ISSN 3006-2543 (Online)
ISSN 1990-3863 (Print)

A
S
J
O

Al-Shifa
Journal of Ophthalmology

Vol. 19, No. 2, April – June 2023

QUARTERLY PUBLISHED

Logo

Abstracts available at https://www.asjoalshifaeye.org and http://www.pakmedinet.com/ASJO
Manuscript submission through online platform ejmanager.com

Indexed in Index Medicus -EMR

Recognized by Pakistan Medical & Dental Council – IP/033

Al-Shifa Journal of Ophthalmology

Editorial inquiries should be addressed to Prof. Dr. Tayyab Afghani, Department of Orbit and Oculoplastics, Al-Shifa Trust Eye Hospital, Jhelum Road Rawalpindi, Pakistan.
Tel: 0092 51 5487821-25, Fax: 0092 51 5487827: Email:aqrcpio@yahoo.com ;
Website: www.asjoalshifaeye.org

ORIGINAL ARTICLE

Spectrum of Work-related Musculoskeletal Disorders among Ophthalmologists in Pakistan

Shehr Bano Abbas[1], Arslan Sajjad[1], Fuad Ahmad Khan Niazi[1], Ambreen Gull[1], Mishaal Abbas[2], Muhammad Abbas[3]

Abstract:

Objectives: To assess the prevalence of work-related musculoskeletal disorders (MSD), associated symptoms, and contributing risk factors among ophthalmologists in Pakistan.

Methods: A web-based questionnaire (Google Form) was developed and circulated via a social media application (WhatsApp) to ophthalmologist members of the Ophthalmological Society of Pakistan across the country. The questionnaire consisted of 21 questions on respondent demographics, practice characteristics, pain, and effects of musculoskeletal disorders on their practice patterns and social life.

Results: The survey was completed by 121 ophthalmologists with a response rate of 60.5%. Out of 121 participants, 96 (79.3%) reported work-related musculoskeletal disorders. Lower back pain was the most common symptom 57 (59.4%). The primary causes of MSD symptoms were abnormal postures during surgical procedures 67 (69.8%) and slit lamp examination 55 (57.3%). MSD attributed loss of productivity was claimed by 46.9% of the respondents.

Conclusion: Musculoskeletal pain is widespread among Pakistani ophthalmologists, significantly affecting their work and well-being. Urgent workplace adjustments, and prioritizing ergonomics in ophthalmic settings are essential. Moreover, integrating ergonomics into resident trainees' curriculum is crucial for raising awareness of risks and promoting proactive prevention strategies. *Al-Shifa Journal of Ophthalmology 2023; 19(2): 52-63.* *© Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

1. *Department of Ophthalmology, Rawalpindi Medical University and Allied Hospitals, Rawalpindi, Pakistan*
2. *Al Nafees Hospital, Islamabad*
3. *King Fahad Armed Forces Hospital, Jeddah, KSA*

Originally Received: 8 April 2023
Revised: 29 April 2023
Accepted: 1 May 2023

Correspondence to:
Shehr Bano Abbas
Department of Ophthalmology, Benazir Bhutto and Holy Family Hospitals, Rawalpindi, Pakistan.
shehrbanoabbas2013@gmail.com

Introduction:

The World Health Organization (WHO) defines work-related musculoskeletal disorders as "health issues affecting the locomotor system, including muscles, tendons, bones, cartilage, ligaments, and nerves." Over the past few decades, work-related musculoskeletal disorders have become a significant and undesirable occupational health risk for healthcare professionals, particularly among healthcare practitioners[1–3]. These disorders can range from mild to severe pain and stiffness, potentially leading to long-term disability and reduced quality of life among healthcare workers[4]. In 2015, the United States Bureau of Labor Statistics reported that work-related musculoskeletal disorders accounted for 31% of all workplace injuries, resulting in estimated annual losses of $45 to $54 billion in wages and productivity[5].

While 21st-century ophthalmologists have access to a variety of advanced ophthalmic devices for diagnosis and treatment, improper ergonomic practices in their usage can paradoxically harm these professionals[6]. Daily activities involving awkward postures, prolonged muscle contractions, static loading, and repetitive movements can lead to serious musculoskeletal injuries. Unfortunately, the field of ophthalmology often neglects the teaching of good ergonomic practices during professional training and clinical practice, which can have disastrous consequences for ophthalmologists[7]

The reported prevalence of musculoskeletal disorders among ophthalmologists varies widely in different countries, ranging from 52% to 80%[8]. A recent study in Pakistan revealed that 74.8% of participants had experienced musculoskeletal symptoms, with the most common complaints being lower back pain in 36.4% and neck pain in 22.4% of ophthalmologists[9]. Another study conducted in the United Kingdom found that 62% of ophthalmologists had experienced symptoms in the cervical, upper body, or lower lumbar regions[10]. A survey of eye care professionals in Saudi Arabia identified neck and back pain in 70% of participants[11]. Furthermore, a study reported that 15% of ophthalmologists faced limitations in their work, 42% of ophthalmic plastic surgeons had to modify their surgical procedures, 8% underwent surgery themselves, and 9% had to discontinue surgeries due to spinal difficulties[8]. Therefore, raising awareness of ergonomics and implementing ergonomic practices is crucial in preventing this modern epidemic. The prevalence of musculoskeletal disorders among ophthalmologists in Pakistan has not been extensively studied. Therefore, we conducted this study to assess the prevalence of work-related musculoskeletal disorders, associated symptoms, and contributing risk factors among ophthalmologists in Pakistan.

Materials & Methods:

A cross-sectional study was conducted in Rawalpindi Medical University and allied hospitals, Rawalpindi. Ophthalmologists working in other institutes all over Pakistan were also included. A web-based questionnaire (Google Form) was developed and circulated via a social media application (WhatsApp) to ophthalmologist members of the Ophthalmological Society of Pakistan across the country. After obtaining the informed consent from all the participants electronically, they were asked to fill out the questionnaire. Data anonymity was secured. The sample size of 120 is calculated by Calculator.net (https://www.calculator.net/sample-size-calculator.html) with anticipated population proportion of ophthalmologists with musculoskeletal pain: 74.8 % [9], with 5% absolute precision and 95% confidence and expected target population 200.

Practicing ophthalmologists within the age-group 25 to 65 years, were included in the study.

The ophthalmologists who had less than one year of their practicing experience and who have had musculoskeletal symptoms prior to the start of their ophthalmology career, were excluded from the study. Data collection was conducted electronically using Google Forms, with survey responses being securely stored in a protected electronic format through a dedicated link. The questionnaire consisted of 21 questions, including inquiries about occupational-related pain frequency, rated as "daily" or by the number of days per month, and pain severity measured using the 5-point Numeric Pain Intensity Scale. Specific survey inquiries covered various aspects, including age, gender, weight, height, years in practice, specialization, patient volume, time allocation between clinic and operating room, practice type (academic vs. private), location and quality of musculoskeletal pain, treatment methods, corrective surgeries, and the impact of musculoskeletal issues on work and social life. To safeguard participant

anonymity, no personally identifying information such as names or email addresses was collected. To ensure the questionnaire's quality and relevance to the study objectives, a group of ten senior members from Rawalpindi Medical University and Allied Hospitals reviewed it. They assessed the questionnaire for clarity, comprehensiveness, and alignment with the research goals, confirming its suitability for data collection. Data was entered and analyzed in SPSS 22.0. Descriptive analysis was performed on all the variables. As all the variables were categorical and hence were represented using frequency and percentage. The data was divided into two distinct groups: one comprising the participants with MSD and the other without MSD. The association between the variables was assessed using Fisher's exact test or Chi square. P-value ≤0.05 was deemed statistically significant.

Results:

A total of 121 ophthalmologists were included in our study. The gender distribution showed a higher representation of males, accounting for 72.7% of the sample. Additionally, the majority 50.4% of participants were older than 45 years. In terms of height, a significant proportion of 90.9% fell within the height range of 5 to 6 feet, and in weight category 47.9% had a weight between 61- 80 kg.

In our study majority 66.9% was of general specialty. Regarding designation, 52.1% were consultants, 28.1% were PGR and 19.8% were general ophthalmologist.

A significant majority 62.8% of the respondents reported working more than 40 hours a week. When it comes to the patient load, 45.5% of the ophthalmologist examined more than 100 patients per week. An almost equal percentage 36.4% had practice for over 20 years and for 10 years or less. Majority 58.7% of the participants spent their time in both the OPD and OT, while 5% spent most of the time in OT. (Table 1) The prevalence of MSD in current study was notably high i-e. 79.3%, with a substantial majority experiencing these disorders. (Figure 1). The distribution of gender among ophthalmologist with MSD and without MSD was equal. But both the groups had higher proportion of males with 69.8% and 84.0%, respectively. (p-0.210) The participants were equally distributed in terms of age, with 50% ophthalmologist in MSD group being 45 year or younger. (p=1.000) The majority of the participants fell within the height category of 5-6 feet in both the groups. The height did not show any statistically significant difference in its distribution among both the groups. (p=0.813) The participants were distributed fair consistently across the weight categories with no statistically significant difference. (p=0.572) Hence, there does not appear to be a statistically significant association between the demographic variables and the presence of MSD in this study. (Table 2)

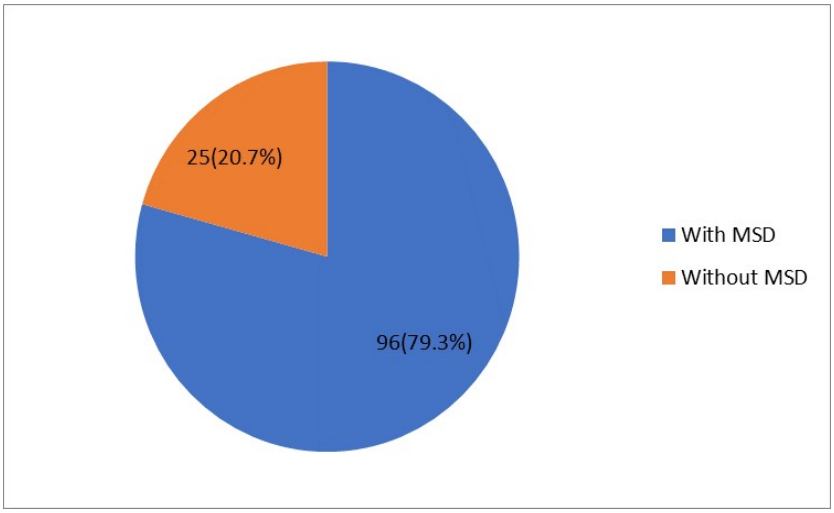

Figure 1: Distribution of ophthalmologists with and without MSD

Table 1: Demographic distribution of the ophthalmologist

Variables	Categories	Frequency	Percentage
Age	≤45 years	60	49.6
	> 45 years	61	50.4
Gender	Male	88	72.7
	Female	33	27.3
Height	< 5 feet	3	2.5
	5-6 feet	110	90.9
	>6 feet	8	6.6
Weight	≤ 60 kg	17	14.0
	61-80 kg	58	47.9
	>80 kg	46	38.0
Specialty	General	81	66.9
	Others	40	33.1
Designation	General ophthalmologist	24	19.8
	PGR	34	28.1
	Consultant	63	52.1
Working hours	≤40 hours	45	37.2
	> 40 hours	76	62.8
No. of patients seen per week	≤ 50	20	16.5
	51-75	19	15.7
	76-100	27	22.3
	>100	55	45.5
Years of Practice	≤ 10 years	44	36.4
	11-20 years	33	27.3
	>20 years	44	36.4
Most of the time spent in	OPD	44	36.4
	OT	6	5
	Both	71	58.7
Numbers of hours spent in operating room	≤ 10 hours	46	38.0
	> 10 hours	75	62.0

In ophthalmologists without MSD, large proportion 76.0% was of general specialty. In other group with MSD 64.6% of them was of general specialty. The distribution of specialty among both the groups was equal. (p=0.345) In terms of designation, consultants constituted majority in both the groups, comprising no significant difference. (p=0.408) The proportion of ophthalmologist with MSD who worked over 40 hours per week was slightly higher 66.7% than those without MSD (48.0%) but without showing any statistically significant difference (p=0.106). Likewise, the number of patients seen per week, years of practice time spent in different practice areas and hours spent in OT were equally distributed among both the groups without exhibiting a statistically significant difference. (Table 4)

Table 2: Comparative analysis of demographic, work type and experience among ophthalmologists with and without MSD

Variables	Categories	MSD	Without MSD	P-value
Gender	Female	29(30.2)	4(16.0)	0.210
	Male	67(69.8)	21(84.0)	
Age	≤45 years	48(50)	12(48)	1.000
	> 45 years	48(50)	13(52)	
Height	< 5 feet	2(2.1)	1(4.0)	0.813
	5-6 feet	88(91.7)	22(88)	
	>6 feet	6(6.3)	2(8.0)	
weight	≤ 60 kg	15(15.6)	2(8.0)	0.572
	61-80 kg	46(47.9)	12(48.0)	
	>80 kg	35(36.5)	11(44.0)	
Specialty	General	62(64.6)	19(76.0)	0.345
	Others	34(35.4)	6(24.0)	
Designation	General ophthalmologist	17(17.7)	7(28.0)	0.408
	PGR	29(30.2)	5(20.0)	
	Consultant	50(52.1)	13(52.0)	
Working hours	≤40 hours	32(33.3)	13(52.0)	0.106
	> 40 hours	64(66.7)	12(48.0)	
No. of patients seen per week	≤ 50	15(15.6)	5(20.0)	0.956
	51-75	15(15.6)	4(16.0)	
	76-100	22(22.9)	5(20.0)	
	>100	44(45.8)	11(44.0)	
Years of Practice	≤ 10 years	39(40.6)	5(20.0)	0.157
	11-20 years	24(25.0)	9(36.0)	
	>20 years	33(34.4)	11(44)	
Most of the time spent in	OPD	34(35.4)	10(40.0)	0.624
	OT	4(4.2)	2(8.0)	
	Both	58(60.4)	13(52.0)	
Numbers of hours spent in operating room	≤ 10 hours	37(38.5)	9(36.0)	0.816
	> 10 hours	59(61.5)	16(64.0)	

Within Colum percentages were reported

The prevalence of MSD in different ophthalmology sub-specialties shows general ophthalmology had 74.1% MSD cases, while vitreo-retina had 92.9% and oculoplastic had 100%. Over all across all subspecialties, 79.3% had MSD. Cornea/Anterior segment had 80% MSD and glaucoma had 80%. (Table 3)

Table 3: Prevalence of MSD among different sub specialties

Specialty	MSD		Total
	Yes	No	
General	60 74.1%	21 25.9%	81 100.0%
Cornea/Anterior segment	9 90.0%	1 10.0%	10 100.0%
Glaucoma	4 80.0%	1 20.0%	5 100.0%
Oculoplastic	7 100.0%	0 0.0%	7 100.0%
Pediatric Ophthalmology	3 75.0%	1 25.0%	4 100.0%
Vitreo - Retina	13 92.9%	1 7.1%	14 100.0%
Total	96 79.3%	25 20.7%	121 100.0%

The mean pain score was 2.13±0.93, indicated a moderate level of pain among ophthalmologist with MSD. Significant 53.1% respondents reported pain on ‘‘some of the days”. Lower back pain emerged as the significant issue affecting 59.4% of the ophthalmologists with MSD. Abnormal posture was identified as the major reason of pain, accounting for 63.5% of the cases. Surgical procedures were found to be the significant factor in causing MSD, impacting 69.8% of the professionals. A substantial 74.0% of the respondents reported fatigue/irritability as consequences of MSD. (Table 4)

Table 4: History and management of pain among the ophthalmologists having MSD

Variables	Category	Frequency	Percentage
Pain score (NSR)	1	26	27.1
	2	41	42.7
	3	21	21.9
	4	7	7.3
	5	1	1.04
Mean ± SD	2.13±0.93		
Frequency of pain	Rarely	16	16.7
	Some of the days	51	53.1
	Most of the days	23	24.0
	Daily	6	6.3
Location of Pain	Head	6	6.3
	Neck	33	34.4
	Upper Back	24	25
	Lower Back	57	59.4
	Upper Extremity	23	24.0
	Lower Extremity	11	11.5
	Joints	4	4.2
Associated Symptoms	Yes	23	24.0
	No	73	76
Reasons	Abnormal posture	61	63.5
	Prolonged surgical procedure	21	21.9
	Continuous work without break	28	29.2
	None	6	6.3
Treatment	Oral Pain Killer	44	45.8
	Physiotherapy	24	25.0
	Steroids	4	4.2
	None	38	39.6
Procedure responsible	Slit Lamp Examination	55	57.3
	Surgical Procedure	67	69.8
	Laser procedure	20	20.8
	None	6	6.25
Impacts	Fatigue/irritability	71	74.0
	Mental Stress	26	27.1
	Loss of productivity	45	46.9
	Abstaining form surgical procedure	34	35.4
	Early retirement	23	24.0
	None	11	11.5

Discussion:

This study conducted a comprehensive analysis of the prevalence of work-related musculoskeletal disorders (MSD), along with associated symptoms and contributing risk factors, among ophthalmologists in Pakistan using a questionnaire-based survey. The findings revealed that 79.3% of the participants reported experiencing symptoms of MSD. This is in line with existing data from both local and international studies, where the prevalence ranged from 57% to 80%[12]. For instance, a 2022 study by Rafique A and colleagues on ergonomics in ophthalmology practice among Pakistani ophthalmologists also identified MSD symptoms in 74.8% of the respondents[9]. Notably, our study observed a higher occurrence of MSD symptoms among ophthalmologists with less than 10 years of professional experience, which is consistent with findings by Dhimitri K.C and associates, WHO reported a higher frequency of neck symptoms in participants with fewer years of practice[13]. This could be attributed to the increased workload, both in outpatient and operating room settings, lower awareness about ergonomic practices, and greater use of modern ophthalmic devices among less experienced ophthalmologists. Conversely, Dabholkar T and colleagues reported opposite findings, with a higher frequency of MSD symptoms among ophthalmologists with more years of work experience[14], suggesting that experienced ophthalmologists may have developed better ergonomic practices over time.

Regarding the location of pain, the lower back was the most commonly reported site of pain, noted by 59.4% of respondents, followed by neck pain in 34.4% and upper back pain in 25% of participants, respectively. These results align with studies conducted among Indian, Pakistani, UK, and Saudi Arabian ophthalmologists[6,9,10,15]. However, studies carried out in the United States by Sidney A et al. and Dhimitri K.C and colleagues found that neck pain was the most prevalent location of pain, affecting 70% and 51.8% of participating ophthalmologists, respectively[5,13]. In our study, it was observed that female ophthalmologists experienced more neck and back pain 87.87% compared to their male counterparts 76.13%. This gender difference in pain prevalence was also demonstrated in a 2005 study by Dhimitri K.C et al., which associated neck and back pain with both female gender and higher stress levels[13]. Conversely, a study of Saudi Arabian ophthalmologists found no association between mental stress and the incidence of neck or back pain[16].In our research, no significant associations were found between reported pain and factors such as age, height, weight, and the number of patients seen per week. These findings are consistent with studies among ophthalmologists in the USA, UK, and Iran[5,10,12]. However, our study did reveal an association between higher pain levels and ophthalmologists who worked longer hours per week and those with fewer years of practice.

Certain subspecialists, such as plastic surgeons or vitreoretinal surgeons, may exhibit a higher susceptibility to musculoskeletal (MSK) disorders due to extended periods in specific postures and repetitive tasks. The current research demonstrates that MSDs were present in 100% of oculoplastic surgeons, while 92.9% of vitreoretinal surgeons experienced MSDs. In a survey conducted by Sivak-Callcott JA et al. among oculoplastic surgeons, 72.5% reported experiencing MSD symptoms. The study also revealed that a concerning minority of participants had to cease their surgical activities due to neck pain and injury. Notably, the use of magnifying loupes and headlights emerged as particular sources of concern. In another recent study led by Al Taisan A et al., the prevalence of MSDs among various subspecialties was explored. In this study, anterior segment and glaucoma surgeons ranked highest in

experiencing MSD symptoms, with rates of 68.6% and 67.1%, respectively, followed closely by oculoplastic surgeons at 65.5%[17].

Among participants experiencing pain, two-thirds reported mild to moderate pain, while less than one-third experienced severe pain, and 1% reported the worst possible pain. The primary causes of pain were identified as abnormal postures during surgical procedures 69.8% and during slit lamp examination 57.3%, with an additional 29.2% attributing their pain to continuous work without breaks. The most commonly utilized methods to alleviate pain were oral medicine and physiotherapy. In the study of Al Taisan A et al, the participants also used the similar remedies to treat their musculoskeletal pain[17].

Our study also highlighted that ophthalmologists experiencing pain had a significant impact on their professional work and quality of life. Fatigue and irritability were reported by 74%, while mental stress was experienced by 27.1% of these individuals. Additionally, loss of productivity was reported by 46.9%, 35.4% were contemplating abstaining from certain surgical procedures, and 24% were considering early retirement. These results suggest a higher level of pain-related impacts on ophthalmologists compared to previous studies[5,9,14]. One potential explanation is that 52.1% of our study consisted of consultants and senior ophthalmologists who had greater exposure to job stress, fatigue from their work, and longer careers, potentially approaching retirement age. Another factor to consider is the possibility of overestimation of self-reported musculoskeletal disorders, as individuals with MSD symptoms may be more inclined to participate in such a survey than those without symptoms.

Implications for Working Environment Modification

Modifying the working environment for ophthalmologists who are grappling with musculoskeletal disorders is of paramount importance to enhance their overall well-being, job satisfaction, and long-term career prospects. To achieve this objective, it is imperative to underscore the significance of integrating ergonomic principles into the practice of ophthalmology. Ergonomics is a scientific discipline and field of study dedicated to the design and arrangement of workspaces, tools, equipment, and tasks in a manner that optimizes the comfort, safety, and efficiency of human interactions with their environment and tasks. The primary goal is to enhance human well-being, productivity, and performance while minimizing the risk of discomfort, musculoskeletal disorders, and errors[18].

The American Academy of Ophthalmology has established a task force on ergonomics with the aim of educating its members about common work-related musculoskeletal disorders and strategies for their prevention. This task force is also actively involved in developing ergonomic guidelines and standards for ophthalmic equipment[19].

In daily practice, ophthalmologists can take proactive steps to mitigate the risk of musculoskeletal disorders. For instance, when operating the slit lamp, it is essential to maintain a neutral posture by aligning the head, neck, and torso vertically. Avoid craning the head forward or tilting it up or down, and reduce the distance between yourself and the patient[20]. Developing habits such as taking micro-breaks and engaging in stretch exercises can also be beneficial. In the operating room, various elements like the microscope, chair, foot pedals, and patient bed can impact the surgeon's ergonomic well-being. Careful adjustment of these elements to achieve an optimal position before commencing a procedure is crucial[21]. Maintaining a neutral spine, which includes keeping the knees bent at 90 degrees, feet flat on the floor, thighs parallel to the floor, and maintaining a straight back, is advisable. Additional modifications, such as the

placement of arm or wrist rests and instrument design, can provide forearm support. There are also specialized ergonomic devices designed for surgeons, including back and neck braces and elbow support pads[19].

Furthermore, daily schedules can be adjusted to minimize the time spent on repetitive tasks, especially in the operating theater, as prolonged operating may exacerbate discomfort for those fatigued by prior repetitive tasks at the slit lamp in the clinic. Lightweight equipment such as indirect ophthalmoscopes and binocular magnification loupes should be utilized to reduce fatigue, and instruments should not be gripped harder than necessary. Shaw et al. have emphasized the importance of considering the maximum holding time (MHT) for specific postures[22]. For instance, moderate flexion of the lower back has an MHT of 5.6 minutes. The increasing use of electronic health records has also extended the time ophthalmologists spend at computers. It is crucial to adjust the chair, table, monitor, keyboard, and mouse to promote a neutral sitting position.

To further enhance ergonomic practices, hospital managements should be encouraged to make the services of ergonomists available on-site. Ophthalmologists should actively advocate for ergonomic solutions from equipment manufacturers, and manufacturers, in turn, should substantiate the ergonomic optimization of their products through rigorous, science-based testing to demonstrate their benefits to users.

Limitations and Future Studies

To the best of our understanding, this research marks one of the initial endeavors to gather nationwide information concerning musculoskeletal issues and ergonomic practices within the ophthalmologist community in Pakistan. However, it's important to acknowledge potential biases in survey studies, particularly self-reporting bias, which is a primary limitation of our study. Additionally, although we achieved a relatively high response rate, the sample size remained modest, constituting another notable limitation. Lastly, given the demanding schedules of ophthalmologists, the frequent solicitations for survey participation may have hindered some individuals from adequately completing the survey due to time constraints. Further studies should be aim for larger, diverse and more representative sample of ophthalmologist across different demographics, geographical locations and practice settings. Validated standardized tools should be used for pain assessment and MSD evaluation rather than subject's self-reporting. In depth investigation of potential risk factors should be conducted. Longitudinal studies should be conducted to observe the progression and causality of MSD over time.

Conclusion:

The prevalence of musculoskeletal pain among ophthalmologists in Pakistan is quite common, and its impact on their work and quality of life can be significant. Given the substantial prevalence of this problem, there is an urgent requirement for workplace environment adjustments, with a particular focus on the integration of ergonomic principles, both in ophthalmic clinics and operating rooms. Furthermore, it is imperative to include ergonomics as a vital component of the curriculum for resident trainees to ensure they are well-informed about the associated risks and can take proactive measures to minimize them. Acknowledgement We are grateful to all the ophthalmologists who participated in this study.

Declaration of conflicting interest

The author declared no potential conflict with respect to the research, authorship and publication of this article.

Funding

The author received no financial support for this research from any funding agency.

References:

1. Koyuncu N, Karcioglu Ö. Musculoskeletal complaints in healthcare personnel in hospital: an

interdepartmental, cross-sectional comparison. Medicine 2018;97:e12597.
2. Zhang Q, Dong H, Zhu C, Liu G. Low back pain in emergency ambulance workers in tertiary hospitals in China and its risk factors among ambulance nurses: a cross-sectional study. BMJ open 2019;9: e029264.
3. Dong H, Zhang Q, Liu G, Shao T, Xu Y. Prevalence and associated factors of musculoskeletal disorders among Chinese healthcare professionals working in tertiary hospitals: a cross-sectional study. BMC Musculoskeletal Disorder 2019;20:1-7
4. S. N. Mansoor, H. Al Arabia, F. A. Rathore. Ergonomics and musculoskeletal disorders among health care professionals: Prevention is better than cure. JPMA June 2022; 72:1243-1245
5. Sidney A. Schechet, Eva DeVience, Stephen DeVience, Shweta Shukla, Mona Kaleem. Survey of musculoskeletal disorders among US ophthalmologists. Digit J Ophthalmol. 2020; 26(4): 36–45.
6. Kaup S, Shivalli S, Kulkarni U, Arunachalam C. Ergonomic practices and musculoskeletal disorders mong ophthalmologists in India: An online appraisal. Eur J Ophthalmol 2020; 30:196-200.
7. Miller NM and McGowen RK. The painful truth: physicians are not invincible. South Med J 2000; 93(10): 966–973.
8. Sivak-Callcott JA, Diaz SR, Ducatman AM, etal. A survey study of occupational pain and injury in ophthalmic plastic surgeons. Ophthalmic Plast Reconstr Surg 2011; 27(1): 28–32
9. Rafique A, Shaheer M, Rasheed U. Ergonomics in ophthalmology practice: cross-sectional survey among Pakistani ophthalmologists. Khyber Med Univ J 2022;14(2): 110-15.
10. Hyer JN, Lee RM, Chowdhury HR, Smith HB, Dhital A, Khandwala M. National survey of back & neck pain amongst consultant ophthalmologists in the United Kingdom. Int Ophthalmol 2015;35:769-75.
11. Al-Nekhilan AF, Al-Tamimi AM, Al-Aqeel BY, AlHawery AA, Al-Fadhel SF, Masuadi EM. Work-related musculoskeletal disorders among clinical laboratory workers. Avicenna J Clin Med 2020;10:29-34.
12. Chams H, Mohammadi SF and Moayyeri A. Frequency and assortment of self-report occupational complaints among Iranian ophthalmologists: a preliminary survey. MedGenMed 2004; 6(4): 1.
13. Dhimitri KC, McGwinG Jr, McNeal SF, et al. Symptoms of musculoskeletal disorders in ophthalmologists. Am J Ophthalmol 2005; 139(1): 179–181.
14. Dabholkar T, Yardi S, Dabholkar YG, Narayan A. Prevalence of Work Related Musculoskeletal Problems in Ophthalmologists practicing in Navi Mumbai and Mumb. Int J Med Res Prof.2015;1(3); 80-84.
15. Abdulrehman M. Alamri, Jaya Shanker Tedla, Irshad Ahmad, Abdullah Laftal, Abdulhamid Al Ghamdi. Musculoskeletal disorders among the ophthalmologists in Kingdom of Saudi Arabia: A cross sectional study. KKU Journal of Health Sciences. 2018; 3(1) ; 8-12
16. Al-Marwani Al-Juhani M, Khandekar R, Al-Harby M, Al-Hassan A, Edward DP. Neck and upper back pain among eye care professionals. *Occup Med (Lond)* 2015; 65:753.
17. Al Taisan A, Al Qurainees A E, AL Sowayigh O M, et al. Musculoskeletal

Pain Among Eye Care Professionals. Cureus 2023 ; 15(5): e39403. doi:10.7759/cureus.39403
18. Khyati Mewada, Yagna Unmesh Shukla. Effects of ergonomics among ophthalmologists on pain and function-an interventional study. International Journal of Research and Review 2020;9(10):442-488.
19. American Academy of Ophthalmology, Ergonomics Task Force Ergonomics Best Practices. https://www.aao.org/course/ergonomics-best-practices-course. Accessed January 28, 2020.
20. Alrashed WA. Ergonomics: Care for Yourself to Improve Patient Care. Imam J Appl Sci. 2016;1:48-63.
21. Devin Betsch, Harald Gjerde, Darrell Lewis, Randall Tresidder, R Rishi Gupta. Ergonomics in the operating room: it doesn't hurt to think about it, but it may hurt not to! Can J Ophthal 2020;55(3 Suppl 1):17-21.
22. Shaw C, Bourkiza R, Wickham L, Mccarthy I, Mckechnie C. Mechanical exposure of ophthalmic surgeons: a quantitative ergonomic evaluation of indirect ophthalmoscopy and slit- lamp bio microscopy. Can J Ophthalmology. 2017;52:302–7

Authors Contribution

Concept and Design: Muhammad Abbas
Data Collection / Assembly: Arslan Sajjad
Drafting: Fuad Ahmad Khan Niazi, Ambreen Gull
Statistical expertise: Mishaal Abbas
Critical Revision: Shehr Bano Abbas