



Correlation between the Body Posture and the Prevalence of Musculoskeletal Disorders in Line and Staff Employees in FARAJA, Yazd

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ABSTRACT

Aims This study aimed to investigate the prevalence of musculoskeletal disorders and determine its correlation with the body posture of FARAJA employees.

Instruments & Methods This descriptive correlation study was conducted on 360 FARAJA employees in Yazd City in 2019, who were randomly selected from different ranks. The Nordic Musculoskeletal Questionnaire was used to collect the necessary information, and the Phi coefficient was used to determine the correlation level.

Findings Among the 360 employees, 277 people had one or more musculoskeletal disorders (76.9%). Overweight had a weak correlation with the being in the Line or Staff ($\varphi=0.20$). Also, it correlated to the rank ($\varphi=0.58$). Neck disorder was correlated to the rank ($\varphi=0.28$). Neck, back and low back disorders had a weak correlation with overweight ($\varphi=0.2$). The bent position of the head and neck while working was correlated with musculoskeletal disorders of the neck, shoulder, back, and low back ($\varphi=0.2$). Observance of correct sitting was correlated to neck and back disorders ($\varphi=0.20$). There was a significant correlation between awareness of correct sitting and neck and knee disorders. Sitting percentage had a moderate correlation with the shoulder ($\varphi=0.36$) and knee ($\varphi=0.41$) disorders.

Conclusion The prevalence of musculoskeletal disorders among FARAJA employees in Yazd city is 76.9%. The level of awareness of the correct body postures during work and their observance is correlated to the type of disorder, and there is a significant correlation between disorders with overweight and job rank.

Keywords Musculoskeletal Disorders; Posture; Military Personnel

CITATION LINKS

[1] Study of musculoskeletal disorders of the cervical spine and upper extremity in Dentists ... [2] The relationship between musculoskeletal system abnormalities and family history in primary school ... [3] Investigating the impact of ergonomic training programs on the prevalence of musculoskeletal disorders of administrative and support ... [4] Evaluation of ophthalmologists' ... [5] Investigation of musculoskeletal disorders and its relationship with ergonomic working ... [6] Musculoskeletal disorders self-reported by dentists ... [7] Working until 70, government policy, economic need and the role of ergonomics ... [8] Association between sitting and ... [9] Associations between individual and workplace risk factors for self-reported neck ... [10] Effect of physical exercise interventions on musculoskeletal pain in all body regions among ... [11] Postural neck pain: An investigation of habitual sitting posture, perception ... [12] Back disorders among Israeli youth: a prevalence ... [13] The prevalence of low back pain and its correlation with functional disability, quality ... [14] Comparative assessment of low back pain and its determinants among ... [15] Epidemiological study of cumulative trauma disorder in ... [16] Development and test-retest reliability of an extended version of the Nordic Musculoskeletal ... [17] Adaptation of questionnaire measuring working conditions and health problems among ... [18] Ergonomic assessment of risk factors for musculoskeletal disorders of the ... [19] Anthropometric measurements and postural evaluation of Nurse's ... [20] The assessment of musculoskeletal condition and its relationship with years ... [21] The relationship between sitting habits during ... [22] Diagnosis and treatment of movement system ... [23] reQUENCY of neck and upper extremity musculoskeletal ... [24] Musculoskeletal pain and limitations in work ability in Swedish marines: a cross-sectional ... [25] Musculoskeletal disorders in the Greek armed ... [26] Musculoskeletal disorders in physically active conscripts: a one-year ... [27] Evaluation of the effect of the ergonomic principles' instructions ... [28] Assessment of ergonomic education in dental ... [29] Comparison of musculoskeletal disorders and pain among students with and without ... [30] Relationships between prolonged neck/shoulder pain and sitting spinal ...

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Introduction

Musculoskeletal disorders are injuries that occur to nerves, muscles, joints, cartilage, and other supporting structures, which are caused and exacerbated by sudden pressure or long-term exposure, such as excessive use, force, pressure, and inappropriate positions. These disorders are related to people's job status, which are caused or aggravated by workplace activities [1]. Correct body posture is one of the knowledges that every person should be familiar with and follow in his/her life in order to prevent physical abnormalities and enjoy the comfort of his/her body [2]. The requirement of this work is to know the standard natural postures as well as familiarity with the weaknesses and abnormalities that occur in the physical posture and to examine the prevalence of each of them in different societies [3].

Many musculoskeletal problems caused by work appear as pain in the joints. Incorrect posture is also a major factor in spine problems. In occupations where people sit for several hours, such as office staff, intervertebral disc problems have been reported more [4].

Researches show that musculoskeletal disorders in military personnel are about 79% [5], and these disorders have significantly caused absenteeism due to illness, reduced productivity and job abandonment [6, 7]. Studies have also been mentioned that the possibility of low back pain in a person with a sedentary job is more than others, and sitting too much can aggravate the symptoms in people who already have back pain. When the factors of vibration and unfavorable posture exist together, such as sitting in a car or driving, the risk of back pain increases four times [8]. Neck pain is the most common musculoskeletal complaint in workers, such as computer users, who perform repetitive movements such as typing or moving the mouse during their work activities [9, 10].

The prevalence of this disorder in computer users has been reported up to 31% [11]. The diseases that occur due to exposure to physical, chemical, biological or psychological factors in the work environment are called occupational diseases. Police officers, like other occupations, face occupational hazards, the consequences and effects of which can have adverse effects on a person's health. Among the injuries that threaten police officers during work are ergonomic mechanical injuries that appear in the form of spine and joint injuries and discomfort in the neck, shoulder, wrist, back, hip, knee, and ankle areas. These problems are mainly due to the posture of the body or the way of performing work activities, which are carried out while sitting or standing, carrying instruments such as weapons, or using special devices such as speed cameras. Maintaining a position for a long time, as well as lack of rest and lack of balance between muscles and repeated blows, can cause bone-joint damage. Foreign studies conducted

on military forces reported that overall 16% of young soldiers had at least one type of abnormal condition, while this prevalence rate for adult soldiers was reported to be around 30% [12].

Previous studies have shown that musculoskeletal problems are very common among employees [4] and police officers [5, 13]. Various researches conducted on some occupations, such as ophthalmologists [5], dentists [1], pharmacists [14], students [2] and other occupations [15], have shown different skeletal-muscular abnormalities and disorders for each occupation. But, none of them have investigated its relationship with the body position during work or with the type of work and rank. Based on the only study conducted in comparison between different occupations, the study of Aminian *et al.* showed that back pain was more common among male dentists than among male pharmacists [14], and in the study of Sedaghati *et al.*, women had more disorders than men [1]. So far, there has been no study on the relationship between body posture while working and physical injuries in the police force.

Considering the high prevalence of musculoskeletal disorders in police officers and destructive injuries that may occur over a long period of time, it is necessary to evaluate the way the body is positioned in different situations while working in this group. So that the common problems in the body posture are revealed, and the necessary information about the correct body posture is given. In this way, the occurrence and aggravation of the mentioned injuries can be prevented, and treatment methods with the lowest cost, such as group therapy or exercise therapy, can be recommended to them.

Therefore, this study aimed to investigate the prevalence of musculoskeletal disorders and determine its correlation with the body posture of FARAJA employees.

Instruments and Methods

This descriptive correlational study was conducted among 360 senior officers, subofficers, and non-commissioned officers in Yazd in 2019. Using Morgan's table, the minimum number of samples was determined to be 327 people, but to be sure, 360 questionnaires were randomly distributed among the employees. There are 72 people from the "Staff" group of 381 people, including administrative, computer and system, telecommunication, logistics, engineering, health, education, and arts (20% of 360 people) and 288 people from the "Line" group of 1639 people, including the information, criminal police department, special operations, and traffic police (80% of 360 people) were selected as samples. The Nordic Musculoskeletal Questionnaire was distributed among them, and at the same stage, their expertise and body posture during work were recorded. This questionnaire consists of two parts: a) general questionnaire and b) specific questionnaire.

The purpose of the general questionnaire is a general examination, and it discusses the symptoms of disorders in the whole body. In the general questionnaire, personal characteristics, such as age, sex, weight, height and left-handedness or right-handedness, are included. In a special questionnaire, a deep analysis of symptoms in certain areas of the body, such as the back, neck, shoulders, hands, and wrists, is done. In general, two goals have been pursued in the design of this questionnaire: a) as a tool for screening skeletal-muscular disorders and b) for use in occupational health services. Screening of skeletal-muscular disorders can be used as a diagnostic tool for analyzing the work environment, workstation and tool design. The general questionnaire is designed to answer these general questions: "What is the prevalence of disorders in the studied society?" and "These disorders are mostly concentrated in which of the body organs?" Considering this issue, this questionnaire has been designed in such a way that it has divided the human body into 9 anatomical regions. These anatomical areas were selected according to two criteria: a) the organs where the symptoms are concentrated and b) the organs that can be distinguished from each other by both the respondent and the researcher.

Verbal questions about each anatomical area of the body were asked to the individual in order, and the individual was asked to answer whether he had discomfort or problems in these areas during the last 12 months and whether these problems caused him to leave work or be unable to work. In addition, it was asked about the presence of pain or discomfort during the 7 days before filling the questionnaire for each of these areas. This standard questionnaire has been widely used in the countries of Denmark, Finland, Norway, Sweden and also in more than 100 different projects in the current activities of occupational health services. This questionnaire provides useful and reliable information about the symptoms of skeletal-muscular disorders, which can be used for deeper investigations or decision-making in the field of corrective measures. In this research, sufficient explanations were provided first, and then individual information was recorded in the questionnaire. Dawson *et al.* evaluated the validity and reliability of this questionnaire in 2009, and Cronbach's alpha was 0.97, and Intra-Class Correlation coefficient (ICC) was 0.90 [16]. This questionnaire collects reliable information about the onset, prevalence, and consequences of musculoskeletal pain in 9 body regions, which can be used in descriptive studies or longitudinal studies. This questionnaire is completed through self-report and personal interviews. Also, Arsalani *et al.* examined the validity and reliability of the translated questionnaire in 2011. In the reliability evaluation, Cronbach's alpha was 0.6 and ICC=0.7 [17].

Kolmogorov-Smirnov test was used to check the normality of data distribution, and Levene's test was

used to check the equality of variances. The Phi coefficient was used to determine the correlation between musculoskeletal disorders and body posture. All analyzes were done with SPSS 25 software.

Findings

The demographic characteristics of the subjects are presented in Table 1.

Table 1) Demographic characteristics of subjects

Variables	Line group (n=288)	Staff group (n=72)
Age (years)	33.91±6.18	38.03±7.17
Weight (kg)	85.48±12.16	79.30±11.61
Height (cm)	176.89±5.82	174.47±6.73
Body Mass Index (kg/m ²)	27.34±3.73	26.05±3.53
Work experience (years)	12.64±5.89	16.90±6.76

Among the 360 people in the examined sample, 277 people had one or more musculoskeletal disorders (76.9%). On average, each person had 2.64±2.24 disorders. The highest prevalence of musculoskeletal disorders was related to the lower back (51.8%) and then the neck (46.5%), which means that almost half of the employees suffered from these two disorders. After these two, knee (34.5%), back (33.4%) and shoulder (26.7%) had the highest prevalence, respectively (Table 2).

The highest rate of absenteeism from work was due to low back and neck disorders, followed by back and shoulders, all of which were due to static, sedentary, and abnormal positions for long periods while performing work and tasks. On average, the personnel were absent from work for 68.25±48.9 days due to disorders. About 40% to 80% of musculoskeletal disorders occurred during work and in the work environment, and most of them were neck, back, and low back (Table 2).

Table 2) The percentage of prevalence of musculoskeletal disorders and the number of days absent from work according to the affected areas

Area	Prevalence of musculoskeletal disorders (%)	Days absent from work (No.)
Neck	46.5	129
Shoulder	26.7	57
Wrist	18.9	48
Back	33.4	70
Low back	51.8	154
Hips and thighs	15.0	13
Knee	34.5	27
Foot and ankle	23.4	48

About 30% of "Line" employees and 24% of "Staff" employees had little or very little knowledge about how to sit correctly, and only 15% of "Line" employees and 15% of "Staff" employees were completely or very aware of how to sit correctly. About 43% of the "Line" employees observed the correct sitting manner at all, very little, or little, and 36% of the "Staff" employees followed the correct

sitting method little or very little. 21% of "Line" employees and 14% of "Staff" employees followed correct way of sitting a lot or completely (Table 3). The head and neck position was bent in 47% of the "Line" employees and 52% of the "Staff" employees. In 51% of the "Line" employees and 48% of the "Staff" employees, the position of the head and neck was straight and along the trunk. Overweight had a weak but significant correlation with the being in the Line or Staff ($\varphi=0.20$). Also, it correlated to the rank ($\varphi=0.58$). Neck disorder was also correlated to the rank ($\varphi=0.28$). Neck, back and low back disorders had a weak but significant correlation with overweight ($\varphi=0.2$). Back and low

back disorders had a significant correlation with the degree of the samples ($\varphi=0.20$). The highest correlation was between overweight and rank ($\varphi=0.58$) followed by rank with neck ($\varphi=0.28$) and low back ($\varphi=0.25$). The bent position of the head and neck while working was correlated with musculoskeletal disorders of the neck, shoulder, back, and low back ($\varphi=0.2$). Observance of correct sitting was correlated to neck and back disorders ($\varphi=0.20$). There was a significant correlation between awareness of correct sitting and neck and knee disorders. Sitting percentage had a moderate correlation with the shoulder ($\varphi=0.36$) and knee ($\varphi=0.41$) disorders (Table 4).

Table 3) The percentage of awareness and observance of correct sitting in the two groups of "Line" (n=288) and "Staff" (n=72)

Variable	At all	Very little	Little	To some extent	Much	Completely
Awareness of correct sitting (%)						
Line group	0.04	16	10	56	11	0.04
Staff group	0.01	12	11	62	11	0.04
Observance of correct sitting (%)						
Line group	0.06	22	15	36	18	0.03
Staff group	0.04	14	18	49	13	0.01

Table 4) Correlation between musculoskeletal disorder with different factors in all samples (Only significant correlations are written.)

Variable	Overweight	Neck	Shoulder	Low back	Back	Knee
Line/Staff	$\varphi=0.20$ $p=0.045$	-	$\varphi=0.20$ $p=0.010$	-	-	-
Rank	$\varphi=0.58$ $p=0.0001$	$\varphi=0.28$ $p=0.007$	-	$\varphi=0.25$ $p=0.021$	-	-
Degree	-	-	-	$\varphi=0.20$ $p=0.003$	$\varphi=0.20$ $p=0.040$	-
Overweight	-	$\varphi=0.20$ $p=0.017$	-	$\varphi=0.23$ $p=0.002$	$\varphi=0.23$ $p=0.003$	-
Awareness of correct sitting	-	$\varphi=0.20$ $p=0.027$	-	-	-	$\varphi=0.23$ $p=0.010$
Observance of correct sitting	-	$\varphi=0.20$ $p=0.045$	-	-	$\varphi=0.20$ $p=0.009$	-
Head and neck position	-	$\varphi=0.23$ $p=0.0001$	$\varphi=0.20$ $p=0.025$	$\varphi=0.20$ $p=0.030$	$\varphi=0.20$ $p=0.003$	-
Sitting percentage	-	-	$\varphi=0.36$ $p=0.05$	-	-	$\varphi=0.41$ $p=0.008$

Discussion

This research aimed to determine the correlation between the prevalence of musculoskeletal disorders and the body posture and the level of awareness of the employees of FARAJA based on their service level, which was conducted on 360 FARAJA employees in Yazd city using the Nordic Questionnaire. The results showed that the prevalence rate was 76.9%, that there was a weak correlation between musculoskeletal disorders of the neck and rank ($\varphi=0.28$; $p=0.007$), and there was a significant moderate correlation between overweight and rank ($\varphi=0.58$; $p<0.001$). In terms of the prevalence rate, other studies have also reported similar prevalence, such as the study by Pajoohnia *et al.*, who reported the prevalence rate in a military center to be 78.4% [18] and the study by Pourtaghi *et al.*, who reported the prevalence rate to be 79% [5]. Musculoskeletal disorders are mostly caused by body posture with long-term repetitions, which are caused by physical work in different

positions [19]. The body posture of each person is affected by various factors, such as structural, physiological, pathological, psychological factors, as well as environmental, social, cultural, and emotional factors.

Undoubtedly, the reason for the similarity of the prevalence of disorders among employees is the nature of the job and the related situations. Long-term and static working position without time intervals for rest increases muscle pressure, fatigue, and finally, increases the amount of pain. If the ergonomic conditions do not change and there is no management to have the necessary time to rest, the risk of developing musculoskeletal disorders increases day by day. Previous research reported that doing certain activities for a long time causes changes in the shape of the spine and adaptation of the body to that particular situation. Beyranvand *et al.* showed that there is a significant relationship between years of work with forward head abnormalities and back kyphosis of subjects. It seems that working

conditions and environment can directly play a role in creating musculoskeletal disorders [20]. Balouchy *et al.* reported that there is a significant relationship between the position of sitting behind the desk and the complications of back kyphosis and forward head posture. In this study, it has also been reported that there is a significant relationship between the position of sitting on one side and the abnormalities of scoliosis and uneven shoulder [21]. Sahrman *et al.* mentioned fixed body position and repetitive movements as two inducers that will lead to small damages and then large damages in the body tissues through adaptation in the nervous and musculoskeletal tissues. And finally, they will cause disorders in the involved area [22]. Improper body posture is considered one of the most important risk factors for causing musculoskeletal disorders in any job because long-term work in a fixed position causes pressure on muscles and joints, as well as stiffness of muscles or destruction of joints. Fixed body postures, especially with long-term improper posture, lead to sustained muscle contraction, which leads to muscle stiffness and makes a person susceptible to all kinds of musculoskeletal disorders [23].

In foreign studies conducted on military forces, it has been reported that, for example, the highest rate of musculoskeletal disorders was seen in tall people with a height higher than 186 cm in the military personnel of the Swedish Navy [24]. Malliarou stated the average rate of musculoskeletal injuries in the Greek army to be 22% [25]. While Taanila *et al.*, who researched musculoskeletal injuries in the Irish army, showed that more than 33% of soldiers have these injuries, and the most disorder is related to low back pain [26], which is consistent with the present research. Holding training courses on the correct ways of doing work in terms of compliance with ergonomic principles, back support programs, and sports programs before and during work to prepare the body with an emphasis on corrective movements to strengthen the muscular system and improve musculoskeletal disorders with Using the advice of sports science experts as the cheapest method can be a suitable solution to reduce musculoskeletal disorders in the workplace. Of course, it has been shown in studies that holding short-term training courses on ergonomic principles cannot be satisfactory in changing postures during work, which have not been familiar with these principles since the beginning of their student days [27], and there is a need to spread the culture of doing work with ergonomic principles among the employees of this profession. The only way to do this is to include ergonomic training units in students' curriculum at appropriate intervals during their studies so that in many educational centers, including in the United States, specialized ergonomic methods and working with military tools are included in the curriculum [28]. Abshenas *et al.*, in their study on the prevalence of musculoskeletal disorders and their relationship

with the amount of physical activity reported that people with low physical activity showed the highest amount of pain and musculoskeletal disorders, and people with good physical activity showed the lowest amount of pain and musculoskeletal disorders [29]. Therefore, it is recommended to the police force employees to increase physical activity, especially by participating in sports activities, in addition to preventing musculoskeletal disorders to achieve better physical fitness as well as ideal weight ratio. As the results show, most of the employees are overweight, and even in each department, type one or two obesity is also seen.

Awareness of correct body postures, such as sitting on the one hand and observing these correct postures on the other hand, can be effective in the occurrence of these disorders. Straker *et al.* investigated the relationship between neck pain, long shoulder pain, and the posture of the vertebral column. Sitting posture habits with and without neck pain and shoulder pain were evaluated. People whose neck pain and shoulder pain were longer, and their neck-chest posture was more bent, had a straighter trunk and more lumbar depression. When the factor of gender was controlled, lumbar depression had a relationship with long neck pain and shoulder pain [30]. Therefore, it is suggested to train the employees during the work and remind them of the obligation to comply with it.

In this study, the amount of physical activity and exercise of employees was not investigated, and only the hours of sitting were considered. Due to the large number of samples and the impossibility of physical examination of people, the amount and severity of physical abnormalities were not investigated. It is suggested that in future studies, the relationship between the level of physical activity and the different types and severity of physical abnormalities should also be investigated. Considering the role of physical activity in the prevention and treatment of disorders, it is suggested that the unit for monitoring the physical health of employees be set up, and along with training, the necessity of physical activity and movement, which have both preventive and curative roles, should be emphasized. Also, according to the results of this research, it is suggested that employees avoid sitting too much and static and monotonous postures, especially to have more physical activity at work.

Considering the high prevalence rate (76.9%) of musculoskeletal disorders among FARAJA employees in Yazd city, it seems that measures should be taken to prevent and control it. Since the level of awareness of the correct body postures while working and observing them is related to the type of disorder, it is recommended to train and encourage employees to observe the correct posture. Despite the correlation between disorders with overweight and job rank, and considering that this correlation is not a cause and effect, the cause of overweight is probably inactivity

and sitting too much, which can be the main cause of disorders.

Conclusion

The prevalence of musculoskeletal disorders among FARAJA employees in Yazd city is 76.9%. The level of awareness of the correct body postures during work and their observance is correlated to the type of disorder, and there is a significant correlation between disorders with overweight and job rank.

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