

# The Frequency of Low Back and Knee Musculoskeletal Disorders Based on Clinical Examination and Radiographic Findings among Naval Personnel of the First Maritime Region

Mohammad Nobakht<sup>1\*</sup>, Mohammad Reza Mansouri Rad<sup>1</sup>, Ali Askari<sup>2</sup>

<sup>1</sup> Marine Medicine Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

<sup>2</sup> School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran

\*Corresponding Author: Mohammad Nobakht, Marine Medicine Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran; Email: amiralijafarnezhad@gmail.com

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## Abstract

**Introduction:** Musculoskeletal disorders (MSDs) are among the most common causes of disability worldwide, particularly affecting the lower back and knees. Military personnel are at greater risk due to the physically demanding nature of their duties. This study aimed to determine the frequency and characteristics of low back and knee musculoskeletal disorders based on clinical and radiographic findings among naval personnel of the First Maritime Region.

**Method:** In this descriptive cross-sectional study, 217 naval personnel were evaluated using demographic and occupational questionnaires, physical examinations, and radiographic assessments. Data were analyzed using SPSS version 22 with descriptive and inferential statistics, including chi-square and Pearson correlation tests, at a significance level of  $p < 0.05$ .

**Result:** The mean age of participants was  $35.9 \pm 6.8$  years, and mean BMI was  $25.7 \pm 3.2$  kg/m<sup>2</sup>. Musculoskeletal pain was reported by 50.7% of participants: 22.6% in the lower back, 12.9% in the knees, and 15.2% in both areas. The most frequent lumbar diagnoses were muscle spasm (16.6%) and disc herniation (11.1%), while knee osteoarthritis (5.1%) and soft tissue injuries (11.5%) were most common. Significant relationships were found between demographic variables (gender, marital status, education) and pain characteristics or treatment ( $p < 0.05$ ).

**Conclusion :** MSDs of the lower back and knee are prevalent among naval personnel. Preventive ergonomic strategies, structured exercise programs, and early rehabilitation should be implemented to reduce disability and maintain operational readiness.

**Keywords:** Low back pain; Knee injury; Musculoskeletal disorders; Military personnel; Radiography.

## Introduction

Musculoskeletal disorders (MSDs) are among the most common causes of disability and reduced occupational performance in human societies. According to the World Health Organization, more than 1.7 billion people worldwide suffer from these conditions<sup>1,2</sup>. Low back pain is recognized as the most prevalent cause of disability among musculoskeletal diseases and imposes a substantial financial and social burden on healthcare systems<sup>3-7</sup>. Multiple studies have shown that factors such as older age, higher body mass index (BMI), low levels of physical activity, longer work experience, and smoking are associated with increased prevalence of low back and knee pain<sup>8-13</sup>. According to the Global

Burden of Disease (GBD 2019) report, low back pain accounts for approximately 7.4% of all years lived with disability worldwide<sup>14</sup>.

In military personnel, the physically demanding and repetitive nature of activities—such as prolonged standing or sitting, carrying heavy loads, and exposure to repetitive mechanical stress—significantly increases the risk of developing MSDs<sup>15-18</sup>.

In Iran, only a limited number of studies have been conducted in this area, particularly using both clinical examination and radiographic findings among naval forces. Therefore, the present study was designed to determine the frequency of low back and knee

musculoskeletal disorders based on physical examination and radiographic assessment among naval personnel of the First Maritime Region.

## Methods

### Study Design and Participants

This descriptive cross-sectional study included 217 active-duty naval personnel from the First Maritime Region of the Islamic Republic of Iran. Sample size was determined using the Cochran formula ( $N=500$ ,  $\alpha=0.05$ ,  $d=0.05$ ).

### Inclusion Criteria

- Active duty in the First Maritime Region
- Work experience of 5–20 years
- No congenital musculoskeletal deformities

### Exclusion Criteria

- Incomplete data
- Lack of consent to participate
- Psychiatric disorders

### Data Collection Tools

1. Demographic and occupational questionnaire: including sex, age, BMI, marital status, education, job type, and physical activity.
2. Physical examination: by an orthopedic specialist, including range of motion and specific tests (Straight Leg Raise, McMurray).
3. Radiography: AP and lateral views of the lumbar spine and knees for symptomatic participants.

### Implementation Procedure

After approval of the research proposal by the Research Deputy of Baqiyatallah University of Medical Sciences and obtaining the ethical approval code (IR.BMSU.REC.1402.000631), as well as the necessary institutional permissions and introduction letters, the researcher visited the healthcare centers affiliated with the First Maritime Region of the Navy that had been approved by the university.

Upon introduction and explanation of the study objectives and procedures to the center managers and obtaining their permission, the sampling process began. Sampling in this study was performed using a convenience sampling method, whereby the researcher selected individuals who met the inclusion criteria. After describing the study's purpose and process, written informed consent was obtained from all participants. Subsequently, participants completed the questionnaires, and clinical examinations were performed for all individuals by an orthopedic

specialist. In addition, radiographic imaging (lumbar spine and knee) was requested for those participants who exhibited relevant clinical signs or symptoms.

### Statistical Analysis

Data were analyzed using SPSS v22. Descriptive statistics (mean, SD, percentage) and inferential analyses (Chi-square, Pearson correlation, t-test, Mann–Whitney) were applied. The significance level was set at  $p < 0.05$ .

## Results

### Demographic and Occupational Characteristics

The demographic and occupational characteristics of participants are shown in Table 1.

A total of 217 naval personnel participated in this study, with a mean age of  $35.9 \pm 6.8$  years. The mean body mass index (BMI) was  $25.7 \pm 3.2$  kg/m<sup>2</sup>, indicating an overweight range. The majority of participants were male (73.3%) and married (59%), and most held a university degree (78.8%).

Regarding occupational characteristics, 31.8% were employed in operational units, 24% in administrative sections, and 23.5% in healthcare-related jobs. Prolonged standing (47%) was the most common dominant activity during work.

Overall, 50.7% of participants reported musculoskeletal pain in either the low back or knee regions. Specifically, 22.6% reported low back pain, 12.9% knee pain, and 15.2% both. The most common lumbar diagnoses were muscle spasm (16.6%) and intervertebral disc herniation (11.1%). In the knee, the most frequent findings were osteoarthritis (5.1%) and other soft tissue injuries (11.5%).

In physical examinations, the Straight Leg Raise (SLR) test was positive in 14% of participants, and the McMurray test was positive in 5%. In terms of treatment, 68% had not received any intervention, 14.7% had used medication, and 9.2% had undergone physiotherapy. Overall, 76.5% of participants were diagnosed as clinically healthy.

### Relationship Between Demographic Factors and MSD Indicators

As shown in Table 2, significant relationships were found between gender and pain location ( $\chi^2=21.93$ ,  $p=0.001$ ), pain duration ( $\chi^2=16.52$ ,  $p=0.001$ ), and treatment type ( $\chi^2=9.80$ ,  $p=0.044$ ). Marital status was significantly associated with pain location ( $p=0.02$ ) and

duration (p=0.03). Education level also correlated with treatment type (p=0.034).

Table 3 presents the treatment pattern by pain site and duration. The majority of participants with acute pain

received conservative treatment (medication or physiotherapy), whereas chronic pain cases were more likely to receive physiotherapy or surgical interventions.

Table 1. Demographic, Physical, and Pain Characteristics of Naval Personnel (n = 217)

Variable	Category / Measure	n (%) or Mean ± SD
Gender	Male	159 (73.3)
	Female	58 (26.7)
Marital status	Single	89 (41.0)
	Married	128 (59.0)
Education level	Below diploma	8 (3.7)
	Diploma	38 (17.5)
	University	171 (78.8)
Job category	Operational	69 (31.8)
	Administrative	52 (24.0)
	Healthcare	51 (23.5)
	Supportive	20 (9.2)
	Others	25 (11.5)
Main physical activity	Prolonged standing	102 (47.0)
	Prolonged sitting	44 (20.3)
	Bending/twisting	31 (14.3)
	Running/jumping	28 (12.9)
	Lifting/carrying	11 (5.1)
Leisure-time activity	None	71 (32.7)
	<30 min/week	33 (15.2)
	30–150 min/week	53 (24.4)
	>150 min/week	60 (27.6)
Smoking status	Non-smoker	217 (100)
Medical history	None	182 (83.9)
	Other conditions	35 (16.1)
Age (years)	————	35.87 ± 6.77
Height (cm)	————	171.64 ± 9.47
Weight (kg)	————	75.92 ± 12.65
BMI (kg/m <sup>2</sup> )	————	25.69 ± 3.16
Body fat (%)	————	14.27 ± 4.47
Low back pain intensity (0–10)	————	1.51 ± 2.59
Knee pain intensity (0–10)	————	2.24 ± 3.02
Pain site	None	107 (49.3)
	Low back	49 (22.6)
	Knee	28 (12.9)
	Both back and knee	33 (15.2)
Pain duration	Acute	52 (24.0)
	Subacute	34 (15.7)
	Chronic	26 (12.0)
	None	105 (48.4)
Treatment received	None	148 (68.2)
	Medication	32 (14.7)
	Physiotherapy	20 (9.2)
	Exercise therapy	14 (6.5)
	Surgery	3 (1.4)
Final diagnosis	Healthy	166 (76.5)
	Lumbar disorder	27 (12.4)
	Knee disorder	19 (8.8)
	Both	5 (2.3)

Table 2. Relationship Between Demographic Variables and Musculoskeletal Disorder Indicators

Demographic Variable	MSD Indicator	$\chi^2$	p-value
Gender	Pain site	21.934	0.001**
	Pain duration	16.518	0.001**
	Low back pain severity	28.256	0.022*
Marital status	Knee pain aggravating factors	22.418	0.001**
	Type of treatment	9.800	0.044*
	Pain site	9.884	0.020*
	Pain duration	8.726	0.033*
	Low back pain type	13.200	0.022*
Education level	Low back pain severity	20.867	0.022*
	Treatment type	16.658	0.034*
Occupational activity	Pain site	27.082	0.028*
Pain site × treatment type		87.754	0.001**

\*p < 0.05, \*\*p < 0.01 (Chi-square test).

Table 3. Treatment Pattern According to Pain Location and Duration

Pain Variable	Treatment Type	No Treatment	Medication	Physiotherapy	Exercise Therapy	Surgery
Pain site	None	103 (96.3)	1 (0.9)	2 (1.9)	1 (0.9)	0 (0)
	Low back	17 (34.7)	17 (34.7)	8 (16.3)	6 (12.2)	1 (2.0)
	Knee	14 (50.0)	3 (10.7)	6 (21.4)	4 (14.3)	1 (3.6)
	Both	14 (42.4)	11 (33.3)	4 (12.1)	3 (9.1)	1 (3.0)
Pain duration	None	103 (98.1)	0 (0)	0 (0)	2 (1.9)	0 (0)
	Acute	23 (44.2)	13 (25.0)	8 (15.4)	8 (15.4)	0 (0)
	Subacute	15 (44.1)	9 (26.5)	7 (20.6)	2 (5.9)	1 (2.9)
	Chronic	7 (26.9)	10 (38.5)	5 (19.2)	2 (7.7)	2 (7.7)

### Discussion

The findings of this study demonstrated that more than half of naval personnel in the First Maritime Region experienced some degree of musculoskeletal pain or injury in the low back and knee regions, consistent with previous studies among military populations<sup>15,16,18</sup>. In a study by Mattila et al. (2017), approximately 28% of military service members reported low back pain during active duty, which often persisted during long-term follow-up.

Similarly, Ghafouri et al. (2022) reported a prevalence of low back pain exceeding 25% in the general Iranian population<sup>11</sup>, which is lower than the rate observed in the current study, likely reflecting the greater physical strain and occupational stress among naval personnel.

The significant association between gender and pain location in this study aligns with the findings of To et al. (2021), who reported that female military members were more susceptible to low back and knee pain than their male counterparts<sup>17</sup>.

Moreover, the positive correlation between BMI and

MSD prevalence is consistent with Darbandi et al. (2023), emphasizing the influence of body weight on the development of these disorders<sup>10</sup>.

Also, prolonged standing—reported by nearly half of participants—was strongly linked to musculoskeletal pain, consistent with the ergonomic risk factors identified by Sadeghi et al. (2022)<sup>8</sup>.

Our results suggest that specific occupational activities—such as prolonged standing or sitting and manual load carrying—play a key role in the occurrence of lumbar and knee injuries among military personnel. Implementing preventive strategies such as ergonomic training, regular exercise programs focusing on core muscle strengthening, and appropriate rest periods could help reduce the incidence and severity of these disorders.

### Conclusion

Musculoskeletal pain and injuries are highly prevalent among naval personnel of the First Maritime Region, particularly in the low back and knee areas.

Given the vital role of these forces in operational

missions, the implementation of periodic screening programs, corrective exercise training, ergonomic interventions, and early rehabilitation measures is strongly recommended to minimize the occupational burden of MSDs and maintain the operational readiness of naval personnel.

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### Conflict of Interest Disclosures

The authors declare that they have no known competing financial interests.

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### Authors' Contributions

All authors worked in this research equally.

### Ethical Statement

This study was approved by the Ethics Committee of Baqiyatallah University of Medical Sciences (approval number: IR.BMSU.REC.1402.000631).

### Declaration of Generative AI and AI-assisted technologies

No generative AI or AI-assisted technologies were used in the preparation of this manuscript.

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