TOPIC

A Study on Prevalence of Work-Related Musculoskeletal Disorders Amongst Physiotherapists of Indore and Surrounding Region

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE AWARD OF

DEGREE OF DOCTOR OF PHILOSOPHY

IN THE FACULTY OF PHYSIOTHERAPY

SUBMITTED BY	CO-SUPERVISOR	SUPERVISOR
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Date:

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ABBREVIATIONS

BMI	Body Mass Index
LBP	Low Back Pain
MSDs	Musculoskeletal Disorders
MSQ	Minnesota Satisfaction Questionnaire
UCS	Upper Cross Syndrome
WMSDs	Work-Related Musculoskeletal Disorders
WRLBP	Work-Related Pain in the Lower Back Portion
WRMSDs	Work-Related Musculoskeletal Disorders
WRULDs	Work-Related Upper Limb Diseases

ABSTRACT

Background: Painful condition known as "Work-Related Musculoskeletal Disorders (WRMSDs)" mostly affects young physiotherapists. The nature of their work has been linked to this as the root cause. Sick leave and reduced work hours have also been linked to WRMSDs. Even though physiotherapists have extensive knowledge of WRMSDs, they have observed a high prevalence of WRMSDs throughout their lives. The study sought to ascertain the physiotherapists in Indore city and its surroundings' coping mechanisms as well as the prevalence and risk factors of work-related musculoskeletal disorders.

Material: 500 physiotherapists were included in this cross-sectional observational study. The data were gathered through the use of a bespoke questionnaire. The participants were physiotherapists in a clinical practice who were between the ages of 23 and 32, had at least one year of experience, and worked for at least eight hours per day. The two sections of the questionnaire were questions about musculoskeletal issues and personal information. The Pearson Chi-square Test was used to determine whether or not demographic variables and the WRMSDs were associated. It was decided that a p value of 0.05 was statistically significant.

Results: The average age of the participants was 27.87 ± 2.88 years, with 51.8 percent being female. The majority worked between 8 and 11 hours per day, averaging 9 hours.20.8% of patients had WRMSDs. The most common conditions were tendinitis, muscle spasms, and ligament sprains. The majority of physiotherapists reported experiencing lower back pain. The majority of them were in pain for two to three weeks, with some suffering for more than three months. Sick leave had been taken by 58.7%

for one to fourteen days. 45.9% had taken one to seven days of sick leave. Only 13.5% of people had sought medical advice. The most common causes of pain were maintaining the same position (59.6%), lifting objects (55.8%), bending and twisting (48.1%), manual therapy (42.3%), and repetitive work (41.3%). WRMSDs were not correlated with demographic variables ($p>0.05$). To deal with these issues, people stopped lifting, stopped getting manual therapy, changed their posture, and stopped working when they were hurt. Due to WRMSDs, none of the physiotherapists quit their clinical work.

Conclusion: In our study, keeping the same position, lifting objects, bending and twisting, manual therapy, and repetitive work were the causes of WRMSDs. WRMSDs and demographic variables had no correlation. These physiotherapists used coping mechanisms like changing their posture, cutting back on manual therapy, and not working when they were in pain.



CHAPTER-1

INTRODUCTION



INTRODUCTION

1.1 WORK-RELATED MUSCULOSKELETAL DISORDERS

Musculoskeletal problems caused by employment are the utmost mutual source of prolonged pain and physical incapacity in today's workforce **(Meirzejewski *et al.*, 1997)**. The majority of musculoskeletal problems related with the work, has time affect to develop and are triggered by job or employee's work environment **(van Doorn *et al.*, 1995)**. Work-related musculoskeletal ailments are known by a variety of names, which includes monotonous gesture injuries; repetitive stress injuries; cumulative distress injuries; overdo syndrome and regional musculoskeletal disorders **(Bork *et al.*, 1996)**.

Physical therapists can develop work-related musculoskeletal diseases (WRMSDs) as a result of their work. However, nothing is known regarding the scope of the issues, their acuteness, or the ramifications for the therapists who are afflicted. Prevailing research has primarily concentrated on back pain, but this play down the wide array of issues that might ascend **(Scholey *et al.*, 1989; Molumphy *et al.*, 1985; Mierzejewski *et al.*, 1997; van Doorn *et al.*, 1995)**.

Individual study of physical therapists with back pain found 29 percent degree of work-related “Low Back Pain” (LBP) **(Molumphy *et al.*, 1985)**. Fresher physiotherapists had maximum rate, which was very alarming. The majority of early episodes arose in acute care or rehabilitation backgrounds, and most onsets happened during the first four years of experience. In earlier investigations of physical therapists, the researchers

discovered a 38 percent twelve-monthly prevalence of back pain **(Scholey *et al.*, 1989)** and a 49.2 percent occurrence of work-related LBP **(Mierzejewski *et al.*, 1997).**

The largest study of WRMSDs among physical therapists looked at how common they were in nine distinct body locations **(Bork *et al.*, 1996)**. The wrists and hands (29.6%), upper back (28.7%), neck (24.7%), shoulders, elbows, hips and thighs, knees, and lower legs and feet (each under 20%) had the highest annual frequency of WRMSDs (45%). Women therapists with spinal side effects and wrist and hand side effects than man specialists.

These studies took a gander at the extent of physical specialists who looked for clinical treatment. **(Scholey *et al.*, 1989; Molumphy *et al.*, 1985; Mierzejewski *et al.*, 1997; van Doorn *et al.*, 1995; Bork *et al.*, 1996)**. One study revealed the proportion of therapists who experienced limits inferable from LBP, while another study recorded the level of specialists who got some much-needed rest from work **(Bork *et al.*, 1996)**.

Physical therapists' specialist field of practise or profession environment is regarded to be a hazard for WRMSDs **(Molumphy *et al.*, 1985; Mierzejewski *et al.*, 1997)**.

On evaluating the association between tasks performed by the physiotherapists and the signs observed, there was a substantial association amongst manual therapy performed and the pain associated with wrist and hand and elbow. The neurologic recovery remained connected to the low-back pain and upper back and knee pain **(Bork *et al.*, 1996)**.

Following is the portion of the components that add to musculoskeletal complaints which are related with the occupation **(Bork *et al.*, 1996)** Vibration has a result on

ligaments, joints, muscles, and nerves, causing coldness in the fingers, touch impairment, hold, and agony; power of exertion, and dull movement; position while working; posture; a small amount of help from colleagues; same posture fixated for long period; and retrograde or abnormal movement.

Indicators of work-related musculoskeletal problems are divided into three categories: **early signs, signs that the condition is progressing, and signs that the condition is advancing**. Aching of the impacted limb may ensue throughout work shifts, but it goes away when the individual interrupts functioning and has no effect on the person's ability to work are the early signs. Aching/fatigue that occurs first in the work-shifts and continues at night, making it hard for the individual to do repetitive work are the signs that the condition is progressing; and advanced condition signs include aching, fatigue, and weakness that persists constantly, making it difficult for the person to sleep and perform light duties.

Any position can induce discomfort and exhaustion if maintained for an extended amount of time; for example, standing for an extended period of time might create sore feet, general muscular fatigue, or LBP. Injuries can be caused by two characteristics of body posture. The first is connected with real position. Wherever there are parts of the body that can no longer move freely; nerves and ligaments contract and stretch. The more extended a body stays in an unmoving or troublesome position, the more probable they are to get WRMSDs. Retaining the neck and shoulder in a rigid locate is one more factor that gives rise to WRMSDs. The range of time expended is a critical factor in the advancement of musculoskeletal complications. The complete contact time frame, moreover, the quantity of replications are significant components. The

total burden on the system is decided by the phases of numerous aspects, like, the amount of power; length of exposure; measure of times an activity is finished and postural burdens.

Because the nature of the effort that physiotherapists do exposes them to a noteworthy risk of discomfort, musculoskeletal damages are one of the most well-known medical issues among them **(Nordin *et al.*, 2011)**. Development of cumulative trauma syndromes has been linked to repeated muscular contractions and static loads.

Consenting to Kroemer, provided substituting activities "that permits breaks in otherwise repetitive or sustained activity" is serious in avoiding such ailments **(Cromie *et al.*, 2000)**. WRMSDs are extensively found in physical therapists, and are routinely broadening.

“Physical therapy or physiotherapy is a physical medicine and rehabilitation specially that remediates impairments and promote mobility, function and quality of life through examination, diagnosis, prognosis and physical interventions”.

1.2 WORK POSTURE AND WORK-RELATED MUSCULOSKELETAL DISORDERS

Repetitive duties, strong-pressure manual strategies for handling patients, procedures that uphold direct strain on specific joints through therapy, testing positioning of joints during unequivocal artifices, and extended restricted positions are all important for the profession in a physiotherapy preparing. Physiotherapists are completely-open to a variety of work-related musculoskeletal sicknesses because of these physical variables **(Nordin *et al.*, 2011)**.

Physical therapists typically administer manual treatment, such as mobilizing the soft-tissue, which exposes the upper arm to musculoskeletal and neurovascular complications. Additionally, these specialists take on responsibilities like transporting a subject, assisting with exercises on the workout carpet and regularly elating and using equipment which has a lot of weight. Because of their exertion, therapists run the risk of experiencing acute and persistent musculoskeletal discomfort **(Salik *et al.*, 2004)**.

Physiotherapists in particular clinical specialties have been linked to workplace injuries in addition to the nature of their work. The three principal clinical regions creating serious work-related damages among therapists have been identified as musculoskeletal casualties (31%), neurological recuperation (14%), and geriatric care (12%). As a result, physiotherapists' scope of practise is a key element in determining the frequency of work-related damages in hospitals. The frequency of work-related injuries varies between subordinate and senior level therapists. During the first five years of practice, junior physiotherapists and newly trained former students are more likely to sustain workplace injuries **(Nordin *et al.*, 2011)**.

A high BMI was most well-known risk factor that contributed to the spread of WRMSDs. Physiotherapists who are weighty are less likely to be physically active, making them more prone to WRMSDs **(Nordin *et al.*, 2011)**.

Physical (work environment) and individual elements (factors) are every now and again referred to as factors connected with occupation low back pain. Individual factors that are non-changeable (age, gender, anthropometry) and perhaps changeable (hard bodily work, lifting, bowing, twisting, and static stance); and physical elements

that are non-modifiable (profound bodily work, raising, twisty, bending, and fixed posture, physical appropriateness, motor control, power) **(Nyland *et al.*, 2003)**.

Regardless of the way that kinesiotherapists have total comprehension of musculoskeletal harms and damage deterrence actions, since their educating and unceasing professional advancement, regardless, they experience fast-paced workplace injuries during their professional practice **(Nordin *et al.*, 2011)**.

Crucial mechanisms of musculoskeletal system are muscles plus joints. The range and plane of motion permitted at the joint are significantly influenced by the structure of the articulating surfaces and the kind of connective tissues. In order to avoid atrophy, skeletal muscles need to be utilised often for movement and posture.

Understanding how pathology affects the musculoskeletal system enables practitioners to treat signs and symptoms and proactively improve musculoskeletal health. Pathology affecting the joints can have a major influence on function and range of motion.

Any bodily posture that is held for an extended amount of time can become uncomfortable and exhausting. Standing is a natural bodily posture and has no unique health risks by itself. However, standing for extended periods of time while working can result in low back discomfort, aching feet, and generalized muscular tiredness. Inadequate workplace design and some duties may also force employees to stand in awkward positions.

Injury-causing body positions can be influenced by two factors. The first has to do with posture. Tendons and nerves are stretched and compressed when bodily

components are moved to the limits of their capacity. People are more prone to acquire WRMSDs when a fixed or difficult body posture is employed for a lengthy period of time. Example, bending the torso forward, backward, or in a twisting motion while working might put too much strain on the low back. Reaching at surpassing shoulder level, back of the body, winding the arms, twisting the wrists frontward, in reverse, or breadthways and achieving too much in facade of the body, are further instances of demanding body positions.

Keeping the neck and shoulders immovable is the second perspective that causes WRMSDs. The shoulder and neck muscles contract and remain active for however long the task calls for in order to carry out any controlled action with the arm.

The blood flow is restricted all the way down to the hand's active muscles as a result of the tightened muscles' compression of the blood vessels.

However, because of the tremendous muscular exertion, here is where the blood is most needed. As a result, two things take place. Even if there is little to no movement, the neck and shoulder muscles get overworked. The muscles that are moving faster because of the lower blood flow to the rest of the arm also become more vulnerable to damage.

1.2.1 Speed of work and repetitive movements

When the same action is done too frequently, too rapidly, or for too long, the risk of injury to the same joints and muscle groups increases. Additional risk aspects for WMSD, for instance motionless body posture and power, are always present in tasks requiring repetitive motions.

1.2.2 Force of any work and its effects

Force is the quantity of strength required of our body while elating things, using gears, or moving about. Since exerting more power requires more muscular work, resting between tasks takes longer. Since there is typically not enough time for recuperation during repetitive activity, the more intense actions wear the body out considerably more quickly. It's dangerous to use force in certain hand postures.

1.2.3 Applying strength in numerous hand situations

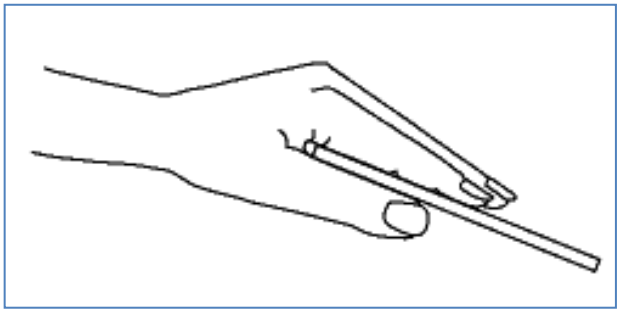


Figure 1: Pulp pinch

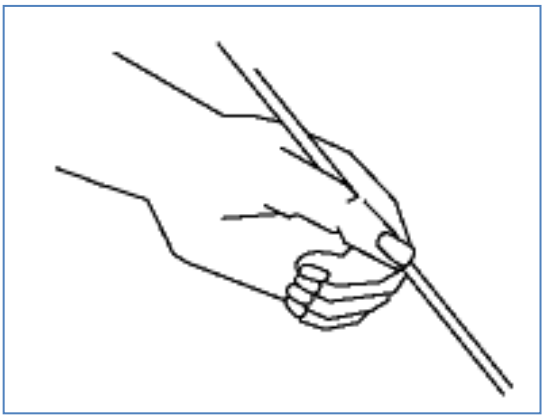


Figure 2 : Lateral pinch

1.2.4 Applying pressure in several hand postures

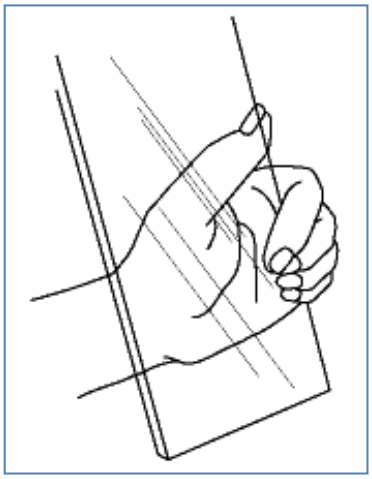


Figure 3 : Palm Filch

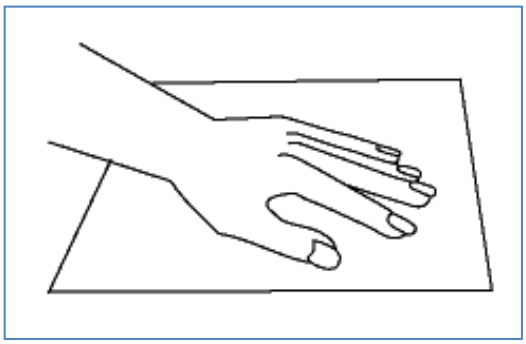


Figure 4 : Finger Squeeze

1.2.5 Applying pressure in numerous hand postures

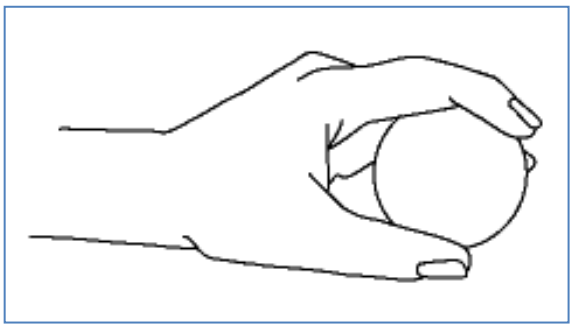


Figure 5: Pulp grab



Figure 6 : Finger compress

The weight of the things and where they are in respect to the body are only two examples of the many variables that affect how much force we use to complete a task.

Following figures show how lifting and carrying a box and lifting the identical things in a “pinch” posture takes more force than lifting them in a “hook”

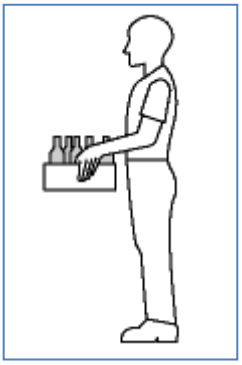


Figure 7 : Elevating in a "pinch"

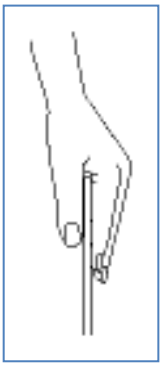


Figure 8 : Pinch location



Figure 9 : Elevating in a "hook"

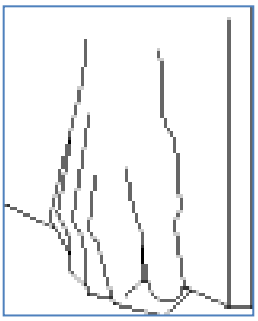


Figure 10 : Hook location

Another key factor is the tool's shape. Tools that prevent the wrist, elbow, and shoulder from being in their ideal positions significantly increase the force needed. Additionally crucial but frequently disregarded are tools that are worn out or badly maintained.

Physiotherapists who use force in their movements run the danger of developing WRMSDs, albeit no one is really sure when this will happen. Forceful movement work is very exhausting again since there isn't enough time for a complete recovery in between movements. To eventually do the same work requires effort. Injuries happen when workers continue working with growing weariness.

1.3 ANATOMY AND PHYSIOLOGY OF WORK-RELATED MUSCULOSKELETAL DISORDERS

WRMSDs encompass following types of injury:

- "Muscle harm"
- "Tendon harm"
- "Nerve harm"

1.3.1 Muscle Injury

As a chemical energy source, glucose is used by muscles when they contract, resulting in the production of lactic acid and other byproducts that are eliminated by the blood. Blood flow is reduced when muscular wasting persists for a considerable amount of time. As a result, the substances produced by the muscles are accumulated in the muscles and are not quickly eliminated. Muscle irritation and discomfort are brought on by the accumulation of these substances. The pain severity is evaluated by the muscle shrinkage and the time delay between the activities required for elimination of irritant substances by the muscles.

1.3.2 Tendon Injury

Groups of fibers connect muscles to bones in a structure called a tendon. Repetitive or frequent work actions or awkward postures can lead to two main types of tendon disorders. Sheath-covered tendon (Figure 11) are prevalent in the wrist and hand, whereas tendons without sheaths (Figure 12) typically manifest in the forearm, elbow,

and shoulder. The hand's tendons are protected by sheaths that allow the tendon to move through.

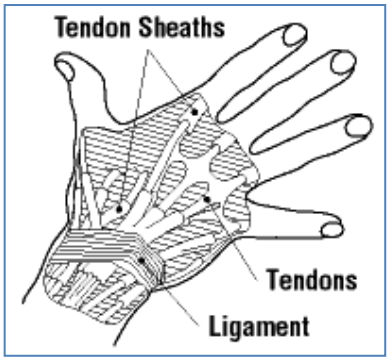


Figure 11 : Finger tendons and their sheaths

Cells found in the sheaths' interior walls produce a slick liquid to lubricate the tendon. The lubricating arrangement may fail if the hand is moved repeatedly or erratically. It might not provide enough fluid or yield fluid with less greasing properties. Resistance between the tendon and its sheath is created by the lubricating system letting down, which leads to inflammation and tendon region expansion. Fibrous matter develops when inflammation occurs frequently. The fibrous substance causes the tendon sheath to thicken and reduces tendon effort. Tenosynovitis is the medical term for inflammation of the tendon sheath.

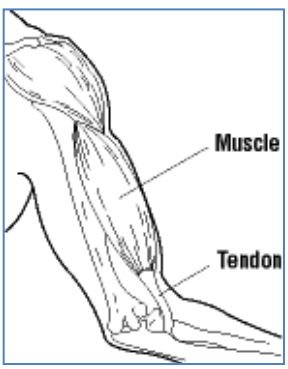


Figure 12 : Tendon, muscle, bone group

Whilst swollen, a tendon cover may enlarge due to lubricant and develop a bulge under the skin. Ganglion cyst is the term used to describe this.

Tendons without sheaths are susceptible to a variety of massages and uncomfortable positions. In reality, portions of a tendon's fibers can rip apart with repeated tension. Inflammation develops as a result of the tendon becoming stiff and rough. The term used to describe tendon inflammation is tendonitis. As in the shoulder, a restricted area between bones is sometimes traversed by tendon. An anti-friction mechanism is the bursa, a lubricating fluid-filled sac between the tendons and bones. The bursa encounters significant resistance and inflammation as the tendons become more and more brittle and rigid. Bursitis is the term used to describe bursa inflammation.

1.3.3 Nerve Injury

The signals that cause muscles to contract are carried by nerves from the brain. They control bodily sensations like sweating and salivation, and also about temperature, sensation of touch and pain. Nerves are covered by tendons, ligaments, and muscles. The tissues next to the nerves swell in repetitive movements and awkward positions, which presses or squeezes the nerves (Figure 13, 14).

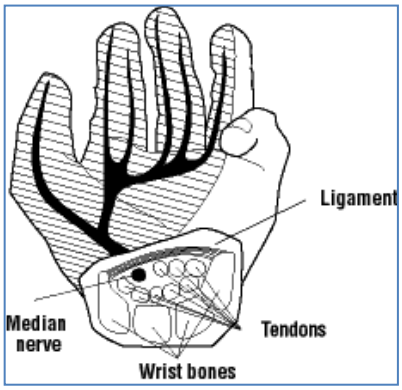


Figure 13 : Wrist in its natural state

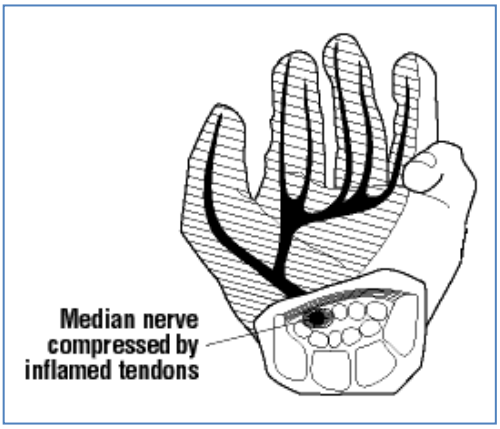


Figure 14 : Signs of Carpal Tunnel Syndrome on the wrist

Numbness is the end-result of the pressure that is put on the nerves, along with "pins and needles" feelings, and muscle wasting. Additionally possible symptoms include dry skin and impaired blood flow to the limbs.

1.4 SYMPTOMS OF WORK-RELATED MUSCULOSKELETAL DISORDERS

The most prevalent symptom is pain. There may occasionally be redness, swelling, tightness in the muscles and joints, as well as joint stiffness. Additionally, some employees may feel "pins and needles," numb, have changes in the color of their skin, and have less hand perspiration.

Advancement from mild to severe WRMSDs take place in stages:

Early stage: “Aching and tiredness of the affected limb occur during the work shift but disappear at night and during days off work. No reduction of work performance.”

Intermediate stage: “Aching and tiredness occur early in the work shift and persist at night. Reduced capacity for repetitive work.”

Late stage: “Aching, fatigue, and weakness persist at rest. Inability to sleep and to perform light duties.”

These phases have varying impact on each person. Indeed, it might be complex to say with absolute certainty when one phase has begun and the other has ended. Soreness is the first indication given by the body, to tell that muscles and tendons now need to rest and recuperate. Otherwise, a wound may fester and occasionally become irreparable. People should react to symptoms as soon as they appear, if possible.

In the table below, professional risk factors and indications are listed alongside the most common upper body conditions linked to WRMSDs.

Table 1: Symptoms, risk factors and disorders identified in the workplace

Disorders	**Occupational risk factors**	**Symptoms**
Tendonitis/tenosynovitis	Repeated wrist movements repeated shoulder movements persistent hyperextension of the arms long-term burden on the shoulders	Symptoms of the affected area include pain, weakness, swelling, burning, or a dull discomfort.
Epicondylitis (elbow tendonitis)	Simultaneous wrist bending and strong, repeated rotation of the forearm	Same symptoms as tendonitis
Carpal tunnel syndrome	Repetitive wrist motions	At the base of the thumb, there is pain, wasting of the muscles, tingling, burning sensations, and a dry palm.
DeQuervain's disease	Twisting hands repeatedly and firmly grasping	Pain at the base of thumb

Disorders	Occupational risk factors	Symptoms
Thoracic outlet syndrome	Extensive shoulder flexion arms raised above shoulder level lugging objects on one's shoulder	Hand aches, numbness, and edema
Tension neck syndrome	Extended posture of restriction	Pain

1.5 RISK FACTORS FOR WORK-RELATED MUSCULOSKELETAL DISORDERS

Bending, flattening, gripping, holding, twisting, compressing and reaching causes work-related musculoskeletal conditions. These activities are routinely performed in daily life, but they do not become hazardous, but when these activities are performed repetitively, in a forceful manner, with a higher speed and not giving time for healing, makes them hazardous.

Work-related musculoskeletal disorders are related through occupation forms that include:

- Rigid or inhibited body stance
- Unceasing replication of gestures
- Power concerted on trivial portions of the physique, such as palm or wrist
- Speed of effort that do not permit adequate recuperation among moves

Typically, not a single element acts independently to induce WRMSD. WRMSDs frequently happen as a consequence of blend and interface among them.

- ♦ The progress of WMSD is also aided by vibration, temperature, and chill.

1.5.1 Healthcare-specific risk factors for musculoskeletal diseases at work

- Raising patients or gear
- Relocating patients
- Responding to unforeseen movement
- Manual healing
- Inability to take rest gaps
- Insufficient staffing
- Derisory training on injury inhibition

1.5.2 External hazard factors

a. Low back

- Small place of work
- High efficiency demands
- Undermanned
- Size, ailment, form, aid with gait, and confused or disturbed state of the patient
- Providing manual resistance
- Problem adjusting couches/mats/seats/commodes

- Monotonous bending, twisting, elating
    - Over the course of a day, week, or entire life, loads on the spine
    - Despite possible low peak forces, repeated cumulative loads raise the possibility of low back tissue damage and injury.

b. Neck/Upper Back/Shoulder

- Type-A behavior
- Preparation
- Breather gaps
- Work-load
- Over Time
- Elevated work-load
- Sameness (Female)
- Manual methods
- High cerebral load
- Busy labor setting
- Overtiredness at end of day
- Disappointing time-off
- Neck of both genders
- Fellows - Shoulder
- Working class (Male)

c. Hand and Wrist

- Significant amount of manual therapy
- Inactive placement of a joint

- Continual length burden through a joint
- Small, unsupported joints
- Exorbitant work load
- Planning/diminished respite interruptions

1.5.3 Internal Risk Factors

a. Low Back

- Woman
    - Weight and height not more than male complements
    - Antenatal, heightened physical demands, and heightened ligamentous elasticity
- Psychosocial Health
    - Pressure
- Lack of knowledge
    - Awkward demanding relief
- Positional Pressures
    - Standing, mobile, slouching

b. Neck/Upper Back/Shoulder

- Unsatisfactory stance "rounded shoulders" - augmented anterior muscle circumference
- Capacity of press is larger than pull - i.e. feebler posterior muscular structure
- Shortage of steadiness through trunk and hips

- Oldness
- Smoke
- Psychological pressure
- Former wound
- Morbid BMI

c. Wrist and Hand

- MCP distress is more frequented in newly practicing therapists
- CMP distress is more frequented in experienced therapists
- Slackness in the joint of CMC
- Tip pinch power is lessened
- Reduced Body Mass Index (BMI)

1.6 CONSEQUENCES OF WORK-RELATED MUSCULOSKELETAL DISORDERS

1.6.1 Personal

- Despondency
- Annoy
- Beginning signs of maturation as a result of pressure
- Prospective undesirable consequences on the clan

1.6.2 Work-Related

- Abandon employment
- Absconder
- Employee Reward

- Wasted output
- Reskilling of workforce

1.6.3 Cost-effective Means

- The head costs of a damage include all hospital and doctor visits, prescription pharmaceutical prices, medical bills, and rehabilitation expenses.
- Indirect expenses of an injury include managerial period spent managing the damage and therapeutic care, increases in insurance expenses, employing another employee to cover the hours the injured worker missed, loss of reputation and client confidence, unwelcome media attention, and more.

1.7 STRATEGIES TO PRECLUDE WORK-RELATED MUSCULOSKELETAL DISORDERS

For the illnesses brought on by prolonged usage of the musculoskeletal system, prevention measures must be created.

Injuries brought on by repeated use, those that develop gradually, or These problems, which can be unpleasant while working or resting, are brought on by repetitive, frequent work activities or activities that require awkward or inappropriate postures.

Nearly majority of the work that humans accomplish is done with their hands and arms. The hands, wrists, elbows, neck, and shoulders are typically affected by labor-related musculoskeletal conditions. The repetitive motion of the legs is probably the cause of musculoskeletal issues in the legs, hips, ankles, and feet that are related to work. Repetitive activities also have an effect on a person's back.

The traditional disease classifications cannot be used to categorize these conditions. As a result, these ailments are given names like:

- Repetitive gesture injuries
- Monotonous strain injuries
- Collective trauma disorders
- Overuse disorder
- Regional musculoskeletal conditions
- Soft tissue ailments

The illnesses are not well described by the phrases mentioned. Therefore, a term like "work-related musculoskeletal diseases" is employed to describe this ambiguity.

1.7.1 Evaluation of WRMSDs

WMSD evaluation includes a look at workplace dangers. The process of evaluation begins with an explanation of the subject's line of work and necessitates an elaborate explanation of all the actions that constitute a characteristic workday. Every task performed at work, such as its incidence, intensity, length, and regularity, is kept in mind.

By using laboratory and technological tests to identify nerve or muscle injury, WRMSDs can be definitively diagnosed. Electromyography (EMG), one such test, and nerve conduction velocity (NCV) are two of its components. “Magnetic Resonance Imaging (MRI)”, a substitute for x-rays, delivers the pictures of musculature, ligaments and tendons with higher reliability than the x-rays.

1.7.2 Restriction of Movement

Avoiding the actions that caused the injury is the first step in treating WRMSDs. Work limitations are frequently needed for this. In some circumstances, switching jobs should be taken into consideration. Additionally, a splint can be used to limit motion or restrain the afflicted joint. Immobilizer use in occupational settings, however, calls for utmost caution. Splints have the potential to do more harm than good if applied improperly. Splints are typically used for one of two purposes: to assist a joint when it is predicted that the joint will be subjected to an unwarranted load or to hamper the activity of wounded joint.

In a professional situation, splints shouldn't be employed as a mechanical assistance for that joint. The task must be altered to prevent the heavy pressure on the employee's joint in first instance. To effectively immobilise an injured joint with splints, the work undertaking that created the damage must be stopped or altered. If dangerous labor is continued, the worker runs the risk of hurting other joints that must make up for the splinted one.

1.7.3 Entreaty of Heat or Cold

Pertinence of heat or frigid tends to reduce discomfort and can hasten the healing progression.

For wounds and inflammations, the use of cold is advised since it lowers pain and swelling (tissues that are inflamed, red, hot and swollen). In cases of muscle pain (spasm), the use of ice is not advised since the cold temperature would cause the

muscle to constrict even more. Ice should only be applied to sore muscles for a brief period of time after the damage has happened.

For the alleviation of muscle pain, heat is advised. Heat helps the removal of lactic acid buildup by increasing blood flow. For wounds with substantial edema and inflammation, it is not advised.

1.7.4 Exercise

Extending is advantageous as it increases circulation and eases tightness in the muscles. However, before engaging in any physical activity, those with WRMSDs should speak with a physical therapist. If not correctly planned, stretching or exercise regimens can worsen an already present condition.

1.7.5 Medication and Surgery

Anti-inflammatory medications help lessen inflammation and pain. If all other measures are unsuccessful, the doctor may try more complex therapies or perhaps surgery.

1.7.6 Low Back Ache

The low back guards the upper body's mass and gives the user freedom for routine movements like bending and turning. While walking, the muscles in the low back flex and rotate the hips while also supporting the spinal column. Muscles in pelvis, feet and legs, are supplied with feeling and energy by the low back's nerves.

The majority of sudden low back discomfort is brought on by a muscle, joint, ligament, or disc damage. The inflammatory healing response is another way in which the body responds to harm. Even though inflammation seems unimportant, it can be really painful.

Numerous symptoms might be present with low back pain. It may be slight and only annoyance-level, or it may be strong and incapacitating. The onset of low back pain might be sudden or it can be progressive, coming and going, possibly getting severe over time.

Based on the inherent source of the pain, indications might manifest themselves in diverse means. For example:

- Low back pain that is dismal or achy in nature
- Numbness or tingling may accompany the sharp, fiery pain (sciatica) that extends all the way down to the backs of the thighs and occasionally into the lower legs or foot. Its location is the low back.
- Stiffness and spasms in hips, pelvis, and lower back muscles
- As you sit or stand for a long time, your pain gets worse
- Having trouble walking, standing straight, or sitting down

1.7.6.1 Types of discomfort

- ***Acute pain.*** This kind of agony is regarded as a natural bodily reaction to injury or tissue damage and often manifests itself unexpectedly and persists for a limited days or weeks. The discomfort gradually goes away as body recovers.
- ***Subacute low back pain.*** This type of discomfort often lasts 1-1/2 months to 3 months and is involuntary in nature (e.g., a muscle strain or joint pain). If the discomfort is severe and makes it difficult to do regular tasks like sleeping or working, a medical exam may be recommended at this time.
- ***Chronic back pain.*** This sort of pain is often grave, does not react to primary therapies, and demands a detailed therapeutic examination to ascertain the precise

cause of the pain. Lower back discomfort that has persisted for more than three months is the standard description of it.

- ***Mechanical pain.*** By far, mechanical discomfort is the leading cause of lower back pain. Which structures—muscles, bones, joints (facet joints, sacroiliac joints), and ligaments—are most responsible for the pain in and around the spine? This type of discomfort typically occurs in the back, buttocks, and occasionally the tops of lower limbs. It often changes depending on activity, forward/rearwards/twisting motion, standing, sitting, or resting, and is typically influenced by the spine's load.

- ***Radicular pain.*** A compressed or inflamed spinal nerve root may cause this kind of discomfort to manifest. A nerve root pattern or dermatome may appear as radicular soreness progresses into the buttocks and/or legs. The defining feeling is a burning-like, electric-type pain that may be followed by coldness or weakness. Usually, it just affects one side of the body.

- There are many additional reasons why people experience pain, comprising claudication pain (caused by stenosis), myelopathic-, neuropathic-pain, malformation, tumours, illness, pain from inflammatory processes (like rheumatoid arthritis), and distress that emanates in different part of the body but shows up in the back (such as stones in kidney, or ulcerative colitis).

- Low back discomfort might also manifest itself without any clear cause. When this happens, focusing on the overall health of the patient and handling the symptoms—rather than the cause of the symptoms—should be the top concerns.

- A thorough diagnosis is necessary to determine the best course of treatment and rehabilitation for moderate and chronic pain in the lower back. The treatment of lower back pain helps to prevent the development of chronic lower back distress and lowers the likelihood of recurring episodes.

1.7.7 Muscle Strain and Ligament Sprain

Repetitive action can cause a low back sprain or strain, which can happen instantly or gradually over time.

- Strains happen when a muscle is overextended and tears, harming the actual muscle.
- Sprains develop when the ligaments that link the bones together are overstretched and torn.

Practically speaking, it makes little difference if a muscle or ligament is injured because the signs and treatments are the same.

Strain and sprain common reasons include:

- Elating a weighty object, or twisting the spinal column while elating
- Sudden activities like falling, which put too much stress on the lower back
- Poor stance over time
- Sports wounds, especially in game that involve twisting

Although sprains and strains may not seem serious and typically do not cause persistent pain, the acute discomfort they produce can be very severe.

1.7.7.1 Onset of Low Back Discomfort Symptoms

The time amongst the start of signs and the etiology of low back pain might be very different. Back discomfort could consist of:

Pain that develops slowly over time

Repetitive activities and stressful situations can create symptoms, which often begin gradually and get worse with time. After certain activities or at the end of a long day, pain may appear and feel like a constant aching.

Pain that comes and goes, but worsens over time

Degenerative disc degeneration in the low back can produce intermittent low back pain, but over time, the severity of pain attacks increases.

Immediate pain after an injury

The spine and the muscles that support it can be injured by abrupt or jarring motions, which results in severe pain right away.

Delayed symptoms after injury

Sometimes, hours or even days after an mishap or injury, symptoms start to appear or get worse. Most people believe that delayed pain is a side effect of the muscles' normal mending processes.

1.7.8 Neck pain

The underlying issue in the majority of neck pain instances includes a postural component. Finding relief from neck pain in such circumstances often depends on being aware of and comprehending improper posture.

1.8 GOOD POSTURE AND POOR POSTURE

Good stance for the neck is typically seen to be when the shoulders are back, the chest is open, and the ears are right high over the shoulders. Stress on the neck is reduced in this neutral location, also known as regular head stance, since the head weight is evenly distributed across the cervical spine.

- ***Augmented stress on the cervical backbone.*** As the head is kept forward in poor stance, the cervical spine must assist increasing amounts of load.
- ***Hyperflexion and hyperextension.*** Hyperflexion of the lower cervical spine is brought on by the excessive forward tilt of the vertebrae. The upper cervical spine becomes hyperextended, but the brain keeps the head up so the eyes can see straight ahead. The elongation of the distance between the base of the head and the base of the neck caused by this change in the curvature of the cervical spine stretches the spinal cord and nearby nerve roots.
- ***Muscle overload.*** In order to resist the force of gravity exerted on the forward-leaning head, a number of muscles in the neck and upper back need to be constantly overworked. As a result, muscles are more susceptible to agonizing spasms and tensions.
- ***Hunched upper back.*** The typical "forward" head position, concurred by "forward" shoulders and a upper back, may exacerbate neck, upper back, and/or shoulder pain.

Neck discomfort, hardiness, and other signs are more probable to develop the longer bad posture—such as slouching on the couch or hunching over a computer—is maintained.

Forward head posture might eventually strain the neck and other parts of the body more and more. Forward head posture can have a number of long-term implications, including:

- ***Muscle imbalances.*** In the neck, high back, shoulders, and chest, some muscles might shorten and become tight, while others can lengthen and become weak.
- ***Elevated risk for spinal degeneration.*** Degenerative spine conditions including cervical deteriorating disc ailment and cervical osteoarthritis may develop or become worse as a result of more pressure on the cervical spine's discs, facet joints, and vertebrae.
- ***Reduced mobility.*** As muscle and/or joint stiffness rises, the neck's range of motion decreases.

1.8.1 Injury, illness and disease

The difference between disease, which is a biological event typically but not always characterized by objective change, and illness, which is also known as being sick or feeling sick. This isn't always the case, though. Both the illness and disease are related in a way. Therefore, it is possible to have an objective infection without likewise having a disease (like a cerebral pain from a headache).

During the panel's discussions, it is essential to keep in mind that a glaring objective change, such as on an X-ray exam, may or may not be added to a symptomatic impairment to the upper extremity or low back. However, X-rays or other investigations may reveal abnormalities of various kinds that are unrelated to or unrelated to any symptoms the patient may be presenting with. Thus, a key element in

making a diagnosis is clinical judgment, or the physician's assessment of all the available data.

Pain syndromes involving the low back or upper extremities typically fail to meet strict diagnostic standards for clinical entities with well-defined clinical entities. Therefore, the traditional sciatic nerve pain radiating condition, which typically denotes lumbar region intervertebral disc herniation with impaction on nerve roots, is not present in the majority of cases of acute or long-term low back pain. In these situations, a patient's indications are not inconsequential or unconnected to observable causative-factors only because their symptom pattern does not match diagnostic criteria for clearly established illnesses. Indeed, it is more common than not the case that there isn't a fit with clearly recognized illnesses.

The most frequent complaint for which people visit doctors is pain, and managing chronic pain in the clinical setting is particularly challenging. Since only the person experiencing the pain can define it precisely, there is no such thing as pain. Widely dispersed throughout the body's tissues, pain receptors appear to be activated by either intense mechanical deformation, temperature extremes, or a variety of chemical compounds released during inflammation or other processes. Peripheral nerves transmit pain signals to the brain and spinal cord. Different reactions are produced through a range of neurological junctures that involve the spine and pathways that descend from the brain. The complexity of these responses is affected by a variety of factors, inclusive of intensity of the pain, its implications for the individual, its impact on physical or social functioning, and others. While some of these responses are reflexive, others involve complex responses that vary greatly from person to person.

In order to comprehend how people, experience pain, it is important to take somatization into account. It is widely understood to mean experiencing and disclosing physical symptoms that have no logical physical explanation and attributing those symptoms to sickness. For these symptoms, medical care is commonly sought. Malingering must be separated from somatization. The deliberate manufacture of incorrect or egregiously exaggerated physical or mental symptoms is known as malingering, and it is motivated by a mindful desire to earn material prizes from the outside world. These qualities do not apply to somatization, which is both inadvertent and involuntary **(Sadock and Sadock, 1999)**.

Signs in somatizing subjects that have a medical explanation might occasionally last for a very longtime. Somatization is an effect of both psychological and cognitive processes, such as heightened attention to common physical sensations or extreme worry over a major reason. Depression and anxiety are two psychological elements that have a very big impact on how painful somatization-related experiences are. Between 30 and 60 percent of somatized subjects exhibit these characteristics **(Kroenke *et al.*, 1994)**. In somatizing patients, both pharmaceutical and nonpharmacological therapy have been shown to reduce symptoms **(O'Malley *et al.*, 1999)**. A somatoform disorder is only diagnosed in a miniscule size of people with a history of persistent, numerous, and unrelated symptoms. Prompt recognition of the potential role that somatization may play in ill people or other constant symptoms is essential to avoid overdiagnosis and ineffective medical and surgical procedures. Treatment for somatization is examined.

1.8.2 Contextual factors

The following diagram illustrates the risk elements for injury, disability, and incapacity related to musculoskeletal issues in a person. It illustrates how factors that are both internal to the person and external to them interact, as well as how physical vulnerability and the emergence of a musculoskeletal condition take place within a comprehensive context of societal, monetary, and cultural elements. Most studies on musculoskeletal ailments in the employment have concentrated on physical exposures and psychological variables. We believe that the underlying scientific facts on the association between vulnerability and estimates of worker impairment should be interpreted taking into account the potential effects of financial incentives, organizational regulations at work, and research. There is a lot of data, which supports the idea that compensatory income substitution, regional unemployment estimates, and cultural factors can impact how commonly musculoskeletal pain or handicap is disclosed. However, it can be challenging to pinpoint the precise timing and volume of these factors.

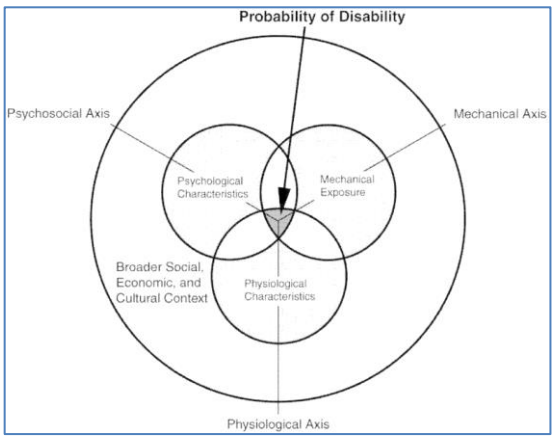


Figure 15 : Factors for the damage, disability, and incapacity imputed to musculoskeletal ailments

1.8.3 Disability benefits

Nearly all studies on workers' indemnity disability compensation show that benefits have a noteworthy bearing on a person's capacity to return to work after an occupational accident. The likelihood of returning to work drops and the amount of time spent away from the workplace rises as welfare levels grow **(Loeser *et al.*, 1995).** However, it is not always easy to pinpoint the cause of the compensation effect. While lower reimbursement rates may encourage some employees to return to work too soon, with significant functional restrictions, and while still experiencing symptoms, higher compensation rates may actually encourage employees who might otherwise return to work to stay off the job longer. Independent of benefits, a link has been found between legal representation and the frequency and length of claims. Legislative proposals to remove barriers to returning to work have arisen as a result of this connection **(Johnson, Baldwin, and Butler, 1998)**. However, it might be difficult to determine which way this "attorney effect" is going. It is not always obvious why a claim is made or why it is delayed because of legal counsel.

1.8.4 Governing policies and practices

In the 1980s, as the implicit and explicit costs of workplace injuries rose, employers and researchers started looking into how workplace policies and procedures might effect employment disability. **Hunt and Habeck (1993)** conducted study on 220 firms' employees in Michigan in 1991 to ascertain the effect of administrative procedures and practices on the periodicity and length of worker disablement. Less lost workdays were reported by businesses that said they kept safe equipment, quickly assessed risks and occurrences, established safety standards, and highlighted safety throughout the

company. Less claims and lost workdays were recorded by companies where the distressed worker and their superior participates actively in “return-to-work” technique, inventive accommodations were made for injured workers, and workers cooperated and coordinated.

Shannon and colleagues conducted a survey of 435 manufacturing workplaces in Ontario in 1996. A variety of factors, including the workforce's experience level (seniority), the level of employee involvement in decision-making, and the degree to which management supported employees' career advancement, were linked to lower rates of lost-time accidents. Profitability, unionization, or the setup or operation of joint health and safety committees did not correlate with lost-time frequency rates. Although it has been shown that union membership delays returning to work in the USA but not in Canada, it is likely that this difference is due to the fact that unions in the US usually have the representation of the attorneys and legal experts, provided by the companies, which may increase the length of workers’ absenteeism **(Johnson *et al.*, 1998).**

Data repeatedly demonstrate that providing injured workers with adjusted employment (often new responsibilities and timetables) increases the likelihood that they will return to the workforce effectively and reduces the amount of time they need to recuperate **(Krause, Dasinger, and Neuhauser, 1998)**. Additionally, how a company treats injured workers may have a big impact on when they can work again **(Strunin and Boden, 2000).**

These outcomes imply that managerial procedures and employment regulations have an effect on the prevalence of worker disabilities. Particularly, businesses that

prioritize worker well-being, safety, decision-making, and accessibility to revised work seem to have reduced rates of lost-time accidents. It's interesting to notice that organizational elements like health and safety committees don't seem to reduce lost-time rates otherwise they are combined with an obligation to employee wellbeing.

1.8.5 Culture

There is also a lot of evidence to support the impact of cultural factors on reporting. Cultural differences may have an impact on musculoskeletal epidemiology, according to research on whiplash injuries and pain in the lower back, despite the truth that this information is difficult to interpret due to the vagueness of these components' descriptions, it's possible that social security systems, industrialization, and westernization in particular all contribute to workers' increasing willingness to disclose low back problems **(Volinn, 1997).** According to research, personal injury insurance drives whiplash injury rates down in certain countries while increasing them in others **(Oblieniene *et al.*, 1999)**. When Saskatchewan switched from tort-based payment, which paid out for pain and distress, to a no-fault arrangement that did not, there were significant declines in the frequency of submits **(Cassidy *et al.*, 2000)**.

1.9 PREVALENCE OF WORK-RELATED MUSCULOSKELETAL DISORDERS

To estimate prevalence of “work-related musculoskeletal disorders,” it is essential to know, how these conditions are distributed across the workforce of the United States by type of employment. However, musculoskeletal disorders and employment cannot be linked with a single, comprehensive surveillance data system. In the absence of one, it is necessary to examine how the association's constituents are portrayed in a variety

of imperfect, somewhat overlapping data sources. A number of national systems, as well as some other systems, which are from a smaller or a more concentrated authority, can be used to create a relatively realistic load assessment.

Table 2: Major Systems Reporting on Workplace Musculoskeletal Disorders: A Comparison of Data Elements

Database	Population	Denominator	Exclusions	Case Definition
“BLS Part I”	165,000 businesses	SIC's working hours	Small farms, independent contractors, homeowners, and employees of the government	OSHA recordable
“BLS Part I”	165,000 businesses	SIC's working hours	Small farms, independent contractors, homeowners, and employees of the government	OSHA recordable with a minimum of one day missing
“NHIS”	106,000 people, 43,000 households	U.S. populace	None	Self-reported ailments
“Washington State Fund”	2/3 employers	Hours worked	Self-employed and self-insured	Accepted situations, racial/gender

Database	Population	Denominator	Exclusions	Case Definition
"Medical claims data"	Insured populace	Elusive in its character	None	Algorithms must be developed.

Case Coding	Exposure Factors	Timing	Demographic Data	Severity Measures
BLS coding	Working hours in SIC	Year	Nil	Nil
BLS coding body part, Nature	SIC, SOC, source, event	Year	Age, gender, race, years of employment	Days off work, shortened workdays,
None	Work: longest, last year, last two weeks	Within the past year	Age, gender, race	Illness or leave from employment
ICD9	Occupation	NA	Nil	Costs of lost time >4 days
ICD9	Information related to each job must match.	For onset, an algorithm needs to be developed.	Age, gender, race	A new algorithm must be developed.

Note: "BLS = Bureau of Labor Statistics; ICD = International Classification of Disease; NHIS = National Health Interview Survey; OSHA = Office of Safety and Health Administration; SIC = Standard Industrial Classification; SOC = Standard Occupational Classification."

The "Annual Survey of Occupational Injuries and Illnesses", which gathers essential statistics on working trauma and sicknesses in the private sector, is carried out by "Bureau of Labor Statistics (BLS)" of "United States Department of Labor." According to "Bureau of Labor Statistics," 2000b, 135 million people, or 75% of the

workforce, are employed by the private sector. Since the 1992 survey, the BLS has collected supplementary worker and case characteristics on workers who have been seriously injured or ill. Businesses that are affiliated with the federal, state, and local governments are excluded, as are private residences, farms with fewer than 11 employees, self-employed individuals, and businesses.

1.10 BIOMECHANICAL FACTORS OF WORK-RELATED MUSCULOSKELETAL DISORDERS

1.10.1 Cumulative trauma load-tolerance model

A complex web of circumstances can lead to work-related musculoskeletal issues that can get worse over time. The cumulative trauma model, in contrast to the acute trauma model, proposes that injury may occur as result of collective effect of intermittent external loads that, taken as a whole, may not be sufficient to exceed internal tissue tolerances. In other words, injury may occur as a result of cumulative external loads. When this loading builds up over time through repeated or prolonged exposures, tissues eventually exceed their internal tolerances. “Cumulative trauma model” which details why musculoskeletal ailments are related to the workplace. In many occupations, workers repeat tasks (sometimes thousands of times) throughout the day or invest a significant amount of time (up to eight hours or more everyday) in doing so. A structure's ability to bear a load is measured by its internal mechanical tolerance. It has many different aspects and is not seen as a threshold but rather as the ability of tissues to resist pressure or stress from mechanical sources for an extended length of time. Frequent or prolonged stress can have a negative impact on the internal tissue tolerances.

1.10.2 Internal loads

Load-bearing system in vertebrate animals is the musculoskeletal system. Gravitational forces and internal forces from the contraction of the skeletal muscles act on bony structures to maintain posture. As a result, bones serve as the body's main load-bearing structure. Gravity is one of the forces that can compress or bend bones when applied to the body. Ligaments bridge the articulations, or points where bones meet, to hold the skeletal structure together. In terms of their anatomical and biomechanical characteristics, ligaments that direct tendons around articulations serve as pulley systems and are comparable to retinacula. In order to produce voluntary motions and exertions, the skeletal system receives muscular forces from the connective tissues known as tendon. Tendons connect bone and muscle. Mechanical and thermal stresses can be caused by the body acting against or applying force to adjacent tissues, body motions, rhythmic energy sent to the body, or heat energy emitted by the body. These comprise intervertebral discs, muscles, tendons, ligaments, and connective tissue.

1.10.3 Ligaments and connective tissue

Ligaments are particularly susceptible to tensile loads because they are the connective tissues that connect the bones in the skeletal system. When ligamentous tissue is stretched, it initially resists elongation only slightly, but once it begins to resist elongation, it quickly grows. This is demonstrated by a typical ligamentous tissue stress-strain curve. When a joint reaches its maximum range of motion, the ligaments, which serve only to connect the skeletal system, start to oppose motion. **Adams *et al.*, (1980)** by tearing ligaments in corpse lumbar motion segments, demonstrated that the

segments of the supraspinous-interspinous ligament are the foremost ligamentous tissues tensing up as the lumbar spine bends forward. Steadiness and motion of the vertebral column in the low-tensile zone. The ligamentous stress-strain curve's low tensile zone must be contracted by the spine or any other articulation for it to stay stable and move. It is not the case that ligaments do not play a role in joint loading; far from it. When the torso is flexed to an excessive degree (bending forward), several authors have demonstrated that the spinal muscles go into electrical silence **(Floyd and Silver, 1955; Toussaint *et al.*, 1995)**. This study suggests that ligaments may occasionally be utilized to prevent the spine from bending. According to **Cholewicki and McGill (1992)**, the extent to which ligaments contribute to the stresses that are reposed on the intervertebral disc when performing manual handling of tasks is a topic of disagreement in the scientific literature. Like other articulations in the body, the intervertebral disc can be subjected to mechanical loads from ligaments that experience tensile stress during powerful movements.

When tendons (pulleys) turn on them, shear forces and contact strains are applied to the ligaments. For example, when the wrist is flexed, the lateral carpal ligament, which connects the carpal bones of wrist, acts as a gantry and alters the course taken by the finger flexor tendons. The tendons that link the far-off phalanges to the finger flexor muscles are likewise kept in good condition by the palmar ligaments. According to **Goldstein *et al.*, (1987)**, the transverse carpal ligament's proximal tendon strain was greater than its distal tendon tension. This study suggests that the ligament experiences shear stresses in addition to normal loads because of resistance amongst the tendon and ligament. He also demonstrated that the relationship between tensile load and posture affected the degree of shear.

1.10.4 Tendons

The collagenous material that connects muscle and bone is called a tendon. The orientation of collagen fibers in tendons resembles parallel bundles. When these tissues are subjected to tensile loading, the amount of stretch or creep is reduced by this fiber arrangement **(Abrahams, 1967).** Tendons that have been repeatedly loaded close to synovial tissues, especially those that envelope the bony or ligamentous structures, may become inflamed. In extreme circumstances, the supraspinatus tendon's collagen fibers may fracture and finally dissolve, producing calcium salt-containing debris that worsens discomfort and edema **(Schechtman and Bader, 1997).**

1.10.5 Muscles

Bony muscles enable movement and stance sustenance by transferring tension to the skeletal system via their attachment to tendons. To create tension, contractile units, or muscle fibers, are actively contracted and passively stretched. Utilizing simple mechanics like levers, the musculoskeletal system causes significant angular shifts in adjacent body parts. Therefore, the measure of muscular effort necessary to generate the desired strain or activity is determined by the characteristics of the extraneous force (impedance or load dynamism) and the distances between the pivot and the points at which the external force is applied and inserted, respectively. A muscle's leverage is almost always very low in relation to the point at which the load is applied, despite the fact that the effective distance between a muscle's pivot and the point of insertion change contingent on the approach of the joint. As a result, the internal muscles of the body typically exert more pressure than the surrounding environment. As a result,

internal muscle forces acting in opposition to external pressures account for the majority of the stresses felt by the joints during an effort.

1.10.6 Intervertebral disc

Because it allows one vertebra to rotate and move in relation to additional, the intervertebral disc is a joint. In addition, it shields the head and upper body off the powerful peak force suffered by the lower limbs and keeps the space between the vertebrae open to prevent compression of the spinal nerves. The two anatomical parts of the disc are the nucleus pulposus and the annulus fibrosus. In the center of disc, there is gelatinous combination of water, collagen, and proteoglycans called 'nucleus pulposus'. According to **White and Panjabi (1990),** the annulus fibrosus's vacillating bands of angled fibers are roughly 60 degrees from vertical. The disc transmits force equally and radially, acting as a pressure vessel. As a result, the disc is able to withstand the significant compressive stresses caused by muscle recruitment. According to study by **Hutton and Adams (1982)**, male cadaver discs between 22 and 46 years of age could typically survive single loads of greater than 10,000N before failing.

The majority of the time, the breakdown was in the vertebral endplate, a slim bony film that separates the disc from the vertebral body. This failure was not caused by nuclear prolapse. Because the disc is an avascular framework, endplate wellness is essential for nutrient interchange, and even minor breakdowns could accelerate degeneration.

According to **Hutton and Adams (1982)**, researchers discovered that when vertebral sections were jammed to mimic a very forward-leaning backbone, prolapsed discs took

place oftentimes. In this configuration, the annulus fibrosis's posterior portion is subjected to tensile stress while the front portion is compressed. **Hutton and Adams (1982)** found that when cadaver discs were examined in this position with a typical compression force of only 5400N, more than 40% of the discs prolapsed. The disc's vulnerability to bending forces is highlighted by this result. In a subsequent study by **Adams and Hutton (1985)**, which simulated recurrent disc loading, formerly healthy discs collapsed at 3,800 N. Once more, the majority of failures involved vertebral body trabecular fractures. These studies show that in a flexed position, repeated loading or exposure to significant compressive forces can damage the disc, particularly the vertebral endplate.

Because it's possible that in vitro reviews of lumbar motion segment breakdown don't accurately reflect the situation in vivo, additional considerations have been taken into account. From the previous considerations of muscle, it should be clear that even relatively insignificant external loads can result in fairly significant internal forces being generated by the muscles. When the muscles that assist, shift, and secure the spinal column are activated, significant pressures are applied to it. Numerous researchers have measured spinal pressure during elevating and during material handling assignments. Static sagittal plane analysis was utilized for the initial measurements of the spinal stresses **(Morris, *et al.*, 1961)**. Electromyographic and disc pressure measurements confirmed these modeling efforts **(Nachemson and Morris, 1964)**. The spine's three-dimensional internal loads have been quantified using more advanced models. **Schultz *et al.*, (1982a)** prepared and endorsed an effective design to ascertain the asymmetric lifting operations-induced three-dimensional internal spine loads.

Others have evaluated spine loads implicitly by testing response pressure and moments derived from related segment models. **McGill *et al.*, (1996)** demonstrated a very strong prognostic association (r^2 =0.94) amongst the extraneous spine moments and response strength in electromyographic-assisted model. This demonstrates that the variations in model's task parameters that affect the easier-to-measure spine feedback moments correspond to variations in the actual spine loading. The disc's compressive and shear forces are significantly affected by lifting speeds, initial lifting heights, and reach distances **(de Looze *et al.*,1993)**. The loading on the spine during asymmetric workloads has recently been evaluated using three-dimensional dynamic connected segment models **(Gagnon *et al.*, 1993)**. These more recent models have been helpful in determining the indirect spine loads brought on by lifting exercises that require a lot of twisting.

1.10.7 Nerves

Despite the fact that nerves do not actively or passively contribute to the body's internal forces, their performance is affected by changes in temperature, pressure, and vibration. Ischemia and carpal tunnel syndrome are thought to have mechanically compressed the median nerve in the wrist's carpal canal. Direct pressure measurements have shown that the median nerve is being compressed by the adjacent tendons **(Tanzer, 1959)**. When the median nerve was compressed experimentally, electrophysiological and tactile abnormalities that are indicative of carpal tunnel syndrome were observed **(Gelberman *et al.*, 1981)**. When wrist- and wrist extension, or finger flexor, exertions were increased, an Armstrong and Chaffin biomechanical wrist model from 1979 predicted an increase in median nerve compression.

Armstrong *et al.*, (1991) found that greater grip exertion and wrist and digit extension and flexion enhanced intracarpal canal pressure. **Rempel *et al.*, (1995)** reported results that are comparable for typing and repetitive hand movements.

1.11 COMMON MANAGEMENT APPROACHES

Soft tissue injuries, also known as musculoskeletal diseases (MSDs), cumulative trauma disorders, and repetitive motion damage, remain to be significant reason of loss in the modern workroom. In **1713, Ramazzini** created among the foremost recorded references to these ailments as "diseases of individuals who undertake beautiful labor." One of the earliest examples of how vibration affects soft tissue is a stone cutter who shapes and cuts limestone with air hammers. They were affected by what **Hamilton (1943)** described as a condition known as "dead fingers. Over time, MSDs have been a problem for workers. After realizing that MSDs—the term that is frequently used in the United States to describe these injuries—were becoming an increasing problem, safety professionals and businesses began implementing controls in the middle of the 1980s.

The fact that MSD terminology varies by region is interesting to note. According to a review of research by **Boocock, Collier, McNair, *et al.*, (2009)** the lack of global agreement in the language used to describe MSD problems in the upper extremities can make it more difficult to manage these disorders across multinational organizations. Fortunately, the associations between the MSD risk factors—primarily awkward posture, high force, prolonged duration, and/or high frequency—are supported by a substantial body of reliable epidemiological research. Even though the upper limits for each of these risk factors vary by joint structure (such as the shoulder,

wrist, or back), increased combinations of these risk variables are associated with an increased likelihood of developing MSD **(NIOSH, 1997a;b)**.

A solid foundation for managing MSDs is provided by this research-supported cause-and-effect relationship. According to **Humantech (2011)**, employers discovered in recent benchmarking studies that MSDs account for between 24 and 75 percent of their recordable injuries. According to additional research, the strategies used to manage these injuries range widely from reactive to proactive and are based on a variety of approaches, such as altering the workplace to better suit employee capabilities and altering employee work behaviors, personal wellness, and fitness levels.

Through benchmarking studies, collaboration with international businesses, and reviews of previously published research and papers, the authors and their coworkers discovered a number of methods utilized to address and manage MSDs. The following five methods were chosen as the most popular ones:

- Fix the person.
- Fit the person to the task.
- Change the person.
- Change how the person performs work.
- Change the work and workplace.

1.11.1 Common Approach #1: Fix the Person

Workers with MSDs or sprain/strain injuries must be diagnosed, treated, and supervised back to work by their employers. Medical management is a proactive program designed to care for injured workers and minimize losses (monetary and time-

related) caused by injuries. Medical treatment is required for all occupational illnesses and injuries, not just MSDs. Medical professionals trained in occupational health and MSD treatment, such as occupational nurses and doctors, typically support this strategy the most.

Fortunately, the diagnosis and treatment of MSD are carried out in accordance with established and widely accepted guidelines **(Decina & Bojanic, 1993)**. The requests of every specialist are considered in this strategy for conclusion, treatment, and return to work. Other operational factors, such as the funding and tracking system for occupational injuries (workers' compensation or government-sponsored healthcare), can have a significant (positive or negative) impact on the employed method as well as its effectiveness and efficiency. method and criteria for classifying injuries sustained at work; how quickly injuries are reported; the treatment's aggressiveness and the return to work; and the capacity to locate and accommodate return-to-work tasks.

At the very least, there should be a plan in place for medically managing MSDs in every workplace. The reactive approach is most effective when the program includes immediate and thorough injury and illness investigations to determine the causes of injuries and initiate corrective action. An effective medical management program typically consists of strong working relationships and cooperation among medical professionals and investigators. Physical and occupational therapists may also assist with the recovery and return-to-work phases. According to "**American Physical Therapy Association (2013)",** these medical professionals identify and treat individuals of all ages who are afflicted with diseases or other conditions that limit

their capacity to move and perform day-to-day activities. The following are some benefits of the approach to medical treatment:

- There are prompt responses to and treatments for reported injuries and illnesses.
- The cost of injuries can be reduced by proactive management.
- Known losses are the focus of resources.
- Employees who are hurt get specific care.

Primary challenges of this approach are that it:

- reacts quickly; only after an injury has occurred is action taken;
- does not prevent injury-related expense and loss; it only aims to make it smaller;
- concentrates on a single workstation or job at a time (exposure).

This approach is beneficial because it helps the injured worker get better and saves money on medical care. The method does not immediately establish the actual cost or the required treatment (prevention), requires a significant investment of time and resources (medical and return-to-work costs), and does not identify or address the subsequent cause of MSD damage. However, reactive programs are essential for responding immediately to injuries of any kind, including MSDs. Totally relying on this model may be the only viable option for businesses with unusual work practices, frequent employee turnover, a lack of internal resources (such as safety personnel or engineers), and little ability to influence the design of tools and workstations.

1.11.2 Common Approach #2: Fit the Person to the Task

In an effort to cut down on strain injuries, many businesses make an effort to "fit the person to the task," or match an employee's abilities to the physical demands of the workplace. Measurements of a person's functional capacities—such as strength, reach, range of motion, and maximum oxygen consumption—are made using this method, and the results of a physical demands analysis are used to compare them to the requirements of the job. This is an aggressive plan. Employers must devote additional time and resources to functional capacity evaluations and prework screening tests in order to meet the physical requirements of each job description. The strategy frequently involves hiring physical or occupational therapists to conduct a functional capacity exam (FCE) in order to "give an objective measure of a patient's/safe client's functional abilities compared to the physical demands of work" **(American Physical Therapy Association, 2013).**

The effectiveness of this strategy is demonstrated by a number of anecdotal reports in trade journals and online, in addition to published research studies. According to **Anderson & Briggs (2008)**, research findings could range from "no difference" to "much less" to "prevents 47% of future MSD (and other) injuries" if the physical demands and functional ability assessments accurately reflect workplace exposures. **Mahmud *et al.*, (2010)** looked at nine studies and came to the following conclusion: Preemployment exams tailored to specific jobs or health conditions may reduce occupational disease, injury, and sick leave, but the evidence is of a very low quality."

Due to the fine line between job placement and discrimination, a physician, occupational therapist, or physical therapist should be a part of a job-matching

program. Use valid and reliable methods to analyze physical demands and FCEs; and necessitate a fundamental comprehension of both federal and state employment law. The “Americans with Disabilities Act” in no way prohibits management with evaluating applicants' and employees' suitability or agility. However, management cannot demand medical examinations until it can be demonstrated that they are related to the job and compatible with business requirements.

An applicant for an occupation can only be subjugated to medical investigations after receiving a provisional offer of work that cannot be withdrawn until the investigation reveals that the candidate is unfit to perform all necessary work tasks for the position **(Zuccarello & Paul, 2011)**.

This approach has the ensuing advantages:

- During screening, preexisting conditions of an employee or job candidate may be discovered.
- It shows employees how strong they are physically.
- Employers are obligated to evaluate and comprehend the responsibilities and requirements of their workplace.

The disadvantages include:

- In order to avoid violation of the “Americans with Disabilities Act,” they must be administered correctly in the United States;
- Necessitates a significant time and financial investment for professional screening;
- Has a low return or payback;
- Truly reflects the physical demands of the entire job task when it comes to testing quality;

- Does not alter or affect workplace causes;
- Necessitates a new evaluation whenever jobs change;
- Focuses on each person individually.

The method of matching employee competence to task requirements was adopted by many businesses beginning in 1960s and continuing into the beginning of 1980s; however, its acceptance appears to be decreasing. The findings of the authors indicate that between 10 and 30 percent of American businesses continue to employ this tactic. The “Occupational Health Clinics for Ontario Workers Inc. (2013)” also recommend physical needs assessments for injured workers returning to work in some Canadian regions. In this instance, a return-to-work program includes finding the individual a job.

The manual material handling and field work that these businesses frequently perform offer little control over working conditions (such as stockpiling, ware-housing and order picking, driving and shipment tasks, urgent helps).

1.11.3 Common Approach #3: Change the Person

By encouraging people to participate in exercises that enhance their stamina, fitness, and talents, some organizations work to prevent MSDs. This is an investment in the workforce's well-being and health. The idea of unified health, safety, and wellness in the workplace is promoted by the "American College of Occupational and Environmental Medicine" (ACOEM, 2011). Instead of focusing solely on MSDs, this strategy places a greater emphasis on employee wellness as a whole.

Some businesses use stretching, exercise, and conditioning programs to change a worker's physical state in order to prevent MSDs. These programs can be used alone

or in conjunction with other interventions. In this strategy, which involves altering each employee's physical capabilities, factors that the employer cannot control include the workforce's readiness, interest, and engagement, each employee's physical health and antecedent circumstances, and the plan of the practices to accommodate occupational demands.

In United States, management who use stretching and exercise to treat MSDs must make sure that they encourage preventative rather than curative activity. "Where a doctor or licensed healthcare practitioner prescribes therapeutic exercise in response to a work-related injury or illness, the case is considered to involve medical treatment and the case is recordable," **OSHA (2010)** defines therapeutic stretching.

The majority of studies examining how stretching affects athletes' performance have found generally positive results. The workplace and employee health, as well as an employer's ability to influence employee health, are, however, distinct. **Hess and Hecker (2003)** compiled a summary of three studies and concluded that the results point to improved worker health, reduced injury severity, and lower costs. "Failed to clearly establish the case for or against stretching," the investigations, on the other hand.

According to **da Costa & Vieira (2008)**, similar studies and literature evaluations arrived at the same conclusion, stating that the findings were contradictory, "not very persuasive," and recommending additional research with higher standards of validity. "Stretching alone might not prevent work-related musculoskeletal problems and injuries," according to **Choi and Woletz (2010)**, despite the fact that research shows that extension improves elasticity, range of motion (ROM), and self-worth.

Despite the fact that some employers mandate stretching before and during the workday, many claim it is challenging to convince employees to participate in these programs and keep them up. **Silverstein *et al.*, (1988)** in an earlier research on the consequences of work out on MSDs, only 41% of the research team attended in the exercise plan on a regular basis, and 28% had stopped all participation.

MSDs will not be reduced by exercise programs on their own. According to advocates of stretching and conditioning, these fitness-based techniques perform best when blended with other intercessions **(Liberty Mutual Group, 2009).** Conclusions promulgated in trade journals and on the web frequently share unscientific accounts of enterprises demonstrating a 15 to 80 percent decline in hurts over a long-term stretching curriculum. Last but not least, the exercises in any stretching or accustoming program should be customized to the participant's physical requirements (task- or job-specific stretches).

When designing stretching and exercise programs for employees, businesses must also take into account any existing medical conditions they may have. If the exercises in generic programs don't meet the physical demands of the job, it can make things worse.

The reported returns on investment for stretching programs range widely. **Hess and Hecker (2003)**, for instance, looked at one study and concluded that stretching had a negative cost-benefit ratio in situations wherein "time is money. "

The likely advantages of extending, fitness, and accustoming activities are as follows:

- evident;
- show the care about the health of your employees;

- give employees brief breaks from their jobs;
- make each employee more aware of their own personal well-being.

The following are disadvantages:

- have not been shown to be efficient by reliable studies;
- Avoid reducing the circumstances that lead to MSD disorders (heavy loads, awkward postures);
- people's productivity suffers when they are absent from work;
- may increase the risk of injury for vulnerable individuals;
- necessitate a significant financial and time commitment (such as staff time, program progress, and program strengthening);
- are difficult to maintain over time and by means of changes in the business cycle;
- Management have no control over employees' preexisting conditions, and they have limited influence over employees' personal health and wellness.

Athletic trainers, physical therapists, and occupational therapists frequently advocate for this preventative strategy. "Healthcare practitioners that collaborate with physicians to maximize exercise and participation of patients and clients," the definition of an athletic trainer reads. According to the “National Athletic Trainer's Association, 2013,” “athletic training involves the prevention, diagnosis, and treatment of emergency, acute, and chronic medical illnesses involving impairment, functional limits, and impairments.”

The stretching and exercising strategy is most effective in businesses that allow employees to take breaks to exercise, have a strong sense of teamwork, and place a high value on the health and fitness of their employees. Construction, heavy assembly,

luggage handling, parcel delivery, and manufacturing are all common applications of this strategy.

1.11.4 Common Approach #4: Change a person's work habits

To reduce exposure to MSD risk factors, some employers also attempt to alter employee behavior or job responsibilities. “Behavior-Based Safety (BBS)” plan, occupation training instruction, and understanding drives that emphasize and strengthen the usage of body mechanism are frequently used to achieve behavior modification in this strategy.

Experts in SH&E know that social wellbeing is a regulatory control that ought to just be utilized subsequent to designing controls (work environment alterations) have been set up and openness to working environment dangers has been limited furthest degree conceivable. People's shifts, workweeks, and careers will all be affected by this behavioral strategy if they don't change their attitudes about work and risk, change their work habits, and get rid of old work habits.

Experts in behavioural safety, psychology, fitness, yoga, and even martial arts can instruct staff members in body mechanics and motions. These experts also support and promote this method. There was no conclusive proof of this strategy's ability to reduce MSDs from a review of studies. However, subjective reports (not specific to MSDs) have discussed the effectiveness of behavioral techniques in reducing total injuries. These reports have been published on a number of websites and in trade journals.

The advantages of this approach include:

- To initiate a stand-alone ergonomic behavior and movement program or conduct training on its own, only a modest financial investment is required.
- The majority of workers enjoy it (they get a pause from work and do anything new).
- It's seen as low-risk alternative by employers.

However, this technique has several drawbacks:

- Low ROI and effectiveness. Even whilst routines do amend, it seldom significantly reduces exposure to MSD risk factors.
- There is evidence that, despite the low implementation costs, cost effectiveness is low (between 10 and 20 percent) **(Goggins *et al.*, 2008)**.
- Programs are hard to keep going.
- There is no evidence to support this method's validity.
- It has no effect on the causes of MSD.
- It has been criticized by managers that enforcing safe work practices and encouraging employees to participate in programs and adhere to them necessitates additional work and time.

This tactic operates well for businesses that don't have time to train and involve employees, can't or won't change the working environment, and already have a behavioural safety observation program in place. Additionally, it is frequently utilized by businesses with unconventional workplaces. There are numerous efficient programs available in the hotel/motel and entertainment services industries, as well as in construction, transporting and delivery consignment, distribution, packaging, and cartage work.

1.11.5 Common Approach #5: Change the Work & Workplace

Adapting the workplace and work procedures to the workers is the aim of occupational ergonomics. According to **NIOSH (1997)**, employment ergonomics is "the science of adapting work environments and job demands to the capabilities of the working population." This definition, which is supported on engineering and design, is uniform with those of other internationally accepted professional organizations and organizations (such as the International Labor Organization and the “Board of Certification in Professional Ergonomics”).

"Furnish to each of his employees’ employment and a place of employment which are free from recognised hazards that are causing or are likely to cause death or serious physical harm to his employees," states the “OSH Act's General Duty Clause.” This requirement is met by the concept of tailoring workplace conditions and job requirements to employees' abilities. Simply put, workplaces that limit exposure to MSD risk factors will be created by businesses that employ effective ergonomic design.

The approach to governing ergonomics in the place of work has undergone significant development since OSHA's 1991 publication of "Ergonomics Program Management Guidelines for Meatpacking Plants." This manual frequently utilized as a source by safety experts starting to handle MSDs. A regular modern strategy is to handle ergonomics in the workplace by effectively recognizing and eliminating the elements that contribute to musculoskeletal-disorders **(NIOSH, 1997)**.

The plan-do-check-act cycle of continuous improvement is followed by this strategy: It evaluates risk, establishes controls, validates their productiveness, and standardizes

restraints. “Brazil (NR-17)”, the "Canadian Standards Association (2012)”, and the "AIHA (2008)” have all endorsed and supported this strategy **(Santos & Neto, 2012)**. “The primary objective of a comprehensive ergonomics schedule, regardless of the model it is based on, is to make tasks, jobs, outputs, environments, and procedures compatible with people's needs, capabilities, and constraints rather than making people compatible with the demands and characteristics of the work” **(Costa & Vieira, 2008)**.

Identification is the beginning step in identifying and quantifying MSD risk context in the workplace. The main factors of threat are gauche posture, great force, frequent use, and/or prolonged use **(NIOSH, 1997)**. The confines of each joint are different for each factor due to the body's anatomical structure. When one or a blend of risk elements are present, the likelihood of having MSD rises. For specific risk factors, whole-body exposure, and segmental exposure, there are valid and reliable evaluation tools.

Effective instruments for evaluation **(Marras, Allread, Burr, *et al.*, 2000)** employ quantifiable measures to detect vulnerability to MSD-associated risk elements. For instance, the NIOSH elevating formula is employed to measure the back whilst performing elevating duties, while the quick complete body analysis is used to estimate expositions to all body joints.

Because of advancements in the convenience of qualitative and quantifiable assessment methods, professionals in non-safety, ergonomics, and medicine can now effectively conduct MSD risk assessments. **Winnemuller *et al.*, (2004)** found that 81% of managers and 77% of employees evaluated ergonomic risks in a manner comparable to that of an ergonomist. They concluded that MSD estimation and administration need to involve individuals from within a company, not merely an ergonomics consultant.

Engineering controls (adjustments and modifications to the physical workplace) and engineering roles (such as engineers and maintenance staff) are required to guarantee that reach, force, and length are within the permitted ranges for the entire workforce. The workplace needs to be designed to accommodate workers from 5th percentile of women to 95th percentile of men if MSD risk factors are to be avoided by all employees. The effectiveness and efficiency of this strategy have been the subject of numerous studies **(Douphrate & Rosecrance, 2004)**.

Changes to work schedules like job rotation, rest breaks, and a slower pace are examples of administrative controls. Because these restraints are based on individuals, it might be harder for managers and supervisors to change their roles or rotate employees. When properly used, administrative interventions simply shorten exposure times (high frequency or long duration), divulging people to factors of risk for briefer times without affecting or removing the presence of risk factors for MSD. You cannot prevent MSDs by changing employment **(Triggs & King., 2000)**. Additionally, **Schneider *et al.*, (2005)** warned that if the exposures to all MSD risk factors across all body parts are not properly balanced, a job rotation approach may fail because its goal is to lower risk for all workers, not just one.

Goggins *et al.*, (2008) looked into cases of 250 individuals, that had been published and discussed the alleged advantages of ergonomics schemes and control extents. The ranking of controls for enhancing workplace ergonomics is supported by their findings. The following MSD controls were found by these researchers to be cost-effective:

- Implement engineering controls to eliminate exposures to MSD risk factors: 60% to 100%.

- Utilizing engineering controls, lower exposure levels: 40% to 60%.
- Utilize administrative controls, breaks, and rotation to shorten exposure time: 20% to 40%.
- Rely on actions: 10% to 20%.

For good ergonomics practices to receive support and engagement, individuals from all parts of a company must be involved. Assessments are carried out effectively by safety and ergonomics teams. The employees' experience aids cross-functional teams in developing controls to reduce MSD risk factors. The best people to assist administrative controls and engineering are maintenance workers, ergonomics experts, and engineers.

Many businesses are working in the direction of or have already implemented a practical functional design procedure in order to recognize and reduce workplace exposure to MSD risks. Despite employing the aforementioned strategies, these businesses have not achieved the anticipated outcomes. They control their workplace and possess the necessary mindset, support, and power to effect change. In addition, these are businesses that understand the value of investing in new tools and changes, are willing to fund those changes, and incorporate the change process into their standard operating procedures in order to diminish the danger of MSDs in the workplace.

Neuman and Dul (2010) discovered, after reviewing 45 empirical studies, that employing ergonomics (human factors) in the design of operations systems enhances worker well-being and system operation in a variety of production settings. Ergonomics is used to manage MSDs in a variety of settings, including call centers,

offices, heavy manufacturing, industrial and production facilities, swift and shipment services, health-related and laboratory settings.

Other than that, a few businesses have advanced to a standardized proactive ergonomics management strategy. Future operations are built to match the skills of the people who will be working there by taking ergonomics into consideration while designing new goods, processes, tools, offices, and layouts.

In a nutshell, this is purpose-based prohibition. Upstream in the ergonomics process, product designers, process engineers, and space planners must be involved. Given the appropriate criteria, future product and process designers can create designs that are suitable for the employed community and impede the development of MSD risk elements in the place of work of the future. **Charlton and O'Brien (2002)** say that correctly designing new tools, procedures, and equipment can save anywhere from one percent to ten percent of the cost of later workplace retrofitting.

This proactive approach has the following advantages:

- Before an injury or loss occurs, MSD causes (risk factors) are detected and restrained.
- Both now and in the future, risk lowering controls advantage everyone active on a project.
- Engineering controls remain in place over time, have a positive impact on employee behavior and accomplishment, and lessen the requirement for BBS plan components.
- Controls can be trusted; The actions of employees have no effect on them.
- Employee participation in improvements guarantees acceptance and change.
- The value of the investment is significantly increased.

Even though engineering controls have costs and capital costs, this investment is much cheaper than paying for MSD claims in the future.

Additionally, a number of obstacles must be overcome:

- Ergonomics must be viewed differently.
- Employees, management, engineers, and maintenance personnel must participate.
- Engineering controls require funding.

1.11.6 The Right System for Each Organization

The most important thing is to locate the ideal location within an organization for any or all of these strategies. The workplace culture, the level of control over the workplace, the capacity to alter the workplace, the availability of resources, and resource commitment are all factors that determine fit. The MSD management program's maturity can also be compared to these strategies for consideration. By means of benchmarking studies, **Humantech (2011)** developed a program with 4 universal stages that can be utilized by businesses to enhance their capability of controlling MSDs.

The maturity curve levels are in line with the five strategies discussed:

Maturity Curve Level	**Approach**
Reactive	"Fix the person"
Preventive	"Fix the person to the task" "Change the person"

Maturity Curve Level	Approach
	“Change how the person performs work”
Proactive	“Change the (current) work and workplace”
Advanced	“Change the (future) work and workplace”

MSDs can be managed in the workplace in a variety of ways. Based on its current requirements, working conditions, corporate culture, level of teamwork and involvement, available support resources, and workplace exposures, each company can find the ideal match. One, a few, or all of the strategies we've talked about can be used by a business. Research into each strategy's efficacy is ongoing. The majority of researchers still recommend including administrative and engineering controls for systematic ergonomics in any plan **(Amick *et al.*, 2009)**.

1.12 NEED OF THE STUDY

Physiotherapists run the risk of developing musculoskeletal conditions while treating patients, particularly distress in the “low back, neck, and shoulders.” Musculoskeletal conditions that disturb physiotherapists at place of work have been the focus of numerous studies. The prevalence of risks for “Work-Related Musculoskeletal Disorders (WRMDS)” is the focus of this research.

1.13 OBJECTIVES

The study aims to learn more about the causes and prevalence of WRMSDS among Indore's and its surrounding region practicing physiotherapists.

1.14 RESEARCH HYPOTHESIS

Null Hypothesis (H_0): "Work-related musculoskeletal disorders is not seen amongst practicing physiotherapists of Indore."

Alternative Hypothesis (H_1): "Work-related musculoskeletal disorders is seen amongst practicing physiotherapists of Indore."



CHAPTER-2

REVIEW OF LITERATURE



REVIEW OF LITERATURE

Molumphy *et al.*, (1985) did a research to ascertain the characteristics of physical therapy experts and the frequency with which they suffer from pain in the lower back pain (LBP) due to their occupation.500 licensed kinesitherapists were selected at random and sent the questionnaires by mail.29% of respondents, or 344 people, stated that their jobs were the cause of their LBP. Typically, the first onset was seen during the initial four years of starting the physiotherapy practice, between the ages of 21 and 30. While providing patient care, primarily in acute care and rehabilitation facilities, 83% of therapists first developed work-related LBP. Injury mechanisms included "lifting with abrupt maximal effort" and "bending and twisting."

Beckerman *et al.*, (1993) did their systematic review to gather information regarding the efficacy of physiotherapy in treating musculoskeletal issues.400 randomised clinical studies were discovered in the literature. Two or three blinded independent reviewers calculated a methodological score for separately randomised clinical test in each meta-analysis using a specified set of criteria and weighting variables. The reviewers were not aware of the results, the journal, or the authors of the publication. The randomised clinical trials were ranked according to their methodological quality score in each meta-analysis. Meta-analyses were conducted for conditions affecting the back, neck, shoulder, and knee, as well as for exercise treatment, traction, ultrasound, and laser therapy. The research's methodological quality appeared to be generally low, and only a few treatments and indications supported the efficacy of physiotherapy. On the other hand, the prevalence of significant methodological issues makes it impossible to claim that physiotherapy has no effect.

Bork *et al.*, (1996) undertook a study to find out how many physical therapists had musculoskeletal ailments over the time period of 1 year. A four-page questionnaire served as the instrument for gathering data. The research utilized 928 questionnaires that were completed to the letter. The neck (24.7 percent), wrist/hand (29.6 percent), lower back (45 percent), and upper back (28.7 percent) were the areas of the back that were most frequently affected. "Lifting and moving dependent patients" was the routine occupational component. They discovered a link between having a musculoskeletal disorder, the workplace, exercise, age, and sex of the physical practitioner.

No authors mentioned (1996). Work-related problems with the musculoskeletal system result in diminished productivity, functional disability, and chronic pain. The paper from the “ICOH's Scientific Committee for Musculoskeletal Disorders” discusses the significant workplace risks. People who are exposed to manual labor, static and repetitive tasks, vibrations, and unfavorable psychological and social circumstances are more likely to develop musculoskeletal illnesses. The best preclusion tactic is to implement ergonomic ethics in the workplace. International agencies ought to develop norms, uniform categories, and jargons. Further development of supervision systems at the national and workplace levels is required, as is increased focus on information dissemination, education, and training.

Mierzejewski *et al.*, (1997) conducted research to ascertain the preponderance of low back pain (LBP) due to occupation. Using a questionnaire, data were gathered. They sent the questionnaires to 462 physical therapists by mail, and 311 of them (67.3 percent) completed them completely. Work-related back pain was mentioned by

49.2% of respondents. In other nations, physical therapists had larger commonness of work-related LBP than the universal populace. There was no discernible difference between those who had occupation-related LBP and those who did not. Before the age of 30, and within the first five years of practicing physical therapy, most cases of occupation-related LBP began. The workplaces with the highest rate of injuries were private offices and hospitals. The most frequently mentioned activities that were linked to injuries were managing patients, bending, bowing, lifting, transporting, and dragging. Back pain that was severe enough to require them to stop working caused 13.7% of therapists to do so.35.3% of people with LBP continued working despite their pain.55.4% of those who replied said they had LBP at the time and had little or no disability.

Leidholm *et al.*, (1998) figured out the risks influencing the occurrence of "work-related musculoskeletal disorders" among physical therapy experts. The questionnaire was sent to 418 individuals who were selected at random. A review of the literature and earlier studies served as the foundation for the survey instrument. General practise, occupational injuries, and demographic data are its three sections. The lumbar spine, wrist/hand, and cervical spines experienced the greatest work-related musculoskeletal problems (34.5 percent, 20.7 percent, and 18.4 percent, respectively). The most challenging task for a physiotherapist is lifting and carrying dependent patients. In order to decrease morbidity in the future, physical therapy needs to conduct more research into the musculoskeletal disorders that are caused by labour.

Holder *et al.*, (1999) analyzed the origins of musculoskeletal injuries midst “Physical therapists (PTs)” and “Physical Therapist Assistants (PTAs)” as well as the prevalence

of these injuries. Using a questionnaire, data were gathered. The study's participants were 500 physiotherapists and an equal number of assistants chosen at random. The response rate was 67%. A musculoskeletal injury was reported by 32% of therapists and 35% of assistants. Sixty-two percent of injured PTs and sixty-six percent of injured PTAs sustained low back injuries. According to the PTs, the back, hand and the wrist, had the second maximum generality (23 percent). According to the PTAs, the upper back had the second maximum generality (28 percent). Both claimed to have altered their work practices, employing improved body mechanics, working with more people, and frequently switching positions. Following the accident, the larger part of participants stated that they did not curtail the time for patient interaction or practice area. They concluded that despite their knowledge of the prevention and medication of musculoskeletal damage, physically demanding work, physical therapy assistants and physiotherapists are still susceptible to these issues.

Kilbom *et al.*, (1999). This review argues that legislation is required to prevent musculoskeletal issues at work. Due to a lack of definitional agreement, inadequate understanding of mechanisms, and exposure-dose-response linkages, designing such regulation is challenging. The difficulties are made more difficult by the intricate nature of the diseases, particularly the dangers associated with the work environment. Regulating these conditions is necessary, however, due to the high costs and ineffectiveness of voluntary prevention. It is stated that the quantitative regulations proposed for some European norms lack adequate scientific backing after reviewing various significant rules. Despite having few quantitative measures, the current ergonomic laws in the Nordic countries for the prohibition of musculoskeletal issues affiliated to occupation represent a step forward because they are successful in

providing advice, some of which addresses organizational issues. Future research should prioritize taking a more scientific approach to ergonomic regulation, and researchers should be more involved in these efforts.

Cromie *et al.*, (2000) attempted a study to determine how prevalent and severe musculoskeletal diseases related to work are. They conducted interviews with 824 physiotherapists, or every fourth physical therapist, for their study. The survey was conducted using a questionnaire of eight pages that was sent by mail to each physiotherapist. They found that every 1/6 of the physiotherapists switched their jobs or quit them, and that the lifelong frequency of musculoskeletal ailments due to occupation was 91%. The incidence of work-related musculoskeletal ailments was higher amongst younger physiotherapists. The methods used to mobilize the patients had affected their thumb. Most of the signs in the neck and upper limbs, as well as postural risk factors, were caused by problems with the spine. They concluded that no one knew why anyone would leave or relocate.

Kwon *et al.*, (2001) conducted research to determine therapists' prevalence of WMD, their anatomical locations, and potential occupational characteristics. The questionnaire consisted of two pages.105 physical therapists provided feedback. It was determined that 99 respondents (94.2%) had experienced WMD. Among physical therapists, the lowest back (74.7%), shoulder (66.6%), neck (41.4%), and wrist (41.4%) had the highest incidence of WMD. Age, treated patient turnover, and the years spent working as a physical therapist all had an impact on WMD. The most challenging aspects of their jobs, according to therapists, were carrying out the same

tasks over and over again (41.3 percent) and handling an immoderate number of cases in a single day (39.5 percent).

West *et al.*, (2001) explored the effects, commonness, risk elements at work, and causes of physiotherapist-related musculoskeletal injuries. Because of the work that physiotherapists do, pain that endured for more than three days was considered a musculoskeletal disease. They discovered that 50% of respondents had been hurt at work and 40% had been injured in the previous year. Injuries to the hands, the neck, and the low back were affected commonly. 56% of the preliminary injuries took place in the initial 5 years of completion of graduation. The employment risk variables that injured respondents were most concerned about were consistently challenging positions, manual therapy procedures, reiteration, working while hurt, and large workloads. Rather than seeking workers' compensation or scheduling surgery, respondents with injuries choose to continue working in spite of their conditions. Due to injury, 38 of the respondents switched workplaces. To cope, the majority of physiotherapists altered their work practices.

Caragianis *et al.*, (2002) determined the incidence of hand pain and occupational injuries amongst therapists. They used a questionnaire to get the information.155 therapists participated in the study. In the end, 110 questionnaires were chosen for the research.75% of respondents said they had been hurt at work. Around the carpometacarpal or metacarpophalangeal thumb joint, pain was most frequently mentioned.

Cromie *et al.*, (2002) conducted research to ascertain how occupational musculoskeletal illnesses affected the values of physical therapists, including their

skills, relationships, knowledge, and work ethics. There were 18 physiotherapists in the study. The participants believed that their knowledge and expertise in physical therapy would help them avoid developing musculoskeletal illnesses because they had no idea that their jobs could lead to their development. Despite having musculoskeletal conditions, the physical therapists upheld the values.

Grover *et al.*, (2002) performed a study in light of the fact that, as stated by the "European Agency for Safety and Health at Work," upper-limb musculoskeletal issues and the neck are a major problem for employees in all EU members. It is an unfortunate irony that members of "Chartered Society of Physiotherapy" are particularly susceptible to sustaining such injuries while carrying out their professional responsibilities, given that physiotherapy is intended to treat injuries to the musculoskeletal system. In fact, musculoskeletal injuries threaten the health and well-being of UK physiotherapists, affect clinical education and practice, and may have a significant impact on how long they stay in the field and contribute to the "National Health Service". Due to the repetitive and labor-intensive nature of their work, physiotherapists are susceptible to musculoskeletal diseases, according to international research. Particularly, (1) Physiotherapists under the age of 30 face a greater risk, chiefly throughout the beginning 4-5 practice years; This is especially regarding the "National Health Service," where physiotherapist holding is a problem; Due to a musculoskeletal injury, up to one in six physiotherapists may switch specializations or exit the profession.4) The most frequently injured areas are the hands and wrists, followed by the low back.5) Raising or moving patients is the activity much liable to cause harm; (6) Rather than visiting an occupational health department, the majority of physiotherapists who tolerate from musculoskeletal disorders self-treat or seek

remedy from a co-worker; Moreover, a lack of break from the work, under staffing, and a heavy load of patients - increase the likelihood of injury.

Snodgrass *et al.*, (2002) conducted the study with the understanding that physiotherapists who use manual techniques to treat orthopaedic musculoskeletal diseases are now aware of the issue of thumb damage caused by work. Due to thumb pain, physical therapists frequently modify their treatment methods, which may reduce the efficiency of physiotherapy helps and raise costs for patients and financing agencies. A significant number of physiotherapists have switched specialties or left the work as an outcome of injuries sustained at work, putting additional strain on the educational and healthcare systems. The precise relationship between specific risk factors and preventative measures and the onset of thumb discomfort in physiotherapists is still up for debate.

Hignett *et al.*, (2003) conducted a thorough investigation into the intervention strategies that diminish the risks affiliated with patient handling activities. The inter-rater constancy of six reviewers was determined prior to the beginning of the main review process. Two reviewers read each manuscript, gave it a quality rating, and a third reviewer worked out any disagreements. There were a total of 2796 papers found, 880 of which were valued. The results of 63 papers on interventions are presented in this document. With the appropriate level of evidence (strong, moderate, limited, or poor), the findings are stated succinctly. They came to the conclusion that technique-based interventions do not alter working procedures or the rates of injuries. The risk elements associated with handling of patient are most likely to be successfully reduced by multifactorial interventions based on a threat evaluation program. It is suggested

that a general intervention program could be built around the seven most popular strategies, with the risk assessment process determining additional local priorities. In light of these findings, healthcare professionals ought to reevaluate their policies and procedures.

Nyland *et al.*, (2003) conducted research to determine how prevalent “low back pain” is among aspiring physiotherapists. The “Nordic Back Questionnaire” was utilized for the evaluation. The survey was completed by 72% of the students. Back pain is experienced by 69% of people at least once in a lifetime, 63% in their initial first year of practice, and 44% in their first month of their beginning the physiotherapy practice. Low back pain was highly likely to occur after the freshman year of study. They discovered that expenditure beyond 20 hours each month "sitting looking down" been affiliated to the occurrence of pain in the lower back within a month. They suggested that instructors alert students towards the possibility of pain in lower-back during sessions.

Rugelj *et al.*, (2003) released a technical comment that described the findings regarding physiotherapists' musculoskeletal issues, including low back pain. The survey was completed by 113 physiotherapists, or 15 percent.73.7 percent of physiotherapists reported experiencing pain in their low backs. Age was the most common risk factor affecting the pain in the back. The agony experienced by these physiotherapists was mainly due to the way in which they handled their patients.

Shehab *et al.*, (2003) performed research on physical therapists to sightsee the attributes of work- and non-work-related agony in the back (lower portion) and to find out the lifetime prevalence. Using a specialized self-administered questionnaire, the

data were gathered. It was sent to 143 physical therapists. The survey was completed by 100 physical therapists, or 70%. The respondents' mean age was 35.9 ± 8.45 years. Lifetime occurrence of low-back discomfort caused by work was 70% (61.8% for men and 74.2% for women).57% of people (68.4% of women and 31.6% of men) experienced back pain. In 82% of cases, each of the 100 therapists worked in regular hospitals and rehabilitation facilities as full-time employees with college degrees. The two most popular specialties were neurology (23%), followed by orthopedics (32%).51% of respondents said that LBP had an impact on their day-to-day activities, 28.6% said that pain caused limitations, and 11.4% said that LBP had changed their work environments. The lower back and buttocks were the utmost problematic areas. Both male and female physical therapists gave the pain the same severity ratings. The authors concluded that physical therapists in Kuwait had high point prevalence rates of LBP that were related to their jobs and disallowed them from doing their daily activities, necessitating workplace modifications.

Useh *et al.*, (2003) did a study to examine how physiotherapists respond to work-related musculoskeletal problems (WMSDs) and how frequently, severe, risky, and safe the workplace is. The study's subjects were physiotherapists who were members of Zimbabwe's Medical Rehabilitation Council. Physiotherapists employed in various Zimbabwean hospitals and clinics received a total of 198 questionnaires via mail.78% of physical therapists reported having WMSDs. The highest preponderance of symptoms was found in the thumbs (32.5 percent), upper back (34.6 percent), and low back (52.1 percent). One out of every four times, a physiotherapist with WMSDs required medical attention or took sick leave. It was reported that complaints pertaining to the back, the thumb, the wrists, the hands, and the neck were more

common among younger physiotherapists. Lifting or moving the patient receiving treatment was the most likely cause of WMSDs. The study found that even-though the physiotherapists themselves are aware of problems related to ergonomics, work-related injuries and also about their treatment, still, they are unable to protect themselves from this disorder. They recommended that further research is required to investigate physiotherapists' workplace safety.

Salik *et al.*, (2004) conducted a study to find out how often occupational musculoskeletal diseases affect physiotherapists in Turkey. To collect the data, they had used closed-ended questions. They stated an 85 percent lifetime prevalence. The neck, lower back, and the shoulders, were the utmost frequently feigned areas (12%), followed by the hands and wrists (18%). The patient being transferred was the primary risk factor (15%).69% of physiotherapists required medical attention for their conditions.76% of physiotherapists did not limit the amount of time they spent with their patients because of musculoskeletal issues.

Childs *et al.*, (2005) physical therapists' knowledge on how to treat musculoskeletal diseases was investigated. They included 182 physical therapy practitioners and 174 physical therapy students in their study. They discovered that in terms of treating their musculoskeletal diseases, seasoned physical therapists were more knowledgeable than student physical therapists. Students studying for a doctorate in physical therapy outperformed those seeking a master's degree. They also found that physical therapists with board certification outperformed non-certified peers on assessments and had higher pass rates.

Glover *et al.*, (2005) Concerning universality of “work-related musculoskeletal disorders,” associate members of the "Chartered Society of Physiotherapy (CSP)," a trade union, academic, and specialist organization that represents physiotherapists, their auxiliaries, and apprentices of physical therapy in the UK, were surveyed. CSP participants reported a 68% career predominance of “Work-Related Musculoskeletal Disorders”. In previous year, 58% of people declared experiencing musculoskeletal issues that lasted longer than three days. 44% of people who said they were hurt said their low backs were hurt the most. Within five years of graduating, 32% of wounded responders experienced their worst injury. At what time a serious injury occurred, the majority of respondents (59%) were younger than 30 years old. According to responders, "performing the same activities repeatedly," "working in the same posture for extended periods of time," and "seeing a high number of patients in one day" were the three significant workplace element that related to injury. Researchers came to the conclusion that physiotherapists in their early careers and fresh graduates looked to require the greatest intercession helps targeted at diminishing injury rates. By seeking out informal therapy from coworkers rather than reporting an injury to management, injured physiotherapists hinder official action and contribute to the problem of work-related injuries going unnoticed. Encourage physiotherapists to report workplace injuries and identify any obstacles to doing so.

Graham *et al.*, (2005) conducted research to evaluate how physiotherapists in their initial five years of practice perceived work-related musculoskeletal illnesses (WRMSDs). Participants thought that even though physiotherapy was a dangerous profession, they wouldn't get "serious" injuries because of their training. Injury prevention measures were frequently overlooked as a result of the heavy caseloads,

time constraints, pressure to seem competent of handling everything, and moral obligations to patients. Typically, the physiotherapists self-treated their WRMSDs, which increased their awareness of their own risk and motivated them to take precautions going forward. This study demonstrates the urgent need to modify the culture of the healthcare system to encourage the adoption of preventative interventions, as well as to increase the knowledge of physiotherapists of their WRMSDs' risks.

Loisel *et al.*, (2015) performed a literature review while keeping in mind how challenging it might be to reintegrate disabled employees into the workforce. Despite rising data about the prevention of job disability, there has been little evidence of acceptance of this evidence. One reason for the limited dissemination of evidence is the topic's complexity, which is further complicated by a number of legal, managerial, social, and cultural issues. A review and a compilation of expert perspectives are provided on the existing evidence for avoiding employment impairments and the challenges to using that evidence. According to the most recent research on preventing work disabilities, some clinical intercessions (like recommendations to return to amended work and stratified activity programs, but not at the level of individual practices) and some non-clinical intercessions (at the level of helps, policies, and communities) are effectual in lowering work nonattendance. Implementing the evidence in the field of work disability is extremely challenging due to the numerous obstacles, multiple parties involved, and ambiguity of intervention concepts that are typically unsuitable for immediate application.

Poitras *et al.*, (2005) performed a research to describe the methods physical therapists used to treat patients who had radiating agony below the knee and either acute or subacute LBP. Clinical management surveys for employees with absence of radiating pain and for workers with radiating agony received responses from 190 and 139 physical therapists, respectively. Two LBP patients, one with radiating pain and the other without, had their therapy goals, methods, and materials recorded by the therapists. They discovered that the majority of physical therapists used heat, functional activity training, manual manipulation, soft tissue mobilizations, interferential current, and spine massage. The majority of therapists also utilized ice and the McKenzie method for radiating pain. As part of their treatment programs, the majority of therapists concentrated on decreasing pain, increasing range of motion, strengthening muscles (their capacity to create force), minimizing muscular tension, and educating patients. Physical therapists use a range of therapy on LBP patients. The bulk of the effectiveness of the listed therapy has not been fully analyzed.

McMahon *et al.*, (2006) undertook study to identify the risks for thumb disorders and the lifetime and current preponderance of thumb difficulties among Australian physical therapists. In their investigation, they included 1562 licensed physiotherapists.961 (or 68 percent) of the 1102 questions had correct responses. Thumb issues accounted for 65% of the population's lifetime prevalence; They are now 41% common. They concluded that thumb issues are common among Australian physiotherapists, some of which are severe enough to prevent them from working.

Potter *et al.*, (2006) undertook a study to learn more about how entry-level physiotherapists view occupational injuries in personal practice and any potential

prevention strategies they may use. During their final year, 79 physiotherapy students were required to discuss self-management strategies and decide between becoming salaried employees or contractors. Additionally, they had to take into account recent injury statistics and common risk indicators for employment. The students' final evaluation included a lengthy written test, one of which included this question. The majority of the students decided to be independent contractors rather than paid workers, and they identified 9 domains for self-managing and lessening the risks. Irrespective of their intended career path, students inclined to choose self-managing plans that ought to have an unfavorable consequence on earnings and the availability of services. This tendency could be brought on by the students' relative lack of exposure to the working conditions in the private sector. Due to the significant prevalence of "work-related musculoskeletal diseases (WRMDs)" in the 5-years following their graduate studies, findings emphasize the significance of addressing workplace health and risks in physiotherapy for educational establishments and business owners. This would include providing avoidance training and introducing the most efficient strategies to each workplace.

Waddell *et al.*, (2006) Musculoskeletal issues are one of the most prevalent reasons for sick days, long-term incapacity from work, and retirement due to sickness. The number of UK beneficiaries of Incapacity Benefit (IB) has quadrupled since 1979 despite improvements in objective health measures. The majority of the trend occurs in everyday circumstances (largely subjective complaints, often with little objective pathology or impairment). Since it takes into consideration all the social, psychological, and physical components of illness and disability in humans, a biopsychosocial framework is required to understand incapacity. Eliminating

biopsychosocial impediments to recovery and employment should be the aim of rehabilitation. Adherence to these fundamental ideas is necessary for improving clinical and vocational therapy as well as minimizing impairment. A decrease of 33-50% in non-specific musculoskeletal condition-related illness absence and disability might be achieved by fundamentally changing how people see these conditions in society, the workplace, and healthcare.

Wijnhoven *et al.*, (2006) published a study on the differences in musculoskeletal pain between men and women, focusing on:2) various anatomical areas of pain; and, thirdly, a number of variables that affect how long musculoskeletal discomfort lasts (such as the prevalence of pain over a one-year period, point prevalence, chronic pain prevalence, and persistent chronic pain prevalence). The "Monitoring Project on Risk Factors for Chronic Diseases study and the population-based Musculoskeletal Complaints and Consequences Cohort study", in the Netherlands provided the research with their data. The people who took part in the study were Dutch citizens between the ages of 25 and 64. Written questionnaires were used to evaluate the self-reported pain issues. Based on two community-based surveys, this study found that women had increased preponderance rates of musculoskeletal pain than men in the Dutch general population between the ages of 25 and 64. Persistent musculoskeletal pain symptoms were experienced by 39% of men and 45% of women in any location. The hip and wrist/hand had the greatest female preponderance, while the lower back and knee had the lowest and least statistically significant sex differences. Women outnumbered men when it came to musculoskeletal discomfort across all duration criteria (prevalence over a one-year period, point preponderance, incidence of chronic pain, and frequency of persistent pain). Women generally rated their chronic pain as being more severe

than that of men. The current study demonstrates that females had higher commonness of musculoskeletal agony in most anatomic locations, independent of how long the pain persisted. Future study should concentrate on defining these gender differences in order to enhance techniques for treating and preventing musculoskeletal pain in men and women.

Barnes *et al.*, (2007) did a study to find out how many practicing physiotherapists suffer from low back pain.84 physiotherapists participated in the study.67% of respondents reported experiencing low back pain.58% of the physiotherapists said they had problems with their musculoskeletal system at work. They concluded that the nature of these physiotherapists' jobs was the primary factor in the work-related musculoskeletal illnesses they experienced.

Carta *et al.*, (2007) did a research to ascertain the preponderance of musculoskeletal conditions among physiotherapists. At the same rehabilitation hospitals, they had 50 physiotherapists and office assistants each. The majority of physiotherapists reported lower back (16%) and upper limb (4%) symptoms, while office workers reported issues with their lower back (70%) and upper limb (36%) symptoms. Physiotherapists were more likely than office workers to suffer from shoulder issues, lumbar disc degeneration, and wrist and hand tendinopathy (10%). They concluded that office workers experience musculoskeletal complaints more frequently than physiotherapists do.

Schofield *et al.*, (2007) undertook research to find answers. “Is the physiotherapy workforce significantly older today than it was in 1986? How much of the workforce has left since 2001, and how much is expected to leave by 2026? Is there a shift in the

workforce toward women? Are workers working more hours?" In the field of physiotherapy, the workforce has significantly aged since 1986. Despite the fact that only about a third of physiotherapists work past the age of 65, 41% of the workforce in physiotherapy in 2001 is expected to retire by 2026. Although the number of men working in physiotherapy has increased from 16% in 1986 to 27% in 2001, there are still more women working in the field than men. Physiotherapists are functioning longer than they used to because there are now more men working in the field. However, women of Generations X and Y are also furthermore likely than women of earlier generations to work longer hours. They came to the conclusion that existing staffing shortages, notably in the public and aged care sectors, may be made worse by the retirement of senior physiotherapists, who are primarily female. However, an overall increase in labor force capacity may be influenced by the rising percentage of male physiotherapists and their higher employment rates.

Stamou *et al.*, (2007) initiated a study to examine the levels of musculoskeletal pain experienced by newly hired Greek physical therapists. A three-page form was used to collect the information.95% of respondents informed having musculoskeletal issues in the previous 12 months. They claimed that psychological factors were also involved in these issues in addition to biomechanical concerns. They suggested holistic preventive strategies for overcoming these challenges.

Adegoke *et al.*, (2008). The commonness of "work-related musculoskeletal disorders" among physical therapy experts was determined by survey. 126 physical therapists had filled out the questionnaire correctly.91.3 percent of the time, musculoskeletal issues related to work were present. It affected females and patients with a lower BMI

(P<0.05). The neck (34.1%) and low back (69.8%) were the body parts most frequently affected. Work-related musculoskeletal illnesses affected 50% of physiotherapists in the first five years after graduating, with a prevalence of 61.7 percent among those under the age of thirty.83.5 percent of respondents cited the treatment of multiple patients as the primary cause of this disease.64.3% of physiotherapists altered the patient's or their own position.62.6% of patients altered or modified their treatment because of job-related musculoskeletal issues. Their research shows that musculoskeletal issues are more prevalent in Nigeria than in comparable nations.

Campo *et al.*, (2008) carried out research to establish the extent of issue and the impact of certain risk factors. The subjects were selected at random from "American Physical Therapy Association" (N=882).67% physiotherapists responded.93% of those who took the initial survey also took the follow-up survey. Over the course of a year, WMSD incidence was 20.7%. Moving patients, repositioning patients, bending or twisting patients, mobilizing joints, manipulating soft tissues, and straining on the job were all risk factors for WMSDs. The prime problem was the number of therapists whose jobs changed in the year of follow-up. They came to the conclusion that physical therapists often get work-related ailments that affect their muscles and joints. Particularly, exposures to physical therapy, patient handling, and manual treatment raise the risk of WMSDs.

Denis *et al.*, (2008) with the knowledge that musculoskeletal disorders (MSDs) remain to be a considerable reason of occupational illness and affect a significant portion of the workforce, a systematic study was carried out. In an effort to improve the effectiveness of treatments, this review examined the preventative measures for these

disorders. Because all 47 articles reported workplace activities that resulted in the implementation of improvements to prevent MSDs, a comprehensive analysis grid was used to categorize the data. The analysis revealed and outlined three primary types of MSD prevention intervention processes: the turnkey (n=14), the simplified (n=17), and the complete (n=17). Differentiators were provided by the methodologies and settings in which these three types of intervention processes were implemented. There were significant differences in the modifications that were made as a result. Due to the diversity of intervention processes and their potential effects on MSD prevention, it is suggested to "delimit" these procedures to improve efficiency.

Landry *et al.*, (2008) undertook research to ascertain the predominance and risks of back pain in the lower portion (LBP). The survey was answered by 344 medical professionals, or 60%. The prevalence of LBP in the sample was 21.5%, while once in a lifetime was 70.9%. Unsatisfactory self-reported health (P=0.019), direct contact with the patient (P=0.015), performing lifts and/or transfers (P=0.016), and a downcast level of job contentment (P=0.039) were all linked to acute LBP. Additionally, it was discovered that the frequency of daily lifting and transfers correlated with an increase in the “prevalence ratio (PR)” of declaring acute LBP (PR:1.4). In this study, none of the other things that are usually linked to LBP, like age of physiotherapist, gender, years of their experience, smoking status, and exercise, were found to be appreciably linked to LBP. Using this cross-sectional data, they came to the conclusion that there was no way to prove a cause-and-effect relationship. But the research does point to one possible risk factor: direct contact with patients, like lifting and/or moving them.

Darragh *et al.*, (2009) did a study on the premise that occupational therapists are more likely to suffer from injuries which are work-related (WRIs) due to the taxing nature of their jobs. Despite that, occupational therapists are not well-versed in the relationship between WRIs and musculoskeletal issues. For instance, studies indicate that their jobs are to blame for the pain and musculoskeletal disorders (WMSDs) that up to 91% of physical therapists suffer from. The goal of study was to find out more about frequency, severity, and types of musculoskeletal complaints and damages at work so that working therapists and physical therapy experts in the state of Wisconsin could compare and contrast their experiences. 3,297 physically and occupationally oriented therapists in Wisconsin received surveys from the researchers. Physical therapists experienced a rate of 16. In 2006, occupational counselors experienced 16 hurts annually for every one-hundred full-time employees, which is equivalent to the rate experienced by workers in heavy industry. The risks of WMSDs and injury that occupational and physical therapists face are comparable and serious.

King *et al.*, (2009) conducted a survey to compare elder and newer therapists' injuries and injury-related behavior. Randomly, a good number of participants from Wisconsin were chosen to take part in a cross-sectional study that looked at work injuries and musculoskeletal symptoms that the therapists themselves reported. Based on data from a sample of 1,158 therapists, older workers got hurt at the same rate as younger workers, but they missed more work because of their injuries. In general, younger and older therapists had more in common than they did not, especially when it came to how they worked. Elder therapists had severe pain symptoms and 2.5 times more likely to have changed jobs due to their pain than younger therapists. They came to the conclusion that older and younger therapists have both been injured on the job in

similar ways. Age can make it more likely that you will miss work and make your pain worse. More direction is needed to figure out how to best incorporate these interventions, like mechanical lift devices, into therapy practice. There are a number of ways that therapists can avoid injuries caused by their work.

Marras *et al.*, (2009). Musculoskeletal conditions are among today's most expensive health problems. Risk has been associated with psychosocial elements, individual traits, physical workplace requirements, and organizational workplace aspects, according to scientific literature. Because musculoskeletal risk is complex, scientists and policymakers may find it valuable to take into account the risk involved with multiple elements when devising injury prevention methods. The set of knowledge that establishes workplace exposure limits has historically been governed by biomechanics, physiology, and psychophysics. However, recent research has examined the connection between job organization, musculoskeletal issues, and psychological factors. The development of exposure metrics, the measurement of the three-dimensional masses positioned on particular joints (like the spine), the identification of tissue specified tolerance and the reaction of tissue to mechanical forces, and the effects of psychosocial stresses are all factors that have contributed to a better understanding of occupational exposure levels. Human tissue's load-tolerance and key risk factors are becoming more well-known, but little is known about how these risk factors interact with one another. It is crucial to identify the impact of relationships between risk variables in order to appropriately quantify workplace risk since they may have an impact that is noticeably bigger than that of any one risk factor.

Alrowayeh *et al.*, (2010) conducted research to ascertain the prevalence, characteristics, and consequences of work-related musculoskeletal conditions among physical therapists. 350 physical therapists participated in the study. In the analysis, 212 of the 350 physical therapist responses were taken into account. The frequency over a year was discovered to be 47.6% of their research. The neck (21%), upper back (19%), shoulder (13%), hand/wrist (11%), knee (11%), ankle/foot (6%), elbow (4%) and hip/thigh (3%) were the next most common problems. These difficulties were unrelated to age, gender, working hours, specialization, or physical exercise.

Chetty *et al.*, (2010) scrutinized the potential benefits of ergonomics and physiotherapy in treating musculoskeletal problems at work. The 29-year-old male employee in this case study suffers of neck and right upper trapezius ache after spending much time at his workstation. They found that physiotherapy assistance and ergonomic measures were more successful in treating occupationally-related musculoskeletal disorders.

Gropelli *et al.*, (2010) conducted a research because workplace musculoskeletal injuries are expensive for the healthcare sector. Back issues are said to be the reason that 12% of nurses quit their jobs each year. We solicited the opinions of 15 nurses and physiotherapists regarding workplace musculoskeletal injuries using the grounded theory methodology. Anxiety and annoyance, enduring problems and aspects of the job, love of the vocation and concerns regarding wanting to stay in it, an elevated risk of damage, medication adherence, detrimental effects on quality-of-life, deleterious perceptions of vocational health department, and training qualifications were among the key themes that surfaced from the scrutiny of the data. Theoretically, in order to

minimize occupational injuries, health care personnel either did nothing or just made minor interventions. More education and transparent communication are required, according to the survey.

Nkhata *et al.*, (2010) did a study to identify the occurrence of workplace issues, risk factors, and coping mechanisms across Zambian physiotherapy personnel. 120 physiotherapists completed the survey. In the year before the study, 3% of those 82 had WRMDs that persisted more than three days. 40% of participants (or 40.7%) had workplace accidents within the first five years of their graduation. Treatment of a significant number of clients per day (97.5%), repeating the alike task (94.9%), using manual therapy methods (93.2%), staying still for long periods of time (92.1%), and lifting and transporting (88.6%) were the work factors that the majority of individuals identified as contributing to WRMDs. Physiotherapy professionals in Zambia's Lusaka, Kitwe, and Ndola regions regularly face work-related musculoskeletal problems, according to the study's findings. The results emphasize the significance of future research with larger sample sizes to investigate the causes of WRMDs among physiotherapy professionals in this nation.

Rozenfeld *et al.*, (2010). Injuries were compared in two different skilled settings: recuperation facilities and clinics for OPD patients. The major objectives of the study were to investigate WRMD risk factors (OPCs), identify PTs' preventative actions, and assess the preponderance and effect of WRMD amongst Israeli physical therapy experts. They gave the PTs a translated and authorized Hebrew version of the Cromie survey at their places of employment. This research comprised 112 PTs who worked in OPCs and RCs and reported being in excellent health. They found that 83% of

people had WRMD at some time in their life. The lowest back (80%) experiences WRMD most frequently. They found that working in RCs was more frequently linked to lower back and shoulder problems, whereas working in OPCs was more frequently linked to thumb and wrist problems. One method physical therapist experts used to lower the risk of WRMD was the practice approach. Implementing administrative and ergonomic adjustments at work was advised by the respondents. The study's authors concluded that workplace-specific PT treatments should be developed and evaluated in subsequent studies to reduce WRMD.

Barnes *et al.*, (2011) did a study with physiotherapists in Bloemfontein to find out what causes thumb and wrist pain over the duration of a person's life. It was a question based on a survey. There are 102 physiotherapists in Bloemfontein, and 88 of them took part. 62 percent of them had pain in their wrists or thumbs at work, at least once in a lifetime. five percent (CI 52.1 - 71.9). Massage, soft tissue mobilizations, and orthopedic manipulations were the main risk factors. Participants thought that clinical practice made their symptoms worse and decreased their work productivity. To develop preventative measures, further research is required on workplace practices and job-related risks.

Grooten *et al.*, (2011) did a study on physiotherapists with at least 15 years of clinical experience to find out how common musculoskeletal illnesses are at work and what causes them. The analysis comprised 131 completely finished surveys. 53.5 percent of physiotherapists experienced musculoskeletal problems at work. The two body parts most commonly affected were the hand/wrist (58%) and low back (56%). Manual treatment techniques, working in small or uncomfortable spaces, and demanding jobs

have all been connected to hand/wrist pain. Lower back pain has been linked to working in a small or uncomfortable space while bending over or squatting.

Nordin *et al.*, (2011). To determine percentage of physical therapist expert who encountered work-related musculoskeletal ailments, a study was carried. The assessment used the Nordic Musculoskeletal Questionnaire. The analysis employed 105 questionnaires. In the preceding year, 71.6 percent of physiotherapists experienced musculoskeletal problems at work. Male prevalence was lower than female prevalence ($P<0.05$). The most frequent risks for occupational musculoskeletal disorders were manual therapy (58.6%) and lifting/transfer jobs. They also found that physiotherapists with a focus on children were more negatively impacted.

Passier *et al.*, (2011a) conducted a study with the goal of identifying WRMD risk factors as perceived by healthcare workers in various occupations (Aim 1) and treatments that they believe will permit them to remain working in difficult clinical positions (Aim 2). A web-based platform for administration and qualitative open-ended questions were part of the first round of the survey. The poll's themes were discussed in four focus group meetings in the second step. 112 (34.3 percent) of the requested health professionals responded to the survey; Physiotherapists made up 66 (58.9%) and occupational therapists made up 46 (41.1%) of them. 24 health care specialists partook in one of the four focus groups. Lifting or carrying, repetitive work, patient-related factors, and work postures and movements were the most frequently cited risk factors by health professionals. Six main themes were identified for assisting therapists in continuing to work in physically demanding clinical occupations. They came to the conclusion that the risk factors and potential remedies for lowering

WRMD have been identified and addressed for these medical professionals in clinically demanding professions.

Passier *et al.*, (2011b) conducted research to determine the variables influencing therapists' occupation-related musculoskeletal disorders (WRMDs). 46 occupational therapists who participated in the study and completed the online survey were included. 29 respondents, or 63 percent, reported having one or more WRMDs in the year prior, and 38 respondents, or 80.4%, said they had them throughout their careers. Of the 76 WRMDs that were discovered, only 5 (6.5%) were reported using official channels, and 37 (48.7%) were not reported at all. They came to the conclusion that a person's job and leisure activities are significantly impacted by musculoskeletal problems at work.

Wilhelmus *et al.*, (2011) conducted research to find out how common WRMDs are among physiotherapists with 15 years or more work experience and what might put them at risk. We sent a mail survey to 203 physiotherapists. These women took care of the survey themselves. The survey was completed by 131 physiotherapists, or 64 percent. 52 (53.5 percent) of the 99 people who answered questions about WRMDs had at least one affected body part. The wrist/hand (n=31;(n=30; 58.5%), and lower back. The most affected areas were (56.5%). For pain in the hands or wrists, relations were found with: techniques for manual therapy ([OR]=3.90; working in tight or awkward spaces (OR=4.96); and psychologically demanding work (OR=4.34). The following risks were allied with lower back pain: working in positions that are awkward or congested (adjusted OR=6.37); as well as squatting or kneeling (OR=4.76). Majority of them mentioned about WRMDs. WRMDs were significantly

linked to specific treatment tasks as well as general physical and psychological workplace exposures.

Al-Eisa *et al.*, (2012) did a study to better gauge the prevalence, underlying causes, and potential therapeutic approaches for work-related musculoskeletal problems. 200 physiotherapists were given questionnaires, and 162 of them responded. 81% of respondents responded. 74% of Saudi physical therapists and 63.9% of Egyptian physical therapists both mentioned a musculoskeletal injury. The neck (25%) and low back (25%) were the most often damaged body parts among Egyptian physical therapists (23,4 percent). The results showed that manual therapy approaches damaged more than a fifth, or 21.8%, of Egyptian physical therapists. Both retaining a position for an extended amount of time and applying manual therapy approaches were similarly associated with symptom recurrence (21.3%). Physical therapists in Egypt made the claim that 17.1% of them had changed their work procedures to forgo lifting and extended positional changes. Harm to the neck and back (low) were utmost common in Saudi Arabia (33 percent and 29%, respectively). The most common cause of injury among Saudi physical therapists (21 percent) was bending and twisting. Lifting accounted for 21% of symptoms returning. As a result of musculoskeletal conditions, 21% of Saudi physical therapists avoided lifting, and 11% altered their work habits to improve body mechanics. Despite the high rate of musculoskeletal injuries, the majority of Egyptian and Saudi physical therapists continued to work. In response to WRMD, coping strategies like altering work routines were utilized.

Buddhadev *et al.*, (2012) took a study with the intention of determining the physiotherapists' factors of risk, prevalence, and strategies to cope with work-related

musculoskeletal diseases. 29 (85 percent) of the 34 physiotherapists who received the questionnaire via email did so. In the previous year, twenty of the 29 patients had had WRMDs in no less than one part. Low back (35%) was the frequently inclined to injury, which is ensued by neck (25%) and shoulders (15%). Majority of respondents identified manual therapy procedures, persistently uncomfortable postures, and treating a huge number of patients, as risk factors. Commonest coping strategy was less time spent with patients (22.2%). In order to treat musculoskeletal disorders, physiotherapists reduced the amount of time they spent with patients in 22.2% of cases, 20.3% sought medical advice, 16.7% adopted exercise or posture programs, 13% sought physiotherapy treatment, 9.3% altered the position of their patients or themselves, 7.4% began taking breaks between treating patients, 7.4% enlisted the assistance of family or friends, and 3.7% relocated their workplace. They came to the conclusion that physiotherapists who work to prevent and treat musculoskeletal injuries are affected by occupational musculoskeletal injuries. WRMDs occur at an extremely high rate. Shorter patient contact times and doctor consultations were the most common coping mechanisms for musculoskeletal issues.

Dyrkacz *et al.*, (2012) studied to ascertain the sorts of workplace injuries, their prevalence, the importance of the practice setting, the cultural and structural elements that affect how individuals respond to these injuries, and the treatment choices for returning to work after an injury. Electronic surveying was used to distribute it to occupational therapists. Of the 600 responders, more than half said they had sustained at least one injury. Accidents involving patient and apparatus handling caused the majority of injuries. The injured occupational therapists sometimes underreported incidents and continued working after suffering injuries in an effort to minimize the

severity of their injuries. Nearly one third of those polled said they had experienced violence or threats at work. These activities may make it harder to come up with ways to reduce occupational therapy risks because it is harder to see the reality of work-related injuries in practice.

Foster *et al.*, (2012) reviewed the data to reevaluate who should be in charge of musculoskeletal issues patients' early diagnosis and treatment. The work was set in the context of how everyone and, more importantly, society as a whole is affected by pain in the musculoskeletal system. It occurs frequently in all communities. The first person to see for this condition is the general practitioner, followed by physiotherapists, chiropractors, or osteopaths. The study, according to the authors, provided advices in favor and against the chief approach for people with musculature agony led by general practitioners. But they found out that this model needs to be changed. It's time to put professional disagreements and hierarchical structures aside. Naturally, the patient experience, safety, clinical efficacy, and cost-effectiveness of any changes to care pathways may require careful evaluation.

Gore *et al.*, (2012) In clinical practice, people with "Chronic Low Back Pain (CLBP)" were looked at in terms of their comorbidities, treatment, use of healthcare resources, and medical outlays. In 2008, a comparison was made between the two groups' comorbidities, pain-related drug therapy, total health care services used, and total costs (pharmacy, outpatient, inpatient, and total). There were 101,294 people with and without CLBP, and 55% of them were women. Average age was 47.2, which is 11.6%. Patients with CLBP had a higher comorbidity load than controls. They were more likely to have musculoskeletal and neuropathic pain circumstances, as well as pain,

side effects like depression (13% vs. 6.1%), anxiety (8%), and sleep disorders (3.4%). Patients with CLBP who took opioids received significantly more pain-related pharmacotherapy (P=0.0001) (37.0% vs.14.8%; NSAIDs (26.2% vs.9.6%; P=0.0001), Tramadol (8.2% vs.1.2%; P=0.0001). Also, there was a statistically significant (P=0.0001) rise in the number of CLBP patients who used "additional" medications for conditions like insomnia, anxiety, and depression. 36.3% of CLBP got combination remedy. The costs of care for the CLBP cohort were much higher (P=0.0001), which shows that more resources were used. The CLBP group's projected direct medical costs were $8386 or $17,507, while the control group's were $3607 or $10,845; P=0.0001). They came to the conclusion that patients with CLBP were more burdened financially and had a greater number of comorbid conditions. This financial burden is caused by an increase in the use of medical resources and prescriptions for painkillers.

Islam *et al.*, (2012) conducted a study on pediatric physiotherapists' most common musculoskeletal conditions at work using subjective data. Thirty-five pediatric physiotherapists were selected as part of a straightforward random sample procedure. The framework of a mix of structured and semi-structured questionnaires that the researcher used was used to ask participants to express their opinions. The researcher discovered that 32 participants had WRMD after conducting an examination. There were 13 of them with low back pain (40.6%), 8 with neck and shoulder pain (25.0%), 2 with upper back and neck pain (6.20%), 5 with neck and back pain (15.60%), 1 with knee and ankle pain (3.10%), and 3 with mechanical pain (9.40%).The WRMD found that the youngest person was 23 and the oldest was 39.Additionally, there were participants between the ages of 20 and 25, 54.30 percent between the ages of 26 and 30, 17.10 percent between the ages of 31 and 40, and 2.90% between the ages of 36

and 40.18.8% of WRMD participants said they were stressed out while doing the same thing over and over again, 28.2% said they were working in a small space, 37.5 percent said they were working in fixated position for a long durations, 12.5% said they were awkwardly bending or twisting their necks, and 3.10 percent said they didn't get enough sleep. Therefore, the two risk factors that were most frequently reported were working in a small or uncomfortable space and maintaining a single posture for an extended period of time.

Sharan *et al.*, (2012) evaluated the musculoskeletal conditions and injuries experienced by physiotherapists, concentrating on individual, environmental, and psychosocial risk factors and suggesting preventive methods. The bulk of the 17 papers that were identified and evaluated that were pertinent focused on the frequency of injuries, musculoskeletal issues, or both. The investigation found that manual therapy, working while hurt, uncomfortable and posture (fixated), physical burden, transporting and lifting, treating more patients, and longer working years, were all major risk factors for physiotherapists. Some of the ways to stop this from happening were mentioned in these pieces of writing: workplace interventions, work allocation, adequate drill, continuous risk valuation and control. Additionally, they included workplace interventions, less manual therapy, appropriate exercise, education about reporting injuries, and new device development.

Ashfaq *et al.*, (2013) undertook a study to find out what factors are most likely to cause the musculoskeletal issues that physiotherapists face on the job. The study included 100 self-administered, semi-structured questionnaires from physiotherapists.56% of workplace musculoskeletal illnesses were prevalent,

according to their analysis. The low back (31.4 percent), neck (18.81 percent), and wrist/hand were most frequently affected. They discovered that manual therapy, managing a enormous number of patients, and working in ungainly positions were the primary risk factors. Changing their work environment, positioning themselves differently from the patient, taking breaks during sessions, and asking an assistant or family member for help were some of their coping strategies.

Chung *et al.*, (2013) conducted research to find out how common musculoskeletal problems at work are, what causes them, and how people deal with them. In their study, they found that 92.4% of workers have problems with their muscles and joints at work. These conditions were commoner in females than in males (P=0.028). The shoulders and low back (53.5 percent) were frequently affected. 90.4% of respondents cited treatment of multiple patients as the primary risk factor, and 89.8% cited a lack of rest. Changing the therapist's or patient's position during manual therapy was their coping strategy. They came to the conclusion that, in comparison to other nations, Korea has a higher rate of musculoskeletal illnesses brought on by work.

Coté *et al.*, (2013) published an article with the intention of highlighting the significance of the work done by the "Musculoskeletal Disorders Research Axis group of the Quebec Occupational Health and Safety Research Network" to improve comprehension of the onset and prevention of work-related MSDs (WMSD). Despite its focus on Quebecers, the organization's activities have a significant global impact, bringing together members of the MSD axis and Quebec-developed knowledge and expertise. The results of member contributions are important because they show how WMSD development is influenced by physical workload, organizational issues, and

psychological work-related factors. Members have also demonstrated how WMSD determinants interact with groups based on age, gender, sex, socioeconomic status, and ethnicity in various ways. Work is being done to learn more about the physiological responses that MSDs cause, which may lead to novel workplace rehabilitation procedures. The group focuses on how workplace interventions and prevention practices ought to be integrated into the design process. As a new part of a theoretical understanding of WMSDs, members have come up with both research-based tools for best practices at work and a unique conceptual model. The group also works to improve WMSD surveillance, use a variety of information sources, spread information about newly discovered health problems, and come up with new ways to assess risk in order to avert disability in the waged populace. Finally, the MSD axis group's research has implications for the organization of legal procedures, the improvement of MSD legal classification as occupational disorders, and the advancement of legal thought. However, there is still a lot to do. The group develops and supports new projects to accomplish this. In conclusion, the group is well-positioned to handle the intricacy of WMSDs because of the novel work's integration of information that advances basic, clinical, and population-based research.

Javed *et al.*, (2013). Researchers looked into how level of physical movement, sub-specialty, and “Body Mass Index” affect low back pain at work. A self-administered questionnaire that had already been tested and was well-structured was used to collect the data. 265 physical therapists participated in the study. 66.4% of people reported experiencing pain in the back due to their jobs, with women having a higher prevalence (42.6%). 69% of them reported experiencing pain in their lower back, as a result of their jobs within two years of starting their practice. Manual therapy was the most

common cause of such pain. They discovered that BMI and physical activity level were not associated with low back pain at work, whereas sub-specialty area was. They suggested ergonomic training and a strategy to avoid back pain.

Kebrit *et al.*, (2013). Musculoskeletal issues will affect everyone at some point in their lives. These are significant issues. These issues frequently arise at work, according to studies. WRMSDs have been experienced by nurses and construction workers, among others, who had been standing or sitting for a considerable amount of time. MSDs at work may be brought on by both personal and external factors. Examples of personal causes include obesity, drug and alcohol abuse, excessive workload, improper lifting and lowering techniques, prolonged sitting (particularly among computer users), and other personal factors. The most significant environmental factors (especially for office workers) are the use of inefficient equipment like working seats and tables and small work areas. Studies have shown that any one of the following can help prevent WRMSDs. maintaining a healthy physical appearance or posture;putting in their absolute best effort;being careful when moving things around;using the appropriate tools;and making their muscles and connective tissues stronger by exercising regularly and eating a healthy diet.

Nizami *et al.*, (2013). A survey with a convenient sample of non-probability participants was carried out to detect risks for pain in the low back among home-based physical therapists. They employed 200 physical therapists to visit Karachi patients in their homes. The information was gathered using a survey that was modeled after a Nordic survey. They discovered that 93% of physical therapists working from home had lately felt pain or discomfort at work. The incidence of lower back pain is 81.5

percent, making it the most frequent. There was a noticeable difference in whether or not they had work-related pain or discomfort depending on whether they were working in the department or as academics offering personal physical treatment. They came to the conclusion that physical therapists who do home-based therapy have more problems at work and are more likely to have LBP because of their jobs. Poor ergonomics, patients' lower bed heights at home, a heavier workload, and physical therapists' poor posture can all contribute to this.

Alperovitch-Najenson *et al.*, (2014) analyzed how often and how to avoid musculoskeletal problems at work, as well as the psychological and social aspects of how nurses and physical therapists (PTs) take care of patients in a rehab-center. A study was done with the help of questionnaires that asked about basic demographic information, how common musculoskeletal diseases were, how much work people had, and how happy they were with their jobs. Even after correcting for the perplexing demographic characteristics, the prevalence of lower back ache was considerably greater among physical therapy experts when 26 of them and 54 nurses, all of whom were female, were compared. Additionally, PTs performed more complete and partial manual transfers, bending, and walking aids than the nurses, and they were much happier with their jobs than nurses were. It's possible that the physical demands of their jobs are the primary reason why so many physical therapists suffer from lower back pain.

Bindu *et al.*, (2014) did a study on active physiotherapists to find out how much musculoskeletal distress they experience at work. The inquiry form was completed and submitted by only 28 of the 40 physiotherapists participated. A closed-ended survey

of two pages enabled in collecting the data. They found musculoskeletal discomfort at work in 20 (71.4%) physiotherapists, with women (55%) and men (45%) reporting it more frequently. The most frequently injured areas at work were the low back, neck, upper back, thorax, wrist, and hands. To lessen the musculoskeletal discomfort experienced by these physiotherapists as a result of their jobs, they suggested employing appropriate management strategies.

Lahoti *et al.*, (2014) conducted a study to find out how often doctors have problems with their musculoskeletal systems at work. Self-administered questionnaires were distributed to medical professionals working at two of Mangalore's largest hospitals. According to specialists in a variety of specialties, MSDs were most prevalent in the lower back (25 percent), neck (20.21%), and knees (14.36 percent). None of the associations between MSDs and age, gender, or work experience were statistically significant, with the exception of the physical undertaking (P=0.042). MSDs and lower back diseases were deemed to be the most prevalent by 58.5 percent of doctors.

McPhail *et al.*, (2014) steered a cross-sectional investigation into the health-related quality of life and physical movement levels of physiotherapists employed in clinical settings in an "Australian Healthcare System." Their survey was meant to test the idea that working physiotherapists would already be physically active and have a better quality of life. For the purpose of preventing musculoskeletal disorders in physically active, healthy physiotherapists, role-specific conditioning methods rather than general physical activity conditioning strategies should be developed and tested, according to this finding. 44 physiotherapists from three outpatient clinics and three inpatient units (63.7%) responded to the study. There is a significant attrition rate, as

evidenced by the fact that the most physiotherapists in our sample were below the age of 30 (n = 25, 56.8%). Majority of respondents (n = 40, or 90.9%) exercised more than the minimal quantity advised. In general, respondents worked out more intensely (180 minutes) and walked more frequently (135 minutes) than they worked out moderately (median = 35 minutes) each week. The majority of participants (79.5%) reported being in great health, and 37 (84.1%) said that pain or discomfort had no bearing on their quality of life in terms of their health. Results suggest that in this physically active population, role- or task-specific conditioning may be more beneficial than overall physical conditioning for the avoidance of musculoskeletal problems among practicing physiotherapists. Physiotherapists who are less physically active or in better health than those who can bear the physical demands of clinical practice may naturally atrophy.

Rivera *et al.*, (2014) did a study to find out how common musculoskeletal diseases caused by work are. There were 28 physical therapists involved in their investigation. The most frequently affected extents of the body were back and the upper limbs. They discovered that gender, the number of coworkers, years of employment, “body mass index”, category 2 and 4 postures, and years of employment were all associated with workplace musculoskeletal diseases in the previous year.

Yasobant *et al.*, (2014) undertook the study to find out how five different health care professionals were affected by musculoskeletal diseases that were caused by their jobs. The study included dental professionals, lab technicians, nurses, doctors, and physiotherapists. They discovered that nurses had the highest risk for musculoskeletal issues related to their jobs, while doctors had the lowest risk. A significant number of

healthcare professionals reported working-related musculoskeletal conditions. They reported that the body part that was impacted the most frequently was the lower back. Risk factors included working in tight or uncomfortable spaces, handling too many patients or samples every day, and sitting a lot.

Atia *et al.*, (2015) took a study to understand how pediatric physical therapists were affected by managing occupation-related musculoskeletal injuries. 150 pediatric physical therapy experts were given a survey to complete on their own. The study gathered information on demographics as well as the prevalence and consequences of musculoskeletal problems over the previous year. The baseline survey had a response rate of 70.66%. 65% replied to the baseline as well as the follow-up survey. Eighty-nine therapists (84.9 percent) had WRMDs, and they said that it had a big effect on their jobs and future career goals. Physical therapists who work with kids often see problems with the bones, muscles, and joints. This might have an effect on the goals they have for their jobs. To reduce the likelihood of injury, plans must be developed.

Balakrishnan *et al.*, (2015) conducted a survey to ascertain the frequency of musculoskeletal issues caused by work among physiotherapists. There are 100 physiotherapists taking part in the survey. Over the course of a year, 70% of physiotherapists had musculoskeletal disorders that were relevant to their jobs. The neck and low back were the most frequently affected areas. Lifting or transporting patients, as well as continuing to work in the fixated position, were the commonest risks for work-related musculoskeletal diseases. Likelihood of having another accident may be reduced by altering one's work habits.

Bevan *et al.*, (2015) published a study that looked at how much money musculoskeletal diseases cost the European workforce. MSD-related productivity losses could amount to 2% of GDP (GDP) for EU citizens of working age, according to estimates. According to "European Labour Force Survey", which was ordered by DG Employment and Social Affairs in Brussels, musculoskeletal diseases made up 53% of all work-related illnesses in the EU-15. The outcome is long-term disability and the loss of an important workday. Musculoskeletal conditions brought on by work were the cause of 50% of absences that lasted longer than three days, 49% of absences that lasted two weeks or more, and approximately 60% of all cases of permanent impairment that were recorded. A total of 240 billion euros, or approximately 2% of GDP, were thought to be spent on musculature disorders. Additionally, it was claimed that between 40 and 50 percent of health issues were caused by work-related musculoskeletal issues. Musculoskeletal issues affect everyone differently. Musculoskeletal diseases can make it hard to work and make you tired. Patients stated that their quality of life had severely worsened in 67% of cases, that 49% of them had reduced capacity to work, and that 25% of adults sought medical assistance for their condition. Inadequate recuperation time, heavy lifting, forceful manual labor, segmental or whole-body vibrations, non-neutral body postures, and musculoskeletal diseases have all been recognized as risk factors (dynamic or static). 33% of European workers spent their shifts in uncomfortable and tiresome positions, 23% lifted or carried heavy objects, 46% endured repetitive hand or arm motions, and 17% were exposed to vibrations from hand tools or machinery. 31% of these workers also utilized computers. Additionally, they noted professions with a high risk of harm, including skilled tradesmen, secretaries, machine operators, packers, and secretaries. They

encouraged employers to play a substantial role in early referral, flexibility in assisting vocational rehabilitation, and graduates returning to work as a regular element of the way that employees with musculoskeletal ailments and other health conditions are accommodated.

Ganiyu *et al.*, (2015) determined the preponderance of work-related musculoskeletal conditions and the relation between these issues and ergonomics' risk among healthcare employees. They had employed physiotherapists, dentists, nurses, and doctors for their research. For the purpose of the analysis, 151 of the completed surveys were utilized. Compared to doctors (25.3%) and dentists (45.4%), nurses (84.5%) and physiotherapists (83.3%) had the uppermost preponderance of musculature disorders. Low back ache accounted for 71.6 percent of all complaints, followed by shoulder pain (46.8%) and neck pain (42.2%). The upper back and elbows were less affected. They discovered a strong connection between the musculoskeletal illnesses brought on by work and the ergonomic risks that were reported. They came to the conclusion that physiotherapists were more susceptible to musculoskeletal conditions as a result of their practice than other healthcare practitioners.

Iqbal *et al.*, (2015) did an online survey of 100 physical therapy experts. 75% of people who took part in an online poll in their study did so. Musculoskeletal conditions related to their jobs were found in 92% of the subjects. When they first started out, they found out that physical therapists were in pain. This had such a big effect on their lives that many of them even changed careers. Pain was influenced by physical therapists' specialization, gender, furniture selection, and patient contact length

(P<0.05). They emphasized the role that ergonomics and patient care play in the onset of workplace pain symptoms.

Islam *et al.*, (2015) did a study to determine how much pain occupational therapists and physiotherapists say they get while working in physical rehabilitation centers. This study included physiotherapy and occupational therapy experts, including diploma and graduate-level holders as well as assistants to the physiotherapists and occupational therapists. 101 physiotherapy and occupational therapy employees participated. The 101 participants had an age of (mean 27.8 ± SD 4.5) years, and 62% had under five years of experience. 95% of respondents stated that they felt bad about their jobs. The majority of people (84) expressed discomfort in their lower back, ensued by pain in their upper back (71) and neck (66). Neck pain (p=0.01) and ankle/foot pain (p=0.05) were found to be significantly correlated with age and gender. They concluded that job-related and physical therapy experts may experience pain as a result of work as therapists, possibly as a result of using their bodies improperly. It might be possible to set up a way to measure the level of practice when dealing with patients to make it easier to take corrective steps. For practice to be effective, incentives need to be thought about.

Jenkins *et al.*, (2015) conducted research to find out how often and what causes work-related thumb problems (WRTP) in physiotherapists who use manual therapy to treat musculoskeletal problems? Two online surveys were used to get the information. There were 395 people in the study as a whole. 65.3% of physiotherapists were affected by WRTP at some point in their careers. People who answered the survey and said they had thumb problems were linked to WRTP if they had grade II–IV unilateral

and central posterior–anterior pressures on the spine or grade II–IV transverse glides on the spine. Regression analysis showed that there was a significant link between WRTP, IP joint hyperextension (>30°), and cervical therapy for up to six patients per day for all 395 respondents. They came to the conclusion that physiotherapists with WRTP are more inclined to treat musculoskeletal diseases with manual therapy.

Macdonald *et al.*, (2015). Risks at work increase workers' likelihood of getting musculoskeletal disorders greatly and exacerbate preexisting conditions (MSDs). The physical demands of the job are known to affect MSD risk, but there is enough data to conclude that workplace-related psychological risks might also have serious repercussions. Some risks can also interact with one another or worsen one another. The existing methods for risk management in the workplace do not take this evidence into consideration. The traditional occupational health and safety (OHS) risk management paradigm, risk assessment tools that narrowly concentrate on subsets of primarily physical hazards but still produce outputs in the form of MSD risk indicators, and regulatory and guidance documents that specifically target MSDs all reflect the majority of this belief. To improve workplace MSD risk management, it is said that frameworks for systems-based management and more in-depth methods for risk assessment and control are required. These protocols must promote worker involvement and address risk from all kinds of hazards collectively rather than alone. To achieve these demands, new MSD risk management solutions are necessary. Additionally, it is probably important to reorganize workplace responsibilities for MSD risk management in order to properly execute such changes. Line managers and supervisors, as well as OHS employees and workers themselves, need to take a more active involvement in routine risk assessment and control procedures since they

frequently play significant roles in the formation of hazards, both physical and psychosocial. The most recent information on how MSDs are acquired is not taken into consideration by workplace risk management techniques, despite the fact that MSDs represent one of our largest issues with occupational health and safety. Because psychosocial hazards are not well understood or regulated, the traditional risk management paradigm prefers a more comprehensive tactic to dealing the cumulative impact of all pertinent hazards rather than concentrating too narrowly on risk from individual hazards. To achieve these improvements, new MSD risk management systems and improved line manager and OHS staff role integration are needed.

Maheshwari *et al.*, (2015) conducted the study with the knowledge that, given the nature of their profession, physiotherapists may suffer musculoskeletal conditions connected to their jobs. The prevalence of work-related injuries continues to be relatively high despite these professionals' vast knowledge of musculoskeletal injuries and related preventative methods. The study included 100 physiotherapists; There were 78 women and 22 men among them. Tricity was used to select the experts, whose ages ranged from 21 to 40. Personal traits, occupational risk factors, and coping mechanisms were all associated with the percentage of self-reported musculoskeletal complaints. The majority of physiotherapists, they discovered, occasionally dealt with WRMSDs. Physiotherapists in Tricity had a significant (91 percent) prevalence of WRMSDs. Work schedule, lifting or moving dependent patients, and working through an illness or injury were the most common risk factors, according to the study. In the study, physiotherapists' low back and neck regions were most often afflicted (72.5%), followed by their upper backs (28.6%), shoulders (20.9%), wrists and hands (17.6%), knees (12.1%), ankles and feet (12.1%), and hips (7.70%). They came to the

conclusion that the physiotherapy profession faces a serious health risk from work-related musculoskeletal conditions. 91% of Tricity's physiotherapists reported experiencing a musculoskeletal condition that was connected to their line of work. As a result, their research supports the hypothesis. The most often damaged locations were discovered to be the lower back and neck (72.5%), followed by the upper back and shoulder.

Yazdani *et al.*, (2015). "Occupational Health and Safety Management Systems (OHSMS)" researchers did study to compile the most recent knowledge on techniques for preventing musculoskeletal disorders (MSD) (OHSMS). 718 possibly pertinent papers were found after scanning commercial, engineering, and health and safety databases, and their application was assessed. 21 papers that satisfied the criteria for selection were subjected to thematic analysis. In the literature, MSD risk assessment and prevention integration into management systems received little attention. Because of a lack of understanding, MSD prevention may become isolated, making it difficult to avoid these disorders at the organizational level. The review's findings confirm the need for additional research to evaluate the strategy's efficacy and incorporate MSD prevention into management systems.

Anderson *et al.*, (2016) have out a thorough assessment of the literature to identify the preponderance and risks for WMSD in AHP. The articles weren't very good. WMSD prevalence rates were found to range from 28% to 96% over the course of a single year, according to several outcome indicators. The bodily part most usually impacted was the lower back. Lack of prior expertise in the position and industry was one of the key elements that led to the creation of WMSD. Future research should primarily

concentrate on WMSD development in AHP and should include excellent prospective studies.

Balakrishnan *et al.*, (2016) looked into how many physiotherapists in Sabah had musculoskeletal issues related to their jobs. The study investigated the factors at play that contributed to WRMDs among Sabah physiotherapists. In numerous regions of Sabah, physiotherapists were given a survey to complete. One hundred questionnaires were sent to various hospitals and rehabilitation centers around Sabah. Injuries have mostly affected the low back in 20 respondents, with odds ratios of 0.785714, or 44%, and 0.25, or 20%. Physiotherapists had a 12-month prevalence of WRMDs of 70 respondents, with an odds ratio of 2.3= 70%. From 20 respondents, injuries have mostly befallen in the low back with an odds ratio of 0.78, or 44%, followed by the neck with an odds ratio of 0.25, or 20%. Working in the same position for an extended period of time had an odds ratio of 4.8, or 82.9 percent, among the 58 respondents, and lifting or transferring dependents had an odds ratio of 4.3, or 81.4 percent, among the 57 respondents. They concluded that physiotherapists in Sabah were more likely to suffer from WRMDs because of their work environment. The majority of respondents stated that modifying work procedures was required to lessen the likelihood of additional accidents.

Happy *et al.*, (2016) conducted research to identify the most frequently encountered musculoskeletal conditions related to employment among CRP neuro physiotherapists. Sixty neuro physiotherapists were selected using a straightforward random sample procedure. Based on a structured question that the researcher used, participants were asked to share their thoughts. The data were entered into Excel and the SPSS 20.0

software with a numerical code. Descriptive statistics were used to determine the study's outcome. After conducting an analysis, the researcher discovered that 57 of the participants had a musculoskeletal disorder that was related to their job. 43 (71%) of them grieved from low back pain, 26 (43%) from upper back pain, 21 (35%) from neck pain, 12 (20%) from knee pain, 10 (16.7%) from wrist pain, and 9 (15%) from ankle pain. Work-related musculoskeletal disorders typically affect people between the ages of 22 and 38. In the WRMD, 41.70 percent of participants were in stressful positions, performing the same task repeatedly, 23.30 percent were working in an ungainly and confined position, 60.00 percent were working with the same posture for long spans, 30.00 percent were bending or twisting their back or neck in a gawky way, and 70.00 percent of participants did not get enough rest throughout the day. As a result, the two main risk factors were excessive daytime rest breaks and repetitive upper-limb movement. They concluded that the study aids physiotherapists from the CRP neurology unit in comprehending workplace-related illnesses. Important terms include work-related musculoskeletal disorder and musculoskeletal disorder.

Liao *et al.*, (2016). An age- and sex-corresponding cohort of 7448 people with or without new-onset spine issues included 1682 physiotherapists, 3724 pharmacists, and 1682 occupational therapists (OTs). The study's goal was to learn more about the connections between people with these disorders and health care providers in the fields of pharmacy, working remedy, and physical healing. Between these three groups, the estimated hazard ratios for the emergence of new-onset spine ailments were calculated. Physiotherapists' overall rate of new-onset SRMD is 32.12. SRMD can be produced in an average of 1.94 years after obtaining a recognized license. Physiotherapists have the lowest percentage of patients without SRMD according to the log-rank test

(P=0.0001). Physiotherapists are more likely than pharmacists and occupational therapists to develop new-onset SRMD, according to the Cox model (P=0.0001). Compared to OTs and pharmacists, physiotherapists who work in clinics have a 2.40-fold higher risk of SRMD (P=0.0001). They came to the conclusion that clinic-based physiotherapists may be more likely to develop new-onset SRMD. We advise physiotherapists to focus more on this subject in order to stop the onset of spine problems.

Milhem *et al.*, (2016). Physiotherapists' prevalence, risk factors, and methods for preventing work-related musculoskeletal diseases were thoroughly examined. The lifetime commonness of WMSDs among PTs was estimated to be amid 55 and 91.3 percent, while the 12-month prevalence was between 40 and 91.3 percent. A lifetime prevalence estimate for the neck, upper back, and shoulders ranged from 26 to 79.6%, whereas a 12-month prevalence estimate for the lower back ranged from 22 to 73.1%. Lifting, moving objects, repeating movements, holding awkward or static positions, carrying a physical load, seeing a lot of clients, and working while injured were the primary risk factors for “Work-Related Low Back Pain (LBP).” Physical therapists who are female, younger, and employed in rehabilitation settings report having low back pain more frequently, suggesting that age and gender are associated to the condition. LBP at work may cause physical therapists to seek therapy, modify their work and leisure schedules, employ assistance and equipment, or transfer their speciality, either within the business or by abandoning it. Workplace accidents cannot be prevented even with the proper body mechanics knowledge and abilities. To lower their WMSDs without lowering the standard of care, PTs should utilize mechanical help used for patient transfers and create creative treatment regimens.

Muaidi *et al.*, (2016) undertook a survey to find out the commonness, reasons for, and bearing of WRMDs in physical therapy experts. 69% participants returned the completed survey (N=690). The correlation between WRMDs and weekly working hours was substantial (P=0.005). The neck (26.6%) and lower back (46.5%) were the two most commonly stated discomfort locations. WRMDs were suggestively correlated with changes in work habits (P=0.036), but "body mass index" was not (P=0.297). The prevalence of WRMDs among physical therapists was 47.7%, with a statistically substantial difference (P=0.023) between full-time and part-time practice. The most common aids were splints (18%) and adjustable beds/plinths (20%). They came to the conclusion that, with a prevalence of 47.7%, physical therapists are particularly prone to WRMDs. Both the environment and the workplace have an impact on WRMDs. 46.5 percent of WRMDs present as lower back pain as their primary symptom. To prevent WRMDs, it is critical to avoid harmful work practices, promote ergonomic awareness, and put safety measures in place.

Prerana *et al.*, (2016) performed a study on physiotherapists in India to look into the prevalence, risks, and managing mechanisms of work-related musculoskeletal diseases. 314 physiotherapists participated. With an 86% response rate, 271 surveys were returned in total. Musculoskeletal problems at work were shown to be the cause of 62.73 percent of cases. The neck (41.8%), shoulder (26.5%), and lower back (65.3%) were the three most affected body parts. The most frequent risk factors, according to therapists' replies to this study, were functional in stationary for prolonged periods, bending and twisting in obdurate positions, and seeing a lot of patients in one day. Many different coping mechanisms were employed by respondents, including shifting one's and the patient's positions (54.1%), modifying the treatment surface's

height (47.1%), and choosing coping mechanisms that did not aggravate or induce discomfort (41.8%). They came to the conclusion that physiotherapists would greatly benefit from modifying risk factors to avert or lessen the incidence of work-related musculoskeletal diseases.

Truszczyńska *et al.*, (2016) did a study to ascertain how frequently the musculoskeletal system is overloaded and how much labor is expected of physiotherapists. There were a total of 108 young physiotherapists enrolled, including 69 women and 39 men amongst the ages of 25 and 35. The study employed a Quick Exposure Check and an anonymous survey. The three most frequent musculoskeletal complaints were low back pain (70 percent), wrist and finger discomfort (70 percent), and neck pain (60 percent), according to physiotherapists (55.6 percent). It was shown that there was a positive statistical link between shoulder soreness and field time. In all of the body locations that were examined, there was a direct affiliation between the hours worked each week and the preponderance of discomfort. Stress levels correlated negatively with professional experience. Musculoskeletal overload was a specific risk for physiotherapists who used manual therapy and exercise physiotherapy. They concluded that increasing physiotherapists' ergonomic knowledge could lessen the incidence of musculoskeletal overload.

Vieira *et al.*, (2016). A thorough examination of the frequency and traits of occupational musculoskeletal disorders among the physical therapy experts was conducted. Research that satisfied the criteria were included in their analysis of 32 studies. 90% of physiotherapists experienced musculoskeletal issues at some point in their careers, and 50% of those experiences occurred in the first five practicing years.

The area of the body that was most frequently impacted was the low back. Women who worked as physiotherapists or in hospitals were more likely to suffer from musculoskeletal diseases. Gender, professional specialization, and job responsibilities were risk variables. Manual treatment chores, patient lifting, and patient transfers have all been connected to the growth of occupational musculoskeletal disorders.

Vieira *et al.*, (2016) did study to scrutinize the preponderance and features of "Musculoskeletal Diseases (MSDs)" amid physical therapists based on their environment and area of specialization (PTs). 121 physical therapists gave them thorough responses; 96% of them reported having MSD symptoms in the previous year, with 64% of those symptoms impacting at least three body areas. Sixty-one percent of the body's symptoms were located in the neck and low back (66 percent of the body). The often-affected body area by PTs with specializations in acute care, geriatrics, and pediatrics was the low back, while the most frequently affected body part by PTs with specialties in orthopedics and neurology was the neck. The neck and back lower portion were the most frequently impacted body parts in PTs working in teaching and home-based therapy settings, while the neck was the most frequently influenced body part in PTs working in hospitals, outpatient clinics, and skilled nursing institutions. They came to the conclusion that MSDs, which most typically affect the neck and low back, are common among physical therapists. The frequency of the affected body parts varied depending on the practice site and the niche.

Abaraogu *et al.*, (2017) conducted a study among physiotherapists practising in southeast Nigeria on JSDs and their affiliation to WMSDs. 126 physical therapists responded in total. The majority of the occupational dimensions examined revealed

high levels of stress: 82.1 percent and 22.8 percent, respectively, of physiotherapists in the most recent year and seven days reported experiencing WMSDs in at least one body area. In both cases, the lower back was the most often impacted area. WMSDs were not connected to any specific domain. According to the authors, more than 80% of physiotherapists are affected by WMSDs. Despite the demanding physical requirements of their jobs, physiotherapists have a supportive social network and have a lot of working autonomy. Initiatives to avoid WMSD should concentrate on risk factors associated with the physical requirement of the occupation.

Alghadir *et al.*, (2017) did a study to determine how common was the low back pain in physical therapists and what causes it? 88 physical therapists participated in the self-administered online survey, and 35.6% of them declared having pain at lower back portion at that time. 89.65 percent of individuals said they experienced low back pain after starting their practise. To address these concerns, they recommended employing preventative methods like ergonomics, stress management, and fostering teamwork.

Çınar-Medeni *et al.*, (2017) did a study to see if nurses, physiotherapists, dentists, and dieticians had pain in their low back (LBP) and to show the connection between LBP, functional posture, and other risks. The study evaluated the functional postures of these professionals. There were enrolled 27 physiotherapists, 34 nurses, 30 dentists, and 16 dietitians. The impairment ratings in LBP cases were assessed using the "Quebec Back Pain Disability Scale." In contrast to the 40.63 percent of those who selected harmful jobs without LBP, 57.2% of those with LBP sat in dangerous positions at work. LBP impacted 79 percent of medical practitioners. People with and without LBP were observed to have distinct distributions in their trunks and heads (p 0.05). Compared to

other groups, dental surgeons and nursing staff had a greater commonness of LBP (p 0.05). Professional LBP evaluations in the Quebec research did not differ by profession (p>0.05). The Quebec scores and a variety of traits in different occupational groups were found to be correlated. Adjusting one's working posture becomes crucial because one of the factors that contributes to LBP is the head-neck and trunk postures, both of which are movable.

Mohamed *et al.*, (2017) physical therapists (P.T.s) working in CAIRO-teaching EGYPT's hospitals were the subjects of a study to ascertain the overall, 12-month, and point preponderance of work-related pain in the lower back portion (WRLBP), as well as workplace or individual determinants and WRLBP characteristics. A special questionnaire was supplied to 84 P.T.s who currently work in Cairo, Egypt's teaching hospitals. Among the 84 percent P.Ts, 77 percent (or 91.6 percent) had finished the survey. The most prevalent physical therapy specialties with WRLBP were cardio-pulmonary (66.6 percent), paediatric (57.1 percent), and orthopaedic. The lifetime prevalence of WRLBP was 54.5 percent (95 percent confidence interval (CI): 43 percent -65 percent), the twelve-month prevalence was 44.1 percent (95 CI: 33 percent -55 percent), the point prevalence was 38.9 percent (95 CI: 28 percent -49 percent), and (54.4 percent). On the numerical pain scale, pain was frequently moderate, ranging from 3 to 4 points. They arrived to the conclusion that all three prevalence levels of work-related low back pain were present among Egyptian P.T.s, making them a high-risk population in Cairo's teaching hospitals who require immediate medical attention.

Rahman *et al.*, (2017) undertook research to recognize the preponderance and risks of occupationally-related musculoskeletal diseases. Data were gathered by using the

Standardized Nordic Questionnaire (SNQ). Sixty-eight percent of the 160 participants in the study, or participants, admitted to having musculoskeletal pain or discomfort in the year prior. The most frequently affected body parts for 42.2 percent of participants were the neck (17.4%), shoulders (13.8%), lower back (11.9%), hips (7.3%), and hands/fingers (4.6%). 29.8% of reported cases of musculoskeletal issues at work were caused by holding the same position for an extended period, 29.1% by treating a huge number of clients per day, 15.9% by doing work in uncomfortable conditions, and 11.6 p The sex and occupation of healthcare workers were substantially correlated with occupation-related musculoskeletal illnesses (P 0.05). They recommended beginning training programmes about coping mechanisms and prevention.

Singh *et al.*, (2017). In order to determine the factors for a work-related injury, the occurrence of "Work-Related Musculoskeletal Disorders" among occupational therapists and physical therapists in India, and the propensity of these professionals to develop these conditions, a study was directed. In order to produce surveys that were self-administered, Holder et al. (1999)—who had previously used two published instruments with physical therapists—as well as Campo et al. (2008)—were both employed. The 19 survey questions focused on demographic data, specific musculoskeletal conditions, and physiotherapy methods that may exacerbate musculoskeletal ailments brought on by the employment. According to the study, occupational therapists and physical therapists have WMSDs and WRI far more frequently than the general population. While WRIs were reported by 60.78 percent of respondents, the incidence of WMSD was found to be 35.19 percent. The areas of the neck and lower back that are most prone to injury are the subject of this study's findings.

Anyfantis *et al.*, (2018) examined the causes, specific treatments, and advised techniques for the musculoskeletal problems that physiotherapists experience. The information was gathered using a questionnaire. 252 physiotherapists were engaged in the study. In their study, 89 percent of participants had musculoskeletal conditions related to their work, and within the first five years of employment, 32.2% of people sustained injuries. Physical therapy sessions helped to solve these issues. The neck, shoulders, upper back, and lower back were shown to be the areas most significantly affected. They discovered that reducing musculoskeletal problems benefited from a properly defined workplace safety and health management system.

Bae *et al.*, (2018). 600 physical therapists (PTs) were given questionnaires as part of a study to examine the bond between presenteeism and "work-related musculoskeletal disorders (WMSDs)". On the questionnaire, respondents were asked to self-report their personal and professional traits, as well as how often they were present at work and absent from it. The effect of non-absenteeism and other variables on demographic and job-related traits was examined using stepwise regression analysis. 399 (81.4%) of the 490 PTs who replied claimed they had at least one WMSD. Despite the low frequency of absences, presenteeism ratings show that it was more common than absenteeism. Regression analyses showed that, presenteeism cases showed the highest prevalence of WMSDs. This study demonstrates that PTs in Korea have a high rate of WMSDs, that WMSDs and presenteeism are related, and that PTs have a high presenteeism rate but a low absenteeism rate.

Epstein *et al.*, (2018) undertook a study to determine how frequently physiotherapists who work in clinical and educational settings have musculoskeletal issues as a result

of their work. There were 210 physiotherapists in total. The neck, lower back, upper back, and knee were often affected body parts, according to clinical and teaching physiotherapists. The left knee took the brunt of the blow more so than the right. They found that musculoskeletal problems at work were significantly more common in clinical and teaching physiotherapists.

Malik *et al.*, (2018). Musculoskeletal disease is the chief cause of debility and pain globally, particularly in developed nations like the United States. In addition to the severe personal suffering they cause, many illnesses are notorious for their spiralling financial costs. $874 billion is the anticipated annual cost alone for the United States. Patients with musculoskeletal illnesses have access to a wide range of treatment options, most of which result in unfavorable outcomes despite these expenditures. Our knowledge of the prevalent symptoms and their dynamic nature is limited and inconsistent, which is just one of many things that lead to poor care. the medical care provided by a diverse set of clinicians who practise a variety of procedures. Unorganized triage is the process of selecting a physician, a mode of care, and a course of treatment at random that is subject to many outside circumstances. Treatments that ignore the underlying pathological processes that are advancing and the cause of the damage to the specific musculoskeletal systems lead to chronic pain and disability. Due to a general lack of preventative treatment, many illnesses are more common than they should be, especially in specific sectors and among those who live high-risk lifestyles. This page describes initiatives for waste containment and improvement as well as improved information, early disease detection, timely application of disease-modifying medications, streamlining present care, and all of these. These discoveries

may reduce the suffering and impotence endured by these patients, enhance the general standard of treatment they receive, and result in significant financial savings.

Rahimi *et al.*, (2018). 319 of the 333 online surveys that were sent and used for data analysis were filled out in order to conduct research on the preponderance of musculoskeletal diseases among Iranian therapists. The main outcome measure was the Nordic Questionnaire in Persian. Nine body parts were identified as experiencing pain or discomfort as a result of their jobs using this questionnaire: the upper back, lumbar, thighs, knee, and ankle, as well as the neck, shoulder, elbow, and wrists. According to the report, 94 percent of Iranian physiotherapists have musculoskeletal problems. The most often affected locations were the lumbar region (65%) the neck (57.4%), the shoulder (50.2%), the upper back (49%) and the knee (45.5%). The least common diseases were those that affected the elbow (21.6%) and the ankle (19.7%%). They concluded that "work-related musculoskeletal disorders" were prevalent among Iranian physiotherapists, particularly in the lumbar, neck, shoulder, and upper back regions.

Salah *et al.*, (2018) did a study to find out how common MSDs are among physiotherapists and to seek for early warning indicators. 30 physiotherapists participated in this survey. The participants' ages ranged from 39.4 to 8.7 on average. For the H/F, the sex ratio was 0.57. The average number of years spent in the field was 10.9 7.11 years. The lumbar spine (73.3%), cervical spine (30%), shoulder (40%) elbow and wrist (23.3%), hand (13.3%), and lower limb (13.3%) all had MSDs (13.3 percent). The respondents rated themselves good marks for exposure to MSD and a medium level for knowledge of MSD. Younger physiotherapists under more stress

experienced MSDs two years earlier (P<0.05). But in the sample that was looked at, there were no early indicators of MSD start. Age (r = 0.538, P=0.002), period of specialized practise (r=0.889, P=0.001), and degree of stress experienced by the physiotherapist were all associated with MSDs. The risk that the physiotherapist will encounter MSDs earlier in his career appeared to increase at this level (r=-0.397, P=0.03). They came to the conclusion that, despite its challenges, MSD prevention offers important benefits. Initial training for physiotherapists must include lessons on industrial ergonomics, stress management, occupational dangers, adaption techniques, and other subjects.

Stock *et al.*, (2018) undertook a study to assess whether job-related musculoskeletal illnesses can be prevented or reduced by interventions that concentrate on work organisation or the psychosocial work environment rather than routine duties (WMSD). They looked at studies that assessed the effect of organisational or psychosocial work interventions on the frequency, severity, or absence from work due to musculoskeletal pain or disorders among non-sick workers. Rehabilitation, individual behavioural therapy, and studies with an attrition rate of more than 50% were also disqualified. They used the GRADE method - "Grading of Recommendations Assessment, Development, and Evaluation" to compare high- and low-quality studies and gather the data. The results' interpretation was strengthened by an evaluation of significant workplace intervention components. 28 out of the 884 papers that were found met the requirements for inclusion, leading to two high-quality studies, ten medium-quality studies, and sixteen low-quality studies. According to some data, extra breaks rather than routine breaks can lessen the severity of specific body parts' symptoms. The evidence quality for other therapies was low to very low

due to factors such high attrition rates, co-interventions, insensitive indicators, and research design-related bias risks. During implementation, the majority of programmes missed crucial intervention elements like work activity analysis and ergonomist supervision, although it has not yet been proven that these elements affect an intervention's success or ineffectiveness. They proposed that emphasising work-rest cycles could reduce WMSD.

Yazdani *et al.*, (2018) determined the key informants' opinions on the incorporation of MSD deterrence programmes into administration systems as a means of resolving problems with separate or isolated programmes. On this subject, interviews were conducted with seven health and safety (H&S) consultants, five H&S managers, five researchers, three legislators, and three labour representatives. The data from the key informant discussions were coded and considered using a theme analysis method. Participants commonly mentioned that a lack of cooperation between management system frameworks and MSD preventive strategies can lead to insufficient attention and subpar prevention policies. It was strongly advised that management systems include MSD prevention. It was suggested that “Failure Mode Effects Analysis,” “Job Safety Analysis”, and “Kamishibai and Ishakawa's (for Lean) Failure Mode Effects Analysis”, be used as decision-making tools and include the identification and assessment of MSD dangers. This study offers professional insight into the difficulties caused by MSD risk factors, as well as answers to current MSD preventive efforts and practical tools that can be used.

AE *et al.*, (2019a). 835 physical therapists participated in survey to find out the affiliation between work-experience and “Work-Related Musculoskeletal Disorders”.

They were divided into four groups, with ages ranging from 21 to 51 and a mean age standard deviation of 28.57±5.31 years. Answers to a modified Nordic questionnaire were requested from participants. A total of 83.5 percent of the 1,000 physical therapists who received the survey responded. Within a 95 percent confidence interval of 96.32-98.44 percent, the study groups had a 12-month incidence of back complaints related to employment of 97.6 percent. With a 95 percent confidence interval (CI) of 87.85-91.69 percent for low back pain, the lifetime prevalence of upper back pain was estimated to be 27.18 percent. Back problems and labour duration had a very substantial connection (p=0.0001). Low back pain affected 95.74 percent of physiotherapists with 7 to 10 years of expertise during the course of their lifetimes. Back issues were reported by physiotherapists who worked between 4-6 and 7-10 hours a week at a rate of 100% annually. They came to the conclusion that Egyptian physiotherapists frequently experienced back discomfort brought on by their jobs. Physiotherapists who have worked in the field for more than a year are more vulnerable to back problems. To lessen the likelihood of damage, work-related modifications and preventative actions should be taken into account.

AE *et al.*, (2019b) researched the association between MSDs and the work-related postures of physical therapists at general hospitals in Cairo, Egypt. Physical therapists' musculoskeletal conditions were surveyed using the Nordic Musculoskeletal Questionnaire (NMQ), and 130 PTs' repetitive work postures were evaluated, analysed, and categorised using the "Ovako Working Posture Assessment System (OWAS)." WinOWAS software was to process the OWAS technique, which called for 16 different work postures. Excel and SPSS were used to statistically analyse the collected data. According to the NMQ, 72% of physical therapists in the preceding

year reported experiencing MSDs in at least one of the nine recognised body locations. Shoulder pain (58%) and neck and lower back pain (65%) were the most seen maladies (75 percent). Standing for extended periods of time revealed a highly significant connection (r = 0.84) and a strong correlation (r = 0.79) with lower limb pain. According to OWAS data, eight postures (59%) were found in category 1 with 77 frequencies, seven postures (35%) in category 2 with 46 frequencies, and one position (5%), with seven frequencies, in category 3. They came to the conclusion that the most common types of difficulty were lower back, neck, and shoulder pain. Significant correlations between MSDs in the neck, upper back, and upper limbs and OWAS work posture 4222 were found (category 3). The neck, upper limbs, and lower back were substantially correlated with work postures 2222 and 2221 (category 2).

Alnaser *et al.*, (2019) to ascertain the preponderance and risks of WMSDs among Kuwaiti PTs, a 12-month study was done. The outcomes were also contrasted between different countries and medical specialties. This study employed a descriptive cross-sectional design. At Kuwait's public hospitals and educational institutions, PT departments were given a self-administered questionnaire. 312 completed questionnaires with a response rate of 69.3 percent were given back. They revealed that 149 (or 48 percent) of the PT had WMSDs. The most often damaged body regions were lower back injuries and muscle spasms. The most commonly associated risk factors for injuries were manual therapy methods and patient transfers. They came to the conclusion that PTs with WMSDs were quite prevalent in Kuwait, which was consistent with studies on PTs with WMSDs working in diverse nations. Work-related stress disorders (WMSDs) were widespread and predominantly attributed to workers' performance in industrialised, emerging, and underdeveloped countries. The best ways

to prevent WMSDs are to educate physical therapists on ergonomic and biomechanical principles and to give them hands-on patient handling training.

Khairy *et al.*, (2019) did study to ascertain frequency, traits, causes, and treatment options for professional musculoskeletal problems in Egyptian physiotherapists. The poll was self-administered, and 82.6% of physiotherapists said they had experienced musculoskeletal problems at work in the previous 24 months. Lower back was most commonly affected (68.8%). Age and years of experience were found the two most significant predictors of work-related musculoskeletal issues. Of the respondents, 55.7% said they had missed at least part of a workday. They came to the conclusion that musculature disorders at work were common among Egyptian physiotherapists.

Kim *et al.*, (2019) did study to investigate the quality of life and musculoskeletal pain that hospital employees experienced while working. 350 hospital employees were given a questionnaire to complete independently. 341 hospital staff members completed the survey. In the previous year, 86.1% of physical therapists, 86.5% of occupational therapists, 77.1% of dental hygienists, and 75.8% of nurses reported experiencing musculoskeletal pain in their work. There was a significant variance amid the individual carrying a physical burden and the type of occupation in both the general and work-related variables. The physical therapist's hand and wrist were the most painful areas, followed by his neck, shoulder, and low back. Therapists mentioned the hand and wrist, shoulder, and neck, while nurses and dental hygienists mentioned the shoulder, back, and hand and wrist. Quality of life scores were significantly higher for dental hygienists and physical therapists than for nurses and occupational therapists ($p=0.001$). They concluded that hospital staff appeared to be significantly more likely

than occupational therapists and dentists to experience work-related musculoskeletal discomfort, and that nurses and physical therapists had a better quality of life.

Mondal *et al.*, (2019). The commonness and trends of musculoskeletal problems among physiotherapists were examined in a study. In their investigation, 61 physical therapists were taken into account. The information was gathered via a self-administered questionnaire. They found that 46% of their physiotherapists, largely men, had musculoskeletal problems. Lower portion of the back discomfort was the most often reported complaint, and persons in their middle years were most frequently impacted. They came to the conclusion that physiotherapists had a much higher incidence of musculature problems.

Prall *et al.*, (2019). To determine the financial cost on businesses and the effects of occupational injuries on workers, a literature analysis was done. This evaluation of the literature concluded that workplace engagement in physical therapy and ergonomic interventions (such as increased productivity, decreased absenteeism, and improved attendance) is linked to considerable advantages for workers, employers, and payers. Physiotherapists must also promote their role in occupational health and offer employees non-traditional specialist care.

Sagahutu *et al.*, (2019) investigated the preponderance, risks, and preventative measures of occupational-related diseases of the musculoskeletal system in the physiotherapists. 49 physiotherapists answered the self-administered questionnaire, and 77.8% of them reported having musculoskeletal issues at work. The lower back was mainly affected (77.1 percent of the time). Within the first one to five years of employment, about 40% of physiotherapists reported having musculoskeletal

conditions connected to their work. The two risk variables that were identified most frequently were treating a lot of patients and working for a long time in one place. These physiotherapists adopted preventive measures including adjusting the bed's plinth or height and preventing extended sitting or standing. For personal reasons, 31.1 percent of physiotherapists left their positions.

Shaikh *et al.*, (2019) conducted research to learn how physiotherapists manage and prevent musculoskeletal problems on the job. Information from physiotherapists who worked in various hospitals, clinics, and rehabilitation centres was gathered using a questionnaire. Regardless of their experience, designation, method of employment, or type of work, both sexes had equally took part in the study with the ages (up to 45 years). They found that musculoskeletal injuries impacted 79 percent of physiotherapists. More women than men had engaged in the activity. The majority of them adopted preventative measures, including changing sleeping positions, the height of their mattresses, and other things that wouldn't exacerbate their symptoms. The authors came to the conclusion that many physiotherapists dealt with musculoskeletal disorders as a result of the study's findings. Other approaches, such changing the workplace and increasing awareness of accidents, were used to handle these problems.

Theurel *et al.*, (2019). Exoskeleton use is one unique strategy getting more attention in studies to address the frequency of work-related MSDs in tasks that demand a lot of physical input. The goal of this study is to connect the pathophysiological underpinnings of MSDs to the putative potential of exoskeletons to decrease muscular demand. Another goal is to review the available literature and identify the most important knowledge gaps in order to guide future research on the exoskeleton. A

narrative review that looked at exoskeleton use in the workplace was finished using an electronic literature search. The pathophysiological aetiology of MSDs will be examined in reference to 30 publications. 22 studies were included. The research' main focus was on the back muscles' activity, but they also considered other elements that can cause pain in the low back, such as muscle fatigue, spine loading, pain perception, and posture. Only eight research on upper-limb exoskeletons were done. They came to the conclusion that exoskeletons have been found to obviously be able to lower local muscular demands when used in the context of the particular task for which they have been built. The use of these technologies to avoid MSDs cannot, however, be recommended without any caveats given the current state of the information. To fully comprehend how the upper limb and/or postural muscle chains assist in regulating posture and movement, more research is required. The impact of movement aid on joint kinematics and neuromuscular coordination must be understood. There are still many unsolved problems, especially those concerning the frequency of muscle fatigue and enduring adaptations.

Waqas *et al.*, (2019) did a study to discover the coping mechanisms physiotherapists employed to address their musculoskeletal disorders. It was a survey with questionnaires. No restrictions were placed on the inclusion of physiotherapists older than 45, regardless of their level of training, title, or line of practise. 79 percent of physiotherapists experienced musculoskeletal injuries, according to the survey. Participation in the poll was more probable among women than among males. They adjusted the height of the bed, experimented with methods that wouldn't exacerbate the symptoms, and adopted varied positions as a coping mechanism. The authors came to the conclusion that many physiotherapists experience musculoskeletal conditions as

a result of their jobs, and that they were able to manage these conditions and their musculoskeletal injuries by switching workstations and being conscious of their ailments.

Desai *et al.*, (2020) carried out a study to establish how commonly musculoskeletal problems are experienced by physiotherapy students. 250 physiotherapists entered in the cross-sectional study that the investigators conducted. The age range of the program's undergraduate physiotherapy students, both male and female, was 18 to 24. The information was gathered using a questionnaire that was self-created. The "Extended Nordic Questionnaire" measured the degree of musculature pain and activity constraint in nine different body areas. After starting their professions as physical therapists, they learned that musculoskeletal discomfort affected 70.1% of physiotherapy students. The low back (177), neck (167), shoulders (114), and upper back (114) were the most commonly affected locations by pain (102). They came to the conclusion that physiotherapy students needed to know the link between bad posture and musculoskeletal problems. Through exercises that correct posture as well as ergonomic advice and modifications, workplace musculoskeletal illnesses may be reduced.

Galeoto *et al.*, (2020) A thorough analysis of cross-sectional research conducted by physiotherapists on musculoskeletal conditions treated with physical therapy was conducted. With the exception of a few minor variations in the degree of progress and the psychological and epidemiological status of the employment between nations, the findings of studies on the WRMDs have generally been similar. Because they are in constant physical contact with patients and frequently have to lift and move them to

prevent repetitive motion injuries, joint strain, and overuse in manual procedures, healthcare workers are amongst the professions most at threat for developing work-related musculoskeletal disorders.

Haleem *et al.*, (2020) did a thorough review to understand more about the preponderance, risk factors, and impact of occupational musculoskeletal ailments on physical therapists. This review included 21 titles that met the criteria. Over the course of a year, the percentage of physiotherapists with a job-related musculoskeletal condition ranged from 38.5 percent to 97.6 percent. The area of the body that was most frequently impacted was the low back. They discovered that using manual therapy and seeing more patients raised the risk. They recommended that physiotherapists alter patient care and cut back on work hours in order to combat work-related musculoskeletal illnesses.

Meh *et al.*, (2020). A sample of physiotherapists was the subject of a study to ascertain the prevalence of occupational musculoskeletal diseases. The study included 102 physiotherapists, and the discoveries revealed that 92.2 percent of workers had a musculature disorder in the last one year. Most often affected extents were the neck and lower back (64 percent and 63 percent, respectively). Age, expertise, and working with many patients on a regular basis were all linked to shoulder and ankle/foot musculoskeletal problems. However, they were unable to find a connection between levels of physical activity and musculoskeletal problems at work.

Rahmati-Yami *et al.*, (2020) undertook a study to examine the association amongst "Work-Related Musculoskeletal Disorders (WRMDs)" and the procedures used by physiotherapists. Questionnaire-based study of 1200 physical therapists was

conducted. Only 685 of the questionnaires had responses. Eleven had additional ailments such cancers, hip replacements, neurological and rheumatic diseases, and four had less than a year of job experience. 16 of them were eliminated since they didn't adhere to specific criteria for inclusion. The mean and standard deviation (SD) ages ranged from 22 to 69, with 53.9 percent of therapists being women and 46.1 percent being men. In seven of the nine domains, the findings demonstrated a significant affiliation between WRMDs and treatment strategies. In particular, manual therapy (P=0.001), myofascial release (P=0.011), mobilisation (P=0.007), muscular energy technique (P=0.007), dry needling (P=0.032), and taping (P=0.014) were linked to WRMDs in the neck and shoulder regions, respectively. Additionally, elbow WRMDS are linked to respiratory physiotherapy (P=0.007). In the wrists and hands, there is a correlation between WRMDS and manual therapy (P=0.027), myofascial release (P=0.001), mobilisation (P=0.046), muscular energy method (P=0.004), and taping (P=0.016). WRMDs are connected to manual therapy (P=0.007), mobilisation (P=0.014), and taping (P=0.004) in the upper back. Myofascial release (P=0.036), mobilisation (P=0.015), taping (P=0.035), and muscle energy (P=0.044) all show WRMDs in the lower back. Last but not least, water therapy for the knees is observed to cause WRDMs (P=0.037). They came to the conclusion that Iranian physiotherapists have a sizable prevalence of WRMDs. The frequency of treatment and the nature of procedures are highly correlated. If specific physical therapy procedures are employed, WRMDs can become more prevalent.

Abu-Taleb *et al.*, (2021). 385 respondents to a survey was done to ascertain the prevalence of occupational musculoskeletal disorders amongst Egyptian physical therapists and possible risk factors for them. During their investigation, they calculated

that 99.5% of musculoskeletal diseases at work were such. The most often affected locations were the lower back (69.1 percent), neck (65.7 percent), shoulder (47.7 percent), wrist/hand (39.1 percent), and upper back (37.0 percent). They found that females were more probable than men to have these disorders, with the exception of the upper back (P0.05). Education and working at several facilities at once were linked to upper back and neck injuries (P0.05). With these disorders, they were unable to identify a relationship between work experience and speciality (P>0.05).

Amin *et al.*, (2021) undertook a review to testify the claim that early physiotherapy therapies can help some musculoskeletal system issues avoid surgery. They found that there is a large gap between the usage of physical therapy and the available data, despite the success of the advised conservative treatment. In contrast, clinical practise uses too many medications, procedures, and diagnostic imaging. Both physiotherapy and surgical intervention were reported to have similar long-term outcomes in the majority of clinical situations. Similar to how patients can benefit from physiotherapy's greater clinical results and affordable treatment compared to surgery. They came to the conclusion that in countries with low-income, where the financial facets of healthcare are significantly weighted, cost-effectiveness plays a big influence. These benefits of physical therapy should be taken into account by practitioners, decision-makers, and patients alike and incorporated into treatment recommendations.

Cornwell *et al.*, (2021) did a study on physical therapists to ascertain the link between manual treatment and work-related musculoskeletal problems. Of the respondents, 38.5% were physical therapists. Females were more likely than males to suffer injuries

during manual therapy. They came to the conclusion that occupational musculoskeletal injuries start quite early in a person's career and get worse with time.

Desai *et al.*, (2021) evaluated the most recent data to see how well physiotherapists understand the frequency, factors, and treatment of WMSD. WMSDs most frequently affected physiotherapists' low back, upper back, shoulders and neck. The knee joint in the lower extremities was frequently impacted. Numerous risk variables, some of which can be managed, have been connected to WMSDs in physiotherapists. They came to the conclusion that WMSD prevention measures should be used early in a physiotherapist's profession to help avoid WMSD and sustain high standards of patient care.

Diener *et al.*, (2021) examined the literature to determine the qualities that patients and therapists need to possess in order to employ self-management effectively (SM). Studies on the efficiency of MSKP's SM have yielded uninspiring findings. The employment of cutting-edge pain neurobiology and psychosocial skills in the treatment of persistent MSKP has, however, been supported by recent research, which has shown some encouraging effects. They came to the conclusion that psychologically informed physical therapy, which addressed psychosocial obstacles to maintaining SM programmes, may produce greater results.

Kakaraparthi *et al.*, (2021) undertook research to ascertain the prevalence, traits, and risk factors for occupational musculoskeletal illnesses in physical therapists. 113 physical therapists took part in the study. Of the respondents, 83.8% reported having a musculoskeletal issue at work. The body component that was most frequently afflicted was the low back (63.7%), followed by the neck (59.2%). The least impacted

bodily portions were the hip and thigh (4.4 percent). They discovered that individuals most impacted by job-related musculoskeletal problems included females, young people, government employees, and orthopaedic specialists. The most prevalent risk factor was discovered to be the everyday treatment of several individuals. They found that the best way to address musculoskeletal problems brought on by job is to change the patient's position.

Mubashir *et al.*, (2021) steered a study to find the prevalence of “Musculoskeletal Disorders (MSDs)” by examining the frequency of "Upper Cross Syndrome (UCS)" among physiotherapists in Pakistan and its connection to WRMSDs. Social media or email were used to hire the physiotherapists. The screening regarding posture and the "Modified Oswestry Neck Disability Index" were included in the questionnaire. Out of 148 physiotherapists, 103 women and 45 men were included. Number of years of experience was the basis of division. They were divided into three groups: 32 percent were competent, 28 percent were proficient, and 40 percent were beginners. Following screening, it was discovered that 73 (49.3 percent) of the physiotherapists had mild impairment and 75 (51.7% had a forward-facing head position). The chi-square analysis (p=0.005) revealed that working position hour length, experience level, and gender all significantly influenced disability. They came to the conclusion that UCS affected 27% of practising physiotherapists, and that it was more common in women and those who had put in lengthy hours at work. To better understand the health-related results, additional study with a large sample size and confounding variables is necessary.

Ramanandi *et al.*, (2021) did a survey to look at the connection between the occurrence of MSDs and the physiotherapists' expanding professional experience. A survey with 322 physiotherapists was conducted online. The commonness of job-associated MSDs and the accumulation of experience did not show any statistically significant link, according to the study. Additionally, females are more prevalent than males (68.63%) (61.19 percent). The neck and lower back were the MSDs that concerned physiotherapists the most (41.3%) and (41.3%). (37.58 percent). They came to the conclusion that a long career does not raise the risk of MSDs. Physiotherapists who are female have a higher incidence of MSDs. Early detection and interventions like ergonomic counselling and physical therapy can therefore considerably lower MSD rates.

Shankar *et al.*, (2021) did study to evaluate the risks and commonness of "Work-Related Musculoskeletal Disorders" amongst healthcare professionals. 310 self-reported questionnaires were distributed to various healthcare professionals; 296 of them were returned with the necessary information. 46.28 percent of people were impacted by WMSD, with surgeons being the most afflicted. Low back pain was the WMSD that was most frequently stated (69.34 percent). Working in awkward positions was the danger factor that was mentioned the most (52.55 percent). They came to the conclusion that the most crucial measures to adopt to avoid or control the WMSD are ergonomics, including targeted exercises and physical fitness programmes for staff.

Tislar *et al.*, (2022). 100 students of physical therapy specialization and 62 physiotherapists took part in a study to gather data for the creation of evidence-based

health promotion initiatives. 63.9 percent of physiotherapists reported a musculoskeletal problem as being connected to their line of work. The neck, shoulders, and lower back were the body parts mostly affected. According to the physiotherapy students, the body parts that were most normally affected were the lower back, neck, and upper back, with a frequency of 46.5%. Physiotherapists had a considerably higher occurrence of musculoskeletal problems than physiotherapy students did. Flexibility tests clearly indicated low scores for the physiotherapy students. They came to the conclusion that stretching activities should be recommended in order to promote flexibility.

Ahmad *et al.*, (2022) in their study determined the musculoskeletal issues that impact working physiotherapists. Data were collected of 132 persons. Within a year of experience, the upper and lower limbs were the most often impacted locations. In the past year, the neck was the painful area, followed by lower back and upper back.

Chen *et al.*, (2022) reviewed the prevalence and incidence of musculoskeletal disorders among physiotherapists at work. The incidence was seen from 6.1 to 29.1 per 100 persons-years, while the prevalence ranged from 6.1 to 75.2%. However, men were more likely to experience this than women, and the age range was 31 to 40. The prevalence was greater among physiotherapists (<30 years) than among women. Age and gender were found to be the two primary risks for the onset of work-related musculoskeletal disorders.

Karanikas *et al.*, (2022) did a review to determine the most frequently studied causes of occupational musculoskeletal disorders. Eleven studies from the years 2012 to 2018 were considered. The components were broken down into 18 groups, their rate across

the sources was tallied, and the median ranks were found. They found that the importance of manual orthopaedic treatments outweighed a significant workload as a contributing factor. However, the trait that received the greatest attention in the literature that we read was demanding and repetitive manual labour. The recurrence of research and the guaranteed commitment of factors exhibited a somewhat strong correlation, but the certainty spans had a significant impact, presumably because the investigations successfully used different philosophies. The degree to which each variable contributes to the establishment of WMSDs is related to the categories of characteristics that studies normally focus on most, their data show.

Modhi *et al.*, (2022) utilized the "ICF model" as a framework to investigate the incidence of WMSDs among Jordanian physiotherapists and the causes of musculoskeletal disorders related to work (WMSDs). The study included 139 physical therapists, 53.2 percent of whom identified as female. The age range of the participants was 23 to 61. The Quick Exposure Check was used to analyse the WMSDs. The findings revealed that 100% of the participants recognised cervical spine overload, lumbar spine overload, shoulder joint overload, and wrist joint overload as the most prevalent musculoskeletal problems. Strong negative correlations between gender and overall exposure were found. Body mass index and the “Minnesota Satisfaction Questionnaire (MSQ)” both showed a substantial and positive connection with total exposure. They came to the conclusion that in order to lower the prevalence of musculoskeletal illnesses, physiotherapists needed a deeper understanding of self-protection techniques. Future research, efforts to improve the quality of care, and educational programmes may be able to lower the rates of WMSDs among physiotherapists with a greater awareness of the elements that may promote WMSDs.

Plange *et al.*, (2022) steered a study to determine the preponderance of WRMSDs, the causes individuals believe are responsible, and how physiotherapists in Ghana treat patients. The study included 102 physical therapists. 76.5 percent of workers were afflicted by "Work-Related Musculoskeletal Disorders (WRMSDs)," which frequently impacted the neck, upper back, and lower back. The elbow and forearm were the least affected areas of the body (1.0%). Daily workload and repetitive motions were cited as the two causes of WRMSDs by respondents (58.8 percent each). The majority of physiotherapists employed posture change as a coping mechanism to prevent WRMSDs. WRMSDs were also correlated with age and employment experience. They came to the conclusion that Ghanaian physiotherapists had a significant prevalence of WRMSDs. As a result, the Ghanaian health service, the Ghana Physiotherapy Association, and the Ministry of Health must put policies in place to help stop or limit its rise (such as creating ergonomic workstations and minimising the physiotherapist's workload).

Waller *et al.*, (2022) examined the research on work-related upper limb diseases (WRULDs) with the specific aims of: 1) determining the prevalence over the course of a year, risk factors at work, effects, and coping mechanisms. There were 12 studies that may be included. Between 7.6 and 52.5 percent of the 1-year WRULDs had thumb disorders, followed by wrist and hand, shoulder, and elbow disorders. The treatment of many patients and the frequent application of manual procedures were risk factors. PTs' coping mechanisms included altering the work environment, procedures, and workload due to the interference with their personal and professional lives. They came to the conclusion that WRULDs are still a threat to the PT staff, probably because of the physical demands of work activities. Enhancing clinicians' comprehension of

WRULDs, occupational risk factors, and their long-term effects is an essential step in reducing WRULDs. To keep, protect, and expand PTs' use of their upper limbs, they need effective coping mechanisms.



CHAPTER-3

MATERIAL AND METHODS



MATERIAL AND METHODS

3.1 STUDY DESIGN

Cross-sectional observational study.

3.2 SOURCE OF DATA COLLECTION

Practicing physiotherapists of various hospitals and clinics of Indore and surrounding regions.

3.3 METHOD OF DATA COLLECTION

3.3.1 Sample Size: 500 samples were taken.

3.3.2 Sample Design: Purposive sampling.

3.4 INCLUSION CRITERIA

1. Both male and female.
2. Physiotherapists who are doing clinical practice for minimum of 8 hours per day
3. Physiotherapists with 22-32 years of age
4. Therapists having at least one year of clinical experience and regularly treating patients

3.5 EXCLUSION CRITERIA

1. Physiotherapists in academic, administrative, and non-clinical settings

2. Pregnant physiotherapists

3. Physiotherapists with fracture of involved area (Neck, Shoulder, Low back)

3.6 MATERIALS USED WITH RELIABILITY AND VALIDITY

A self-administered questionnaire was used for the study.

3.6.1 Content Validity

One experienced physiotherapist validated the questionnaire used in this study, as well as one senior orthopedician. They had completed the evaluation form, evaluating the content validity of the questionnaire used in the present study. The experts rated the questionnaire from 1 to 5, with 1 being not valid at all and 5 being very high valid. Both the experts rated the questionnaire as very high valid, stating that, the questionnaire is valid and can provide unbiased data for the investigation, allowing 0 to 5% of error. The questionnaire is capable of achieving the study's objective, according to the consensus of all validators. **(Appendix-iv)**

3.7 PROCEDURE AND METHOD

Participants were informed of the study's objective after meeting the inclusion criteria. The WRMSDS were analyzed using a self-administered questionnaire that was distributed by hand. Before completing the questionnaire, participants signed the appropriate consent form. The questionnaire was explained to participants, and they were asked to complete it. An anatomical region-specific diagram was included in the questionnaire. The questionnaire had two sections:

1) **Personal characteristics:** Age, sex, height (cm), weight (kg).

2) **Musculoskeletal problem according to the anatomical area (Neck, shoulder, low back):** Years of experiences, number of contact hours with patients. Number of sick leave, activities responsible for pain like bending and twisting, lifting, maintaining a position for prolong period of time, performing repetitive tasks, and alteration in work habits. The duly filled questionnaire copies were obtained and documented.

3.7.1 Variables

Independent variables: Years of experiences, number of contact hours with patients, activities responsible for pain like bending and twisting, lifting, maintaining a position for long period of time, and performing repetitive tasks.

Dependent variables: Neck pain, shoulder pain, low back pain.

3.8 OUTCOME MEASURES

Years of experiences, number of contact hours with patients, activities responsible for pain like bending and twisting, lifting, maintaining a position for long period of time, performing repetitive tasks, neck pain, shoulder pain and low back pain were the outcome measures in our study.

3.9 STATISTICAL ANALYSIS

An elaborate questionnaire on musculoskeletal disorders and their work history was administered in 500 physiotherapists. The questions were used to determine whether

physiotherapists had any work-related injuries like tendinitis, muscle strain, ligament sprain, etc. Other variables include age, sex, exercise, area of involvement, contact hours with patients, activities responsible for pain Descriptive analysis was presented in the form of numbers and percentages. For association of “age”, “sex (gender)”, “years of experience”, “number of contact hours with patients”, “exercise”, “area of involvement”, “activities responsible for pain” with “Work-Related Musculoskeletal Disorders (WRMSDs)”, the Pearson Chi-square test was applied. A p value of <0.05 was taken as statistically significant. The final data was presented in the form of tables and graphs.

The IBM SPSS Version 20.0.0.0 was used for analyzing the data.



CHAPTER-4

RESULTS



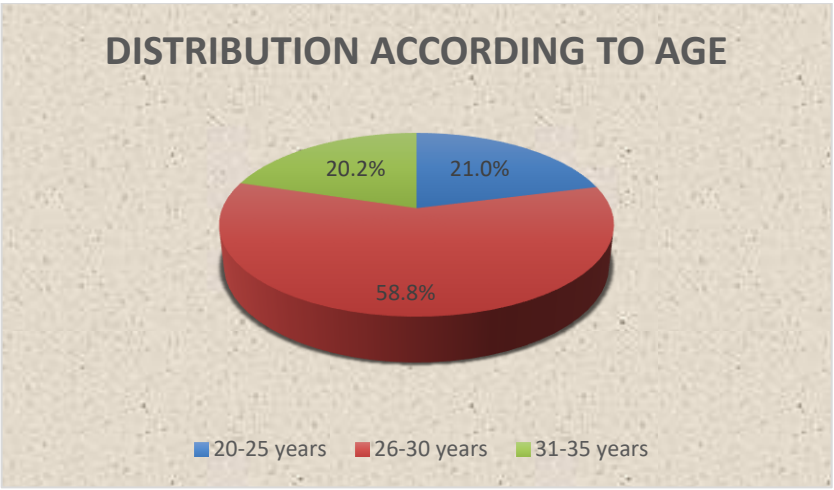
RESULTS

Table 3
Distribution of physiotherapists pursuant to the age

Age	Number	Percentage
20-25 years	105	21.0
26-30 years	294	58.8
31-35 years	101	20.2
Total	500	100.0

The age distribution of physiotherapists is depicted in the table 3.

There were 105 (21.0%) physiotherapists in the age group 20-25 years, 294 (58.8%) were in the age group 26-30 years and 101 (20.2%) physiotherapists were in the age group 31-35 years. Majority of the physiotherapists were in the age group 26-30 years. The mean age was 27.87 ± 2.88 years.



Graph 1 : Age-based distribution of physiotherapists in a pie chart

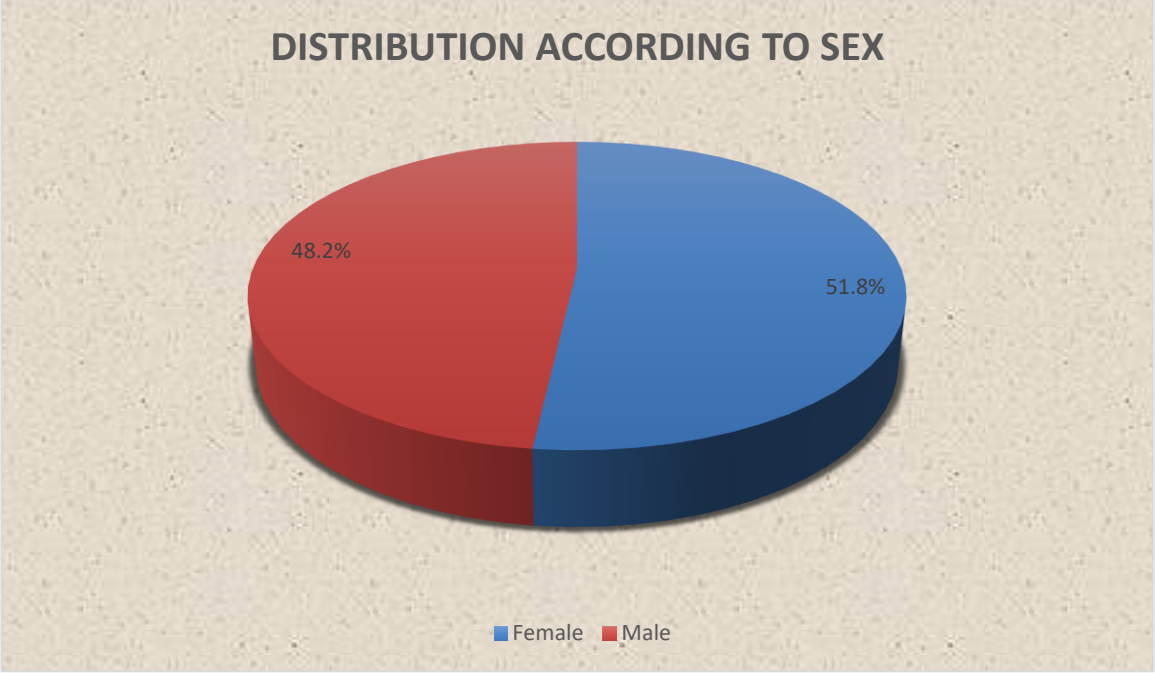
Table 4

Distribution of physiotherapists pursuant to the sex

Sex	Number	Percentage
Female	259	51.8
Male	241	48.2
Total	500	100.0

The gender-based distribution of physiotherapists is depicted in the table 4.

There were 259 (51.8%) females and 241 (48.2%) males in our study, showing a slight female predominance in the study.

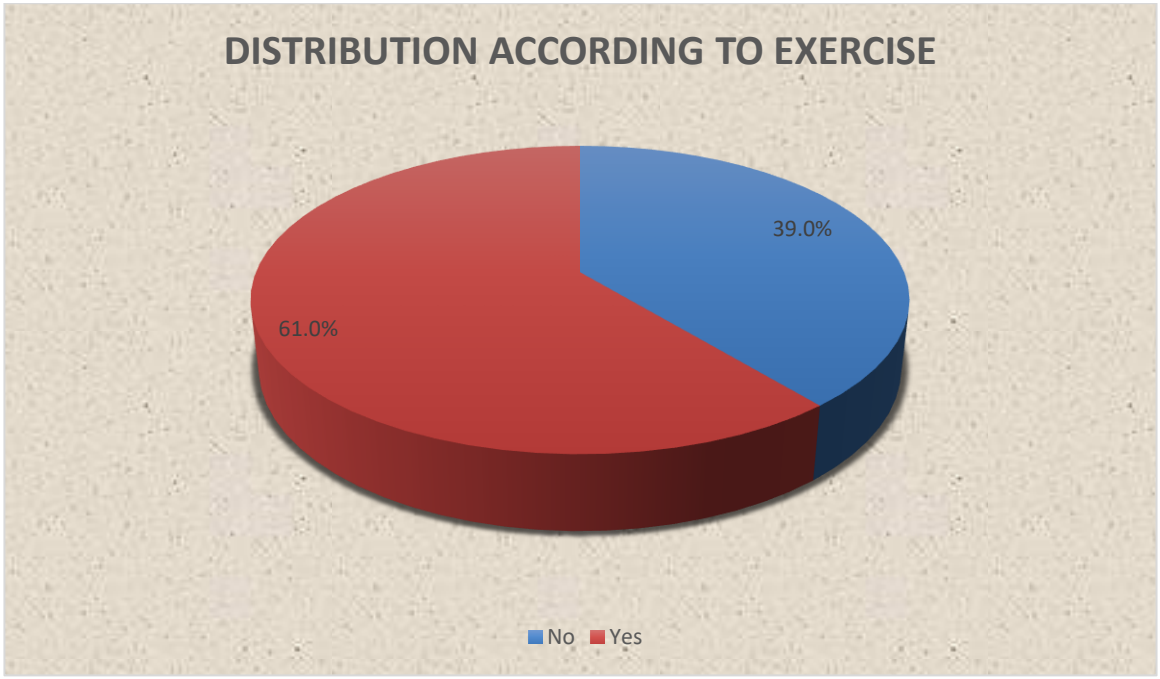


Graph 2 : A pie chart depicting the gender-based distribution of physiotherapists

Table 5
Distribution of physiotherapists pursuant to the exercise

Exercise	Number	Percentage
No	195	39.0
Yes	305	61.0
Total	500	100.0

The distribution of physiotherapists in response to the exercise is depicted in the table 5. 195 (39.0%) physiotherapists do not perform exercises, while 305 (61.0%) physiotherapists perform exercises.

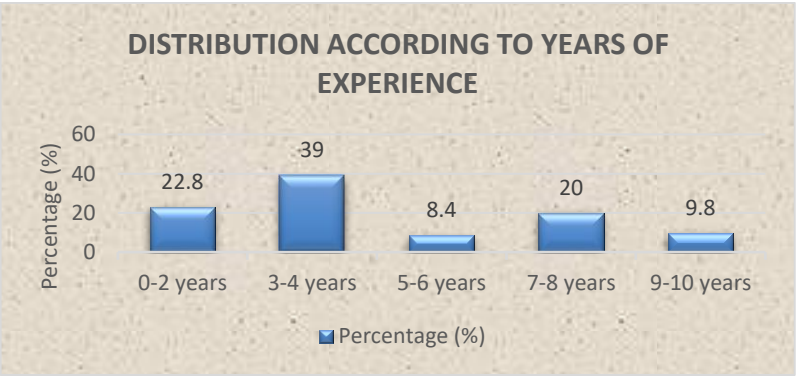


Graph 3 : The distribution of physiotherapists in relation to exercise is depicted in a pie chart

Table 6
Distribution of physiotherapists pursuant to years of experience

Years of Experience	Number	Percentage
0-2 years	114	22.8
3-4 years	195	39.0
5-6 years	42	8.4
7-8 years	100	20.0
9-10 years	49	9.8
Total	500	100.0

The distribution of physiotherapists according to years of experience is depicted in table 6. 114 (22.8%) physiotherapists had 0-2 years of experience, 195 (39.0%) had 3-4 years of experience, 42 (8.4%) had 5-6 years of experience, 100 (20.0%) had 7-8 years of experience and 49 (9.8%) had 9-10 years of experience. Majority of the physiotherapists had 3-4 years of experience, followed by 0-2 years of experience.

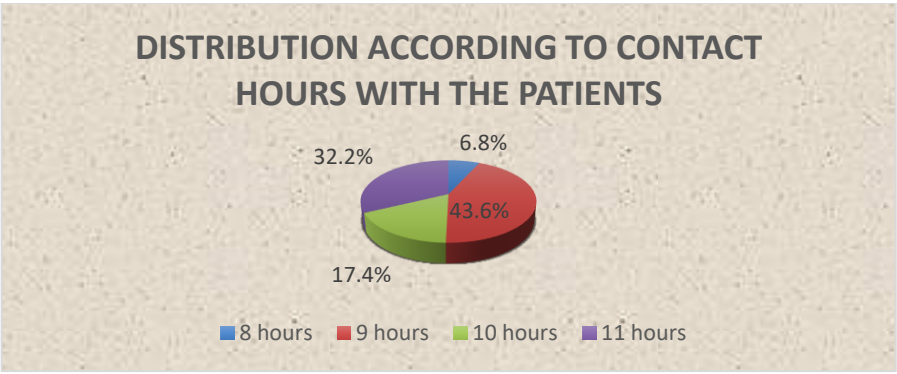


Graph 4 : The distribution of physiotherapists according to years of experience is depicted in a bar chart

Table 7
Distribution of physiotherapists pursuant to number of contact hours with the patients

Number of Contact Hours with the Patients	Number	Percentage
8 hours	34	6.8
9 hours	218	43.6
10 hours	87	17.4
11 hours	161	32.2
Total	500	100.0

The distribution of physiotherapists according to the number of contact hours working with patients is shown in table 7. 34 (6.8%) physiotherapists had 8 hours of contact with the patients, 218 (43.6%) had 9 hours of contact with the patients, 87 (17.4%) patients had 10 hours of contact with the patients and 161 (32.2%) physiotherapists had 11 hours of contact with the patients. Majority of the physiotherapists had 9 hours, followed by 11 hours of contact with the patients.

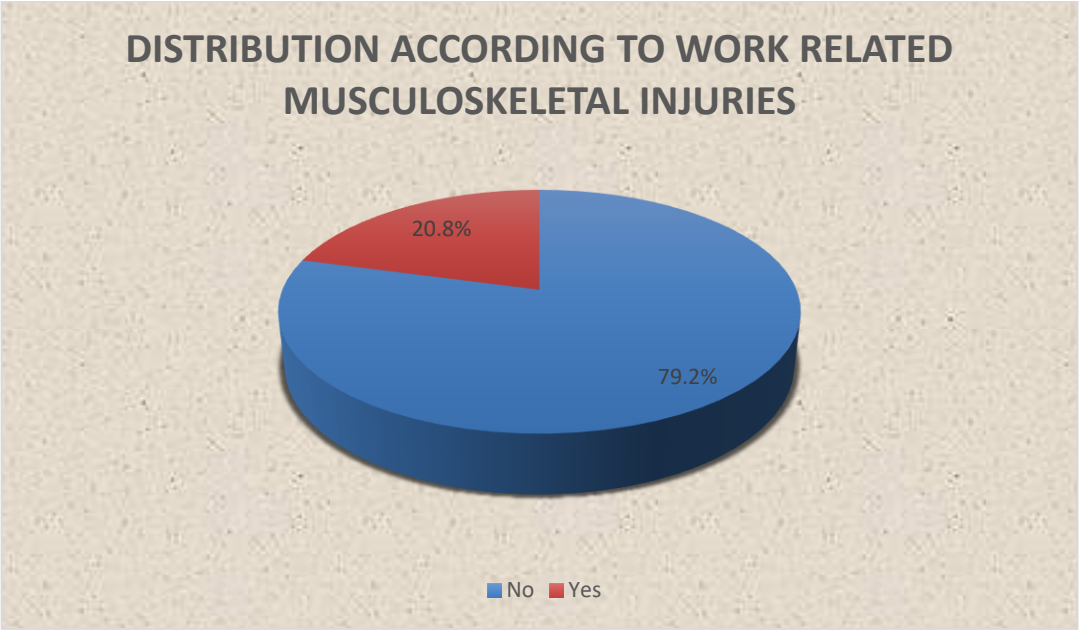


Graph 5 : A pie chart depicts the distribution of physiotherapists according to patient contact hours

Table 8
Distribution of physiotherapists pursuant to work related musculoskeletal injuries

Work related musculoskeletal injuries	Number	Percentage
No	396	79.2
Yes	104	20.8
Total	500	100.0

The distribution of physiotherapists pursuant to work-related musculoskeletal injuries is depicted in table 8. In 396 (79.2%) physiotherapists there was no work related musculoskeletal injuries, while in 104 (20.8%) physiotherapists there was work related musculoskeletal injuries. 20.8% physiotherapists were suffering from work related musculoskeletal injuries.



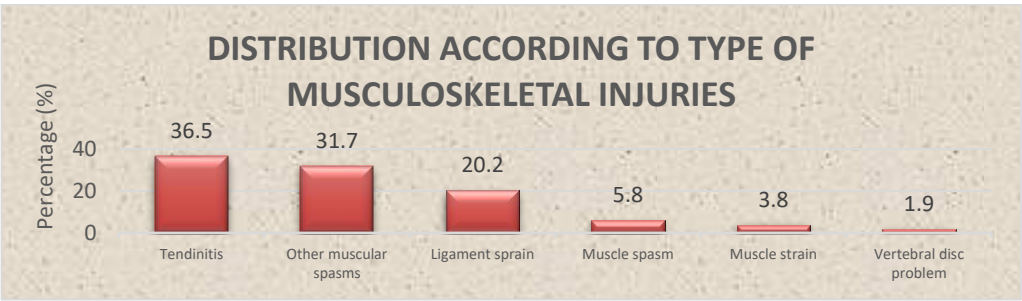
Graph 6 : Physiotherapists' distribution according to work-related musculoskeletal injuries is depicted in a pie chart

Table 9
Distribution of physiotherapists pursuant to type of work related musculoskeletal injuries

(N=104)

Type of work related musculoskeletal injuries	Number	Percentage
Tendinitis	38	36.5
Other muscular spasms	33	31.7
Ligament sprain	21	20.2
Muscle spasm	6	5.8
Muscle strain	4	3.8
Vertebral disc problem	2	1.9
Total	104	100.0

The distribution of physiotherapists according to the type of work-related musculoskeletal injuries is shown in table 9. Work related musculoskeletal injuries were seen in 104 physiotherapists. Of these 21 (20.2%) were suffering from ligament sprain, 6 (5.8%) were suffering from muscle spasm, 4 (3.8%) from muscle strain, 33 (31.7%) from other muscular spasms (areas other than neck, shoulder and low-back), 38 (36.5%) from tendinitis and 2 (1.9%) were suffering from vertebral disc problem. Majority of the physiotherapists were suffering from tendinitis.



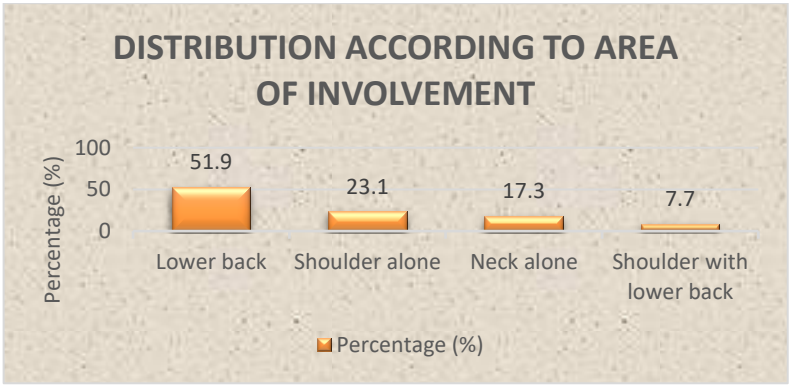
Graph 7 : The distribution of physiotherapists according to the type of work-related musculoskeletal injuries is depicted in a bar chart

Table 10
Distribution of physiotherapists pursuant to area of involvement

(N=104)

Area of Involvement	Number	Percentage
Lower back	54	51.9
Shoulder alone	24	23.1
Neck alone	18	17.3
Shoulder with lower back	8	7.7
Total	104	100.0

The distribution of physiotherapists pursuant to area of expertise is depicted in table 10. In 54 (51.9%) physiotherapists the main area of involvement was the lower back, in 24 (23.1%) physiotherapists shoulder alone was involved, in 18 (17.3%) physiotherapists neck alone was involved and in 8 (7.7%) physiotherapists shoulder along with lower back was involved. Lower back and shoulder are the most commonly affected areas in these physiotherapists.



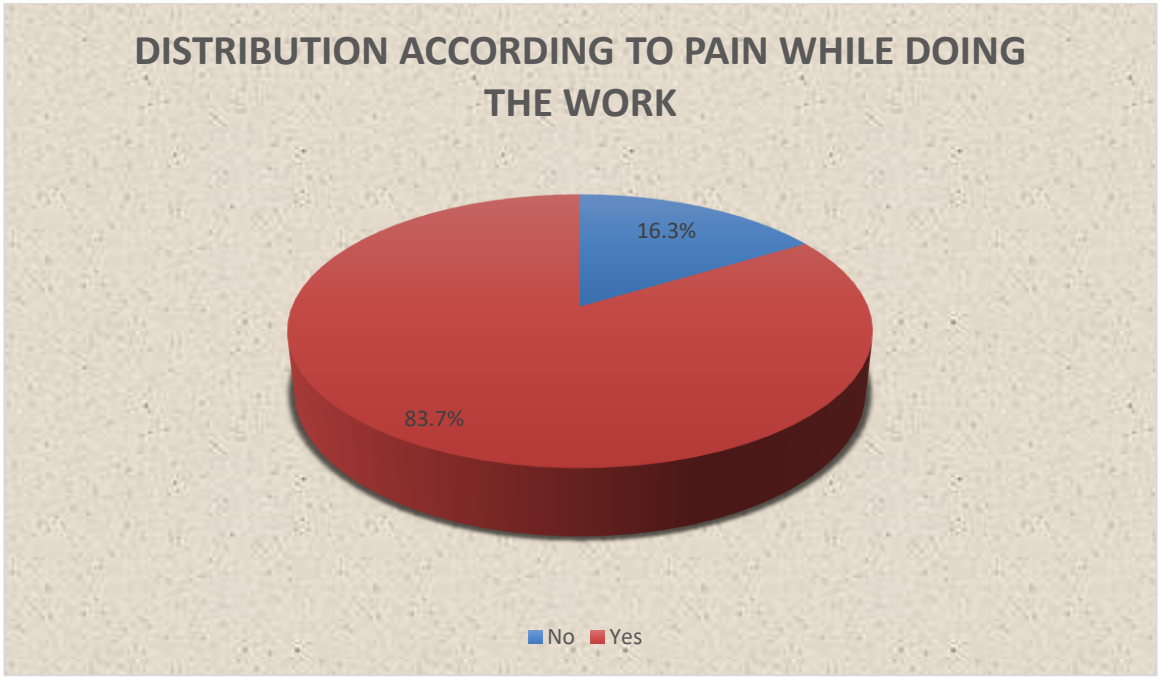
Graph 8 : The distribution of physiotherapists by area of involvement is depicted in a bar chart

Table 11
Distribution of physiotherapists pursuant to pain while doing the work

(N=104)

Pain while doing the work	Number	Percentage
No	17	16.3
Yes	87	83.7
Total	104	100.0

The distribution of physiotherapists pursuant to pain while working is shown in table 11. Pain while doing work was experienced by 87 (83.7%) physiotherapists, while the rest did not experience any such pain. Majority of the physiotherapists experienced pain during the work.



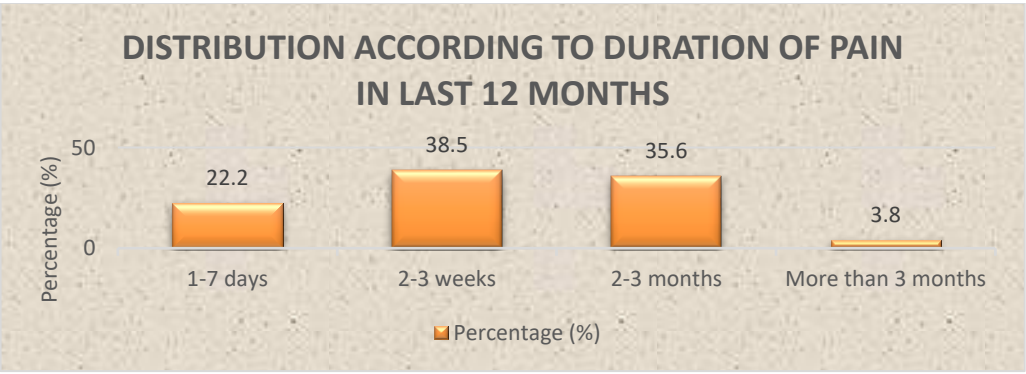
Graph 9 : The distribution of physiotherapists according to pain during work is depicted in a pie chart

Table 12
Distribution of physiotherapists pursuant to duration of pain in the last 12 months

(N=104)

Duration of Pain	Number	Percentage
1-7 days	23	22.2
2-3 weeks	40	38.5
2-3 months	37	35.6
More than 3 months	4	3.8
Total	104	100.0

The distribution of physiotherapists pursuant to duration of pain in the last 12 months is depicted in table 12. In the last 12 months, in 23 (22.2%) physiotherapists the pain remained for 1-7 days, in 40 (38.5%) physiotherapists it remained for 2-3 weeks, in 37 (35.6%) physiotherapists it remained for 2-3 months and in 4 (3.8%) physiotherapists it remained for more than 3 months. In majority of the patients the pain remained for more than 2-3 weeks, followed by 2-3 months.



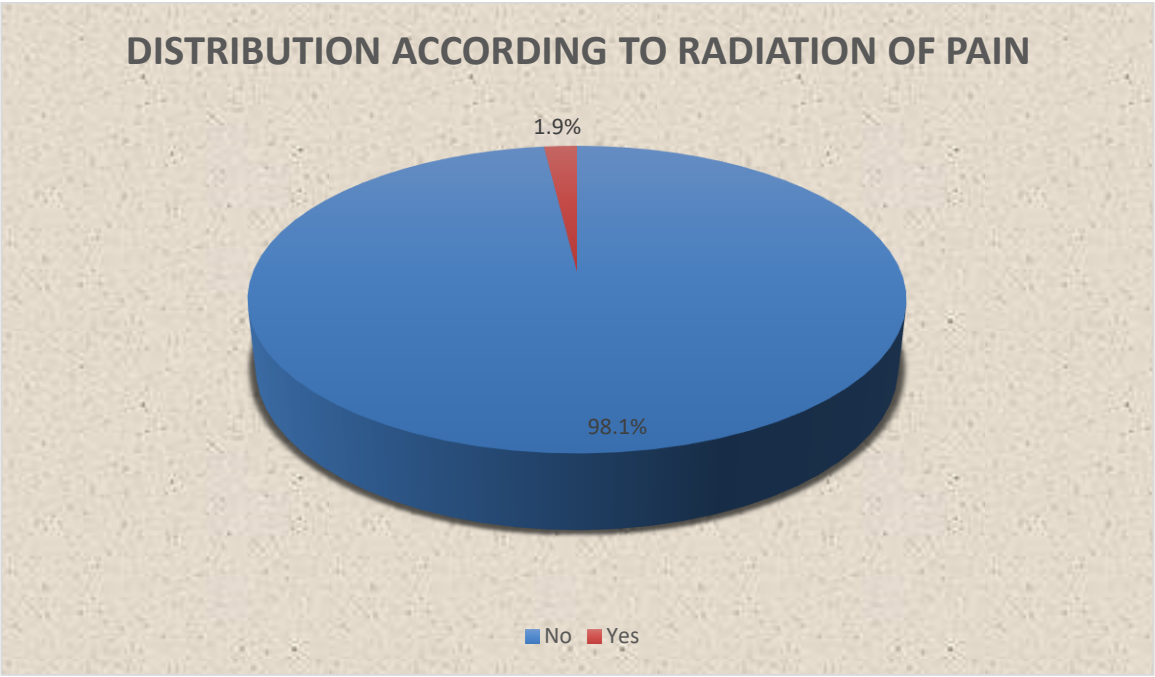
Graph 10 : The distribution of physiotherapists according to pain duration over the past year is shown in a bar chart

Table 13
Distribution of physiotherapists pursuant to radiation of pain

(N=104)

Radiation of Pain	Number	Percentage
No	102	98.1
Yes	2	1.9
Total	104	100.0

The distribution of physiotherapists pursuant to radiation of pain is depicted in table 13. In 102 (98.1%) physiotherapists there was no pain radiation seen and in 2 (1.9%) physiotherapists the pain was radiating. Only a small percentage of physiotherapists had radiation of pain.



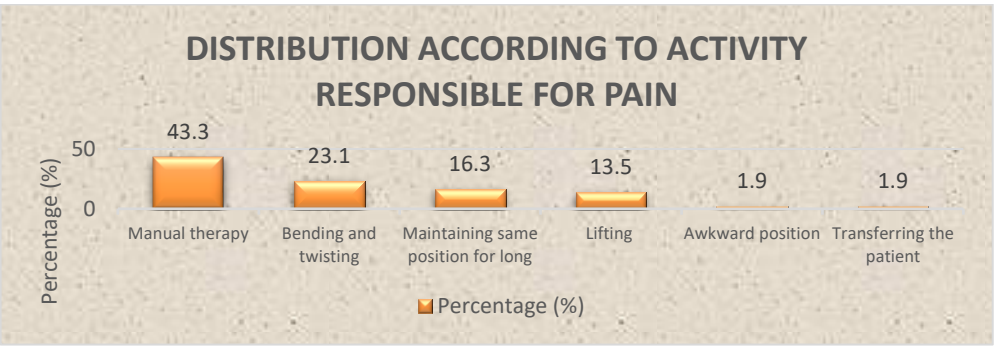
Graph 11 : The distribution of physiotherapists according to pain radiation is depicted in a pie chart

Table 14
Distribution of physiotherapists pursuant to the activity responsible for pain

(N=104)

Activity Responsible for Pain	Number	Percentage
Manual therapy	45	43.3
Bending and twisting	24	23.1
Maintaining same position for long	17	16.3
Lifting	14	13.5
Awkward position	2	1.9
Transferring the patient	2	1.9
Total	104	100.0

The distribution of physiotherapists pursuant to the activity responsible for pain is depicted in table 14. In 45 (43.3%) physiotherapists manual therapy was responsible for pain, in 24 (23.1%) physiotherapists pain was during bending and twisting, in 17 (16.3%) physiotherapists pain was due to maintaining same position for long, in 14 (13.5%) physiotherapists pain was due to lifting and in 2 (1.9%) physiotherapists each the pain was due to awkward position and while transferring the patient, respectively. The most common activity was while giving manual therapy, followed by bending and twisting.



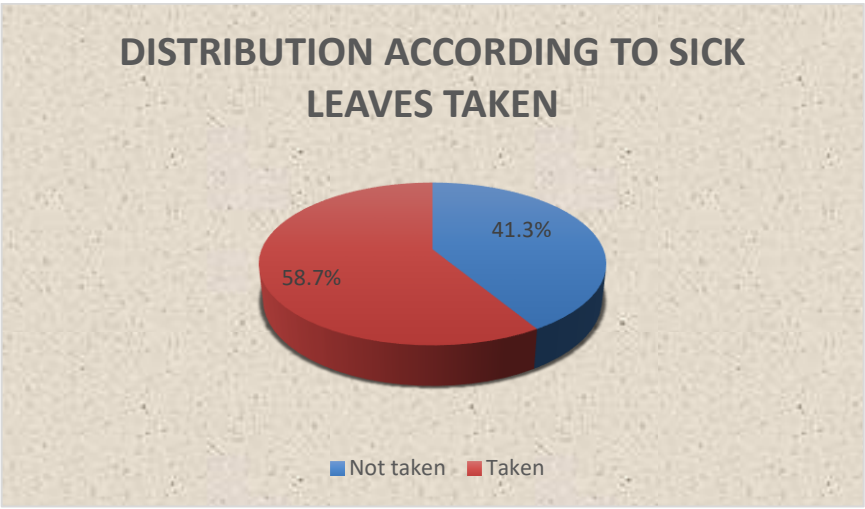
Graph 12 : A bar chart depicts the distribution of physiotherapists according to the activity that causes pain

Table 15
Distribution of physiotherapists pursuant to sick leaves taken for work related musculoskeletal injuries

(N=104)

Sick Leave	Number	Percentage
Not taken	43	41.3
Taken	61	58.7
Total	104	100.0

The distribution of physiotherapists pursuant to sick leaves taken for work related musculoskeletal injuries is depicted in table 15. 61 (58.7%) physiotherapists had taken sick leave for their work related musculoskeletal injuries, while 43 (41.3%) physiotherapists had not taken sick leave even though they were suffering from work related musculoskeletal injuries. The majority of the physiotherapists had taken sick leave due to musculoskeletal injuries they had sustained at work.



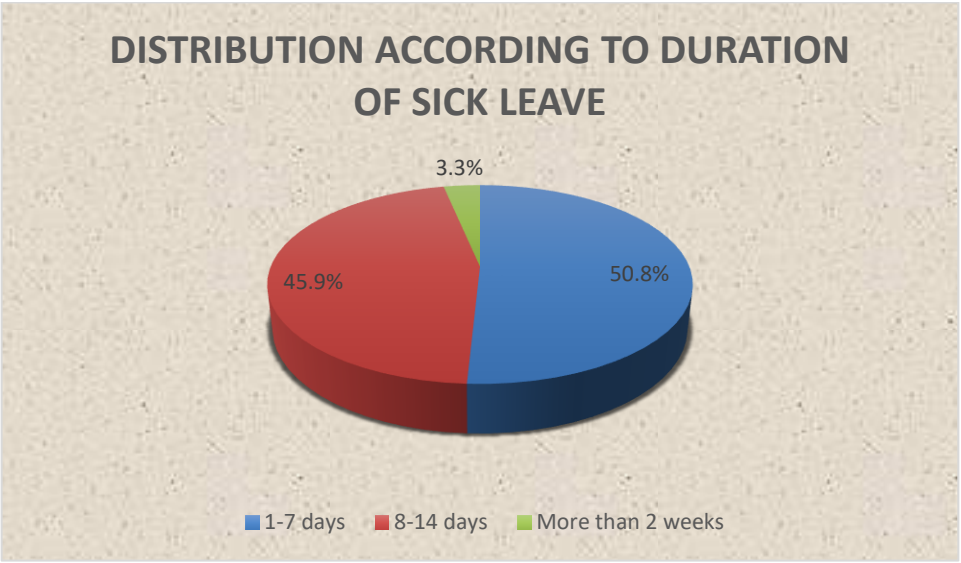
Graph 13 : Distribution of physiotherapists according to sick leave taken is depicted in a pie chart

Table 16
Distribution of physiotherapists pursuant to duration of sick leave

(N=61)

Duration of sick leave	Number	Percentage
1-7 days	31	50.8
8-14 days	28	45.9
More than 2 weeks	2	3.3
Total	61	100.0

The distribution of physiotherapists according to sick leave duration is depicted in table 16. Of the 61 physiotherapists who had taken sick leave, 31 (50.8%) physiotherapists had taken 1-7 days of sick leave, 28 (45.9%) physiotherapists had taken 8-14 days of sick leave and 2 (3.3%) physiotherapists had taken more than 2 weeks of sick leave. Majority of the physiotherapists had taken 1-7 days of sick leave.



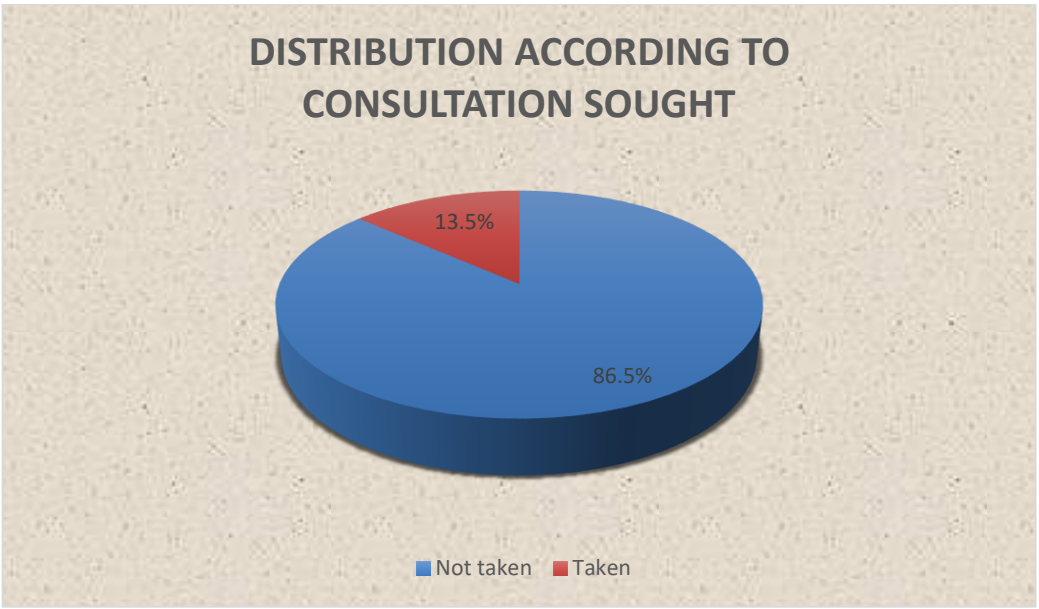
Graph 14 : The distribution of physiotherapists according to sick leave duration is depicted in a pie chart

Table 17
Distribution of physiotherapists pursuant to consultation sought

(N=104)

Consultation Sought	Number	Percentage
Not taken	90	86.5
Taken	14	13.5
Total	104	100.0

The distribution of physiotherapists who are consulted for work-related musculoskeletal injuries is depicted in table 17. Only 14 (13.5%) physiotherapists had taken consultation for their work related musculoskeletal injuries, while 90 (86.5%) physiotherapists had not sought any consultation for their pain. Majority of the physiotherapists did not take any consultation for their pain.



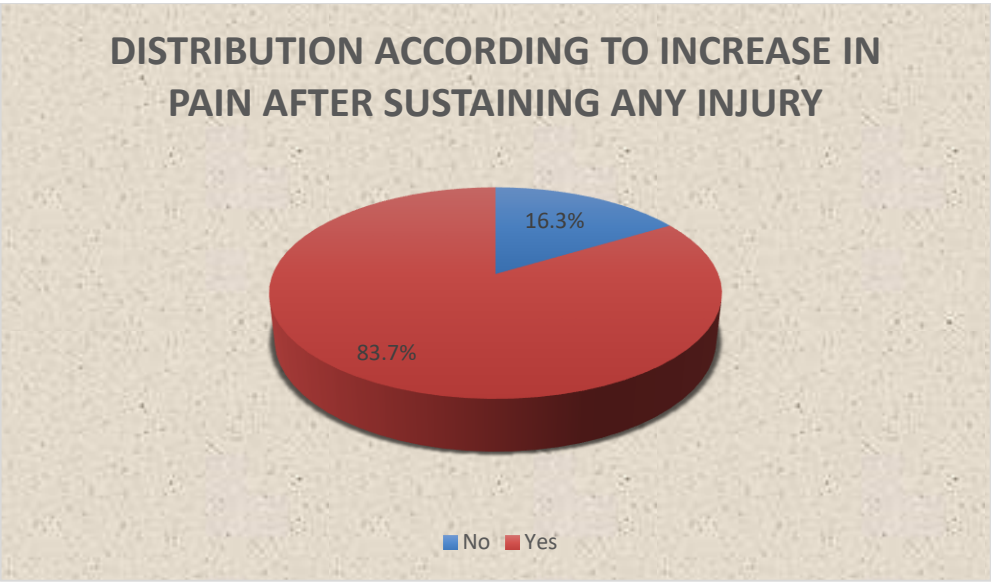
Graph 15 : A pie chart depicts the distribution of physiotherapists in response to requests for consultation

Table 18
Distribution of physiotherapists pursuant to increase in pain after sustaining any injury

(N=104)

Increase in pain after sustaining any injury	Number	Percentage
No	17	16.3
Yes	87	83.7
Total	104	100.0

The distribution of physiotherapists based on an increase in pain following an injury is shown in table 18. In 17 (16.3%) physiotherapists there was no increase in pain, while in 87 (83.7%) physiotherapists the pain increased after sustaining an injury. In majority of the physiotherapists, there was an increase in pain after sustaining injury.



Graph 16 : A pie chart depicts the distribution of physiotherapists in response to an increase in pain following an injury

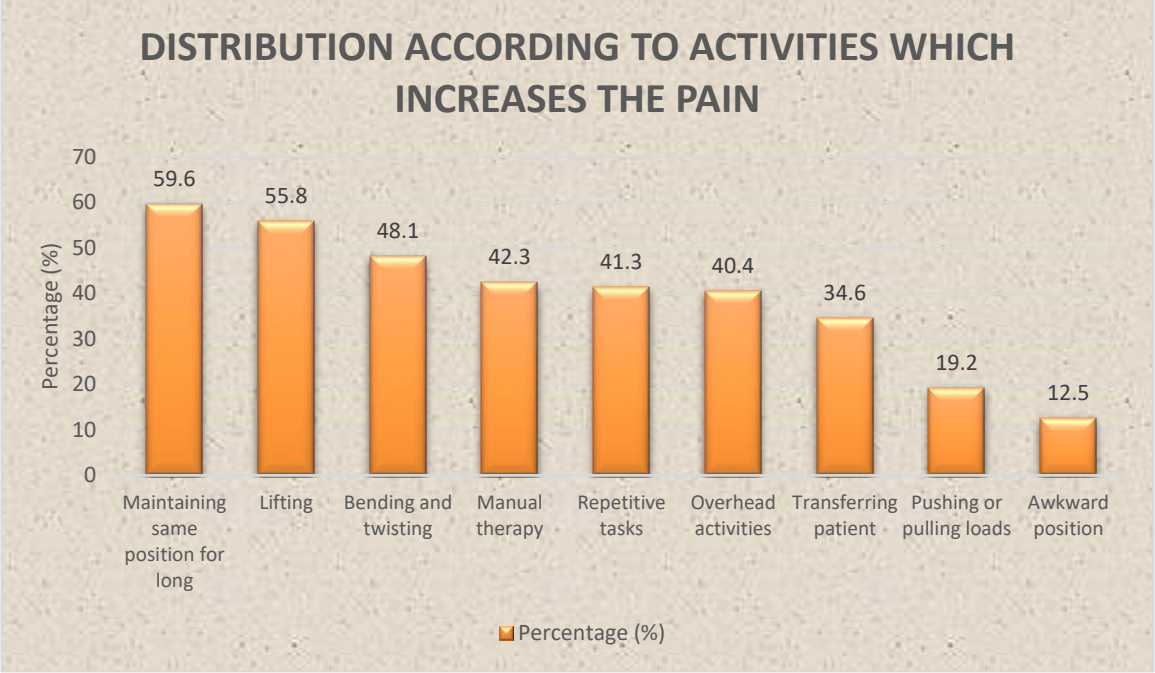
Table 19
Distribution of physiotherapists pursuant to activities which increases the pain

(N=104)

Activity which increases the pain	Number	Percentage
Maintaining same position for long	62	59.6
Lifting	58	55.8
Bending and twisting	50	48.1
Manual therapy	44	42.3
Repetitive tasks	43	41.3
Overhead activities	42	40.4
Transferring patient	36	34.6
Pushing or pulling loads	20	19.2
Awkward position	13	12.5

The distribution of physiotherapists based on activities that cause more pain is shown in table 19. In 62 (59.6%) physiotherapists maintaining the same position increased the pain, in 58 (55.8%) physiotherapists pain increased due to lifting objects, in 50 (48.1%) physiotherapists pain increased due to bending and twisting, in 44 (42.3%) physiotherapists pain increased due to giving of manual therapy, in 43 (41.3%) physiotherapists pain increased due to performing of repetitive tasks, in 42 (40.4%) physiotherapists pain increased due to performing overhead activities, in 36 (34.6%) physiotherapists pain increased while transferring the patient, in 20 (19.2%) physiotherapists pain increased due to performing pushing or pulling loads and in 13 (12.5%) physiotherapists pain increased due to remaining in awkward position.

Maintaining the same position for long, lifting objects, bending and twisting and manual therapy were the commonest activities which increased the pain in these physiotherapists.



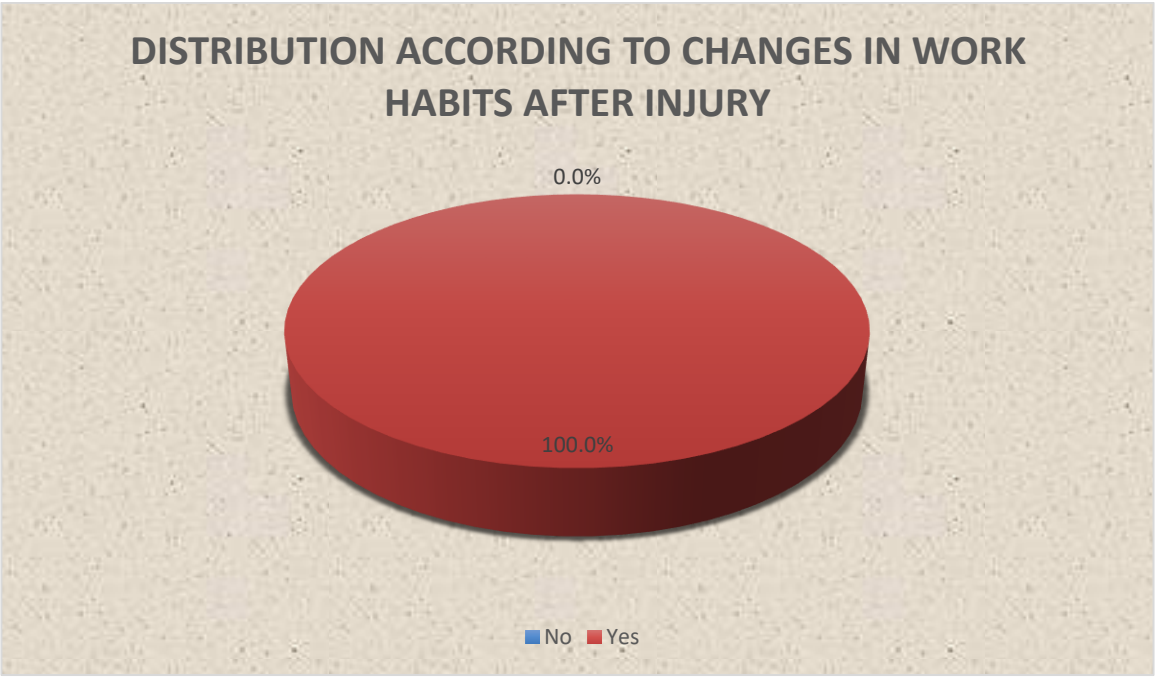
Graph 17 : The distribution of physiotherapists according to pain-inducing activities is depicted in a bar chart

Table 20
Distribution of physiotherapists pursuant to change in working habits after injury

(N=104)

Change in working habits after injury	Number	Percentage
No	0	0.0
Yes	104	100.0
Total	104	100.0

The distribution of physiotherapists based on shifts in work habits following an injury is depicted in table 20. After injury, all 104 (100%) physiotherapists had changed their working habits.



Graph 18 : A pie chart depicts how physiotherapists are distributed according to how their work habits have changed since an injury

Table 21
Distribution of physiotherapists pursuant to the modified working habits

(N=104)

Modified Working Habits	Number	Percentage
Avoid lifting, less manual therapy	25	24.0
Change posture	21	20.2
Avoid lifting, change posture, less manual therapy, stop work when pain	20	19.2
Avoid lifting, change posture	13	12.5
Avoid lifting, change posture, stop work when pain	13	12.5
Avoid lifting, less manual therapy, change posture, stop work when pain	8	7.7
Avoid lifting, stop work when pain	2	1.9
Change posture, stop work when pain	2	1.9
Total	104	100.0

The distribution of physiotherapists based on altered work habits is depicted in table 21. After modified working habits, 25 (24.0%) physiotherapists avoided lifting and performed less manual therapy; 21 (20.2%) physiotherapists changed their posture; 20 (19.2%) physiotherapists avoided lifting, changed posture, performed less manual therapy and stopped working when in pain; 13 (12.5%) physiotherapists avoided lifting and changed posture; 13 (12.5%) physiotherapists avoided lifting, changed posture and stopped working when in pain; 8 (7.7%) physiotherapists avoided lifting, reduced manual therapy, changed posture and stopped working when in pain; 2 (1.9%) physiotherapists avoided lifting and stopped working when in pain and another 2

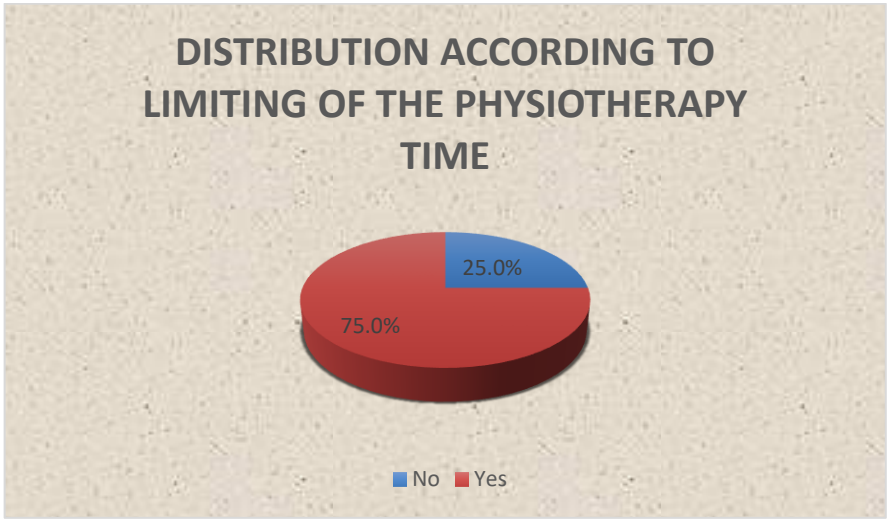
(1.9%) physiotherapists changed posture and stopped working when in pain. Nearly all the physiotherapists either avoided or performed less of those activities which caused them pain.

Table 22
Distribution of physiotherapists pursuant to Limiting of the physiotherapy time

(N=104)

Limiting of physiotherapy time	Number	Percentage
No	26	25.0
Yes	78	75.0
Total	104	100.0

Table 22 depicts the distribution of physiotherapists pursuant to limiting of the physiotherapy time. After injury, 78 (75.0%) physiotherapists limited their physiotherapy time.



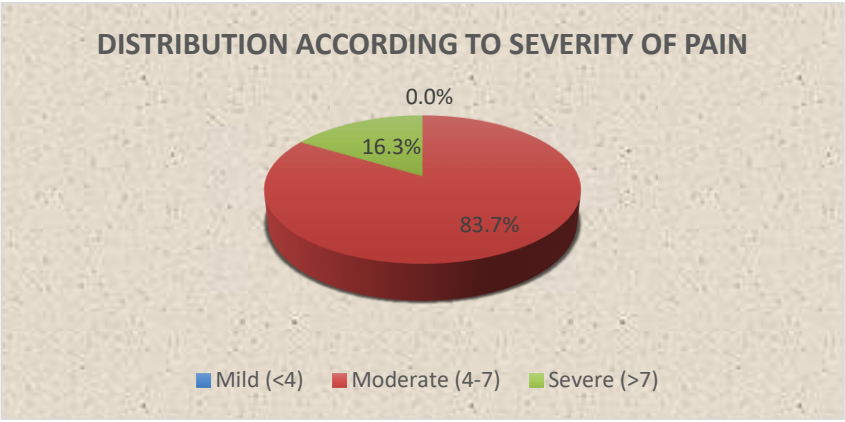
Graph 19 : The distribution of physiotherapists in response to the time limit for physiotherapy is depicted in a pie chart

Table 23
Distribution of physiotherapists pursuant to severity of pain

(N=104)

Severity of Pain (VAS)		Number	Percentage
Mild	(<4)	0	0.0
Moderate	(4-7)	87	83.7
Severe	(>7)	17	16.3
Total		104	100.0

Table 23 depicts the distribution of physiotherapists pursuant to severity of pain. Severity of pain was assessed using Visual Analogue Scale (VAS) on a scale of 0-10. A score of less than 4 was considered as mild, between 4-7 was considered as moderate and more than 7 was considered as severe. 87 (83.7%) physiotherapists said they had moderate pain and 17 (16.3%) physiotherapists said they had severe pain. Majority of the physiotherapists experienced moderate pain.



Graph 20 : The distribution of physiotherapists according to pain severity is depicted in a pie chart

Table 24
Association between age and the work related musculoskeletal injury

(N=500)

Age	Work Related Musculoskeletal Injury		Total	χ2 value	P value
	No	Yes			
20-25 years	83	22	105	0.002, df=2	0.999, NS
26-30 years	233	61	294		
31-35 years	80	21	101		
Total	396	104	500		

Pearson chi-square test. P=0.999, Not significant

Table 24 illustrates the association between age and work-related musculoskeletal injuries. There was no statistically significant association seen between age and the work related musculoskeletal injury (p=0.999), showing that the work related musculoskeletal injury is not dependent on the age of the physiotherapists. Any physiotherapist can have musculoskeletal injury irrespective of their age.

Table 25
Association between gender and the work related musculoskeletal injury

(N=500)

Gender	Work Related Musculoskeletal Injury		Total	χ2 value	P value
	No	Yes			
Female	205	54	259	0.001, df=1	0.977, NS
Male	191	50	241		
Total	396	104	500		

Pearson chi-square test. P=0.977, Not significant

The relationship between gender and musculoskeletal injuries caused by work is depicted in table 25. There was no statistically significant association seen between gender and the work related musculoskeletal injury (p=0.977), showing that the work related musculoskeletal injury is not dependent on the gender of the physiotherapists. Any physiotherapist can have musculoskeletal injury irrespective of their gender.

Table 26
Association between doing exercise and the work related musculoskeletal injury

(N=500)

Doing Exercises	Work Related Musculoskeletal Injury		Total	$\chi 2$ value	P value
	No	Yes			
No	154	41	195	0.010, df=1	0.921, NS
Yes	242	63	305		
Total	396	104	500		

Pearson chi-square test. P=0.921, Not significant

The relationship between working out and work-related musculoskeletal injuries is shown in table 26. There was no statistically significant association seen between doing exercises and the work related musculoskeletal injury (p=0.921), showing that the work related musculoskeletal injury is not dependent on the performing of exercises by the physiotherapists. Any physiotherapist can have musculoskeletal injury irrespective of their doing or not doing exercises.

Table 27
Association between years of work experience and the work-related musculoskeletal injury

(N=500)

Years of work experience (Years)	Work Related Musculoskeletal Injury		Total	χ2 value	P value
	No	Yes			
0-2	90	24	114	0.031, df=4	1.000, NS
2-4	155	40	195		
5-6	33	9	42		
7-8	79	21	100		
9-10	39	10	49		
Total	396	104	500		

Pearson chi-square test. P=1.000, Not significant

The relationship between work-related musculoskeletal injuries and years of experience can be seen in table 27. There was no statistically significant association seen between years of work experience and the work-related musculoskeletal injury (p=1.000), showing that the work-related musculoskeletal injury is not dependent on the years of experience of the physiotherapists. Any physiotherapist can have musculoskeletal injury irrespective of their work experience.

Table 28
Association between contact hours with the patients and the work related musculoskeletal injury

(N=500)

Contact hours with the patients (Hours)	Work Related Musculoskeletal Injury		Total	χ2 value	P value
	No	Yes			
8	27	7	34	0.023, df=3	0.999, NS
9	172	46	218		
10	69	18	87		
11	128	33	161		
Total	396	104	500		

Pearson chi-square test. P=0.999, Not significant

The relationship between the number of hours spent interacting with patients and work-related musculoskeletal injuries is depicted in table 28. There was no statistically significant association seen between number of contact hours with the patients and the work related musculoskeletal injury (p=0.999), showing that the work related musculoskeletal injury is not dependent on number of contact hours of physiotherapists with the patients. Any physiotherapist can have musculoskeletal injury irrespective of number of contact hours with the patient.



CHAPTER-5

DISCUSSION



DISCUSSION

Our study included 500 physiotherapists, the majority of whom were between the ages of 23 and 32, with a slight preference for women. The average age being 27.87 ± 2.88 years. All of the participating physiotherapists are younger adults. About 39% of people regularly exercised. When compared to the men in the study, the majority were women **(Adegoke *et al.*, 2008; Nordin *et al.*, 2011; Chung *et al.*, 2013; Maheshwari *et al.*, 2015)**, which is comparable to our study findings, but with a slight but non-significant predominance seen in the present study.

The majority of physiotherapists had three to four years of experience, with some having up to ten years. Every physiotherapist reported at least 8 hours of patient contact, with the majority working 9 hours per day and some working up to 11 hours. **Molumphy *et al.*, (1985)** conducted a study on physiotherapists with 1 to 4 years of experience. **Mierzejewski et al., (1997); West et al., (2001)** conducted the study on physiotherapists with less than or equal to 5 years of experience, while **Nyland *et al.*, (2003)** did a study on aspiring physiotherapists and, **Shehab *et al.*, (2003)** study enrolled physiotherapists of age more than 35 years. The present study included physiotherapists with any length of work experience.

Our study's prevalence of work-related musculoskeletal disorders (WRMSDs) was lower than that of many other authors, at 104 out of 500 (20.8%). The prevalence in the United States was 61% **(Bork *et al.*, 1996)**, in Australia it was 91% **(Cromie *et al.*, 2000)**, and in Nigeria it was 91.3% **(Adegoke *et al.*, 2008)**. This is equivalent to a study that reported an prevalence of 20.7 percent **(Campo *et al.*, 2008)**. One possible

explanation for this low incidence could be that the greater part of physiotherapists had fewer years of experience providing physiotherapy.

Most of our physiotherapists experienced pain for at least two to three weeks, with the remaining experiencing pain for longer than two months. A small number of them reported feeling pain radiating to their thighs. The majority of physiotherapists described their pain as moderate, with 16.3% reporting severe pain.42% of the physiotherapists reported experiencing pain that lasted for more than 3 days **(Glover *et al.*, 2002)**.

Due to musculoskeletal injuries caused by work, nearly 60% took sick leave for at least a week, ranging from one to more than 14 days, as seen in the present study.

Work-related musculoskeletal disorders had no correlation in our investigation with age; gender; doing workouts; a long history of employment; and contact hours with patients ($p>0.05$). Age, work hours per week, and years of experience were all found to be comparable between participants with and without WMSDs ($P > 0.05$) **(Nordin *et al.*, 2011)**, which supports our study findings.

The most prevalent diagnoses in this study were tendinitis, ligament sprain, and muscle spasm. Approximately 2% of physiotherapists had a vertebral disc problem.52% experienced pain in the lower back, 23% in the shoulder, 17% in the neck, and about 8% in both the shoulder and the lower back. While performing the work, 84% felt pain. After an injury, 84% of physiotherapists reported an increase in pain. The low-back, hand-wrist, shoulders and neck were the most commonly affected areas in physiotherapists **(Bork *et al.*, 1996; Salik *et al.*, 2004; and Ganiyu *et al.*, 2015)**, while

upper back and elbow were less affected **(Ganiyu *et al.*, 2015)**, and the upper back and the neck were also mostly affected **(Bork *et al.*, 1996)**. Our results slightly vary with the study done by **Bork *et al.*,** who found higher prevalence of upper back and neck pain in their participants, while the same was not seen in the present study.

In the current study, we found that around 60% of physiotherapists said that staying in the similar position for a long-time hurt. Approximately 55% of them reported experiencing pain as a result of lifting objects, 48% as a result of bending and twisting, 42% as a result of providing manual therapy, 41% as a result of performing repetitive tasks, 40% as a result of performing overhead activities, 35% as a result of shifting the patient, 19% as a result of pushing or pulling the loads, and 13% as a result of working in awkward positions. Handling a large number of patients each day, doing repetitive works over and over, and maintaining the same stance for extended periods of time are the three most significant occupational risk factors contributing to the work-related musculoskeletal injuries **(Glover *et al.*, 2002)**. Workplace posture and movements, lifting or carrying, and patient-related factors all contributed to musculoskeletal disorders in physiotherapists **(Passier *et al.*, 2011)** Manual therapy is associated with 3.5 times higher risk of work-related musculoskeletal disorders **(Nordin *et al.*, 2011)**. The working stance, length of work-hours, bending, lifting, twisting, and manual therapy are all associated with the development of work-related musculoskeletal disorders in these physiotherapists.

In our study, 13% physiotherapists had taken physician consultation for their work-related musculoskeletal disorders. Nearly 69% of the physiotherapists sought medical

attention for their pain **(Salik *et al.*, 2004)**, the prevalence reported is much lower in the present study.

All of these physiotherapists work with a variety of musculoskeletal conditions on a daily basis. They dealt with these work-related musculoskeletal ailments using a range of coping strategies. Many people embraced posture adjustment to lessen the discomfort they felt while working, which decreased the load on their musculoskeletal systems. The biggest factor generating extreme pain in physiotherapists was manual therapy. The physiotherapists either curtailed or avoided manual treatment as a result of this. After that, raising the patient also resulted in excruciating lower back discomfort. In order to reduce their back discomfort, physiotherapists either refrained from lifting their patients or enlisted the assistance of their aides. To manage their work-related musculoskeletal illnesses, many physiotherapists either reduced the amount of time they spent practicing their profession or quit their occupations entirely. Physiotherapists modified their working posture or the posture of their patient, while working to cope with their work-related musculoskeletal disorders **(Adegoke *et al.*, 2008)**. Nearly one-third of them left their profession and more than 60% of the physiotherapists, modified the way they treated their patients **(Salik *et al.*, 2004)**. Work allocation, modification in work practices, work environment and equipment, physical condition and capacity, and education and training were adopted by the physiotherapists to cope with the work-related musculoskeletal disorders **(Passier *et al.*, 2011)**. All of the studies concluded that some of the coping mechanisms used by individuals to deal with their job-related musculoskeletal difficulties included changing their working style, refraining from doing laborious tasks, or delegating their

work. In some severe circumstances, these physiotherapists abandoned their jobs or professions, yet these coping mechanisms allowed them to keep up their professions.

LIMITATION OF THE STUDY

The only limitation of the study was that the results are entirely dependent on the information provided by the physiotherapists. As a result, the physiotherapists' bias in filling in the data could cause the results to be either underestimated or overestimated.

FUTURE SCOPE OF THE STUDY

We recommend that, the physiotherapists ought to develop coping mechanisms and adhere to them consistently. They will be able to get some relief from their pain as a result of this, and they will be able to continue the clinical practice they enjoy.



CHAPTER-6

CONCLUSION



CONCLUSION

Physiotherapists frequently encounter work-related musculoskeletal disorders (WRMSDs). Ergonomics issues during work are the most common cause of these disorders. The lower back is most commonly affected, and this disorder frequently results in absence from work. The most prevalent diagnoses are tendinitis, ligament sprain, and muscle spasm. According to our research, the only way to manage this condition is to alter one's lifestyle while practicing physiotherapy.



CHAPTER-7

SUMMARY



SUMMARY

The present research entitled "***A Study on Prevalence of Work-Related Musculoskeletal Disorders Amongst Physiotherapists of Indore and Surrounding Region***" was conducted on 500 physiotherapists who were in clinical practice at the time of survey. The present study was a questionnaire-based survey.

Of the 500 physiotherapists included in the study, majority of them (58.8%) were in the age group 26-30 years, with female preponderance. More than half of the physiotherapists had less than 6 years of clinical practice as a physiotherapist. Most of the physiotherapists were devoting nearly 9 or more hours to their clinical practice. In our study work-related musculoskeletal disorders were seen in 20.8% physiotherapists. Tendinitis, ligament sprain, and other muscular spasms (areas other than neck, shoulder and low-back) were most common areas of injury.

Of the physiotherapists with work-related musculoskeletal injuries, lower back (51.9%), shoulder alone (23.1%) and neck alone (17.3%) were the most common affected areas seen in these physiotherapists. 83.7% physiotherapists experienced pain while working. Majority of these physiotherapists experienced pain of less than or equal to 2-3 weeks.

Of the physiotherapists with work-related injuries, manual therapy (43.3%), bending and twisting (23.1%), maintaining same position for long (16.3%) and lifting (13.5%) were the most common activities responsible for pain.

These injuries were found to restrict the physiotherapists from performing their work properly. More than half of them took sick leave, which extended from 1 to 7 days each time. Only a few of them took physician consultation for pain. 83.7% physiotherapist found that the pain severity increased after they had sustained work-related musculoskeletal injury. Of all the activities performed by physiotherapists, maintaining same position for long, lifting, bending and twisting, manual therapy, repetitive tasks and overhead activities proved to be enervative to these physiotherapists.

To cope with these work-related musculoskeletal disorders, all these physiotherapists modified their working pattern. These changes include – reduction in the use of manual therapy, avoid lifting, changing posture and to stop working when in pain.

More than 3/4th of the physiotherapists limited their physiotherapy time to cope with their pain. Every physiotherapist experienced moderate to severe pain.

Even though the physiotherapists themselves are aware of these issues and know how to deal with them, it was observed that they are unable to avoid sustaining these injuries. Physiotherapists should be well-managed for work-related musculoskeletal disorders so they don't quit their jobs.



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2. Khurana R, Jain DC (2022) Effect of Core Stabilization Exercises in Physiotherapist with Work Related Musculoskeletal Disorders Involving Lower Back. *European Journal of Molecular & Clinical Medicine*. 9(2):1783-8.

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Work Related Musculoskeletal Disorders in Physiotherapists: Challenges and Coping Strategies WRMSDs in Physiotherapists

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Abstract:- Background: Work-related musculoskeletal disorders (WRMSDs) is a debilitating condition which affects the younger age physiotherapists. The etiology is their professional working pattern. Reason for sick leaves and loss of work hours have been attributed to WRMSDs. Even though physiotherapists are aware of WRMSDs, a high prevalence is seen among them. The aim was to find out the prevalence and risk factors for WRMSDs in physiotherapists working in Indore city.

Material: 500 physiotherapists participated in this cross-sectional observational study. Questionnaire was used for collecting the data. Young physiotherapists working at least for 8 hours daily with at least 1 year of experience were included. Association between demographic variables and the WRMSDs was done using Pearson Chi-square Test.

Results: The prevalence of WRMSDs was 20.8% in our study. Tendinitis, muscular spasms and ligament sprain were the most common. Lower back pain was complained by most of them. 2-3 weeks of persistent pain was reported. 58.7% took sick leave due to WRMSDs with a duration of 1-14 days. Maintaining same position (59.6%), lifting heavy objects (55.8%), bending and twisting (48.1%), manual therapy (42.3%) and repetitive work (41.3%) were the main etiology of pain. Avoidance of lifting, manual therapy time reduction, posture change and avoiding work when in pain were the common coping strategies adopted by them. There was no relationship between demographic variables and WRMSDs ($p>0.05$).

Conclusion: WRMSDs were seen among young physiotherapists and to cope with that they avoided lifting heavy objects, reduced manual therapy time and avoided work when in pain.

Keywords:- *Work-Related Musculoskeletal Disorders, Manual Therapy, Low Back Pain, Changed Posture, Stop Working When in Pain, Coping Strategies for WRMSDs.*

I. INTRODUCTION

Work-related musculoskeletal disorders (WRMSDs) is defined as pain persisting for more than 3 days owing to their professional work[1]. Physiotherapists are more commonly affected by WRMSDs[2]. Majority of the review done on this topic deals with back pain,[3,4,5,6] but this understates the wide range of issues that might arise. One study[4] done on physical therapists reported a prevalence of 29% of back pain. It was more common in younger therapists. Physical therapists experience more of this pain during their first 4 years of professional experience. One of the largest studies done on physical therapists looked at nine distinct body locations. They reported that low back pain is the commonest of work-related musculoskeletal disorders, followed by wrists and hands, upper back, neck and shoulders, elbows, hips and thighs, knees and ankles and feet in this decreasing order. Spinal symptoms were more common in female and wrist and hand symptoms more in male therapists.

The activities performed by the physical therapists contributes to work-related musculoskeletal disorders. Vibration has an effect on tendons, muscles, joints, and nerves, causing numbness in the fingers, loss of touch, grip, and pain; force of movement and repetitive motion; work posture; posture; perception of low support (coworkers); long-term position; reaching behind the body and backward or twisted movement.

The length of time spent exposed is a significant determinant in the development of musculoskeletal problems. The total exposure period, as well as the number of repetitions per unit time (e.g., each day), are the major determinants (e.g., per day or days per month). The overall load on the musculoskeletal system is determined by the levels of several load factors, such as: The level and direction of forces; duration of exposure; number of times an exertion is performed per unit of time and postural demands.

Manual therapy, such as soft-tissue mobilisation, is commonly performed by physical therapists, exposing the upper limb to risk factors linked with musculoskeletal and neurovascular problems. These experts also undertake tasks such as transferring a patient (from exercise mat to chair to parallel bar, etc.), assisting with activities on the exercise mat, and lifting and using heavy equipment on a regular basis. Therapists are at risk for both acute and chronic musculoskeletal pain as a result of their work[7]. Aside from the nature of therapists' jobs, working in certain clinical specialisations in physiotherapy has also been linked to work-related injuries. One of the most prominent risk factors for the development of WRMSDS was a high BMI.[2]

According to Kroemer, providing alternating activity "that permits breaks in otherwise repetitive or sustained activity" is critical in preventing such diseases.[8] WRMSDS are widely seen in physiotherapists and are constantly expanding.[8]

Despite the fact that physiotherapists have comprehensive understanding of musculoskeletal injuries and injury prevention measures as a result of their training and ongoing professional development, they nonetheless report a high rate of work-related injuries throughout their professional practice.[2]

The present study was undertaken to determine the prevalence and risk factors for work related musculoskeletal disorders (WRMDS) among the practicing physiotherapists of Indore city and to find out the coping strategies adopted by these physiotherapists to deal with work-related musculoskeletal disorders.

II. PARTICIPANTS AND METHOD

The present cross-sectional observational study was conducted in Department of Physiotherapy, Index Medical College, Indore (M.P.) during the period October 2018 To April 2019. We had included 500 practicing physiotherapists working in various hospitals and clinics of Indore city using purposive sampling technique. The inclusion criteria for the study was: Physiotherapist who are doing their clinical practice for a minimum duration of 8 hours per day in the age group 22-32 years of either gender and having at least 1 year of clinical experience and willing to provide their voluntary written informed consent to participate in this study. The exclusion criteria was: Physiotherapists who are in the administrative duty, academics or performing non-clinical work, females physiotherapists who are pregnant, those going to gym for their fitness and those having a fracture of either neck, shoulder or low back region and also those who were not willing to provide consent for participation.

Questionnaire

We had developed a customized self-administered questionnaire for the study. The contents of which were validated by three experts. Two physiotherapists (one internal and one external) and an orthopedic surgeon validated and all three approved to the designed questionnaire.

The questionnaire consisted of two parts: a) Personal information and b) Questions related to musculoskeletal problems.

The personal information inquired about the age, sex, height (cm), weight (kg) and if the physiotherapist is doing some exercises. While the second part inquired about musculoskeletal problems such as Years of experiences, number of contact hours with patients. Number of sick leave, activities responsible for pain like bending and twisting, lifting, maintaining a position for prolong period of time, performing repetitive tasks, alteration in work habits and NPRS, etc. The second part consisted of closed-ended questions with multiple choices. All these information were filled by each physiotherapist.

Methodology

The researcher met each physiotherapist in person and explained in detail about the purpose of the study, how this study will help the physiotherapists in future, etc. After evaluating the inclusion criteria and exclusion criteria and after finding the physiotherapist to be eligible for participation, the self-administered questionnaire was given to the physiotherapist. Prior to this, a written informed consent for participation in the study was obtained from each physiotherapist. Instructions on how to fill the questionnaire was given and then duly filled questionnaires were collected back from the physiotherapist. Each questionnaire was checked for their completeness and clarity of information.

After collecting the 500 questionnaires which were complete in all respects, like complete information, all fields properly filled and legibility, the data from these questionnaires was transferred to Microsoft Excel for analysis.

Descriptive statistics were presented in the form of number of percentages and association between demographic variables and the presence / absence of work related musculoskeletal disorders was evaluated using Pearson Chi-square test. A p value of < 0.05 was taken as statistically significant.

The present study was not funded by any institution and all the expenses related to the study were borne by the researcher.

III. RESULTS

We had included 500 physiotherapists in the present study. Majority of the physiotherapists (58.8%) were in the age group of 26-30 years, 21% in 20-25 years and 20.2% in 31-35 years age group. The mean age was 27.87 ± 2.88 years. There was a slight female predominance in the study (51.8%). 39% of the physiotherapists were doing exercises regularly, while the rest 61.0% were not doing them. Majority of the physiotherapists had an experience between 3-4 years (39.0%), while 22.8% had 0-2 years of experience and 20% had 7-8 years of experience. The experience of these physiotherapists ranged from 1 to 10 years. Each physiotherapist was having at least 8 hours contact time with the patients, ranging upto 11 hours each day. Majority of them (43.6%) were having 9 hours contact time and 32.2% were having 11 hours of contact time. Of these 500 physiotherapists included, only 104 (20.8%) physiotherapists reported to have work related musculoskeletal disorders (WRMSDs).

21 (20.2%) were suffering from ligament sprain, 6 (5.8%) were suffering from muscle spasm, 4 (3.8%) from muscle strain, 33 (31.7%) from other muscular spasms, 38 (36.5%) from tendinitis and 2 (1.9%) were suffering from vertebral disc problem. (Table I)

In 54 (51.9%) physiotherapists the main area of involvement was the lower back, in 24 (23.1%) physiotherapists shoulder alone was involved, in 18 (17.3%) physiotherapists neck alone was involved and in 8 (7.7%) physiotherapists shoulder along with lower back was involved.

87 (83.7%) physiotherapists experienced pain while doing the work, while 17 (16.3%) physiotherapists did not experience any such pain. (Table II)

In the last 12 months, in 23 (22.2%) physiotherapists the pain remained for 1-7 days, in 40 (38.5%) physiotherapists it remained for 2-3 weeks, in 37 (35.6%) physiotherapists it remained for 2-3 months and in 4 (3.8%) physiotherapists it remained for more than 3 months. In 2 (1.9%) physiotherapists the pain was radiating and it mostly radiated to the thigh region.

In 45 (43.3%) physiotherapists manual therapy was responsible for pain, in 24 (23.1%) physiotherapists pain was during bending and twisting, in 17 (16.3%) physiotherapists pain was due to maintaining same position for long, in 14 (13.5%) physiotherapists pain was due to lifting and in 2 (1.9%) physiotherapists each the pain was due to awkward position and while transferring the patient, respectively. (Table III)

61 (58.7%) physiotherapists had taken sick leave for their work related musculoskeletal injuries. Duration of sick leave ranged from 1 to more than 14 days. Majority of them (45.9%) taking sick leave of 1-7 days. For their problems, 14 (13.5%) had taken consultation from doctor. In 87 (83.7%) physiotherapists the pain increased after sustaining an injury.

In 62 (59.6%) physiotherapists maintaining the same position increased the pain, in 58 (55.8%) physiotherapists pain increased due to lifting objects, in 50 (48.1%) due to bending and twisting, in 44 (42.3%) due to giving of manual therapy, in 43 (41.3%) due to performing of repetitive tasks, in 42 (40.4%) due to performing overhead activities, in 36 (34.6%) while transferring the patient, in 20 (19.2%) pain increased due to pushing or pulling loads and in 13 (12.5%) due to remaining in awkward position. (Table IV)

All the physiotherapists changed their working habits after an injury. They either avoided or performed less of those activities which caused them pain. 25 (24.0%) avoided lifting and performed less manual therapy; 21 (20.2%) changed their posture; 20 (19.2%) avoided lifting, changed posture, performed less manual therapy and stopped working when in pain; 13 (12.5%) avoided lifting and changed posture; 13 (12.5%) avoided lifting, changed posture and stopped working when in pain; 8 (7.7%) avoided lifting, reduced manual therapy, changed posture and stopped working when in pain; 2 (1.9%) avoided lifting and stopped working when in pain and another 2 (1.9%) changed posture and stopped working when in pain. 78 (75%) limited or reduced their physiotherapy time.

The severity of the pain was assessed using visual analogue scale (VAS). 87 (83.7%) physiotherapists said they had moderate pain and 17 (16.3%) physiotherapists said they had severe pain.

In our study we did not find any relationship of age; gender; doing exercises; years of work experience; contact hours with the patients and work related musculoskeletal disorders ($p>0.05$).

DISTRIBUTION OF PHYSIOTHERAPISTS ACCORDING TO TYPE OF WORK RELATED MUSCULOSKELETAL INJURIES

Type of work related musculoskeletal injuries	Number	Percentage
Tendinitis	38	36.5
Other muscular spasms	33	31.7
Ligament sprain	21	20.2
Muscle spasm	6	5.8
Muscle strain	4	3.8
Vertebral disc problem	2	1.9
Total	104	100.0

DISTRIBUTION OF PHYSIOTHERAPISTS ACCORDING TO AREA OF INVOLVEMENT

Area of Involvement	*Number*	*Percentage*
Lower back	54	51.9
Shoulder alone	24	23.1
Neck alone	18	17.3
Shoulder with lower back	8	7.7
Total	104	100.0

DISTRIBUTION OF PHYSIOTHERAPISTS ACCORDING TO THE ACTIVITY RESPONSIBLE FOR PAIN

Activity Responsible for Pain	*Number*	*Percentage*
Manual therapy	45	43.3
Bending and twisting	24	23.1
Maintaining same position for long	17	16.3
Lifting	14	13.5
Awkward position	2	1.9
Transferring the patient	2	1.9
Total	104	100.0

DISTRIBUTION OF PHYSIOTHERAPISTS ACCORDING TO ACTIVITIES WHICH INCREASES THE PAIN

Activity which increases the pain	*Number*	*Percentage*
Maintaining same position for long	62	59.6
Lifting	58	55.8
Bending and twisting	50	48.1
Manual therapy	44	42.3
Repetitive tasks	43	41.3
Overhead activities	42	40.4
Transferring patient	36	34.6
Pushing or pulling loads	20	19.2
Awkward position	13	12.5

IV. DISCUSSION

We had included 500 physiotherapists in our study who were mostly in the age range of 23-32 years, with a slight female preponderance. The mean age was 27.87 ± 2.88 years. All the physiotherapists who participated are young adults. Around 39% were doing regular exercises. A study done on Nigerian physiotherapists reported a significantly higher incidence in females[9], while we found only a slight predominance, but not significant one.

Most of the physiotherapists had an experience between 3-4 years with an experience range upto 10 years. At least 8 hours of patient contact time was reported by every physiotherapist with majority of them working for 9 hours a day and in some it even went upto 11 hours.

The incidence of work-related musculoskeletal disorders (WRMSDs) in our study was 104 out of 500 (20.8%) which is lower than that reported by many authors. The reported prevalence in USA was 61%[10], in Australia it was 91%[11] and in Nigeria it was 91.3%,[9] while it is comparable to a study which reported an incidence of 20.7%.[12] The probable reason for this low incidence could be that majority of the physiotherapists had a lesser number of years of experience in doing physiotherapy.

Majority of our physiotherapists remained in pain for at least 2-3 weeks, around one-fifth of them experienced pain of less than 7 days and rest had pain of more than 2 months. With a small percentage of them reporting of radiation of pain to the thigh region. Majority of the physiotherapists reported moderate pain, while 16.3% reported severe pain. In a study done by Glover et al[13] reported that 42% of their physiotherapists experienced pain of more than 3 days.

Nearly 60% of took sick leave due to work related musculoskeletal injuries and at least for a period of 1 week, with a range from 1 to more than 14 days.

In our study we found no relationship between age; gender; doing exercises; years of work experience; contact hours with the patients and work-related musculoskeletal disorders ($p>0.05$). These findings are comparable with the study done by Nordin et al[2] who also found that age, work hours per week and years of experience did not differ significantly among participants who reported WMSDs and those who did not experience WRMSDs ($P > 0.05$).

Tendinitis, ligament sprain and muscle spasm were the commonest diagnosis seen in the present study. Around 2% physiotherapists were suffering from vertebral disc problem. Lower back was involved in 52%, shoulder alone in 23%, neck alone in 17% and around 8% experienced pain in both the shoulder and the lower back. 84% experienced pain while performing the work. 84% physiotherapists reported increase in pain after sustaining an injury. Salik et al[7] also reported that 26% had injuries occurring mostly in the low back, hand-wrist in 18%, shoulders in 14% and neck in 12% physiotherapists. Ganiyu et al[14] reported that among health care workers the most common complaint was low back pain (71.6%), followed by shoulder (46.7%), and neck (42.2%). The upper back (14.7%) and elbow (8.3%) were the areas of the body that were least impacted.

Around 60% physiotherapists reported pain due to remaining in the same position for long periods of time. With around 55% of them reporting pain due to lifting of the objects, 48% due to bending and twisting, 42% experienced pain while giving manual therapy, 41% reported pain while performing repetitive tasks, 40% due to performing overhead activities, 35% reported pain during shifting of the patient, 19% reported pain while pushing or pulling the loads and 13% reported while working in awkward positions. A study[13] reported three most significant occupational risk factors contributing to injury are performing the same duties over and again, working in the same posture for extended periods of time, and treating a high number of patients in one day. Passier et al[15] in their study also reported work postures and movements, lifting or carrying, patient related factors and repetitive tasks to be the risk factors for work related musculoskeletal disorders. Nordin et al[2] in their study reported that manual therapy has been linked to an increased risk of WRMD, with health care workers who conducted manual therapies on a regular basis having 3.5 times the risk of musculoskeletal injuries as those who did not.

Consultation from a doctor was taken by 13% physiotherapists. Salik et al[7] reported that 69% of their physiotherapists visited a physician for their pain.

To cope with these disorders, in the present study, all the physiotherapists modified their working life-style in such a way that it reduced pain and reduced the stress on their musculoskeletal system. Majority of them avoided lifting and performed less manual therapy; many changed their posture; many of them stopped work when they are in pain and nearly one-third physiotherapists limited or reduced their physiotherapy time. According to the study done by Adegoko et al[9] to cope with the WRMDs 64.3% physiotherapists modified their position and/or the patient's position. 13% of physiotherapists left their profession and 62.6% modified the method of treatment due to their WRMDs. Salik et al[7] in their study reported that 33% of the physiotherapists had limited their patient contact time due to injury. Passier et al[15] in their study identified the problems and found organisational strategies, workload or work allocation, work practices, work environment and equipment, physical condition and capacity, and education and training to be the strategies to cope with these disorders.

The only limitation of the study was that the results are completely dependent on the information given by the physiotherapists, which may carry the physiotherapist's bias while filling the data and this may either underestimate or overestimate the results.

V. CONCLUSION

Work-related musculoskeletal disorders (WRMSDs) are commonly encountered by physiotherapists. The most common cause of these disorders is related to ergonomics while performing the work. Lower back is most commonly affected and, in many situations, there is absence from duty. Tendinitis, ligament sprain and muscle spasm are the commonest problems seen. In our study, we found that modification in the lifestyle while doing the professional work is the only solution to cope with these conditions.

ACKNOWLEDGMENT

We thank all the physiotherapists for giving their valuable time for filling the questionnaire. Because of their valuable inputs we are able to bring forward the real life challenges

faced by them and provide inputs for the future physiotherapists for coping strategies to be adopted to combat these WRMSDs.

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Publication No. 2

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Effect of Core Stabilization exercises in Physiotherapist with work related Musculoskeletal disorders involving Lower back.

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[2]Maharaj Vinayak Global University, Jaipur, India
First Author: Dr. ReshmaKhurana
Corresponding Author: Dr. D.C. Jain

Abstract:
Background &Method: The aim of this study is to study the Effect of Core Stabilization exercises in Physiotherapist with work related Musculoskeletal disorders involving Lower back. Out of 54 subject, 50 volunteered for participation in the study. Of them, 4 were screened out on the basis of exclusion criteria. Remaining subjects (50 in number) were divided into control group (group A) and experimental group (group B). group A had 25 subjects and group B had 25 subjects.

Result:

Conclusion: This study concludes that core stability training is effective in improvement of lower trunk endurance performance. Previous studies have shown that trunk endurance performance is directly linked to the prevention of low back pain and the improvement in sports performance. Thus core stability training is effective to lower the risk of developing low back pain or low back injury among recreationally active population. The present study evaluated only the isometric endurance performance, thus further studies may evaluate the effect of core stabilization training on the dynamic lower trunk endurance performance.

Keywords: Core, Stabilisation, Physiotherapist & Musculoskeletal.

Study Designed: Prospective Observational Study.

1. INTRODUCTION

Low back pain is an extremely common patient complaint with approximately 80% of the World population developing low back pain at some point[1]. It is the main cause of years lived with disability[2]. It is among 10 of the leading reasons for patient visits to medical facilities.[4] Non-specific low back pain is tension/soreness and or stiffness in the lower back region whereby it is not possible to find a cause for the pain[3]. Most cases resolve fairly quickly, but a significant number of patients develop chronic lower back pain. Patients experience unremitting pain and often become functionally impaired. Chronic LBP represents a greater financial burden in the form of direct costs resulting from loss of work and medical expenses, as well as indirect costs.

Generally there is a scarcity of information on the prevalence and incidence of chronic low back pain, partly due to lack of agreement about its definition. Chronic low back pain is mostly defined as persistent pain occurring on most days and lasting longer than 3 months[5]. Others also define it as pain exceeding normal healing times and frequently reoccurring back pain over long periods. Acute and chronic LBP warrant separate consideration as they may respond differently to the same interventions.

The longer the patient suffers from back pain the worse the prognosis. The chance of low back pain resolving is its highest during the first week. By the end of year one that chance diminishes significantly. In 1999 reported similar outcomes at 1 year with 10% of patients complaining of the same back pain form the first episode[6]. Carey et al. 2000 found that 2/3 of patients with chronic low back pain at 3 months still had functionally disabling symptoms at 22months and only 16% of patients became symptom-free[7]. Most patients on disability for more than 6 months will not return to work. The number of patients returning to work approaches zero at 2 years.

2. MATERIAL & METHOD

METHOD

Subjects

50 physiotherapists (20 males, 30 females) the study was conducted from July 2021 to Dec 2021.

Inclusion criteria

1. without any known neuromuscular, orthopedic or cardiovascular conditions
2. area of involvement was low back only.
3. both male and female.
4. Physiotherapist who were doing clinical practice for minimum 8 hours.
5. Physiotherapist having minimum 1 year of experience.

Exclusion Criteria

1. Subjects who were participating in any fitness training program or professional sports training
2. history of any surgery or previous fracture in any part of body.
3. history of low back pain during last six months.

Materials used with reliability and validity

The Quebec pain disability scale

Core stability training exercise protocol.

Randomization

Out of 54 subject, 50 volunteered for participation in the study. Of them, 4 were screened out on the basis of exclusion criteria. Remaining subjects (50 in number) were divided into control group (group A) and experimental group (group B). group A had 25 subjects and group B had 25 subjects.

Two separate boxes (one for group A names and other for group B names) with chits having names written on it and were well shuffled. One unrelated person withdrew 10 chits from each box (thus 5 group A and 5 group B chits), and whose names appeared on the chits were allocated to groups.

Similarly another unrelated person withdrew 10 chits from each box and persons, whose name appeared on chits, were allocated to group A (control group). Thus both training and control group consisted of 25 and 25 subjects each, who was selected randomly.

Procedure

Selected candidates underwent consent taking and were explained the procedure of testing and training. All subjects received the explanation and the familiarization trials of the testing procedures. A gap of two days (to avoid the fatigue due to familiarization trials) was kept between the familiarization session and the pre-test data recording session.

Group A was control group (CG) which did not receive any training and group B was core stability training group (CSTG), which received six weeks of core stability training (Table 1). Both groups had 25 subjects each.

Participants were instructed not to change their training schedule or activity level acutely during the period of the entire study.

Protocol of the Training

Interventions were given for CSTG at a frequency of three sessions per week for six weeks (total 18 sessions). Each session lasted approximately 40—50 min (initial sessions took some less time because of lesser sets and less repetitions) for each participant. The CG did not participate in any training. The post-test readings were taken two days after the last day of the 6-week training sessions. The exercise program for CSTG consisted of progression over the period of six weeks. Initial exercises focused on the training of the deep lumbar stabilizer in isometric fashion in a variety of positions. Then the progression consisted of utilizing this contraction through a variety of functional positions

This training was carried on Swiss ball, plane surfaces in single as well as multiple planes of movements. The post-training data was recorded in both training groups as well as CG two days after the last training session.

3. RESULTS

Table 1: Descriptive Statistics of Subjects (Group Wise), Baseline Comparison.

Characteristics	**Group A (n = 25) Mean ± SD**	**Group B (n = 25) Mean ± SD**	**P Value**
Gender	28M ± 22F	32M ± 18F	
Age (years)	23.85 ± 1.38	24.62 ± 1.29	
Weight (kg)	65.8 ± 8.37	64.7 ± 10.42	
Height (cm)	168.63 ± 2.83	168.2 ± 3.51	
BMI (kg/m2)	23.15 ± 2.92	22.92 ± 3.69	

Table 2: Group A

	Mean	Std. Deviation	Minimum	Maximum
Out of bed	4.28	.737	3	5
Night sleep	4.36	.638	3	5
Bed turning	4.80	.408	4	5
Car ride	4.68	.557	3	5
Stand 20-30 Min.	4.44	.583	3	5
Sit in a chair	4.56	.583	3	5
Climb stairs	4.40	.707	3	5
Walk 300-500m	4.28	.678	3	5
Walk kilometres	4.60	.577	3	5
Reach high shelves	4.64	.569	3	5
Throw ball	4.00	.866	3	5
Run 100m	4.68	.476	4	5
Food out refrigerator	4.64	.490	4	5
Make bed	4.60	.577	3	5
Put socks	4.60	.500	4	5
Bend over	4.52	.586	3	5
Move a chair	4.44	.583	3	5
Pull or push	4.64	.490	4	5
Carry two bags	4.40	.577	3	5
Lift and carry	4.48	0.51	4	5

Table 3: Group B Pre

	Mean	Std. Deviation	Minimum	Maximum
Out of bed	1.80	.500	1	3
Night sleep	1.56	.507	1	2
Bed turning	1.76	.597	1	3
Car ride	1.52	.586	1	3
Stand 20-30 Min.	1.64	.569	1	3
Sit in a chair	1.56	.507	1	2
Climb stairs	1.72	.678	0	3
Walk 300-500m	1.44	.712	0	2
Walk kilometres	1.52	.586	1	3
Reach high shelves	1.64	.638	1	3
Throw ball	1.44	.583	1	3
Run 100m	1.68	.476	1	2
Food out refrigerator	1.24	.523	1	3
Make bed	1.84	.473	1	3
Put socks	1.52	.510	1	2
Bend over	1.44	.507	1	2
Move a chair	1.08	.759	0	2
Pull or push	1.28	.737	0	3

Carry two bags	1.76	.436	1	2
Lift and carry	1.80	.408	1	2

Table 4: Group B Post

	Mean	Std. Deviation	Minimum	Maximum
Out of bed	4.72	.458	4	5
Night sleep	4.36	.490	4	5
Bed turning	4.64	.490	4	5
Car ride	4.48	.510	4	5
Stand 20-30 Min.	4.68	.476	4	5
Sit in a chair	4.56	.507	4	5
Climb stairs	4.48	.653	3	5
Walk 300-500m	4.28	.678	3	5
Walk kilometres	4.52	.714	3	5
Reach high shelves	4.76	.436	4	5
Throw ball	3.56	.507	3	4
Run 100m	4.76	.436	4	5
Food out refrigerator	4.52	.510	4	5
Make bed	4.72	.458	4	5
Put socks	4.64	.490	4	5
Bend over	4.76	.436	4	5
Move a chair	4.32	.557	3	5
Pull or push	4.68	.476	4	5
Carry two bags	4.56	.507	4	5
Lift and carry	4.96	.200	4	5

4. DISCUSSION

Mechanical low back pain is described as a musculoskeletal painwhich varies with physical activities and not involving root compressionor serious spinal diseases[8].

The primary aim of this study was to determine performingexercises for the core stabilization resulted in reducing backpain more effectively. Exercise programs that aim to improve thestability of the lumbar spine are widely utilized in the managementof patients with chronic low back pain. These programs target avariety of trunk muscles and aim to optimize the control of segmentalmotion, spinal stability, spinal stiffness, spinal orientation,or a combination of these characteristics[10].

Franca et al compared the efficacy of two exercisesprograms-segmental stabilization and superficial strengthening ofabdominal and trunk muscles-on pain, functional disability, andactivation of the TrA muscle in individuals with chronic low backpain. Both techniques resulted in pain amelioration and reduceddisability[9&10].

Similar studies by Koumantakis and O'Sullivan of chroniclow back pain, spondylolysis or spondylolisthesis demonstrateda decrease in pain in subjects allocated to the core stabilizationgroup[11]. Core stabilization exercise enhances the ability of the segmentalmuscles that result in improved function and decreasedpain in the subject with chronic nonspecific low back pain[12].

5. CONCLUSION

This study concludes that core stability training iseffective in improvement of lower trunk enduranceperformance. Previous studies have shownthat trunk endurance performance is directlylinked to the prevention of low back pain and theimprovement in sports performance. Thus corestability training is effective to lower the risk ofdeveloping low back pain or low back injuryamong recreationally active population. The presentstudy evaluated only the isometric enduranceperformance, thus further studies mayevaluate the effect of core stabilization training onthe dynamic lower trunk endurance performance.

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CURRICULUM VITAE



CURRICULUM VITAE

Mrs. Reshma Khurana (P.T)

ACADEMIC QUALIFICATION

1. Pursuing Ph.D from Maharaja Vinayak global, university. Jaipur.

2. Masters of physiotherapy(orthopedics) : Year – 2003 – 2006
   From Indore institute of medical sciences, DAVV Indore.

   Thesis topic:
   An electromyographic study to compare the motor unit action potentials of the 4 heads of quadriceps muscle in normal individuals.

3. Bachelors in physiotherapy: Year – 1997 - 2001
   From Indore institute of medical sciences, Indore secured 7th position in university merit in BPT (DAVV,INDORE)

ACADEMIC ACHIEVEMENTS

Professor & Principal, Index Department of Physiotherapy & Paramedical Sciences, Malwanchal University, Indore, (MP)

Chairperson Board of Studies (paramedical) Malwanchal University

Chairperson board of Examination (paramedical) Malwanchal University

CEC Central Zone (IAP)

National Head PG Academic Committee in IAP.

PUBLICATIONS

1. Khurana R, Jain DC (2021) Work Related Musculoskeletal Disorders in Physiotherapists: Challenges and Coping Strategies WRMSDs in Physiotherapists. *International Journal of Innovative Science and Research Technology*. 6(2):793-7.

2. Khurana R, Jain DC (2022) Effect of Core Stabilization Exercises in Physiotherapist with Work Related Musculoskeletal Disorders Involving Lower Back. *European Journal of Molecular & Clinical Medicine*. 9(2):1783-8.

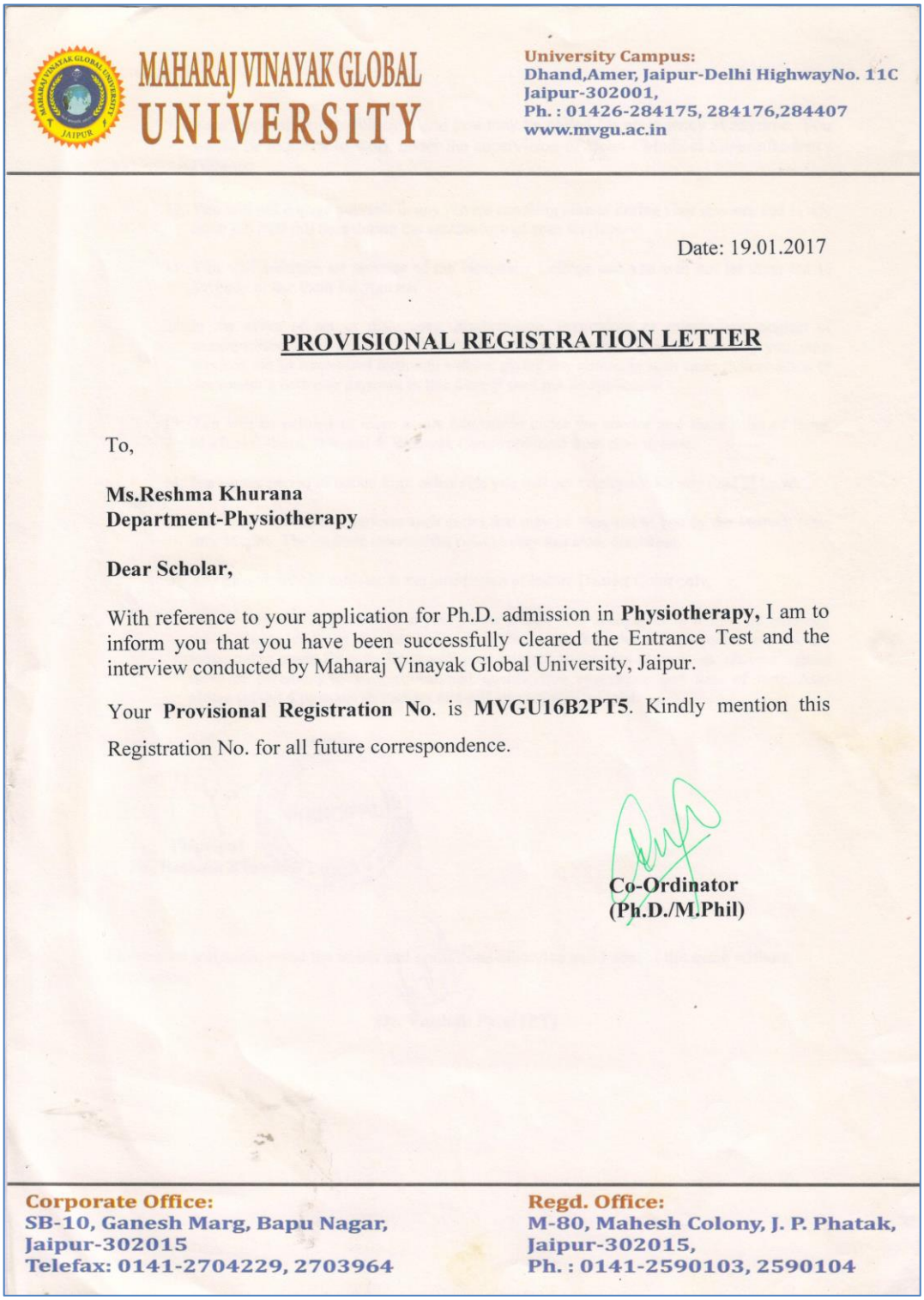


APPENDICES



Appendix-i

PROVISIONAL REGISTRATION LETTER



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Date: 19.01.2017

PROVISIONAL REGISTRATION LETTER

To,

Ms.Reshma Khurana
Department-Physiotherapy

Dear Scholar,

With reference to your application for Ph.D. admission in **Physiotherapy,** I am to inform you that you have been successfully cleared the Entrance Test and the interview conducted by Maharaj Vinayak Global University, Jaipur.

Your **Provisional Registration No**. is **MVGU16B2PT5**. Kindly mention this Registration No. for all future correspondence.

Co-Ordinator
(Ph.D./M.Phil)

Corporate Office:
SB-10, Ganesh Marg, Bapu Nagar,
Jaipur-302015
Telefax: 0141-2704229, 2703964

Regd. Office:
M-80, Mahesh Colony, J. P. Phatak,
Jaipur-302015,
Ph. : 0141-2590103, 2590104

Appendix-ii

INFORMED CONSENT FORM

INFORMATION FOR PARTICIPANTS OF THE STUDY

1. **Title of the Thesis:** A Study on Prevalence of Work-Related Musculoskeletal Disorders Amongst Physiotherapists of Indore and Surrounding Region.

2. **Name of the investigator:**
Reshma Khurana

Name of the guide:
Dr. Dharam Chand Jain

3. **Purpose of this study:**
The purpose of this study is to find out the prevalence of work-related musculoskeletal disorders amongst the physiotherapists of Indore and surrounding regions. To identify the most important risk factors for the area affected and to identify the coping strategies adopted by these physiotherapists in overcoming the work-related musculoskeletal disorders.

4. **Procedure / method of the study:**

After meeting the inclusion criteria the participants will be explained regarding the purpose of the study.
A self-administered questionnaire will be used for study in order to analyze the WRMSDS and it is distributed by hand.
Consent form will be duly signed from physiotherapists before filling up the questionnaire.
Participants will be selected using purposive sampling technique. Questionnaire will be administered to each physiotherapist and will be given time to fill the whole questionnaire.
The questionnaire includes diagrams with the anatomical regions clearly marked.

Questionnaire includes 2 parts:

Personal characteristics: Age, sex, height (cm), weight (kg).

Musculoskeletal problems according to the anatomical area (Neck, shoulder and low back); years of experience; number of contact hours with the patients; number of sick leave, activities which aggravates pain like twisting, lifting or maintaining a position for prolonged period of time; performing repetitive tasks and so on.

A complete copy of questionnaire will be obtained and documented.

5. Benefits to be expected from the research to the participant or to others

1. The number of practicing physiotherapists of Indore and surrounding areas who have WRMSDS.
2. The maximum affected area (out of neck, shoulder and low back) can be found.
3. Making the physiotherapists aware of the problems so that he/she can take remedial measures.

6. Any risks expected from the study to the participant?

There are no known risks associated with this research.

7. Maintenance of confidentiality of records:

We will do everything for protecting your privacy. Your identity will not be revealed in any publication resulting from this study.

8. Provision of free treatment for research related injury:

Not applicable.

9. Compensation of the participants not only for disability or death resulting from such injury but also for unforeseeable risks?

Not applicable.

10. Freedom to withdrawal from the study at any time during the study period without the loss of benefits that the participant would otherwise be entitled.

Your participation in this research study is voluntary. You may withdraw your consent to participate at anytime.

11. Possible current and future uses of the biological material and of the data to be generated from the research and if the material is likely to be used for secondary purposes or would be shared with others.

Address and telephone number of the investigator and guide:

Investigator:
Reshma Khurana
Principal,
Department of Physiotherapy and Paramedical Sciences
Index Medical College Hospital & Research Centre
Indore (M.P.)

Guide:
Dr. Dharam Chand Jain
Professor
Maharaj Vinayak Global University
Jaipur, Rajasthan

Appendix-iii

TOOLS USED

Questionnaire on occupational injuries and pain (Neck, Shoulder, Low Back) in physical therapists

Section A: Personal Portion

Name: Age: Sex:

Weight: Height:

Phone No.:

Do you exercise? Yes / No

Do you have any history of trauma or work-related musculoskeletal injuries in past 12 months? Yes / No

If yes, then tick the option:

- Ligament sprain
- Muscle strain
- Tendinitis
- Dislocation
- Vertebral disc problem
- Synovitis
- Degeneration
- Other,

……..

Section B: Occupational Portion

Years of experience:

Hours of the contact with patients?

What body part(s) was/were affected? Please tick the appropriate ones.

- Shoulder
- Neck
- Lower back (Lumbar / Sacral)

1. NECK

1. Is your neck pain in past 12 months associated with work? Yes / No

2. How long was the neck pain in past 12 months?
   - 1-7 days
   - Between 2 and 3 weeks
   - Between 3 weeks and 3 months
   - More than 3 months

3. Have you experienced any radiating pain in past 12 months due to neck pain?
   Yes / No
   If yes, in which area? …….

4. What activity were you doing when you were injured?
   - _____ Bending or twisting
   - _____ Lifting
   - _____ Maintaining the same posture for a prolonged period
   - _____ Performing manual therapy techniques
   - _____ Performing repetitive tasks
   - _____ Transferring a patient
   - _____ Performing overhead activities
   - _____ Pushing or pulling loads
   - _____ Working in an awkward or cramped position
   - _____ Working when physically fatigued

5. Did you report to any physician for the injury?
   Yes / No
   If yes, …….

6. Did you take any sick leave in the past 12 months because of your neck pain?
   Yes / No
   If yes, ……

7. What is the total number of days with sick leave in the past 12 months?
   - 1-7 days
   - 8-14 days
   - Over 14 days

8. Since your injury, have your pain been exacerbated by clinical practice?
   Yes / No

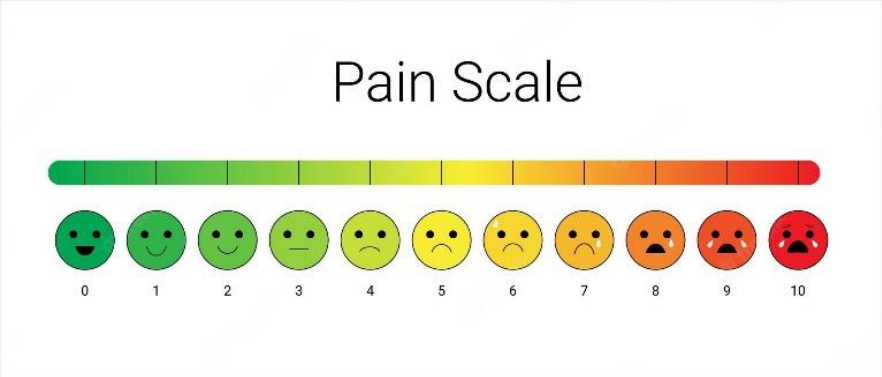
9. Has the injury caused you to alter your work habits?
   Yes / No

   If yes, what do you do differently? Please check all that apply.
   a. _____ Avoid lifting

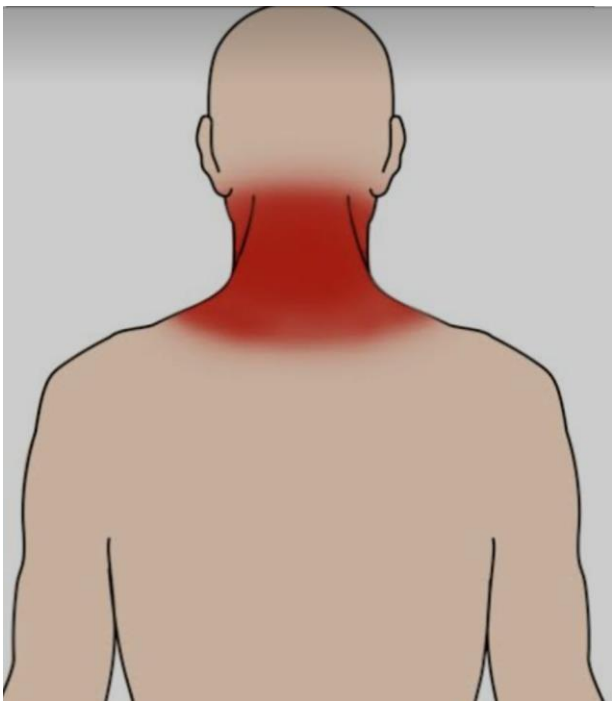
b. _____ Change working position frequently
c. _____ Decrease manual techniques
d. _____ Stop working when hurt or when pain occur

10. Have you limited your patient contact time as a result of the injury? Yes / No

11. How will you describe your neck pain? Please circle the number.



(Please fill the details of the affected part(s) only)



2. SHOULDERS

1. Is your shoulder pain in past 12 months associated with work? Yes / No

2. How long was the shoulder pain in past 12 months?
   - 1-7 days
   - Between 2 and 3 weeks
   - Between 3 weeks and 3 months
   - More than 3 months

3. What activity were you doing when you were injured?
   - _____ Bending or twisting
   - _____ Lifting
   - _____ Maintaining the same posture for a prolonged period
   - _____ Performing manual therapy techniques
   - _____ Performing repetitive tasks
   - _____ Transferring a patient
   - _____ Performing overhead activities
   - _____ Pushing or pulling loads
   - _____ Working in an awkward or cramped position
   - _____ Working when physically fatigued

4. Did you report to any physician for the injury?
   Yes / No
   If yes, ……..

5. Did you take any sick leave in the past 12 months because of your shoulder pain?
   Yes / No
   If yes, ……..

6. What is the total number of days with sick leave in the past 12 months?
   - 1-7 days
   - 8-14 days
   - Over 14 days

7. Since your injury, have your pain been exacerbated by clinical practice?
   Yes / No
   If yes, what activity causes pain to exacerbate? Please check all that apply and also mark the area:
   - _____ Bending or twisting
   - _____ Lifting
   - _____ Maintaining the same posture for a prolonged period
   - _____ Performing manual therapy techniques
   - _____ Performing repetitive tasks
   - _____ Transferring a patient
   - _____ Performing overhead activities

- _____ Pushing or pulling loads
- _____ Working in an awkward or cramped position

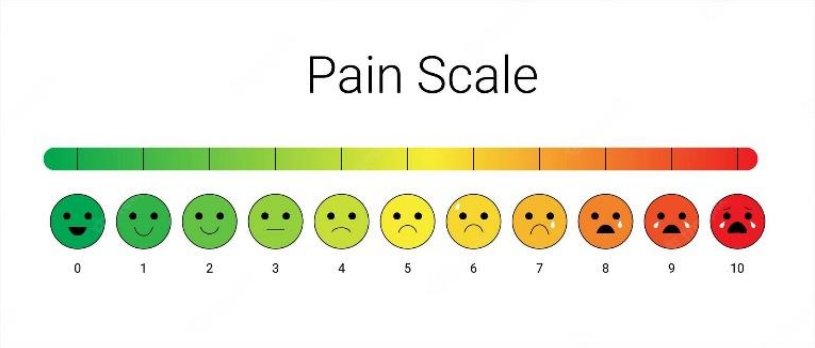
8. Has the injury caused you to alter your work habits?
Yes / No

If yes, What do you do differently? Please check all that apply.

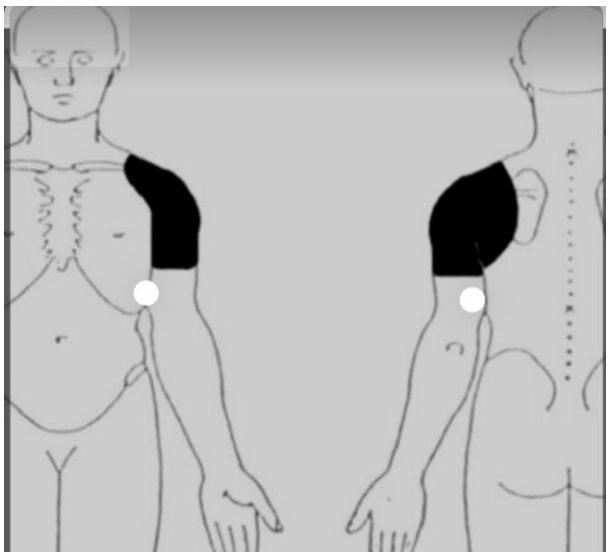
a. _____ Avoid lifting
b. _____ Change working position frequently
c. _____ Decrease manual techniques
d. _____ Stop working when hurt or when pain occur

9. Have you limited your patient contact time as a result of the injury?
Yes / No

10. How will you describe your shoulder pain? Please circle the number.



(Please fill the details of the affected part(s) only)



1. LOWER BACK (LUMBAR / SACRAL)

1. Is your Lower Back (Lumbar / Sacral) pain in past 12 months associated with work? Yes / No

2. How long was the Lower Back (Lumbar / Sacral) pain in past 12 months?
   - 1-7 days
   - Between 2 and 3 weeks
   - Between 3 weeks and 3 months
   - More than 3 months

3. Have you experienced any radiating pain in past 12 months due to Lower Back (Lumbar / Sacral) pain? Yes / No
   If yes, in which area? …….

4. What activity were you doing when you were injured?
   - _____ Bending or twisting
   - _____ Lifting
   - _____ Maintaining the same posture for a prolonged period
   - _____ Performing manual therapy techniques
   - _____ Performing repetitive tasks
   - _____ Transferring a patient
   - _____ Performing overhead activities
   - _____ Pushing or pulling loads
   - _____ Working in an awkward or cramped position
   - _____ Working when physically fatigued

5. Did you report to any physician for the injury?
   Yes / No
   If yes, ……..

6. Did you take any sick leave in the past 12 months because of your Lower Back (Lumbar / Sacral) pain? Yes / No
   If yes, ……..

7. What is the total number of days with sick leave in the past 12 months?
   - 1-7 days
   - 8-14 days
   - Over 14 days

8. Since your injury, have your pain been exacerbated by clinical practice?
   Yes / No

   If yes, what activity causes pain to exacerbate? Please check all that apply and also mark the area:
   - _____ Bending or twisting
   - _____ Lifting

- _____ Maintaining the same posture for a prolonged period
- _____ Performing manual therapy techniques
- _____ Performing repetitive tasks
- _____ Transferring a patient
- _____ Performing overhead activities
- _____ Pushing or pulling loads
- _____ Working in an awkward or cramped position

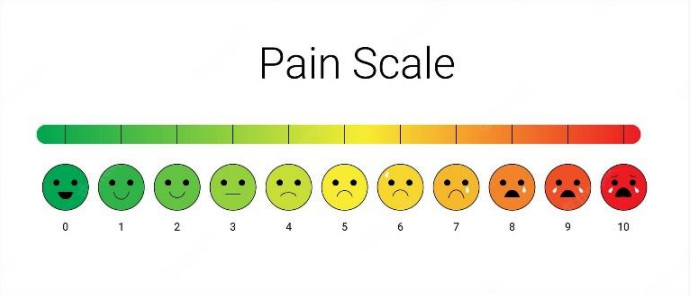
9. Has the injury caused you to alter your work habits?
Yes / No

If yes, what do you do differently? Please check all that apply.

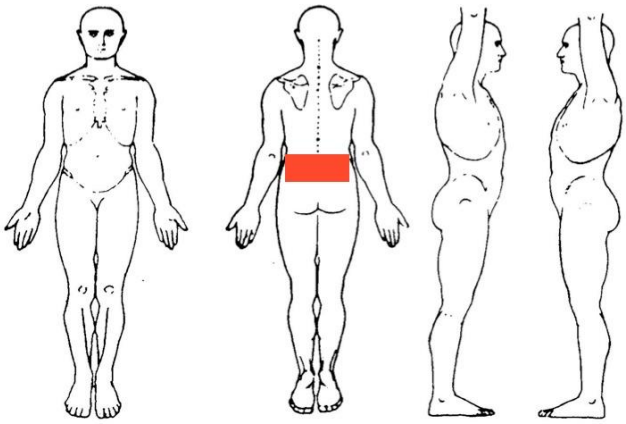
a. _____ Avoid lifting
b. _____ Change working position frequently
c. _____ Decrease manual techniques
d. _____ Stop working when hurt or when pain occur

10. Have you limited your patient contact time as a result of the injury?
Yes / No

11. How will you describe your Lower Back (Lumbar / Sacral) pain? Please circle the number.



(Please fill the details of the affected part(s) only)



Appendix-iv

TOOL VALIDITY FROM EXPERTS

A study on prevalence of work-related musculoskeletal disorders amongst Physiotherapist of Indore & surrounding region

BY

Research Scholar: Reshma Khurana
Year: 2016
Batch: Eighth
Under The Supervision Of: Dr. Dharamchand Jain

Direction: This tool asks for your evaluation of the questionnaire to be used In the data gathering for the investigation stated above, to establish its validity. You are requested to give your honest assessment using the criteria stated below; please check (☑) only one from the selection.

Scale	Interpretation	Description
5	Very high valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 0-5% error
4	High Valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 8-10% error
3	Valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 11-15% error
2	Less Valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 16-20% error
1	Not valid at all	The questionnaire is valid and can provide unbiased data for the investigation, allowing 21-25% error

Validators' Questionnaire Assessment

Indicators	Rating				
The indicators in the questionnaire consistently and accurately measure each variables of the investigation.	5				
The questionnaire fits with the variables under investigation, thus measuring what it tends to measure	5				
The questionnaire has the capability to measure items of variables within a given time frame	5				
The questionnaire has the ability to distinguish the characteristics or the subjects under study	5				
The questionnaire has the ability to gather factual data, eliminating biases and subjectivity	5				
Quick and complete data can be generated by the questionnaire within the time frame Allowed to obtain the data	5				

The questionnaire has no influence on the variables being measured	5				
The questionnaire is framed in a clear, simple, in order to avoid risk of error	5				
The questionnaire is capable of generating data that will be of value and practical use to the sectors concerned in the investigation	5				

Comments and Suggestions:

Approved and Validated

DR. SAKINA KANCHWALA (P.T.)

Signature over printed name of the validator

S.M. PHYSIOTHERAPY CENTRE
Dr. Sa[illegible]wala
(B.P.T., M.I.A.P., B.E.M.S.)
M.D.E.H.
Reg No. 18390
75, Main Street, [illegible]

A study on prevalence of work-related musculoskeletal disorders amongst Physiotherapist of Indore & surrounding region

BY

Research Scholar: Reshma Khurana
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Direction: This tool asks for your evaluation of the questionnaire to be used In the data gathering for the investigation stated above, to establish its validity. You are requested to give your honest assessment using the criteria stated below; please check (☑) only one from the selection.

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Validators' Questionnaire Assessment

Indicators	Rating				
The indicators in the questionnaire consistently and accurately measure each variables of the investigation.	5				
The questionnaire fits with the variables under investigation, thus measuring what it tends to measure	5				
The questionnaire has the capability to measure items of variables within a given time frame	5				
The questionnaire has the ability to distinguish the characteristics or the subjects under study	5				
The questionnaire has the ability to gather factual data, eliminating biases and subjectivity	5				
Quick and complete data can be generated by the questionnaire within the time frame Allowed to obtain the data	5				

The questionnaire has no influence on the variables being measured	5				
The questionnaire is framed in a clear, simple, in order to avoid risk of error	5				
The questionnaire is capable of generating data that will be of value and practical use to the sectors concerned in the investigation	5				

Comments and Suggestions:

APPROVED AND VALIDATED



DR. MUSTAFA JOHAR M.S. (ORTHO)

Signature over printed name of the validator

PROFESSOR & H.O.D.
Department of Orthopaedics
Index Medical College Hospital
& Research Centre, Indore

Appendix-v

WORKSHOPS AND CONFERENCES ATTENDED



1st International Conference of Physiotherapy

RPAICON 2017

Organised by

RAJASTHANI PHYSIOTHERAPY ASSOCIATION

(Reg. under section 28, 1958, No. 713, 2016)

Certificate of Appreciation

This is to certify that Dr. / Mr. / Ms. RESHMA KHURANA has delivered lecture as a key note speaker/ presented a scientific Paper / Scientific poster/Chaired the scientific session titled To Evaluate the effectiveness of Combined Closed & Open Chain Exercises on Pain in female patients of OA knee. in the 1st International Confernce of Physiotherapy (RPAICON-2017) held at Mahatma Gandhi University of Medical Sciences & Techology, Jaipur on 28th & 29th January-2017 .

Dr. M L Swarankar, Chairperson, MGUMST | Dr. D.P. Punia, President, MGUMST | Dr. Madhusudan Tiwari, Organizing Chairperson | Dr. Ajeet Saharan, Organizing Secretary | Dr. Mahesh Shou, Convener



CERTIFICATE

OF PARTICIPATION

ENGAGING MINDS, EMPOWERING SUCCESS

This certificate is proudly presented to

Dr./ Mr./ Ms. DR. RESHMA KHURANA for attending

Sports Connect 2019

2nd National Sports Conference of Physiotherapy held on 3rd March, 2019

at Delhi Haat Auditorium, Janakpuri, Delhi.

He/She has participated as Participant of Paper - Poster Presentation

To study the prevalence of LBP and its relation with activities.

SPORTS CONNECT 2

Dr. R.K. Meena, Patron | Dr. Ruchi Varshney, Organising Chairperson | Dr. Eshan Kaushik, Organising Secretary



CERTIFICATE

of Appreciation

2nd STATE IAP CONFERENCE

M.P. PHYSIOCON - 2020

(HOSTED BY - IAP UJJAIN BRANCH)

1-2 February, 2020

Dr./Mr./Mrs. Reshma Khurana Participated in

MP Physiocon - 2020 of IAP from February 1st - 2nd as Panelist/Speaker. He/She has Chaired the Scientific

Session / presented paper / as invited speaker; entitled To study association between contact hours of Physiotherapist with patient and resulting musculoskelatal injuries.

Theme of the conference:- Physiotherapy for Geriatrics Population.

Organizing Chairman
Dr. Sanjiv K. Jha

Scientific Incharge
Dr. Ruchi Mishra

Scientific Coordinator
Dr. Sarita Aarse

शिन्दे ऑर्थोपेडिक हॉस्पिटल

1-बी, क्षपणक मार्ग, एल.आई.सी. बिल्डिंग के सामने, जी.डी.सी. रोड़, दशहरा मैदान,
उज्जैन (म.प्र.) 456010 फोन : 0734-2514109, 2530037

Web. : www.shindeorthohospital.com
E-mail : shindeorthocare@gmail.com
Mob. 98933-99890



The Indian Association of Physiotherapists
An ISO 9001:2015 Certified Association

World Physiotherapy
MEMBER ORGANISATION

2nd NATIONAL IAP
CORPORATE CONFERENCE 2022

Certificate of Participation

This is to certify that **Dr. / Mr. /Ms.** RESHMA KHURANA

participated as Professional / Delegate

in the 2nd National IAP Corporate Conference 2022 organized by The Indian Association of Physiotherapists

held on 15th & 16th October 2022 at Travancore International Convention Centre, Karyavattom, Trivandrum, Kerala, India.

Dr. Sanjiv K. Jha	Dr K.M. Annamalai (PT)	Dr Ruchi Varshney (PT)	Dr Sreejith M Nampoothiri (PT)	Dr Jim Gopalakrishnan (PT)	Dr Baiju v Jayakumar
Central Organising Chairperson	Central Organising Secretary	Central Treasurer	State Organising Chairperson	State Organising Secretary	State Treasurer



ADESH UNIVERSITY
ACADEMIC PARTNER

Sports Connect 4

SPORTS CONNECT

Certificate of Participation

Incisive and Inclusive Rehabilitation

This is to certify that

Dr./ Mr./ Ms. DR. RESHMA KHURANA has participated

in **Sports Connect 4** as a **Delegate**

4th National Sports Conference on Sports Physiotherapy and Advancements

Organised at Amritsar, Punjab on 11th and 12th December 2021

Dr. Sanjiv K Jha	Dr. Ruchi Varshney	Dr Jitender Sharma	Dr Harpreet Bawa
Patron	Patron	Organising Chairperson	org secretary



INDEX Department of Physiotherapy & Paramedical Sciences
Malwanchal University, Indore
&
Sparsh Health Education Social Welfare & Cancer Rehabilitation Foundation

Sparsh Health Education • Cancer Rehabilitation

Date : 01.10.2022

CERTIFICATE

Shecr No. : 2022/442

This is to certify that

DR. RESHMA KHURANA

Has participated in Hands-on Workshop on

"CANCER REHABILITATION (EMPHASIS ON BREAST CANCER REHABILITATION)"

Held on 30th September & 1st October 2022 at
INDEX Department of Physiotherapy & Paramedical Sciences
Malwanchal University, Indore

CONTACT HOURS : 16

Instructor
Dr. Shailandra Mehta (PT)
Ph. D. M.P.T. (Ortho), P.G.D.C.B.R, P.G.D.Y. ED.
Professor in Physiotherapy
Certified Lymphedema Managment Physiotherapist
(Trained By Tata Memorial Hospital, Bombay &
Lymphedema Training Academy (U.K.)

Dr. Reshma Khurana
Principal
Organizing Secretary
Physiotherapy and Paramedical courses


CERTIFICATION
International Registration Number 2022- 332
FASCIAL FLOSS
Has succesfully completed the professional education
OF FASCIAL FLOSS 2 DAYS FORMATION COURSE
Dr. Reshma Khurana
Index Medical College Hospital and Research
Center (Paramedical) Indore June 2022
EUROPEAN REGISTER OF THERAPISTS
Dr Chirag Verma
Academy of Exercise,
Health and Therapy
ACADEMY OF EXERCISE HEALTH & THERAPY
Dr. Christian Villella
PT. DO. PhD BSC
CREATOR OF FASCIAL FLOSS

Appendix-vi

TURNITIN PLAGIARISM REPORT

Reshma_final

ORIGINALITY REPORT

9%	7%	3%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ijisrt.com Internet Source	3%
2	Submitted to University of Dammam Student Paper	1%
3	epdf.pub Internet Source	<1%
4	hdl.handle.net Internet Source	<1%
5	rehabilitationj.uswr.ac.ir Internet Source	<1%
6	pubmed.ncbi.nlm.nih.gov Internet Source	<1%
7	bmcmusculoskeletdisord.biomedcentral.com Internet Source	<1%
8	www.researchgate.net Internet Source	<1%
9	www.science.gov Internet Source	<1%

10	journals.lww.com Internet Source	<1 %
11	www.koreascience.or.kr Internet Source	<1 %
12	www.ccohs.ca Internet Source	<1 %
13	www.jisprm.org Internet Source	<1 %
14	Amin Yazdani, Margo Hilbrecht, Daniel Imbeau, Philip Bigelow, W. Patrick Neumann, Mark Pagell, Richard Wells. "Integration of musculoskeletal disorders prevention into management systems: A qualitative study of key informants' perspectives", Safety Science, 2018 Publication	<1 %
15	www.nap.edu Internet Source	<1 %
16	innovpub.org Internet Source	<1 %
17	bfpt.springeropen.com Internet Source	<1 %
18	www02.us.archive.org Internet Source	<1 %
19	worldwidescience.org	

Recommendations…

1. Physiotherapist should develop coping mechanisms and adhere to them consistently.
2. We further recommended that the physiotherapists with WMSD's should be examined/ assessed clinically for rehabilitation.
3. The factors associated with the development of WMSD should be analyzed in depth such that correlation with age, gender etc can be studied.
4. The length of work experience of Physiotherapist should also be considered.
5. The various Physiotherapists from Indore in our study have reported complaints pertaining to Back, Shoulder, Neck, region lifting or moving patients are the likely the cause of WMSD. We recommend further research to investigate physiotherapist workplace safety.
6. In our study, there was a slight female predominance. We recommend further research to investigate the effect of gender on WMSDs.