4
Occupation	Post graduate	11	2.2
	Housewife	406	81
	Working women	61	12.2
Menstrual status	Retired	31	6.2
	Menopausal	360	71.9
	Menstruating	140	27.9

associations between present shoulder pain and history of shoulder trauma. Cervical radiculopathy, osteoporosis, and trapezius muscle pain were also found to be significantly associated with the point prevalence of shoulder pain. However, there were no significant associations between present shoulder pain and diabetes mellitus or postural deviation. Multiple analyses of the risk factors showed that the history of shoulder trauma (OR = 10.28,  $p < 0.001$ ) and cervical radiculopathy (OR = 15.99,  $p = 0.01$ ) were the most prominent predictive risk factors for shoulder pain. Table 3 presents the frequencies and ORs with 95% CIs for some of the risk factors for present shoulder pain. The results of the linear regression analyses demonstrated that there was a significant reduction in the active and passive shoulder ROMs in the presence of shoulder pain except for the active medial rotation and passive flexion indicating lesser ROMs in women with present shoulder pain. Table 4 shows the ROM analyses.

## 4. Discussion

### 4.1. Prevalence of shoulder pain

This cross-sectional study was the first observational study conducted on middle-aged Iranian women. It was designed to provide essential information regarding the risk factors of shoulder pain to reduce its prevalence. The results of this study demonstrated that the point and lifetime prevalence of shoulder pain in middle-aged Iranian women were 18.6% and 27.6%, respectively. Shoulder pain was seen in almost 1/5 middle-aged women and, thus, can be considered to be a common problem. Very few studies have attempted to estimate the prevalence of shoulder pain in middle aged women. Therefore, we do not have an informative database with which to compare our results. However, several studies reported the prevalence of work-related shoulder pain in middle-aged women (Alipour et al., 2008; Al-mohrej et al., 2016; Herin et al., 2014). The decision to seek care is probably influenced by the family situation, occupation, level of education as well as physical activity during leisure time and in society (Fredriksson et al., 2002; Sandmark et al., 2000; Leclerc et al., 2009). In our study, the majority of women were educated to high school level. According to some research, educational level is related with

**Table 3**  
Odds ratios and 95% CIs for factors associated with point prevalence of shoulder pain using logistic regression mode.

Variables	Percent	Single logistic regression OR	95% CI	P-value	Multiple logistic regression OR	95% CI	P-value
Trapezius pain	3.4	7.90	1.06–58.68	0.04	–	–	–
Radiculopathy	10	6.76	1.11–41.15	0.03	8.61	1.38–53.49	0.02
Postural deviation	50.7	1.46	0.90–2.34	0.11	–	–	–
History of shoulder trauma	3.6	10.28	4.00–26.38	0.00	10.21	3.93–26.52	0.00
Osteoporosis	19.4	2.00	1.16–3.46	0.01	1.95	1.09–3.47	0.02
Diabetes	16.4	1.35	0.74–2.46	0.32	1.35	0.71–2.56	0.35

CI = confidence intervals, OR = Odds ratio.

**Table 4**  
Effects of present shoulder pain on shoulder joint ROM using linear regression mode.

movement	$\beta$	95% CI	p-value
Active flexion	-16.27	-12.34 _ -20.20	0.00
Passive flexion	-17.29	0.59 _ -35.17	0.058
Active extension	-5.25	-2.46 _ -8.03	0.00
Passive extension	-6.48	-3.87 _ -9.10	0.00
Active abduction	-21.42	-16.86 _ -25.98	0.00
Passive abduction	-17.22	13.18 _ -21.25	0.00
Active medial rotation	-29.11	37.22 _ -95.45	0.38
Passive medial rotation	-14.99	-3.69 _ -26.28	0.008
Active lateral rotation	-9.98	-7.18 _ -12.77	0.00
Passive lateral rotation	-9.75	-19.18 _ -0.31	0.04

CI = confidence intervals,  $\beta$  = Coefficient of regression.

unhealthy habits and physical activities (Ersoy and Imamoglu, 2006). The studies indicated there is a direct association between educational level and musculoskeletal diseases (Ozcan et al., 2018; Zarei et al., 2012). Zarei et al. (2012) reported chronic pain was less prevalent among those with a Master's degree or higher, because this demographic tended to pay more attention to their health and treat their disease in an appropriate timely manner. Furthermore, the population in this study consisted mainly of housewives. This could be explained by the fact that a large proportion of women living in Iran are not employed, but work as housewives (Navadeh et al., 2011). The prevalence of musculoskeletal pain may be different in housewives compared with working women (Saravi et al., 2012). Thus, the data from the current study need to be interpreted with caution when applied to middle-aged women elsewhere.

### 4.2. Present shoulder pain and associated risk factors

#### 4.2.1. History of shoulder pain and trauma

According to the results of the present study, women with a history of shoulder pain and trauma were more likely to report having shoulder pain at the time of the study than women without a history of shoulder pain. This finding was consistent with previous studies that reported that shoulder pain can be recurrent and frequently progresses to the chronic stage (Rekola et al., 1997; Macfarlane et al., 1998; Meislin et al., 2005). Rekola et al. (1997) found that 25% of people who sustained shoulder or neck pain experienced at least 1 recurrence within 1 year of the initial onset. In a prospective study, Macfarlane et al. (1998) reported that more than 50% of individuals with shoulder pain had shoulder pain at a 3-year follow-up. The incomplete recovery of inflammation and edema resulting from soft tissue impairment may lead to the recurrence of pain and the development into chronicity. This chronicity is usually associated with fibrosis and adhesions of the glenohumeral joint capsule and surrounding soft tissue structures (Ko et al., 2008). According to published evidence, only 50% of all new episodes of shoulder complaints presented in primary care had completely recovered within 6 months, while the remaining

complaints became chronic (Kuijpers et al., 2004).

#### 4.2.2. Trapezius muscle pain

The results of the current investigation showed a significant association of trapezius muscle pain with shoulder pain. Consistent with our findings, one study documented painful trapezius muscles in approximately one third of workers with chronic neck and/or shoulder pain (Sjøgaard et al., 2006). The trapezius muscle is considered to be the one of the most important stabilizing and mobilizing muscles of the scapula. The altered activity of the upper trapezius muscle due to pain can lead to poor scapulohumeral rhythm during shoulder elevation which may be a contributing factor in the development of shoulder impingement (Ludewig and Cook, 2000). Abnormal patterns of activity of the upper trapezius muscle have been identified in individuals with shoulder impingement and frozen shoulder (Ludewig and Cook, 2000; Lin et al., 2005). However, it is quite possible that any pain in the shoulder joint may be distributed to the trapezius muscle.

#### 4.2.3. Cervical radiculopathy

The results of the present study showed that cervical radiculopathy is associated with shoulder pain. Pain in the shoulder region is not always attributed to the shoulder joint; some problems, including fibromyalgia, cervical radiculopathy, and thoracic outlet syndrome, can affect the shoulder region and cause shoulder pain (Burbank et al., 2008). Cervical radiculopathy pain can be described as a sharp, achy, or burning feeling in the area of the involved nerve root, which can be in the neck, shoulder, arm, or chest (Rhee et al., 2007). For example, the irritation or compression of the fourth cervical nerve root may radiate to the superior aspect of the shoulder joint and posteriorly to the scapula. The radiculopathy of the fifth cervical nerve root often presents with numbness and localized pain on the lateral aspect of the shoulder joint, which can be confused with a pathological shoulder condition (Dobie et al., 2016). Thus, the pain that radiates from the shoulder should be explored because cervical pathology can mimic shoulder pathology. Therefore, it is reasonable that there is an association between cervical radiculopathy and shoulder pain.

#### 4.2.4. Osteoporosis

The analyzed data of the current study indicated that osteoporosis had a positive association with shoulder pain. However, there was limited evidence in this investigation into the relationship of shoulder pain with osteoporosis because of limited access to the medical records. In agreement with our result, Dimitriou et al. (2014) found a significant association between bone density and rib or lower spine pain in women (Dimitriou et al., 2014). Evidence confirmed that women have the highest risk of osteoporosis because of the loss of endogenous estrogen after menopause (Lerner, 2006; D'amelio et al., 2008). On the other hand, a decrease in bone mineral density (BMD) and muscle mass is typically observed with aging, which may partly contribute to a reduction in habitual physical activity and lead to inactivity, immobilization, and bed rest (Levesque et al., 2016). Furthermore, several genetic and environmental factors may influence the BMD and development of osteoporosis (Evans et al., 1988). Shivappa et al. (2016) reported the BMD of Iranian women is higher than Japanese, Hong Kongian and Canadian women (Shivappa et al., 2016). This issue may be due to the different geographical situation. The majority of this country's terrain is covered by deserts and this along with the climate may help inhabitants to receive more vitamin D. Another study indicated BMD values of Iranian women were generally lower than those of the American population. This could be due to the differences in ethnicity, diet, lifestyle, and body habitus, biological factors or to different secular changes between the Iranian and American

populations (Omran et al., 2006). Overall osteoporosis and osteopenia are common problems among Iranian population older than 30 years and women are at higher risk of osteoporosis than men and was significantly higher during postmenopausal period than premenopausal period (Irani et al., 2013). Asadi-lari et al. (2018) also reported that the prevalence of self-reported osteoporosis was 6.84% in Iranian women living in Tehran. Accordingly, we suggested that it was necessary to consider osteoporosis as an important risk factor for shoulder pain in women. Therefore, strategies for the prevention of osteoporosis should be taken to reduce the prevalence of shoulder pain.

#### 4.2.5. Shoulder joint range of motion

The present study investigated the association between shoulder pain and shoulder joint ROM. The shoulder joint ROM for middle-aged women with shoulder pain was significantly less than that for women without shoulder pain. This result was consistent with the findings of previous studies that reported on the association of shoulder pain with the loss of shoulder joint ROM (Michener et al., 2003; Hollmann et al., 2015; Ludewig and Cook, 2000). The shoulder is a complex anatomical structure that allows movement in three planes (Nakayama et al., 2018). A limited ROM may result from structural changes in the periarticular structures, such as the shortening of capsules, ligaments, or muscles, as well as from inflammation and adhesion formation (Hollmann et al., 2015; Tyler et al., 2000). A marked shoulder ROM deficit is commonly observed in frozen shoulder, which is usually seen in women and individuals over 40 years old (Guyver et al., 2014). Frozen shoulder is characterized by an insidious and progressive loss of active and passive ROM in the glenohumeral joint due to the actual adherence of the shoulder capsule (Griggs et al., 2000). Other structural problems that lead to a decrease in shoulder joint ROM can be moderate to severe osteoarthritis of the glenohumeral joint, rotator cuff pathology, and shoulder impingement (Michener et al., 2003). However, a limited ROM may also be caused by problems that are not associated with structural changes in the periarticular tissues. For example, pain and the associated protective muscle contractions that prevent painful movements or the presence of a loose body within the joint space can also lead to a decreased ROM (Hollmann et al. 2015, 2018). In addition, when the shoulder ROM is decreased, the patient may attempt to compensate by using unaffected muscles and tissues to perform daily activities. This compensation places additional strain on the other muscle groups and soft tissues, which leaves them overloaded and tender (Siegel et al., 1999).

#### 4.2.6. Postural deviation

In the present study, no significant association was found between the forward head posture, rounded shoulders, and kyphosis with shoulder pain. However, other studies showed a significant association between thoracic kyphosis and the development of subacromial pain syndrome (Gumina et al., 2008; Otoshi et al., 2014). It seems that kyphosis alters the scapular kinematics and muscle activity, and leads to a potential compression of the subacromial tissues, including the subacromial bursa and rotator cuff under the acromion (Gumina et al., 2008; Cheshomi, 2013). One study showed that the forward head and rounded shoulder posture and thoracic kyphosis contribute to altered scapular kinematics and muscle activity, which increase the stress on the shoulder and predispose individuals to shoulder pain and dysfunction (Thigpen et al., 2010). The discrepancies between our study and others may be related to the observation technique of the posture.

#### 4.2.7. Diabetes mellitus

The findings of the current study demonstrated that there was

no significant association between diabetes and shoulder pain. However, previous clinical studies revealed that the prevalence of shoulder complaints, such as adhesive capsulitis and tendinopathy, are significantly higher in people with diabetes mellitus than in healthy individuals (Raynor and Kuhn, 2016; Ranger et al., 2016). Previous studies also indicated that the duration of diabetes mellitus correlated with an increased risk of frozen shoulder (Milgrom et al., 2008; Thomas et al., 2007). Unfortunately, we did not have access to patients' medical records and, thus, no data were available about the duration and severity of the diabetes mellitus. As this study tested middle-aged women, it is possible that the duration and severity of diabetes in this population was short and low, respectively. Therefore, the absence of a statistically significant relationship between diabetes and shoulder pain in the present study may be due to a lack of information.

#### 4.3. Limitations of the study

The interpretation of the results of the current study may be affected by the presence of the following limitations. As the majority of our participants (81%) were housewives, we could not investigate the relationship between a specific working activity and shoulder pain. It is recommended that future studies address the effects of specific jobs on the prevalence of shoulder pain. Another limitation of this study was the lack of access to the medical records of the participants, which could have provided information about the duration and severity of diabetes mellitus and osteoporosis. In addition, it was not possible to accurately assess the posture of the participants in this study due to cultural sensibility. Therefore, it was possible that there were confounding factors in our results. The cross-sectional design of the present study limited us to investigate a cause-and-effect relationship between the possible risk factors and shoulder pain. In the future, prospective cohort studies should be used to provide valuable information on the relationship between the effects of the risk factors and the development of shoulder pain.

## 5. Conclusion

The results of the present study demonstrated that the prevalence of shoulder pain is considerable in middle-aged women in Iran. Furthermore, the association of shoulder pain with some risk factors, such as history of shoulder trauma, trapezius muscle pain, and osteoporosis was highlighted in the current study. This is the first study to investigate the prevalence of shoulder pain in middle-aged women. Despite the fact that we only investigated Iranian middle aged women, the findings is important to recognize the risk factors of shoulder pain and to improve the health conditions of women worldwide due to having similar risk factors. More attention should be given to middle-aged women who have these risk factors so that they can be diagnosed early and given proper treatment to prevent pain recurrence and progression to the chronic stage.

#### 5.1. Clinical relevance

- The point and lifetime prevalence of shoulder pain in middle-aged women were 18.6% and 27.6%, respectively.
- Osteoporosis increases the risk of shoulder pain in middle aged women significantly. This finding emphasizes a critical need to improve preventive strategies for osteoporosis.
- History of shoulder trauma was found as the strongest risk factor for shoulder pain in middle-aged women. This finding highlights the importance of improving lifestyle and physical fitness to prevent falling and trauma in this population.

## Declaration of interest

There is no conflict of interest to declare for any authors.

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