

Awareness of Work-Related Musculoskeletal Disorders among Medical Laboratory Workers

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Author's Contribution

^{1,4,5,6} Substantial contributions to the conception or design of the work for the acquisition, analysis or interpretation of data for the work, ^{2,3,4} Drafting the work or reviewing it critically for important intellectual content, ^{1,3,4} Final approval of the version to be published, ¹ Agreement 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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Introduction

Musculoskeletal Disorders (MSDs) have been increasing rapidly around the globe, affecting every third person's quality of life.^{1,2} According to the World Health

A B S T R A C T

Background: Musculoskeletal Disorders (MSDs) have been significantly increasing among the varied range of occupations; however, these are not eluded due to compromised work-related ergonomics. In particular to medical professionals, MSDs are responsible for morbidity, thereby lowering the quality of worker's life and productivity.

Objective: The study investigates the awareness of work-related musculoskeletal disorders among medical laboratory workers.

Methodology: A cross-sectional survey was conducted among 135 young male and female laboratory workers of primary and tertiary care hospitals in Karachi using a self-administered questionnaire. Data was analyzed using SPSS. Participants' descriptive statistics were measured, and associations were drawn for work-related variables.

Results: A total of 136 laboratory workers (n=136) voluntarily participated in the study, with the majority being females (61.8%) and males (38.2%) within the age range of 26-30 years (44.1%). It was shown that, on average, only 40.7% of laboratory workers are aware of inappropriate work-related ergonomics (p = 0.04) and have developed neck pain (34.6%, p = 0.02) and wrist pain (30.4%, p = 0.03) due to workload demand. Most lab workers reported neck pain (34.6%, 40.4%), primarily due to frequent vibrating tools and strenuous shoulder/arm movements (p = 0.01). Additionally, wrist pain was significantly associated with increased workload demand (p = 0.005).

Conclusion: It was concluded that many laboratory workers lack awareness of inappropriate work-related ergonomics in their physically demanding jobs and the associated risk of work-related musculoskeletal disorders (WRMSDs). Therefore, implementing targeted ergonomic training programs, promoting correct posture, and optimizing workplace ergonomics may help significantly reduce the prevalence of musculoskeletal disorders.

Keywords: Musculoskeletal Disorders, Health, Work-load, Physical Activity, Pain.

Organization (WHO), 70% to 80% of people suffer from spinal pain, most commonly with neck and lower back pain, particularly young and older people.³ These may include a variety of factors such as workload, bad posture, incorrect

ergonomics, degenerative changes, or trauma that compromises their quality of life.⁴ MSDs are conditions that particularly affect muscles, joints, tendons, ligaments, capsules, or nerves that subsequently lead to the development of several conditions such as Osteoarthritis (OA), Gout, Neck or Lower back pain, Frozen shoulder, etc.⁵ In addition, according to Global Burden of Disease (2010), low back pain is considered the most prevalent MSD, ranging between 22% and 65%, similar to neck pain, which may lead to underlying ailments and injuries.⁶

Besides, WHO declared that Work-Related Musculoskeletal Disorders (WRMSDs) have been considered one of the leading health problems amongst laboratory workers due to the repetitive injuries that develop over time during routine laboratory procedures such as pipetting, working at the microscope, operating microtomes, using cell counters, and video- display terminals.^{7, 8, 9} Moreover, compromised ergonomics may also result in work-related injuries. Several pieces of evidence documented a high prevalence of WRMSDs in at least one body region varying 40% to 95% in Asian than Western population, affecting the lower back (29%-64%), neck (34%-63%), and shoulders (17%-75%) were among the most prominent affected areas.^{10, 11}

The objective of this study was to assess how aware medical laboratory workers are of musculoskeletal disorders (MSDs) and to explore ways to enhance prevention strategies. Research has consistently shown a strong association between WRMSDs and work-related posture, particularly physical factors such as poor postures, repetitive movements, excessive force, prolonged static work, and exposure to vibration.^{12, 13} Additionally, psychosocial factors, including workplace stress and job demands, have been recognized as significant contributors to the gradual development of these disorders.²¹ By identifying gaps in knowledge and workplace practices, this research aims to support the development of effective coping mechanisms that can ultimately improve workers' long-term health and well-being.

Methodology

A cross-sectional study was conducted among medical laboratory workers in Karachi in May 2023. The data was collected from primary and tertiary care laboratory workers, including Dr. Ziauddin Hospital, Liaquat National Hospital, and Dow University Hospital through a non-probability convenience sampling. The sample size was calculated using Open EPI software, version 3.01. Therefore, considering a 100000 population with 50% anticipated frequency, 95% confidence interval, and 8% bound of error, a

sample size of n=150 was calculated.² The study's inclusion criteria were males and females aged 25-40 years working for at least ≥ 1 year as medical laboratory professionals such as Medical Technologists, Clinical Laboratory Scientists, Phlebotomists, Pathologists, and Histotechnologists, and are willing to participate. Currently enrolled students working as interneers, recent graduates, and individuals having less than 1 year of experience were excluded from the study. The data was collected using a self-administered questionnaire to evaluate their awareness. It was sectioned into *demographic details* (age, gender, working experience, and hand dominance), *work-related ergonomics* (6 questions related to the application of ergonomics in the field), *work-related conditions* (6 questions related to working preference, activity implementation, and duration), *musculoskeletal disorders with workload demand* (4 questions related to the mode of working and associated MSDs that lead to pain in the wrist/hand, neck, and upper and lower back) and *prophylactic remedies* (4 areas that include medicinal management and physical activities/physiotherapy for reducing pain).

Data was collected in person and online from primary and tertiary care hospitals in Karachi using a self-administered questionnaire. Before the data collection, all participants were provided with informed consent to have detailed information about the study. The information of all the participants was kept confidential by the investigator. In contrast, participants may refuse to take part in the study or provide any information related to the study. Institutional review board approval was attained in May; reference number 160633RMT6.

Data was entered and analyzed on SPSS. Participant's demographic details were represented through descriptive statistics through mean and standard deviation, whereas responses were stated as frequency and percentage. A chi-square test was applied to examine the association of demographic and work-related variables at a significance level of $p < 0.05$. This test was applied for analyzing categorical data, allowing us to determine whether an association exists between variables without assuming a normal distribution.

Results

A total number of (n=136) lab workers voluntarily participated in the study, of which the majority were females (61.8%), males (38.2%) with the age range of 26-30 years (44.1%), and 1-2 years of practicing (30.9%), followed by 3-4 and >5 years (25.7%) respectively. Only (30.9%) were specialists. Moreover, the ratio of private employees (61.8%) was greater than government (38.2%). The details are depicted in Table 1.

It was revealed that only (41.9%) have an idea about ergonomics and its application in practice, knowing that it might improve their daily performance. However, the majority (51.5%) of participants revealed that their job is physically demanding and (44.1%) exhausting, whereas (49.3%) were aware of the risk factors related to inappropriate work ergonomics.

It was shown that the majority of workers preferred a sitting position (51.5%) for working, while (32.4%) preferred both sitting and standing positions. It was also revealed that (56.6%) of participants worked for more than 10 hours shift, testing 7-9 samples/patients (32.4%) per day. However, (72.1%) were found to take breaks in between breaks or perform physical activity/stretching (58.1%) during or after work.

It was revealed that the majority of lab workers have neck pain (34.6%, 40.4%) due to frequent use of vibrating tools and strenuous shoulder/arm movement. Also, wrist pain was found to be highest in strenuous movement (30.9%), inconvenient postures (29.4%), and prolonged sitting/standing (36.8%), whereas upper and lower back pain were present with varying rates in all conditions as shown in Figure-2.

Prophylactic management was found to be common among participants with analgesics (30.9%), steroids (57.4%), and physical activity (58.1%), while (44.1%) seek physiotherapy for the condition (Table 2).

The chi-square test showed a significant association of inconvenient working postures with increasing age ($p=0.004$), strenuous movements, and prolonged sitting/standing with increasing number of practicing years ($p=0.03$) and right-handedness in developing musculoskeletal pain, as depicted in Table 3.

Table 1 Demographic Characteristics of Participants	
No. of Participants	n=136
Gender	
Male	52 (38.2%)
Female	84 (61.8%)
Age	
20-25	9 (6.6%)
26-30	60 (44.1%)
31-35	25 (18.4%)
36-40	15 (11%)
>40	27 (19.9%)
Years of Practice	
1 year	24 (17.6%)
1-2 years	42 (30.9%)
3-4 years	35 (25.7%)
>5 years	35 (25.7%)

Table 2 Prophylactic Management for WRMSDS		
	Yes	No
Analgesics	42 (30.9%)	94 (69.1%)
Physiotherapy	60 (44.1%)	76 (55.9%)
Steroids	78 (57.4%)	58 (42.6%)
Physical Activity	79 (58.1%)	57 (41.9%)

Table 3 Chi-Square Test of Association			
	Value	Df	Asymp. Sig
Pearson	29.08	12	0.004**
Chi-square	17.715a	9	0.039*
	19.281a	9	0.023*
	7.482a	3	0.058
	8.556a	3	0.036*

Significance level: $p<0.05^*$, $p<0.01^{**}$

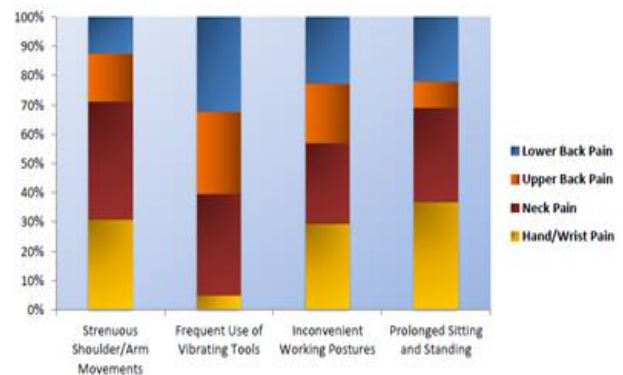


Figure 1: MSDs with Work Load Demand

Discussion

WRMSDs are the most common health problem among workers that may lead to increased absenteeism and disabilities than in any other condition.¹⁴ Laboratory operations in the workplace frequently include repeated and precise task accuracy that involves immobile, protracted, and uncomfortable postures, all of which increase the risk of musculoskeletal pain. Micro-trauma from everyday chores is included in the cumulative risk, which may increase by time restrictions and accuracy demands inherent in laboratory tasks.¹⁵

The findings of this study showed that, on average, only (>40%) laboratory workers are aware of the inappropriate work-related ergonomics in their physically demanding job (44.1%) and have developed neck and wrist pain (>30%) with workload demand. Likewise, research conducted in both Iran and India utilizing the Standardized Nordic Musculoskeletal Questionnaire reported 72% to 80% of musculoskeletal

issues due to work ailments among lab workers. Many studies have discovered alarming rates of self-reported musculoskeletal disorders among healthcare professionals, as more than a third of health workers endure WRMSDs throughout their practical laboratory training either in 1 week or a year. *Sadeghian et al.* and *Maulik et al.*, in their respective studies, discussed that with laboratory technicians, the most frequently affected areas for musculoskeletal issues were the lower back (30%), neck (24%) and upper back (21%) in the individuals during laboratory activities.^{16, 17} Similarly, our study highlighted that the majority of lab workers have neck pain (34.6%, 40.4%) due to frequent use of vibrating tools and strenuous shoulder/arm movement. Also, wrist pain was found to be highest in strenuous movement (30.9%), inconvenient postures (29.4%), and prolonged sitting/standing (36.8%), whereas upper and lower back pain was present with varying rates in all conditions. This is consistent with research from the United States, Ethiopia, Iran, Sweden, and Switzerland as it was reported that the neck (40%–60%) and lower back (9%–57%) are the most commonly affected regions of musculoskeletal ailments among laboratory technicians.¹⁸ Moreover, lower back issues account for 33% of all musculoskeletal injuries in Australia, which supports the high incidence of lower back disorders.¹⁴ *Maulik et al.*, 2012 in their study indicated that pipetting has been linked to musculoskeletal problems in the hands, shoulders, and neck are frequently affected, with excessive use and fatigue playing a significant role in injury occurrence. Pipetting tasks accounted for around a third of the time spent by laboratory workers, which might explain why they reported difficulties with their hands (12%), shoulders (15%), and neck (15%).¹⁷ However, our study didn't specify tasks particularly associated with developing MSDs.

Agrawal et al., in the study, Laboratory activities' repetitive and physical demands have been highlighted as factors contributing to the onset of musculoskeletal disorders. The authors stated that regions including back, shoulder, and neck pain have been associated with prolonged and awkward working postures, leading to static strain on muscles which is consistent with the most commonly reported complaints by healthcare professionals.¹⁵ Such that our study revealed that the majority of workers (56.6%) worked for more than 10 hours per shift, testing 7- 9 samples/patients (32.4%) per day. However, (72.1%) were found to take breaks in between or perform physical activity/stretching (58.1%) during or after work. Also, the poorly constructed workstation height set at excessively elevated or lowered levels may have contributed to these musculoskeletal challenges. According to an earlier study,¹⁷ In addition, our study showed that the majority of workers preferred a sitting position (51.5%) for working, while (32.4%) preferred both sitting and standing positions, which may be a consequence of the inappropriate working station or unit.

Although lower limb musculoskeletal disorders were reported less frequently by healthcare workers, the prevalence

was comparable to that seen in the literature. *Penkala et al.*, in 2018, determined the prevalence of knee, ankle, and foot disorders ranging from 5% to 10%, in contrast to the 10% to 20% reported in workforce literature. Lower limb difficulties have previously been linked to extended standing and movement throughout the workplace for various equipment, including fume hoods and centrifuges.^{17, 19}

According to a study by *Williams et al.*, certain musculoskeletal issues due to work are less common; they can nonetheless affect everyday activities and necessitate medical attention. Musculoskeletal injuries are reported by early-career health professionals in 45% of cases, typically occurring within the initial five years of practice.²⁰ The current study raises concerns that laboratory workers, regardless of age, gender, and number of practicing years, maybe pre-exposed to musculoskeletal difficulties that might put them at a higher risk of having more severe musculoskeletal ailments at the start of their careers. This highlights the need to control laboratory workplace ergonomics and training.

Conclusion

This study concluded that many laboratory workers lacked awareness of improper work-related ergonomics and the associated risk of WRMSDs. Implementing ergonomic interventions, promoting correct posture, and optimizing work conditions can help reduce the prevalence of MSDs. Future research should explore the progression of musculoskeletal disorders, assess the impact of targeted exercise programs on job performance, and evaluate the ergonomic design of workstations. Addressing these workplace challenges is essential for ensuring a healthier and more productive workforce.

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