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Research Paper

Musculoskeletal Disorders among Oil Field Workers: Influences of Health Beliefs, Mental Health and Somatisation Tendency

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Studies in recent years have suggested that health beliefs, mental health and somatising tendency can affect musculoskeletal disorders (MSDs).The present survey was conducted to determine the prevalence of MSDs among Iranian oil field workers and their association with these psychological and physical risk factors. A cross-sectional survey was carried out among 60 workers in one of the southern oil fields of Iran in 2008. Data were collected using the standardized CUPID questionnaire, administered through interviewing by a physician. Chi-square (χ^2) and logistic regression were used to analyze the data through SPSS. About 86.7% of workers reported at least one MSD in the previous 12 months. The most prevalent MSDs were knee pain (71%), low back pain (62%) and shoulder pain (52%). Low back pain was significantly associated with health beliefs that physical activity adversely effects back disorders. Neck, shoulder, elbow and wrist/hand pain were each associated with somatising tendency and knee pain was associated with climbing stairs and poor mental health. The prevalence of MSDs among oil field workers is high. Somatising tendency is importantly associated with MSDs.

Key words: Musculoskeletal disorders, health beliefs, somatisation tendency, risk factor, physical activity

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INTRODUCTION

At present musculoskeletal disorders are one of the most common occupational health problems among working populations (Parot-Schinkel *et al.*, 2012). Work-related MSDs can increase disability (Andersen *et al.*, 2012), impair quality of life and lead to loss of work time with financial consequences for the individual, employers and society (Tinubu *et al.*, 2010). MSDs are more prevalent in some occupations than others. In a study of workers in Norway's offshore petroleum industry over 12 years (1992-2003), work-related MSDs made up half of all occupational diseases (Morken *et al.*, 2007).

In a British study, MSDs were reported to be the most prevalent health problem among oil field workers, accounting for 23% of all sick bay consultations (Parkes and Swash, 2005). Epidemiological studies have shown associations of MSDs with individual factors, work-related risk factors such as handling loads, heavy physical work and repetitive movements and psychosocial factors (Da Costa *et al.*, 2010; Larsson *et al.*, 2007; Ijzelenberg *et al.*, 2004). WHO has classed musculoskeletal disorders as multi factorial physical, organisational, psychosocial and sociological risk factors (Kulin and Reaston, 2011). Moreover, in recent years research has revealed that health beliefs, mental health and somatising tendency also affect the MSDs (Palmer *et al.*, 2008; Solidaki *et al.*, 2012; Leaver *et al.*, 2011).

Occupations in the oil extraction industry involve exposure to many of these recognised risk factors (Morken *et al.*, 2007). Nevertheless, few studies of MSDs among oil field workers have been published and none from Iran. This survey has been carried out to assess common musculoskeletal complaints (low back, neck, shoulder, elbow, wrist/hand and knee pain) and their associations with health beliefs, mental health and somatising tendency and other risk factors among oil field workers in Iran.

MATERIALS AND METHODS

Study design and questionnaire: The study sample comprised all 60 of the workers who were employed in one of the southern oil fields of Iran in 2008. Participants worked in drilling, maintenance and repair, service and engineering occupations. Data were collected using the standardized CUPID questionnaire (Coggon, 2005), administered at interview by a physician. This questionnaire covers demographic and organisational characteristics; aspects of lifestyle (age, level of education, age of finishing full time education, smoking, main occupation, duration of employment, weekly work hours), physical and psychosocial factors at work (use of a keyboard, repeated movements of the wrist or fingers, repeated bending and straightening of elbow, working with hands above shoulder height, lifting weights of 25 kg or more by hand, climbing up or down more than 30 flights of stairs a day, working under pressure by a fixed time, decision-making, bonus, support from colleagues or supervisor, job security, second job....), musculoskeletal symptoms at each of six anatomical sites (questions adapted from the Nordic questionnaire; Kuorinka *et al.*, 1987); health beliefs about the impact of physical activity and work on MSDs (based on the Fear Avoidance Beliefs questionnaire; Waddell *et al.*, 1993); somatising tendency (elements of the Brief Symptom Inventory (BSI) questionnaire; Derogatis and Melisaratos, 1983); mental health (questions from Short Form-36 (SF-36) questionnaire; (Ware and Sherbourne, 1992; Montazeri *et al.*, 2005) and awareness of other people with MSDs. Validity and reliability of questionnaire had been approved in other studies (Kuorinka *et al.*, 1987; Waddell *et al.*, 1993; Derogatis and Melisaratos, 1983; Ware and Sherboune, 1992; Montazeri *et al.*, 2005). The questionnaire was translated from English into Persian and then was independently back-translated to English with amendment of the Persian version where problems were identified. Somatising tendency was graded to two and mental health to three levels, according to scores for relevant sections of the questionnaire. Interviews were conducted to obtain these data.

Statistical analyses: Statistical analysis was carried out with SPSS 18 software. In the first stage of the analysis, associations between every risk factor with pain in each body site (low back, neck, shoulder, elbow, wrist/hand and knee) were tested by χ^2 test (or Fisher's exact test, as needed). Then, all independent variables that showed significant associations with a p-value <0.05, were included in a backward stepwise logistic regression in order to investigate associations of all risk factors simultaneously. And they were summarised as Odds Ratios (ORs) with associated 95% Confidence Intervals (CIs). Age was included in the model independently of its p-value. The level of significance was set up at $p<0.05$.

RESULTS

Study population: All of the 60 men were eligible and agreed to take part in the survey. There were no female oil workers. The ages of participants ranged from 24-60 years, with a mean of 35.5 years. The average hours worked per

Table 1: Characteristics of study group

Demographic factors	No.	%	Mean±SD
Age			35.5±9.9
Hours per week			72.5±9.4
Education (elementary and guidance)	20	33.4	
High school	27	45.0	
University	13	21.7	
Smoking (Yes)	13	21.7	
Jobs (Drilling)	23	38.3	
Services	19	31.7	
Maintenance and repair	10	16.7	
Engineering	8	13.3	
Job history >5 years	29	48.3	
Physical and psychosocial factors			
Working with hands above shoulder height 1+hour	50	83.3	
Lifting weights of 25 kg or more by hand	53	88.3	
Climbing up or down more than 30 flights of stairs a day	27	45.0	
Working under pressure to complete tasks by a fixed time	56	93.3	
Deciding about work time table and breaks (never)	36	60.0	
Support from colleagues supervisor/manager (often)	24	40.0	
Satisfied with job	32	53.4	
Beliefs			
Physical activity should be avoided in LBP (agree)	43	72.9	
Somatic distress score (low)	39	65.0	
Medium and high	21	53.0	
Mental health score (high)	13	22.0	
Medium	31	52.7	
Low	15	25.4	

Somatic distress score, Low: 0-7, Medium: 8-14, High: 15-22, Mental health score, Low: 0-250, Medium: 250-375, High: More than 375

Table 2: Prevalence of musculoskeletal disorders in the past 12 months among study group

Disorders	No.	%
Neck	28	46.7
Shoulder	31	51.7
Low back	37	61.7
Elbow	24	40.1
Wrist	12	17.7
Knee	43	71.7
Any MSDs	52	86.7

week in the two week periods when they were at work was 72.5 (range 70-84 h).Among subjects 48.3% had worked in their job for longer than five years and 21.7% smoked cigarettes. There were 38.3% in drilling jobs, 31.7% in service jobs, 16.7% in maintenance and repair jobs and 13.3% in engineering jobs. Also 93.3% reported working under pressure to complete tasks by a fixed time. Table 1 summarises the individual and psychosocial characteristics of the study sample.

Prevalence: The analysis of data showed that in this survey 86.7% of participants reported at least one musculoskeletal complaint in the previous 12 months. The highest prevalence rates were found for knee pain (71.1%) followed by low back pain (61.7%) and shoulder pain (51/7%). Table 2 presents the 12 month prevalence of complaints of back, neck, shoulder, wrist/hand, elbow, knee and each MSDs.

Among the study group 15% reported pain only in one region of body, 58.4% in 2-5 regions and 15% in all six

regions (low back, neck, shoulder, elbow, wrist/hand, knee pain). The highest prevalence of MSDs was in drilling occupations.

Potential risk factors: All variables in the first stage of the study (using χ^2 and fisher's exact tests) showed significant associations with each MSDs, with a p-value <0.05. Subsequently, the variables along with the variable of age were included in a multivariate logistic regression model (Table 3). In the final model of stepwise logistic regression analyses, low back pain was significantly associated with a belief that physical activity should be avoided when the symptom occurs (OR = 4.6) (95% CI 1.2-17.3). This means people with this avoidance belief are exposed 4.6 times more to the risk of LBP.

The neck pain associated with knowing people at work who suffered from neck pain in the past 12 months (OR = 11.9) (p-value = 0.030) and somatisation tendency, the OR in the medium and high versus the low band of somatisation tendency was 4.5 (95% CI 1.2-17.8). The shoulder, elbow and wrist/hand pain also associated with somatisation tendency. Risk of these pains tended to increase according to the score of somatic symptoms. The ORs for shoulder pain, elbow pain and wrist/hand pain were 6.9 (95% CI 1.8-26), 9 (95% CI 2.1-38.8) and 5.9 (95% CI 1.7-20.1), respectively. The results also showed knee pain associated with mental health (OR = 8.8) and climbing up or down more than 30 flights of stairs a day

Table 3: Association with prevalent musculoskeletal disorders: results from the multiple regression backward analysis

Disorders	Risk factors	No.	%	OR	95% CI	p-value <0.05
Low back pain	Belief in avoiding physical activity in low back pain					
	Disagree	6	16.7	1.0		
	Agree	30	83.3	4.6	1.2-17.3	0.026
	Lifting weights of 25 kg or more by hands					
	No	1	2.7	1.0	-	-
	Yes	36	93.7	11.2	1.1-115.7	0.043
	Do you know anyone at work who has had low back pain in the past 12 months?					
	No	2	5.6	1.0	-	-
	Yes	34	94.4	5.9	0.95-38.1	0.057
Neck pain	Do you know anyone at work who has had neck pain in the past 12 months?					
	No	1	3.7	1.0	-	
	Yes	26	96.3	11.9	1.3-110.8	0.030
	Do you know anyone outside work who has had neck pain in the past 12 months?					
	No	8	29.6	1.0	-	-
	Yes	19	70.4	3.7	0.94-14.2	0.060
	Somatic distress score					
	Low	12	42.9	1.0		
	Medium and high	16	57.1	4.5	1.2-17.8	0.029
Shoulder pain	Working for longer than one hour in total with your hands above shoulder height?					
	No	2	6.5	1.0	-	-
	Yes	29	93.5	5.02	0.84-30.1	0.076
	Somatic distress score					
	Low	14	45.2	1.0	-	
	Medium and high	17	54.8	6.9	1.8-26	0.004
Elbow pain	Somatic distress score					
	Low	3	25.0	1.0	-	
	Medium and high	9	75.0	9	2.1-38.8	0.003
Wrist/hand pain	Do you know anyone at work who has had pain in the arm, shoulder or hand in the past 12 months?					
	No	3	12.5	1.0	-	-
	Yes	21	87.5	3.7	0.84-16.1	0.083
	Somatic distress score					
	Low	10	40.0	1.0	-	-
	Medium and high	15	60.0	5.9	1.71-20.1	0.005
Knee pain	Mental health score					
	High	5	11.9	1.0	-	-
	Medium	24	57.1	42.7	4.2-426.9	0.001
	Low	13	31.0	8.8	1.5-51.5	0.016
	Climbing 30+flights of stairs					
	No	20	46.5	1.0	-	-
	Yes	23	53.5	10.8	1.9-59.1	0.006

Mental health score; Low: 0-250, Medium; 250-375, High: More than 375, Variable(s) entered on step 1 regression model for; Low back pain: Age, belief in avoiding physical activity in low back pain, lifting weights of 25 kg or more by hands, knowing anyone at work who has had low back pain, somatic distress, Neck pain: Age, deciding about work time table and breaks, knowing anyone at work who has had neck pain, knowing anyone outside work who has had neck pain, somatic distress, Shoulder pain: Age, somatic distress, working for longer than one hour with your hands above shoulder height, knowing anyone at work who has had arm, hand/shoulder pain, Elbow pain: Age, main occupation, somatic distress, Wrist/hand pain: Age, knowing anyone at work who has had arm, hand/shoulder pain, somatic distress, Knee pain: Age, main occupation, climbing of stairs, somatic distress and mental health

OR = 10.8) (p-value = 0.006). Thus, the OR for knee pain increased 8.8 times more in workers in the highest versus the lowest band for the SF-36 mental health score.

DISCUSSION

The present study showed that prevalence of musculoskeletal complaints among Iranian oil field workers was high (86.7%) and higher than that in a similar study in China (56%) (Chen *et al.*, 2005). In a study by Choobineh *et al.* (2009), among workers of an Iranian sugar-producing factory 87.1% reported musculoskeletal disorders in the past year while a study by Karimfar *et al.* (2008) showed that 77.6% of workers in the Zinc Industry reported at least one MSD in the previous 12 months. The highest prevalence was reported in the lower back (47.9%).

In the present study the most prevalent MSD was knee pain (71.7% of all subjects and 82.7% of those with musculoskeletal pain), whereas in most other studies back pain has been more prevalent than other musculoskeletal disorders. For example, in the offshore petroleum industry in Norway, back and knee problems accounted for 20 and 12% of work-related musculoskeletal disorders over 12 years (Morken *et al.*, 2007).

Moreover, in China, the most prevalent MSD in the past year among oil field workers was low back pain 32% (Chen *et al.*, 2005). In a similar longitudinal British survey conducted in 2000-2005, LBP was reported 34 and 46%, respectively (Parkes, 2008).

Fernandes and Carvalho (2000) surveying among 1,026 oil drilling workers in northeast Brazil indicated an overall prevalence rate of 5% for intervertebral disc disease, with rates of 1.8% among people who did not

carry heavy loads, 4.5% among people who sometimes carried heavy loads and 7.2% among those who usually carried heavy loads. In a study of car manufacturing workers in Iran, the reported prevalence of back pain in the past year was 51.1 and 81.8% among workers who had to lift heavy loads (Dehghan-Manshady *et al.*, 2003). The relationship between lifting heavy loads and low back pain has been recognised for many years (Elders and Burdorf, 2004; Andersen *et al.*, 2007). In the present study, almost all participants (88.3%) reported lifting heavy loads and therefore it was not possible to draw meaningful conclusions about the association of low back pain with lifting.

We did, however, find a significant association of back pain with health beliefs about avoidance of physical activity when the symptom occurs, a finding that has also been previously reported by Waddell *et al.* (1993). Andersen *et al.* (2007) reported a similar association for back and also other regional musculoskeletal pain. It is probable that people who suffer from back pain are more aware that physical activities exacerbate their symptoms and therefore think that they should be avoided. However, it is also possible that beliefs about the influence of physical activity on back pain predispose people to getting back problems. A longitudinal study would be needed to test this.

Neck pain was associated with knowing other people at work with neck pain (OR = 11.9). It could be that greater awareness of MSDs predisposes people to be troubled by such symptoms. Alternatively, it might be that when people have pain, they talk about it to others and then find out about other people's pain as a consequence.

Neck, shoulder, elbow and wrist/hand pain all showed significant associations with somatising tendency. Similar associations have been observed in other studies (Warnakulasuriya *et al.*, 2010). In Greece, Solidaki *et al.* (2012) found that pains at two or more anatomical sites were associated with somatisation tendency. A study in New Zealand by Harcombe *et al.* (2010) indicated weak associations of somatisation with musculoskeletal pain at most sites. In addition, Matsudaira *et al.* (2011) in a study of four occupational groups in Japan found that somatising tendency was the strongest risk factor for musculoskeletal disorders.

In the present study, shoulder pain with prevalence of 51.7% is in the third position after other musculoskeletal disorders which is higher than that (22 and 29%) in a similar British longitudinal study (Parkes, 2008).

According to the results, the highest rates of all of MSDs were found in workers of drilling group but in a study by Morken *et al.* (2007) in oil field, workers of

maintenance and repairing reported the highest prevalence and also significant relationships were indicated between musculoskeletal disorders of upper, lower extremities, low back and neck pain with four job groups of oil fields.

In this study, knee pain was significantly associated with climbing up or down of stairs. Baker *et al.* (2003) have previously linked repetitive climbing of stairs with an increased risk of meniscal tear in the knee and in another study in an oil field 10% of workers reported walking on hard surfaces and climbing stairs and ladders as reasons of musculoskeletal disorders (Morken *et al.*, 2007).

We also found that knee pain was associated with poor mental health. People who reported low mental health had knee pain 8.8 times more than those who reported high mental health. In another study, poor mental health was associated with increased risk of both knee pain and associated disability (OR = 2.1, OR = 4.7) (O'Reilly *et al.*, 1998).

Sagmanli *et al.* (2009) in Turkey showed significant positive correlation between low back pain intensity and emotional status while Parkes and Swash (2005) reported an association between poorer mental health and greater number of MSDs consultations. In a study by Antonopoulou in Greece, among all aspects of quality of life and all MSDs, the mental health domain was influenced only by knee pain (Antonopoulou *et al.*, 2009). In a study in Japan among nurses, computer operators, sales/marketing personnel and transportation operatives, people who reported poor mental health had 1.4 fold higher risk of musculoskeletal pain at ≥3 body sites (Matsudaira *et al.*, 2011). Also, in a study using the Short Form 36 questionnaire, regional pain at four sites (elbow, forearm and hand; low back; hip, knee, foot and neck/shoulder) was associated with poor mental health and vitality (Andersen *et al.*, 2007). Warnakulasuriya *et al.* (2010) in a study among 852 participants in four occupational populations in Sri Lanka found MSDS pain was strongly associated with low mood. Part of this association may occur because musculoskeletal pain causes mental distress but poor mental health may also predispose people to the development of musculoskeletal symptoms.

CONCLUSION

This study found prevalence of musculoskeletal complaints and especially of knee pain, among oil field workers is high. The most consistent risk factor for symptoms was tendency to somatize, an association that has been observed in other countries and occupational

groups. In addition, back pain was associated with beliefs about adverse effects of physical activity and knee pain with low mood and frequent climbing of ladders or stairs. A follow-up longitudinal study could help to establish the extent to which the associations with psychological variables are causal.

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