

## Review Article

# Work related musculoskeletal disorders among medical laboratory professionals: a narrative review

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### ABSTRACT

Work related musculoskeletal disorders are common health problem and increasing cause of disability. Laboratory professionals are unique group of healthcare professionals who play an essential part in diagnosis and therapy planning and often their work is associated with potential health hazards. Objective of current study was to review literature on prevalence of work-related musculoskeletal disorders among medical laboratory professionals. Electronic databases and bibliographies were searched and identified papers evaluated against inclusion criteria. The searching strategy uncovered 13 reports. Total 7 studies were included for the review. A high degree of heterogeneity among studies was observed. The overall prevalence's ranges from 40-60%. With neck being more prevalent 18-78%. However additional high quality studies are required in this area.

**Keywords:** WRMSD, Pathologist, Microscope user, Laboratory technician

### INTRODUCTION

Musculoskeletal disorders (MSDs) are an increasing health problem in workplaces.<sup>1</sup> These disorders are a major cause of concern for several reasons: the health problem leading to workers' disability, the lost time from work, and the social costs.

Healthcare professionals, including pathologist, microbiologist, biochemist and technician 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.<sup>2</sup>

The primary functions of the hospital laboratory in the hospital are to perform analytic tests and procedures on body fluids and tissues taken from patients and to provide the results of these tests to physicians in order to confirm

diagnosis determine prognosis or ascertain or assess the patient's treatment. The laboratory medical staff functions in an atmosphere of continual pressure from the responsibility of providing accurate and precise information with no margin of error. Results must be carefully checked and rechecked since the responsibility for treatment of the patient depends on the reports issued from the laboratory.<sup>3</sup>

Laboratory professionals are at risk of injury because of sitting rigidly at microscope most of the day and turning knobs again and again to move the stage and objectives while screening slides.

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 laboratory workers are considered to be sedentary workers and many a time the stress involved with this job which can affect their musculoskeletal system causing their function to decline is ignored. The literature on medical laboratory hazards has largely centered on infections, this is partly because laboratory acquired infections tends to be more easily remembered than the hazardous events its impact on musculoskeletal system are often ignored.

Therefore, aim of our study is to review the literatures available on incidence and prevalence of WRMSD's among medical laboratory professionals.

## METHODS

Studies were included for review if they reported incidence or prevalence and risk factors for WRMSD among pathologist, microbiologist, biochemistry professionals and medical laboratory technicians

### *Inclusion and exclusion criteria*

Articles were included for the current analysis if they met the following criteria

1. Peer reviewed paper or conference presentation.
2. Cross-sectional surveys and cohort studies.
3. If the outcome of the research was to note the incidence or prevalence of WRMSD in any body parts among medical Laboratory professionals i.e. pathologist, microbiologist, biochemist technician, medical laboratory technician dealing with human fluids.
4. Participants in age group of 18 and above.
5. Studies published in English or with detailed summary in English.

### *Searching techniques*

The following databases were searched for the period 1980 to 2013: MEDLINE, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Sports Discus, the Social Sciences Index, INdMed, OpenMED, PubMed, Proquest and Scopus. All searches were restricted to English-language articles. The search terms included "WRMSD," "pathologist," "microbiologist," "pain," "overuse," "microscope" "neck pain" and "back pain" "ergonomics".

### *Data synthesis*

The searching strategy uncovered 13 reports of which total 7 studies were included for the review. 4 of them were intervention studies and one study was about the ergonomic microscope so excluded. One study could not

be reviewed as full text could not be obtained through any means.

The areas which were focused included incidence, prevalence and the risk factors identified.

## RESULTS AND DISCUSSION

### *Incidence of musculoskeletal pain*

Only one study noting the incidence of musculoskeletal pain could be retrieved. Eshetu et al.<sup>4</sup> has reported this study on 156 laboratory personnel. The mean age of the participants was 33.9 (SD ± 8.48). Nordic questionnaire was used to assess musculoskeletal disorders. 336 reports of musculoskeletal pain was given by the participants affecting 9 areas of the body. Feet/ankle (21.7%) were noted highest in incidence followed by knees (20.8%) and upper back (10.7%) 16.7% of the participants had visited doctors in the past due to these pain. 4.5% of them reported having taken sick leave ranging from 3 to 10 days. Among the type of lab, the participants working in hematology and clinical chemistry noted more symptoms 26 (in Numbers) in each area followed by parasitology and urine analysis where only total 11 symptoms were noted. However this study had used questionnaire for screening the symptoms rather than interview based evaluation which might have masked the actual incidence percentage.

### *Prevalence of musculoskeletal pain*

#### *One month prevalence*

Only one study reported the one month prevalence. Florian et al.<sup>5</sup> has done online survey on pathologist of Switzerland through a questionnaire. 163 pathologists were involved in the study. 40% prevalence of musculoskeletal symptoms was noted in this study. Among all the body parts neck was found to be highest in prevalence. Details of the body area involved are described in Table 1.

However this study has only included pathologist so prevalence among other professionals in laboratory area cannot be generalized. Also, since it was online survey so there are chances of symptoms being under reported or over reported.

#### *12 months prevalence*

Marianne et al.<sup>6</sup> reported MSD in upper extremity through a cross-sectional study done on 128 female laboratory technicians. The laboratory technicians who were mainly involved in pipetting were mainly targeted. Risk factors associated with pipetting was only studied. MSD in Hand (44%) shoulder (58%) and neck pain (44%) was more compare to other body parts. However this study didn't consider the other task of laboratory professionals for e.g. microscope task, computer task etc.

Evan George<sup>7</sup> reported in a study on cytotechnologist that neck pain is the most prevalent symptoms being 55-60% followed by upper back (53%), hand and wrist and lower back. The participants involved in this study were mainly dealing with microscope. This was similar to the prevalence noted by Kalavar and Hunting<sup>8</sup> in 1996 and Alireza et al.<sup>9</sup> in 2010. However, values were lower than the value reported by Evan George.

Another study on medical laboratory technician by Shreya Maulik<sup>10</sup> et al. reported the musculoskeletal problems among these professionals. This study included the lab technician of clinical pathology, hematology, biochemistry, histology, clinical microbiology and serology. However finding of this study reported low back as the most prevalent symptoms followed by upper back and neck which is unlike the findings of previous studies reporting neck symptoms as most prevalent.

**Table 1: Summary of the studies of prevalence/incidence of musculoskeletal disorders.**

Study	Samples	Response rate	Outcome measured	Prevalence /incidence	Area of study	Prevalence (last 12 months)
Marianne et al.	158 lab technicians using pipettes	81%	Musculoskeletal complaints	12 months prevalence	Sweden	Neck (44%), upper back (25%), lower back (34%) shoulder (58%), elbows (18%), hand & wrist (44%), hips (20%), knees (19%), feet/ankles (12%)
Kalavar and Hunting	125 cytotechnologist	69% questionnaire based	Musculoskeletal complaints	12 months prevalence	Washington	Neck (61.5%), hand and wrist (56.4%), lower back (42.3%)
Thompson et al.	244 cytotechnologist	Questionnaire based survey	Musculoskeletal pain		Washington	Neck (55-60%), upper back (53%), lower back (57%), elbow (35%), wrist (37% left, 55% right), hands (38% left, 48% right)
Alireza Rahimi et al.	Pathologist	Interview based on questionnaire	WMSD	12 months prevalence		Neck (33.3%), back (21.6%), arm (9.8%), elbow (7.8%), forearm (5.9%), leg (5.9%), wrist (5.9%), shoulder (9.8%)
Florian et al.	Pathologist	Questionnaire based 65%	Musculoskeletal problems	One month prevalence	Switzerland	Neck (78%), shoulder (60.2%), upper back (45.5%), lower back (39.8%), hand/arm (27.6%), others (5.7%)
Shreya et al.	Laboratory technicians (pathology, histology, hematology, clinical microbiology, serology & biochemistry)	NA	Musculoskeletal problems	12 months prevalence	Mumbai, India	Neck (18.3%), shoulders (4%), upper back (20.4%), low back (30.6%), wrists (2%), hip/thighs/buttocks (8%), knees (20.4%), ankle/feet (10.12%)
Eshetu et al.	156 laboratory staff	Questionnaire based		Incidence	Ethiopia	Neck (8.9%), shoulder (10.7%), upper back (10.7%), lower back (8.9%), elbow (4.4%), wrist/hand (3.8%), hip (9.8%), knees (20.8), feet/ankle (21.7%)

NA - Not applicable

### **Risk factors**

#### *Sustained postures*

While using microscopes for viewing slides or looking through computer more concentration is required leading

to use of sustained posture. During this task, neck and back muscles are mainly acting and blood flow to these muscles may not be optimal due to gravitational forces, lack of movement and increased tension leading to musculoskeletal symptom in these area.<sup>7</sup> Also, Postural analysis revealed that most of the activities carried out in the laboratory are at high risk, since these professionals

work in awkward and constrained postures which ultimately lead to MSDs.<sup>10</sup>

#### *Awkward posture*

Most users have had to flex the neck and upper back to view through the eyepiece. They also tend to attain these awkward postures while viewing computer screen, writing, cutting frozen sections etc. After years of this practice, they tend to develop forward leaning posture and extensor muscle dysfunction accompanied by symptoms of pain, stiffness, and muscle fatigue.<sup>7</sup>

#### *Time spent with particular task*

The pipetting task requires neck and shoulder muscles to work statically when head and neck are beyond the neutral position (bend forward more than 30 degrees and arm is elevated without support for lengthy period. In a study reported by Marianne et al.<sup>6</sup> a dose of more than 300hour per year is associated with increased risk of hand and shoulder ailments. Also, subjective ratings by laboratory technicians showed that perceived fatigue increases as time spent on pipetting increases.

#### *Increased working hours*

Fritzsche et al. and Eshetu et al. reported increased working hours are associated with musculoskeletal problems.

#### *Psychosocial factor (Work content)*

Various literatures reported that monotonous work induces boredom as well as expose the worker to particular risk more as compared to task on rotation. Study by Marianne et al. noted more prevalence of shoulder ailments due to repetitive, monotonous work in addition to physical strain leading to less satisfactory work content. Also, author recommended that the work organization that promotes task variety is necessary to provide a physically and mentally good work environment.

#### *Work place ergonomics*

Fritzsche et al. reported in the study that presence or absence of workplace ergonomics introductions were not significantly associated with the overall or one-month prevalence of musculoskeletal problems. However Eshetu et al. contradicted this statement and found that main factor for reports of work related musculoskeletal disorder is poor ergonomic design in workstations so, applying administrative and engineering control in laboratory environment can reduce ergonomic hazard.<sup>4</sup>

#### **Limitation**

It is possible that some studies were not identified in the searches if they were not published in mainstream

journals. One eligible study was excluded as they did not have detailed English summary. We also didn't assess the quality of the study as there was only limited quality research available pertaining to the topic which would have made review difficult.

#### **CONCLUSION**

This review has contributed to explaining variation among prevalence estimates of musculoskeletal disorders in laboratory professionals. The studies reviewed provide some initial although limited evidence. The overall prevalence's ranges from 40-60%. With neck being more prevalent 18-78%. However additional studies are required in this area.

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