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*Full length Research* ***Paper***

# Associations between Musculoskeletal Pain and Work-related Factors amongst Computer Staff

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***Abstract***
*Understanding computer sciences in occupational activities were establishing very rapid. Epidemiological reviews have proven that musculoskeletal issues are extensively regularly occurring amongst staff working with a computer. The goal of this study was to evaluate the prevalence of musculoskeletal discomfort in a lot of anatomical areas and its associations with man or woman, ergonomic, and psychosocial reasons among computer workers from three technology companies in Cairo, Egypt. The investigation which includes two components – questionnaire study (Nordic Musculoskeletal Questionnaire and Copenhagen Psychosocial Questionnaire) and direct observation (analysis of labor ergonomics making use of the Rapid Upper Limb Assessment [RULA]) – used to be carried out in three randomly selected technology companies of Cairo, Egypt. The study sample comprised 5 employees. The prevalence of musculoskeletal ache in 5 anatomical areas of the body (shoulders, elbows, wrists/hands, as well as higher and low back) used to be evaluated. The prevalence rates of shoulder, elbow, wrist/hand, upper and low back discomfort were 50.5 %, 20.3 %, 26.3 %, 44.8 %, and 56.1 %, respectively. Character causes equivalent to gender, age, computer work experience, and body mass index were located as huge for musculoskeletal pain in various musculoskeletal areas. The respondents reporting pain in shoulder, wrist/hand, upper pain, and back pain areas had a statistically significantly bigger mean RULA score. The period of working with a computer was determined as a significant factor for shoulder pain. High quantitative needs have been concerning musculoskeletal pain in all investigated anatomical areas count on for the low back; weak social support was a significant predictor for complaints in higher and low pain areas. This study established an association between musculoskeletal pain and work ergonomics; thus, preventive measures on the office will have to be directed to the advance in ergonomic work environment, education, and workload optimization.*

***Key words:*** *Musculoskeletal, Computer work, Ergonomics, RULA*

## Introduction

Musculoskeletal (MS) disorders are one of the most computer work associated health problem in Europe, affecting thousands of workers [1]. It is usually the most important workforce of occupational illnesses accounting for about one third and more of all registered occupational disorders in the U.S., Scandinavian international locations, and Japan [2]. Know-how computer sciences have come to be critical within the place of work environment, which has led to intensified computer use. Many epidemiological experiences show that MS complaints are widely prevalent amongst staff working with a computer [3–10]. Scientific reports point out that computer users mostly report complaints about suffering the neck area [7–11]. A survey on MS complaints in the neck and their associations with work related factors has shown an extraordinarily excessive prevalence (65.7 %) of MS ache in these areas in the course of a 12-month interval [12]. Nonetheless, complaints about pain in other anatomical body regions (shoulders, upper extremities, pain) are also usual amongst computer users. Big associations of those complaints with each physical [10, 13–15] and psychosocial [16–19] work environment are famous in reports. Research confirms that the working environment is not the only component that has an have an impact on the development of MS disorders – person characteristics akin to gender, age, and body mass index (BMI) are also colossal [6, 20–22]. Some reports have suggested evidence that MS issues have a multifactorial beginning [3, 23, 24]; nevertheless, different systematical reviews have not verified psychosocial causes to have a predictive worth for MS complaints [25] or have now not located even reasonable evidence to verify causative relationship between computer work and identified MS problems [26]. To be able to absolutely take into account the predisposing features of MS problems, all explanations – man or woman, physical, and psychosocial – had been analyzed on this study. The aim was to evaluate the prevalence of MS pain in

various anatomical regions and its associations with man or woman, ergonomic, and psychosocial causes amongst computer staff within the main technology companies in Cairo, Egypt

**Materials and Methods**

This study was a cross sectional epidemiologic study in the period from September to December 2014. Scientific literature established that frequency of the event of interest – MS issues – in computer working populations varies from 6.6 % to 70 %. The sample size calculation was based on the frequency with 5 % probability of error and 95 % reliability, and 0.5 relative frequencies [27], and this resulted in 384 individuals needed to participate in the study. The study population had been randomly selected to recruit members from three large scale technology companies located in Cairo, Egypt. Employees whose work ware directly involving computer use were invited to take part in the study. A total of 750 questionnaires had been distributed amongst workers, and 653 staff agreed to take part in the study and completed the questionnaire properly (response expense, 87.0 %). The participation in this study was nameless and voluntary; written informed consent to be obtained from all participants.

**Questionnaires**

A 3-part questionnaire was used in this study. The first part of the questionnaire included the questions that have been designed to gather individual knowledge of the respondents (age, gender, height, weight, and computer work expertise). The division into age categories was executed for the purpose of statistical analysis; the individuals had been divided into four age groups. Computer work experience was once labeled into three corporations. The second phase was once intended to check the 12month occurrence of MS pain involving five anatomical areas of the body: shoulders, elbows, wrists/arms, as good as upper and low back. For this rationale, the Nordic Musculoskeletal Questionnaire was used [28]. The standardized Copenhagen Psychosocial Questionnaire was once employed in order to evaluate the psychosocial work environment [29].

Five scales (quantitative demands, cognitive demands, responsibility demands, degree of freedom at work, and social support) of the Copenhagen Psychosocial Questionnaire, every made from a specified combination of questions, were used in this study (Every question had five viable response options (always, often, sometimes, rarely, never or correct, almost correct, somewhat correct, almost wrong, wrong). Solutions had been transformed right into a quantity between zero and one hundred. A total scale ranking used to be computed because the mean score throughout questions in every scale. Depending on the mean scale ratings, the respondents had been divided into three groups based on the margins of tertiles: high, average, and low level of observed phenomena (Fig. 1). The internal reliability of all five scales and the Nordic Musculoskeletal Questionnaire scale was (Cronbach's $\alpha>0.7$).

**Instrument of ergonomic investigation**

In the course of this study, the Rapid Upper Limb Assessment (RULA) [30] was used in order to assess the work posture and performed actions among computer workers. If the investigator was no longer able to investigate it during surveillance, the employee used to be asked a few questions, e.g., how much time a day a worker spends talking on the cell pinching it to the ear with the aid of the shoulder, even as performing the movements tasks with the computer; how long he/she daily spends arranging the records or speaking to clients etc. Without utilizing a computer. Following this process, the work posture and movements of individual areas of the body were evaluated in ratings with a higher rating indicating higher stress for the MS subject under investigation.

**Statistical analysis**

Statistical knowledge analysis used to be carried out using the SPSS (variation 20.0) program bundle. Hypotheses about the equality between the averages of two quantitative variables and two percentage variables have been examined by means of U (non-parametric Mann–Whitney experiment) and z exams, respectively. Values of $P<0.05$ have been regarded statistically giant. So as to check whether or not the chosen character and work-associated reasons have been related to MS complaints, binary logistic regression analysis (multivariate) was utilized. The outcome of the evaluation is awarded as odds ratios (ORs) and ninety five % self-belief intervals (CIs).

**Results**

The overwhelming majority of the studied population was females (94.7 %) with a mean age of 45.9±11.1 years and mean computer work expertise of 10.7±5.5 years (Table 1). Nearly all of the respondents estimated they labored with a computer greater than 6 hours per day and did not have a brake each 2 working hours. The distribution evaluation confirmed that about quarter of employees suggested weak social support, one-1/3, high job needs and practically half, low degree of freedom at work (Table 1,).

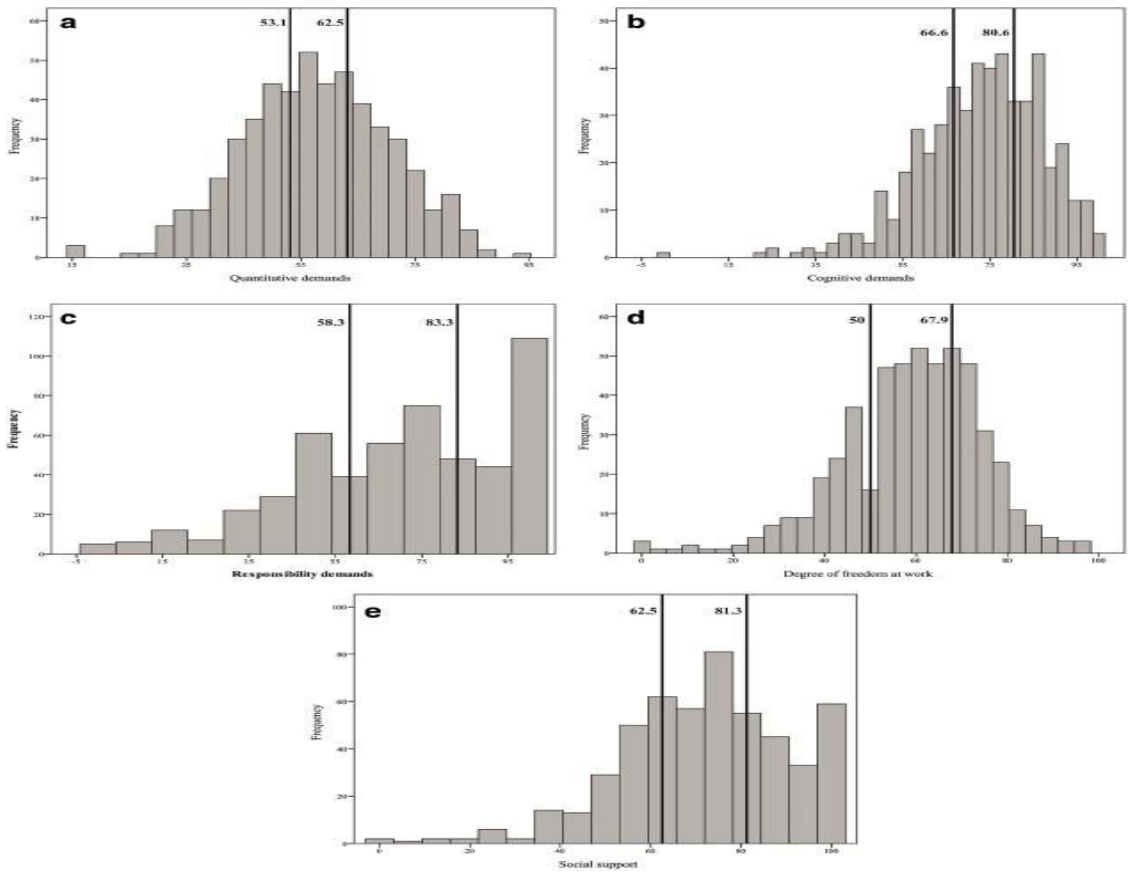


**Fig. 1.** Tertile margins of psychosocial characteristics: a Quantitative demands, b Cognitive demands, c Responsibility demands, d D egree of freedom at work, e Social support

**Table 1,** Personal and Work-related characteristics of the studies group

| Variables | N (%) |
|---|---|
| Gender | |
| **Male** | 35 (5.3) |
| **Female** | 618 (94.7) |
| Age (years) | |
| **23- 29** | 70 (10.7) |
| **30-39** | 116 (17.7) |
| **40-49** | 190 (29.1) |
| **50-70** | 277 (42.5) |
| Computer work experience (years) | |
| **1-5** | 146(22.4) |
| **6-15** | 365 (55.9) |
| **16-36** | 142 (21.7) |
| BMI (kg/m²) | |
| **< 18.5** | 24 (3.7) |
| **18.6-24.9** | 325 (49.7) |
| **> 25** | 304 (46.6) |
| Duration of working with a computer(hours/day) | |
| **< 4** | 26 (3.9) |
| **4-6** | 112 (17.2) |
| **>** | 515 (78.9) |
| Taking a break every 2 hour | |
| **Yes** | 88 (13.5) |
| **No** | 565 (87.5) |
| Quantitative demands | |

| | |
|---|---|
| **Low** | 264 (40.5) |
| **Average** | 182 (27.9) |
| **High** | 207 (31.6) |
| Cognitive demands | |
| **Low** | 179 (27.5) |
| **Average** | 243 (37.2) |
| **High** | 231 (35.3) |
| Responsibility demands | |
| **Low** | 181 (27.7) |
| **Average** | 216 (33.1) |
| **High** | 256 (39.2) |
| Degree of freedom at work | |
| **Low** | 308 (47.2) |
| **Average** | 200 (30.6) |
| **High** | 145(22.2) |
| Social support | |
| **Weak** | 175 (26.9) |
| **Average** | 233 (35.7) |
| **strong** | 244 (37.4) |

**Table 2**. Prevalence to Musculoskeletal pain in association with individual and work related factors

| **Variables** | **Shoulder (%) (50.5)** | **Elbow (%) (20.3)** | **Wrist/Hand (%) (26.3)** | **Upper Back (%) (44.8)** | **Low Back (%) (56.1)** |
|---|---|---|---|---|---|
| Gender | | | | | |
| **Male** | 14.8 | 7.4 | 14.8 | 45.5 | 55.6 |
| **Female** | 52.5* | 21.0 | 27.0 | 33.3 | 56.2 |
| Age (years) | | | | | |
| **23- 29** | 34.5 | 7.3 | 21.8 | 34.5 | 54.5 |
| **30-39** | 46.2* | 11.0 | 23.1 | 41.8 | 52.7 |
| **40-49** | 50.3* | 24.2* | 28.9 | 56.4* | 52.7 |
| **50-70** | 56.4* | 24.8* | 27.1 | 40.8 | 56.1 |
| Computer work experience (years) | | | | | |
| **1-5** | 41.7 | 1.2 | 22.6 | 34.8 | 53.9 |
| **6-15** | 53.0 | 22.6* | 27.9 | 50.2* | 57.5 |
| **16-36** | 53.2 | 22.5* | 26.1 | 41.4 | 55.0 |
| BMI (kg/m²) | | | | | |
| **< 18.5** | 47.4 | 0.0 | 21.1 | 31.6 | 42.1 |
| **18.6-24.9** | 50.2 | 19.6 | 27.8 | 47.8 | 51.0 |
| **> 25** | 51.0 | 22.6 | 25.1 | 41.7 | 60.3* |
| Duration of working with a computer(hours/day) | | | | | |
| **< 4** | 30.0 | 30.0 | 25.0 | 40.0 | 40.0 |
| **4-6** | 53.4* | 15.9 | 19.3 | 40.9 | 62.5 |
| **>** | 50.9* | 20.7 | 27.9 | 45.9 | 55.6 |
| Taking a break every 2 hour | | | | | |
| **Yes** | 43.5 | 21.7 | 18.8 | 37.7 | 44.9 |
| **No** | 51.6% | 20.0 | 27.5* | 45.9 | 57.9* |
| Quantitative demands | | | | | |
| **Low** | | | | | |
| **Average** | 40.4 | 15.4 | 20.2 | 35.1 | 58.8 |

| | | | | | |
|---|---|---|---|---|---|
| **High** | 55.9* | 21.0 | 25.9 | 48.3* | 55.2 |
| | 58.6* | 25.9* | 34.6* | 54.3* | 59.9 |
| Cognitive demands | | | | | |
| **Low** | 41.8 | 12.1 | 22.0 | 39.7 | 52.5 |
| **Average** | 50.3 | 21.5* | 28.3 | 40.8 | 59.7 |
| **High** | 50.5* | 25.4* | 27.6 | 53.0* | 55.2 |
| Responsibility demands | | | | | |
| **Low** | | | | | |
| **Average** | 44.4 | 16.2 | 24.6 | 35.9 | 56.3 |
| **High** | 46.5 | 16.5 | 26.5 | 47.6* | 57.6 |
| | 58.2* | 26.4* | 27.4 | 48.8* | 54.7 |
| Degree of freedom at work | | | | | |
| **Low** | 55.8* | 21.5 | 29.8* | 47.1 | 57.0 |
| **Average** | 46.5 | 21.0 | 25.5 | 43.9 | 55.4 |
| **High** | 44.7 | 16.7 | 20.2 | 41.2 | 55.3 |
| Social support | | | | | |
| **Weak** | 54.3 | 22.5 | 26.8 | 52.9* | 64.5* |
| **Average** | 46.4 | 18.6 | 25.1 | 42.1 | 52.2 |
| **strong** | 51.6 | 20.3 | 27.1 | 41.7 | 51.0 |

*z test, *P < 0.05; comparing with: youngest age group; smallest work experience group; 18.624.9 kg/m$^2$ BMI group; <4 h/day working with computer respondent group those whotake break after every 2 hours; working in a positive work environment with respect to current psychosocial factor.*

More than half of the staff complained about shoulder and low back pain, even as elbow suffering was once least general with 2/5 of the respondents complaining about it (Fig. 2).

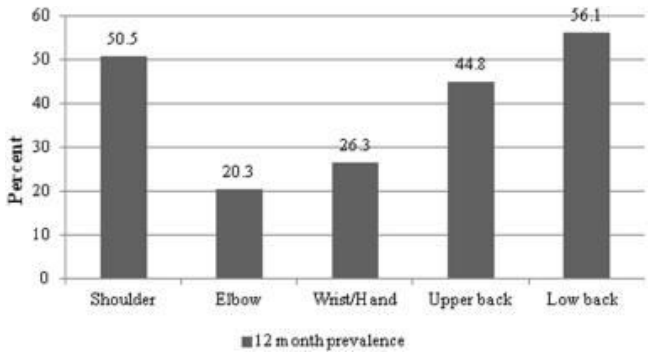


**Fig 2.** Prevalence of Musculoskeletal pain according to different body regions

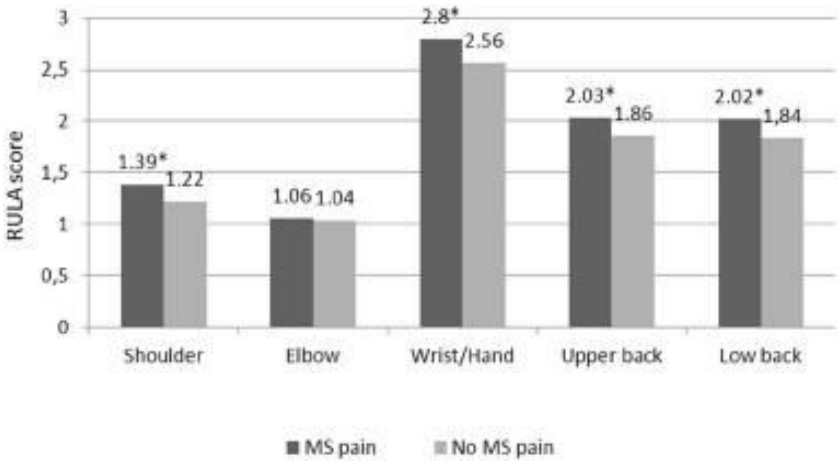


**Fig. 3** Mean RULA posture and movement scores in the groups of respondents with and without musculoskeletal (MS) pain

The prevalence of MS signs was analyzed taking into account person and work-associated reasons (Table 2). The youngest respondents drastically much less most commonly complained about pain within the shoulder than their older counterparts. Elbow pain was documented extra typically among staff working with a computer for more than 5 years. A BMI bigger than 25 kg/ $m^2$ had big associations handiest with low back pain suffering. Period of working with a computer was once tremendously associated only with the occurrence of MS suffering in the shoulder: the employees working with a computer more than 4 h per day extra commonly complained about soreness in this field. Wrist/hand and low back complains have been extra usual amongst folks who did not have any smash each 2 hour. The respondents who said low quantitative demands had discomfort less typically in all investigated anatomical areas besides for the low back. Low cognitive and accountability needs have been related to much less generic pain within the shoulder, elbow, and higher back areas. Enormously greater frequencies of complaints within the shoulder and wrist/hand areas have been discovered for respondents reporting a low degree of freedom at work. Respondents with weak social support had a larger frequency of MS complaints within the low back region (Table 2).

The RULA score significantly differed evaluating the corporations of respondents with and without MS pain (Fig. 3). The respondents experiencing pain in shoulder, wrist/ hand, upper back, and low back areas had a statistically significantly higher mean RULA rating.

Table 3 indicates the results of logistic regression analysis investigating associations between character and work-related factor, and pain in one of anatomical area. The outcome of Hosmer-Leme show test revealed just right matches for all units ($\chi2$ =7.70, df=8, P=0.46 for shoulder mannequin; $\chi2$ =10.02, df=8, P=0.26 for elbow mannequin; $\chi2$ = 4.61, df=8,P=0.79 for wrists/hand model; $\chi2$ =three.16, df =8,P=0.92 for higher pain mannequin; $\chi2$ =5.78, df=8,P= 0.67 for low back model). Women and 50–70-years old had been 6 and 2 occasions extra possible than men and older respondents, respectively, to expertise MS soreness within the shoulder. Moreover, time spent working with a computer 4–6 hours a day, better stages of quantitative demands, and excessive degree of accountability demands were associated with a multiplied risk of getting shoulder suffering. For each one-point develop within the RULA rating, the possibility of getting shoulder agony expanded with the aid of 68 %. Being a 50–70 per 12 months historical and excessive levels of quantitative and accountability demands had been related to a larger danger of experiencing elbow ache. The probability of getting wrist/hand pain used to be positively associated with an excessive level of quantitative needs. For each one factor expand in the RULA score, the likelihood of getting wrist/hand discomfort multiplied by way of 59 %. Computer work experience of 6–15 years, larger levels of quantitative and accountability demands and susceptible social help at work were discovered to be related to a higher odd of experiencing upper back ache. For each and every one-factor expand in the RULA score, the likelihood of having upper back pain multiplied by 38 %. Having a BMI of >25 kg/m2, no taking a destroy each 2 h, and susceptible social help at work had been related to an elevated danger of having low back pain. For every one-factor increase in the RULA score, the likelihood of getting low back suffering improved by 30 %.

**Table 3** Logistic regression model for musculoskeletal pain in various anatomical regions

| Variable | Musculoskeletal region | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **shoulder** | | **Elbow** | | **Wrist/hand** | | **Upper back** | | **Low back** | |
| | **OR** | **95%CI** | **OR** | **95%CI** | **OR** | **95%CI** | **OR** | **95%CI** | **OR** | **95%CI** |
| **Gender** | | | | | | | | | | |
| **Male** | 1 | | 1 | | 1 | | 1 | | 1 | |
| **female** | 6.1 | 1.95-19.08 | 2.95 | 0.59-14.58 | 1.52 | 0.491-4.88 | 1.21 | 0.50-2.93 | 1.12 | 0.48-2.61 |
| **Age** | | | | | | | | | | |
| **23- 29** | 1 | | 1 | | 1 | | 1 | | 1 | |
| **30-39** | 1.48 | 0.65-3.37 | 1.15 | 0.30-4.34 | 0.78 | 0.30-2.05 | 0.80 | 0.34-1.86 | 0.92 | 0.41-2.06 |
| **40-49** | 1.89 | 0.65-3.53 | 2.94 | 0.62-8.21 | 1.09 | 0.41-2.91 | 1.62 | 0.68-3.85 | 1.07 | 0.46-2.46 |
| **50-70** | 2.16 | 1.02-4.99 | 3.38 | 1.87-12.05 | 1.11 | 0.41-2.00 | 0.93 | 0.39-2.23 | 0.91 | 0.42-2.23 |
| **Computer work experience** | | | | | | | | | | |
| **1-5** | 1 | | 1 | | 1 | | 1 | | 1 | |
| **6-15** | 1.03 | 0.56-1.86 | 1.49 | 0.66-3.37 | 1.31 | 0.65-2.62 | 1.87 | 1.01-3.46 | 0.90 | 0.50-1.63 |
| **16-36** | 1.04 | 0.51-2.09 | 1.46 | 0.58-3.62 | 1.16 | 0.52.2.60 | 1.42 | 0.70-2.91 | 0.81 | 0.41-1.61 |
| **BMI** | | | | | | | | | | |
| **< 18.5** | 0.79 | 0.50-1.25 | 0.88 | 0.53-1.46 | 0.77 | 0.22-2.61 | 0.75 | 0.24-2.31 | 1.48 | 0.55-3.99 |
| **18.6-24.9** | 1 | | 1 | | 1 | | 1 | 1 | 1 | |
| **> 25** | 1.44 | 0.75-2.77 | 1.02 | 0.64-2.42 | 0.17 | 0.45-1.15 | 0.70 | 0.46-1.08 | 1.50 | 1.24-4.24 |
| **Duration of** | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **working with computer** | | | | | | | | | | |
| **< 4** | 1 | | 1 | | 1 | | 1 | | 1 | |
| **4-6** | 3.03 | 1.97-9.40 | 0.41 | 0.14-1.70 | 0.46 | 0.17-1.90 | 0.70 | 0.23-2.13 | 2.14 | 0.76-6.01 |
| **>** | 2.40 | 0.81-7.11 | 0.59 | 0.22-2013 | 0.70 | 0.22-2.22 | 0.93 | 0.32-2.73 | 11.58 | 0.59-4.21 |
| **Taking break every 2 hours** | | | | | | | | | | |
| **Yes** | 1 | | 1 | | 1 | | 1 | | 1 | |
| **No** | 0.80 | 0.44-1.46 | 0.61 | 0.29-1.27 | 1.31 | 0.63-2.68 | 0.95 | 0.51-1.76 | 1.65 | 1.16-2.95 |
| **RULA SCORE** | 1.68 | 1.2-2.36 | 1.62 | 0.69-3.81 | 1.59 | 1.15-2.21 | 1.38 | 1.04-1.75 | 1.30 | 1.03-1.65 |
| **Quantitative demands** | | | | | | | | | | |
| **Low** | 1 | | 1 | | 1 | | 1 | | 1 | |
| **Average** | 1.67 | 1.05-2.68 | 1.27 | 0.70-2.95 | 1.2 | 0.70-2.07 | 1.68 | 1.04-2.71 | 0.88 | 0.55-1.41 |
| **High** | 1.83 | 1.14-2.92 | 1.75 | 1.12-3.11 | 1.86 | 1.11-3.12 | 2.00 | 1.25-3.20 | 1.09 | 0.69-1.74 |
| **Cognitive demands** | | | | | | | | | | |
| **Low** | 1 | | 1 | | 1 | | 1 | | 1 | |
| **Average** | 1.17 | 0.73-1.89 | 1.52 | 0.78-2.95 | 1.08 | 0.62-1.86 | 0.75 | 0.46-1.22 | 1.22 | 0.76-1.96 |
| **High** | 1.20 | 0.71-2.04 | 1.51 | 0.76-300 | 0.86 | 0.47-1.56 | 1.20 | 0.71-2.04 | 1.01 | 0.60-1.68 |
| **Responsibility demands** | | | | | | | | | | |
| **Low** | 1 | | 1 | | 1 | | 1 | | 1 | |
| **Average** | 1.18 | 0.72-1.93 | 1.164 | 0.60-2.22 | 1.24 | 0.72-2.14 | 1.78 | 1.08-2.92 | 1.11 | 0.69-1.79 |
| **High** | 1.89 | 1.14-3.14 | 2.04 | 1.09-3.82 | 1.21 | 0.69-2.11 | 1.54 | 1.06-2.57 | 1.09 | 0.66-1.78 |
| **Degree of freedom at work** | | | | | | | | | | |
| **Low** | 0.94 | 0.55-1.59 | 1.61 | 0.78-2.82 | 1.25 | 0.66-2.34 | 1.26 | 0.71-2.23 | 1.05 | 0.64-1.71 |
| **Average** | 1.39 | 0.84-1.59 | 1.48 | 0.81-3.19 | 1.44 | 0.81-2.56 | 1.34 | 0.73-2.21 | 1.05 | 0.62-1.76 |
| **High** | 1 | | 1 | | 1 | | 1 | | 1 | |
| Social support | | | | | | | | | | |
| **Weak** | | | | | | | | | | |
| **Average** | | | | | | | | | | |
| **strong** | 1.35 | 0.82-2.16 | 1.31 | 0.62-1.93 | 0.88 | 0.53-1.46 | 1.74 | 1.07-2.83 | 1.86 | 1.15-3.00 |
| | 0.97 | 0.61-1.52 | 1.10 | 0.73-2.35 | 0.66 | 0.56-1.63 | 1.10 | 0.70-1.75 | 1.22 | 0.79-1.90 |
| | 1 | | 1 | | 1 | | 1 | | | |

**Discussion**

The purpose of this cross sectional be taught was to evaluate the prevalence of MS pain in various anatomical areas among computer employees within the technology company in Cairo, Egypt. This study Showed a high prevalence of MS pain in body regions as shoulders, upper back, and low back among office workers. In step with countless reviews, neck pain is in the main area with the occurrence ranging from 19 % to 70 % in the population of place of business employees [4, 5, 8, 11, 12, 21, 31–36]. The prevalence of shoulder pain on this study used to be also high (50 %), and this is in step with the discovering of Australian [4] and Chinese [31] reviews, at the same time Finnish [5] and German [37] experiences documented a lower prevalence of MS complaints in this area. It's worth noting that some epidemiological studies report the prevalence of neck and shoulder complaints or complaints in the arm, neck, and shoulder areas collectively considering the fact that of equivalent etiology factors. In special experiences, the prevalence of suffering in these localizations used to be also about 50 % [10, 33, 38]. Soreness in arm, wrist, and hand areas can also be usual, and in general about 30 % of computer staff have MS complaints in these anatomical regions [4, 31, 33].

In our study, about quarter of the respondents complained about pain in elbow and hand/wrist areas (20.6 % and 26.3 %, respectively). Pain suffering is a very customary MS criticism in the normal population as good, and according to a scientific

evaluation by using Walker, which included 53 studies, it levels between 22 % and 65 % [39], displaying that there are a variety of predisposing hazard factor related now not best with the work environment, but in addition with home or other routine [20]. Our study additionally showed a high occurrence cost of pain discomfort accounting for 44.8 % in the upper pain and 56.1 % in the low back.

Considering that computerization stages in the place of job work environment have dramatically increased, the query of a multifactorial origin of MS disorders is being mentioned by scientists. There may be evidence that all predisposing factor – person, ergonomic, and psychosocial – are related to the progress of MS complaints [3, 23, 24]. The results of our study additionally demonstrated that MS pain was associated with individual and ergonomic as good as psychosocial reasons amongst computer employees.

Opposite to previous studies that verified variations between genders and documented that females are more likely to experience MS discomfort [4–6, 8, 20–22, 40], our study confirmed that most effective shoulder pain used to be more familiar amongst women and this was demonstrated through the results of multivariate logistic regression as good. However, it should be mentioned that women incorporate a main percentage of Egyptian technology company's employees, and in our study, men accounted only for 5.3 % of the overall be taught population. On the grounds, that of this drawback, the distribution of MS agony in the male team would no longer mirror an actual problem.

In our study, the frequency of complaints in nearly all anatomical areas used to be better in older and oldest respondents' age groups as in comparison with the youngest team. Additionally, multivariate logistic regression analysis showed that the oldest contributors (50–70 years ancient) were greater than 2 and three times as likely to have MS complaints in shoulder and elbow areas. Some epidemiological stories have stated that center-aged workers are most vulnerable to pain in neck and shoulder localizations [4, 8, 41–43]. One would count on that the respondents of this detailed age staff have the most important expertise of working with computers; nevertheless, our study did not affirm that greatest work expertise related to greater prevalence of MS pain.

Among individual risk causes, also BMI and its relationship with MS pain have been investigated. A BMI of >25 kg/m2 used to be observed to be related to MS discomfort in the low back anatomical area, and this is in agreement with different epidemiological stories [20, 44]. For the period of complete evaluation of the risk of complaints about MS pain, it is principal to do not forget ergonomics on the workplace for individuals who work with a computer. Purpose investigations on muscular activity have documented accelerated muscle tension in the course of computer work [40, 45–47]. Other epidemiological reports have shown that fallacious localization of apparatus within the computerized office is associated with MS suffering [48, 49].

In view that that not simplest inadequacy of the computer can examine the employee's posture and movements, we assessed the ergonomics of computer work by means of the RULA process, which evaluates detrimental posture and movements for particular areas of the body. The primary force of this study used to be ergonomic analysis with the RULA process utilized by the investigators in an effort to reap greater objectivity. The results confirmed that a better RULA rating used to be statistically vastly related to a larger threat of having MS complaints within the shoulder, wrist/hand, upper back, and low back anatomical areas.

In many epidemiological studies, MS ache in shoulder area was once investigated together with neck complaints; for that reason, work posture and movements have been recognized as big explanations having an influence on pain in both neck and shoulder areas [13, 14]. In our study of, the length of labor with a computer for four–6 h a day multiplied the likelihood of experiencing ache within the shoulder field, but Blatter et al. Confirmed that workers who work with a computer more than 6 h per day had been at multiplied hazard of shoulder agony [50]. Awkward posture and movements of computer employees had been confirmed as massive chance causes for MS pain in the arm field [10, 15, 32, 51, 52]; however, our information confirmed huge associations these reasons and pain simplest in hand/wrist anatomical regions.

The neck and shoulders are the most affected anatomical areas of the human body in computer staff, and for this reason, MS agony within the pain including each upper and low back is less investigated in scientific reports involving computer employees as a study population. Despite this, some epidemiological stories [4, 32, 49] as good as our data proved associations between MS agony in the back subject and insufficient work posture and movements. Development of knowledge computer sciences and computerization has ended in many alterations in office employees' respectable observe and consistently increasing job needs. Terrible penalties of computerization as a result of growing workload, business enterprise expectations, or job anxiety to staff have been famous [53], and excessive job demands were determined to be related to MS symptoms in many populations of place of work workers [16, 10, 54]. Our study additionally established that quantitative job demands had been significantly associated with MS complaints in virtually all investigated anatomical areas except for the low back. Accountability needs had been discovered to be a significant aspect for shoulder, elbow, and upper pain complaints; even as weak social support had a tremendous impact on both upper and low back

discomfort. The remark that the odds ratios of all MS pain-predisposing factors – man or woman, psychosocial, and ergonomic – have been nearly of equal magnitude advocate that their contribution to etiology of MS soreness is very identical.

**Conclusion**

The occurrence of MS agony among computer users was once excessive, with shoulders and low back being probably the most affected anatomical areas. Large associations between person factor, work ergonomics (inappropriate posture and actions), and MS suffering had been determined. Work related psychosocial causes had a huge effect on experiencing suffering as well: excessive quantitative demands have been associated with MS complaints in nearly all anatomical areas, and weak social support was a significant predictor for MS complaints in the higher and low back areas. Preventive measures on the office will have to be directed to the improvement in ergonomic work environment and decreasing job stress prompted inadequate workload, high duties, and weak social support.

**Abbreviations**

BMI: Body mass index; CI: Confidence interval; MS: Musculoskeletal; OR: Odds ratio; RULA: Rapid upper limb assessment

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**Competing interests**

The author has no competing interests to declare.

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