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Original Article

Risk Factors For Work-Related Musculoskeletal Disorders In Pathologists: A Case Control Study

Yusra Malik, Wajeeha Mahmood*, Tahir Mahmood, Rubab Naqvi***, Aleena Waheed****

Department of Physiotherapy, Chaudhry Muhammad Akram Research & Teaching Hospital,Lahore Pakistan,*Department of Physiotherapy, University of Health Sciences, Lahore Pakistan,**Department of Physiotherapy, Rashid Latif Khan University Lahore Pakistan,***Department of Physiotherapy, Faculty of Allied Health Sciences Superior University, Lahore-Pakistan

ABSTRACT

Objective: To determine the risk factors of work-related musculoskeletal disorders among pathologists.

Study Design: Case-control study.

Place and Duration of Study: Departments of Pathology, various hospitals, Lahore, Pakistan, from Oct 2021 to Apr 2022.

Methodology: We enrolled participants from either gender, within the age range of 30 to 60 years, who were working as pathologists for at least 2 years, using a non-probability consecutive sampling technique. They were divided into two groups, cases and controls. Risk factors were designated and associated using a validated musculoskeletal questionnaire for Musculoskeletal Disorders (MSDs) having validity of 0.78. Odds Ratio was calculated to determine risk factors.

Result: Of 164 pathologists, there were 70 (42.68%) males and 94(51.32%) females. Among cases, there were 26(41.30%) males and 37(58.70%) females while in the controls, there were 44(43.60%) males and 57(56.40%) females. The five dominant risk factors were poor workstation ergonomics, OR=4.24 (2.16-8.30), sitting in slouching or slouched down posture at a computer workstation, OR=4.18(2.05-8.52), prolonged static posture, OR=3.77(1.68-8.50), sustained neck flexion, OR=3.77(1.68-8.50) and absence of low back support at OR=3.04 (1.34-6.9).

Conclusion: Pathologists have many risk factors for musculoskeletal disorders, among them, the five most dominant risk factors were poor workstation ergonomics, sitting in a slouch or slouch down posture, prolonged static posture, sustained neck flexion, and absence of low back support.

Keywords: Ergonomics, Healthcare personnel, Posture, Pathologists, Risk Factors

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INTRODUCTION

Work-related muscular problems are a critical problem among health care professionals[1] as these issues arise at the workplace especially laboratory professionals[2] including pathologists, microbiologists, and laboratory technicians.[3,4] They may injure their back, shoulders, elbow , and other muscles due to poor ergonomic conditions.[5] Abnormal posture while using microscope binoculars forces people to bend down without back support leading to persistent backache and cervical pain.[6] Prolonged sitting is related to musculoskeletal disorders, especially among the desk working positions as adjustable chairs can control abnormal stress on the neuromuscular system and can help in controlling musculoskeletal pain in an uncomfortable position.[7] Laboratory professionals have a high prevalence of MSDs with 84% frequency among laboratory technician.[8] Previous study reported visual discomfort and musculoskeletal stress especially in the neck and shoulders with unsuitable computer screen height because of high monitor position causing neck extension.[9] Additionally, absence of footrest leads to excessive knee flexion while sitting and slouched back posture, which are leading components of work-related musculoskeletal disorders.[10] Due to the lack of literature among laboratory professionals in our target population and workstation risk factors in pathologists, this study will help to identify the risk factors related to ergonomics among pathologists.

Correspondence: Dr Tahir Mahmood Department of Physiotherapy, University of Health Sciences, Lahore Pakistan

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METHODOLOGY

This case-control study was conducted from 2 October 2021 to 25 April 2022 at Chaudhary Muhammad Akram Teaching and Trust Hospital, Jinnah Hospital, Mayo Hospital, Children Hospital, Hameed Latif Hospital, Ittefaq Hospital, Farooq Hospital, Ghurki Hospital, Sheikh Zayed Hospital and Sharif City Hospital, Lahore. After taking approval on 1 October 2021 from Institutional Ethics Review Committee (Reference # SU/ANCRD/IERC/056.) of Azra Naheed Centre for Research and Development (ANCRD), this study was started. Sample size of this study was 164 which was calculated using an online sample size calculator. $n = \frac{r+1(p)1-p)\ (Z\beta+Z\ a/2}{r(p1-p2)2}$.[14]

According to this formula, a sample size of 164 was required with 82 in each group, by using following parameters: Ratio of control to case(r) = 1, Power of the study = 80 %, Zα/2= 1.96 (Standard normal variate at 5% type I error (p<0.05), Proportion of risk factor in case group (P1) = 20% and Proportion of risk factor in control group (P2) = 40%. 10-15 Non-randomized, consecutive sampling technique was used to enroll the required sample.

Inclusion Criteria: Male and female pathologists, aged 30 to 60 years and working as a professional for at least 2 years were included.

Exclusion Criteria: Pathologists not working regularly, having any systemic disease leading to musculoskeletal pain, previous injury in last 3 months, having any deformity or pain due to any secondary cause were excluded.

Informed consent was taken from all participants. A validated Musculoskeletal Questionnaire for MSD was used for data collection. It was pre-tested on a sample of 30 pathologists for 20-items with Cronbach's Alpha 0.78. Hours of microscope usage, poor workstation ergonomic, and period of work without break, awkward posture, high-speed work pace, and repetitive movement were taken as risk factors from literature.[12-16] Statistical Package for Social Sciences (SPSS) version 24.00 was used for the purpose of statistical analysis where mean and standard deviation (SD) were calculated for age, height and weight while Body Mass Index (BMI) was categorised according to the underweight , normal , overweight and obese. The p-values for gender were calculated through chi-square test, and their odd ratios were calculated for all recorded risk factors.

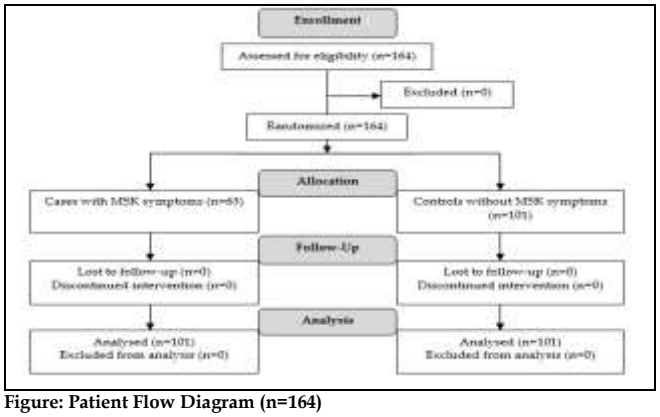

Figure: Patient Flow Diagram (n=164)

RESULTS

Our study enrolled 164 pathologists, out of which 70(42.68%) were males and 94(51.32%) were females. Among cases, there were 26(41.30%) males and 37(58.70%) females while in the control group, there were 44(43.60%) males and 57(56.40%) females. In the case group, 50(79.40%) were normal and 13(20.60%) were overweight while in the control group, 1(1.00%) was underweight, 67(66.30%) were normal and 33(32.70%) were overweight. The mean age of participants in the case group was 35.81±10.19 years and in the control group was 35.29±10.75 years while p-value of age (p=0.75), height (p=0.50), and weight (p=0.50), show that both groups were comparable according to socio-demographic characteristics, as shown in Table-I.

Table -I: Socio-demographic Characteristics of Study Participants (n=164)

Demographic Variables	Category	Cases (with disorders) n=63	Control (without disorders) n=101	Total n=164	p-value
Gender	Male	26(41.30%)	44(43.60%)	70(42.70%)	
	Female	37(58.70%)	57(56.40%)	94(57.30%)	
Body Mass Index	Underweight	0(0.00%)	1(1%)	1(0.60%)	
	Normal	50(79.40%)	67(66.30%)	117(71.30%)	
	Overweight	13(20.60%)	33(32.70%)	46(28.00%)	
Mean	Age (Years)	35.81±10.19	35.29±10.75		0.758
	Height (feet)	5.44±0.26	5.47±0.30		0.505
	Weight (Kg)	66.02±9.97	67.27±12.51		0.503

*Kg: Kilogram, *p-value significant at ≤ 0.05*

The odds ratio for prolonged static posture was 3.77(1.68-8.50) and the absence of low back support was 3.04(1.34-6.90). The odds ratio for the variable, absence of footrest while using a microscope was 2.13(1.02-4.44), and absence of leg space while using a microscope was 2.93(1.53-5.63). The odds ratio for sustained neck flexion was 3.77 (1.68-8.5) and sitting in a slouch or slouched down posture at a computer workstation was 4.18(2.05-8.52) as shown in Table II.

DISCUSSION

According to this study, the five prominent risks factors were poor work-station ergonomics, sitting in a slouched posture, sustained neck flexion, prolonged sitting posture, and absence of low back support while working. Rest of the other risk factors for work-related musculoskeletal complaints were the absence of leg space, absence of footrest while working on microscope, awkward wrist deviation during work on the microscope, work on microscope for more than 5

hours, unsupported arms, usage of excessive force hours were related to musculoskeletal complaints.[19]

Table-II: Risk Factors (n=164)

Items of Outcome		MSK Disorders		Total	OR(95%CI)	*p*-value
		Yes n=63	No n=101			
Do you work for more than 5 hours in front of microscope?	Yes	33(52.40%)	38(37.6%)	71(43.30%)	1.82(0.96-3.45)	0.064
	No	30(47.60%)	63(62.40%)	93(56.70%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you work without break?	Yes	23(36.50%)	26(25.70%)	49(29.90%)	1.66(0.84-3.27)	0.143
	No	40(63.50%)	75(74.30%)	115(70.10%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you work with fast pace?	Yes	50(79.40%)	75(74.30%)	125(76.20%)	1.33(0.63-2.84)	0.455
	No	13(20.60%)	26(25.70%)	39(23.80%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have poor work station ergonomic?	Yes	43(68.30%)	34(33.70%)	77(47.00%)	4.24(2.16-8.3)	< 0.001
	No	20(31.70%)	67(66.30%)	87(53.00%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you work more than 2 hours in front of computer screen?	Yes	35(55.60%)	60(59.40%)	95(57.90%)	0.85(0.45-1.61)	0.630
	No	28(44.40%)	41(40.60%)	69(42.10%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Have you use excessive force?	Yes	23(36.50%)	27(26.70%)	50(30.50%)	1.58(0.8-3.1)	0.220
	No	40(63.50%)	74(73.30%)	114(69.50%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you use repetitive movement?	Yes	42(66.70%)	64(63.40%)	106(64.60%)	1.16(0.6-2.24)	0.740
	No	21(33.30%)	37(36.60%)	58(35.40%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you use prolong static posture?	Yes	54(85.70%)	62(61.40%)	116(70.70%)	3.77(1.68-8.5)	<0.001
	No	9(14.30%)	39(38.60%)	48(29.30%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have absence of low back support?	Yes	54(85.70%)	62(61.40%)	116(70.70%)	3.04(1.34-6.9)	0.010
	No	9(14.30%)	39(38.60%)	48(29.30%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have absence of foot rest while using microscope?	Yes	50(79.40%)	65(64.40%)	115(70.10%)	2.13(1.02-4.44)	0.050
	No	13(20.60%)	36(35.60%)	49(29.90%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have inappropriate head posture while using mouse?	Yes	25(39.70%)	36(35.60%)	61(37.20%)	1.19(0.62-2.27)	0.600
	No	38(60.30%)	65(64.40%)	103(62.80%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have unsupported arms while using microscope?	Yes	42(66.70%)	54(53.50%)	96(58.50%)	1.74(0.91-3.35)	0.110
	No	21(33.30%)	47(46.50%)	68(41.50%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have absence of leg space while using microscope?	Yes	39(61.90%)	36(35.60%)	75(45.70%)	2.93(1.53-5.63)	<0.001
	No	24(38.10%)	65(64.40%)	89(54.30%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have awkward deviation of wrist while using microscope?	Yes	33(52.40%)	35(34.70%)	68(41.50%)	2.07(1.09-3.94)	0.030
	No	30(47.60%)	66(65.30%)	96(58.50%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have inappropriate microtome grip in microtome workstation?	Yes	1(1.60%)	2(2.00%)	3(1.80%)	0.8(0.07-8.99)	0.860
	No	62(98.40%)	99(98%)	161(98.20%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have absence of leg clearance in microtome workstation?	Yes	1(1.60%)	5(5.00%)	6(3.70%)	0.31(0.04-2.71)	0.260
	No	62(98.40%)	96(95.00%)	158(96.30%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have absent foot rest ledge in standing workstation?	Yes	30(47.60%)	53(52.50%)	83(50.60%)	0.82(0.44-1.55)	0.550
	No	33(52.40%)	48(47.50%)	81(49.40%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you have sustained neck flexion?	Yes	30(47.60%)	53(52.50%)	83(50.60%)	3.77(1.68-8.5)	<0.001
	N0	33(52.40%)	48(47.50%)	81(49.40%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		
Do you sit in slouch or slouch down posture at computer workstation?	Yes	49(77.80%)	46(45.50%)	95(57.90%)	4.18(2.05-8.52)	<0.001
	No	14(22.20%)	55(54.50%)	69(42.10%)		
Total		63(100.00%)	101(100.00%)	164(100.00%)		

p-value significant at ≤ 0.05

while doing pipetting, and work without breaks.[17] The burden of musculoskeletal problems frequency among pathologists was associated with the workload, ergonomics, sustained postures, bending and twisting the neck and standing for a long period so in order to reduce job-related strain, reduce the speed of the task and make the environment better for working.[18] The odds ratio for the variable, "working more than 5 hours in front of the microscope" was 1.82(0.96-3.45) similar to another study on health risk experienced by pathologists, which concluded that rising working Another study stated that mean working hours were linked to tightness in wrist and ankle,[20] similar to our study. In addition, working positions with prolonged or awkward postures in particular cause inappropriate movement of the upper limb that ultimately forces the neck and shoulder into painful spasms.[21] In another comparative study, 38% reported symptomsbut reported to awareness of ergonomics, highlighting need of education and prevention strategies mainly focusing on ergonomics.[22]

LIMITATIONS OF STUDY

This case-control study's use of non-probability consecutive sampling from pathology departments across various Lahore hospitals introduces selection bias and limits generalizability to pathologists in other regions or practice settings. The modest sample size (n=164) may reduce statistical power for detecting less prevalent risk factors, while reliance on self-reported data from a musculoskeletal questionnaire (despite reported validity of 0.78) risks recall and reporting biases. Lack of objective ergonomic assessments, adjustment for potential confounders (e.g., years of experience, physical activity), and unclear case/control definitions further constrain causal inferences regarding the identified risk factors (e.g., poor workstation ergonomics, OR=4.24).

CONCLUSION

Different risk factors of musculoskeletal disorders among pathologists with an odd ration of more than 1 were noted, out of these, the five most dominant risk factors were poor workstation ergonomic, sitting in slouch or slouched down posture, prolonged static posture, sustained neck flexion and absence of low back support.

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Authors' Contribution

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

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

TM & RN: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AW: 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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