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# Musculoskeletal Disorders among Healthcare Network Staff using Rapid Office Strain Assessment (2019)

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ABSTRACT

**Aim:** Work related Musculoskeletal Disorders (MSDs) are one of the most common complaints among staff doing static or repetitious tasks using the upper limbs and individuals who work with computer for hours. The aim of this study is to evaluate the prevalence of MSDs among computer users in the office department of Healthcare Network of Iran.

**Method and Instruments:** This descriptive-analytic study was conducted on 105 computer users in the Healthcare Network who were selected through census sampling method in 2018. The data collecting tools included the Cornell Musculoskeletal Discomfort Questionnaires (CMDQ) and the Rapid Office Strain Assessment (ROSA) checklist. To investigate the relationship between demographic variables and the final ROSA score, Analysis of Variance ANOVA and T-test were used.

**Findings:** Totally, 105 computer users with mean age of 38.7 ± 7.1 years and mean work experience 7.4 ± 14.7 years were assessed. Discomfort and musculoskeletal pain in the neck and hip were more common than the other parts. The results of the ROSA method showed that the final mean ROSA score was 5.38 ± 1.07. About 37.1% of the cases need just notification and 62.9% of them need ergonomic intervention. Moreover, gender and work experience had a significant effect on the final ROSA score (P<0.001).

**Conclusion:** A high prevalence of MSDs was observed in the neck and hip regions of computer users. Given the ROSA score, which was at notification area, a series of ergonomic and managerial measures are needed to improve the conditions of the workstations and reduce the prevalence of MSDs.

**Keywords:** Musculoskeletal Disorders, Healthcare Workers, Rapid Office Strain Assessment.

## Introduction

Despite the fact that science and technology lead occupational duties towards automation, physical activities, such as carrying stuff, still cause pressure on the body[(1)] in almost all occupations, which is mostly due to improper body posture. Work-related Musculoskeletal Disorders (WMSDs) are one of the most important factors affecting job satisfaction. The WMSDs are a series of disorders that can affect various parts of the body, including muscles, tendons, joints, and nerves [(2)].

According to Office of Occupational Safety and Health's report in 2010, Musculoskeletal Disorders (MSDs) are one of the the most common health problems in workplaces affecting millions of people, with an estimated prevalence of 61-70% among office staffs [(3, 4)]. In spite of significant efforts made to reduce the prevalence of MSDs, they still account for high economic and social costs and a major factor in reducing productivity [(5, 6)]. The prevalence of these disorders increase dramatically with increase of exposure to risk factors in workplaces.

Major MSDs risk factors include physical risk factors (e.g. adverse postures,repetitive movements,and prolonged sitting), organizational/ psychosocial risk factors (e.g. work stress, work load, and work shift duration), environmental risk factors, and individual risk factors [(7, 8)]. Researchers have referred

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to the work shift duration (sitting behind the desk or using a computer) as the main MSDs-associated factor. These disorders generally occur in the upper limbs, head, neck, and back regions of computer users [9]. Using Rapid Office Strain Assessment (ROSA) method, Farasati et al. investigated MSDs in Video Display Terminal (VDT) users. The results showed that ROSA can be used as a useful tool for identifying and grading ergonomic risks in modern office environments [10]. In another study in Iran, Nasiri et al. evaluated the MSDs risk factors and implemented ROSA using the ergonomic intervention program in Bank Sepah employees. In this study, the prevalence of MSDs was significantly decreased nine months after interventions [11]. In other previous study, it was also suggested that computer works as one of the most dangerous occupations leading to MSDs [12]. The staff of the health networks are exposed to MSDs due to their daily and continuous work with computers, repetitive works, and high workload.

Today, various methods have been developed to assess occupational exposure to the risk factors involved in these disorders. Each of these methods calculates the final score based on deviation of the body from the natural posture, factors such as static and dynamic forces affecting the body, a repetitive posture, duration of work, and other environmental, organizational, and individual factors. They also determine the type of intervention needed based on the obtained score. Rapid Upper Limb Assessment (RULA), Quick Exposure Checklist, and ROSA are among these methods.

In order to determine the risk of ergonomic factors and provide reports for the implementation of interventions and thus to preserve the health of human resources, all of these methods function based on posture, industry, and the occupation in question, and the users [13]. Various studies have shown that computer work can cause MSDs and injuries in various parts of the body, including neck, shoulder, elbow, wrist, and fingers [14, 15].

However, adverse work posture and its relationship with the risk factors of occupational environments is always an important health concern for office staff. Therefore, considering the prevalence of occupational risk factors among computer users and the frequency of MSDs as well as the high population of computer users on one hand, and the importance of preventing such disorders and injuries in work environments on the other, is essential to study MSDs in order to control the disorder and improve the work condition of office staff.

In light of these justification, the aim of this study is to investigate the risk factors for the MSDs in the workplace of office staff who are required the use of computers for hours every day in a static and sitting positions.

## Method and Instruments

This descriptive-analytic study was conducted in 2018 on 105 staffs of the healthcare network in Ardabil Province-Iran. The participants were selected using census sampling. Inclusion criteria included all healthcare staff who had worked with computers for at least one year and three hours per day. Exclusion criterion was a history of MSDs. All subjects performed their tasks in the sitting position and their tools equipments included computers, monitors, keyboards, mousse, telephones, and office letters.

The data collecting tools included Cornell's Musculoskeletal Discomfort Questionnaire (CMDQ) and the ROSA checklist. The CMDQ is an effective tool for evaluating musculoskeletal discomforts based on self-reporting data on the severity of pain and discomfort in the neck, shoulder, upper back, upper arm, lower back, forearm, wrists, hips, thighs, and knees.

The tool has acceptable validity and reliability for ergonomic evaluations [16]. The ROSA

is a pen-paper and observational method introduced in 2012. It focused on the activity of office users, especially office activities in the jobs that frequently include working with a computer. The tool has been developed based on the earlier assessment methods. This method has a good reliability to evaluate MSDs. The assessment process in this method consists of three main sections and the obtained scores for the following sections were placed in the respective tables including chair and sitting posture, screen and phone, mouse and keyboard, the persons' posture when using these tools, and the duration of using each of these tools per day. The final ROSA score is determined by summing up scores obtained in each section. The final ROSA score is between 6 and 16 that scores 3-5 and above 5 indicate warning and the need to intervention, respectively [10]. To determine the relationship between demographic variables with final ROSA score, Analysis of variance ANOVA, T-test, and Chi-square tests were used in SPSS.22.

## Findings

In total, 63 (60%) men and 42 (40%) staff participated in the study. The mean age of the subjects was 38.7 ± 7.1 years and the average years of work experience of the staff was 14.7 ± 0.7 years (Table 1).

**Table 1** Demographics of participants

| Variable | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|
| Age(y) | 38.7 | 7.1 | 25 | 52 |
| BMI (kg/m2) | 26.5 | 3.4 | 17.1 | 33.2 |
| Work experience (y) | 14.7 | 0.7 | 1 | 30 |

The results of ROSA method used to determine the level of risk at the workstations. This test showed that the mean ROSA score was 5.38±1.07, which means 37.1% of sample group were in the notification area (score 3 to 5) and 62.9% need ergonomic intervention (5<). These results are presented in Table 2.

The results showed, 22 (63%) and 26 (45%) of the participants complained of neck and hip problems respectively. Table 3 lists the prevalence of MSDs based on the results of the Cornell questionnaire for each organ and . Table 4 shows the results of the Chi-square test for assessing the relationship of the prevalence of MSDs with years of work experience, gender, Body Mass Index (BMI), and final ROSA score of the workplace risk level.

**Table 2** The final ROSA score for determining the prioritization of corrective measures

| Score | N (%) |
|---|---|
| 4 | 3(8.6) |
| 5 | 10 (28.6) |
| 6 | 16 (45.7) |
| 7 | 2 (5.7) |
| 8 | 4 (11.4) |
| Total | 35 (100) |

**Table 3** The prevalence of MSDs based on the responses of users to the Cornell

| Area | Pain and discomfort N (%) |
|---|---|
| Neck | 22 (63) |
| Shoulder | 13 (37.1) |
| Upper back | 14 (34.4) |
| Lower back | 12 (32.4) |
| Forearm | 9 (25.7) |
| Wrist | 9 (21.2) |
| Hip | 26 (45.7) |
| Thigh | 9 (25.7) |
| Knee | 8 (18.2) |
| Lower part | 10 (28.6) |

MSD: Musculoskeletal Disorder

ANOVA test was used to investigate the relationship between years of work experience, final ROSA score and BMI at

**Table 4** The relationship between the prevalence of MSDs of the organs and the variables studied

| | Variable | | | | |
|---|---|---|---|---|---|
| | **Gender** | **Work experience (y)** | **BMI (kg/m2)** | **Level of Education** | **Risk levels** |
| Neck | 0.714 | 0.315 | 0.570 | 0.343 | 0.124 |
| Shoulder | 0.140 | 0.522 | 0.773 | 0.961 | 0.462 |
| Upper back | 0.146 | 0.730 | 0.463 | 0.951 | 0.314 |
| Lower back | 0.348 | 0.632 | 0.818 | 0.544 | 0.302 |
| Forearm | 0.787 | 0.904 | 0.085 | 0.831 | 0.273 |
| Wrist | 0.800 | 0.936 | 0.821 | 0.940 | 0.424 |
| hip | 0.303 | 0.790 | 0.020 | 0.760 | 0.194 |
| thigh | 0.224 | 0.636 | 0.758 | 0.859 | 0.444 |
| Knee | 0.628 | 0.916 | 0.858 | 0.652 | 0.515 |
| Lower part | 0.101 | 0.942 | 0.135 | 0.230 | 0.281 |

**Table 5** Relationship between the mean final ROSA score and the demographic variables

| **Test** | **Gender** | **Work experience (y)** | **BMI (kg/m2)** | **Level of Education** |
|---|---|---|---|---|
| ANOVA | - | 0.001 | 0.736 | 0.370 |
| T_TEST | 0.001 | - | - | - |

level of p= < 0.05. Independent t-test was also used to compare the mean scores of men and women. Results of the both statistical tests were reported in Table 5.

## Discussion

The risk factors of MSDs were examined using ROSA method for different parts of the body of office staff working in healthcare network. It was observed that musculoskeletal discomforts and pains were more common in the neck and hip regions than the other organs. Dormohammadi et al. reported that pain in the neck and waist was more frequent [17]. This can be due to inappropriate design of workstations, adopting adverse postures while working with computers, and spending many hours in sitting position. Moreover, office work often requires static posture and sitting on a chair for a long time. In a study on 1428 office staff, Janwantanakul et al. found a high prevalence of MSDs in the practitioners, with highest rates of MSD in the neck, waist, and back regions; which is consistent

with the present study [18]. In contrast, the lowest pain level was observed in knees, which is consistent with Moom et al. (2015) [18]. The effect of the years of work experience on the final ROSA score showed that individuals with higher years of work experience were more exposed to workplace risk factors, which indicates the aggregative nature of factors affecting the occurrence of MSDs, which is consistent with the results of other the studies [10, 19]. The results of present study also showed the significant effect of gender on the final ROSA score. Previous studies have shown the effect of gender on the final score of other ergonomics evaluation methods [20, 22]. This effect may be explained by the fact that most of workstations are designed for men's anthropometric dimensions and smaller body and muscle size of women increases the risk factors for the women are exposed to these workstations at workplace.

The findings of this study also showed that the final ROSA score was not significantly related to education level and BMI. In a study on musculoskeletal injuries and associated risk factors in the office work environment, Choobineh et al., found no significant relationship between education level and the incidence of these disorders, which is consistent with the present study. This difference may be due to the dispersion of education levels and BMI values among participants [23].

In the present study, it has been shown that all the participants who had skeletal musculoskeletal discomfort and pain in one of their organs were in the notification and need areas for ergonomic intervention. The disproportion between workstations and physical dimensions of operators, the use of non-ergonomic desks and chairs, and inappropriate postures can cause premature fatigue or musculoskeletal injuries. Analyses of the ROSA scores showed that the condition of work stations was inappropriate. However, Chi- square test did not show a significant relationship between the final ROSA score and the prevalence of MSDs.

## Conclusion

Overall, the findings showed a high prevalence of MSDs in the neck and hips of computer users and the need for corrective measures to ease the pains that the staff suffered. The ROSA assessment method is a useful tool for determining the work postures based on office equipment and computer workstations. The ROSA scores can be a basis for corrective measures to improve the ergonomic conditions of the work environment. Hence, a series of ergonomic and managerial measures can be effective in improving workstation conditions to reduce MSDs.

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## Ethical Permission

This study was approved by ethical committee of Ardabil University of Medical University with code IR.ARUMS.1397.076

## Conflicts of interest

None of the authors has any conflict of interest in this manuscript.

## Author Contribution

AL designed the study.

MFA analyzed and interrelated the data

HEG participated in collecting and managing the data.

NR participated in collecting and managing the data.

BE participated in collecting and managing the data

AB approved the study design and manage

the conducting process and wrote the paper. All authors read and confirmed the paper.

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