

## Correlation of Vitamin D and Core Stabilization Exercise in Low Back Pain: A Narrative Review

Lilima Patel<sup>1,2\*</sup>, Jagatheesan Alagesan<sup>2</sup>

<sup>1</sup>Apollo College of Physiotherapy, Hyderabad, India

<sup>2</sup>Saveetha College of Physiotherapy, SIMATS, Chennai, India

\*Email: lilimapatel853@gmail.com

### Abstract

**Background and Aim:** Low back pain is a complex condition that can have various causes and its management involves multiple treatment strategies as per the cause. Use of vitamin D supplementation for LBP has gained attention due to its anti-inflammatory effect and helps to improve bone density whereas core stabilization exercises can help to strengthen core and spinal muscles and stabilize the spine. While there is evidence to suggest that both Vitamin D and core stabilization exercise may have potential benefits for low back pain, the direct correlation between these two factors is not well established. So the aim of this narrative review is to find out the correlation of Vitamin D and Core Stabilization exercise in low back pain.

**Methods:** We searched the articles using PubMed and Google Scholar regarding the correlation of Vitamin D and Core Stabilization exercise in male and female low back pain subjects.

**Results:** Evidence from human studies suggest that Vitamin D and core stabilization exercises both are important for overall functioning of intervertebral disc integrity and its stability. Vitamin D is a vital nutrient that plays a critical role in maintaining bone health, regulating the immune system, and reducing inflammation whereas Core stabilization exercises improves core and spinal muscle strength that stabilizes the spine.

**Conclusions:** Clinicians caring for patients must be aware of this Vitamin D and Core stabilization exercises to find the right treatment course for each patient. In many cases quick Vitamin D supplementation along with Core stabilization exercises may be used to manage LBP. While there is a rightful role for Vitamin D in management of lumbar low back pain, non-pharmacological options like Core stabilization exercises should also be considered as they can play an important role in physiotherapy management of low back pain.

### Keywords

LBP, Core Stabilization, Vitamin D, Degenerative disease

### Introduction

Low back pain (LBP) is the most common symptom of spinal diseases which manifests due to a series of pathological conditions like disc degeneration, intervertebral disc bulge, spinal canal stenosis, spinal segmental instability and osteophytes formation and can cause back and leg pain (Chen et al., 2012). There are several studies that have observed an association between low vitamin D level and increase risk of experiencing LBP (Huang et al., 2019). One of the most common cause

**Submission:** 16 August 2023; **Acceptance:** 17 August 2023



**Copyright:** © 2023. All the authors listed in this paper. The distribution, reproduction, and any other usage of the content of this paper is permitted, with credit given to all the author(s) and copyright owner(s) in accordance to common academic practice. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license, as stated in the website: <https://creativecommons.org/licenses/by/4.0/>

of lower back pain in due to disc degeneration in which multiple signaling pathways are involved (Huang et al., 2019). One among them is NF- $\kappa$ B signaling pathway, a very classical pathway involving intervertebral disc degeneration by increasing the levels of inflammatory factors and matrix metalloproteinase (Narouei et al., 2020; Hlaing et al., 2021). Vitamin D has an inhibitory effect on NF- $\kappa$ B signaling pathways which plays an important role in relieving inflammatory reactions, resisting oxidative stress, inhibiting apoptosis and delaying cell senescence (Lamba et al., 2013). Vitamin D deficiency has not only been linked to an increased risk of degenerative diseases but also it is important to note that several studies have observed an association between vitamin D levels with musculoskeletal health, including muscle function which leads to muscle pain, weakness (including core muscle) and decrease in bone density (Narouei et al., 2020; Inani et al., 2013).

Evidences suggested that there are separate studies showing associations between vitamin D deficiency and LBP as well as between core muscle weakness and LBP, whereas the specific correlation between vitamin D deficiency and core muscle weakness in relation to LBP is less well established. Some studies have indicated that vitamin D deficiency is associated with muscle weakness including core muscles, which could potentially contribute to LBP so appropriate vitamin D supplementation and core stabilization exercise can reduce the risk of developing LBP (Inani et al., 2013; Hlaing et al., 2021). While there is a rightful role for Vitamin D in management of lumbar low back pain, non-pharmacological options like Core stabilization exercises should also be considered as they improve core muscle strength and spinal stability. Research suggests that core stabilization exercises focus on strengthening of core muscles which in turn provides stability to spine, reduce the intensity of pain, improve spinal health and also reduces risk of further injury (Inani et al., 2013; Hlaing et al., 2021).

Considering the individual effect of vitamin D and core stabilization exercises, it is plausible that optimize vitamin D levels and engaging in core stabilization exercises may have complementary benefits on lower back pain combiningly (Hlaing et al., 2021; Frizziero et al., 2021). Maintenance of sufficient vitamin D concentrations is essential for musculoskeletal health whereas core stabilization exercise focuses on improving muscle strength, stability and coordination which can help to support the spine and alleviate stress on lower back. (Hlaing et al., 2021; Nezhad et al., 2012; Zadro et al., 2017). Stronger core muscles can promote better posture and reduce the risk of LBP (Zadro et al., 2017; Singh Santosh Kumar et al., 2023). However, it is important to note that the direct correlation between these two factors in the context of LBP has not been extensively reviewed. Thus based on the current evidences, our narrative review of the literature aimed to find out the correlation of vitamin D and core stabilization exercise in low back pain.

### **Methodology**

We searched the articles using PubMed and Google scholar published between 2013 to 2023 on human in both the gender from 30-60 years of age regarding the correlation of Vitamin D and Core stabilization exercise in male and female low back pain (Ramalingam et al., 2023).

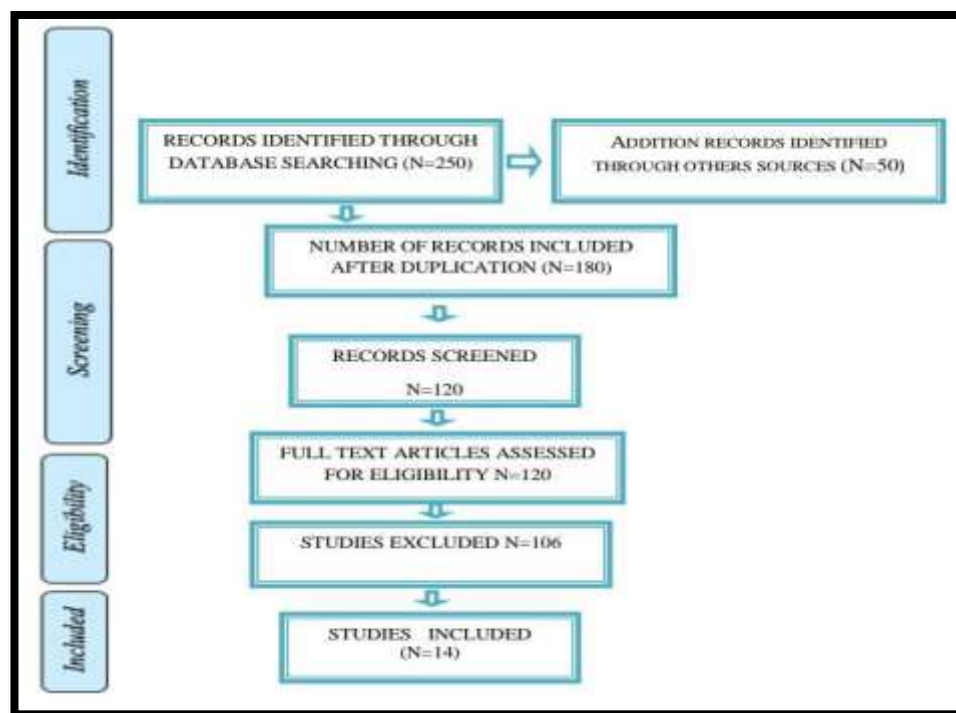


Figure1. Flow Diagram

Table 1. Review Articles on Effect of Vitamin D on LBP

| Author                | Year | Sample                         | Study  | Main Findings   |
|-----------------------|------|--------------------------------|--|---|
| Lakkiredy et al.      | 2019 | 84 subjects with LBP           | Efficiency of vitamin D supplementation in patients with mechanical low back ache. RCT   | Results indicate that Subjects of Vitamin D nano syrup group have shown significantly better improvement compared to others.  |
| Solymani and Habibian | 2021 | 48 Chronic LBP subjects        | Effect of core stabilization exercise and vitamin D intake in patients with chronic low back pain: A clinical trial study. RCT | Results indicate that Both core stabilization and vitamin D intake can be effective in improving chronic low back pain patients having abnormal low vitamin D levels. |
| Muraih and Tamadhr    | 2021 | 150 LBP & 100 normal subjects. | Effect of Vitamin D, Calcium and Phosphate on the Low Back Pain. RCT   | Results indicate that all patients have low level of vitamin D (21ng/mL) when compared to the normal subjects (62.8 ng/ mL)   |
| Kumalangi et al.      | 2022 | 988 articles                   | The Effect of Vitamin D Supplement as Analgesic in Low Back Pain Patients: A Literature Review.                                | Vitamin D has the potential to aid in the healing process as an analgesic in patients suffering from low back pain.   |

|                |      |  |  |   |
|----------------|------|--|--|---|
|                |      |  |  |   |
| Papori et al.  | 2017 | 100 LBP cases and 100 controls.              | Study of Vitamin-D status in patients with low backache. Case control study  | Results indicate that there is a high possibility of vitamin D deficiency in the etiology of low backache.  |
| Narayan et al. | 2023 | 260 subjects with LBP                        | Chronic low back pain and its association with serum Vitamin D level in an Indian tertiary care center. An Observational study | Results shows that there is high prevalence of vitamin D deficiency in Indian population with chronic low back pain and may lead to lower functional capacity       |
| Zadro et al    | 2017 | 29 articles included in this systemic review | Mapping the association between vitamin D and Low back Pain: A Systematic Review and Meta-analysis of Observational studies.   | Results indicate that Vitamin D deficiency is associated with LBP, with stronger associations observed in younger women and those with severe levels of deficiency. |

Table 2. Review Articles on Effect of Core stabilization exercise on LBP

| Author           | Year | Sample                              | Study   | Main Findings   |
|------------------|------|-------------------------------------|---|---|
| Lamba et al.     | 2013 | 30 Chronic LBP subjects             | Effects of Core Stability Exercises Versus Conventional Treatment in Chronic Low Back Pain. RCT   | Results indicate that Core stabilization exercises on Swiss ball are safe and effective in long term management of chronic low back pain.                             |
| Narouei et al.   | 2020 | 32 nonspecific chronic LBP subjects | Effects of core stabilization exercises on thickness and activity of trunk and hip muscles in subjects with nonspecific chronic low back pain. RCT  | Results indicate that Core stabilization exercises shows increased contracted thickness of Transverse Abdominis and Gluteus maximus muscles and decreased disability. |
| Hlaing et al     | 2021 | 36 LBP subjects                     | Effects of core stabilization exercise and strengthening exercise on proprioception, balance, muscle thickness and pain related outcomes in patients with subacute nonspecific low back pain. RCT | Results indicate that Core stabilization is superior to strengthening exercise and effective in reducing pain, greater reduction of functional disability.            |
| Inani and Selkar | 2013 | 320                                 | Effect of core stabilization exercises versus conventional  | Results indicate that Core stabilization exercises were found to  |

|                 |      |                                  |  |   |
|-----------------|------|----------------------------------|--|---|
|                 |      | Nonspecific LBP subjects         | exercises on pain and functional status in patients with non-specific low back Pain. RCT   | be more effective in reducing pain and improving functional status.   |
| Watanabe et al. | 2022 | 812 high school baseball players | Associations between core stability and low back pain in high school baseball players: A cross-sectional study.  | Study shows that high school baseball pitchers with reduced core stability showed a higher probability of reporting low back pain during lumbar extension movement.   |
| Frizziero et al | 2021 | 49 articles                      | Efficacy of Core Stability in Non-Specific Chronic Low Back Pain. Systematic review  | Results indicate that core stability provides beneficial effects in patients with non-specific chronic low back pain by reducing pain intensity, functional disability, and improving quality of life, core muscle activation, and thickness. |
| Singh et al.    | 2023 | 50 Nonspecific LBP subjects      | Effect of Core Muscle Stabilization Exercises on Disability Associated with Non-Specific Low Back Pain in Postmenopausal Women: A Prospective Longitudinal Study | Results indicate that core stabilization exercises are proved to be more effective than conventional physical therapy in reducing disability associated with non-specific low back pain in postmenopausal women.                              |

### Conclusion

The purpose of this narrative review was to elucidate the role of Vitamin D and Core Stabilization exercises in male and female subjects with low back pain, providing current evidence from human studies. Evidences from the studies suggested that Vitamin D and Core Stabilization exercises both are important for overall functioning of intervertebral disc integrity and its stability. In many cases quick Vitamin D supplementation along with Core Stabilization may be used to manage lower back pain. While there is a rightful role for Vitamin D in management of low back pain due to degenerative spinal disease, non-pharmacological options like Core Stabilization exercises should be considered as they can play an important role in improving spinal strength and stability.

### Acknowledgements

This research work is presented during Stride'23 International Physiotherapy conference on April 6<sup>th</sup> and 7<sup>th</sup> and the abstract is published as conference proceedings in International Journal of Physiotherapy and Occupational therapy (IJPOT).

## References

- Chen, W., Li, G., Sun, H., Ye, W., Huang, D., Su, P., & Zhang, Z. (2012). Association of vitamin D receptor gene polymorphism in Han people with lumbar degenerative disc disease. *African Journal of Pharmacy and Pharmacology*, 6(16), 1211–1215.
- Frizziero, A., Pellizzon, G., Vittadini, F., Bigliardi, D., & Costantino, C. (2021). Efficacy of core stability in non-specific chronic low back pain. *Journal of Functional Morphology and Kinesiology*, 6(2), 37.
- Hlaing, S. S., Puntumetakul, R., Khine, E. E., & Boucaut, R. (2021). Effects of core stabilization exercise and strengthening exercise on proprioception, balance, muscle thickness and pain-related outcomes in patients with subacute nonspecific low back pain: A randomized controlled trial. *BMC Musculoskeletal Disorders*, 22(1), 1–13.
- Huang, H., Cheng, S., Zheng, T., Ye, Y., Ye, A., Zhu, S., & Lin, X. (2019). Vitamin D retards intervertebral disc degeneration through inactivation of the NF- $\kappa$ B pathway in mice. *American Journal of Translational Research*, 11(4), 2496–2508.
- Inani, S. B., & Selkar, S. P. (2013). Effect of core stabilization exercises versus conventional exercises on pain and functional status in patients with non-specific low back pain: A randomized clinical trial. *Journal of Back and Musculoskeletal Rehabilitation*, 26(1), 37–43.
- Kumalaningtyas, M. A., Rosyidah, D. U., Sulistyani, S., & Nursanto, D. (2022, April). The effect of vitamin D supplement as analgesic in low back pain patients: A literature review. In *Proceedings of the International Conference on Health and Well-Being (ICHWB 2021)* (pp. 20–28). Atlantis Press.
- Lakkireddy, M., Karra, M. L., Patnala, C., Iyengar, R., Cherukuri, N., Hussain, K. A., ... Peddamadyam, S. K. (2019). Efficiency of vitamin D supplementation in patients with mechanical low back ache. *Journal of Clinical Orthopaedics and Trauma*, 10(6), 1101–1110.
- Lamba, D., Kandpal, S., Joshi, M., Koranga, M., & Chauhan, N. (2013). Effect of core stability exercises versus conventional treatment in chronic low back pain. *Indian Journal of Physiotherapy and Occupational Therapy*, 7(3), 76–80.
- Narayan Praveen, B. R., Harshavardhan, R. P. R., Chintapalli Surya Sri Karun, & K. M. Gopinath. (2023). Chronic low back pain and its association with serum vitamin D level in an Indian tertiary care centre. *European Journal of Molecular & Clinical Medicine*, 10(3), 788–810.
- Narouei, S., Barati, A., Akuzawa, H., Talebian, S., Ghiasi, F., Akbari, A., & Alizadeh, M. (2020). Effects of core stabilization exercises on thickness and activity of trunk and hip muscles in subjects with nonspecific chronic low back pain. *Journal of Bodywork and Movement Therapies*, 24(4), 138–146.
- Nezhad Roomezi, S., Rahnema, N., Habibi, A., & Negahban, H. (2012). The effect of core stability training on pain and performance in women patients with non-specific chronic low back pain. *Journal of Research in Rehabilitation Sciences*, 8(1), 57–64.
- Papori Borah, F., Begum, F., Arjun Khakhlari, R., Kayal, A. K., & Goswami, M. (2017). Study of vitamin-D status in patients with low backache. *International Journal of Health Research and Modernization in Line with Practice (IJHRMLP)*, 3(1), 81–84.
- Rainville, J., Hartigan, C., Martinez, E., Limke, J., Jouve, C., & Finno, M. (2004). Exercise as a treatment for chronic low back pain. *The Spine Journal*, 4(1), 106–115. [https://doi.org/10.1016/S1529-9430\(03\)00277-7](https://doi.org/10.1016/S1529-9430(03)00277-7)

- Ramalingam, V., Jagatheesan, A., & Suganthirababu, P. (Eds.). (2023). *Proceedings of International Physiotherapy Conference – Stride '23* (pp. 1–143). International Journal of Physiotherapy and Occupational Therapy. <https://ijpot.com/conference.html>
- Shamsi, M., & Sarrafzadeh, J. (2016). The effect of core stability and general exercise on abdominal muscle thickness in non-specific chronic low back pain using ultrasound imaging. *Physiotherapy Theory and Practice*, 32(4), 277–283.
- Singh, S. K., Singh, J., Shankar, R., Mukherjee, S., & Yadav, R. (2023). Effect of core muscle stabilisation exercises on disability associated with non-specific low back pain in postmenopausal women: A prospective longitudinal study. *Journal of Clinical and Diagnostic Research*. Advance online publication. <https://doi.org/10.7860/JCDR/2023/60500.17201>
- Solymani, N., & Habibian, M. (2021). Effect of one course of core stabilization exercise and vitamin D intake on some renal function biomarkers in patients with chronic low back pain: A clinical trial study. *Journal of Gorgan University of Medical Sciences*, 23(1), 1–10.
- Standaert, C. J., Weinstein, S. M., & Rumpeltes, J. (2008). Evidence-informed management of chronic low back pain with lumbar stabilization exercises. *The Spine Journal*, 8(1), 114–120.
- Watanabe, Y., Kato, K., Otoshi, K., Tominaga, R., Kaga, T., Igari, T., ... Konno, S. I. (2022). Associations between core stability and low back pain in high school baseball players: A cross-sectional study. *Journal of Orthopaedic Science*, 27(5), 965–970. <https://doi.org/10.1016/j.jos.2022.05.005>
- Zadro, J., Shirley, D., Ferreira, M., Carvalho-Silva, A., Lamb, S., Cooper, C., & Ferreira, P. (2017). Mapping the association between vitamin D and low back pain: A systematic review and meta-analysis of observational studies. *Pain Physician*, 20(7), E891–E910.