CHAPTER 1

INTRODUCTION
1.1. Musculoskeletal disorder (MSD)

“Musculoskeletal Disorders (MSDs) are injuries and illnesses that affect muscles, nerves, tendons, ligaments, joints, spinal discs, skin, subcutaneous tissues, blood vessels, and bones”.\(^1\) MSD, an increasing issue in healthcare sector globally, has become the second leading cause of disability worldwide.\(^2\) It can arise from sudden exertion or can have a gradual onset. In most cases it has gradual onset so, the person is usually unable to relate pain to a specific cause.\(^3\)

1.2. Burden of the MSD global and India

Musculoskeletal disorders has become a global burden, and looking at the scenario WHO declared 2000-2010 a “bone and joint decade”.\(^4\)

According to labor force survey in Great Britain, out of total illness, prevalence of MSD was noted to be 40% in the year 2011/12 and 141000 new cases of MSD was reported in the same year. (HSE 2013)

In united states, 16.3 million injuries in 2004 were musculoskeletal injuries involving stains, sprains, sudden movement or overuse injuries.\(^5\)

An overall prevalence of Musculoskeletal pain was found to be 25.9% nationally in various capital regions.\(^6\) National study reported the point prevalence rate as 7.08 in Delhi, 9.53 in Jodhpur and 11.52 in Dibrugarh, which indicated MSDs is a significant health care burden even in India too. Out of total disorder and disease conditions among patients visiting a health professional, 48% are musculoskeletal disorder.\(^7\)
1.3. Musculoskeletal Disorder and work

Employment or work can influence our lives in a positive way as a source of income and social benefits but on the other hand, it can have a negative influence on workers’ physical mental, and psychosocial state of health. Many names have been used for MSD like, Cumulative trauma disorders, Overuse syndrome, Repetitive strain injuries, Repetitive stress injuries or “occupational overuse syndrome”.

“Work-related Musculoskeletal Disorders (WMSDs) are the musculoskeletal disorders to which the work environment and the performance of work contribute significantly”. Unlike various occupational diseases that originate due to exposure to particular hazardous agents, most WRMSDs termed as work related because their work conditions are a major contributing factor for the development or exacerbation. The global prevalence for WRMSDs is 20%-30% with most commonly affecting lower back. According to the World Health Organization (WHO) technical report, global productivity and work performance of working age adults depends on extent of management of WRMSDs.

1.4. Causes of Work related musculoskeletal disorder

The MSD has multifactorial etiology, and includes ergonomic, individual, psychological and social factors. MSD can be work-related in variety of ways when affecting workers. The contributory factors towards WMSDs are:

- Repetitive movements
- Poor postures
- High cognitive demands
• Physical factors like extremes of temperatures, vibration
• Long work-shifts hours
• Lack of a work-rest schedule during work \(^{12}\)
• Exposure to high or low intensity loads repeatedly over a long period

1.5. Musculoskeletal disorder and sick leave/absenteeism

Sick leave being an important public health problem not only is the result of health related consequences but, both social and economic consequences for the individual as well as society. \(^{13}\) MSD is one of the most common reasons for work disability and sick leave

"WHO-ILAR (International League of Associations for Rheumatology) COPCORD (Community-Oriented Programme for Control of Rheumatic Diseases) and the Bone and Joint Decade 2000–2010" initiative had reported the burden of musculoskeletal pain arising due to MSD, as a critical issue. In developed and developing nations, the most common health related reason for long-term absence from work is musculoskeletal complaints.

1.6. Musculoskeletal disorder and productivity

Decreased job performance while at work, is called "sickness presenteeism". Health disorders not only causes absence from work, but also "presenteeism" which is used to describe loss of productivity at work due to MSD. Work-related factors is an important determinants of productivity loss. \(^{14}\) WMSDs are the leading cause for the human suffering and loss of working days leading to loss of productivity thus increasing the economic burden of the society.
MSD also causes negative impact on the health and productivity of the employees\(^\text{15}\) drawing more attention for employees, employers and governments because of their Sickness absence and permanent disability which are the significant components of reduced productivity\(^\text{16}\).

1.7. Musculoskeletal disorder and Upper Quadrant

Among various occupational health problems, musculoskeletal disorders of the neck and upper extremities are common which accounts for majority of lost time at work\(^\text{17}\). Several studies have reported the incidence and prevalence of neck, upper extremity and upper back MSD in various occupations involving use of upper extremity. The prevalence of WRMSD was reported to be 19% in neck, shoulder, arm and wrist among dutch population, which was estimated by European countries by Central Bureau of Statistics\(^\text{17,18}\). The Researches have been done in various industrial settings as well sedentary workers to investigate the work-relatedness of problems in upper quadrant.

1.8. Evaluation of WRMSD

Assessment of WRMSD can be qualitative, semi quantitative or quantitative. Qualitative tool analyses the symptoms based on observation and assessment of risk factors using job analysis checklist or simple ergonomic analysis. The main principle behind checklist are its simplicity and speed. The results of qualitative analysis could then be further strengthened by using semi quantitative or quantitative method.
Semiquantitative analysis tools require more effort to collect data and include both judgment data and simple quantitative data, e.g., Snook tables, threshold limit value (TLV). These analysis tools require knowledge of ergonomics as well as effort from analyst.

Quantitative analysis may be done using tools like “National Institute of Occupational Safety and Health” (NIOSH) lifting equation, biomechanical analyser etc. These analysis tools require more effort to collect data and greater expertise by the analysts. It focuses on a body region and its analysis is complex which measures or predict the forces acting on or within the body.

1.9. Outcome measures for WRMSD

WRMSD can influence the worker through the pain they perceive, disability which arises out of pain and quality of life which gets affected. Various outcome measures have been established in measuring the intensity of symptoms some of these are Numerical pain rating scale, brief pain inventory etc. Disability can be measured based on the body part affected. There are various instrument available to measure function of upper limb and lower limb. Some of them are “Michigan hand questionnaire” (MHQ) which is specific to hand disability and involves subjective assessment, Patient-rated wrist evaluation score (PRWE), The Constant-Murley questionnaire to measure the function of shoulder, Disability of arm, shoulder and hand (DASH).
Literatures have documented that quality of life deteriorates for a worker who experience persistent disability originating from professional injury or WRMSD. It leads to loss of self-esteem and distress. Quality of life can be measured by individualized subjective QOL or through generic measure as short function questionnaire (SF36) which measures health related quality of life.

1.10. Musculoskeletal disorder and various intervention

A comprehensive review has shown that Multicomponent interventions are more successful than a single interventions in reducing work-related MSD. So it should consider both prevention as well rehabilitation. Multidisciplinary approach for WRMSD include engineering, administrative and personal intervention.

Engineering intervention are the engineered or physical manipulation of the sources for occupational hazards. This could include alternative computer mouse or keyboard designs and tool designs or seating chair modification.

Administrative interventions are initiated by the management which modifies the work process. This may include job rotation and break timings.

Personal interventions are those which addresses the worker behavior and education. It may include training on the job exercises program.

Ergonomics:-

It is one of the method to manage work-related musculoskeletal disorders. Ergonomic design and ergonomic interventions aimed at training have been widely considered for the prevention of WRMSDs (NIOSH1997; NIOSH 2001). The design
of tools or workplace equipment and work environment are the part of Ergonomic design. One example of this can be, design of equipment in case of computer professionals (e.g. hand tools, mouse, keyboard), workplace design (e.g. lighting, workstations modification), and job design (e.g. work and rest cycle, working pace). Ergonomic training involves training for recognition of risk factors causing WRMDs, selection of appropriate equipment or tools, proper work practice, workstation adjustment and correct use of equipment.

1.11. WRMSD and health Professionals

Work related injuries are not limited to only industrial workers. Its prevalence is also noted among healthcare professionals like dentist, surgeons, physiotherapist, nurses etc. 24, 25 Very often, healthcare workers report musculoskeletal disorders (MSDs) as well as respiratory symptoms at a higher rate than reported by workers in mining, construction and manufacturing. In 2002 in the US, 12.6% occupation related illnesses or injuries occurred among employees in nursing homes.3 Back and shoulders are commonly affected areas among various injuries and illnesses in healthcare employees.3

Among various healthcare professionals, medical laboratory professionals are too at risk for work related musculoskeletal symptoms. Laboratory professionals such as pathologist, microbiologist, and laboratory technician are exposed to number of work related risk factors at workplace of which shoulder and back injuries, various other joints and muscles exertion, are more common which gets aggravated or prolonged by work conditions.
They work under great time pressure as well as the activities carried out poses physical demands. The procedures involving bacteriological, chemical, immunological, hematological, microscopic, and diagnostic analyses on body fluids such as, sputum, urine, stool, blood, cerebrospinal fluid (CSF), pericardial fluid, and synovial fluid etc. for long periods and particular postures involve a variety of risk factors.

Factors identified for WRMSD in these professionals include awkward posture, static work postures and repetitive task as their tasks demand concentration, precision and high visual acuity.26
1.12 Need for the study

The following research needs were identified as important research requirements:

- Most of the studies in the literature pertaining to occupation related musculoskeletal disorder are mainly focused on office workers as they are large in number. The laboratory workers are considered as sedentary workers and, most often the musculoskeletal stress leading to decline in function with this job is ignored.

- The literature on hazards related to medical laboratory has mainly focused on infections, this may be because laboratory acquired infections are easily remembered than the hazardous events.\textsuperscript{26, 27} Also, very often its impact on musculoskeletal system is ignored.

- WRMSD prevalence scenario among laboratory professionals in India is lacking.

- There is dearth of literature pertaining to intervention for musculoskeletal disorders associated with laboratory professionals in Indian population.
1.13. Aim of the Study

To examine the effect of ergonomic intervention on work related musculoskeletal disorders among medical laboratory professionals.

1.14. Objectives

Phase I

- To estimate the prevalence of musculoskeletal disorder among medical laboratory professionals of Udupi district.
- To study the risk factors for these musculoskeletal disorders.

Phase II

- To determine the effect of structured ergonomic intervention on upper quadrant function and quality of life among medical laboratory professionals.