

**Review Article****Effectiveness of Physical Remedy in Lumbar Spinal Stenosis: A Systematic Review**Shradha Jain<sup>1</sup>, Shikha Singh<sup>2</sup>, Gaurav Pratap Tyagi<sup>3</sup>

1. PG Student (MPT), 2. Assistant Professor 3. P G, Clinical

**Abstract**

Neurogenic claudication is a clinical condition and a common cause of lower back pain, extremity discomfort, difficulty in walking, and other forms of disability in the elderly is brought on by lumbar spinal stenosis. Symptomatic lumbar spinal stenosis is the most common reason for spine surgery in patients over 65, although the incidence and prevalence of this condition are unknown. The narrowing of the spinal canal is a hallmark of lumbar spinal stenosis as shown on radiographs and anatomically. The neural foramina, the central spinal canal, or the region under the facet joints may experience constriction more laterally. Lumbar spinal stenosis is often symptomatic due to nerve root Compression; however, it can also be asymptomatic and fall under several other categories. The study's goal is to review Randomized Controlled Trials, Controlled Trials studies and systematic reviews to determine the efficacy of physical remedies for Lumbar spinal stenosis. When multiple trials presented with the same subjects and results, care was taken to include each study only once. The following information was extracted from each study: the total number of subjects; age (mean and range); inclusion and/or exclusion criteria; assessment; follow-up; and the authors' conclusions. All English-language studies on the effectiveness of Physiotherapy interventions for adult Lumbar stenosis patients were included. The review found that supervised exercise was more effective in Lumbar spinal stenosis than self-management or home exercise. Massage, flexibility and strengthening exercises, stabilization techniques (Core Stabilization), heat/ice therapy, aqua therapy, or aerobic (e.g., treadmill, cycling) exercises can all be beneficial in different parameters when combined with psychotherapy or behavioral therapy. Although physical therapy is commonly prescribed for cases of Lumbar Spinal Stenosis (LSS), little is known about its effectiveness. From 2010 to 2022, a methodical literature search was used. According to the findings of this review, Physical therapy Interventions give better prognosis when integrated approaches are used.

**Key words:** Degenerative Stenosis, Spinal Canal Stenosis, Neurological claudication, Low back ache, Physical Therapy

**Address for correspondence:** Shradha Jain, PG Student (MPT), Jyotirao Phule Subharti College of Physiotherapy, Swami Vivekanand Subharti University, Meerut, UP, 250005

**Mail:** [shradhajain4230@gmail.com](mailto:shradhajain4230@gmail.com)

**Contact:** +91- 9761038950

**Introduction**

Lumbar spinal stenosis (LSS) is a term used to describe a condition in which symptoms caused by an anatomical reduction in the size of the lumbar spine. [1] The problem with this anatomically grounded description is that, while it's needed for the opinion of LSS, it's inadequate for determining the inflexibility of symptoms and functional impairment that prompts a case to seek treatment. Asymptomatic cases can have severe anatomical spinal stenosis. This review focuses on the efficacy of physical remedies for LSS operation. Degenerative spinal stenosis can attend with other conditions similar to Spondylolisthesis or scoliosis [2]. Although individualities with these conditions are included in numerous studies of degenerative LSS, they're beyond the compass of this review. Natural or acquired etiologies can cause spinal stenosis. Only 9 of the cases affect by natural etiologies. Some common natural causes include achondroplasia, locked pedicles, osteoporosis, apical vertebral wedging, spinal dysraphism, segmentation failure early vertebral bow ossification, thoracolumbar kyphosis, osseous exostosis.

Acquired stenosis occurs primarily from trauma, degenerative changes, iatrogenic causes, and

systemic processes. Trauma generally affects the vertebral canal acutely with a mechanical force. Degenerative changes do when there's a narrowing of the central conduit and side recess from posterior fragment herniation, ligament flavum hypertrophy, and spondylolisthesis. Laminectomy, emulsion, and discectomy surgeries can beget iatrogenic spinal stenosis. [3, 4, 5, 6] Lumbar spinal stenosis is common, affecting roughly 11 of aged grown-ups in the US. While studies have set up that roughly 20 of grown-ups aged than 60 times have substantiation of spinal stenosis on imaging reviews, further than 80 don't witness symptoms and thus don't need treatment. [7] Common symptoms of lumbar spinal stenosis are pain extending from the lower reverse to the buttocks and frequently to one or both legs. Occasionally the pain is accompanied by impassiveness or chinking in the lower legs or bases. Pain due to lumbar spinal stenosis generally increases with standing or walking and is relieved with sitting or leaning forward. Due to the gradational worsening of pain over time, some cases may develop severe limitations in exertion. [7] Clinical experience indicates that exercises performed during lumbar flexions similar to bicycling are generally better permitted than walking. Exercises that strengthen the abdominal musculature

may help cases avoid inordinate lumbar extension. Although there are no trial data to guide opinions about the use of lumbar corsets in cases with characteristic spinal stenosis, corsets may help cases maintain a posture of slight lumbar flexion and are worth trying. To avoid atrophy of Para spinal muscles, the corset should be worn only for a limited number of hours per day. [1] The study aims to determine the effectiveness of Physiotherapy Management in adult cases (25- 30 ages) with lumbar spinal stenosis.

## Methodology

### Search Strategy and Selection

A systematic literature search was conducted from January 2010 to December 2022 to identify relevant trials for this review. The following methods were employed:

The Medscape database was searched using keyword combinations such as "low backache," "physical therapy," "spinal stenosis," and "neurological claudication."

The PubMed database was searched using the keywords "Neurological Claudication", "Lumbar Spinal Stenosis", "Degenerative Lumbar Spinal Stenosis".

The Google Scholar database was searched using the terms "Lumbar Spinal Stenosis," and "Degenerative Lumbar Spinal Stenosis."

The New England Journal and Springer Data are also being studied to better understand the structural and functional changes that occur in patients with Lumbar Spinal Stenosis.

In addition, Bibliographic Reference list of related journal articles and books were included.

### Eligibility

All English-language studies on the effectiveness of Physiotherapy interventions for adult Lumbar stenosis patients were included, whether they used Physical Therapy in experimental or control groups. Studies that examined all exercises or specific exercises based on the needs of patients were included. The design of the study was not an exclusion criterion (e.g. only randomized controlled trials).

### Study Selection and Data

Ten randomized controlled trials, two mixed design studies, two non-randomized studies, and one experimental study were included in the studies. Exclusion criteria included: studies comparing Physical Therapy interventions to surgical or medical treatment; no clearly stated use of Physical Therapy effectiveness; and Physical Therapy Management of stenosis in other body parts other than the lumbar spine.

When multiple trials presented the same subjects and results, care was taken to include each study only once. Each article's entire text was read. The following information was extracted from each study:

the total number of subjects; age (mean and range); inclusion and/or exclusion criteria; assessment; follow-up; and the authors' conclusions.

### Data Synthesis

Ten randomized controlled trials, two mixed design studies, two non-randomized studies, and one experimental study were included in the studies

Evidence is revealed by combining the results of two studies.

### Synthesis

A narrative synthesis was used to synthesize the data from all of the studies and express their findings. The data from the included studies were described qualitatively, and the authors evaluated the results.

## Results

### Study Selection

Records were found in a literature review by searching databases such as PubMed (n=20), Google Scholar (n=80), and Medscape (n=9). 109 papers in total were screened. Unrelated studies, another study language, undesirable study design, duplicate articles, undesirable intervention, and undesirable sample features (n=94) were excluded. The full text of 15 articles intended to follow the screening provisions was analyzed.

### Study Characteristics

The vast majority of studies (Total 10 RCTs) met the patient follow-up period (8-14, 16-17, 23, 31), and four studies are more review based with mixed study type. Because of various causes, all studies have concentrated on LSS (e.g., degenerative). Almost all of the studies included patients above 30 Yr. of age. Table 1 displays the study's findings.

### Physical Therapy Interventions Along with their Effectiveness

Only three studies [12, 13, and 14] did not specify whether the allocation was concealed or not. These studies were unable to determine which physical therapy treatment is superior for LSS; additionally, there was low-quality evidence suggesting that modalities have no additional effect to exercise and that surgery leads to better long-term (2-year) outcomes for pain and disability, but not walking distance, than physical therapy in patients with LSS. Because of their variable quality, published RCTs can only provide limited evidence to support recommendations for nonsurgical/physical therapy treatment of LSS. These limitations exist because they may serve to overemphasize evidence from "weaker" trials [14].

In RCTs by Tomlin et. Al. 75 study participants reported having physical therapy care.

Massage (27%), strengthening exercises (23%), flexibility exercises (18%), and heat/ice (14%), were the treatments mentioned by patients the most frequently. The 76 physical therapists most frequently suggested heat/ice (76%), acupuncture (63%), joint mobilization (62%), flexibility (87%), stability (86%), and strengthening exercises (83%). He also added that Future research should concentrate on massage, flexibility and strengthening exercises, stabilization techniques, and heat/ice treatments because they offer patients with LSS effective management. This is based on the study's findings. [8]

Exercise is much better than doing nothing, cycling and body-weight treadmill walking have similar effects, and corsets are better than not wearing them, however, the evidence from Luciana et al. RCT results is of low quality [13].

Michael J et al. included 259 participants (mean [SD] age, 72.4 [7.8] years; 137 women [52.9%]) who were randomly assigned to medical care (88 [34.0%]), At 2 months, adjusted between-group analyses revealed that manual therapy/individualized exercise improved symptoms and physical function more than medical care (2.0; 95% CI, 3.6 to 0.4) or group exercise (2.4; 95% CI, 4.1 to 0.8). When compared to medical care (7.6% and 48.7%, respectively) or group exercise (3.0% and 46.2%, respectively), manual therapy/individualized exercise had a higher proportion of responders (30% improvement) in symptoms and physical function (20%) and walking capacity (65.3%) at 2 months. There were no differences in mean outcome scores of both groups responder rates at 6 months. In a randomized controlled.

As a result of these RCTs, it is clear that manual therapy provides better short-term outcomes and can improve walking capacity with nonsurgical approaches.<sup>[11]</sup>

Maynooth t et al. present findings from a comparison of aquatic physical therapy and conventional physical therapy with (n=24) and analyzed using repeated functional measures right away and Wilcoxon at 33-month follow-up. The findings indicate that aquatic therapy, which is a safe and enjoyable intervention, can provide better short-term improvement in pain and function than Masakazu et al. used single-centered open-labeled randomized controlled trials and analyzed the study using usi. ICQ physical function, self-paced walking test (SPWT) performance, pain as judged by a numerical Pain rating scale (NPRS), and daily step count as measured by a pedometer were all secondary outcomes. Random assignment was used to place patients with LSS in either a PT (supervised PT twice a week for 6 weeks) or a home exercise (HE) group. Manual therapy, individually tailored stretching and strengthening exercises, cycling, and body weight-supported treadmill walking were all part of the physical therapy sessions. At random, 43 patients were split into the PT group and 43 patients into the HE group. Compared to standard therapy, but with weaker support from research<sup>[12]</sup>.

In comparison to the HE group, the PT group had a higher percentage of responders who met the minimal clinically significant difference in ZCQ symptom severity (30.2% [9.1-48.6], p=.01), ZCQ physical function (32.6% [11.6-50.6], p.01), SPWT walking distance (39.5% [18.8-56.7], p.01), and NRS leg pain (34.5% [18.8-56.7], p.01).

As a result, supervised physical therapy (PT) for people with LSS significantly reduced symptoms, physical function, walking distance, pain, and physical activity when compared to unsupervised exercise.<sup>[10]</sup>

According to their review, Faith et.al. found that supervised exercise was superior to self- management or at-home exercise for LSS. Additionally, workouts for core stability, aqua therapy, or aerobic fitness (such as running on a treadmill or cycling) might be advantageous in several different ways. The exercise was combined with the practical and effective application of manual treatment.<sup>[15]</sup>

Luciana Gazzi Macedo et. al. included 5 RCTs, 2 controlled trials, 2 mixed design studies, and 1 longitudinal cohort study in their review. The combined results of two studies revealed that adding a physical therapy modality to exercise had no statistically

significant effect on outcomes. The pooled effects results of RCTs comparing surgery to physical therapy revealed that surgery was superior to physical therapy only in the long term (2 years). Other findings indicated that exercise is superior to no exercise, that cycling and body-weight-supported treadmill walking has comparable effects, and that corsets are superior to no corsets.

However, no conclusions could be drawn from the review as to which physical therapy treatment is superior for LSS In their RCT, Masakazu Minetama et al. enrolled 86 patients and administered therapies twice weekly for six weeks. The main result was the severity of symptoms on the Zurich claudication questionnaire after a year. Physical function, discomfort, health-related quality of life, and the surgery rate after a year were considered secondary outcomes. At one year, more patients in the physical therapy group than in the home exercise group experienced minimum clinically significant differences in the severity of Zurich claudication questionnaire symptoms (60.5% vs. 32.6%; adjusted odds ratio [AOR] 4.3, [95% CI [1.5-12.3], P = 0.01); physical function on the Zurich claudication questionnaire (55.8% vs. 32.6%; AOR 3.0 [1.1-8.1], P = 0.03); bodily pains surgery rate at 1 year was lower in the physical therapy than in the home exercise group (7.0% vs 23.3%; AOR 0.2 [0.04– 0.9] P = 0.04). Accordingly, the study comes to the firm conclusion that supervised physical therapy resulted in higher improvements in symptom severity and physical function than unsupervised exercise and was linked to a lower risk of needing surgery within a year.<sup>[17]</sup>

30 patients with lumbar spinal stenosis were randomly assigned to one of two 33-week physical therapy regimens (experimental group, n=15; control group, n=15) by S Kumar et al. Exercise programmes for flexibility, strengthening, and functional/recreational activities were a part of the first programme, while exercise programmes for electrotherapy and canal expansion were a part of the second programme (Hot fomentation, IFT, Flexion Exercises). Indicators of success To gauge perceived improvement, the Oswestry Disability Questionnaire was utilised (ODQ). Secondary outcomes were the Modified Schober Test, Straight Leg Raise, Slump test, and Numeric Pain Rating Scale (NPRS) (MST). It suggests that integrated exercise management has a more significant impact than conventional PT management.

This study published in the pen Journal of Therapy and Rehabilitation concludes that manual therapy along with basic therapeutic exercise objectives provides the following manual techniques yielded positive results: flexion-distraction manipulations, sidelying lumbar rotation thrust, and posterior-to-anterior mobilizations, side-lying to side bending manipulations, thoracic thrusts, and neural mobilizations. It may include lumbar spine and hip mobility exercises, lumbar bending and rotation exercises, spinal flexibility exercises recommended to patients i.e. thoracic extension self-mobilization or stretching exercises and lumbar rotation exercise core strengthening/stabilization is one of the most useful treatment programs for low back pain and it may benefit from the use of biofeedback, the treatment with biofeedback is called RUSI.<sup>[18]</sup>

Carlo Ammendolia et al. conducted a systematic review of 177 trials and concluded that there is moderate-quality evidence from three trials that: manual therapy

Table 1: Summary of Included articles

Author	Title	Patie nt age	Interventions	Outcome Measures	Results
Michael J et al.	Comparative Clinical Effectiveness of Nonsurgical Treatment Methods in Patients With Lumbar Spinal Stenosis A Randomized Clinical Trial	>50	Manual therapy/ individualized therapy, Group exercises, and Medical care		Manual therapy/ individualized exercise had a greater proportion of responders (30% improvement) in symptoms and physical function (20%) and walking capacity (65.3%) at 2 months compared with medical care (7.6% and 48.7%, respectively) or group exercise (3.0% and 46.2%, respectively)
Luciana Gazzi Macedo et al.	Physical Therapy Interventions for Degenerative Lumbar Spinal Stenosis: A Systematic Review	40 or > 40	Massage, Strengthening, Flexion exercises, Aerobic conditioning, Bracing/ Walking Devices	MA Modified version of Newcastle – Ottawa Quality Assessment Scale, Self-Assessment Scale	Exercise is significantly better than exercise, that cycling and body-weight – supported treadmill walking have similar effects, and corsets are better than no corset. But No conclusions could be drawn from the review regarding which physical therapy treatment is superior for LSS
Masakazu Minetama et al.	Supervised Physical therapy vs. Home exercise for patients with lumbar spinal stenosis: a randomized controlled trial	All age groups	Manual Therapy, Individually Tailored Stretching, strengthening exercises, cycling and Body weight-supported treadmill training	Zurich Claudication Questionnaire (ZCQ), self-paced walking test (SPWT) performance, pain indicated using a numerical rating scale (NRS), and the number of daily steps measured by pedometer	Supervised PT for patients with LSS resulted in significant short-term improvements in symptom severity.

S Kumar et al.	Effect of integrated exercise protocol in lumbar spinal stenosis as compared with conventional physiotherapy-a randomized control trial	>50	Flexibility exercise, Specific experimental canal enlargement exercise, strengthening exercise, functional/ recreational activities), while the other included electrotherapy and exercise program (Hot fomentation, IFT, Flexion Exercises).	ODQ, NPRS, S LR, Slump test, and MST	It suggests that the integrated exercise approach has significant effect than conventional PT management
Kaynoosh t et al.	Comparison of the effect of aquatic physical therapy and Conventional physical therapy in patients with lumbar spinal stenosis (a randomized controlled trial)	50-80	Aqua Therapy and Conventional Physical Therapy	Repeated Measure Test, Wilcoxon Test, Man - Whitney Test	Aqua therapy is more effective than conventional therapy
Carlo Ammendolia et al.	Non-operative treatment for lumbar spinal stenosis with neurogenic claudication: an updated systematic review	>30	Manual Therapies and exercises, community-based group exercises.	Repeated functional measure	Moderate-quality evidence from three trials that: Manual therapy and exercise provides a superior and clinically important short- term improvement in symptoms and function compared with medical care or community- based group exercise

Faith Ogden et al.	The effectiveness of physical exercise in patients with lumbar spinal stenosis: a systematic review	>18	Core stabilization, aqua therapy, or aerobic (e.g., treadmill, cycling) exercises, ergometric cycling	-	Results showed that Supervised exercise was more effective in LSS than self-management or home exercise. In addition, core stabilization, aqua therapy, or aerobic (e.g., treadmill, cycling) exercises can be advantageous in different parameters.
Luciana Gazzi Macedo et al.	Physical Therapy Interventions for Degenerative Lumbar Spinal Stenosis: A Systematic Review	>18	Ultrasound, TENS, and the heat pack to an exercise, Aqua Therapy, Treadmill training, Flexion exercises, Strengthening and core stabilization technique, lumbosacral corset/ assisted devices	Based on Pain and Disability	Ultrasound, TENS, and heat packs for an exercise program at short-term follow-up. The pooled results demonstrated that the addition of modalities had short-term effect than no modalities also corset is better than no corset.
John K Hsiang et al.	Spinal Stenosis	>50	Home exercise program (e.g., flexion-biased lumbar stabilization, flexibility training, gluteal strengthening, aerobic conditioning),	Pain and Disability	Specific exercises show better improvement than no exercise
Masakazu et al.	Supervised physical therapy versus unsupervised exercise for patients with lumbar spinal stenosis: 1-year follow-up of a randomized controlled trial	>50	Supervised HE (Flexion exercise, aerobic and treadmill training, core stabilization, lumbosacral corset/ walking assisted device) and N Non specific treatment	ICQ NPRS SPOT	Supervised PT for patients with LSS resulted in significant short-term improvements in symptom severity, physical function, walking distance, pain, and physical activity compared with unsupervised exercise.
<b>Oswestry Disability Questionnaire (ODQ), Numeric Pain Rating Scale (NPRS), Straight Leg Raise (SLR), Slump test and Modified Schober Test (MST), SSelf-Paced Walking Test (SPWT), Home Exercise (HE)</b>					

and exercise provide a superior and clinically important short-term improvement in symptoms and function compared to medical care or community-based group exercise while demonstrating superior and clinically important improvements in walking distance in the immediate to long term compared with self-directed home exercises.<sup>[23]</sup>

According to John K Hsiang et al., patients with lumbar spinal stenosis should be educated on how to avoid aggravating factors like excessive lumbar extension and downhill ambulation. Furthermore, patients should be instructed on proper posture and given instructions for a home exercise program (e.g., flexion-biased lumbar stabilization, flexibility training, gluteal strengthening, aerobic conditioning), but the effectiveness of specific interventions cannot be guaranteed.<sup>[29]</sup>

Back Pain: Discogenic; May 2022, Ya-Ting Chen et al. The most effective treatment option is multimodal physical therapy, but efficacy was not demonstrated in the study. There are several limitations to the current systematic review that should be addressed. To begin, due to the diverse designs of the included studies, only narrative synthesis could be provided. Second, we were unable to access several databases. Third, presenting the effectiveness of a specific type of exercise on spinal stenosis could provide more detailed practical information; however, the number of studies available for inclusion in this systematic review was limited. Finally, due to human error, some studies on this topic may have been overlooked

## Discussion

The diversity of interventions as well as the variation in study designs was a weakness of this review. This failure made it delicate to compare studies. Because treatments were constantly "whisked," the impact of a specific physical remedy treatment couldn't be banded. Physical remedy programs were also constantly listed as "typical physical remedy treatment" without being described in detail (e.g. Parameters, lozenge). Physical remedy programs must be better defined to allow for better interpretation of study results, replication in unborn studies, and operation. Several studies had to be barred because, in addition to physical remedy, surgery, specifics, or epidural steroids were the primary forms of treatment. Because of this limitation, it was delicate to determine What aspect of a case's conservative treatment affected their pain, especially since epidural steroids are a type of pain drug? Still, because we believe that numerous cases will be taking some form of anti-inflammatory or pain drug while entering physical remedy treatment for LSS, we allowed NSAIDs to be used as part of conservative treatment as long as they weren't a major part of the treatment. In one study comparing physical remedy, education, and NSAIDs to surgery, 52 nonsurgical cases also entered steroidal injections. Also, Exercise appears to be a common point of the interventions studied; still, the stylish type of exercise (specific or general), weight loss protocols, corsets, and the addition of primer remedy and other forms of treatment to exercise must be determined. Further mechanisms of action for these and other interventions must be precisely considered and presented to support long term effectiveness of physical therapy in term of improvement in LSS

## Conclusions

According to the findings of this review, supervised exercise was more effective in LSS than self-management or home exercise. Physical therapy with a multimodal approach is the most effective treatment option, for example, massage, flexibility and strengthening exercises, stabilization techniques (Core Stabilization), and heat/ice therapy, aqua therapy, or aerobic (e.g., treadmill, cycling) exercises can be beneficial in different parameters along with psychotherapy or behavioral therapy. Clinicians' treatment beliefs should take a patient-specific approach into account. So this is concluded that integrated exercise management has a more significant impact than conventional (only spinal flexion exercise therapy) PT management and provide significant improvement, when corset and exercises are continued by patient in their daily routine.

**Source of Support: Nil**

**Conflict of interest: Nil**

**Acknowledgement: None**

## References

1. Katz et al, the Center for Orthopedic and Arthritis Outcomes Research, Brigham and Women's Hospital, 75 Francis St., B3, Boston, MA 021, N Engl J Med 2008;358:818-25.
2. Stephane G Genevaand Steven J Atlas, Best practice & research Clinical rheumatology Author Manuscript, HHS Public Access, Lumbar Spinal stenosis volume 24 issue2; April 2010
3. Raja A, Hoang S, Patel P, et al. Spinal Stenosis. [Updated 2022 Jul 17]. [PubMed, Google Scholar]
4. Messiah S, Tharian AR, Candido KD, Knezevic NN. Neurogenic Claudication: a Review of Current Understanding and Treatment Options. Curr Pain Headache Rep. 2019 Mar 19;23(5):32
5. Bagley C, MacAllister M, Dosselman L, Moreno J, Aoun SG, El Ahmadieh TY: Current concepts and recent advances in understanding and managing lumbar spine stenosis; F1000Res. 2019;8
6. Melancia JL, Francisco AF, Antunes JL, Spinal stenosis. Handb Clin Neurol. 2014; 119:541-9
7. Katz JN, Zimmerman ZE, Mass H, Makhni MC. Diagnosis and management of lumbar spinal stenosis: a review. JAMA Published May 3, 2022.
8. Tomkin et al. Physical therapy treatment options for lumbar spinal stenosis. 2010 Mar 5.
9. S Kumar, A Narkeesh, Effect of integrated exercise protocol in lumbar spinal stenosis as compared with conventional physiotherapy-a randomized control trial, Int J Neurorehabilitation 4 (301), 2376-0281.1000301,2017
10. Masakazu et al. Supervised physical therapy vs. home exercise for patients with lumbar spinal stenosis: a randomized controlled trial,2019 Sep 4
11. Michael et al. Comparative Clinical Effectiveness of Nonsurgical Treatment Methods in Patients With Lumbar Spinal Stenosis A Randomized Clinical Trial, 2019 Jan 4.
12. Maynooth al. compare the effect of aquatic physical therapy and conventional physical therapy in patients with lumbar spinal stenosis (a randomized controlled trial), 2015 April 14.

13. Luciana et al. Physical therapy interventions for degenerative lumbar spinal stenosis: a systematic review, Oxford Academy, 2013.
14. De QH Tran et al. Lumbar spinal stenosis: a brief review of the nonsurgical management, Canadian Journal of Anesthesia/Journal cCanadiend'anesthésie 57 (7), 694-703, 2010
15. Faith oOgden et al. The effectiveness of physical exercise in patients with lumbar spinal stenosis: a systematic review, 2022 Jan 24
16. Luciana et al. Physical Therapy Interventions for Degenerative Lumbar Spinal Stenosis: A Systematic Review, Physical therapy; vol 93; No. 12; Dec 2013
17. Masakazu et al. Supervised physical therapy versus unsupervised exercise for patients with lumbar spinal stenosis: 1-year follow-up of a randomized controlled trial, 2021 Jan 10
18. Lumbar Stenosis of the Aging Spine: Evaluation and Treatment According to the Evidence-Based Medicine for the Improvement of the Quality of Life, Open Journal of Therapy and Rehabilitation > Vol.5 No.1, February 2017
19. Jon Lurie et al. Management of Lumbar Spinal Stenosis, BMJ; 2016
20. Fei-Long Wei et al. Management for lumbar spinal stenosis: A Network Meta-analysis and systematic Review, Int J Surg; 2021 Jan.
21. Surgical versus non-surgical treatment for lumbar spinal stenosis.
22. Zaina F, et al. Surgical versus non-surgical treatment for lumbar spinal stenosis, Cochrane Database Syst Rev. 2016, 21..
23. Carlo Ammendolia et al. Non-operative treatment for lumbar spinal stenosis with neurogenic claudication: an updated systematic recompiled22.
24. Samuel C Overley et al. Tandem Spinal Stenosis: A Systematic Review; Sep2017
25. Fabio Zhan et al. Surgical versus Non- surgical treatment for Lumbar Spinal Stenosis;2016
26. Carlo Ammendolia et al. Non-operative treatment of lumbar spinal stenosis with neurogenic claudication: a systematic review, 2012
27. Carlo Ammendolia et al. What interventions improve walking ability in neurogenic claudication with lumbar spinal stenosis? A systematic review, Eur Spine J; 2014 Jun
28. Sherif El-Daw et al. Role of Machine Learning in Management of Degenerative Spondylolisthesis; 2021
29. John K Hsiang et al. Spinal Stenosis; 2021 Feb 01
30. Ya-Ting Chen et al. Back Pain: Discogenic; May 2022
31. S Kumar et al. Effect of integrated exercise protocol in lumbar spinal stenosis as compared with conventional physiotherapy-a randomized control trial, Int J Neurorehabilitation 4 (301), 2017

**How to cite this article:** Jain S, Singh S, Tyagi G P. Effectiveness of Physical Remedy in Lumbar Spinal Stenosis: A Systematic Review. Subharti J of Interdisciplinary Research, Dec. 2022; Vol. 5: Issue 3, 13-20