ORIGINAL ARTICLE

ERGONOMICS ASSESSMENT OF EXPOSURE TO RISK OF MUSCULOSKELETAL SYMPTOMS IN BANK EMPLOYEES

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ABSTRACT

Objective: Work-related musculoskeletal problems are common in many occupations and these musculoskeletal problems can decrease an individual's quality of life by affecting their daily living activities. The objective of this research was to evaluate the level of exposure to musculoskeletal symptoms risk among employees working in banks.

Materials and Methods: This cross-sectional study was conducted in Rawalpindi and Islamabad, Pakistan from January 2018 to June 2018. 620 bank employees of both genders, with the age of 25-45 years were included in this study, and employees with musculoskeletal and neurological disorders, amputee or prosthetic limb, and any trauma were excluded from this study. Rapid office strain assessment (ROSA) and quick exposure check (QEC) scales were used to assess the risk and prevalence of musculoskeletal symptoms. Data were analyzed by using SPSS 21.

Results: According to the scoring of QEC scales 92.2% of participants fall in the acceptable ergonomics category, 6% fall into investigate further and 1.1% fall into investigate and change soon, with the highest symptoms among low back (17.7%). And the mean ROSA final score (5.51) indicates that most of the participants have a high risk of musculoskeletal symptoms.

Conclusion: Regarding the scoring of ROSA and QEC scale musculoskeletal symptoms has a high prevalence among bank employees.

Keywords: Ergonomics, Employee, Environment, Pain, Risk.

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INTRODUCTION

Physical well-being and good physical state are particularly essential. Job-related musculoskeletal pain is the main problem nowadays and it refers to tissue damage to the musculoskeletal system and to the nerves. [1] The prevalence of the job-related musculoskeletal problem is important in many occupations and this has a noticeable effect on occupation. [2] These musculoskeletal problems can decrease quality of life by affecting daily living activities. [3] Originating from Greek roots, the term "ergonomics" encompasses a series of systematic principles that delve into the interactions between humans and their environment.[4] Adhering to proper ergonomic practices not only improves work efficiency and job satisfaction but also preserves individual well-being. The most significant sign of development is the health and well-being of the population. Adverse deviations in the physical state and appearance of the body can disturb its structure and function and disturb other characteristics of human life. [1] Work-related musculoskeletal problems due to information technology usage have increased extremely in recent decades. In many countries, computer use is nowadays become a new risk factor for musculoskeletal problems. [5] Sustained posture and repetitive movements of extremities apply statistically high pressure on some areas of the body which results in pain, muscle spasms, tingling sensation, and stiffness of joints. Some occupational activities in which repetitive movements of the wrist and hand can cause physical stress on joints, which in turn can cause musculoskeletal pain. [6] Studies showed that musculoskeletal pain does not only occur in a single joint it may affect other joints of the body so we can say this musculoskeletal pain is often occur in the frequent joint. [7]

A study by a French company reported that office workers have the largest population for sickness leave due to shoulder, elbow, and wrist disorders. [8] Another study having workers assess the musculoskeletal disorders of the low back in Kuwait showed that 80% suffered from a single attack of musculoskeletal disorder and 42% through disability. [9] In Sri Lankan prevalence of complaints of arm, neck, and shoulder (CANS) in one year is approximately 63.6% so can have a significant impact on individual and industrial and health areas. [10] In office workers, 33%

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of the young population experienced pain in the upper trapezius muscle from being in a static posture while using screens. [11] Musculoskeletal pain in the neck/shoulder and back are 55%-69%, 15%-52%, and 31%-51% respectively. [12] Approximately 40% of the participants reported experiencing neck pain, while discomfort in other areas was noted as follows: right shoulder (39%), left shoulder (37%), and low back (36%). Nearly 90% of the respondents had a ROSA score exceeding 5, indicating that a majority of individuals were exposed to a high level of ergonomic hazards in Pakistan. [13] The significance of the study is to highlight the ergonomics risk of musculoskeletal symptoms in bank employees of twin cities, in Pakistan. And the highlighted poor ergonomic settings of workstations could be modified and the quality of life of bank employees can be improved.

MATERIALS AND METHODS

This cross-sectional study was conducted in Rawalpindi and Islamabad, Pakistan from January 2018 to June 2018. The study was approved by Riphah Ethical Committee, Riphah College of Rehabilitation Sciences, Riphah International University, Islamabad.

620 bank employees were recruited by purposive sampling technique and sample size was calculated through epitool. Informed consent was taken from all participants. Employees of both genders, with the age of 25-45 years were included in this study, and employees with major musculoskeletal and neurological disorders, amputee or prosthetic limbs, and any other trauma were excluded from this study. Rapid office strain assessment (ROSA) and quick exposure check (QEC) scales were used to assess the risk and prevalence of musculoskeletal symptoms.

Assessment by using QEC was completed within 10 minutes for each bank employee and each task was assessed and scored separately. QEC has 8 parameters to assess including back, shoulder/arm, wrist/hand, neck, driving, vibration, work pace, and stress, which was done with observation and discussion with the bank employees. QEC has two indexes, the observer's assessment, and the worker's assessment. The observer's assessment was done by directly observing the participant of the study and the most appropriate box was marked. For the worker's assessment, asked the participants to mark the appropriate box. Each index was then scored and analyzed and interpreted for more exposure to risk factors for MSK problems. The graduation of the shading areas indicates the increased risk for MSK problems.

ROSA is a picture assessment tool that was established to assess musculoskeletal disorders risk factors for computer users in banks. The ROSA was considered to rapidly measure the risks associated with computer work. It contains 5 parameters: 1) Chair which is further subdivided into chair height, pan depth, arm-rests and back support 2) Monitor 3) Telephone 4) Keyboard 5) Mouse. The factors were diagrammed and coded as increasing scores from 1 to 3. The Scoring ROSA scale has 3 sections. In section A, arm-rests and back support are added with seat height. In section B monitor and telephone values can be measured. In section C keyboard and mouse values can be measured. In the end, ROSA's final score can be calculated. ROSA final scores ranged in magnitude from 1 to 10 with each successive score representing an increased presence of risk factors. A person with a score greater than 5 is at high risk for developing musculoskeletal disorders.

RESULTS

A total of 620 employees with a mean age of 33.3 ± 7.26 years, mean height was 5.52 ± 0.36 feet, mean weight was 67.98 ± 12.03 kgs, mean BMI was 23.48 ± 3.69 kg/m2, and mean length of bank service was 2.48 ± 1.09 years. Out of 620, 143 (23.1%) employees <1 year of service, 185 (29.8%) have 1-3 years, 139 (22.4%) has 3-5 years and 153 (24.7%) have more than 5 years of service. Regarding the socioeconomic status of employees, 168 (27.1%) of the upper class, 434 (70%) of the middle class, and 18 (2.9%) of the lower-class population. According to the musculoskeletal problems, 277 (44.75%) of bank employees had previous MSK pain whereas 343 (55.3%) had no previous pain, and the region of pain was cervical, upper thoracic, low back, knee 76 (12.3%), 49 (7.9%), 110 (17.7%) and 42 (6.8%) respectively. Whereas 343 (55.3%) had no pain in any region. On the other hand, 176 (28.4%) employees took treatment for their pain whereas 444 (71.6%) did not take any treatment, 83 (13.4%) employees took medicines, 94 (15.2%) treated their pain through physical therapy and 443 (71.5%) did not take any physical therapy treatment.

According to the relationship between the QEC list and MSK problems, employees with static back posture 26 (22.3%) on low, 55 (8.9%) on moderate, 86 (13.9%) on high, 22 (3.5%) on very high risk and 331 (53.4%) had no risk respectively. While employees with dynamic back posture 160 (25.8%) at low risk, 142 (22.9%) at moderate risk, 26 (4.2%) at high risk, 3 (0.5%) at very high risk, and 289 (46.6%) did not have dynamic back posture. Problems of shoulder/arm were low, moderate, high, and very high 325 (52.4%), 256 (41.3%), 30 (4.8%), and 9 (1.9%) respectively. While in wrist/hand problems, 324 (52.3%) were at low, 249 (40.2%) at moderate, 41 (6.6%) at high, and 6 (1.0%) at very high risk. Neck problems were at low, moderate, high and very high risk 244 (39.4%), 204 (32.9%), 113 (18.2%), and 59 (9%) respectively. MSK problems risk were low, moderate, and high in driving 407 (65.6%), 179 (28.9%), and 34 (5.5%), while for vibration 501 (80.8%), 102 (16%) and 17 (2.7%) respectively, and 234 (37.7%), 309 (49.8%) and 779 (12.4%) respectively for work pace.

Risk for MSK problems with stress was at 204 (32.9%), 231 (37.3%), 104 (16.8%), and 81(13.1%) for low, moderate, high, and very high respectively. (Table 1)

According to the correlation between REC and MSK problems, gender, BMI, length of service, and pain history have a strong correlation, while, age, duration of work, and socioeconomic status have no correlation with MSK pain. Correlation between ROSA and MSK problems, gender, BMI, length of service, and pain history have a strong correlation, while, age, duration of work, and socioeconomic status have no correlation with MSK pain. (Table 2)

The independent t test was applied to measure the correlation of QEC/ROSA. The median interquartile ranges of static back posture were 5 (3), dynamic back posture 3 (4), shoulder/arm 1 (1),

wrist/hand 1 (1), and neck 2 (2), while median interquartile ranges of driving were 1 (3), vibration 1 (0), workplace 4 (3) and stress 4 (6). The p-values of QEC categories were 0.272, 0.003, 0.588, 0.724, 0.597, 0.021, 0.090, 0.947, and 0.466 accordingly. The median and standard deviation of the chair score on the ROSA scale was 5.06 ± 1.56, the monitor and telephone score were 2.58 ± 1.14, the mouse and keyboard score were 4.47 ± 1.39 and the final score was 5.51 ± 1.40, and the p-value of ROSA categories were 0.893, 0.910, 0.733 and 0.757 respectively. (Table 3)

DISCUSSION

The evaluation of musculoskeletal risk factors in individuals within the banking sector was conducted using assessment tools like ROSA and QEC, revealing that the primary musculoskeletal concern among bankers revolves around the lower back, followed by the cervical region, then the knees, with the upper thoracic region being the least affected. These findings stem from inadequate ergonomic practices. Furthermore, the study identified correlations between musculoskeletal issues and factors such as age, gender, BMI, length of service, and history of pain.

A study conducted by Mika et.al (2017) also found the most affected region in workers is lower back (6.1%). (14) Another study observed that lower back is the most affected region for musculoskeletal problems (38%). [15] In the current study ergonomics assessment of bankers showed that the most affected region is lower back (17.7%) due to static posture in sitting. And QEC score showed that the prevalence of low back pain is (13.9%). When observing shoulder, wrist/hand, and neck problems, a study in 2017 revealed that (1.2%) of office workers experienced shoulder problems. [16] While another study showed that (20%) of office workers faced wrist/hand and (42%) head/neck problems in their service duration. [17] In the current study prevalence of shoulder pain is (41.3%), (and 40.2%) wrist/hand problems according to the QEC score.

According to the QEC score, neck pain is more common in bankers (32.9%), the low back (17.7%), upper thoracic (7.9%), and knee pain (6.8%). Moderate pain was reported due to dynamic back posture in bankers and employees who adopted static back posture are at high risk of low back pain. The previous study also supports current results that are, the most common symptom of musculoskeletal in office workers is neck (69.2%). The authors also showed that three areas may affect due to improper ergonomics and cause pain low back (58.2%), knee (41.8%), and upper back (34.1%). [18]

Rehman et.al. (2018) showed that the highest prevalence rate of musculoskeletal problems among office workers was low back (53.9%). [19] ROSA assessment tool is also used for the assessment of ergonomics in bankers. In the previous study conducted in 2015 to evaluate the ergonomics of office workers, researchers documented chair score was (3.45± 0.55), the score of monitor and telephone was (3.11±0.61), the score for mouse and keyboard was (2.11±0.31) and the final score of ROSA scale was (3.61±0.64). (20) On the other hand, in the current study, the mean score for the chair section is (5.06±1.56), the score for monitor and telephone is (2.58±1.14), the score for the mouse and keyboard ac-

Table 1: Relationship Between Region of Pain and QEC

Variables	Low n (%)	Moderate n (%)	High n (%)	Very High n (%)	None n (%)
Static Back Posture	26 (22.3%)	55 (8.9%)	86 (13.9%)	22 (3.5%)	331 (53.4%)
Dynamic Back Posture	160 (25.8%)	142 (22.9%)	26 (4.2%)	3 (.5%)	289 (46.6%)
Shoulder/Arm	325 (52.4%)	256 (41.3%)	30 (4.8%)	9 (1.9%)	-
Wrist/Hand	324 (52.3%)	249 (40.2%)	41 (6.6%)	6 (1.0%)	-
Neck	244 (39.4%)	204 (32.9%)	113 (18.2%)	59 (9%)	-
Driving	407 (65.6%)	179 (28.9%)	34 (5.5%)	-	-
Vibration	501 (80.8%)	102 (16.5%)	17 (2.7%)	-	-
Work pace	234 (37.7%)	309 (49.8%)	779 (12.4%)	-	-
Stress	204 (32.9%)	231 (37.3%)	104 (16.8%)	81 (13.1%)	-

Table 2: Comparison of SpO2 Levels between Experimental and Control Groups

Variables	QEC	ROSA
	Co-relations	
Age	0.001	0.064
Gender	0.845	0.899
BMI	0.772	0.642
Socioeconomic Status	0.000	0.000
Duration of Work	0.000	0.011
Length of Service	0.241	0.629
Pain History	0.628	0.046

Table 3: P-Values of QEC/ROSA Categories

QEC Score	Median (IQR) Mean ± SD	P – value
Static Back Posture	5 (3)	0.272
Dynamic Back Posture	3 (4)	0.003*
Shoulder/Arm	1 (1)	0.588
Wrist/Hand	1 (1)	0.724
Neck	2 (2)	0.597
Driving	1 (3)	0.021*
Vibration	1 (0)	0.090
Work Place	4 (3)	0.947
Stress	4 (8)	0.466
ROSA Score		
Chair Score	**5.06 ± 1.56**	**0.893**
Monitor and Telephone	**2.58 ± 1.14**	**0.910**
Mouse and Keyboard	**4.47 ± 1.39**	**0.733**
Final Score	**5.51 ± 1.40**	**0.757**
***p>0.05**		

cording to the ROSA scale is (4.47±1.39), and the final score of ROSA is (5.51±1.40). Shahla, et.al. documented the prevalence of complaints of musculoskeletal problems in different regions of the body and the highest prevalence rates were found for the neck (33%), shoulder (31%), and hand (11%). [21]

Another study also showed that office workers which are younger than 30 years were more likely to have symptoms of musculoskeletal in the upper back than those older than 49 years ($p<0.05$). [22] Current study also showed that age is also a factor for musculoskeletal problems. This study used long and extensive tool that was time-consuming and not comparing private and public banks. Due to lengthy questionnaires bank employees sometimes refuse to fill out the form. This study represents bankers only from twin cities.

CONCLUSION

The assessment of musculoskeletal risk factors in bankers by using ROSA and QEC assessment tools showed that the major musculoskeletal problem in bankers is low back followed by cervical then knee and least is upper thoracic. All these problems are due to improper ergonomics.

Physical and psychological problems should address for ergonomics assessment. Ergonomics awareness and training were given that can reduce MSK problems. Suggestions for improvement of the workplace, the use of stretching exercises in the training program, and active breaks with postural change may be effective in reducing pain and discomfort. Use objective evaluation tool.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Kausar A	✓	×	✓	×	✓	×
Rafique A	✓	✓	×	✓	✓	×
Rafique N	✓	×	×	✓	×	×
Afzak K	×	×	✓	✓	×	✓
Ali M	✓	✓	×	✓	✓	×

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethical Approval:

This Manuscript was approved by the Ethical Review Committee of Riphah College of Rehabilitation Sciences, Islambad

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