

COMPARISON BETWEEN EFFECTIVENESS OF MCKENZIE EXERCISE WITH CONVENTIONAL THERAPY AND SOFT TISSUE MOBILIZATION (TRANSVERSE FRICTION MASSAGE) WITH CONVENTIONAL THERAPY OF NONSPECIFIC LOW BACK PAIN AMONG PHLEBOTOMIST”.

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Abstract

Background: Phlebotomists face a high risk of developing non-specific low back pain due to prolonged standing and awkward bending positions during blood sample collection.

Objective: This study compared the effectiveness of McKenzie exercises versus soft tissue mobilization (transverse friction massage), both combined with conventional therapy, for non-specific low back pain among phlebotomists

Methodology: A pre-and-post experimental study was conducted in Hyderabad involving 30 male phlebotomists aged 21–52 years (pp. 28, 43). Participants were divided into two groups of 15 (p. 31). Both groups received conventional therapy consisting of TENS and heating pads for 15 minutes (p. 31). Group A performed McKenzie exercises for 2 weeks (p. 31). Group B received transverse friction massage for 20 minutes, 3 times a week for 2 weeks (p. 31). Pain and disability were evaluated using the Visual Analogue Scale (VAS) and the Oswestry Disability Index (ODI).

Results: Both groups showed a significant reduction in pain and disability scores (pp. 43-44). Group A's mean VAS dropped from 5.73 to 3.13, and ODI dropped from 34.14 to 20.48 (p. 43). Group B's mean VAS dropped from 5.26 to 2.86, and ODI dropped from 34.39 to 21.76 (pp. 43-44). Post-treatment comparisons showed that Group B achieved slightly lower pain scores, while Group A showed slightly better improvement in functional disability (p. 44).

Conclusion: Both McKenzie exercises and soft tissue mobilization are highly effective treatment strategies for mitigating low back pain and reducing functional disability in working phlebotomists.

INTRODUCTION

CHAPTER-I

LOW BACK REGION

The lower back region is defined as “The area between the lower border of 12th rib superiorly and crease of buttocks inferiorly”. (1)

COMPOSITION OF LOW BACK REGION

The inferior back region is made up of 5 lumbar and 5 sacral vertebrae that are combined with each other. The lumbosacral spine helps stabilizing the chest and superior body in postures of sitting, upright. There are many ligaments and muscles including the erector spinae group, abdominals, multifidus, quadratus lumborum are important structures in stabilizing the lumbosacral spine. The lumbosacral spine is an important weight bearing component. The lumbar side of the spine is the highly mobile part of the vertebral column. (2)

TYPES OF LOW BACK PAIN ACCORDING TO DURATION

According to the extent of occurrence it is divided into 3 types acute, subacute and chronic.

3.1 Acute Low Back Pain

The extent of an occurrence of lower back pain appearing before 6 weeks is called as Acute low back pain. (1)

3.2 Sub-Acute Low Back Pain

The extent of an occurrence of pain that occurs between 6 and 12 weeks is called as sub-acute low back pain. (1)

3.3 Chronic Low Back Pain

The extent of an occurrence of pain having time duration of 12 weeks or after is called as chronic low back pain. (1)

TYPES OF LOW BACK PAIN ACCORDING TO PATHOLOGY

According to pathology it is divided into 2 types.

4.1 Non-Specific Low Back Pain or Mechanical Low Back Pain

Non-specific low back pain is defined as “A stiffness, strain, discomfort, distress or tenderness

present in lower back without any definite cause” or “Pain secondary to over use of a normal structure, extended posture and stationary loading of the vertebral column” (2) (3)

4.2 Specific Low Back Pain or Non-Mechanical Low Back Pain

Specific low back pain is defined as “Pain that is associated with known pathology infection or inflammatory disease affecting the spine, spinal fracture, osteoporosis, structural deformity such as spondylolisthesis and spondylosis, nerve root compression, radicular pain, tumor and cauda equina syndrome”.(3)

RISK FACTORS

Work related hazards include weighty physical work, regular flexing, twisty, lifting, dragging, exerting force, repetitive exertion, static positions, obesity and trembling. (1)

Psychosocial hazards include stress, tension, suffering, anxiety, nervousness, unhappiness, cognitive dysfunction, aching performance, profession disappointment, and psychological strain at exertion. (1)

CAUSES OF LOW BACK PAIN

The inferior back bone pain is started because of the effect of mechanical injury due to unnecessary extended poor mechanics and posture, an inactive routine life and insufficient conditioning. Variation in pelvic morphology may cause inferior back bone pain. Vertebral pain indicates the source of pain is in the backbone and/or its supportive structure. The adjacent muscles and ligaments may develop reactive spasm and pain occurs. There is an excellent recovery for prognosis of low back pain. (4)

In modern society, the routine sign in musculoskeletal disease is low backbone pain and is measured as a very known medical disease. Virtually 90% of the short-term pain display recovering result after the physical intervention; residual 10% are predisposed to change into long-lasting pain.(2)

Low back bone pain is the routine health problem and disturbs maximum individuals affecting one time in their generation. According to the

National Institute of Sports Medicine and Athletic Trauma (NISMAT), actions for the inferior back remain an operative technique to avoid and regulate pain. A consistent sequence of modest interventional trainings supports to improve muscles. The intervention of short duration spinal pain is replied very quickly by maximum individuals. About 90 percent of individuals with acute low back pain are symptom-free and many of the residual estimated 10 percent recover within 3 months. (4)

PHLEBOTOMY

The term Phlebotomy is a Greek word, “Phlebo” meaning vein while “tomy” narrates to making incision or cutting. Therefore, Phlebotomy is a method of drawing a blood sample by creating an incision into the vein. (5)

TYPES OF PHLEBOTOMY

It is divided into two types. (5)

8.1 Adult Phlebotomy

The adult phlebotomy is for adult from 16 years or above. (5)

8.2 Pediatric Phlebotomy

The pediatric phlebotomy is for kids below the time of life of 16 years or below 14 depends on the kind of hospital or state. (5)

PHLEBOTOMIST

Phlebotomists are group of skilled people trained to draw a sample of life blood through the vein by using capillary sampling or venipuncture methods without any or slight injury to the patient for the use of clinical testing. (5)

PREVALENCE OF LOW BACK PAIN AMONG PHLEBOTOMIST

Phlebotomy is single of the utmost invasive methods normally used in health care division and still in use for longer period of time. The research was performed in London, United Kingdom (2014) regarding symptoms of inferior back bone pain. The material was collected by using self-administered questionnaires through subjects which perform phlebotomy (N=241) working in

10 NHS health care sectors. There is a recurrent job activity because of the occupation by bending down and collecting a sample which results into back and wrist distress. During blood collection there is an awkward positioning in which phlebotomists perform phlebotomy. This awkward bending extended position which might outcome into spinal and lower limb joint distress. The hazard reasons are stated to have straight connection with work associated inferior back bone pain. The consequences of this study recommend that lengthy upright position, awkward position (flexing/rotation of vertebral spine) increases the hazard of emerging inferior spinal pain. It developed stronger that lower spinal pain poses a determined task among phlebotomist. (5)

WORK RELATED MUSCULOSKELETAL DISORDERS AMONG LABORATORY PROFESSIONALS

Muscles and skeletal system illnesses are a growing medical complication in workrooms. A narrative review was conducted in India by Parul et al (2014). Healthcare experts, including specialist having back and shoulder problems which are increased by work conditions, because they are visible to amount of hazard issues in the working environment for muscles and skeletal system illnesses. The research laboratory staffs jobs in an environment of constant burden from the duty of giving exact and accurate material without boundary of mistake. The research laboratory specialists are at hazard of damage for deskbound strictly at simple microscope utmost of the daytime. Difficult position although observing from simple microscope causes persons to onward, away after the posterior of the chair so the skull, superior and inferior backbone moves outside adequate boundaries causing agony of the cervical and lumbar region. The investigation laboratory employees are considered as danger of emerging musculoskeletal complaints because of working conditions. Several time the tension occurs by this occupation that causes disturbance in their muscles and skeletal structure. (6)

PREVALENCE, PERCEPTION AND CORRELATES OF LOW BACK PAIN AMONG HEALTHCARE WORKERS IN TERTIARY HEALTH INSTITUTIONS:

Inferior back bone pain is a source of ill health globally. A research was directed in Sokoto, Nigeria through Kehinde et al (2017). Healthcare employees remain at hazard of having low back pain due to the bodily and expressive features related by occupation. Medical care employees frequently involved in inferior back bone pain at a proportion beyond that of employees working in making of building, and industry. These damages are due in big portion to frequent physical lifting actions of medical ill person, frequently concerning weighty physical lifting related through moving, moving medical ill person and employed in very difficult positions. Medical care employees frequently trust that inferior back bone pain is interrelated to job. Although it may be exact that certain events in the workplace may precipitate or worsen low back pain. These inaccurate observations can pressure managers to push employees having inferior back bone pain, thus producing a reduction which decreases effectiveness in healthcare organization. (7).

SOFT TISSUE MOBILIZATION

Soft Tissue Mobilization is stated as the applied movement of soft tissues, i.e., muscle, tendons and ligaments. Soft tissue mobilization remains a component of a comprehensive physical treatment program that includes assessment and action of articular, neurovascular, and neuromuscular impairment. This technique helps to facilitate normalization of soft tissue impairment. (8)

TYPES OF SOFT TISSUE MOBILIZATION

14.1 Augmented Soft Tissue Mobilization

Augmented soft tissue mobilization is non-invasive and safe. A method that uses especially considered hand-held instruments for assisting the manual therapist in the movement of unwell systematized scar material in and round muscles, tendons and myofascial structures.(9)

14.2 Myofascial Release

Myofascial release therapy is a combination of prolonged assisted stretching exercises planned to break up fascial adhesions by the manual skilled practitioner that is showed completely by response after the receiver's body to regulate stretch away, power, and length to treat precise soft tissue limits. It is important to note that this involves contribution by the manual practitioner and the medical ill person in terms of response.(10)(11)

14.3 Massage

Massage is “a mechanical manipulation of body tissues in order to rub and press different structures of body with regular rhythmical pressure, repeated movements, and stroking in order to relax them to reduce pain and stiffness in the joints for the purpose of promoting well-being”. (12)

14.4 Acupressure

Acupressure, is a non-intrusive manual approach that comprises the application of manual pressure over the body's acupuncture points with primarily the fingertips instead of needles. In addition to fingertips, different body parts (knuckles and forearms) also be used to progress the movement of the body's Liveliness. (13)

14.5 Muscle Energy Technique

Muscle energy technique is a type in which manually designed treatment by the voluntary contractions of muscle of changing intensity occurs in a specific way, on the other way the therapist manually applies a counteraction in opposite direction to stop the movement. This treatment can be used to stretch adaptively shortened muscles and fascia. (14)

14.6 Strain-Counter Strain (Positional Release)

Strain-counter strain is a mild, and simple manual therapy technique, in which dysfunctional joints and their muscles by passively moving the body part takes into a position of ease to induce a therapeutic effect.(15)

14.7 Transverse Friction Massage

Transverse friction massage in which the pressure is applied transversely to the soft tissue for distributing each fiber, automatically supporting in the arrangement of recently shaped collagen throughout healing. The distinct kind of connective tissue massage applied after a damage or mechanical overuse of soft tissues. (16)

Transverse friction massage is a hands-on practice in which the deep massage is intervene in transversely cross wise direction to the precise tissue involved. (17)

14.7.1 Benefits of Transverse Friction Massage

1.To recognize and remove abnormally uninhibited response to reduce soft tissue by decreasing myofascial pain and spasm. Preserve the elasticity inside the soft tissue constructions of ligament, tendon, and adhesions.(17)

2.It helps in supporting through movement and lymphatic effluent, increasing the flexibility and inflexibility features of connective tissue, fostering relaxation in addition alleviating myofascial pain.(18)

3.To restore lifeblood movement to structures, maintain regular variety of movement and elasticity, decrease or eradicate the fundamental reasons of long-lasting pain forms and excite muscle tissue. (12)

15. MCKENZIE METHOD OF TREATMENT

The McKenzie method given by Robin McKenzie in 1981. A patient of Dr. McKenzie, Mr. Smith came in because of pain radiating to the side of his leg. McKenzie unintentionally lay Mr. Smith on his abdomen on an inclined assessment table in lumbar extension. Mr. Smith informed to Dr. McKenzie after 10 minutes that his leg is feeling well which was in pain for last 3 weeks. There began a path that led to McKenzie method of medical diagnosing and therapy. (19)

The McKenzie method is a well-defined arrangement scheme. When we are categorizing ill persons with inferior back bone pain this assessment and intervention model have established good examined reliability. McKenzie concept divides low back pain into 3 types. Derangement, the most common subgroup. (20)

16. POSTURAL SYNDROME

Postural Syndrome refers to a condition whereby prolonged sustained or repetitive poor positioning of one's body can lead to pain and dysfunction. There is no substantial harm or disturbance to the structures. Repetitive movements do not alter symptoms. (21)

16.1 Dysfunction Syndrome

The dysfunction syndrome is the condition in which shortening occurs that is adaptive, or adherence of soft structures producing uneasiness. It decreases mobility, ache and at last series of the activities which limits movement. (21)

16.2 Derangement Syndrome

Derangement syndrome stays defined as a disturbance or change in the usual inactive location of the diseased articulating joint area causing mechanical obstruction in movement within joint. This change will affect the normal relative movements (21)

This treatment foundation for treating inferior backbone pain in numerous nations and mainly in the USA and Europe. Arrangement for technique tails a broad experimental investigation with inspection of position and mobility, along through the calculation of ill person's indicative reply towards diverse loading approaches useful to the spinal column. The fundamental constituent of intervention in the process is movement, which comprises of constant positions or repetitive actions alike to the loading approaches used for diagnosing. This technique also comprises other mechanisms such as instruction and postural exercise. (22)

The McKenzie treatment method is a complete technique for inferior back bone pain performed by physical therapist that highlight self-intervention and enhance self-awareness of discomfort in comparative to position and back bone program. McKenzie valuation is related with a desirable response and dramatic variation in the pain strength and site.(4)

17. CONVENTIONAL PHYSICAL THERAPY

Conventional physical therapy intervention comprises of transcutaneous electrical nerve stimulation and heating. Modality which producing heating is used in daily exercise and by

ill persons themselves as treatment approach. Heating contains application of superficial heat to the skin via transmission or convection. Heating is supposed to decline pain, to rise upper and lower layers of tissue temperature and life blood movement affecting soft structures of body. (Selina et al 2018) (23)

The use of transcutaneous electrical nerve stimulation is an easy, cost effective, non-intrusive, and harmless modality that may help reduce back pain. A meta-analysis was completed to assess the effectiveness of transcutaneous electrical nerve stimulation for the management of inferior back bone pain (Jauregui et al 2016) (24)

CHAPTER-II LITERATURE REVIEW

Antony et al (2013) directed a research on efficiency of integrated soft Tissue mobilization. In this study 60 applicants divided into two groups. The strengthening program and stretching maneuvers treatment were given to control group. The soft tissue mobilization treatment was given to experimental group. All the measurements were taken again after follow up of three weeks. After comparison to the control group in relations of mobility of lumbar spine, there is significant decrease in disability and modest improvement in aching severity. The value of integrated soft tissue mobilization in inferior back bone pain has been showed in this study. (2)

A research was led to find healthier intervention selection among McKenzie and William's intervention in 2017 by Qurat et al. 120 patients of equally genders were involved in treatment sessions. Participants with age limit of 18-35 years were involved in study. McKenzie intervention significantly decrease aching and disability in ill persons. McKenzie intervention shows better advancement on decrease in agony and disability but less than the effects of William intervention. (3)

In 2003 a future cohort research on efficacy of McKenzie treatment in long-lasting inferior back pain was showed by Saud et al. 105 (52 men and 53 women) participants were classified into 2-groups. Both group of patients demonstrated substantial calculable progresses in bodily routines

that persisted for 10 weeks as a consequence of aching and associated fear and disability beliefs in long-lasting low back pain. (4)

Aklunjide et al (2014) performed a cross sectional study on signs of lower back occupation associated muscles and skeletal illnesses between phlebotomists in London. Two hundred and forty-one forms were lastly investigated. The results of this study give a relationship among extended upright position (flexing/rotation of back) and the hazard of emerging disease. It developed stronger that lower spinal pain poses a determined task among phlebotomist. (5)

A narrative review was conducted on occupation associated muscles and skeletal system illnesses between medicinal laboratory specialists in 2014 by Parul et al. The review included a total of 7 studies. The inclusive frequencies vary from 40-60%. (6)

In 2017 a cross sectional research was directed in Sokoto Nigeria on occurrence, awareness and associates of low back pain between medical care employees in tertiary care organizations by Kehinde et al. Most of the members which were constantly feeling low back pain informed that it began after initiating occupation, and they feel that it is because of standing for prolong periods, abnormal positions and holding substantial stuffs/ill persons at work. The occurrence of pain is high between medical care employees; even though it was similarly linked with elder age and female sex, working for 10 years, heavy weight, and holding substantial stuffs/ill persons at work. (7) Mateusz et al (2012) conducted an experimental study by comparing the efficiency of two variety of massage: therapeutic and deep tissue massage on long-lasting low back pain. The research was made on 26 patients divided into two groups. The statistically significance of deep tissue massage has improved more than therapeutic massage. (12)

A research was directed on the effect of deep transverse massage in long-lasting low back pain in the year 2017 by Arbnore et al. In this study 120 patients of age group 20-80 years old were incorporated in research. The degree of ache was decreased with statistically significant difference. There is statistically important difference regarding the existence of a negative straight leg

raise test after treatment. Among treatment technique for lasting pain the deep transverse massage is an effective. (17)

In 2012 an investigational study was performed by using deep cross friction massage to relieve long lasting back pain by Yong et al. In this study 22 subjects, with aged 51.6 ± 6.7 divided into 2 groups. Throughout the two weeks subsequently post-treatment. The group (received deep friction massage) improved in pain scale Oswestry disability index, but the TENS (Transcutaneous electric nerve stimulator) group did not. This research recommends that deep cross-friction massage can be a helpful therapeutic method for long lasting back pain patients. (18)

Olivier et al (2018) conducted a literature evaluation to examine the effectiveness of McKenzie method for decreasing ache and disability in ill persons. In ill person with long-lasting vertebral ache, there is modest to good suggestion that McKenzie method is higher to other restoration treatments for decreasing disability and ache.(20)

A study was conducted to relate the efficacy of Extension movements v/s normal routine movements in lower spinal pain in the year 2016 by faisal et al. 60 ill persons were separated into two groups. The outcome presented that McKenzie movements made better progress, as compared to normal routine movements. McKenzie movements were easy to administer found to be efficient, resultant in decrease in pain concentration as comparison to ill persons undergoing normal routine movements suffering from lower back bone pain. (21)

In 2014 a prospective research was directed to investigate whether treatment with deep tissue massage performs parallel outcomes to collective treatment comprising of deep tissue massage and Nonsteroidal anti-inflammatory drugs by Marian et al. Simultaneous usage of both the groups contributed to backbone pain lessening in an equal way then the deep tissue massage performs. (25)

Piotr et al (2018) directed an evaluation on effects of myofascial release in long-lasting lower spinal pain. The aim remained to overview the success of techniques facilitate soft tissue ache in chronic

lumbar-sacral spine on newly available study. A total of 9 competent to analyze the researches examining the outcome of relaxing soft tissue pain and variety of movements in different limits, movement of muscles and the usefulness of life in persons with long lasting lower spinal pain. It is determined that the myofascial release can be a better intervention for lower spinal pain. (26)

An observational research was conducted to assess the incidence and numerous hazard features for lower spinal pain by Sudhir et al in the year 2017. A total of 1,355 (741 males and 641 females) aged 18–35 years medical postgraduate aspirants and young Indian Administrative Service aspirants. The subsequent factors were marital status, earlier history of spinal column difficulties, energetic workout, work fulfillment, dullness, strain, regular figure of learning periods, and family history of spine problems. (27)

In the year 2000 a cross-sectional study was carried out to determine the occurrence of lower spinal pain among its workers in a health care sector in south-western Nigeria by Omokhodion et al. The incidence of lower spinal pain between workers was 46%. The maximum incidence of lower spinal pain was noted amongst nursing workers, administrators/executive workers, cleaners/helpers, substantial heavy work, awkward position and prolong upright position or deskbound were the furthestmost regular activities stated to be related with lower spinal pain. (28)

B. Arun (2014) carried out a study on efficacy of soft tissues treatment on aching associated ill health, value of sleep and unhappiness in elder adults with long-lasting lower spinal pain. 37 participants with long lasting lower spinal pain were included in the study. They were given soft tissue treatment along with heat up to 6 weeks. A substantial benefit was seen shows that myofascial treatment is very operative in decreasing the aching associated disability, value of sleep and hopelessness. (29)

A research was directed on supporting back extension resistance exercise by James et al in the year 2017. Nine applicants have been pretested, after that there was a control time of 12 weeks, a 12-week treatment time, and lastly post tested. Outcomes of the current research, shows isolated

lumbar extension exercises gives helps in improving power, ache, and disability, not found any result on height of spine. (30)

In 2012 a research was conducted by Anetta et al to examine the result of restoration shown by McKenzie technique on the worth and aspects of aching illnesses. The research involved 45 participants given treatment. McKenzie therapy expressively diminishes the intensity of aching complaints related with disc disease in lumbar spine. (31)

Alessandra et al (2014) conducted a randomized experimental research about efficacy of McKenzie technique in participants with long-lasting lower spinal pain. They are aimlessly assigned to two interventional groups: McKenzie treatment and Placebo (detuned ultrasound and short-wave treatment). This will be the initial experiment which shows that McKenzie shows better improvement than placebo in patients with long-lasting lower spinal pain. (32)

Nigerian Specialist Hospital carried out an observational research regarding incidence and risk issues of lower spinal pain amongst nurses by Sikiru et al in the year 2014. Four hundred and eight respondents were included. The 1-year incidence of lower spinal pain was 73.53%. It was related to work-related danger and deprived information of backbone. The incidence found among low back pain in Murtala Mohammad Specialist Hospital is equivalent to stages noted out of the country. Poor backbone care ergonomics is the main disposing factor of lower spinal pain. (33)

A clinical trial research conducted by cherkin et al in the year 2001 by comparing the efficiency of different type of massage and personal care instruction for constant spinal pain. The group which was given massage uses the minimum medicines. Relaxing massage was efficient apparently giving lifelong effects. Outdated Chinese therapeutic acupuncture was relatively unproductive. Massage might be an efficient substitute to conservative health care for determined spinal pain. (34)

In 2002 a research was conducted to evaluate the effectiveness of massage treatment for lower spinal pain by Frulan et al. They examined with no

restrictions of language on different research sites. Massage was related with changed vigorous interventions. They displayed that massage was larger to relaxation therapy, acupuncture, and self-care education. Massage will be useful for ill persons with short term and long-lasting nonspecific lower spinal pain, particularly when collective with movements and instruction. (35)

Keren et al (1997) led an investigation on approval of the questionnaire for measuring disability caused by spinal pain. There are various strategies for measuring disability as a viability that are depended on self-report, additional data is required about outcomes. These included announced limitation on the important subsections of the Oswestry Low Back Pain Disability Questionnaire by looking at real execution on lifting, sitting and working assignments. A factor-analytic research started, which shown that it has two different features of disability can be calculated by this tool. The outcomes had the option to show validity and reliability.(36)

A meta-investigation was directed to decide if electric nerve stimulation a compelling treatment for chronic musculoskeletal pain by Michael et al in the year 2007. Randomized, controlled trials distributed were gotten from the different research sites. Forthcoming, examinations utilizing any methodology of electric nerve stimulation for treating pain in any structural area were incorporated. These outcomes show that it is a viable treatment methodology for constant musculoskeletal pain.(37)

In the year 2015 the investigation was directed to calculate the adequacy of the McKenzie technique treatment, in sub-intense and long lasting lower spinal pain by Arbnore et al. McKenzie strategy builds the portability and diminishes the pain in the lumbar region more on sub-intense stage. Transient treatment of patients, (on sub-intense and long-lasting stage) by McKenzie technique is increasingly successful in lessening pain. McKenzie technique is best in sub-intense and long lasting lower spinal pain.(38)

Al Obaidi et al (2011) led an investigation to evaluate the bio-behavioral and physical routine features of people with long lasting lower spinal

pain who confirmed the McKenzie intervention by measuring at before and after intervention. Substantial developments peaked at the end for all results, with slight increase in bio-behavioral factors.(39)

A randomized medical experiment was conducted by Browder et al in the year 2007 to observe the effectiveness of an intervention method in a subcategory of persons with lower spinal pain. The extension-oriented intervention method established better modification in aching and was more effective than upper back exercise.(40)

In the year 1999 four randomized medical experiment was conducted by Ernst that shows that massage stood experienced as a single therapy for lower backbone pain. The purpose of this evaluation was to give the suggestion regarding its efficiency. The researches propose that massage is greater to no intervention. Two hearings suggest that it is similarly to vertebral manipulation or electric stimulation. One research proposes that it is least active than vertebral mobilization. Massage appears to take nearly possibility as a treatment for low back pain. Further researches of this subject are urgently desirable.(41)

Choi G et al (2005) directed a research to regulate the effectiveness of an extension exercises after surgery. The outcomes backing the helpful effectiveness of an extension exercises after surgery on aching, reoccurrence to occupation, and power of spinal soft tissues in ill persons afterward procedure of lumbar disease of disc. (42)

A thorough analysis was performed on randomized medical experiment to examine the effectiveness of McKenzie treatment in the intervention of vertebral aching by Clare et al in the year 2005. Files investigated from different databases. Six of them were found to be qualified, all relating McKenzie treatment to a contrast intervention. These comprised of medicines, informative brochure, backbone acupressure, backbone information, physical activity, back mobilization and routine exercises. The outcomes illustrate lower spinal aching ill persons McKenzie treatment effect in better reduction in aching and ill health in the brief period than other ordinary treatments.(43)

In the year 1984 a study was conducted by Ponte et al to govern effectiveness of Williams or McKenzie procedure of intervention together are further active in reducing aching and helping in the arrival of movements of spinal column. Twenty-two ill persons takes six assessment: specific aching, relaxed sitting period, anterior movements, side movements, and straight leg raise. Resulting of the conclusion of action, a judgement of the perfection values specified those getting the McKenzie procedure enhanced expressively to a better degree than did the participants of the Williams treatment.(44)

Damian et al (2012) perform a thorough review for knowing the worldwide incidence of lower spinal pain that included all-inclusive community distributed between 1980 and 2009. As the people are increasing in age, the worldwide figure of people with lower spinal pain is expected to rise significantly over years. The research approver is stimulated to approve current references for a usual description of lower spinal pain and to look up a freshly established instrument for measuring the hazard of bias of incidence researches.(45)

The research was directed in the year 2018 by Stefania et al for inspecting the occurrence, public places, ash impact and possible answers for occupational assisted difficulties in health discipline undergraduates throughout their academy research lab learning. Occupational assisted soft tissue diseases influence normal occupation, employed capability, and value of lifespan. Explanations recommended involved well chairs, relaxation stages and instruction. Some health discipline undergraduates throughout learning are previously feeling increase stages of musculoskeletal difficulties, earlier they go in to the work.(46)

In 2010 an observational research was performed to explore the occurrence, the significances and the danger issues related with lower spinal pain amongst health care worker by Wong et al. Risk issues related with lower spinal pain were specialized groups, awkward position, carrying items or patients, stages of occupation fulfilment and demanding job. The research shows increase incidence of lower spinal pain amongst health care

worker, subsequent in important health and other values.(47)

Ofonime et al (2016) conducted a research in a medical sector to administer the occurrence and hazard features of lower spinal pain amongst the employees. Information was gathered using an examiner supported, designed form. Low back pain was a public issue amongst workers in the medical sector. Also, long upright position/deskbound, being heavy, and carrying of substantial items remained amongst hazard issues described by individuals with lower spinal pain.(48)

A directed randomized, assessor-blinded experimental intervention to examine the comparative efficiency of three physical interventions for individuals with lower spinal pain in 2002 by Hsieh et al. Not any changes were important among group were creating. For subacute lower spinal pain, collective myofascial therapy and joint manipulation were equally functional as either interventions are given alone.(49)

In 2013 a study was performed representing that physical treatment that intervene the soft tissue might be cooperative in the management of signs of fibromyalgia. There is a significant decrease in tight areas and aching after treatment of one month on two clinical trials of myofascial treatment in comparison to sham ultra-sound found by Ginevra et al. (50)

Bervoets et al (2015) conducted an experimental trial for finding soft tissue treatment is effective for people in comparison to any other intervention or no intervention with skeletal system illnesses. Massage as a separate treatment, decreases aching and increases movements in contrast to alternative kinds of intervention, no strong advantage was apparent.(51)

A directed complete evaluation of all 4 studies associated to usage of McKenzie treatment for nonspecific lower spinal pain in 2011 by Angela et al. Directional preference movements are one such treatment, with primary information signifying its efficiency in the treatment of lower spinal pain. The results specify that extension movements might take confident features in the treatment of low back pain.(52)

In 2014 a study for investigating the difference of routine physical treatment and massage treatment on individuals with chronic and sub-intense mechanical lower spinal pain. In this study 30 female volunteer female subjects are divided into massage treatment group and conventional treatment group. The manual movement of tissues is applied in the massage therapy group along with the stretching and stabilizing exercise of hamstrings and paravertebral muscles. It can be determined that mutually both the treatments are suitable in mechanical lower spinal pain intervention. Massage is further efficient in comparison to different modes of treatment performed by Kamali et al. (53)

OBJECTIVE OF THE STUDY

The objective of the study was to determine the comparison between effectiveness of McKenzie exercises with conventional therapy and soft tissue mobilization (transverse friction massage) with conventional therapy of nonspecific low back pain among phlebotomists.

SIGNIFICANCE OF THE STUDY

Nonspecific low back pain is the most common medical complaint and affects most people at least once in their lifetime. There is a prevalence of low back pain among phlebotomist. This research helps regarding effectiveness of treatment of nonspecific low back pain among phlebotomist.

RATIONALE OF THE STUDY

McKenzie exercise is considered as most effective intervention for nonspecific low back pain. A number of researches have been carried out however, there are not so much researches related to treatments of back pain among phlebotomist. This research will contribute to elimination of gap in existing pool of literature.

CHAPTER-III

MATERIALS AND METHOD

STUDY DESIGN

A pre and post experimental study design.

STUDY SETTING

Data collected from phlebotomist working in different laboratories of Hyderabad. Laboratories include Asian institute of medical sciences laboratory, Rahila laboratory, Sindh laboratory, Aga Khan laboratory, Indus laboratory and any other laboratories where phlebotomist was having low back pain. Data was collected in clinics of Hyderabad.

DURATION OF STUDY

6 months after approval of proposal.

SAMPLING TECHNIQUE

Simple random technique of sampling was used.

SAMPLE SIZE

30 patients of male gender were selected.

SAMPLE SELECTION

6.1 Inclusion Criteria

Subjects in age group of 21-52 years.

Patient with nonspecific low back pain.

Phlebotomist, working in laboratory for at least 1 year.

Vas scale of 3-7 score.

Patient with 7 hours of working duration for 5 days a week.

6.2 Exclusion Criteria

Subject diagnosed as having a tumor, infection or inflammatory disease affecting the spine.

Spinal or lower limb surgery.

Spinal fracture or structural deformity such as spondylolisthesis and spondylosis.

Patients contraindicated to exercise therapy.

Patient having nerve root compression, defined as radicular pain, decreased tendon reflex, sensory loss and motor defects.

DATA COLLECTION INSTRUMENTS

The information was obtained through VAS (Visual Analogue Scale) for pain score (1 to 10), and Oswestry Low Back Pain Disability Questionnaire for scoring minimal disability, moderate disability and severe disability. Screening of nonspecific low back pain was done through self-structured questionnaire, taking from

section b, questions for back pain in garment industry.

7.1 Visual Analogue Scale (VAS)

It is a tool that attempts to measure a features or attitude of the quantity of pain that a patient feels ranges from none to an extreme quantity of pain. Functionally a VAS is frequently a straight line, 100 mm in measurement, at each end the far-left specifies "no pain" and the far-right specifies "worst pain ever."

Educate the patient to point to the site on the line among the expressions to specify how much pain they are presently observe. as a category of none, mild, moderate and severe.(54)

7.2 The Oswestry Disability Index (also known as the Oswestry Low Back Pain Disability Questionnaire)

It is a really vital tool that investigators and disability assessors use to assess a patient's permanent functional disability and value of life.

The assessment is called the 'gold standard' of low back functional result.

The outcome measures consist of 10 items: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, traveling and changing degree of pain.

For each section the total possible score is 0-5. A score of 0 correlates to no present disability and 5 is maximum disability.

The percentage is calculated as follows:

Formula: Total score /total possible score (50) ×100=% of disability

A score of 50 was measured to indicate 100% disability.

The disability scores among

0%-20% indicates minimal disability,

20%-40% indicates moderate disability,

40-60% denote severe disability,

60-80% indicates crippled and

80-100% indicates bedridden status. (55)

DATA COLLECTION METHODS

Patients are separated into two groups as A & B. Group A is given McKenzie exercise along with conventional therapy and Group B is given soft tissue mobilization (transverse friction massage)

along with conventional therapy. Both contain 15 patients each.

The written consent was taken from individual patient.

Each phlebotomist was given conventional therapy (Transcutaneous electrical nerve stimulation along with heating pad for 15 minutes) on the low back region.

The dry heat was applied through electrical heating pad of base made company only on lower back. The tens of company comfy stim model no EV-807 with 2 sticky pads applied on lower back with frequency 80-120 Hz and pulse width of 175-200us on lower back pain

Group A Phlebotomist: McKenzie treatment applied for 2 weeks on every 4 day.(3)(21)

Group B Phlebotomist: Soft tissue mobilization (transverse friction massage) applied on paravertebral muscles for 20 minutes, three times in a week for 2 weeks.(18)

8.1 Group A Phlebotomist

After giving conventional therapy for 15 minutes, the Group A was performed McKenzie Exercise.

Exercise 1 Prone lying down with face in extension: Lie on your belly with arms are positioned at your sides and head twisted to one side. Keep in this posture for 5 to 10 minutes.

Exercise 2 Prone lying on elbows with head in extension: Lie on your belly with your load on your elbows and forearms and your hips touching the base. Settle down your lower back. Keep in this posture 5 to 10 minutes. If their pain occurs, exercise 1 should be repeated, and then try again.

Exercise 3 Prone press-ups with head in extension: Lie on your belly with palms in direction of shoulders, just like a standard push-up. Slowly push your shoulders up, keeping your hips on the surface and letting your back and belly sag. Slowly lower your shoulders. Repeat 10 times.

Exercise 4 Progressive extension with pillows: Lie on your belly and place a cushion below your

chest. After several minutes. Add a second cushion. If this does not cause any discomfort, add a third pillow after a few more minutes. settle in that posture up to 10 minutes. Take out cushions one at a time over numerous minutes.

Exercise 5 Standing extension of whole back: While standing, place your hands in the small od of your back and lean backward. Hold for 20 seconds and repeat. The phlebotomist will be guide to do exercise after normal activities during the day that position your back in a flexed position (56)

8.2 Group B Phlebotomist

After giving conventional therapy for 15 minutes, the Group B was given transverse friction massage on low back.

Use a reinforced thumb or index contact to apply the friction massage transversely across the muscles that are attached to lumbar spine. Rolling the fingers over the erector spinae, quadratus lumborum, paraspinal muscles, back and forth perpendicular to the fiber direction. Affixing at a tight zone and stretching away from the spot, release muscle from entrapment and mobilizing the muscle in the medial and lateral direction of lumbar spine.(12)

DATA ANALYSIS METHOD

Data was evaluated by using SPSS-21 software. Descriptive statistics analysis was used to analyze the frequency and t test was applied.

ETHICAL CONSIDERATION

Permission was taken from ethical review committee. Confidentiality of the participants was maintained. Data was coded and subjects was given the right to willingly participate in the study.

BUDGET

The budget was approximately 15000 PKR.















CHAPTER IV RESULTS

A total of 30 participants were included in the study among which all were male Phlebotomists. The response rate was 100%. A pre and post experimental study was done on to find out the effectiveness of two physical therapy techniques on the management of low back pain among phlebotomists. The age of the participants was ranging from 21 to 52 years. The data was

collected in the duration of 6 months after acceptance of proposal.

The mean age of participants was 30.6333 with standard deviation ± 7.63605 . Minimum age of participants was 21 years old and maximum age was 52 years old. (shown in table and figure IV-1) The group A Phlebotomist which receives conventional therapy along with McKenzie exercises has pretreatment (VAS score) of mean 5.7333 and standard deviation of 1.03280 and

posttreatment (VAS score) of mean 3.1333 and standard deviation of 1.06010. (shown in table and figure IV-2)

The group A Phlebotomist which receives conventional therapy along with McKenzie exercises has pretreatment (ODI score) of mean 34.1473 and standard deviation of 10.15057 and post treatment (ODI score) of mean 20.4827 and standard deviation of 7.87095. (shown in table and figure IV-3)

The group B Phlebotomist which receives conventional therapy along with Soft Tissue Mobilization (Transverse Friction Massage) has pretreatment (VAS score) of mean 5.2667 and standard deviation of 1.57963 and posttreatment (VAS score) of mean 2.8667 and standard deviation of 1.35576. (shown in table and figure IV-4)

The group B Phlebotomist which receives conventional therapy along with Soft Tissue Mobilization (Transverse Friction Massage) has pretreatment (ODI score) of mean 34.3967 and standard deviation of 11.14935 and posttreatment

(ODI score) of mean 21.7613 and standard deviation of 5.96689. (shown in table and figure IV-5)

The group A Phlebotomist which receives conventional therapy along with McKenzie exercises has posttreatment (VAS score) of mean 3.1333 and standard deviation of 1.06010 in comparison to the group B Phlebotomist which receives conventional therapy along with Soft Tissue Mobilization (Transverse Friction Massage) has posttreatment (VAS score) of mean 2.8667 and standard deviation of 1.35576. (shown in table and figure IV-6)

The group A Phlebotomist which receives conventional therapy along with McKenzie exercises has post treatment (ODI score) of mean 20.4827 and standard deviation of 7.87095 in comparison to the group B Phlebotomist which receives conventional therapy along with Soft Tissue Mobilization (Transverse Friction Massage) has posttreatment (ODI score) of mean 21.7613 and standard deviation of 5.96689. (shown in table and figure IV-7)

Table IV-1: Age Of Participants

Mean	30.6333
Standard dev.	7.63605
Minimum	21.00
Maximum	52.00

Table IV-2: Group A Phlebotomists Which Receives Conventional Therapy Along With Mckenzie Exercise

	Mean	N	Std. Deviation	P-value
VAS score (pretreatment)	5.7333	15	1.03280	0.001
VAS score (posttreatment)	3.1333	15	1.06010	

Table IV-3: Group A Phlebotomists Which Receives Conventional Therapy Along With Mckenzie Exercise

	Mean	N	Std. Deviation	P-value
ODI score (pretreatment)	34.1473	15	10.15057	.0000
ODI score (posttreatment)	20.4827	15	7.87095	

Table IV-4: Group B Phlebotomists Which Receives Conventional Therapy Along With Soft Tissue Mobilization (Transverse Friction Massage)

	Mean	N	Std. Deviation	P-value
VAS score (pretreatment)	5.2667	15	1.57963	0.000
VAS score (posttreatment)	2.8667	15	1.35576	

Table IV-5: Group B Phlebotomists Which Receives Conventional Therapy Along With Soft Tissue Mobilization (Transverse Friction Massage)

	Mean	N	Std. Deviation	P-value
ODI score (pretreatment)	34.3967	15	11.14935	0.909
ODI score (posttreatment)	21.7613	15	5.96689	

Table IV-6: Comparison Of The Post treatment Of The (Vas) Score Of The Group A And Group B Phlebotomist

	Mean	N	Std. Deviation	P-value
Posttreatment of the (VAS) score of the group a	3.1333	15	1.06010	0.106
Posttreatment of the (VAS) score of the group b	2.8667	15	1.35576	

Table IV-7: Comparison Of The Post treatment Of The (Odi) Score Of The Group A And Group B Phlebotomist

	Mean	N	Std. Deviation	P-value
Posttreatment of the (ODI) score of the group a	20.4827	15	7.87095	0.117
Posttreatment of the (ODI) score of the group b	21.7613	15	5.96689	

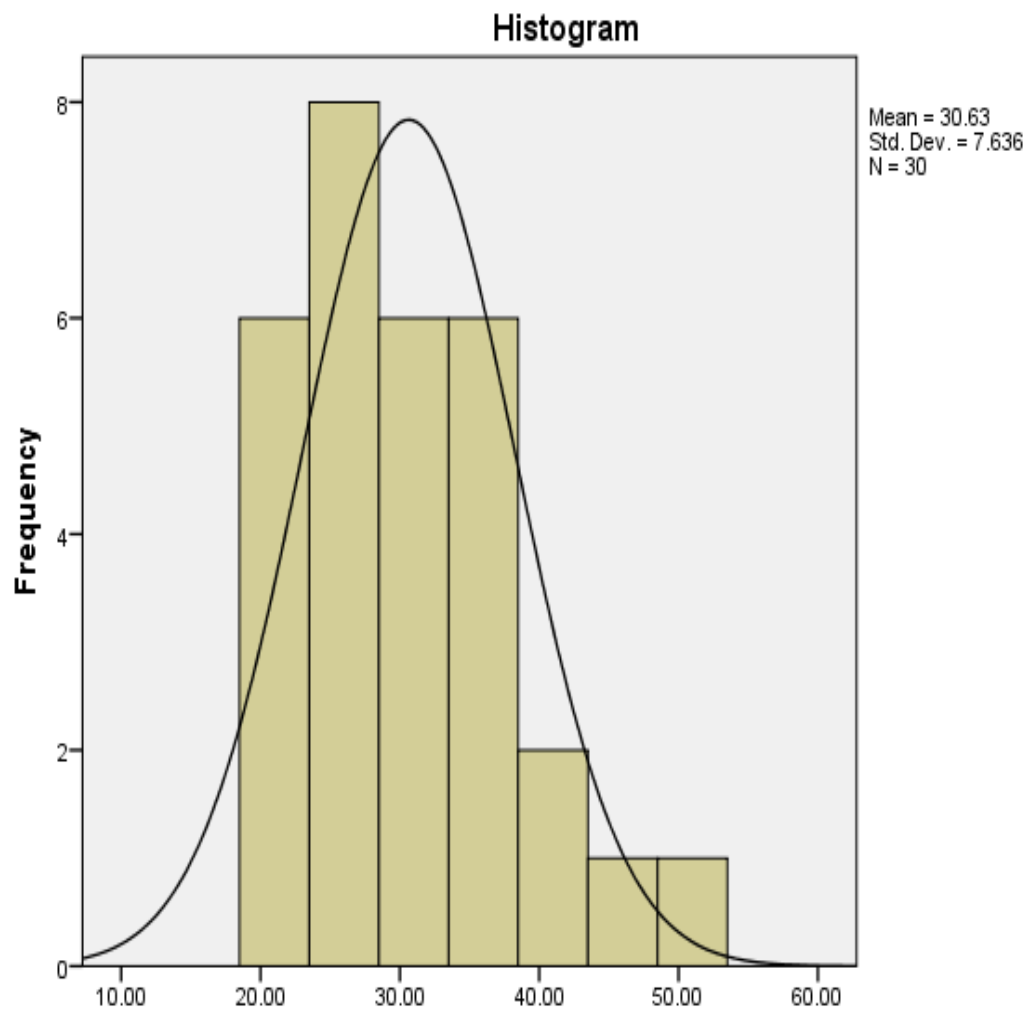


Figure IV-1: Age Of Participants

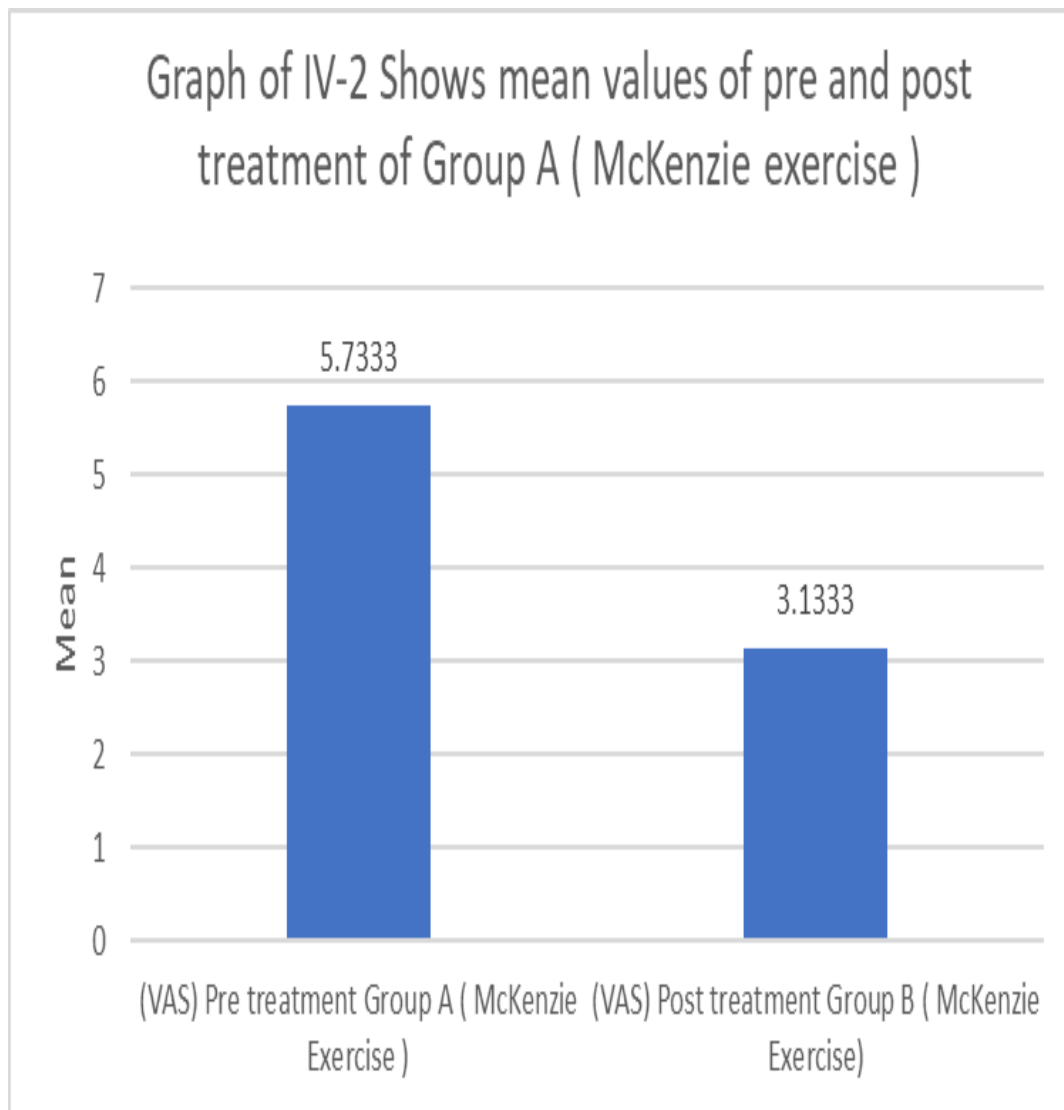


Figure IV-2: Group A Phlebotomists Which Receives Conventional Therapy Along With Mckenzie Exercise

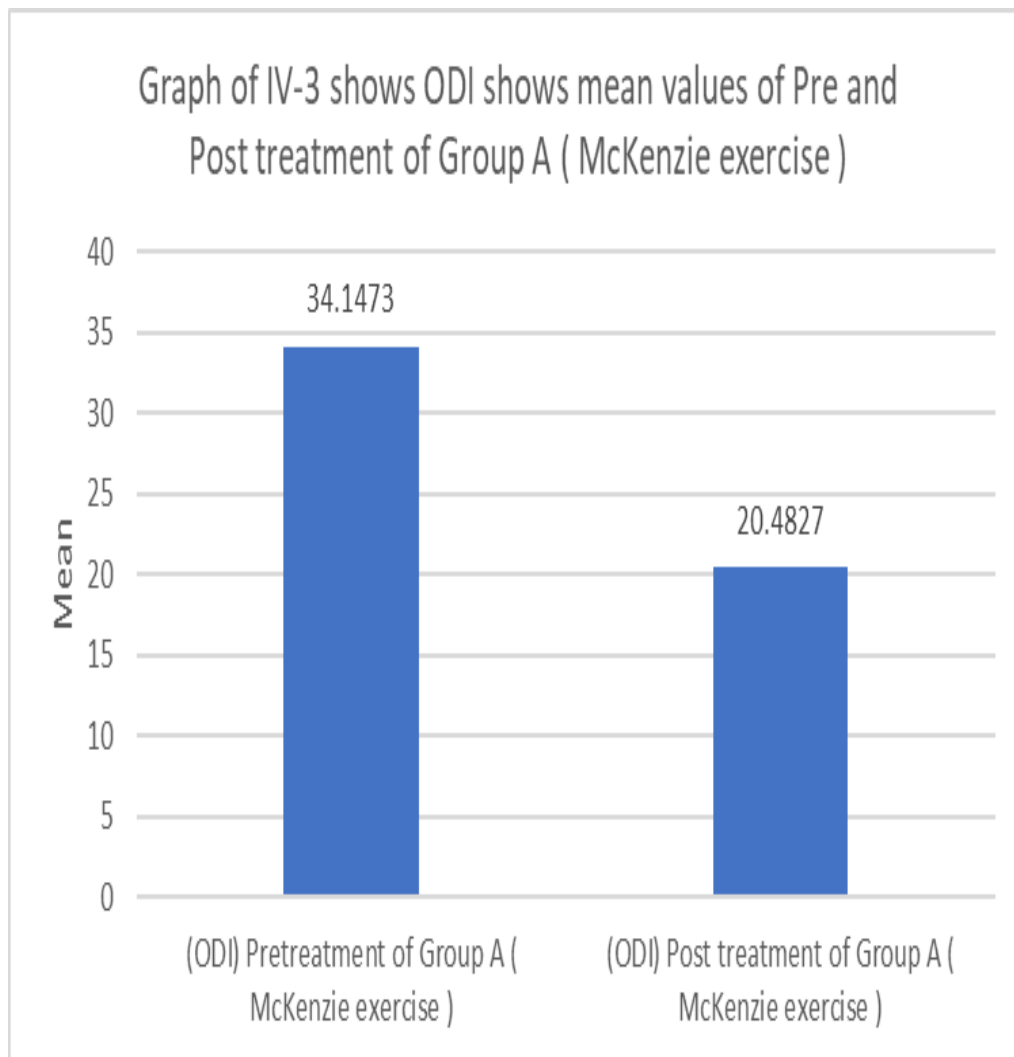


Figure IV-3: Group A Phlebotomists Which Receives Conventional Therapy Along With Mckenzie Exercise

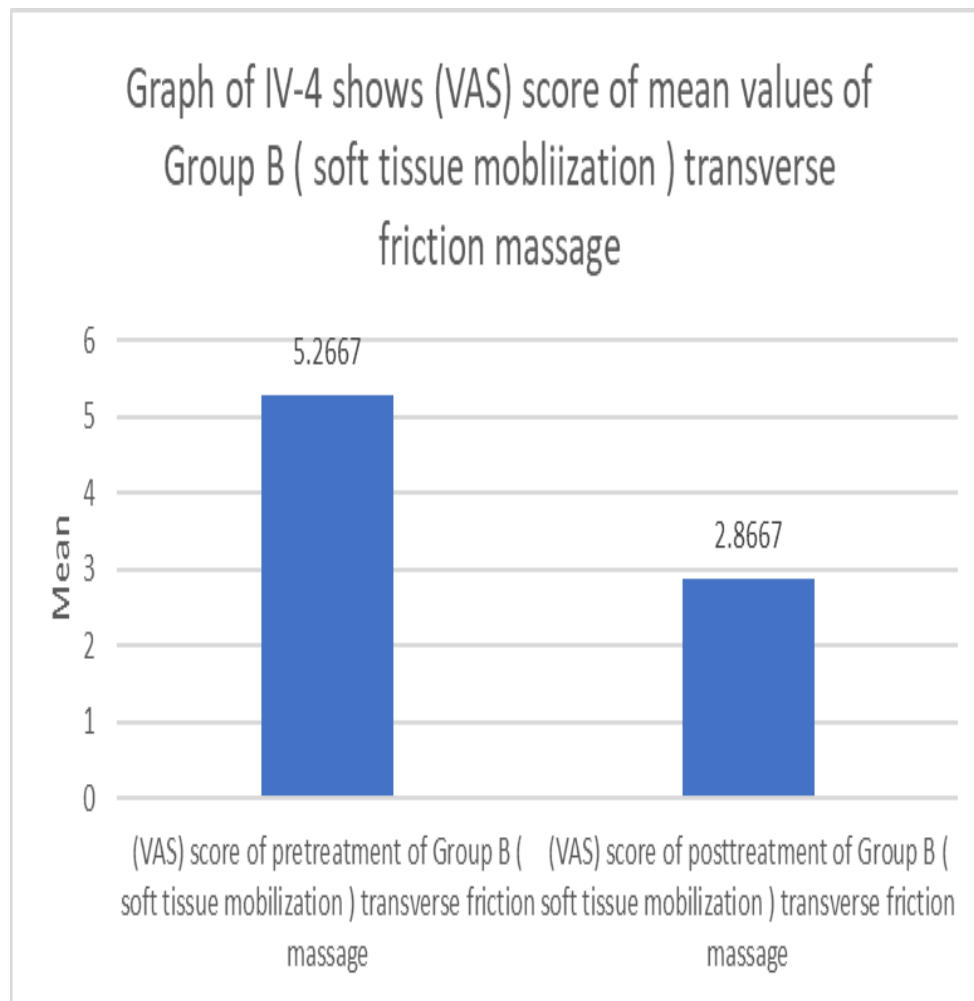


Figure IV-4: Group B Phlebotomists Which Receives Conventional Therapy Along With Soft Tissue Mobilization (Transverse Friction Massage)

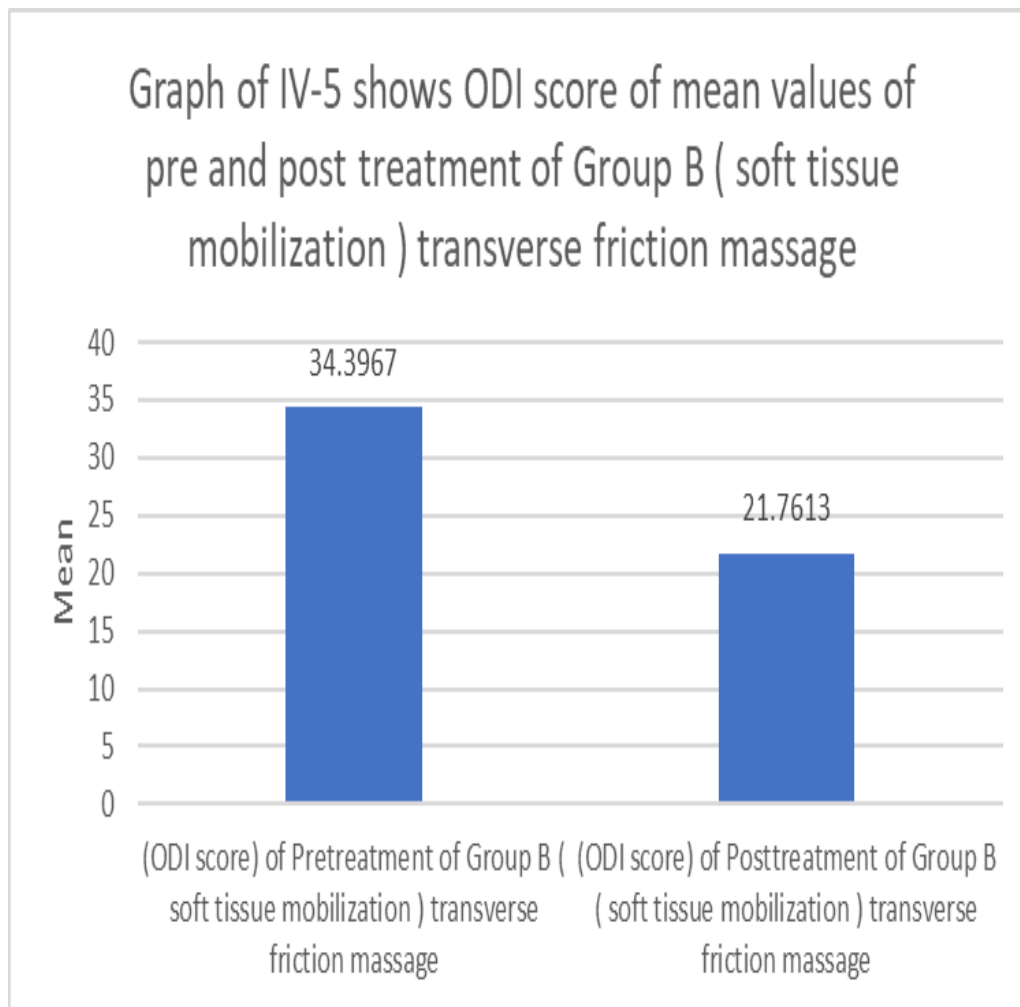


Figure IV-5: Group B Phlebotomists Which Receives Conventional Therapy Along With Soft Tissue Mobilization (Transverse Friction Massage)

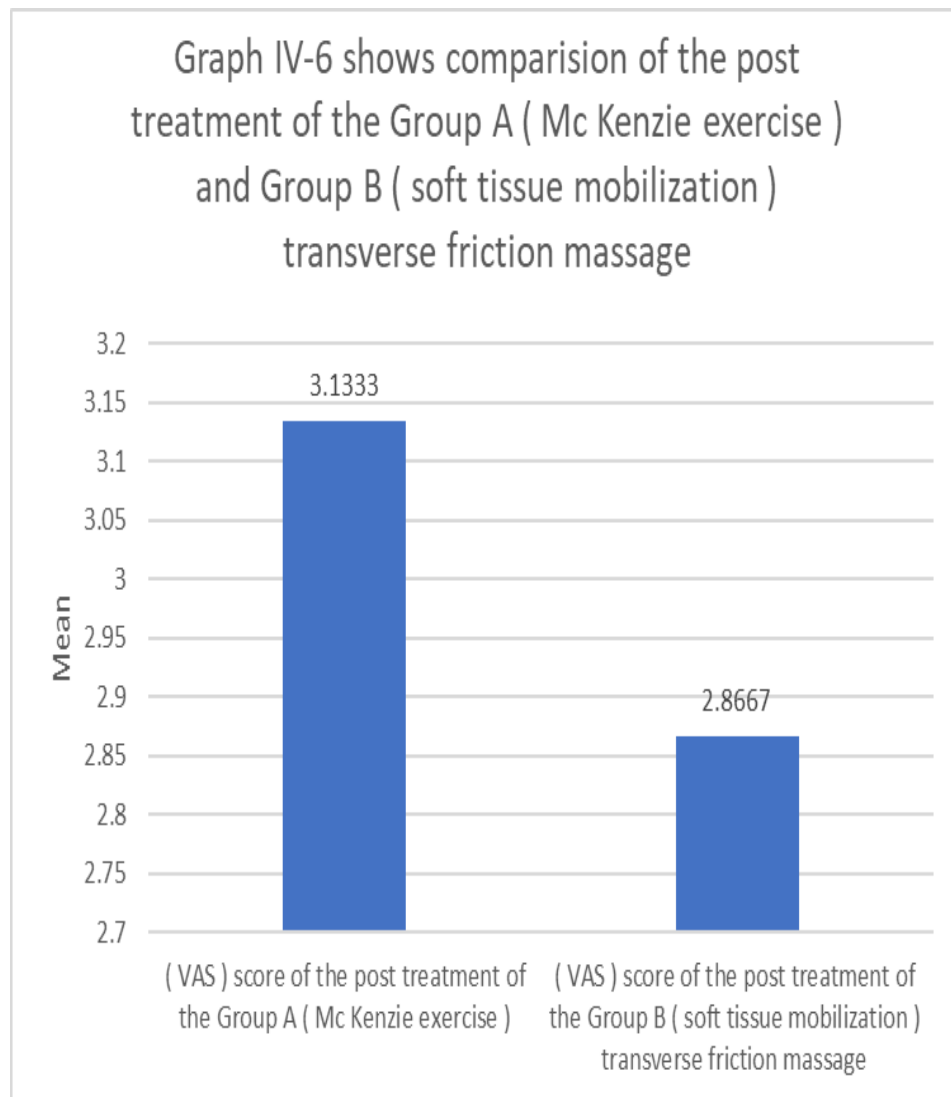


Figure IV-6: Comparison Of The Post treatment Of The (Vas) Score Of The Group A And Group B Phlebotomist

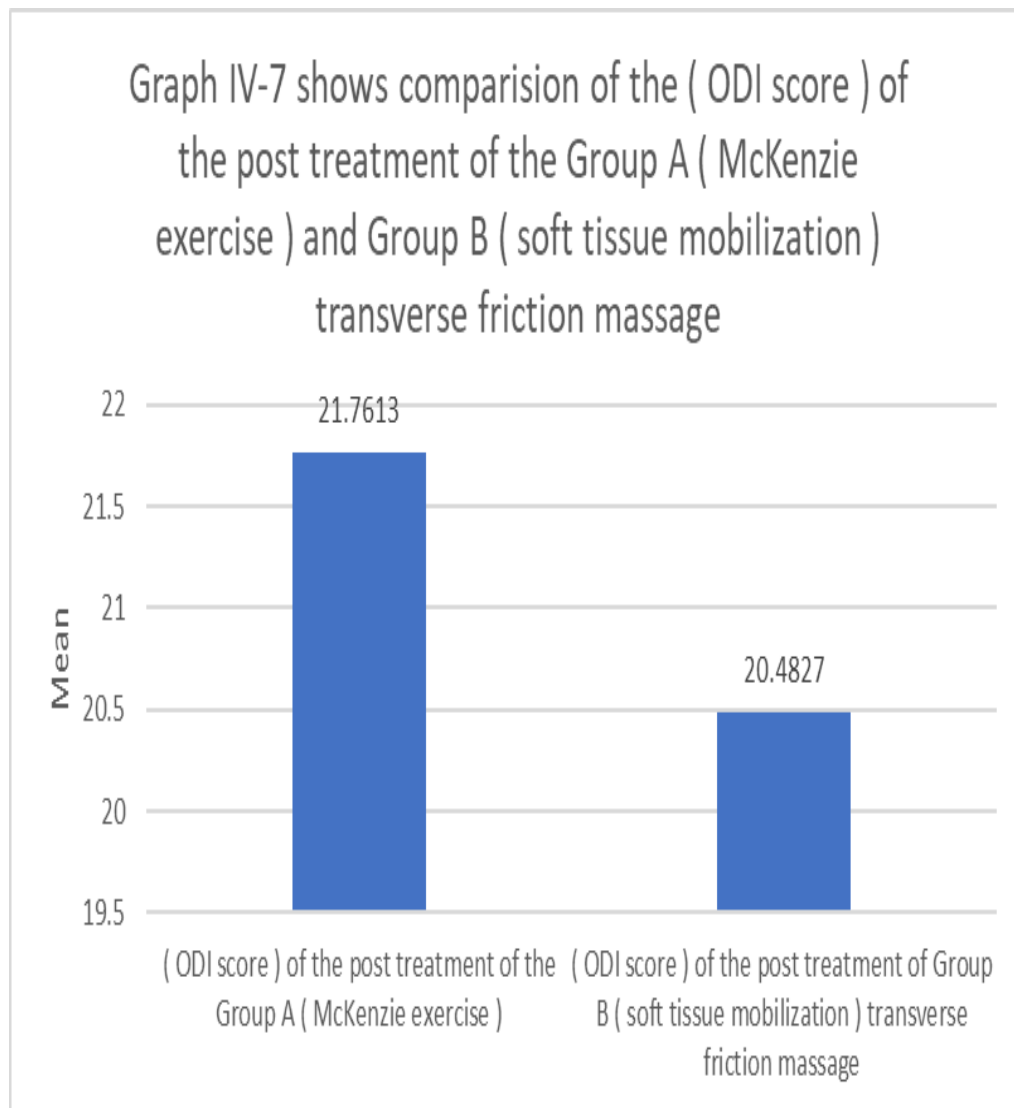


Figure IV-7: Comparison Of The Post treatment Of The (Odi) Score Of The Group A And Group B Phlebotomist

CHAPTER V DISCUSSION

The purpose of the experimental research was to relate the effect of McKenzie exercises and soft tissue mobilization (transverse friction massage) in nonspecific low back pain among phlebotomists. There is an occurrence of low back pain amongst phlebotomist. The low back pain is started as the effect of mechanical injury due to unnecessary extended poor mechanics and posture, an inactive routine life and insufficient conditioning. Variation in pelvic morphology may cause low

back pain. Back pain indicates the cause of pain is in the backbone and/or its supportive structure. The adjacent muscles and ligaments may develop reactive spasm and pain occurs. There is an excellent recovery for prognosis of low back pain. (4) The significance of this study helps regarding effectiveness of intervention of nonspecific low back pain among phlebotomist. The rationale of the research was that there are not so many researches related to treatments of back pain among phlebotomist. This research will contribute to elimination of gap in existing pool of literature.

This study included the comparison of two different approaches for the intervention of lower back pain among phlebotomists. McKenzie method is proved to be more helpful in the management of non-specific low back pain among phlebotomists of Hyderabad as compared to soft tissue mobilization techniques. These findings are more consistent which are used as comparison with the other studies.

A study was directed by Anetta et al (2012) carried shows McKenzie therapy expressively diminishes the severity of pain complaints. Alessandra et al (2014) about the efficacy of the McKenzie technique in patients with long-lasting nonspecific low back pain. McKenzie was found to be more effective in the management of non-specific low back pain in relation to this our research also helps in decreasing pain by McKenzie intervention

A study was conducted by Qurat et al (2017) found that McKenzie exercises significantly decrease pain and disability in patients with nonspecific low back pain. faisal et al (2016) found McKenzie exercises were easy to administer found to be effective, with minimal side effects resulting in reduction in pain intensity as compared to patients undergoing general conditioning exercises suffering from low back pain. James et al (2017) supporting isolated lumbar extension exercises gives resistance training to improve strength, pain, and disability. Browder et al (2007) showed. An extension-oriented treatment approach was more effective than trunk strengthening exercise in a subgroup of subjects hypothesized to benefit from this treatment approach. Ponte et al (1984) govern the McKenzie procedure of intervention was further active in both reducing pain and quickening the arrival of pain-free range of lumbar spine movement. Saud et al (2003) demonstrated substantial calculable improvements in bodily performances as a result of improved pain and associated fear and disability beliefs in chronic low back pain. Olivier et al (2018) examine the effectiveness of mechanical diagnosis and therapy for improving pain and disability in patients with either acute (less than 12 weeks in duration) or chronic (greater than 12 weeks in duration) low back pain in relation to this our research also decreases pain and disability.

.Arbnore et al (2017) directed the degree of ache was decreased with statistically significant difference in treatment of deep transverse friction massage. Bervoets et al (2015) found massage as a separate treatment, decreases aching and increases movements in contrast to alternative kinds of intervention. Ginevra et al (2013) performed a study representing that physical treatment that intervene the soft tissue. There is a significant decrease in tight areas and aching after treatment of one month on two clinical trials of myofascial treatment. Kamali et al (2014) performed a study for investigating the difference of routine physical treatment and massage treatment on individuals with chronic and sub-intense mechanical lower spinal pain. Massage is further efficient in comparison to different modes of treatment in relation to this our study also shows that transverse friction massage also decreases intensity of pain.

CHAPTER VI CONCLUSION

The study was concluded that McKenzie Technique along with conventional therapy is more effective in reducing disability related to low back pain than transverse friction massage along with conventional therapy in nonspecific low back pain patients among phlebotomist.

CHAPTER-VII LIMITATIONS OF STUDY

This study is limited to only male phlebotomists, there is a least sample size of 30 individuals, this study is limited to Hyderabad region only, this study is limited to population of phlebotomist only and this study is limited to only nonspecific low back pain patients.

CHAPTER-VIII RECOMMENDATION

It is recommended to do experimental study with large sample size, also do the comparison with female phlebotomists, also recommended to do study on other regions populations and in all other types of low back pain patients.

REFERENCES

- Airaksinen O, Brox J I, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F, Mannion A F, Reis S, Staal J B, Ursin H, Zanoli G. European guidelines for the management of chronic non-specific low back pain. *European Spine Journal*.2006;15(2) 125-127.
- Aseer A L, Subramanian I L. Effectiveness of integrated soft tissue mobilization on the functional outcome in chronic low back pain patients. *Journal of Exercise Science and Physiotherapy*.2013;9(1) 57-68.
- Ain Q U, Ishaq I. Comparison between the effectiveness of McKenzie extension exercises and William flexion exercises for the treatment of nonspecific low back pain. *Journal of University Medical and Dental College*.2017;8(3) 68-72.
- AlObaidi S M, AlSayegh N A, Nakhi H B and Skaria N. Effectiveness of McKenzie intervention in chronic low back pain: a comparison based on the centralization phenomenon utilizing selected bio-behavioral and physical measures. *International Journal of Physical Medicine & Rehabilitation*.2013;1(4) 1-8.
- Ajisafe A S. Self-reported symptom of lower body (low back) work related musculoskeletal disorders among phlebotomists in London, United Kingdom submitted to *Division of Environmental Health and Risk Management School of Geography, Earth and Environmental Science University of Birmingham*. (preprint) 2014. Available from <http://www.oshresearch.co.uk/>
- Agrawal P R, Maiya A G, Kamath V, Kamath A. Work related musculoskeletal disorders among medical laboratory professionals: a narrative review. *International Journal of Research in Medical Sciences*.2014;2(4) 1262-1266.
- Awosan K J, Yikawe S S, Oche O M, and Oboirien M. Prevalence, perception and correlates of low back pain among healthcare workers in tertiary health institutions in Sokoto, Nigeria. *Ghana Medical Journal*.2017;51(4) 164-174.
- Johnson G S “Soft Tissue Mobilization” Donnatelli(ed.) and Wooden(ed.) *Orthopedic Physical Therapy*, chapter 27 Fourth Edition, 2010. P.599-639
- Davies C C, Brockopp D, Moe K. Astym therapy improves function and range of motion following mastectomy. *Breast cancer: Targets and Therapy*.2016;8 39-45.
- McKenney K, Elder A S, Elder C, Hutchins A. Myofascial Release as a Treatment for Orthopedic Conditions: A Systematic Review. *Journal of Athletic Training* 2013;48(4) 522-527.
- Liptan G, Mist S, Wright C, Arzt A, and Jones K D. A pilot study of myofascial release therapy compared to Swedish massage in Fibromyalgia. *Journal of Bodywork and Movement Therapies*.2013 July;17(3) 365-370.
- Romanowski M, Romanowska J, Grzeskowiak M. A comparison of the effects of deep tissue massage and therapeutic massage on chronic low back pain. *Studies in health technology and informatics*.2012;176 411-414.
- Adams A, Eschman J, Ge W. Acupressure for chronic low back pain: a single system study. *The Journal of Physical Therapy Science*.2017;29(8) 1416-1420.
- Selkow N M, Grindstaff T L, Cross K M, Pugh K, Hertel J, Saliba S. Short-Term Effect of Muscle Energy Technique on Pain in Individuals with Non-Specific Lumbopelvic Pain: A Pilot Study. *The Journal of Manual and Manipulative Therapy*.2009;17(1) E14-E18.
- Hutchinson J R. An investigation into the efficacy of strain-counterstrain technique to produce immediate changes in pressure pain thresholds in symptomatic subjects.2007 <https://unitec.researchbank.ac.nz/handle/10652/1355>.
- Arora P K, Yardi S, Pathak K. Efficacy of deep transverse friction massage in treatment of chronic ankle sprain. *Indian Journal of Physiotherapy and Occupational Therapy*.2011;5(1) 85-89.

- Gashi A I, Zivkovic V, Gara E. The influence of deep transverse massage in chronic nonspecific low back pain. *Research in Physical Education, Sport and Health*.2017;6(1) 19-23.
- Yoon Y S, Lee K J, Kwak S H, Kim J Y. development and application of a newly designed massage instrument for deep cross-friction massage in chronic non-specific low back pain. *Ann Rehabil Med* 2012; 36(1) 55-65. Available at doi: 10.5535/arm.2012.36.1.55.
- Krekoukias G, Gelalis I D, Xenakis T, Gioftos G, Dimitriadis Z, and Sakellarib V. Spinal mobilization vs conventional physiotherapy in the management of chronic low back pain due to spinal disk degeneration: a randomized controlled trial. *J Man Manip Ther*.2017; 25(2) 66-73.
- Lam O T, Strenger D M, Fee M C, Pham P T, Preuss R A, Robbins S M. Effectiveness of the McKenzie method of mechanical diagnosis and therapy for treating low back pain: literature review with meta-analysis. *Journal of Orthopedic & Sports Physical Therapy*.2018;48(6) 476-490.
- Yamin F, Rehman A U, Aziz S, Zeya N, Choughley A. To compare the effectiveness of McKenzie exercises v/s general conditioning exercises in low back pain. *Indian Journal of Physiotherapy and Occupational Therapy*. 2016;10(1) 82-86.
- Machado L A C, Maher C G, Herbert R D, Clare H, McAuley J H. The effectiveness of the McKenzie method in addition to first-line care for acute low back pain: a randomized controlled trial. *BMC Medicine*.2010;8(10) 1-10.
- Wittenwiler S, Stoop R, Hohenauer E, Clijsen R. Thermal therapy in patients suffering from non-specific chronic low back pain—a systematic review. *International Journal of Clinical Medicine*.2018;9(4) 294-314.
- Jauregui J J, Cherian J J, Gwam C U, Chughtai M, Mistry J B, Elmallah R K, Harwin S F, Bhav A, Mont M A. A meta-analysis of transcutaneous electrical nerve stimulation for chronic low back pain. *Surgical Technology International*.2016;28 296-302. <https://www.ncbi.nlm.nih.gov/pubmed/27042787#>
- Majchrzycki M, Kocur P, and Kotwicki T. Deep tissue massage and nonsteroidal anti-inflammatory drugs for low back pain: A prospective randomized trial. *The Scientific World Journal*. 2014;6 1-7 pages available from doi: 10.1155/2014/287597.
- Ożog P, Natański D, Goch A, Rajek M W, Zukow W, A, Radzimińska A. Effects of myofascial release in chronic low back pain - review papers. *Journal of Education, Health and Sport*. 2018;8(9) 194-203.
- Ganesan S, Acharya A S, Chauhan R, Acharya S. Prevalence and risk factors for low back pain in 1,355 young adults: a cross-sectional study. *Asian Spine Journal*.2017;11(4) 610-617.
- Omokhodion F O, Umar U S and Ogunnowo B E. Prevalence of low back pain among staff in a rural hospital in Nigeria. *Occupational Medicine*.2000; 50(2) 107-110.
- Arun B. Effects of myofascial release therapy on pain related disability, quality of sleep and depression in older adults with chronic low back pain. *International Journal of Physiotherapy and Research*.2014;2(1) 318-23.
- Steele J, Low S B, Smith D, Jessop D, and Osborne N. Isolated lumbar extension resistance training improves strength, pain, and disability, but not spinal height or shrinkage (“creep”) in participants with chronic low back pain. *Cartilage* (preprint) 2017 Available from doi:10.1177/1947603517695614.
- Cubała A, Hoffman J, Hagner W, Jurkiewicz T, Molski P, Ratuszek D, Sniegocki M, Nowacka A. Effects of McKenzie method on the severity and location of pain in patients with lumbosacral discopathy. *Medical and Biological Sciences*.2012,26(4) 65-70.

- Garcia A N, Costa L D C M, Hancock M J, Almeida M O D, Souza F S D, Costa L O P. Efficacy of the McKenzie method in patients with chronic nonspecific low back pain: a protocol of randomized placebo-controlled trial. *Physical Therapy*.2015;95(2) 267-73.
- Sikiru L, Hanifa S. Prevalence and risk factors of low back pain among nurses in a typical Nigerian hospital. *African Health Sciences*.2010;10(1) 26-30.
- Cherkin D C, Eisenberg D, Sherman K J, Barlow W, Kaptchuk T J, Street J, Deyo R A. Randomized trial comparing traditional chinese medical acupuncture, therapeutic massage, and self-care education for chronic low back pain. *Archives of Internal Medicine*.2001;161(8) 1081-8.
- Furlan A D, Brosseau L, Imamura M, and Irvin E. Massage for low-back pain: a systematic review within the framework of the cochrane collaboration back review group. *SPINE*.2002; 27(17) 1896-1910.
- Fisher K, Johnston M. Validation of the Oswestry low back pain disability questionnaire, its sensitivity as a measure of change following treatment and its relationship with other aspects of the chronic pain experience. *Physiotherapy Theory and Practice*.2009;13(1) 67-80.
- Johnson M, Martinson M. Efficacy of electrical nerve stimulation for chronic musculoskeletal pain: a meta-analysis of randomized controlled trials. *Pain*.2007; 130(1-2) 157-165.
- Ibrahimaj A, Deliu S, Miftari S. Effectiveness of the Mckenzie method in the treatment of low back pain in subacute and chronic stage. *Research in Physical Education, Sport and Health*.2015;4(1) 79-86.
- Al-Obaidi S M, Al-Sayegh N A, Ben Nakhi H, Al-Mandee M. Evaluation of the McKenzie intervention for chronic low back pain by using selected physical and bio-behavioral outcome measures. *PM&R*. 2011;3(7) 637-664.
<https://doi.org/10.1016/j.pmrj.2011.04.025>.
- Browder D A, Childs J D, Cleland J A and Fritz J M. Effectiveness of an extension-oriented treatment approach in a subgroup of subjects with low back pain: a randomized clinical trial. *Physical Therapy*.2008; 87(12) 1-11.
- Ernst E. Massage Therapy for Low Back Pain: A Systematic Review. *Journal of Pain and Symptom Management*.1999;17(1) 65-69.
- Choi.com G, Raiturker P P, Kim M J, Chung D J, Chae Y S, Lee S H. The effect of early isolated lumbar extension exercise program for patients with herniated disc undergoing lumbar discectomy. *Neurosurgery*.2005;57(4) 764-772.
<https://doi.org/10.1227/01.NEU.0000175858.80925.38>.
- Clare H A, Adams R, Maher C G. A systematic review of efficacy of McKenzie therapy for spinal pain. *Australian Journal of Physiotherapy*.2004;50(4) 209-216.
- Ponte D J, Jensen G J, Kent B E. A preliminary report on the use of the McKenzie protocol versus williams protocol in the treatment of low back pain. *The Journal Of Orthopaedic And Sports Physical Therapy*.1984;6(2) 130-139.
- Hoy D, Bain C, Williams G, March L, Brooks P, Blyth F, Woolf A, Vos T, Buchbinder R. A systematic review of the global prevalence of low back pain. *Arthritis & Rheumatism*.2012;64(6) 2028-203.
- Penkala S, El-Debal H, Coxon K. Work-related musculoskeletal problems related to laboratory training in university medical science students: a cross sectional survey. *BMC Public Health*.2018; 18(1) 1208.
- Wong T S, Teo N, Kyaw M O. Prevalence and risk factors associated with low back pain among health care providers in a district hospital. *Malaysian Orthopaedic Journal*.2010;4(2) 23-28.
- Johnson O E, Edward E. Prevalence and risk factors of low back pain among workers in a health facility in South-South Nigeria british. *Journal of Medicine & Medical Research*.2016;11(8) 1-8.

- Hsieh C Y J, Adams A H, Tobis J, Hong C Z, Danielson C, Platt K, Hoehler F, Reinsch S, Rubel A. Effectiveness of four conservative treatments for subacute low back pain a randomized clinical trial. *SPINE*.2002;27(11) 1142-1148.
- Liptan G, Jones K D, Mist S, Wright C, Artz A. A pilot study of myofascial release therapy compared to massage in reducing symptoms of fibromyalgia. *J Bodyw Mov Ther*. 2013; 17(3): 365-370.
- Bervoets D C, Luijsterburg P A, Alessie J J N, Buijs M J, Verhagena A P. Massage therapy has short-term benefits for people with common musculoskeletal disorders compared to no treatment: a systematic review. *Journal of Physiotherapy*.2015;61(3) 106-116.
- Dunsford A, Kumar S, Clarke S. Integrating evidence into practice: use of McKenzie-based treatment for mechanical low back pain. *Journal of Multidisciplinary Healthcare*.2011;4 393-402.
- Kamali F, Panahi F, Ebrahimi S, Abbasi L. Comparison between massage and routine physical therapy in women with sub-acute and chronic nonspecific low back pain. *Journal of Back and Musculoskeletal Rehabilitation*.2014; 27(4) 475-480.
- D. Gould et al. 2001 Blackwell Science Ltd, *Journal of Clinical Nursing*, 10, 697-706.
- Fairbank J C, Pynsent P B. The Oswestry Disability Index. *Spine* 2000 Nov 15;25(22) 2940-52;
- Jeganathan A, Kanhere A, Monisha R. A comparative study to determine the effectiveness of the McKenzie exercise and williams exercise in mechanical low back pain. *Research Journal of Pharmacy and Technology*.2018;11(6) 2440-2443.

