
**Research Article**

## Comparison of Mulligan Mobilization Technique versus Mckenzie Exercises among Patient with Sacroiliac Joint Dysfunction: A Randomized Clinical Trial

Faisal Ghafoor<sup>1</sup>, Zunaira Ahmad<sup>1</sup>, Afia Irfan<sup>2</sup>, Aisha Munawar<sup>1</sup>, Iqra Sabir<sup>3</sup>, Faseeh Zulqernain<sup>4</sup>

### Abstract

**Background:** Sacroiliac joint dysfunction frequently causes pain in low back. Localized tenderness and pain around the sacroiliac joint are signs.

**Objective:** This study aimed to compare the effectiveness of mulligan mobilization Technique Versus McKenzie exercises among patients with sacroiliac joint Dysfunction.

**Methodology:** Total 58 patients, with sacroiliac joint dysfunction were included who were fulfilled the eligibility criteria. This trial was registered in Iranian registry with ref#NCT05404451 Dated 01-08-2022. This study is assessor blind. We have used the convenient sampling technique and the Lottery Method was used to randomly select. Participants were then divided into the two groups at random. The researcher and participants were not informed of the allocation process. In envelopes, the allocation was concealed. Group A received treatment with mulligan mobilization technique while group B received treatment with McKenzie exercises. Both groups received treatment for four weeks. Using the VAS and the MODI scale, pain and disability were evaluated before and after treatment.

**Results:** It was observed that McKenzie exercises were more effective than Mulligan mobilization techniques at reducing pain, disability, and enhancing sitting, standing, and walking in patients P value was ( $>0.005$ ). While there was no significant difference has been observed in personal care lifting, sleeping, when comparing both groups P value was ( $>0.005$ ).

**Conclusion:** The McKenzie exercises are more efficient than Mulligan's Mobilization technique when the two groups are compared (at reducing pain, disability, and enhancing sitting, standing, and walking in patients).

**Keywords:** Sacroiliac joint dysfunction Mulligan's Mobilization; McKenzie exercise; Therapy; Posterior superior iliac supine

### Introduction

Most common symptom of Low Back Pain (LBP) is pain that causes disability in individuals of community. Disability due to Low Back Pain (LBP) has been appeared in 11%-12% patients. Patient disability treatment becomes a considerable challenge for the researcher to cope up with this uneconomical condition. Sacroiliac Joint Dysfunction (SIJD) is one of the most recurrent factors which cause low back pain [1]. Sacroiliac joint pain is characterized as pain felt over buttocks and sacroiliac joint, which is dull, nature. Pain may be felt in groin area, around greater trochanter, radiates into the back of thigh, knee and in frequently the posterior and lateral side of

### Affiliation:

<sup>1</sup>Department of Physical Therapy, Faculty of AHS, The superior University, Lahore Pakistan

<sup>2</sup>Department of Physical Therapy, ILM College Lahore, Affiliated with Govt. College University Faisalabad

<sup>3</sup>Department of Physical Therapy, Helping Hand organization, Muzaffarabad AJK, Pakistan

<sup>4</sup>Department of Physical Therapy, College of Physical Therapy, Niazi Medical and Dental College, Sargodha Pakistan

### \*Corresponding Author:

Faisal Ghafoor, Department of Physical Therapy, Faculty of AHS, The superior University, Lahore Pakistan.

**Citation:** Faisal Ghafoor, Zunaira Ahmad, Afia Irfan, Aisha Munawar, Iqra Sabir, Faseeh Zulqernain. Comparison of Mulligan Mobilization Technique versus Mckenzie Exercises among Patient with Sacroiliac Joint Dysfunction: A Randomized Clinical Trial. Journal of Orthopedics and Sports Medicine. 5 (2023): 145-153.

**Received:** February 27, 2023

**Accepted:** March 10, 2023

**Published:** March 14, 2023

calf ankle and then to foot due to the involvement of neural tissues [2]. Joint dysfunction is defined as restraining the joint to perform movement [3]. When a person is standing without proper anterior pelvic support, dysfunction frequently starts during trunk flexion. The innominate rotates anteriorly and downward and fixes on the sacrum because of the anterior shift in weight of the upper trunk [4]. The 44 percent of women and 42 percent of men have symptoms around the sacroiliac joint [5]. In recent study prevalence of back pain due to SIJ have been reported that in 15%-30% cases SIJ is leading cause of pain [6].

Sacroiliac joint is situated between pelvis and sacrum main function of the joint is to transfer the weight of upper limbs and torso to lower extremities, strong muscles and ligaments around the joint provide stabilization to the joint [7]. In SIJD pain is not always felt over single localized point instead there are many patterns of pain referral. Pain referral patterns have been reported in different 2000 studies that included pain radiate down to the lateral and posterior thigh (50%), pain run down to the knee (28%), moves to foot (14%) [8]. Patient with SIJD present pain during seating which run down to back of thigh and to the knee and during stair climbing, or lie down in affected side. Sacroiliac joint does not occur gradually its onset is inciting in nature. The most frequent initiating factors are collisions, slips and falls, chronic stress, or pregnancy [9]. Inflammation, faulty position, trauma, hypo-mobility, joint locking, muscular imbalances, disturb the alignment of pelvis or derangement. All are causes of SIJD [10]. The treatment of sacroiliac joint pain is quite challenging. In physical therapy manual therapy, bracing, massage general aerobic exercises and patient education are all involved as intervention [11].

Mechanical Diagnosis and Therapy (MDT) is commonly known as McKenzie exercise and is a distinguished manual therapy approach used for treatment of spine and related conditions. Spine and extremity dysfunction assessed and managed by employing repeated movements in MDT. This classified patient dysfunction into postural syndrome, derangement, dysfunction or many other classes. From all of these dysfunctions the most frequently occur derangement that cause pain by disturbing normal resting position of joint and disturb alignment and symmetry of normal joint by displacing the articular tissue in joint. For the treatment of SIJD by using McKenzie principal patient performed active rotation of innominate in anterior and posterior direction in painful side and then which movement alleviates the symptoms of patient that movement becomes part of treatment for SIJD. Mackenzie approach has been proved useful for the treatment of pathologies related to SIJ and lumber conditions. To tackle with derangement syndrome in patient MDT has been considered successful technique reported in a case [10].

By regaining the proper balance and functionality of the lumbar and pelvic muscles and ligaments, physiotherapy procedures are used to physically treat SIJ mal-alignment.

According to the positional fault theory, articular misalignment causes changed kinematics and ultimately dysfunction. Mulligan described this theory. The joint track, a positioning error, and a mechanical problem are all fixed using Mobilization With Movement (MWM). Positional defects were proposed as a joint surface configuration, alteration in orientation, capsular and cartilage thickness, musculotendinous components. By correcting the innominate posterior rotation with respect to the sacrum, MWM method, when used on SIJ, makes load transfer successful. MWM of SIJ restores SI mobility by using the hip's or lumbar's end range of motion [12]. In this manual technique physiotherapist apply sustained glide at particular joint while the patient actively perform physiological movement [13]. Kenkampha et al. observed that the mobilization of sacroiliac joint prevent adhesion formation by repairing and improving flexibility and tensile strength of tissues and also help to increase the healing process by facilitating fluid flow to the tissues, also promote elongation of shortened tissues. Mobilization of joint also enhances vascular flow and thus reduce pain by removing free radicals and p substances found by Abhay et al. [2].

In clinical practice pain provocation tests and the motion-palpation and pain are typically used to examine and diagnose SIJD. Several studies have urged that a cluster of tests should be used to diagnose SIJD rather than relying solely on one test. Combining pain provocation tests and motion can increase the reliability and accuracy of the diagnosis of SIJD [10]. The particular tests that allow us to diagnose SIJ dysfunction (SIJD), such as prone knee bending supine mapping, Patrick test, passive Straight Leg Raise (SLR), Supine to sit, Gaenslen, supine to sit, and standing forward flexion and sitting forward flexion. Few authors have suggested using four tests to determine whether someone has SIJD, three of which must yield positive results [14].

The study will assist us in finding reliable techniques to lessen disability in people with sacroiliac joint dysfunction. In order for the person to independently conduct everyday activities and their necessary daily activities. The findings of this study will also assist physiotherapists in selecting the finest techniques to offer their patients the greatest care for quicker and better recovery. Limited evidence comparing the effects of mulligan mobilization and McKenzie exercises on SIJ dysfunction is present, despite the large number of studies done on these approaches in SI dysfunction. Therefore, the purpose of the current study is to equivalence the effects of mulligan mobilization and McKenzie exercises on patients with sacroiliac joint dysfunction to determine the best method for treating sacroiliac joint dysfunction.

The purpose of study was to help us to find effective techniques reduce disability in individuals due to sacroiliac joint dysfunction. So that individual can perform activities of daily life and their instrumental activities of daily living

independently. Moreover, the results of this study help the physiotherapist to choose best technique provide best services to their patient for better and fast recovery.

## Materials and Methods

This study was a randomized Clinical trial. It is an assessor blind study. This study was conducted in Social Security hospital manga road raiwind and at Chaudhary Muhammad Akram research and teaching hospital. This study was conducted after taking the approval from the ethical committee of the superior university and followed the Helienski guidelines'. We have selected the patients from the community having the sacroiliac joint dysfunction. The duration of our study was 6 month Sample size was calculated using data from previous studies using Visual Analogue Scale as an outcome measurement tool with  $\mu_1$ - $\mu_2$  the sample size was calculated using the following formula.

$$n = [(z_{\alpha/2} + z_{\beta})^2 \times \frac{(\mu_1 - \mu_2)^2}{\sigma^2}]$$

Where n is sample size required in each group.  $Z_{\alpha/2}$  depends on the level of significance, for 5% this is 1.96.  $Z_{\beta}$  depends on power, for 80% this 0.84.  $\sigma$  is the standard deviation, which is 2.37.  $\mu_1$  is the mean change in visual analog scale values in group A, which is 4.09.  $\mu_2$  is the mean change in visual Analog scale values in group B that is 2.42 [10]. Based on the above formula, the sample size required per group is 29. Hence total sample size required is 58.

We have used the convenient sampling technique in this study. The inclusion criteria of the was following patient Age range of 18 to 65 [15]. Patients with Low back pain in both sex's males and females [16]. Patients with Sacroiliac joint pain (PSIS) that may radiate to the buttocks [17]. Patients with Having acute or sub-acute pain between 4 to 12 weeks of the starting and 3 out of 4 tests must be positive [14]. Patients with Lumber stenosis, Lumber radiculopathy, Spondylolisthesis, back pain along the midline, pregnant women who have SIJD excluded in this study [15]. Patients, with any hip fracture, lower limb disease, rheumatoid arthritis excluded in this study [16]. Patients with prior orthopedic surgeries and histories of arthrodesis, spinal laminectomy, and ankylosing spondylitis excluded in this study [14].

Fifty eight sacroiliac joint dysfunction patients who met the inclusion criteria were chosen from Chaudhary Muhammad Akram Research and Teaching Hospital and the Social Security Hospital on Manga Road. Anyone willing to take part in this study was a part of it. Participants were informed about the study, and everyone received a thorough explanation of how it worked. Patients' information was gathered using convenient sampling technique. In this study, readings at pre- and post-treatment levels were taken using assessor blinding. We selected outcome assessors and

blinded them to the therapy group. The Lottery Method was used to randomly select a participant who met the criteria for participation, and participants were then divided into the two groups at random. The researcher and participants were not informed of the allocation process. A research assistant who was unrelated to the next stage of the study covered up the allocation method. In envelopes, the allocation was concealed (Figure 1).

## Intervention (Group A Group B)

Participants who were chosen were randomly divided into groups A and B by using Lottery Method. A thorough pre-evaluation of the participants was conducted. The pre-evaluation included an orthopedic evaluation that gathered data on the patient's demographics, medical history, personal history, pain assessment, and functional scale. Visual Analogue Scale (VAS) was used to measure pain, and the Modified Oswestry Disability Index (MODI) was used to measure disability. Single blinded research.

In this trial, the assessor was blinded. Mulligan technique was used on Group A participants, and McKenzie exercise was used on Group B participants 10 repetitions in 3 sets over the course of 12 weeks comprised the treatment plan. Among group A While group B patients were instructed to perform the exercises every two or three hours, four treatment sessions carried out over week were provided to group B patients for 12 weeks [10]. Hot therapy as part of the standard treatment was administered for 20 min to both groups [2]. Participants in both groups completed post-treatment evaluations, and pre- and post-treatment data were recorded.

## Statistical Analysis

Data was analyzed by using version 25.0 of SPSS. Normality of pretreatment and post-treatment Variables were check by Shapiro wilks and kolmogorov smirnov tests. Across the groups comparison was conducted by using independent t tests. Within the groups comparison was extracted by using paired t tests. P value <0.05 was consider significant.

## Results

Total 58 diagnosed patients of sacroiliac joint dysfunction was analyzed using SPSS 16.0 the tests of normality as per measured by Kolmogorov-Smirnova and Shapiro-Wilk test showed by non - significant p value (>0.05) that the data is normally distributed in Table 1 therefore, the data are parametric. There was no missing of follow ups. The results regarding descriptive statistics of age showed that mean and standard deviation found to be  $38.948 \pm 11.351$  of participant in Figure 1. The result regarding descriptive statistics of BMI showed that mean and standard deviation of  $24.241 \pm 3.0201$ .

The results regarding gender of participant showed that there were 67.2% male and females 32.8% out of 58 patients. The results regarding affected side showed that there were

CONSORT 2010 Flow Diagram

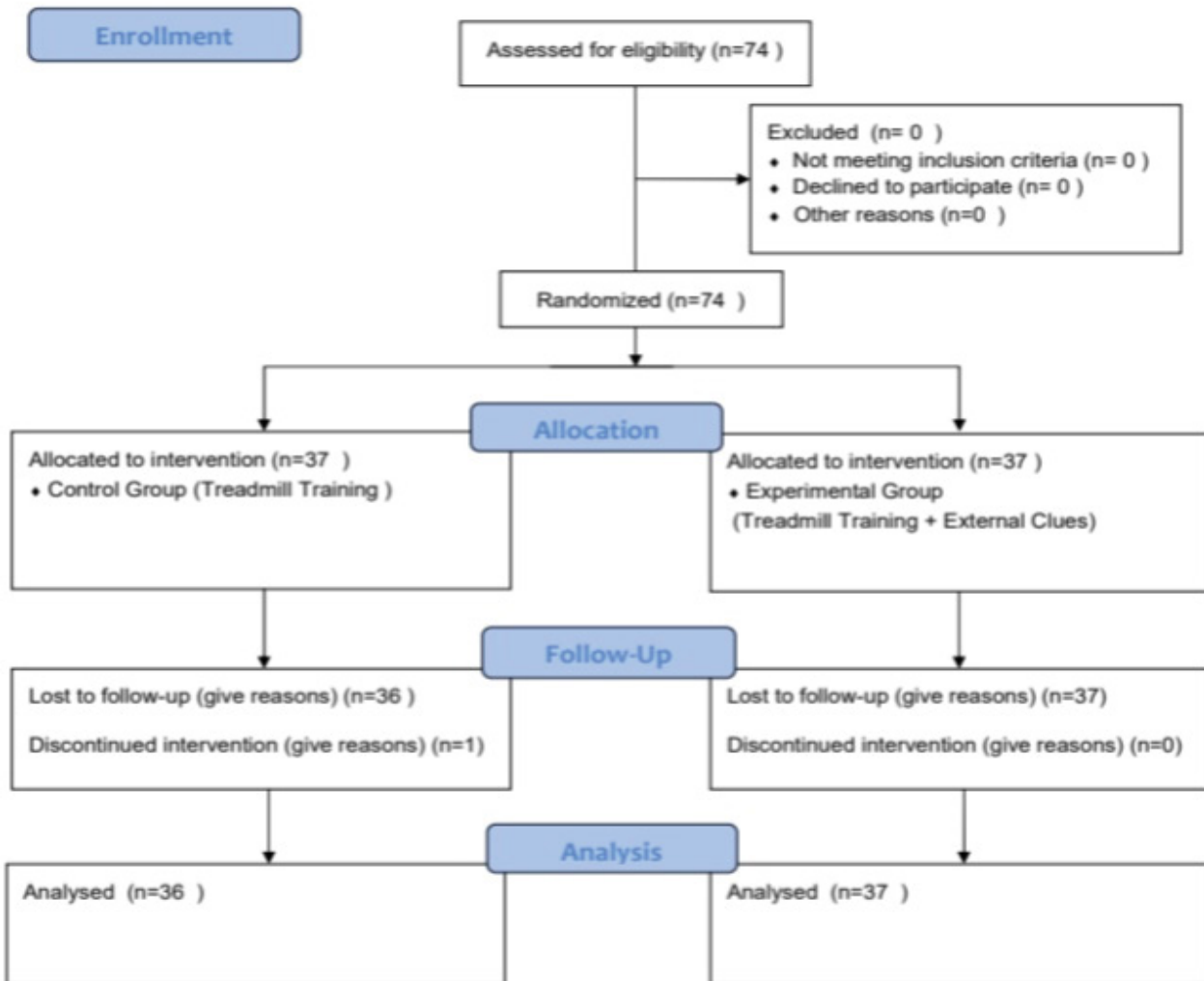


Figure 1: CONSORT Flowchart showing enrollment, intervention allocation and follow up the patient.

77.6% subject having right side involved and 22.4% subjects having left side involved in the study. Baseline values of both VAS scale and MODI scales in group A and B showed in Table 1.

Within-group analyses were performed using the Paired Sample T-Test shows Table 2 an the mean and standard deviation of Vas Scale in pre value was  $66.93 \pm 17.08$  and the post value of Vas Scale within the group was  $41.60 \pm 14.76$ . The mean difference between pre and post Vas scale value was calculated  $25.33 \pm 2.32$  and for disability the mean and standard deviation of Modified oswestry disability index scale in pre value was  $27.74 \pm 6.81$  and the post value of Modified oswestry disability index scale within the group was  $15.00 \pm 5.99$ . The mean difference between pre and post were Modified oswestry disability index scale calculated 12.74

$\pm 0.82$  within the two groups P-value was less than ( 0.05) in term of pain and disability so that there was statistically significant improvement for pain, and showed improvement in disability.

To compare pain and disability in group A (Mulligan) and group B (McKenzie) Independent t- test was performed. Across the group analysis of VAS scale showed in Table 3 that the mean and SD pre value of VAS scale in group A (mulligan) was  $66.13 \pm 16.43$  and pre value in group B (McKenzie) was  $67.72 \pm 17.97$ . The mean and SD post value of VAS scale in group A (mulligan) was  $49.41 \pm 13.84$  and post value in group B (McKenzie) was  $33.79 \pm 11.22$ . The mean difference in pre and post value of group A (mulligan) was  $16.72 \pm 2.59$  and mean difference between pre and post value of group B (McKenzie) was  $33.93 \pm 6.75$  the p value

**Table 1:** Base Line Measurement for visual analogue scale and Modified oswestry disability index scale.

	Group A	Group b	P value
	Mean ± SD	Mean ± SD	
Visual analogue scale	66.13 ± 16.43	67.72 ± 17.97	0.727
Modified oswestry disability index scale	27.89 ± 66.41	27.58 ± 7.30	0.264
Pain intensity pre score	4.17 ± 0.71	3.89 ± 1.17	0.284
Personal care pre score	1.93 ± 1.16	2.84 ± 1.32	0.098
Lifting pre score	3.79 ± 0.94	4.20 ± 0.77	0.073
Walking pre score	2.62 ± 0.77	2.75 ± 1.05	0.574
Sitting pre score	3.24 ± 0.78	3.10 ± 0.85	0.526
Standing pre score	2.93 ± 1.53	2.89 ± 1.49	0.931
Sleeping pre score	1.82 ± 1.58	1.00 ± 0.75	0.014
Social life pre score	2.31 ± 1.25	1.96 ± 1.14	0.28
Traveling pre score	3.13 ± 1.43	2.62 ± 1.32	0.158
Employment	2.68 ± 1.22	2.72 ± 1.41	0.921

**Table 2:** Within group Comparison of VAS and Modified Oswestory Scale Values.

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	vas pre-treatment values - vas post-treatment values	25.3276	12.0356	1.58035	22.16299	28.49219	16.027	57	0
Pair 2	modi pre-treatment values - modi post-treatment values	12.7414	4.98616	0.65471	11.43034	14.05242	19.461	57	0
Pair 3	pre pain intensity values - post pain intensity values	1.53448	0.62732	0.08237	1.36954	1.69943	18.629	57	0
Pair 4	pre personal care values - post personal care values	1.13793	0.75969	0.09975	0.93818	1.33768	11.408	57	0
Pair 5	pre lifting values - post lifting values	1.7069	0.64912	0.08523	1.53622	1.87757	20.026	57	0
Pair 6	pre sitting values - post sitting values	1.56897	0.56544	0.07425	1.42029	1.71764	21.132	57	0
Pair 7	pre standing values – post-standing values	1.17241	0.95766	0.12575	0.92061	1.42422	9.324	57	0
Pair 8	pre sleeping values - post sleeping values	0.87931	0.67739	0.08895	0.7012	1.05742	9.886	57	0
Pair 9	pre social life values - post social life values	1.25862	0.86977	0.11421	1.02993	1.48732	11.021	57	0
Pair 10	pre traveling values - post travelling values	1.15517	0.81223	0.10665	0.94161	1.36874	10.831	57	0
Pair 11	pre-employment values - post employment values	1.2931	0.89851	0.11798	1.05685	1.52935	10.96	57	0

**Table 3:** Between group comparison of visual analogue scale and modified Oswestry disability index scale.

		Group A	Group B	P value
		mulligan	McKenzie	
Visual analogue scale	Pre vas	66.13 ± 16.43	67.72 ± 17.97	0.727
	Post vas	49.41 ± 13.84	33.79 ± 11.22	0
MODI	Pre MODI	27.89 ± 6.41	27.58 ± 7.30	0.264
	Post MODI	18.86 ± 5.09	11.13 ± 4.40	0
Pain intensity score	Pre pain intensity	4.17 ± 0.71	3.89 ± 1.17	0.284
	Post pain intensity	3.13 ± 0.64	1.89 ± 0.95	0
Personal care score	Pre personal care	1.93 ± 1.16	2.48 ± 1.32	0.098
	Post personal care	1.24 ± 0.98	0.89 ± 0.81	0.153
Lifting score	Pre lifting	3.79 ± 0.94	4.20 ± 0.77	0.073
	Post lifting	2.58 ± 1.08	2.00 ± 0.84	0.026
Walking score	Pre walking	2.62 ± 0.77	2.75 ± 1.05	0.574
	Post walking	1.48 ± 0.68	1.03 ± 0.68	0.016
Sitting score	Pre sitting	3.24 ± 0.78	3.10 ± 0.85	0.526
	Post sitting	2.00 ± 0.84	1.20 ± 0.77	0
Standing score	Pre standing	2.93 ± 1.53	2.89 ± 1.49	0.931
	Post standing	2.27 ± 1.19	1.20 ± 1.44	0.001
Sleeping score	Pre sleeping	1.82 ± 1.58	1.00 ± 0.75	0.014
	Post sleeping	0.86 ± 1.30	0.20 ± 0.41	0.012

between pre value of group A and pre value of group B 0.727 and p value between post value of group A and group B was 0.000. And across the group analysis of MODI scale showed in Table 3 that the mean and SD pre value of MODI scale in group A (mulligan) was 27.89 ± 6.41 and pre value in group B (McKenzie) was 27.58 ± 7.30. The mean and SD post value of MODI scale in group A (mulligan) was 18.86 ± 5.09 and post value in group B (McKenzie) was 11.13 ± 4.04. The mean difference in pre and post value of group A (mulligan) was 9.03 ± 1.32 and mean difference between pre and post value of group B (McKenzie) was 16.45 ± 3.26. The p value between pre value of group A and pre value of group B and p 0.664 value between post value of group A and group B was 0.000. Results showed that in comparison to mulligan mobilization technique pain and disability was greatly reduced with McKenzie exercise.

## Discussion

This study compared the effectiveness of McKenzie (MDT) exercises and Mulligan mobilization for treating of sacroiliac joint dysfunction. McKenzie exercises and Mulligan mobilization were both included as interventions in the current study's 12-week therapy plan for SIJD patient. According to the findings, participants of both therapy groups experienced an improvement in VAS and Modified Oswestry index ratings as well as a reduction in pain and disability. Additionally, it was observed that McKenzie exercises (MDT) were statistically and clinically more effective than Mulligan mobilization techniques at reducing pain, functional disability, and enhancing sitting, standing, and walking in patients when four weeks of McKenzie and manual treatment sessions have been done there was no significant difference has been observed in personal care

lifting, sleeping, when comparing both groups. The improve pain around posterior superior iliac spine and disability in sacroiliac joint patient study results are coherent with results of a study conducted by Saumya Srivastava who conducted a clinical trial to see the short-term effects of muscle energy technique and mechanical diagnosed therapy (McKenzie) in SI joint dysfunction [10].

In their case study from 2007, Horton and Franz made the hypotheses that the MDT approach aids in moving the entrapped debris during repetitive motions, lowering pain and enhancing SIJ mobility [18]. Derangement is one of the SIJD's primary causes [10]. Due to internal and external derangements SIJD can occur. Any articulating surface may abruptly experience internal derangement. However, the absence of nucleus pulposus gel in the SIJ is the only reason why internal derangement seen their differs from that in the cervical and lumbar areas. The synovial membrane or articular cartilage may impinge on the SIJ, causing internal derangement. One of the potential causes of discomfort and locking could be this [19]. The formation and trapping of loose bodies or intra-articular adhesions are additional reasons that could result in internal derangement [20]. The findings of our investigation support the aforementioned concept and suggest that repeated anterior or posterior rotation of the innominate have lessens the derangement by dislodging any intra-articular adhesions or obstructing loose bodies.

A further study by Sydney researcher Helen A. Clare examined the effectiveness of McKenzie therapy for people with low back pain. The study's findings demonstrated that McKenzie exercise reduced pain, disability in a patient with low back quicker than other conventional treatments [21]. The results of this study support our findings, which show

that McKenzie exercises are more effective at reducing pain and enhancing patients' functional status.

In India Saumya Srivastava conducted the study of the effectiveness of Mechanical Diagnosed Therapy (MDT) for treating SI joint pain in 2018. For four sessions, the patients received 30 repetitions of either an anterior or posterior rotation of the in-nominate. The effectiveness of the treatment was evaluated using PPT and the Visual Analogue Scale (VAS). After four consecutive sessions of therapy, one group compared the McKenzie technique to a control group that underwent alternative manual therapies. This study demonstrated that McKenzie exercise was successful in helping SIJ sufferers manage their pain [22]. The results of our study are also consistent with earlier research, which revealed that patients with SIJ pain who received MDT experienced significant improvements in their MODI and VAS scores.

Conceptual evidence of MDT's effectiveness in the musculoskeletal system is limited [23]. However, a clinical trial found that performing McKenzie's knee to chest exercise immediately improved the length of the hamstrings [24]. Therefore, we hypothesize that by performing repeated movements, tight hamstrings or the iliopsoas were released, unlocking the joint (increasing its mobility) and causing the dysfunction to be corrected.

A study by Fayed Ibrahim to determine the effectiveness of McKenzie exercises and manual therapy in chronic low back patient. The results of study showed that McKenzie exercise reduces pain and disability significantly in a patient with chronic low back pain. The result of this study support result of our study that McKenzie exercises are useful to treat patient with low back pain and reduce disability and increase their functional level [25].

McKenzie exercise are more effective than conventional treatment to treat chronic low back pain instead of acute low back pain the result of our study is coherent with the study by Olivier T. for checked the effectiveness of McKenzie exercise for low back pain patients Randomized controlled trials examining MDT in patients with Low back pain was recognized from 6 databases risk of bias. Effects of MDT to those of other interventions in patients who have acute or chronic Low back pain and showed that the effectiveness of McKenzie is not quite effective in disability and acute low back pain and but most effective in chronic low back pain [26].

The McKenzie Method's effectiveness in the finding and treatment of low back pain was reviewed in a study by Maciej Czajka, According to the research; the McKenzie Method is highly helpful in assessing pain, depending on the amount of training of the therapists using it. The McKenzie Method worked best when combined with other types of therapy to increase spinal mobility, boost general quality

of life, and lessen disability. The findings of this previous study are consistent with finding of our study that McKenzie exercise greatly reduces pain and disability in patient with back pain due to SIJ dysfunction when combined with other conventional treatments [27].

One more study by Rahman et al. [28] to determine the effectiveness of McKenzie exercises in low back pain patient in which the researcher compared the McKenzie with counter-strain and strain technique the result of this study concluded that McKenzie exercises are effective alone or with counter-strain technique in a patient of low back to reduce their pain. Thus result of this study is coherent with our study that McKenzie therapy is effective therapy for low back pain patient [28].

## Declaration

### Ethical approval letter and consent to participant

All the study protocol was applied to conduct this study accordance to the relevant guidelines and regulation. The subjects who agreed to participate in the study that was conducted provided written, informed consent. It has not affected patient's cultural norms, values and ethics. This study was approved from the ethical committee of the superior university and participant in this study has given their proper consent before the start of the study. The Consent form also available and will provided on request.

### Consent of publication

The subjects who agreed to participate in the study that was conducted provided written, informed consent. Consent from all the patients was taken including the study publication.

### Availability of data and materials

The datasets used and/or analyzed during the current study and available from the corresponding author or reasonable request.

### Competing interests

The authors declare that they have no competing interests.

## Funding

No funding was done.

## Author's contribution

FG has done conception and design of the work. ZA drafted the work and substantively revised it. AI has done the acquisition and analysis. AM has done the interpretation and analysis. IS has revised the work and approved and submitted version. FZ has revised the work and helped to draw the discussion and methodological work. All the authors have approved the manuscripts for the submission. It is confirmed that the content of the manuscript has not been published, or Submitted for the publication elsewhere. All authors read and approved the final manuscript.

## Acknowledgement

I am grateful to the Dr. Prof. Asghar Ali for his continuous help, support and motivation in my every research activity.

## References

1. Kamali F, Zamanlou M, Ghanbari A, et al. Comparison of manipulation and stabilization exercises in patients with sacroiliac joint dysfunction patients: a randomized clinical trial. *Journal of bodywork and movement therapies* 23 (2019): 177-182.
2. Kaur H, Sharma M, Hazari A. Effectiveness of Maitland Mobilization and Mulligan Mobilization in Sacroiliac Joint Dysfunction: A Comparative Study. *Critical Reviews™ in Physical and Rehabilitation Medicine* 31 (2019).
3. Katada S. Principles of Manual Treatment for Sacroiliac Joint Dysfunction. *Principles of Manual Medicine for Sacroiliac Joint Dysfunction*: Springer (2019): 23-25.
4. Thawrani DP, Agabegi SS, Asghar F. Diagnosing sacroiliac joint pain. *JAAOS-Journal of the American Academy of Orthopaedic Surgeons* 27 (2019): 85-93.
5. Saleh HM, Ibrahim AH, Yosef AO, et al. Effect of Radial Extra Corporeal Shock Wave Therapy Versus Mulligan Mobilization on Sacroiliac Joint Dysfunction. *Journal of Critical Reviews* 7 (2020): 8055-8059.
6. Kiapour A, Joukar A, Elgafy H, et al. Biomechanics of the sacroiliac joint: anatomy, function, biomechanics, sexual dimorphism, and causes of pain. *International Journal of Spine Surgery* 14 (2020): S3-S13.
7. Fortin JD, Falco FJ. The Fortin finger test: an indicator of sacroiliac pain. *American Journal of Orthopedics (Belle Mead, NJ)* 26 (1997): 477-480.
8. Thawrani DP, Agabegi SS, Asghar F. Diagnosing Sacroiliac Joint Pain. *The Journal of the American Academy of Orthopaedic Surgeons* 27 (2019): 85-93.
9. Raj MA, Ampat G, Varacallo M. Sacroiliac joint pain. *StatPearls [Internet]* (2021).
10. Srivastava S, KU DK, Mittal H, et al. Short-term effect of muscle energy technique and mechanical diagnosis and therapy in sacroiliac joint dysfunction: A pilot randomized clinical trial. *Journal of Bodywork and Movement Therapies* 24 (2020): 63-70.
11. Kawishwar SS, Samal S, Ramteke S. To Study the Effect of Mulligan Mobilization Versus Conventional Therapy in Sacroiliac Joint Pain. *Indian Journal of Public Health Research and Development* 11 (2020).
12. Farooq S, Zahid S, Hafeez S, et al. Effectiveness of Mulligan mobilization and Kinesiotaping technique on the anterior innominate dysfunction in females. *Journal of the Pakistan Medical Association* (2021): 1-11.
13. Vaidya A, Babu VS, Mungikar S, et al. Comparison between Muscle Energy Technique and Mulligan's Mobilization with Movement in Patients with Anterior Innominate Iliosacral Dysfunction. *Int J Health Sci* 1 (2019).
14. Ribeiro S, Heggannavar A, Metgud S. Effect of mulligans mobilization versus manipulation, along with mulligans taping in anterior innominate dysfunction—A randomized clinical trial. *Indian Journal of Physical Therapy and Research* 1 (2019): 17.
15. Brizzolara KJ, Wang-Price S, Roddey TS, et al. Effectiveness of Adding a Pelvic Compression Belt to Lumbopelvic Stabilization Exercises for Women With Sacroiliac Joint Pain: A Feasibility Randomized Clinical Trial. *Journal of Women's Health Physical Therapy* 42 (2018): 76-86.
16. Ahmad S, Ijaz S, Altam T, et al. Maitland's Mobilization versus Mulligan's Mobilization Technique to Treat Anterior/Posterior Innominate Dysfunctions. *Journal of Islamic International Medical College Quarterly* 14 (2019): 81-85.
17. Khamar K, Soni K. Core Muscle Strengthening Exercises on Stable Surface versus on Labile (Physioball) Surface Along with Moist Pack in Participants with Sacroiliac Joint Dysfunction. *International Journal of Science and Research (IJSR)* 10 (2019): 1664-1668.
18. Horton SJ, Franz A. Mechanical diagnosis and therapy approach to assessment and treatment of derangement of the sacro-iliac joint. *Manual therapy* 12 (2007): 126-132.
19. McKenzie R, May S. *The human extremities: mechanical diagnosis and therapy*: Spinal Publications (NZ) Limited (2000).
20. Donatelli RA, Wooden MJ. *Orthopaedic physical therapy*: Elsevier health sciences (2009).
21. Clare HA, Adams R, Maher CG. A systematic review of efficacy of McKenzie therapy for spinal pain. *Australian journal of Physiotherapy* 50 (2004): 209-216.
22. Srivastava S, Kumar DK, Mittal H, et al. Short-Term Effect of "Mechanical Diagnosis and Therapy" in the Management of Sacroiliac Joint Pain. *Journal of Clinical and Diagnostic Research* 12 (2018).
23. Szulc P, Wendt M, Waszak M, et al. Impact of McKenzie method therapy enriched by muscular energy techniques on subjective and objective parameters related to spine function in patients with chronic low back pain. *Medical science monitor: International Medical Journal of Experimental and Clinical Research* 21 (2015): 2918.



24. Dhargalkar P, Kulkarni A, Ghodey S. Added effect of muscle energy technique for improving functional ability in patients with chronic nonspecific low back pain. *Int J Physiother Res* 5 (2017): 2082-2087.
25. Namnaqani FI, Mashabi AS, Yaseen KM, et al. The effectiveness of McKenzie method compared to manual therapy for treating chronic low back pain: a systematic review. *Journal of musculoskeletal and neuronal interactions* 19 (2019): 492.
26. Lam OT, Strenger DM, Chan-Fee M, et al. Effectiveness of the McKenzie method of mechanical diagnosis and therapy for treating low back pain: literature review with meta-analysis. *Journal of Orthopaedic and Sports Physical Therapy* 48 (2018): 476-490.
27. Czajka M, Truszczyńska-Baszak A, Kowalczyk M. The effectiveness of McKenzie Method in diagnosis and treatment of low back pain—a literature review. *Advances in Rehabilitation* 32 (2018): 5-11.
28. Rahman A, Hashim M, Hassan D, et al. Effect of McKenzie therapy with and without strain counter strain technique in patients with non-specific low back pain. *Rawal Medical Journal* 47 (2022): 179-182.