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Ergonomic Assessment and Prevalence of Work-Related Musculoskeletal Disorders (WRMSDs) Among Administrative Clerical Staff in Tertiary Care Hospitals of Rawalpindi

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ABSTRACT

Objective: To identify ergonomic factors contributing to work-related musculoskeletal disorders (WRMSDs) amongst clerical staff of tertiary care hospitals at Rawalpindi.

Study design: Analytical cross-sectional.

Place and Duration of study: Pak Emirates Military Hospital, Combined Military Hospital, Rawalpindi, Pakistan, from Sept to Dec 2024.

Methodology: The study was conducted on 217 clerical staff of both genders aged 30-50 years. A self-structured questionnaire, comprising three sections, was used. The first part comprised demographic information, the second part consisted of questions regarding various factors contributing to musculoskeletal discomfort, and the third part ascertained whether the pain was work-related. Workstation risk assessment was done by the Rapid Office Strain Assessment (ROSA) tool. Data was analyzed using SPSS version 26.00. The chi-square test and Pearson correlation were applied to find an association between the ROSA high-risk category and WRMSDs.

Results: A workstation assessment was done, and 138(63.88%) workstations were at risk. The major areas of complaint were neck pain 72(33.33%) and back pain 67(31.01%). Years of service, number of breaks, and duration of breaks were significantly associated with WRMSDs. A significant association (p=0.001) was seen between the ROSA risk category and the development of WRMSDs. A weak positive correlation (R2=0.059) was found between the ROSA grand score and the WRMSD score. Lumbar/cervical support usage was found among 76(50.3%) of the clerical staff having WRMSDs.

Conclusion: Most administrative clerical staff with poor ergonomic setups and high ROSA scores had significant musculoskeletal discomfort, particularly neck (34%) and back pain (27.5%).

Keywords: Ergonomics, Musculoskeletal disorder, Risk assessment, Workstation.

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INTRODUCTION

The computer workstation is an integral part of clerical work. It is defined as a space designed for optimal ergonomics to accommodate a desktop computer along with its peripherals.[1] Regular use of a computer workstation that is not well designed for the employees results in work-related musculoskeletal disorders (WRMSDs). WRMSDs are conditions that are significantly influenced by the working environment in their development, and where prolonged work duration contributes to the progression of symptoms.[2] According to a report published by WHO in July 2022, approximately 1.71 billion people have musculoskeletal conditions worldwide, and lower back pain is the main contributor to the overall burden of disease.[3]

Ergonomics is defined by the Cambridge dictionary as the scientific study of people and their working conditions, especially done to improve effectiveness.[4] Essentially, ergonomics facilitates the concept of "matching the task to the worker.[5] Ergonomics is relatively recent in Pakistan, yet to be widely acknowledged as an essential element in most businesses. The importance of ergonomics in addressing issues such as pain, numbness, tingling in the wrists, shoulders, back, and legs, as well as eye strain resulting from mechanical exposure of the upper limbs at work, is well established in the literature.[6]

When it comes to computer use, several factors should be considered, including the duration of usage, total work hours, consecutive hours worked, job nature, type of computer, and its placement. Both physical and psychosocial aspects need to be assessed to improve effectiveness. Clerical staff organizing the workplace, adjusting seat height, maintaining proper posture, using armrests and backrests correctly, aligning wrists and elbows, and positioning on the keyboard help minimize WRMSDs. To counter the

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effects of cervical and lumbar discomfort, different types, sizes, and shapes of neck and back support cushions are used.[7]

This study assesses the understanding of ergonomic principles among clerical staff, who often lack formal education or training in the subject. The findings aim to guide future research and practical ergonomic interventions to enhance their occupational well-being.

METHODOLOGY

This Analytical cross-sectional study was carried out on the administrative clerical staff of two tertiary care hospitals, i.e., Pak Emirates Military Hospital and Combined Military Hospital Rawalpindi, from September 2024 to December 2024. Ethical permission for the study was taken from the ethical review board of the institute (ERC/ID/401), after which data collection was done till end of December 2024. A total of 217 administrative clerical staff were assessed for their existing workstations and questioned about work-related pain or discomfort, along with demographic details. The sample size was calculated by the OpenEpi sample size calculator, keeping the confidence level at 95%, margin of error at 6%, and prevalence of WRMSDs at 28.3%.[8] Simple random sampling was used to collect the sample, ensuring everyone had an equal chance of being included. A complete list of eligible clerical staff was prepared, and random numbers were generated using a computer-based random number generator. Selected individuals were then approached for participation after obtaining informed consent.

Inclusion Criteria: The study recruited permanent administrative clerical staff of both genders with a 5-year minimum service and an age range from 30 to 50 years.

Exclusion Criteria: Clerical staff having multiple comorbidities or any surgery in the last year were excluded from the study.

Informed consent was taken before the participants were included, and they were assured of the strict anonymity of their data. Participants were given a self-structured questionnaire regarding WRMSDs, followed by a workstation assessment done by an interviewer using the Rapid Office Strain Assessment tool (ROSA).[9] The questionnaire was translated into Urdu as well and had three sections. In the first section, demographic details such as age, gender, institute, etc., were included.

The second section included questions regarding various factors contributing to any musculoskeletal discomfort, such as service duration, working hours, number of breaks during work, duration of break during work, etc. All the questions were answered on a Likert scale with "1 as never", "2 as sometimes", and "3 as always". The third section of the questionnaire was to ascertain whether the pain or discomfort experienced was work-related or not. The clerical staff were questioned about their work-related pain via a work-related musculoskeletal disorder (WRMSD) scale. With scores ranging from 0 to 15, it evaluated the pain on five different factors, including pain experienced while working, after duty hours, a week away from work, and the interference of pain with work and life outside work. Three variables were inverse scored, i.e., pain after the duty hours, pain a week away from shift, and interference outside work. The combined score of all five components was termed as global score of WRMSD. A WRMSD score of 10 or higher signified that pain was work-related. A pilot study was conducted with 30 participants, and the scale was validated by subject specialists. Reliability analysis was performed in SPSS, yielding a Cronbach's alpha of 0.804.

Assessment of the existing workstations was done by the ROSA tool, a picture-based posture checklist to identify hazards associated with the use of computers in the workplace, and to ascertain the degree of change required to minimize the risk factors. The ROSA score sheet was subdivided into seat pan details, backrest, armrest, phone, monitor, keyboard, and mouse positions. The results of the chair subsection (including seat pan details, backrest, and armrest) and the peripherals subsection (including phone, keyboard, and mouse) were then matched on a ROSA scoresheet to obtain a ROSA grand score. The score ranged from 1 to 10. A score greater than 5 indicated that the workplace was of higher risk, and measures for ergonomic improvement must be taken.

The data was assessed for frequency, and percentages were calculated for categorical variables. The chi-square test was applied to find the association between the presence of work-related musculoskeletal disorders and various risk factors, while the Spearman correlation was applied between ROSA grand score and Work-related musculoskeletal disorders score. A *p*-value of less than 0.05 was regarded as statistically significant.

RESULTS

The ages of 217 clerical staff ranged between 30 and 50 years, with a mean age of 37.21±4.96 years. The association of demographic characteristics of clerical staff with ROSA Risk Category is shown in Table-I. After assessment by the ROSA tool, 138 (63.88%) out of 217 workstations were found to be at risk and needed ergonomic intervention. No significant association between demographic characteristics and ROSA risk category was found. Frequent areas of pain were neck pain 72(33.33%) and back pain 67(31.01%). The association of risk factors with work-related musculoskeletal pain is shown in Table-II. A significant association between years of service, number of breaks, duration of breaks, and work-related musculoskeletal pain was found (p<0.001), (p=0.003), and (p<0.001), respectively. The association of ROSA risk category with Work-related musculoskeletal pain is shown in Table-III. Musculoskeletal pain was reported in 107(70.8%) out of 138 clerical staff of the ROSA high-risk workstations. A significant association (p=0.001) was seen between ROSA risk category and the development of work-related musculoskeletal pain. ROSA grand score was found to be significantly associated (p=0.001) with work-related musculoskeletal disorder score, showing a weak positive correlation (R2=0.059) as evident in Figure. The association between the use of cervical/lumbar support and work-related musculoskeletal pain is shown in Table-IV. WRMSDs and the use of lumbar/cervical support were significantly associated (p<0.001) with 76 (50.3%) of the clerical staff having WRMSDs always using lumbar/cervical support.

Table-I: Demographic Characteristics of Clerical Staff with Rapid Office Strain Assessment Tool Risk Category (n=217)

Parameters	ROSA Category		*p*-value
	Risk (n=138)	No Risk (n=78)	
Gender			
Male	126(91.3%)	72(92.3%)	0.798
Female	12(8.6%)	6(7.6%)	
Age			
30 - 35 Years	58(42%)	36(46.1%)	0.831
36-40 Years	45(32.6%)	23(29.4%)	
40-50 Years	35(25.3%)	19(24.3%)	
Area of Pain			
No Pain	10(7.2%)	7(8.9%)	0.295
Neck	47(34%)	25(32%)	
Back	38(27.5%)	29(37.1%)	
Arms	16(11.5%)	5(6.4%)	
Wrist	18(13%)	11(14.1%)	
Knees	9(6.5%)	1(1.2%)	
Job Title			0.967
LDC	104(75.3%)	59(75.6%)	
UDC 34 (24.6%)	19(24.3%)		

ROSA: Rapid Office Strain Assessment; LDC: Lower Degree Clerk; UDC: Upper Degree Clerk

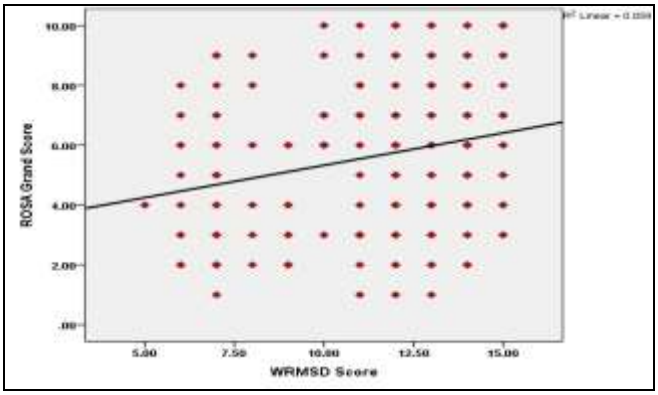

Figure: ROSA Grand Score and Work-related Musculoskeletal Disorder Score

Table-II: Work-related musculoskeletal pain with risk factors (n=199)

Parameters	WMRSD		*p*-value
	Present (n=151)	Absent (n=48)	
Years of service			
> 5 Years	45 (29.8%)	29 (60.4%)	<0.001
> 10 Years	51 (33.7%)	12 (25%)	
> 15 Years	55 (36.4%)	7 (14.5%)	
Number of Breaks Between Work			
None	55 (36.4%)	13 (27%)	0.003
Once	67 (44.3%)	14 (29.1%)	
More than once	29 (19.2%)	21 (43.7%)	
Duration of breaks			
10-15 mins	77 (50.9%)	9 (18.7%)	<0.001
16-30 mins	66 (43.7%)	14 (29.1%)	
> 30 mins	8 (5.2%)	25 (52.08%)	
Main working position			
Sitting	139 (92.05%)	42 (87.5%)	0.338
Sitting/standing	12 (7.9%)	06 (12.5%)	
Reaching away from Body During Work			
Never	23 (15.2%)	7 (14.5%)	0.965
Sometimes	120(79.4%)	38(79.1%)	
Always	8(5.2%)	3(6.25%)	
Handling Objects Above the head or near the floor			
Never	105 (69.5%)	33 (68.7%)	0.779
Sometimes	26 (17.2%)	10 (20.8%)	
Always	20 (13.2%)	5 (10.4%)	

WRMSD: Work Related Musculoskeletal Disorder

Table-III: Rapid Office Strain Assessment Tool risk Category with Work related musculoskeletal pain (n=199)

ROSA Category	WRMSD (n=151) n (%)	No WRMSD (n=48) n(%)	*p*-value
No Risk	44(29.1%)	27(56.25%)	0.001
Risk	107(70.8%)	21(43.75%)	

ROSA: Rapid Office Strain Assessment; WRMSD: Work Related Musculoskeletal Disorder

Table-IV: Use of Cervical/Lumbar Support with work-Related Musculoskeletal Pain (n=199)

Use of Cervical/Lumbar support	WRMSD (n=151) n (%)	No WRMSD (n=48) n(%)	*p*-value
Never	26(17.2%)	41(85.4%)	<0.001
Sometimes	49(32.4%)	6(12.5%)	
Always	76(50.3%)	1(2%)	

WRMSD: Work Related Musculoskeletal Disorder

DISCUSSION

This study highlights the significant prevalence of work-related musculoskeletal disorders (WRMSDs) among administrative clerical staff in tertiary care hospitals, shedding light on the ergonomic and occupational factors contributing to these issues. The study demonstrates that ergonomic assessment using the Rapid Office Strain Assessment (ROSA) tool revealed majority of workstations were at risk for developing musculoskeletal disorders. This percentage of high-risk workstations emphasizes the importance of regular ergonomic assessments to identify and mitigate accordingly.[10]

These findings of the study are consistent with the literature, which showed that 75 % and 66 % of the office workers had high-risk ROSA scores and immediate need for change in workstations.[11]

Most of the participants reported neck and back pain, reflecting a high prevalence of musculoskeletal discomfort in these areas of the body. This observation is consistent with a study of Ehsani *et al*., where lower back pain was observed in the majority of the office workers, emphasizing the pervasive nature of these issues in occupational settings.[12] Similarly, a study by Etana et al., has shown that neck pain is among the most common musculoskeletal disorders, with an age-standardized prevalence of 27.0 per 1000 individuals.[13] These findings are similar to various studies conducted by Kasaw *et al*.[14]

A significant association was found between musculoskeletal disorders and factors such as years of service, number of breaks, and duration of breaks. This relationship is supported by research conducted by Elashaer *et al*., where prolonged working hours without adequate breaks were associated with a higher prevalence of WRMSDs among bank staff.[15] Similarly, studies conducted by De-Barros *et al*., have identified inadequate rest breaks as major contributors to low back pain among office workers. These findings emphasize the importance of regular breaks and appropriate work schedules in reducing the risk of WRMSDs.[16]

Musculoskeletal pain was observed in most of the participants whose ROSA scores indicated ergonomic risk. This correlation aligns with research by Besharati *et al*., which highlights the ROSA tool's efficacy in identifying ergonomic risk factors that contribute to musculoskeletal discomfort.[17] Additionally, a study by Cezar *et al*., has emphasized the importance of ergonomic assessment by ROSA in identifying and addressing workplace risks to mitigate musculoskeletal discomfort and improve overall employee health.[18]

It was noted that half of the clerical staff experiencing musculoskeletal pain consistently used cervical or lumbar support. Similar results were obtained by a study conducted in Brazil by Gabrielle *et al*., which confirmed that the use of supportive devices, such as lumbar supports, was noted among those suffering from Musculoskeletal disorders.[19]

The study signified that administrative clerical staff with suboptimal ergonomic setups and higher ROSA scores commonly report musculoskeletal discomfort, most often involving the neck and back. This study aimed to identify ergonomic factors associated with work-related musculoskeletal disorders (WRMSDs) among clerical staff in tertiary care hospitals.

LIMITATIONS OF STUDY

The analytical cross-sectional design limits the ability to infer causality between ergonomic risk factors and the prevalence of Work-Related Musculoskeletal Disorders (WRMSDs). A longitudinal study would be better suited to establish temporal and causal relationships. While the ROSA assessment was conducted by the researcher, subjective variability in scoring may have occurred despite efforts to standardize the evaluation process. Independent assessments or inter-rater reliability tests could provide more robust findings. The study is confined to clerical staff in tertiary care hospitals, which might limit the generalizability of findings to other administrative populations or non-healthcare sectors. The study primarily focused on current workstations, without considering the impact of changes in workstation setup or ergonomic interventions over time.

CONCLUSION

The study concludes that most administrative clerical staff with poor ergonomic setups and high ROSA scores experience significant musculoskeletal discomfort, particularly neck and back pain. While ergonomic risks and factors like years of service, break patterns, and workstation design were associated with musculoskeletal disorders. Likewise, the use of cervical and lumbar supports was prevalent among affected staff. However, additional factors such as physical activity, stress, and non-occupational influences, which were not included in this study, may also contribute to the prevalence of WRMSDs.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

FS & MAR: Data acquisition, data analysis, critical review, approval of the final version to be published.

MFB EM: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AM: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

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.

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