



## **Prevalence of work-Related Musculoskeletal Disorders Among Medical Laboratory Professionals in North Kerala Population: A Cross-Sectional Survey Method**

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Received: 16 January 2024

Published: 02 February 2024

DOI: <https://doi.org/10.5281/zenodo.10848214>

## **Abstract**

**Background:** Work-related musculoskeletal disorders (WRMDs) have been widely identified as a major problem affecting the work force. However, data on WRMDs in medical laboratory workers in North Kerala Population. The aim of the study is to evaluate the frequency of WRMSDs in medical laboratory population. Many a person, across the globe suffer from occupational related musculoskeletal problems. This study tries to find out the prevalence of work-related musculoskeletal problems seen in medical laboratory professionals in North Kerala Population.

**Objective:** To find out the prevalence of work-related musculoskeletal disorders among medical laboratory professionals in North Kerala Population.

**Method:** 300 Medical laboratory professionals were selected based on inclusion and exclusion criteria. The entire laboratory workers were given a validated Standardized Nordic Musculoskeletal questionnaire (SNMQ). From the outcome of the questionnaire, we obtained the percentage of work-related musculoskeletal injuries among medical laboratory workers from North Kerala population.

**Results and Discussion:** The high annual prevalence of musculoskeletal disorders was found on the neck region (82%), followed by lower back (64%). The other areas were found to be in less compared to neck and lower back. It was around shoulder (36%), Elbow (16%), wrist/ hands (15%), Upper back (35%), one or both hips (8%), one or both knees (9%) and Ankles/feet (7%). The high weekly prevalence of musculoskeletal disorders was found on the neck region (51.66%), followed by lower back (32.33%). The other areas were found to be in less compared to neck and lower back. It was around shoulder (6.66%), Elbow (0%), wrist/ hands (0%), Upper back (3.66%), one or both hips (0%), one or both knees (0%) and Ankles/feet (0%).

**Conclusion:** The study concluded that high prevalence of WRMDs among medical laboratory professionals in North Kerala Population with the neck and lower back most commonly affected irrespective of medical laboratory workers.

**Key words:** Prevalence, Work Related Musculoskeletal Disorders, Medical Laboratory Workers, Standardized Nordic Musculoskeletal Questionnaire.

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## Introduction

Musculoskeletal disorders (MSDs) are a significant cause of physical limitation affecting humans around the globe. Work-related musculoskeletal disorders involve isolated or multiple problems in muscles, tendons, joint tissue, nerves, fascia and ligaments, with or without tissue degeneration, caused by work [1]. MSDs can cause severe physical impairment, pain, and can greatly alter the psychosocial status of the affected individuals. In 2016, The Global Burden of Disease (GBD) study reported that MSDs were the second most common cause of disability worldwide, with back pain as the leading cause. Approximately 71.1% of people worldwide live with a musculoskeletal condition.

The World Health Organization (WHO) defines MSDs as “multifactorial, with work contributing significantly, though not exclusively, to causing the disease”. Work-related musculoskeletal disorders (WMSDs) can result from or be worsened by recurrent, vigorous, or prolonged work activities with inadequate recuperation. Clinical laboratory employees work long hours in a confined seated or standing position. Their work involves continuous repetitive hand movements, such as during pipetting this is of major concern. The important risk factors of hand/wrist injuries include frequent movement of the arm or wrist, motions that require extremes of hand or arm position, and sustained static postures, and vibration [2].

WMSDs are also reported to cause lost work time or absenteeism, increase work restriction, transfer to another job, or disability than any other group of diseases with a considerable economic toll on the individual, the organization and the society as a whole. Findings of scientific research have identified physical, psychosocial/organizational, and individual occupational “risk factors” for the development of WMSDs [3]. Most common body regions affected with MSDs are the low back, neck, shoulder, forearm, and hand. The risk factors associated with MSDs include forceful exertions, repetitive movements, awkward, and/or sustained postures such as prolonged sitting and standing. Globally, MSDs are one of the most common work-related illnesses and causing significant economic burden in terms of lost wages, treatment, and compensation and also responsible for considerable impact on the quality of life [4].

World Health Organization (WHO) attributes a multifactorial aetiology to WMSDs, these disorders seem as consequence of the worker exposure to the different number of work-related risk factors. A risk factor is any source/situation with the potential to cause injury or lead to the development of a disease. In order to measure WMSDs there are three groups of risk factors. These are: a) Physical factors (Ergonomics): involving sustained or awkward postures, repetition of the same movements, forceful exertions, hand-arm

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vibration, all-body vibration, mechanical compression, and cold. b) Psychosocial factors (Work Stress): involving work pace, autonomy, monotony, work/rest cycle, task demands, social support from colleagues and management and job uncertainty. c) Individual factors: involving age, gender, professional activities/skills, sports activities (workers' fitness), domestic activities, recreational activities, alcohol/tobacco consumption and, previous WMSD [5].

Work-related musculoskeletal problems impact everyday function, working ability, and quality of life. Unaddressed musculoskeletal problems can lead to major injury and loss of function, contributing to participation restrictions, economic loss and the increasing burden of disease worldwide. Workplace laboratory tasks often require repetitive, fine task precision, static, sustained and awkward postures which increase musculoskeletal injury risk. Looking through a microscope requires keeping the head in the same exact position for long period. This type of posture especially strains the neck muscles. Depending upon the type of microscope and sample, work can be either standing or sitting. Sitting or standing for long periods of time strains the muscles and cause discomfort. Work with a microscope often requires forward or side abduction movements of the upper extremities in order for the adjustment knobs to be used. Such kind of occupations which require maintaining static postures for long hours put increase load or forces on the muscles and tendons which contributes to fatigue [6].

Medical laboratory professionals are exposed to number of risk factors in the workplace for musculoskeletal disorders such as back and shoulder injuries and even other joints and muscles exertion, which are aggravated or prolonged by work conditions [7]. Awkward posture while looking through microscope eyepieces causes people to lean forward, away from the back of the chair so the head, upper and lower back are all inclined beyond acceptable limits leading to back and neck pain.

The Nordic musculoskeletal questionnaire is adopted in this study to assess self- reported musculoskeletal complaints with respect to nine body part areas such as neck, shoulder, elbows, wrist/hands, hips, knee, lower back, upper back, ankles/feet. The occurrence of these symptoms over the past week (weekly prevalence) and over the past year (annual prevalence) were noted [8,9].

Therefore, the aim of the study is to evaluate the frequency of WRMSDs in medical laboratory population. Now a days the prevalence of musculoskeletal problems is increased due to physiological and mechanical causes. Many a person, across the globe suffer from occupational related musculoskeletal problems. This study tries to find out the prevalence of work-related musculoskeletal problems seen in medical laboratory professionals.

## **Objectives**

### **Objective**

To find out the prevalence of work-related musculoskeletal disorders among medical laboratory professionals in North Kerala Population.

### **Hypothesis**

#### **Null Hypothesis(H<sub>0</sub>)**

There will be no significant difference in the prevalence of work-related musculoskeletal disorders among medical laboratory professionals in North Kerala Population.

#### **Alternative Hypothesis(H<sub>1</sub>)**

There will be significant difference in the prevalence of work-related musculoskeletal disorders among medical laboratory professionals in North Kerala population.

## **Methodology**

### **Research Question**

Is there any prevalence of work-related musculoskeletal disorders among medical laboratory professionals in North Kerala population?

### **Study Design**

Cross-sectional Survey method.

### **Study Setting**

The study was conducted among medical laboratory professionals from various work places that are Kozhikode, Malappuram, Kannur, Kasaragod, Wayanad districts from North Kerala population.

## **Sampling**

Sample Size: 300 samples were selected who were satisfying both inclusion and exclusion criteria. In the clinical practitioners were taken.

Study Duration: 2 months

### **Inclusion Criteria:**

- Medical laboratory professionals only clinical practitioners.
- Should have at least 2 years working experience.
- Both males and females.
- Age group between 25-35 years.
- Pain and any discomfort for one or more week.
- Those who work more than nine hours.

### **Exclusion Criteria:**

- Previous pathological condition.
- History of any surgery.
- Any recent fractures, trauma
- Post-partum females within one year.

### **Sampling Procedure:**

#### ➤ **Sample Design:**

Simple Random Sampling

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➤ **Study Procedure:**

300 Medical laboratory professionals were selected based on inclusion and exclusion criteria. The entire laboratory workers were given a validated Standardized Nordic Musculoskeletal questionnaire (SNMQ). From the outcome of the questionnaire, we obtained the percentage of work-related musculoskeletal injuries among medical laboratory workers from North Kerala population.

### **Materials**

- Pen
- Pencil
- Record sheet
- Standardized Nordic Musculoskeletal Questionnaire (SNMQ) used for screening of musculoskeletal discomfort.

### **Methods Including**

Method Of Data Collection:

- Questionnaire method Outcome Measurement:
- Standardized Nordic Musculoskeletal Questionnaire

### **Funding**

Self-funding

**Results**

**Techniques of Data Analysis and Interpretation**

**Statistical Tool**

SPSS21.0 software was used to find out the statistics mentioned below

1. Arithmetic Mean

$$\bar{x} = \frac{\sum x}{N}$$

Where-  $\bar{x}$  = Arithmetic Mean

$\sum x$  = Sum of the variables

N = Total number of variables

2. Standard deviation

$$S \cdot D = \sqrt{\frac{\sum (x - \bar{x})^2}{N}}$$

Where, x= the individual score

$\bar{x}$  = the Mean score

N = Total number of scores

**Analysis of Demographic Data of Medical Laboratory Professionals**

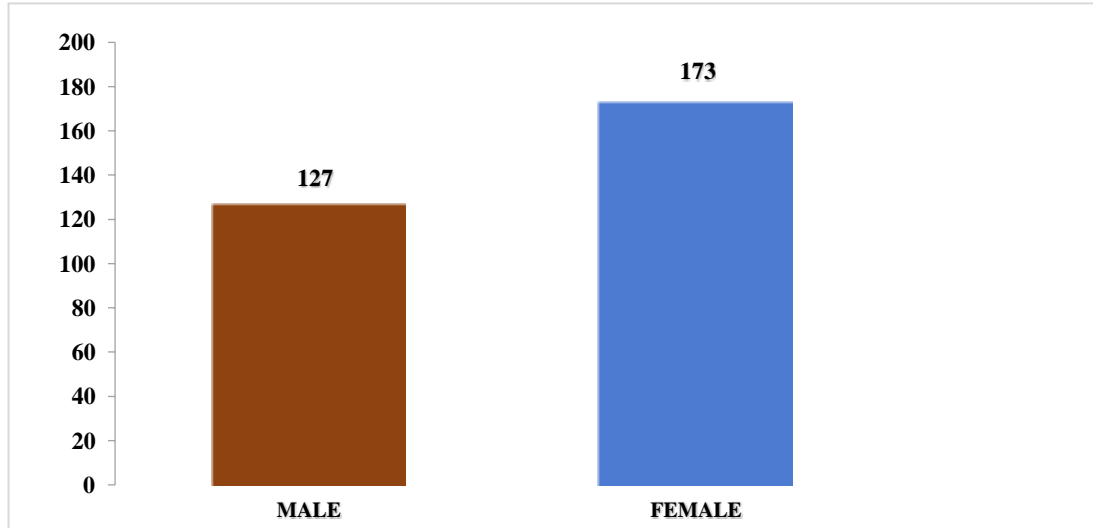
AGE (In years)	GENDER		PROFESSION
	MALES (N)	FEMALES (N)	
25-35	127	173	MEDICAL LABORATORY WORKERS (CLINICAL PRACTITIONERS)

N=300

**Table no:1**



**Interpretation:** The above table shows the demographic data of medical laboratory workers: age between 25-35 years, number of males (127) and number of females (173) were participated in this study, and sample taken from medical laboratory workers who were working as a clinical practitioner in north Kerala districts.



**Graph 1: Gender Difference in both Male and Female Medical Laboratory Workers**

**Interpretation:** Here the above diagram shows the gender difference between 127 males and 173 females participated in this study.

**Analysis of Descriptive Data**

**Descriptive Statistics of Males**

	N	Minimum	Maximum	Mean	Std. Deviation
AGE	127	25.00	35.00	29.77	0.935
HEIGHT	127	150	166	158.40	5.245
WEIGHT	127	46	66	57.07	4.631

**Table no:2**

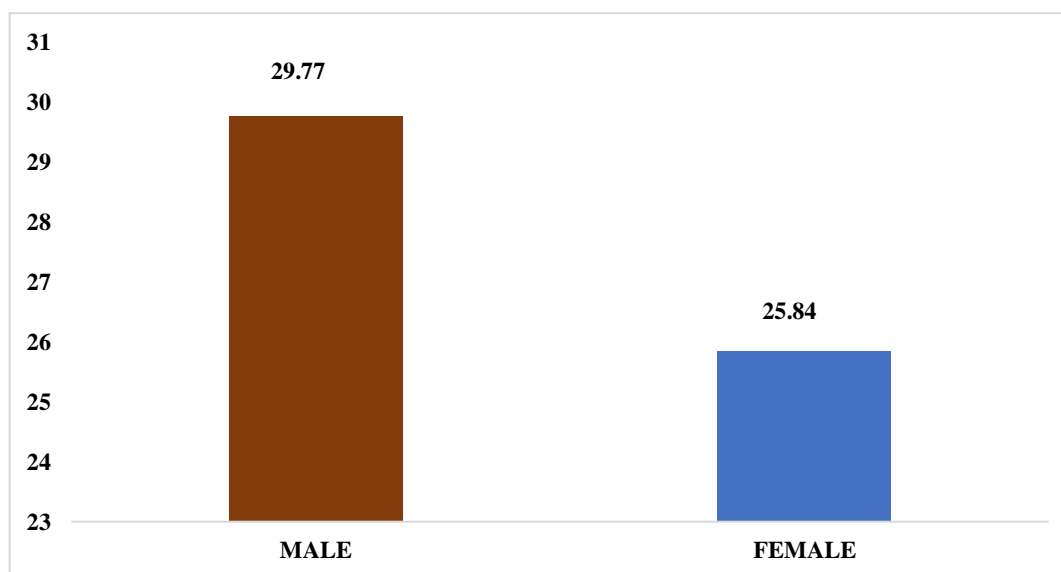
**Interpretation:** Above table show the mean age, height, and weight of the 127 male medical laboratory workers participated in this study are 29.77 years, 158.40 cms, 57.07 kgs, respectively.

**Descriptive Statistics of Females**

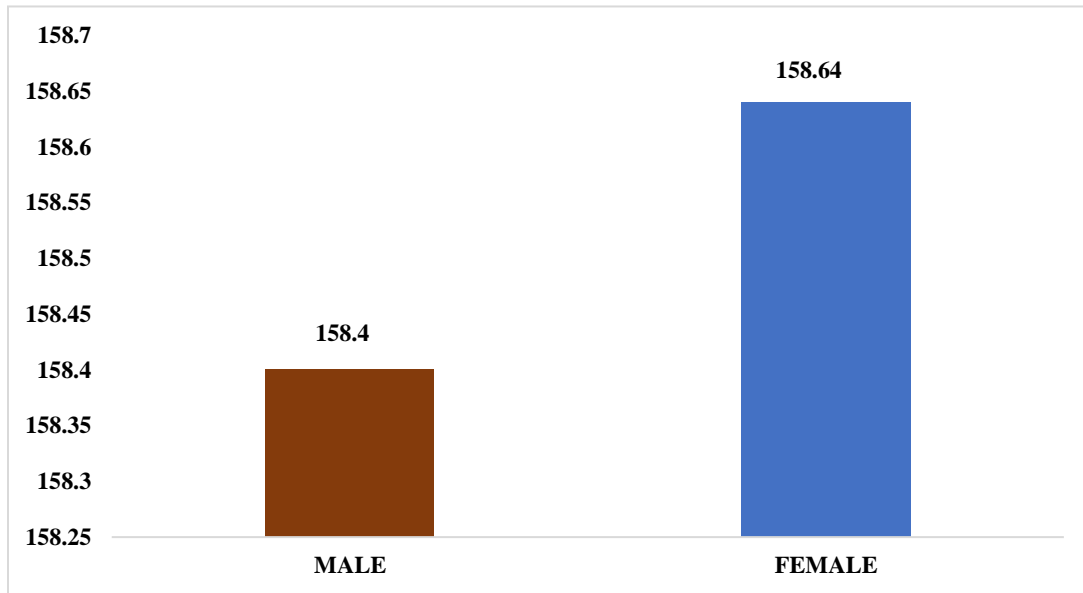
	N	Minimum	Maximum	Mean	Std. Deviation
AGE	173	25.00	35.00	25.84	1.192
HEIGHT	173	150	166	158.64	5.436
WEIGHT	173	47	66	57.30	4.241

**Table no:3**

**Interpretation:** Above table shows the age, height, and weight of the 173 female medical laboratory workers participated in this study are 25.84 years, 158.64 cms, 57.30 kgs, respectively.

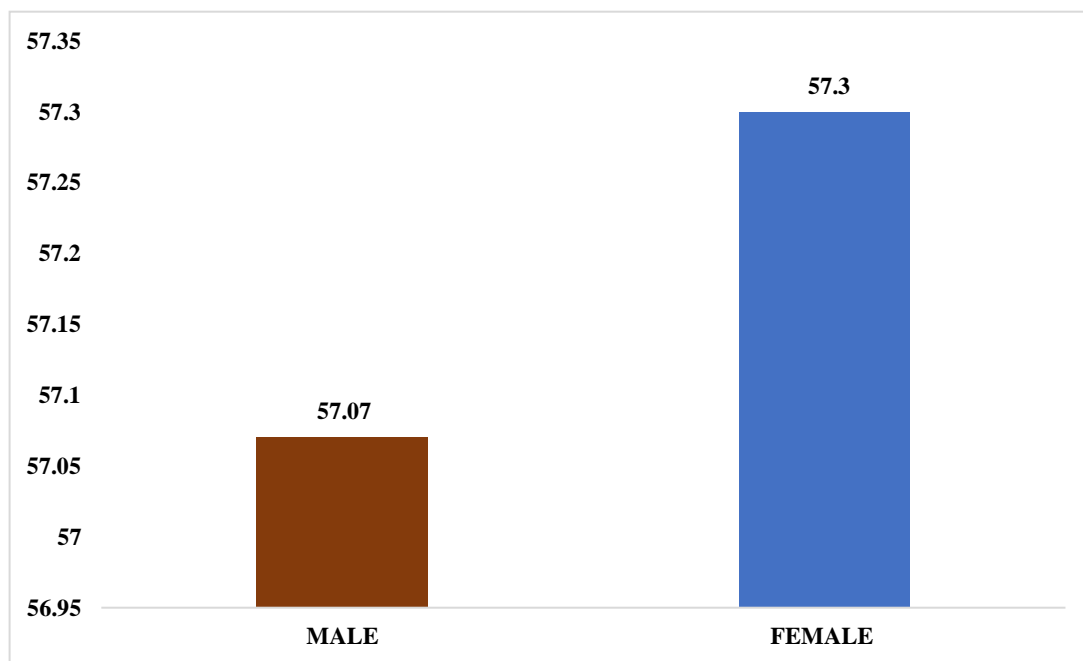
**Graph 2: Mean Age of both Male and Female Medical Laboratory Workers**

**Interpretation:** The above diagram shows the mean age of male medical laboratory workers were 29.77 years and female medical laboratory workers were 25.84 years.



**Graph 3: Mean Height of both Male and Female Medical Laboratory**

**Interpretation:** The above diagram shows the Mean height of male medical laboratory workers: 158.4cms and female medical laboratory workers: 158.64cms



**Graph 4: Mean Weight of both Male and Female Medical Laboratory Workers**

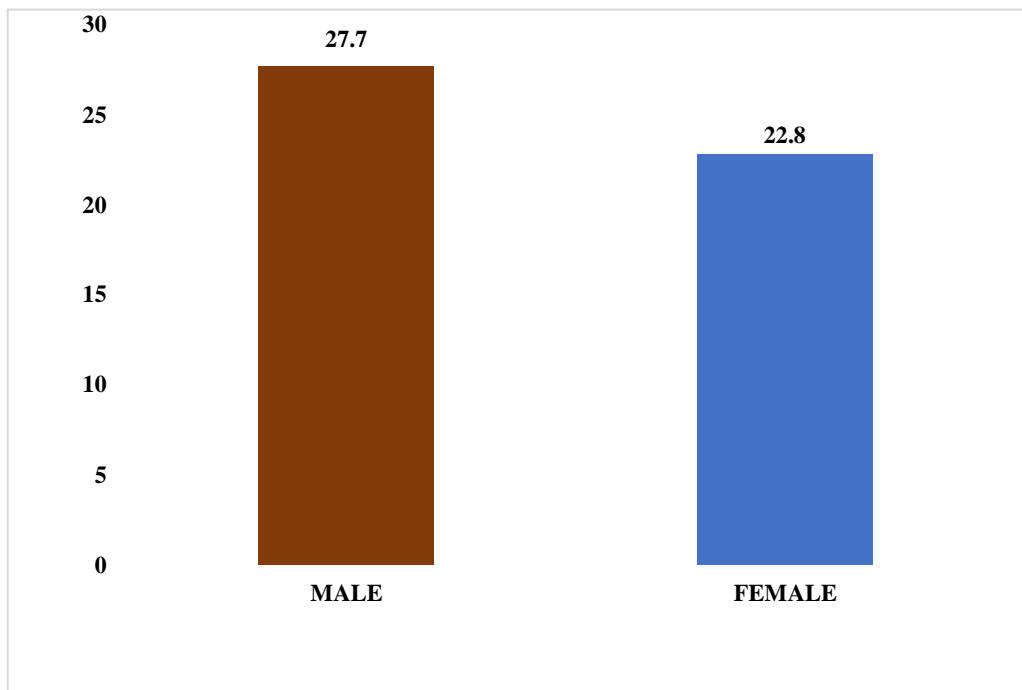
**Interpretation:** The above diagram shows the mean weight of male medical laboratory workers: 57.07kgs and female medical laboratory workers: 57.3kgs

**Analysis of BMI Difference between Males and Females**

Mean BMI difference between male and female medical laboratory workers

MEAN	MALE	FEMALE
Height	158.4	158.64
Weight	57.07	57.3
BMI	27.7	22.8

**Table no:4**



**Graph 5: Mean BMI of Both Male and Female Medical Laboratory Workers**

**Interpretation:** The above diagram shows the mean of BMI of male medical laboratory workers 27.7 and female medical laboratory workers 22.8.

**Analysis of Standardized Nordic Musculoskeletal Questionnaire (SNMQ)**

“Medical laboratory workers screening Standardized Nordic Musculoskeletal Questionnaire for work related musculoskeletal discomfort ”

**12 Months Prevalence**

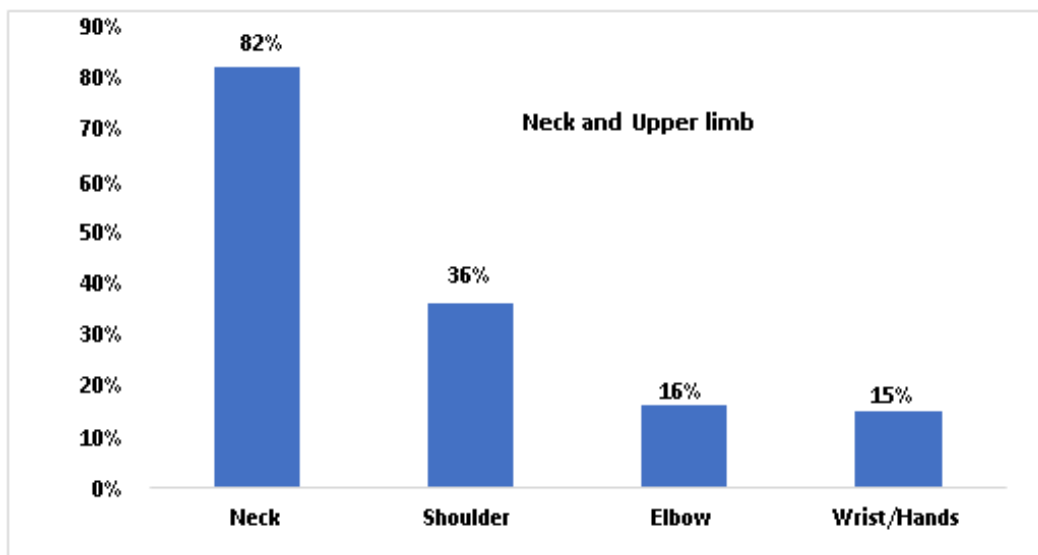
A. Have you at any time during the last 12 months had trouble? (Ache, Pain, Discomfort, Numbness)

**Analysis of Neck and Upper Limb**

NECK AND UPPER LIMB		
AREA OF MSD	N=300	PERCENTAGE
NECK	246	82%
SHOULDER	108	36%
ELBOW	48	16%
WRIST/HANDS	44	15%

**Table no:5**

**Interpretation:** Above table reveals majority of the sample shows, there is high prevalence of musculoskeletal disorders was found on the neck region (82%). The other areas were found to be in less compared to neck. It was around shoulder (36%), Elbow (16%) and wrist/ hands (15%).



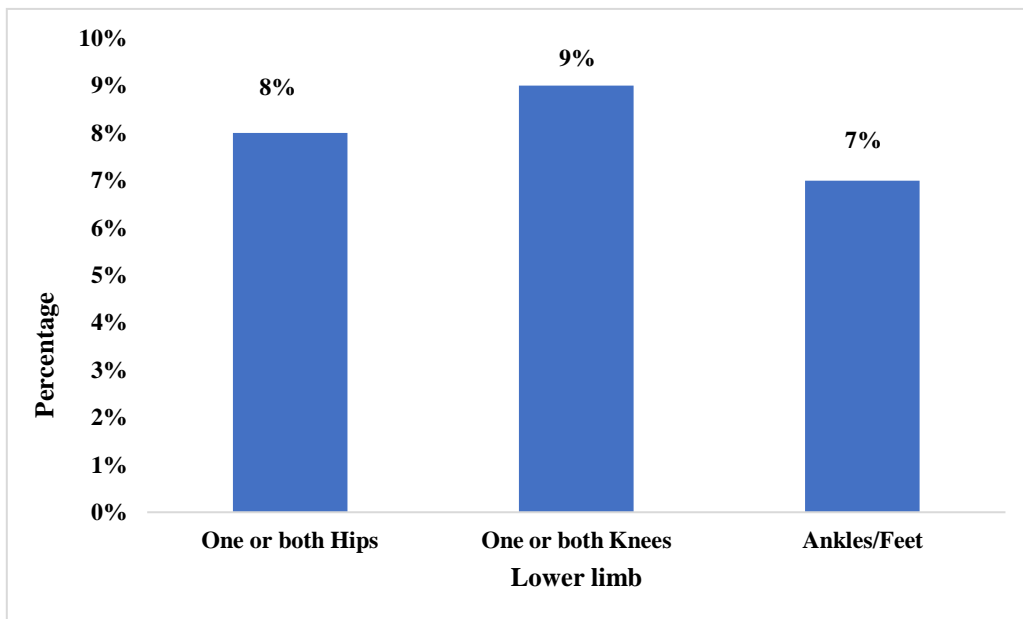
**Graph 6: Neck and Upper Limb Prevalence**

**Analysis of Lower Limb**

LOWER LIMB		
AREA OF MSD	N=300	PERCENTAGE
ONE OR BOTH HIPS	23	8%
ONE OR BOTH KNEES	28	9%
ANKLES/FEET	20	7%

**Table no:6**

**Interpretation:** In lower limb there is comparatively lower rate of prevalence are reported than upper limb. It was found to be around 8% in hips, knee around 9%% and 7% in ankle/feet.



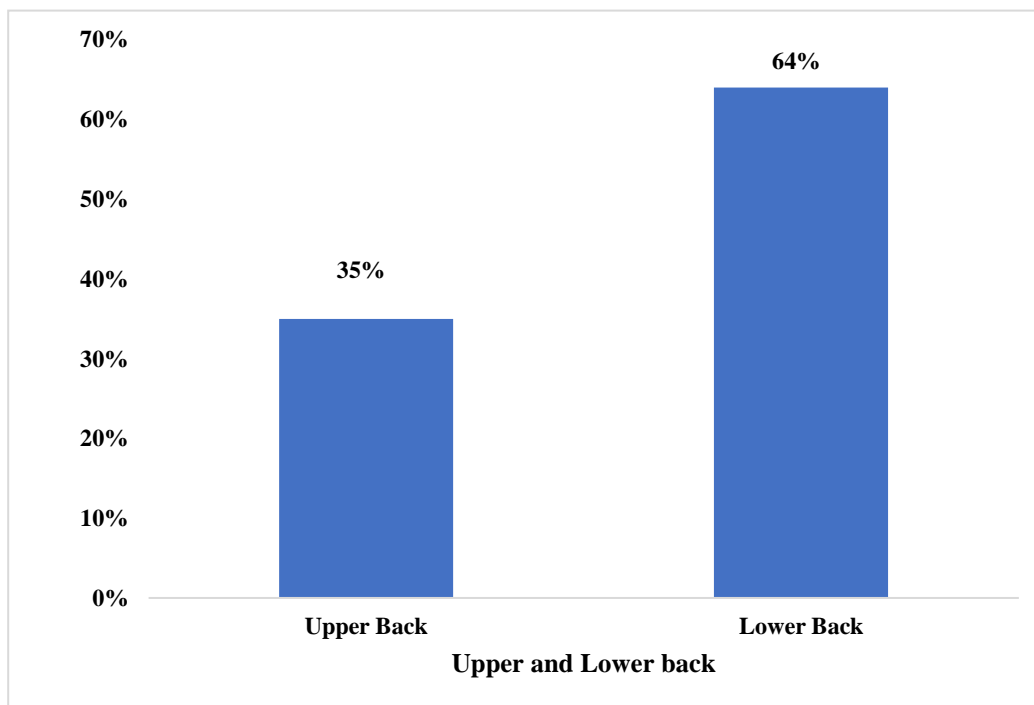
**Graph: 7 Lower Limb Prevalence**

**Anlysis of Upper Back and Lower Back**

UPPER BACK AND LOWER BACK		
AREA OF MSD	N=300	PERCENTAGE
UPPER BACK	104	35%
LOWER BACK	191	64%

**Table 7**

**Interpretation:** Above table reveals majority of the sample shows, there is high prevalence of musculoskeletal disorders was found on the lower back region (64%). And comparatively lower prevalence in upper back region (35%).



**Graph: 8 Upper Back and Lower Back**

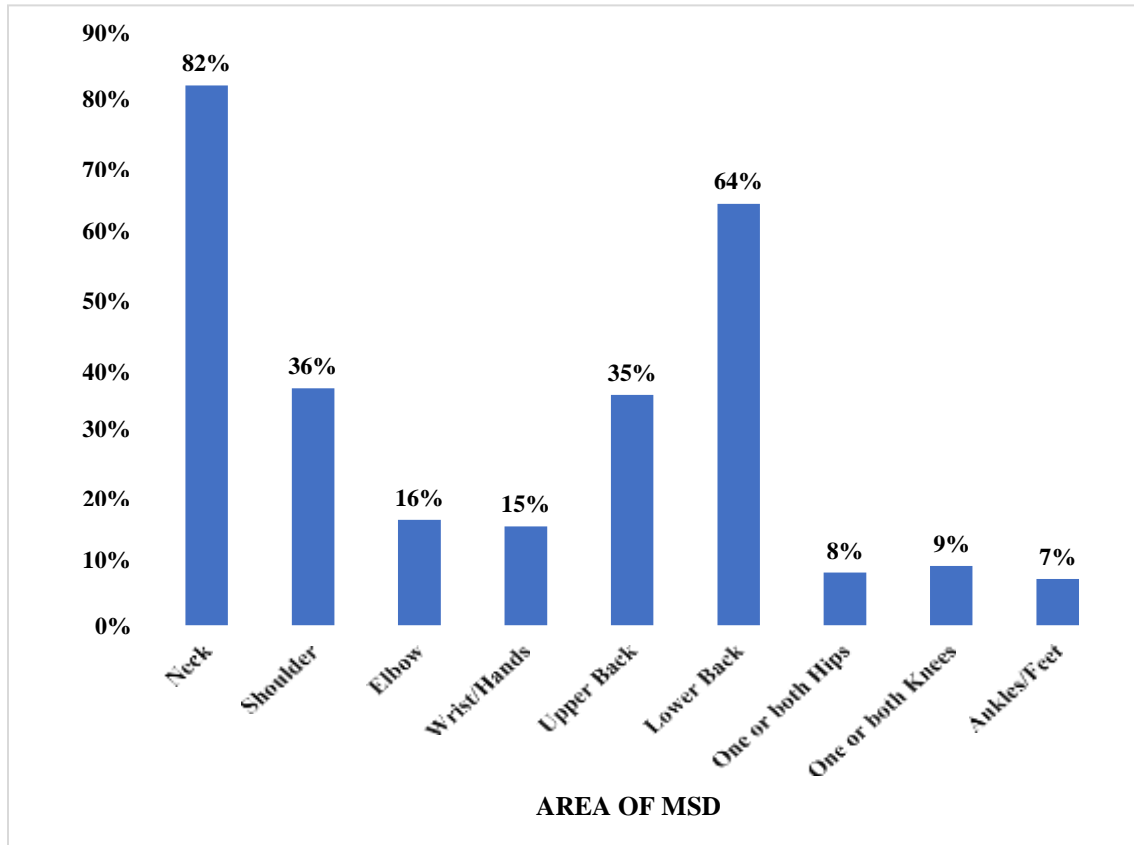
**Annual Prevalence of Nine Body Parts Musculoskeletal Problems**

<b>BODY PART</b>	<b>PERCENTAGE %</b>
<b>NECK</b>	<b>82%</b>
<b>SHOULDER</b>	<b>36%</b>
<b>ELBOW</b>	<b>16%</b>
<b>WRIST/HANDS</b>	<b>15%</b>
<b>UPPER BACK</b>	<b>35%</b>
<b>LOWER BACK</b>	<b>64%</b>
<b>ONE OR BOTH HIPS</b>	<b>8%</b>
<b>ONE OR BOTH KNEES</b>	<b>9%</b>
<b>ANKLES/FEET</b>	<b>7%</b>

**Table no:8**

Interpretation: Above table reveals majority of the sample shows, there is high annual prevalence of musculoskeletal disorders was found on the neck region (82%), followed by lower back (64%). The other areas were found to be in less compared to neck and lower back. It was around shoulder (36%), Elbow (16%), wrist/ hands (15%), Upper back (35%), one or both hips (8%), one or both knees (9%) and Ankles/feet (7%).





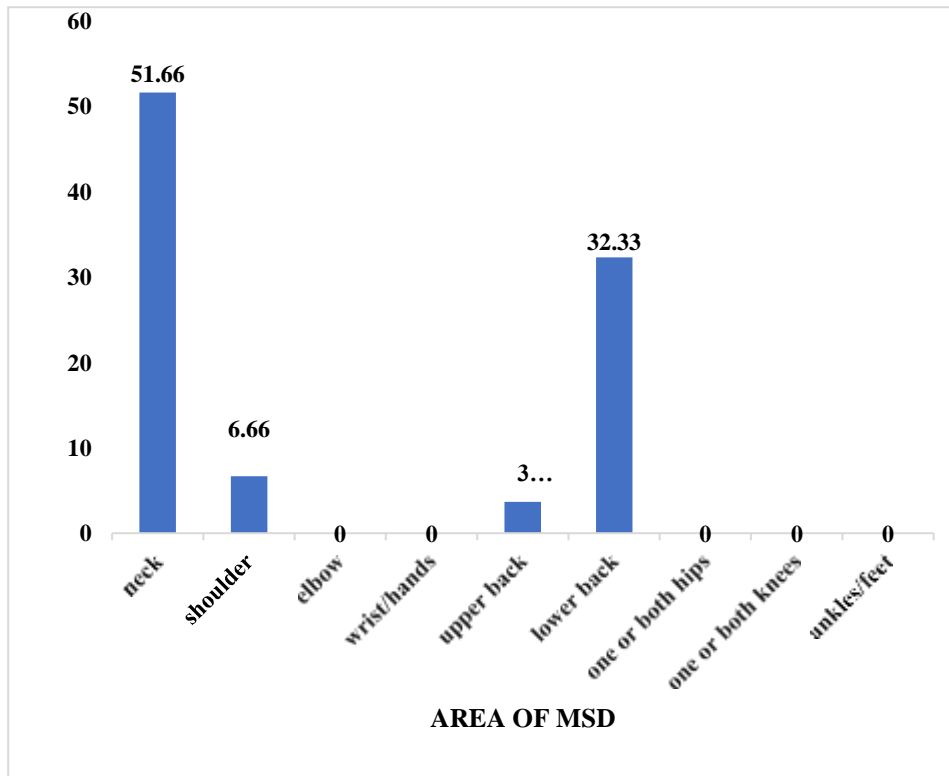
**Graph 9: 12 Months Prevalence of WMSDs Medical Laboratory Workers**

**Weekly Prevalence of Nine Body Parts Musculoskeletal Problems**

BODY PARTS	PERCENTAGE
NECK	51.66%
SHOULDER	6.66%
ELBOW	0%
WRIST/HANDS	0%
UPPER BACK	3.66%
LOWER BACK	32.33%
ONE OR BOTH HIPs	0%
ONE OR BOTH KNEES	0%
ANKLES/FEET	0%

**Table no:9**

**Interpretation:** Above table reveals majority of the sample shows, there is high weekly prevalence of musculoskeletal disorders was found on the neck region (51.66%), followed by lower back (32.33%). The other areas were found to be in less compared to neck and lower back. It was around shoulder (6.66%), Elbow (0%), wrist/ hands (0%), Upper back (3.66%), one or both hips (0%), one or both knees (0%) and Ankles/feet (0%).



Have you had trouble at any time during the last days?

**Graph:10: 7 Days Prevalence (Weekly Prevalence)**

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## Results

### Flow of participants

A total of 300 medical laboratory workers (127 males and 173 females) completed the validated Standardized Nordic Musculoskeletal Questionnaire (SNMQ) for screening work related musculoskeletal discomfort. Question was about the prevalence of work-related musculoskeletal injuries among medical laboratory workers. The mean age, height, weight, and BMI of the 300 medical laboratory workers participated in the study are shown respectively (Table 6.2,6.3, and 6.4).

### Influence of BMI (Body Mass Index) in Work Related Musculoskeletal Injuries

As shown in the Table 6.4 and Graph 5. The medical laboratory workers that were having work related musculoskeletal injuries their weight status was found to be overweight. So, for some extent the BMI also influence the prevalence of work-related injuries among medical laboratory workers.

### 12 Months Prevalence of WMSDS in Medical Laboratory Workers

The result show that the high annual prevalence of musculoskeletal disorders was found on the neck region (82%), followed by lower back (64%). The other areas were found to be in less compared to neck and lower back. It was around shoulder (36%), Elbow (16%), wrist/ hands (15%), Upper back (35%), one or both hips (8%), one or both knees (9%) and Ankles/feet (7%).

### 7 Days Prevalence (Weekly Prevalence)

The result show that the high weekly prevalence of musculoskeletal disorders was found on the neck region (51.66%), followed by lower back (32.33%). The other areas were found to be in less compared to neck and lower back. It was around shoulder (6.66%), Elbow (0%), wrist/ hands (0%), Upper back (3.66%), one or both hips (0%), one or both knees (0%) and Ankles/feet (0%).

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## Discussion

The study was carried out to evaluate the prevalence of work-related musculoskeletal disorders among medical laboratory professionals in North Kerala population. This study was done on a sample of 300 medical laboratory workers on basis of inclusion and exclusion criteria. All subject were given the validated Standardized Nordic Musculoskeletal Questionnaire (SNMQ). Musculoskeletal disorders (MSDs) are a significant cause of physical limitation affecting humans around the globe. Work-related musculoskeletal disorders involve isolated or multiple problems in muscles, tendons, joint tissue, nerves, fascia and ligaments, with or without tissue degeneration, caused by work.[1]

The statistical data reveals that during the past one-year prevalence and seven days prevalence of work-related musculoskeletal problems significantly higher among medical laboratory workers. This finding is in agreement with finding from several studies. The study found that among 300 medical laboratory workers, were 127 males and 173 females having work related musculoskeletal disorders. Medical laboratory workers with a BMI over 25 reported the highest prevalence of work-related musculoskeletal problems (Graph 5). In this study the medical laboratory workers that were having work related musculoskeletal problems their weight status was found to be overweight. So, for extends the BMI also influence the prevalence of work-related musculoskeletal problems.

In this cross-sectional survey, a 12-month prevalence rate was observed on the neck region (82%), followed by lower back (64%). The other areas were found to be in less compared to neck and lower back. It was around shoulder (36%), Elbow (16%), wrist/ hands (15%), Upper back (35%), one or both hips (8%), one or both knees (9%) and Ankles/feet (7%). This study found that most common area which is more prone for work related injuries were neck (82%) and lower back (64%). They were more prone for discomfort and pain in medical laboratory workers. The neck and lower back region were the most common site for work related musculoskeletal injuries among medical laboratory workers in this study, followed by shoulder, elbow, wrist, upper back, hips, knees, and ankle region (Graph 9).

In this study 7 days prevalence rate was observed on the neck region (51.66%), followed by lower back (32.33%). The other areas were found to be in less compared to neck and lower back. It was around shoulder (6.66%), Elbow (0%), wrist/ hands (0%), Upper back (3.66%), one or both hips (0%), one or both knees (0%) and Ankles/feet (0%). The weekly prevalence is neck and lower back region were the most common site for work related musculoskeletal injuries among medical laboratory workers in this study.

Same result was found in previous studies that prevalence of work-related musculoskeletal injuries, the most common site was lower back region (35%) and neck region (29%), followed by shoulder (19%) and the upper back region (10%). The cause of the high incidence rate of low back and neck injuries among medical laboratory workers was use high backless stools with the lowest incidence occurring among those using the low stools with backrests. Also, there was a high incidence of WRMDs occurring in those respondents who reported being uncomfortable with their sitting platform at work with majority of them using high backless stools. This may imply that their sitting platforms could be a cause for their low back pain as majority of those respondents using high backless stools reported pain in the low back. And they have pain in their neck due to constant exposure to microscope, static neck postures for a long period of time.

The major musculoskeletal problems were found in this study from Standardized Nordic Musculoskeletal Questionnaire for work related musculoskeletal discomfort. Questionnaire was divided into three parts, the first part collected the demographic data such as age, gender and also their duration of work, total hours spend during duty. This factor may contribute to develop WRMSDs. The second part we defined WRMSD as work related symptoms (pain, numbness, tingling, aching) that result from a work-related illness, excluding others injuries experienced during last one year this indicated chronicity of pain, other question was does this pain was the reason for you to prevent doing normal work (at home or away from home) this indicates sick leave. The last phase include pain in last seven days this indicates acute pain.[36]

Medical laboratory workers like doing pipetting work reported increased occurrence of pain related to neck, shoulder, elbow, back, and hand. Mechanism for work related musculoskeletal disorders involves fibrosis, tissue injury, recurrent cycle inflammation that further lead to recurrent pain, muscle diseases, and dysfunction of ligament and fascia.

This occupation which is mostly sedentary i.e., sitting job with static posture of the spine and other body parts for long periods of time. Microscopic works requires a lot of steady posture for examination of samples. Keeping the neck in steady position and simultaneous movements of arms to adjust the eye piece is the main demand of the job.

Static postures refer to physical exertion in which same position is held throughout the time. This exertion puts increased loads on the muscles and tendons which leads to fatigue. These situations often lead to overuse or repetitive syndromes; persistence of such symptoms thus becomes chronic. Therefore, these practicing professionals are at high risk for the development of MSDs of the neck, upper back, lower back, shoulders, and upper extremities related to cumulative trauma.[6]

The lower back and neck were the most frequently affected body part by WRMDs. This could be due to their ergonomically unsuitable sitting positions, work platforms, frequent use of the microscope and computers. There was a very high incidence of WRMDs among those who use high backless stools with the lowest incidence occurring among those using the low stools with backrests. Also, there was a high incidence of WRMDs occurring in those respondents who reported being uncomfortable with their sitting platform at work with majority of them using high backless stools.[37]

Repetitive tasks, performing lots of procedures, insufficient breaks, over exertion and static positions were the most cited risk factors for WRMDs by the respondents. This suggests that tasks performed by the medical laboratory workers have a significant effect on the occurrence of WRMDs. Work-related musculoskeletal problems can indicate lack of awareness regarding the work-related ergonomics. This also indicates the need for enlightenment about proper management of WRMDs among Medical Laboratory workers.

Work related musculoskeletal problems (WRMSDs) are on a rise and are affecting the social lives of the people. There was strong evidence that High levels of static contraction, prolonged static loads, and awkward postures were associated with an increased risk for WRMSDs. So, the present study concluded that high prevalence of WRMDs among medical laboratory professionals in North Kerala Population with the neck and lower back most commonly affected irrespective of medical laboratory workers.

### **Limitations**

- The study has been conducted on small size sample only.
- This study took shorter duration to complete.

### **Recommendations**

- Ensure that all medical laboratory technicians know about the ergonomic risks/hazards that come from their workplaces, tasks, equipment and etc.
- Maintain constant supervision of medical laboratory workers activities regards getting the workspace set-up as the following:
  - Adjust the workstation height to the task you are carrying out.

- 
- Use the swivel in your chair to decrease body twisting.
  - Change working positions frequently.
  - Always face the object of work.
  - Keep your body close to your work.
  - Keep trays and other supplies that you use frequently in close reach.
  - Adjust the workstation or your chair to avoid working with your arms elevated.
  - Take regular breaks and apply stretching exercise

## Conclusion

The study concluded that high prevalence of WRMDs among medical laboratory professionals in North Kerala Population with the neck and lower back most commonly affected irrespective of medical laboratory workers.

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