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Comparing the Effectiveness of Lumbar Traction and Mckenzie Exercises versus Mckenzie Exercises Alone on Pain, Range of Movement and Function on Individuals with Intervertebral Disc Prolapse

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Abstract

Background: Low back pain has a huge economic impact on any healthcare system. Prolapse in lumbar intervertebral disc (PIVD) can lead to the development of LBP. Until the moment, there is inconclusive evidence regarding the best treatment option for PIVD. Aim: The purpose of this research was to examine the effectiveness of lumbar traction and McKenzie exercises versus McKenzie exercises alone on pain, range of movement and function on individuals with PIVD. Methods: A randomised clinical trail study design was utilised in this research. Participants were divided into two groups. Group A received lumbar traction and McKenzie exercises and Group B received McKenzie exercises alone. Different outcome measures such as goniometer readings, Oswestry Disability Index and numeric pain rating scale were used. Quantitative data was represented using descriptive statistics, while qualitative data was depicted through frequencies and percentage. Various statistical analyses were conducted to interpret the collected data. Results: Thirty-two individuals took part in this study. Sixteen individuals were allocated in each group in this study. There was no statistical significant difference between both groups in terms of gaining more range of movement and restoring lost function ($p>0.05$). However, there was a significant statistical change between groups in favour of Group A in terms of pain reduction ($p<0.05$). Conclusion: The findings of this study suggest that it will be more beneficial to add lumbar traction to McKenzie exercises to achieve more pain reduction. It seems that adding lumbar traction helped to relieve pain as it might helped in relieving excessive pressure exerted between lumbar vertebrates.

Introduction

Low back pain (LBP) as a symptom affects many lives around the world (Kassebaum et al., 2016; Al-Oraini et al., 2024). It is estimated that at least eight individuals out of ten might experience an episode of LBP once in their whole life (Ferreira et al., 2023; Mohammad et al., 2024). LBP represents a heterogeneous group of musculoskeletal disorders that affect people productivity level and leads to work absence (Punnett et al., 2005; Wu et al., 2020; Hijjawi et al., 2023). There are many definitions of LBP but commonly the topological definition of this common symptom is "any pain in the area between the inferior margin of the 12th rib and the inferior gluteal fold" (Hoy et al., 2010).

Usually, the majority of LBP cases occurs without a well identified cause (Hoy et al., 2012; Zuhri et al., 2023; Al-Zyadat et al., 2022). In fact, approximately 80% of low back pain patients are diagnosed with non-specific LBP [2,7]. However, injuries to different anatomical structures within the spine and surrounding soft tissues structures might lead to the sensation of pain in the back region (Al-Nawafah et al., 2022). The most

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commonly referred to anatomical structure within the spine that is associated with the occurrence of new episode of LBP is any injury to intervertebral disc (Gadiya et al., 2016; Thackeray et al., 2010). There are many injuries that occurs to the intervertebral discs. One of the most prevalent injuries is Intervertebral Disc Prolapse (PIVD) (de Carvalho et al., 2016; Rahamneh et al., 2023). Disc prolapse and disc bulge are commonly known as contained injuries and on the other hand disc extrusion and sequestration are commonly known as noncontained injuries (Ito et al., 2001; Alsaraireh et al., 2022).

Lumbar disc prolapse or herniation prevalence is higher in male as compared to female and affects most those individuals who are between 30 and 50 years of age (Singh et al., 2021). There are many other risk factors that are associated with PIVD such as obesity, smoking, sedentary lifestyle, and socioeconomic conditions.

Disc prolapse is more common in the lumbar region in comparison to other region in the spine column (Lee et al., 2000; Azzam et al., 2023). Studies reported that PIVD is more frequent between L4-L5 and L5-S1 levels (Demirel et al., 2017; Schoenfeld & Weiner, 2010). Usually PIVD leads to radicular pain, which is one of the most common and disabling symptoms [16]. PIVD lead to sensory and motor deficits and leaves the person incapacitated (Deyo & Mirza, 2013; Al-Husban et al., 2023).

This research work focuses on the impact of PIVD on Saudi Arabia economy. The Kingdom of Saudi Arabia went through a rapid socioeconomic change in the past 10 years especially in the public healthcare sector (Al-Sharqi & Abdullah, 2013; Almalki et al., 2011). In the 2023 Lancet review [2] of the burden of LBP in the adult general population concluded that LBP is more prevalent in high income countries than in low income countries. Therefore, LBP has been recognized by governments as a major public health problem and a complicated challenge for any healthcare systems, leading to the declaration of a 'call for action' (Hartvigsen et al., 2018; Buchbinder et al., 2020). In the 2020 review by Aldera the overall LBP prevalence in these studies conducted in Saudi Arabia was between 63.8% and 89% (Aldera et al., 2020).

Literature Review

Traction

Kumari et al. (2021) conducted a high quality study (8/10) according to PEDro database that compared the acute effects of three traction forces on the straight leg raise (SLR) test and LBP intensity. Participants were allocated into three groups, labelled as A, B, and C. In these groups, traction forces corresponding to 1/5, 1/3, and 1/2 of study participants body weight were applied, respectively. The study assessed the ROM during SLR and pain levels both before and immediately after traction was administered. The results showed that there was a significant enhancement in SLR ROM for all three groups ($p < 0.05$). However, concerning pain relief, a significant improvement ($p < 0.05$) was only observed in the group subjected to traction at 1/2 of their body weight. Notably, there was no statistically significant difference ($p > 0.05$) among the three groups for both variables. This indicates that all three levels of force were equally effective in promptly increasing SLR ROM in patients with lumbar PIVD. Nevertheless, pain relief was specifically associated with the 1/2 body weight force.

Schimmel et al. (2009) conducted a high quality study (8/10) according to PEDro database that investigated the effect of intermittent traction sessions when added to a standard graded activity program for chronic LBP patients. In a randomized controlled trial conducted at a single center with a single-blind design, 60 consecutive patients were divided into two groups: the SHAM group and the intermittent traction sessions group. Both groups received standard conservative therapeutic care, which included graded activity.

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Additionally, all participants underwent 20 sessions on the Accu-SPINA device. In the intermittent traction sessions group, the traction weight was gradually increased until it reached 50% of each person's body weight plus an additional 4.45 kg (equivalent to 10 lb). In contrast, the SHAM group received a non-therapeutic traction weight of 4.45 kg in all of their sessions. A repeated measures analysis was conducted, revealing that the two groups were similar in terms of demographic, clinical, and psychological characteristics at the outset. This suggests that the random assignment process was successful. The Visual Analog Scale (VAS) scores for low back pain notably improved from an initial average of 61 (±25) to 32 (±27) with the treatment protocol, and from 53 (±26) to 36 (±27) in the SHAM protocol. Furthermore, both groups demonstrated significant improvements in leg pain, Oswestry Disability Index (ODI) scores, and SF-36 quality of life scores. The use of pain medication decreased significantly, and scores related to kinesiophobia and coping remained at non-pathological levels with no noticeable differences between the two protocols. In summary, both treatment approaches had positive effects on low back pain, leg pain, functional status, and quality of life over the course of 14 weeks. However, the additional axial, intermittent, mechanical traction added to a standard graded activity program, was found to be ineffective.

Filiz et al. (2018) conducted a moderate quality study (7/10) according to PEDro database that compared the effects of mechanical lumbar traction either in the supine or in the prone position with conventional physical therapy (PT) in patients with chronic low back pain and lumbosacral nerve root involvement in terms of disability, pain, and mobility. 118 patients successfully completed this study. All of the study groups showed significant improvements in the ODI, the VAS, and the modified lumbar Schober test ($p < 0.05$). In the comparative analysis between groups, it was observed that the improvements in the ODI and VAS were notably better in the prone traction group when compared to the group that received only physical therapy (adjusted p-values of 0.031 and 0.006, respectively). This study suggested that incorporating prone traction along with other treatment modalities resulted in more substantial immediate enhancements in terms of pain relief and reduced disability. This suggests that, when considering the use of traction, starting with prone traction might be the preferred option. However, additional research is required to validate the advantages of employing lumbar traction in the prone position.

After a rapid review of the literature, previous studies suggested to use at least half of the patient body weight in the prone position.

McKenzie Method

Halliday et al. (2019) conducted a moderate quality study (7/10) according to PEDro database that aims to compare the effects of the McKenzie method and motor control exercises on trunk muscle recruitment in people with PIVD classified with a directional preference. The research findings indicated that there was not significant between-group difference found for trunk muscle thickness. Observed recovery was slightly higher in the McKenzie group in comparison to the other group; however, there was no statistically significant difference between groups with regards to perceived pain or restoring lost body functions.

Petersen et al. (2022) conducted a moderate quality study (7/10) according to PEDro database that assessed the effect of the McKenzie approach in comparison with that of intensive dynamic strengthening training in individuals who are complaining of PIVD. 260 consecutive patients with PIVD were admitted into this study. There were allocated randomly and equally into either the McKenzie treatment method group or intensive dynamic strengthening training group. Both groups received 8 weeks of treatment at an outpatient clinic followed by 2 months of self-management treatment programme that they carried out at home. The intention-to-treat analysis revealed a trend indicating a potential disparity in the reduction of disability, with the McKenzie group showing a favourable outcome during the 2-month follow-up evaluation. However,

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no differences were found between groups at the end of treatment and at the 8-month follow-up evaluation. Furthermore, no statistical difference was observed at any time between the groups.

Garcia et al. (2013) conducted a high quality study (8/10) according to PEDro database that compared the effectiveness of back school and McKenzie methods in patients with chronic non-specific low back pain. Patients assigned to the McKenzie group experienced greater enhancements in their level of disability after one month, with an average improvement of 2.37 points (95% confidence interval 0.76 to 3.99). However, there was no notable difference in terms of pain, with an average improvement of 0.66 points (95% confidence interval -0.29 to 1.62). No significant variations between the two groups were observed for any of the secondary outcomes. The monitoring of the home exercise program was not feasible, and both therapists and patients were aware of the treatment they received. In summary, the McKenzie method, which is a more resource-intensive intervention, was somewhat more effective than back school in terms of reducing disability, but not in alleviating pain immediately after treatment in individuals with chronic low back pain.

To sum up, it seems that there is a moderate quality evidence that support the use of McKenzi treatment methods in restoring functional abilities in comparison to other physiotherapy treatments methods.

Methods and Materials

Study Design

This study will utilise an experimental research design that compare three different outcomes. A randomised clinical trail will be used in this study.

Setting

This study will be conducted in the hospitals of Najran city in the southern region of Saudi Arabia. Hospitals that contain Physiotherapy departments with outpatients' clinics will be invited to take part in this study. It is expected to conduct this clinical trail between November 2023 and February 2024.

Population

Individuals with PIVD who live in Najran city and who are between 18 to 60 years of age will be eligible to be involved in this study. The research team will check both inclusion and exclusion criteria to determine whether to admit participants into the study or to exclude participants.

Sample size

According to a recent study by Alhowimel et al. [33] the prevalence of LBP in Saudi Arabia was 27.9%. This research assume that therapeutic effect will be detected with 80% power (0.80) and a significance level alpha of 0.05. According to the General Authority of Statistic in Saudi Arabia, 608,467 individuals are living in Najran city in their last count conducted in 2019. Taking into account that effect size for before-after study, paired t-test will be used. Thirty-two individuals will be recruited in this study.

Sampling design

Simple random sampling will be used in this research. In this approach, every element within a population has an equal opportunity to be selected, and the selection process is entirely random, without any pattern

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or bias. By assigning an equal probability to each member of the population, simple random sampling ensures that the resulting sample is representative of the larger group, making it an effective tool for generalizing findings and drawing meaningful conclusions.

Selection criteria

Inclusion Criteria

1. Individuals who are between 18 to 60 years of age.
2. Patients with the primary complaint PIVD.
3. Individuals who are living in Najran city.
4. Patients who have not previously received physiotherapy for LBP.
5. Patients referred to physiotherapy by their GP - to represent typical clinical practice.

Exclusion Criteria

1. Patients deemed to require urgent physiotherapy input by their GP - so as not to interrupt the normal process of care
2. Unable to speak either Arabic or English
3. Unwilling to be included in this study.
4. Individuals who underwent spinal surgeries in the past 6 months.

Equipment and materials

1. Traction machine
2. Gymnastic room
3. Tape measurement
4. Therapeutic beds

Figure-1: showing traction machine

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Figure-2: Showing the tape measurement for (schober test)

Evaluation Parameters

Study participants will be allocated randomly into all study groups. Measurements of pain intensity level, functional abilities and range of movements will be taken at baseline, at the beginning and at the end of each treatment session.

Pain Intensity Level

Pain intensity level will be measured using Numeric Pain Rating Scale (NPRS). The NPRS is a widely employed instrument in the healthcare sector for the evaluation and quantification of a patient's pain. This simple scale typically features a numeric range spanning from 0 to 10, where 0 denotes the absence of pain, and 10 signifies the most extreme pain imaginable. Patients are requested to self-assess their pain by selecting the number that best corresponds to their current pain level. The NPRS is widely used for its simplicity and its capacity to measure a quantitative assessment of pain, thus enhancing communication between healthcare providers and patients. This scale proves beneficial in clinical settings, enabling the straightforward monitoring of pain levels over time and aiding in the tailoring of appropriate pain management strategies.

Functional Abilities

Functional abilities will be assessed in this research using the Oswestry Disability Index (ODI). The ODI is a well-established and frequently employed questionnaire within the domain of musculoskeletal medicine and orthopedics. Its primary purpose is to evaluate how lower back pain impacts a patient's daily life and functional capabilities. Comprising ten sections that encompass various dimensions of daily activities and pain severity, patients provide self-assessments of their level of disability for each component. The cumulative scores are then used to compute a percentage value that offers an overall representation of disability.

Range of Movement

Range of movement will be assessed in this research work through Schober's Test and measurement tape. Schober's Test is a clinical evaluation method employed in the fields of orthopedics and rheumatology to gauge lumbar spine flexibility and the extent of lumbar flexion. This test involves marking two points on

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the patient's lower back, one aligned with the dimples of Venus and the other positioned 10 centimetres above this reference point. The patient is then directed to bend forward as much as possible while maintaining straight knees. The examiner proceeds to measure the alteration in distance between these marked points as the patient leans forward. Also measurement tape will be used to assess the ability of the participant to lean in all four directions of the spinal column using the tip of their middle finger in their hand and the floor surface.

Statistical Methods

The demographic and clinical characteristics of study participants will be evaluated using descriptive statistics. Pearson's correlation matrix will be used to assess associations between variables. Researchers will calculate the difference between measurements at baseline, at the beginning and at the end of each treatment session and a comparison between groups will be carried out according to the following rules. For nonparametric data a chi-square test will be used and for parametric data t-test will be used. All statistical calculations will be carried out using SPSS 27 statistical software package (IBM, 2020). Statistical significance was set at P=0.05.

Results

Thirty-two individuals willingly participated in this study. All participants were refereed to physiotherapy clinics from orthopaedics clinics. Participants were approached by physiotherapists who are working in the Saudi Ministry of Health and were asked if they are interested to take part in this current study. They were giving information sheets about this research and informed consents to sign. Participants were giving one week after their initial assessment and if they were interested to take part in this study they signed their consent form and allocated randomly using simple random table to one of the study groups. Quantitative data was represented using measures such as mean, median, standard deviation, and range, while qualitative data was depicted through frequencies and proportions. Various statistical analyses were conducted to interpret the collected data. The distribution characteristics and homogeneity of variance were assessed using Shapiro-Wilk tests. For comparing continuous data between two groups, Student's t-test (T) and Mann-Whitney U test (MW) were utilized as appropriate. Independent qualitative variables were analysed using Pearson's Chi-square test (χ^2). Repeated measures of Oswestry Disability Index (ODI) scores and Numeric Pain Rating Scale (NPRS) were examined using the Friedman test. Additionally, changes in Range of Motion (ROM) scores before and after intervention were evaluated using the Wilcoxon Signed Ranks Test (WS).

The percentage of improvement in Range of Motion (ROM) was calculated according to the following formula:

Percentage of improvement = [(ROM after intervention – ROM before intervention) / ROM before intervention] * 100

Participants were split into two groups: Group A, which received lumbar traction and McKenzie exercises, and Group B, which only received McKenzie exercises. Table 1 revealed no significant statistical contrast between the groups regarding the demographic characteristics of the participants. The data indicated that both groups shared similar age distributions ($p>0.05$), with a mean age of 40 years in Group A and 38.4 years in Group B. Additionally, the gender distribution was comparable across both groups ($p>0.05$), with a similar proportion of men and women. There was no significant difference in Body Mass Index (BMI)

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between the two groups ($p>0.05$), with mean BMIs of 27.8 kg/m² in Group A and 27.3 kg/m² in Group B. Nearly two-thirds of the patients studied were male.

Table (1): Demographic characteristics of the studied patients.

Variables	Group A (n=16)	Group B (n=16)	Test of Sig.	p-value
Age (years): *Mean ± SD*	40.0 ± 7.3	38.4 ± 7.2	T 0.6	0.5
Sex: *Male* *Female*	10 (62.5%) 6 (37.5%)	12 (75.0%) 4 (25.0%)	χ^2 0.6	0.4
BMI (kg/m²): *Mean ± SD*	27.8 ± 3.4	27.3 ± 3.1	T 0.5	0.6

Table 2 displays a notable reduction in Oswestry Disability Index (ODI) scores among all patients throughout the sessions. ODI scores exhibited a significant decrease across sessions for all patients under study. Table 2 shows that within the same group, a pre-post analysis revealed a statistically significant change. For example, the median ODI scores in Group A decreased significantly ($p<0.001$) from 22.5 (range: 12-47) in the first session to 13 (range: 3-22) in the sixth session. Similarly, the median ODI scores in Group B decreased from 24 (range: 14-49) in the first session to 15.5 (range: 8-20) in the sixth session. Nevertheless, there was no statistically significant contrast observed between the groups regarding the ODI scores of patients. Initially, the median ODI scores were 22.5 in group A and 24 in group B. By the 6th session, the median ODI score decreased to 13 in group A and 15.5 in group B.

Table (2): Oswestry Disability Index (ODI) scores of the studied patients.

Variables	Group A	Group B	MW	p-value
1st session: *Median (Range)*	22.5 (12 – 47)	24 (14 – 49)	0.4	0.7
2nd session: *Median (Range)*	20.5 (12 – 45)	20.5 (12 – 43)	0.4	0.7
3rd session: *Median (Range)*	18.5 (10 – 37)	17.5 (12 – 32)	0.4	0.7
4th session: *Median (Range)*	17 (4 – 29)	18 (12 – 24)	0.2	0.8
5th session: *Median (Range)*	14.5 (4 – 29)	15 (9 – 24)	0.3	0.8
6th session: *Median (Range)*	13 (3 – 22)	15.5 (8 – 20)	1.1	0.3
Friedman	68.7	34.3		
p-value	**<0.001***	**<0.001***		

* Statistically significant

Figure 3 depicts a substantial decrease in Disability Index (ODI) scores for all patients throughout the sessions. ODI scores showed a noticeable reduction as the sessions advanced for all participants in the research. Initially, group A had ODI scores of 22.5, while group B had scores of 24. By the 6th session, these scores had decreased to 13 for group A and 15.5 for group B.

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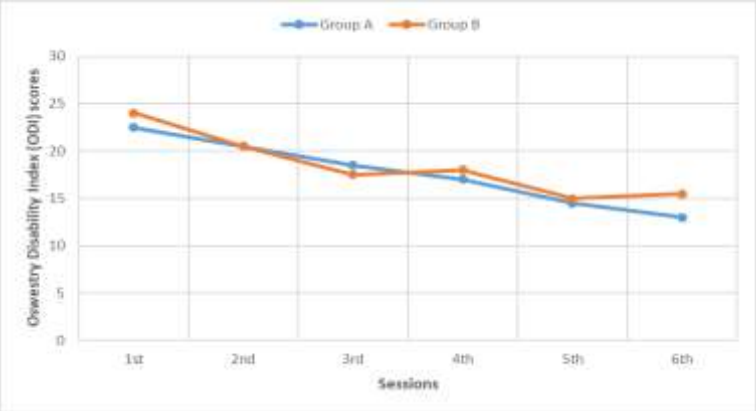

Figure (3): Oswestry Disability Index (ODI) scores of the studied patients.

Table (3): Numeric Pain Rating Scale (NPRS) of the studied patients.

Variables	Group A	Group B	MW	p-value
1st session: *Median (Range)*	7 (6 – 8)	6.5 (5 – 9)	1.4	0.2
2nd session: *Median (Range)*	7 (6 – 8)	6 (5 – 8)	2.0	0.06
3rd session: *Median (Range)*	6 (5 – 7)	6.5 (5 – 7)	1.2	0.3
4th session: *Median (Range)*	5 (3 – 6)	5 (5 – 7)	1.2	0.3
5th session: *Median (Range)*	3.5 (2 – 7)	5 (4 – 7)	2.8	**0.006***
6th session: *Median (Range)*	3 (2 – 5)	4 (2 – 7)	2.1	**0.04***
Friedman	62.2	32.4		
p-value	**<0.001***	**<0.001***		

* Statistically significant

Table 3 demonstrates a statistically significant decrease in the Numeric Pain Rating Scale (NPRS) scores for all patients throughout the sessions. A pre-post analysis shows that at the beginning of the study, the median NPRS scores were 7 for Group A, and these scores decreased to 3 by the sixth session. Similarly, the median NPRS scores for Group B were 6.5 in the first session, decreasing to 4 by the sixth session.

There was no statistically significant difference between the two groups in terms of the Numeric Pain Rating Scale (NPRS) scores during the first four sessions. However, there was a statistically significant difference between the groups during the 5th and 6th sessions. Group A had significantly lower NPRS scores compared to Group B (3.5 versus 5 in the 5th session and 3 versus 4 in the 6th session, respectively).

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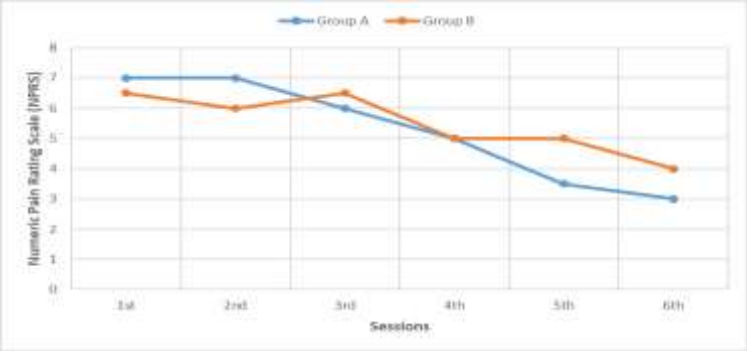

Figure (4): Numeric Pain Rating Scale (NPRS) of the studied patients.

Figure 4 illustrates a statistically significant decrease in the Numeric Pain Rating Scale (NPRS) scores for all patients over the sessions. At the initial session, the median NPRS scores were 7 for group A and 6.5 for group B. By the 6th session, these scores had decreased to 3 for group A and 4 for group B.

During the 5th and 6th sessions, group A exhibited significantly lower NPRS scores compared to group B (3.5 versus 5 in the 5th session and 3 versus 4 in the 6th session, respectively).

Table (4): Range of Motion (ROM) of the studied patients.

Variables	Group A	Group B	MW	p-value
Before intervention: *Median (Range)*	18 (17 – 20)	19 (15 – 22)	1.4	0.2
After intervention: *Median (Range)*	23.5 (21 – 24)	23 (20 – 25)	2.0	0.06
WS	3.5	3.3		
p-value	**<0.001***	**<0.001***		

* Statistically significant

Table 4 displays a statistically significant increase in the Range of Motion (ROM) for all patients after both interventions' groups. In group A, ROM increased from 18 to 23.5, while in group B, ROM increased from 19 to 23. However, there was no statistically significant difference between the two groups in terms of the ROM either before or after the intervention.

Table (5): Percentage of improvement in Range of Motion (ROM) of the studied patients.

Variables	Group A	Group B	MW	p-value
Improvement (%): *Median (Range)*	30.6 (1.0 – 41.2)	26.5 (0.0 – 47.1)	1.4	0.2

Table 5 indicates that there was no statistically significant difference between the two groups in terms of the Percentage of Improvement in Range of Motion (ROM). Group A showed a 30.6% improvement, while Group B showed a 26.5% improvement in ROM.

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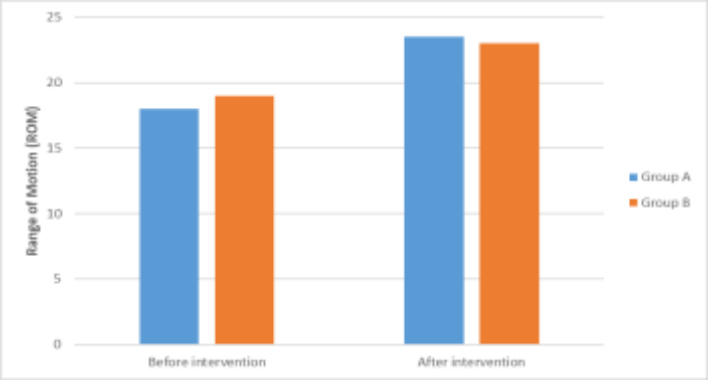

Figure (5): Range of Motion (ROM) of the studied patients.

Figure 5 illustrates a statistically significant increase in the ROM for all patients after the both interventions. In group A, ROM increased from 18 to 23.5, while in group B, ROM increased from 19 to 23.

Discussion

Low back pain (LBP) as a symptom lead to disability worldwide [2]. Lumbar intervertebral disc prolapse (PIVD) is a leading cause of LBP, often driving individuals to seek medical assistance (Nv et al., 2019). Its impact on society, both epidemiologically and economically, underscores the necessity for cost-effective, evidence-based interventions in the management of lumbar PIVD.

Thus, this study aimed to compare the effectiveness of lumbar traction and McKenzie exercises versus McKenzie exercises alone in individuals with intervertebral disc prolapse, focusing on pain, range of motion (ROM), and physical function. The results of this current study indicated a statistically significant change in both groups between the initial and final treatment sessions. These findings suggested that individuals with PIVD who participated in this study experienced a positive trajectory following either kind of management procedures, resulting in pain reduction, increased ROM, and restored physical functions.

Similar positive changes following the initiation of physiotherapy treatment sessions have been reported in numerous other studies conducted worldwide. For example, in a recent meta-analysis published in 2021, the results showed a significant improvement in pain and disability after physiotherapy management in patients of lumbar PIVD (Gugliotta et al., 2016).

After reviewing the existing literature, it seems that our study is the first to compare the effectiveness of adding lumbar traction to McKenzie exercises. It is worth mentioning that lumbar traction is a passive procedure that requires the patient to relax, while the traction machine applies various mechanical forces to the affected intervertebral disc. On the other hand, McKenzie exercises are an active technique designed to encourage the displaced disc to return to its correct position, thereby reducing pain and improving spinal mobility.

Previous research has suggested that the evidence supporting the use of traction for lower back pain (LBP) remains inconclusive due to a lack of methodological rigor and limited application of clinical parameters relevant to clinical practice (Harte et al., 2003). The results of this study showed that there was no significant difference between both study groups disability levels and ranges of movement. However, it seems that pain intensity level decreased more with the addition of lumbar traction to McKenzie exercises. This was also reported by another study by Thackeray et al. who did not find any additional reduction in pain and disability after using different combination of physiotherapy intervention (Welch & Gerszten, 2002).

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Regardless to the conflicting and inconclusive evidence within the medical literature related to the effectiveness of either lumbar traction or McKenzie exercises in the reduction of pain, increasing ROM and restoring lost physical functions, it seems that physiological and biomechanical factors are believed to play a significant role in the management of lumbar PIVD through physiotherapy interventions (Eichen et al., 2014). According to McMorland et al. (2010), spinal traction and mobilization techniques can be a preferred treatment option when medical management fails, as it improves symptoms in 60% of cases of lumbar PIVD that have not responded well to medications treatment.

The results of this current study endorse the addition of lumbar traction to McKenzie exercises as the results showed decrease pain level and improved spinal mobility more in comparison to the control group who received only McKenzie exercises. The likely mechanism of lumbar traction in the management of PIVD involves correcting the displaced disc and releasing entrapped synovial folds (Koçak et al., 2018; Naoyuki et al., 2006).

The results of this study can assist physiotherapists in their clinical practice by considering the combination of a passive physiotherapy modality, such as lumbar traction, with an active physiotherapy technique, such as McKenzie exercises, to achieve more favourable clinical outcomes for individuals with PIVD at both the short and long terms.

Future research should consider including a more diverse and heterogeneous sample and increase the sample size to include more individuals from different parts of Saudi Arabia. The quality of this study will be enhanced further if it comprises an equal number of males and females from different age groups. This will ensure greater generalizability of the study findings. Furthermore, future research should include other outcome measures such as functional abilities and patient satisfaction with the treatment options.

Study limitations

Randomized controlled trials (RCTs) are widely regarded as the gold standard for assessing the effectiveness, efficacy, and safety of numerous medical interventions. Despite their rigorous design, RCTs have several limitations. One such limitation is the potential for selection bias. Participants included in this study were randomly referred from orthopaedic clinics, and all those referred to physiotherapy departments had an equal opportunity to participate in this study. Their decision to be involved in this study was entirely voluntary, and they were allocated to groups randomly using appropriate measures.

Despite randomization, differences in baseline characteristics between treatment groups may still exist, leading to biased estimates of treatment effects. However, in this research, participants' demographic characteristics were similar in both groups at baseline. However, other factors were not considered such as educational level and the presence of chronic disorders which might affect the results directly and indirectly.

Additionally, blinding was not feasible, particularly in studies assessing non-pharmacological interventions or surgical procedures, which can introduce performance and detection bias. However, despite these limitations, RCTs remain crucial for providing high-quality evidence to guide clinical decision-making.

Finally, the study sample did not contain an equal number of males and females, with a slight overrepresentation of men compared to women. This might be related to the Saudi culture as women hesitate more to take part in research more than women especially if the researchers were men.

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Conclusion

This study adopted an RCT study design and followed a rigorous approach not only in collecting data but also in analysing and interpreting it. The sample included in this research had similar demographic characteristics before the commencement of this study. The findings suggested that there was no statistically significant difference between groups in terms of back disability level, as the scores of the Oswestry Disability Index were similar between both study groups. Similarly, there was no statistically significant difference between groups at the end of treatment sessions in terms of range of movement, as goniometer readings were similar between Group A and Group B.

The results clearly showed that both groups benefited from McKenzie exercises. However, the findings of this research suggested that adding lumbar traction to McKenzie exercises helped reduce pain intensity levels more compared to performing McKenzie exercises alone.

This was the first study to investigate the addition of lumbar traction to McKenzie exercises in individuals with PIVD. Additionally, this study was the first conducted in Saudi Arabia to investigate the benefits of McKenzie exercises for individuals affected by PIVD. The findings of this study will help Saudi physiotherapists and policymakers at a managerial level make informed clinical decisions that may, in turn, help individuals suffering from PIVD.

This study forms the foundation upon which future research can be conducted. There are several ways to enhance the quality of this research in the future. It is recommended that future research include a more heterogeneous sample that contains an equal number of men and women from different age groups. This will ensure greater generalizability of the study findings. Furthermore, other outcome measures such as patient satisfaction and psychosocial outcome measures should be considered. Using different outcome measures in an RCT study design will provide breadth and depth to the information gathered from study participants.

In conclusion, this study found that adding lumbar traction to McKenzie exercises significantly helped reduce pain by relieving excessive pressure between lumbar vertebrates.

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