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Prevalence of Work-Related Musculoskeletal Disorders in Laboratory Technicians from Bangalore

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***Abstract*: Background: Musculoskeletal problems are faced by everyone in daily life. Most of the musculoskeletal pain is work or occupation related. Over a period of time due to increased hours of work and constant postural habits, work related musculoskeletal pain has evolved. The prevalence of work-related musculoskeletal disorders (WRMSDs) is high in occupations which involve constant postures for long hours, excessive use of specific movements, lack of corrective measures taken etc. like IT professionals, call centre jobs, laboratory technicians, watch repairers, Tailors and many more. Of these, microscope users show high prevalence of neck pain, shoulder pain, elbow pain, hand pain and back pain. Aim of the Study: This study is aimed to find out the prevalence of work-related musculoskeletal disorders in Laboratory technicians from Bangalore Methodology: In this study a total of 100 laboratory technicians of age group 23 to 60 will be tested for musculoskeletal disorders. They will be evaluated Using the standardized general questionnaire of the Nordic musculoskeletal pain questionnaire. Result: The study examined musculoskeletal disorders (MSDs) among 100 laboratory technicians. Participants were 52% female and 48% male, with a mean age of 28.94 ± 8.71 years; most (76%) were 20–29 years old. The highest 12-month prevalence was in the lower back (24%), neck (20%), and upper back (20%), with 7-day rates of 13%, 13%, and 11% respectively. Functional limitations were most associated with neck and upper back pain (15% each) and lower back pain (13%). Other regions, including shoulders, hips, knees, and ankles, showed lower prevalence and fewer limitations. Neck, upper back, and lower back pain were most disabling. Conclusion: The study found musculoskeletal pain to be common among laboratory technicians, especially in the neck, upper back, and lower back. These regions caused the most functional limitations, affecting work and daily activities. Prolonged standing, repetitive tasks, and awkward postures were key occupational factors contributing to these disorders.**

***Keywords*: Laboratory technicians, Work-related musculoskeletal disorders, Nordic musculoskeletal pain questionnaire.**

1. Introduction

Work-related musculoskeletal disorders (WRMSDs) are widespread among laboratory workers, with prevalence rates between 72% - 80% in both developed and developing nations [4]. Extended use of microscopes has been associated with persistent pain conditions, particularly targeting the neck and upper back [1]. Laboratory activities such as pipetting, microscope work, and handling various instruments contribute to repetitive strain injuries, leading to ailments like carpal tunnel syndrome, tendonitis, and spinal issues [2]. Research indicates that laboratory technicians often experience neck and shoulder discomfort due to prolonged muscle exertion, heightening the risk of WRMSDs [2].

Medical laboratory technicians (MLTs) are a distinct group of healthcare professionals essential for disease diagnosis and medical research. However, their workplace subjects them to various occupational hazards, including biological, chemical, and ergonomic dangers [4]. WRMSDs are particularly common among laboratory personnel due to extended durations of static postures, repetitive hand motions, and frequent microscope usage [2].

Extended use of microscopes has been linked to persistent pain conditions, particularly affecting the neck and upper back [1]. Among musculoskeletal conditions, lower back pain is the most prevalent, affecting 568 million people globally [5].

Several occupational risk factors contribute to the high prevalence of WRMSDs among laboratory technicians, including prolonged static postures, repetitive hand movements, awkward work positions, and inadequate ergonomic interventions [1]. Psychological stress, long working hours, and genderspecific differences further influence the occurrence of musculoskeletal disorders [4]. Studies have found that female laboratory workers are at a higher risk of developing WRMSDs due to increased working hours and biomechanical differences [4].

The economic and social impact of WRMSDs is profound, affecting both individual workers and the healthcare system [1]. These disorders not only lead to physical discomfort but also result in lost productivity, absenteeism, and increased healthcare costs [4]. Despite the growing concern, limited studies have been conducted on the ergonomic hazards faced by laboratory technicians, particularly in regions such as Bangalore [2].

Bangalore, known as a major hub for healthcare and medical research in India, has a significant population of laboratory technicians working in hospitals, diagnostic centers, and

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research institutions. However, there is a lack of comprehensive studies assessing the prevalence of WRMSDs among laboratory technicians in this region [1]. Given the increasing workload, long hours of microscope use, and lack of ergonomic awareness, there should be an immediate need to evaluate the prevalence, risk factors, and impact of WRMSDs in laboratory technicians in Bangalore [4].

This study aims to determine the prevalence of WRMSDs among laboratory technicians in Bangalore, assess the magnitude of musculoskeletal discomfort, identify ergonomic risk factors, and establish the relationship between WRMSDs and occupational variables [2]. The findings of this research will contribute to the existing literature and help in the development of preventive measures to enhance the occupational health and well-being of laboratory technicians [1].

2. Need of the Study

Understanding these distinctions is crucial for developing targeted ergonomic interventions and physiotherapy based strategies to improve workplace health and productivity

As there has not been much literary evidence on how work-related musculoskeletal disorders (WMSDs) affect laboratory technicians, this study helps us relate how such conditions influence their posture, repetitive activities, work endurance, and overall health in laboratory practice. Laboratory technicians are the backbone of diagnostic and research services, and their efficiency is essential for accurate patient care and scientific progress. Since they perform tasks such as prolonged standing, repetitive pipetting, microscopic examinations, and handling equipment in awkward postures, they are at constant risk of developing WMSDs.

Technicians are a vital part of the healthcare and research system. If they are affected by musculoskeletal disorders, it may lead to reduced productivity, errors due to fatigue or discomfort, and long-term health consequences. This not only affects their personal well-being but also the quality of laboratory services provided to patients and researchers.

As the demand for diagnostic and laboratory services is increasing in Bangalore—a hub for medical and research laboratories—there is always a need to ensure the health and safety of laboratory personnel. Thus, identifying the prevalence of WMSDs among laboratory technicians is necessary for planning ergonomic interventions, preventive physiotherapy strategies, and occupational health policies.

Therefore, knowing the prevalence and impact of work-related musculoskeletal disorders in laboratory technicians is essential to safeguard their health, enhance work efficiency, and maintain the standards of laboratory services.

3. Methodology

Study Design: Cross sectional study
Study Setting:

- Dr. B.R. Ambedkar Medical college and Hospital
- Hospitals and Laboratories within Bangalore

Sample Size:100
Sampling Method: Stratified sampling method
Materials Used:

- Paper
- Pen
- Google forms

A. Criteria for Sample Selection

The participants are selected for the study based on following criteria:

B. Inclusion Criteria

- Both male and female lab technicians.
- Lab technicians between the age of 23 to 60 with average working hours of 6 to 10 hours
- Participants must be able to follow directions and perform the test.

C. Exclusion Criteria

- Those who are having any recent Musculoskeletal injuries due to trauma.
- Congenital deformities
- Having any neurological problems (excluding work - related neurological Problems)
- Recent fractures.
- Metastasis.
- Those who are involved in any form of Exercise or workout daily.
- Those who play any sport.

D. Outcome Measures

- Nordic musculoskeletal pain questionnaire

E. Procedure

This cross sectional survey aims to assess the prevalence of work related musculoskeletal disorders among 100 Laboratory technicians from Bangalore using Google form questionnaire

- Participants, aged 23-60 years (male and female) will be recruited from Laboratories in Bangalore and Dr. B.R. Ambedkar medical hospital through stratified sampling method.
- The survey includes the Nordic musculoskeletal pain questionnaire to measure pain severity and functional limitations.

Data will be collected over 3 months and the findings will help identify risk factors and physiotherapy interventions for pain management.

4. Data Analysis

The statistical analysis was done using SPSS 23.0. The categorical variables were represented in frequency and percentage. Numerical variables were presented using mean and standard deviation.

In the present study, the majority of participants (76%) belonged to the age group of 20–29 years, followed by 10% in the 30–39 years age group. Participants aged 50–59 years constituted 8% of the sample, while the least representation was from the 40–49 years age group, accounting for 6% of the total

population. The mean age of the participants was 28.94 ± 8.71 years.

Table 1
Distribution based on age

Age	Frequency (%)
20 – 29 Years	76
30 – 39 Years	10
40 – 49 Years	6
50 – 59 Years	8
Total	**100**

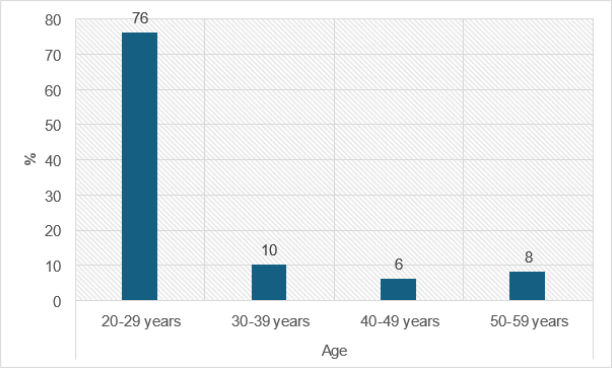

Fig. 1. Representation based on age

Table 2
Distribution based on gender

	Frequency	Percent
Female	52	52.0
Male	48	48.0
Total	**100**	**100.0**

In the present study involving laboratory technicians, the majority were females, constituting 52% of the participants, while males accounted for 48% of the sample. This indicates a nearly equal gender distribution among the study population.

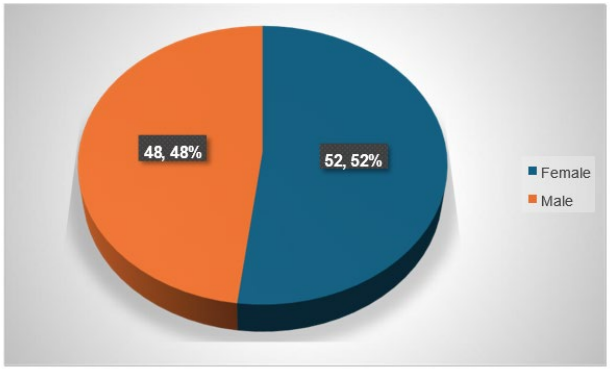

Fig. 2. Representation based on gender

Table 3
Distribution based on neck pain

Neck Pain		Frequency	Percent
12 Months	No	80	80.0
	Yes	20	20.0
7 Days	No	87	87.0
	Yes	13	30.0
12 Month Activity Limit	No	85	85.0
	Yes	15	15.0

Neck Pain: In the past 12 months, 20% of participants reported experiencing neck pain, while 80% had no such complaints. Within the last 7 days, 13% reported neck pain. Regarding limitations in daily activities due to neck pain in the past 12 months, 15% experienced activity restrictions.

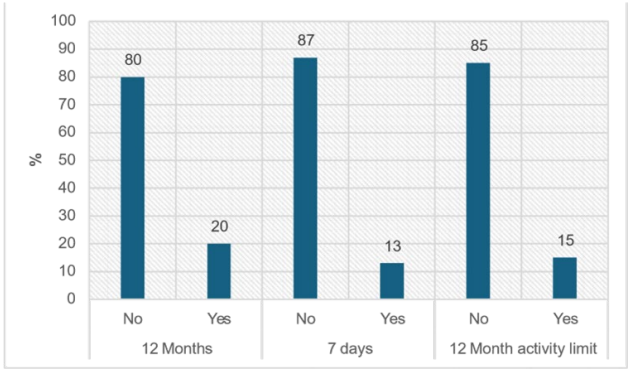

Fig. 3. Representation based on neck pain

Table 4
Distribution based on shoulder pain

Shoulder Pain		Frequency	Percent
12 Months	No	100	100.0
7 days	No	94	90.0
	Yes	6	6.0
12 Month activity limit	No	91	91.0
	Yes	9	9.0

Shoulder Pain: All participants (100%) reported no shoulder pain in the past 12 months. In the last 7 days, only 6% reported experiencing shoulder pain. Limitations in normal activities due to shoulder pain over the past year were noted in 9% of participants.

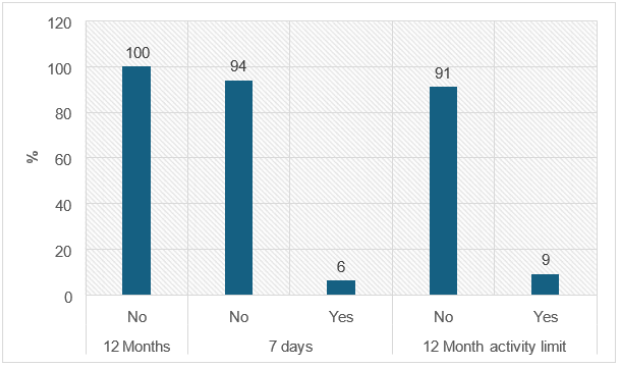

Fig. 4. Representation based on shoulder pain

Table 5
Distribution based on Elbow pain

Elbow Pain		Frequency	Percent
12 Months	No	100	100.0
7 days	No	100	100.0
12 Month activity limit	No	99	99.0
	Yes	1	1.0

Elbow Pain: No participants reported elbow pain in the past 12 months or within the last 7 days. Activity limitation related to elbow pain in the past year was reported by just 1% of the sample.

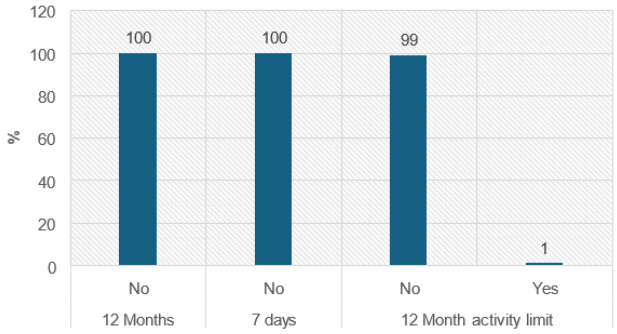

Fig. 5. Representation based on elbow pain

Table 6
Distribution based on wrist pain

Wrist Pain		Frequency	Percent
12 Months	No	100	100.0
7 days	No	98	98.0
	Yes	2	2.0
12 Month activity limit	No	97	97.0
	Yes	3	3.0

Wrist Pain: In the past 12 months, none of the participants reported wrist pain. Over the last 7 days, 2% experienced wrist discomfort. Activity limitations due to wrist pain in the past 12 months were reported by 3% of the participants.

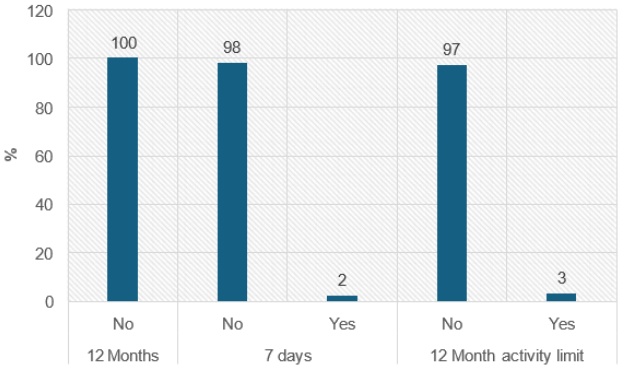

Fig. 6. Representation based on wrist pain

Table 7
Distribution based on upper back pain

Upper back pain		Frequency	Percent
12 Months	No	80	80.0
	Yes	20	20.0
7 days	No	89	89.0
	Yes	11	11.0
12 Month activity limit	No	85	85.0
	Yes	15	15.0

Upper Back Pain: Upper back pain was reported by 20% of participants in the past 12 months. In the last 7 days, 11% experienced upper back discomfort. Activity limitation over the past year due to this pain was reported by 15% of the sample.

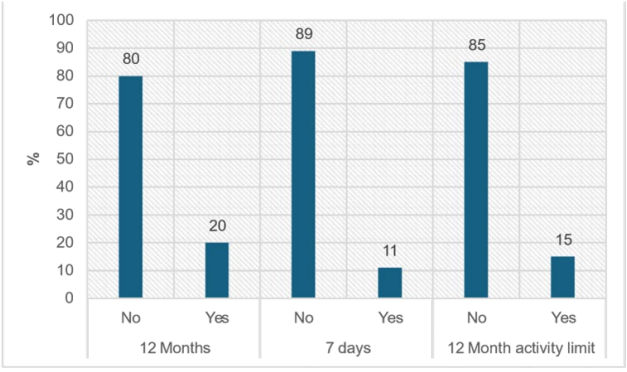

Fig. 7. Representation based on upper back pain

Table 8
Distribution based on lower back pain

Lower back pain		Frequency	Percent
12 Months	No	76	76.0
	Yes	24	24.0
7 days	No	87	87.0
	Yes	13	13.0
12 Month Activity limit	No	87	87.0
	Yes	13	13.0

Lower Back Pain: In the past 12 months, 24% of participants experienced lower back pain. During the last 7 days, 13% reported lower back discomfort. Limitations in daily activities due to lower back pain in the past year were also reported by 13% of participants.

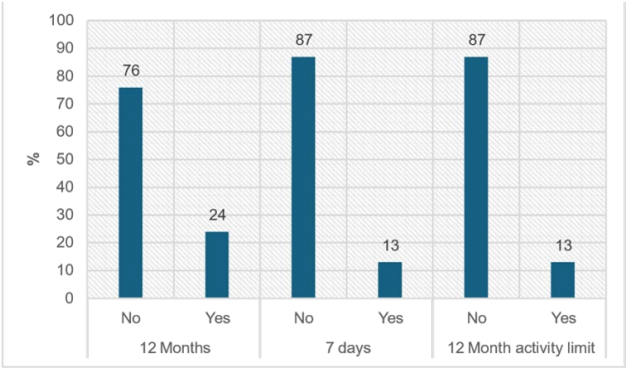

Fig. 8. Representation based on lower back pain

Table 9
Distribution based on Hip-Thigh pain

Hip-Thigh pain		Frequency	Percent
12 Months	No	92	92.0
	Yes	8	8.0
7 days	No	95	95.0
	Yes	5	5.0
12 Month activity limit	No	95	95.0
	Yes	5	5.0

Hip/Thigh Pain: Hip or thigh pain was experienced by 8% of participants in the past 12 months. In the last 7 days, 5% reported such pain. Activity limitations over the past year due to hip or thigh pain were also reported by 5% of participants.

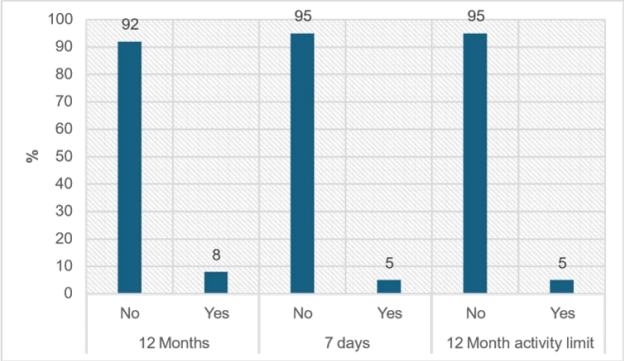

Fig. 9. Representation based on hip-thigh pain

Table 10
Distribution based on knee pain

Knee Pain		Frequency	Percent
12 Months	No	93	93.0
	Yes	7	7.0
7 days	No	96	96.0
	Yes	4	4.0
12 Month activity limit	No	95	95.0
	Yes	5	5.0

Knee Pain: Knee pain in the past 12 months was reported by 7% of participants, while 4% experienced it in the last 7 days. Limitations in daily activities over the past year due to knee pain were reported by 5% of the sample.

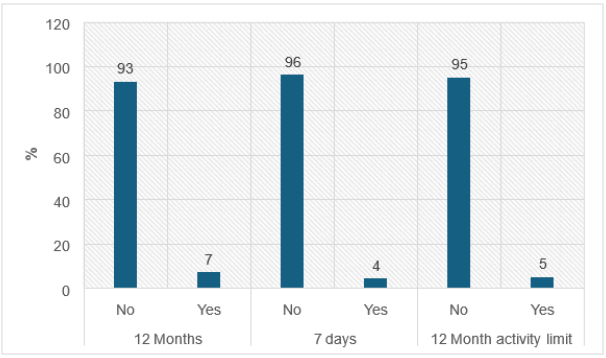

Fig. 10. Representation based on knee pain

Table 11
Distribution based on Ankle pain

Ankle feet Pain		Frequency	Percent
12 Months	No	92	92.0
	Yes	8	8.0
7 days	No	97	97.0
	Yes	3	3.0
12 Month activity limit	No	94	94.0
	Yes	6	6.0

Ankle/Feet Pain: Ankle or feet pain was reported by 8% of participants over the past 12 months. In the last 7 days, 3% experienced this pain. Activity limitation related to ankle or feet pain in the past year was reported by 6% of participants.

Based on the findings, functional activity limitation over the past 12 months was most frequently reported for the neck and upper back, with both affecting 15% of participants. This was followed by lower back pain, which limited activities in 13% of individuals. Limitations due to shoulder pain were reported by 9% of participants, while ankle/feet pain affected 6%, and hip/thigh and knee pain each affected 5%. The lowest reported limitation was for the elbow (1%) and wrist/hand (3%). These results suggest that pain in the neck and upper back regions had the greatest impact on functional activities among the participants.

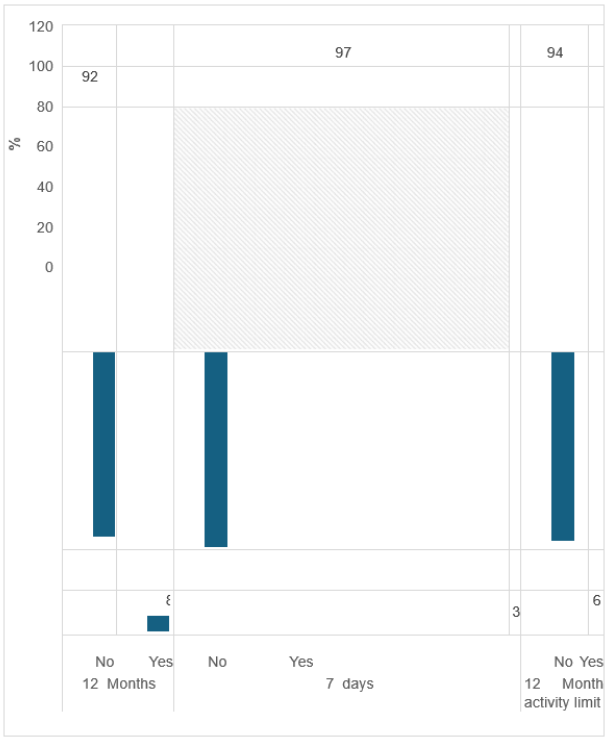

Fig. 11. Representation based on ankle pain

5. Result

The study aimed to investigate the prevalence of musculoskeletal disorders among laboratory technicians and their impact on functional activities. Statistical analysis was performed using SPSS version 23.0. Categorical variables were expressed in frequency and percentage, while numerical variables were analyzed using mean and standard deviation.

The gender distribution of participants in the study showed that 52% were females and 48% were males, out of 100 respondents, indicating an almost equal representation.

The age distribution revealed that the majority of respondents (76%) were in the age group of 20–29 years, followed by 10% in the 30–39 years group, 8% in the 50–59 years group, and 6% in the 40–49 years group. The mean age of participants was 28.94 ± 8.71 years.

With respect to musculoskeletal pain, the prevalence varied across different body regions. Neck pain was reported by 20% of respondents in the past 12 months and 13% in the past 7 days, with 15% reporting activity limitation. Upper back pain showed a similar pattern with 20% reporting it in the past year, 11% in the past week, and 15% experiencing functional limitation. Lower back pain was reported by 24% in the past year and 13% in the last 7 days, with 13% reporting activity restriction.

In contrast, pain in other regions was less frequent. Shoulder pain was not reported in the past year, though 6% experienced

it in the past 7 days, and 9% noted functional limitations. Hip/thigh pain was reported by 8% in the past year, with 5% reporting activity limitation. Knee pain was observed in 7% of participants in the past 12 months, with 5% reporting related limitations. Ankle/feet pain was reported by 8% in the past 12 months and 3% in the past 7 days, while 6% experienced functional limitations. Very few participants reported elbow pain (1%) or wrist/hand pain (3%) associated with activity limitation.

Overall, functional activity limitations were most frequently associated with neck and upper back pain (15% each), followed by lower back pain (13%). Shoulder, knee, hip/thigh, and ankle/feet pain contributed to moderate levels of limitation, whereas elbow and wrist pain were least reported.

These results suggest that musculoskeletal pain, particularly in the neck, upper back, and lower back regions, had the most significant impact on the functional abilities of laboratory technicians.

6. Discussion

Musculoskeletal disorders (MSDs) are a growing concern worldwide, particularly among occupational groups engaged in repetitive or prolonged tasks. Laboratory technicians, due to the nature of their work such as prolonged standing, awkward postures, and repetitive movements, are prone to developing musculoskeletal pain. The present study aimed to investigate the prevalence of musculoskeletal pain among laboratory technicians and its impact on functional activities.

The findings revealed that neck pain (20%), upper back pain (20%), and lower back pain (24%) were the most commonly reported complaints, with these regions also showing the greatest impact on functional activity limitation.

These findings are in line with earlier studies conducted among laboratory workers and similar occupational groups. Ali et al. (2021) reported that 38% of laboratory workers experienced work related musculoskeletal disorders (WRMSDs), with neck and upper back pain being among the most prevalent complaints. Similarly, Maulik et al. (2014) found a 73.3% prevalence of musculoskeletal problems among medical laboratory technicians, with the trunk, knees, and neck being the most affected regions. Our results are consistent with these studies, confirming that laboratory work involving microscopes, pipetting, and prolonged standing places significant strain on spinal and trunk regions.

The high prevalence of neck pain in this study (20%) also aligns with the findings of Ganjave and Shikrapurkar (2019), who reported a 100% prevalence of neck pain among clinical laboratory technicians in Mumbai, with the majority experiencing mild to moderate disability. This strongly suggests that microscope-based tasks and sustained postures are major contributors to cervical spine stress and discomfort.

In comparison with other occupations, Shanmugam et al. (2021) observed a 70.8% prevalence of MSDs among building painters, with neck (65.4%) and shoulders (69.5%) being the most affected regions. Although the occupational tasks differ, both painters and laboratory technicians share risk factors such as awkward postures and repetitive tasks, reinforcing the importance of ergonomic interventions across different professions.

The present study also observed lower but notable reports of musculoskeletal pain in the shoulder (6%), knee (7%), hip/thigh (8%), and ankle/feet (8%) regions. Abdelsalam et al. (2023), in their study among kitchen workers, reported that the lower back (64.8%), knee (46.9%), and foot (46.1%) were the most affected sites. This contrast highlights that while heavy manual work (as in kitchens) primarily affects lower extremities, laboratory work exerts greater strain on the neck, trunk, and upper back due to static and repetitive activities.

Taken together, the evidence from our study and previous literature strongly indicates that laboratory technicians are at considerable risk of musculoskeletal disorders, especially in the cervical and spinal regions. The high prevalence of pain and functional limitations underscores the urgent need for ergonomic awareness, proper workstation design, regular rest breaks, and preventive physiotherapy strategies to reduce occupational strain and improve long-term health outcomes.

7. Conclusion

In conclusion, the present study demonstrated that musculoskeletal pain is highly prevalent among laboratory technicians, particularly in the neck, upper back, and lower back regions. A total of laboratory technicians were approached and data was collected using standardized questionnaires. According to the findings, there were notable variations in the distribution of pain across different body regions, with spinal areas being most affected. Functional limitations were reported most frequently with neck and back pain, highlighting their impact on work performance and daily activities. This study showed that occupational factors such as prolonged standing, repetitive movements, and awkward postures play a major role in the development of musculoskeletal disorders among laboratory workers.

8. Limitations

- This study was conducted on a relatively small sample size, which may limit the generalizability of the findings to a larger population of laboratory technicians.
- The study design was cross-sectional, so it could not establish a causal relationship between occupational exposure and the development of musculoskeletal pain.
- Data was collected using self-reported questionnaires, which may be influenced by recall bias or under-/over-reporting of symptoms.
- Certain important factors such as body mass index (BMI), years of work experience, psychosocial stress, and workload intensity were not included in the analysis, though they may influence musculoskeletal health.
- The study was limited to laboratory technicians in a single geographical region, which may not reflect variations in work conditions across different laboratories or regions.

9. Recommendations

- Different ergonomic factors such as workstation design,

posture, and equipment use can be further studied to identify specific contributors to musculoskeletal pain in laboratory technicians.

- Different laboratory environments and working conditions can be compared in future studies to explore how variations in workload, space, and equipment influence musculoskeletal health.
- Other assessment tools apart from questionnaires, such as clinical examinations and ergonomic risk assessment methods, can be used in future studies to provide more objective data.

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