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To find the association between Vitamin D Deficiency and Pain intensity in Patients with Low Back Pain: An Observational Study

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ABSTRACT

Introduction: One of the most common musculoskeletal disorders affecting individuals worldwide is low back pain which significantly increases morbidity, disability, and healthcare burden. Vitamin D deficiency has been implicated in various musculoskeletal disorders, including Low back pain, due to its role in bone health, muscle function, and inflammation. Given the widespread prevalence of vitamin D deficiency and its potential impact on pain levels, understanding this association is crucial for improving the management of Low back pain.

Objectives: This observational study aimed to investigate the connection between Vitamin D deficiency and pain intensity in individuals suffering from low back pain.

Methodology: This cross-sectional study was carried out from September 2024 to December 2024 at a Nepal Police Hospital (NPH) in Kathmandu, Nepal, in the pain and orthopedic outpatient department after obtaining approval from the ethical committee. The level of serum 25-hydroxy vitamin D (25(OH)D), Visual Analogue Scale (VAS), age, education level, marital status, employment status, and body mass index (BMI) were documented. A cutoff value for Vitamin D deficiency was established at 20 ng/mL. Patients were classified into two categories based on their Vitamin D levels. Patients with serum 25(OH)D levels below 20 ng/mL were identified as having Vitamin D deficiency (Group 1), while those with levels of 20 ng/mL or higher were classified as having normal Vitamin D levels (Group 2). Statistical analyses were conducted to assess the frequency of Vitamin D deficiency and low back pain and to investigate potential associations.

Results: Among the 216 participants, 61.46% were found to have Vitamin D deficiency (serum 25(OH)D < 20 ng/mL). Vitamin D level was 15.89 ± 4.06 ng/mL in group 1 as compared to mean vitamin D level of 28.03 ± 7.66 ng/mL in Group 2 which was statistically significantly (P < 0.0001). The median Visual Analog Score (VAS) was 8 in Group 1 and 5 in Group 2, indicating a higher pain intensity in patients with lower Vitamin D levels.

Conclusion: This study provides evidence suggesting a potential association between Vitamin D deficiency and higher pain intensity in patients with low back pain.

Introduction

Low back pain is one of the most prevalent musculoskeletal issues at Nepal Police Hospital, with the large number of patients seeking treatment for this condition steadily increasing. This growing trend highlights the need for effective management strategies to address and reduce the impact of low back pain among patients. Low back pain is not only a source of physical discomfort but also results in reduced quality of life, increased healthcare utilization, and lost productivity. The multifactorial nature of LBP, which includes mechanical, inflammatory, and systemic factors, complicates treatment strategies. Recently, Vitamin D deficiency

has emerged as a potential contributor to musculoskeletal pain, including low back pain, due to its role in bone metabolism, immune function, and muscle health.

Vitamin D, a fat-soluble vitamin, belongs to a group of sterols that function as hormones and hormone precursors since it can be synthesized within the body. Its primary effects include regulating calcium and phosphorus metabolism and promoting bone mineralization.

In recent years, it has been found that the lack and inadequacy of Vitamin D are linked to various chronic diseases. Vitamin D may have a role in the emergence and maintenance of chronic pain disorders and associated comorbidities because it affects how pain is manifested anatomically, hormonally, neurologically, and immunologically.

This observational study aims to explore the potential association between Vitamin D deficiency and pain intensity in individuals suffering from Low back pain. By investigating serum Vitamin D levels and correlating them with pain severity, we hope to shed light on whether improving Vitamin D status could serve as an adjunctive treatment strategy for managing pain in these patients. The findings from this research may provide valuable insights into the management of Low back pain, especially for those with concurrent Vitamin D deficiency, and may contribute to broader discussions on the significance of Vitamin D in musculoskeletal health.

Methodology

This cross-sectional study was conducted from September 2024 to December 2024 at Nepal Police Hospital (NPH) in Kathmandu, Nepal. Ethical approval for the study was obtained from the Institutional Review Committee to ensure the research adhered to ethical standards and patient safety protocols. We enrolled patients of 22-50 years of age visiting pain and orthopedics outpatient department. The exclusion criteria were patients with Known metabolic bone diseases (such as osteoporosis, osteomalacia, or Paget's disease of bone), recent fractures and current vitamin D supplementation. All the patients visiting to pain and orthopedics out-patient department, fulfilling the eligibility criteria were enrolled in the study after written informed consent. Standardized Proforma were used to record the data.

The sample size was determined utilizing the Cochran formula.

Where:

e represents the required level of precision (i. e. the margin of error),

p denotes the (estimated) proportion of the population that possesses the attribute in question.

q is $1 - p$

Sample size calculation(n) $n = z^2(PQ)/d$

Using cochrans formula kept confidence level 95%, error margin 5%, population proportion – 16.9% based on previous study. The minimum sample size was 216.

The demographic data, including age and gender, along with additional information such as ethnicity, socio-economic status, and geographical location, were noted. The level of Serum 25-hydroxyvitamin D (25(OH)D), visual analog score (VAS) and body mass index (BMI) values was recorded. The cutoff value of Vitamin D was agreed upon as 20 ng/mL. Patients were categorized into two groups based on their Vitamin D levels. Individuals with serum 25(OH)D concentrations lower than 20 ng/mL were identified as having Vitamin D deficiency (Group 1), while those with values of 20 ng/mL and higher were regarded as normal regarding Vitamin D (Group 2).

Analyses of data were performed upon completion of the study. Data were entered in MS Excel and analyzed using descriptive statistical methods SPSS-version-21. Assessment of the visual analog score (VAS) of both the groups were done for noting the severity of pain. Mean \pm SD and median were utilized for continuous variables, while number and percentage (%) were applied for categorical variables. Values of $P \leq 0.05$ were considered to be statistically significant.

Results

This study included a total of 216 patients who presented with low back pain at the pain and orthopedics outpatient department. Among the 216 cases, the majority were male, with 159 patients (73.6%) being male, while the remaining 57 patients (26.3%) were female (Table 1).

The study compared various factors, including sex, BMI ($47.61 \pm 5.17 \text{ kg/m}^2$ vs. $46.70 \pm 4.30 \text{ kg/m}^2$), education level, marital status, and working conditions. However, no statistically significant differences were found between these factors in relation to the occurrence or severity of low back pain.

The mean age of the group 1 is 37.61 years and in group 2 the mean age group 39.43 years, ranging from 22 to 50 years.

Table 1: Showing Demographic Parameters of The Patients.

Variables	Group 1	Group2	total	P value
No of patients	133	83	216	
Age (years) (Mean \pm Sd)	37.61 \pm 9.54	39.43 \pm 7.27		0.1381
male	97	62	159	
female	36	21	57	

Based on the vitamin D levels, 133 (61.46%) patients were suffering from Vitamin D deficiency (Group 1), and in 83 (38.42%) patients, levels were normal (Group 2).

In Group 1, the mean Vitamin D level was $15.89 \pm 4.06 \text{ ng/mL}$, compared to a mean Vitamin D level of $28.03 \pm 7.66 \text{ ng/mL}$ in Group 2, which was statistically significant ($P < 0.0001$) (Table 2). The median Visual Analog Score (VAS) was 8 in Group 1 and 5 in Group 2, indicating a higher pain intensity in patients with lower Vitamin D levels.

Table 2: Showing Vitamin D Status and VAS of Both the Group

variable	Group1	Group 2	P value
Mean \pm Sd	15.89 ± 4.06	28.03 ± 7.66	<0.0001
Median (VAS)	8	5	

The visual analog score (VAS) in the patient with Vitamin D deficient group was higher (7.39±1.082) in comparison to the normal group (5.286±1.030) which is statistically significant (Table 3)

Table 3: Showing the Correlation of visual analogue Score with Vitamin D Status.

variable	VAS	Vitamin D	P value
Group1	7.39±1.082	15.89 ± 4.06	<0.0001
Group2	5.286±1.030	28.03 ± 7.66	<0.0001

Discussion

In this study, we found that 61.46% of the total patients were suffering from Vitamin D deficiency. Our findings suggest that individuals with lower levels of Vitamin D were more likely to experience higher pain intensity, whether they were suffering from chronic or acute low back pain. This indicates a potential link between Vitamin D deficiency and increased pain severity in low back pain patients.

Vitamin D is a fat-soluble hormone which regulate calcium levels in the body. Vitamin D deficiency can manifest in a range of symptoms, from nonspecific musculoskeletal pain to more definitive clinical presentations such as osteomalacia. The latter may include symptoms like pain, tenderness, muscle weakness, and even difficulty walking. The lack of vitamin D increases the possibility of inflammation activity in the final edition of the spine, which reduces pain, leading to the generalized pain of muscles and bones.

Low back pain and vitamin deficiencies are the most prevalent health issues in our nation and worldwide. One of the primary factors contributors to vitamin D deficiency is inadequate sunlight exposure, as more than 90% of vitamin D synthesis in the body occurs through sunlight. Consuming Vitamin D through food has minimal impact, particularly if no supplements are taken. Seasonal and regional variations can directly affect Vitamin D production, as sunlight is the main source.

The prevalence of low back pain in Nepal ranged from 52% to 91%, while musculoskeletal pain varied between 35% and 70%.

The cross-sectional study conducted at a tertiary care hospital in Kathmandu, Nepal, revealed a prevalence of 69.6% for Vitamin D deficiency, 16% for insufficiency, and 14.3% for sufficient Vitamin D levels. The deficiency was more common in older individuals and females, with severe deficiency observed in 16.2% of the study population. The average prevalence of Vitamin D deficiency in studies conducted in the USA is reported to be 41.6%, with 82.1% in Black individuals and 69.2% in Hispanics.

Al Faraj and Al Mutairi conducted a study which included patients from 15 to 52years with chronic low back pain, it was revealed that 299 out of 360 participants, accounting for 83%, had low levels of Vitamin D. Vitamin D deficiency was identified as a significant contributor to chronic Low back pain. Similarly in this study patients who had lower levels of Vitamin D were linked to higher pain intensity in individuals suffering from Low back pain.

Badsha et al. conducted a study involving 139 patients suffering from pain and Vitamin D deficiency, who were treated with Vitamin D supplementation. The results showed that 90% of the patients experienced clinical improvement.

Kushal Parikh and his team conducted prospective observational study at department of orthopaedics at simmer hospital (tertiary care hospital), surat to study on low back pain and its association with levels of vitamin D3. In their study among 197 patients with chronic low back pain, it was found that 62.9% had inadequate levels of vitamin D3, 16.8% had insufficient levels, and 20.3% had acceptable levels of the vitamin. The average vitamin D3 level in the study group was 20.9 ng/mL. Similarly in our study 61.46% among 216 patients with chronic low back pain were suffering from Vitamin D deficiency and the mean of vitamin D level was 15.89ng/ml.

Hovsepian et al. reported a 50.8% prevalence of Vitamin D deficiency in the young adult population. Gokcek E and his team conducted a retrospective, observational study in 98 patients aged 18–70 years. They found 84 (85.7%) of the patients were suffering from vitamin D deficiency. our study had also similar finding.

Kumar M, Ahmed M, Hussain G, et al carried an observational study from August 2016 to August 2019 at Khairpur Medical College and Shaheed Mohatarma Benazir Bhutto Medical College, Karachi, Pakistan in Patients aged 18 years and above suffering from chronic low back pain. They included 1,152 cases with chronic lower back pain. Despite of low level of vitamin D they found no relationship between chronic lower back pain and vitamin D levels. In contrast, our study found a significant association between the severity of low back pain and Vitamin D deficiency, suggesting that lower Vitamin D levels may contribute to more intense pain in individuals with low back pain.

In our study, a clear association was observed between Vitamin D deficiency and higher pain intensity in individuals suffering from low back pain. The data indicated that individuals with deficient Vitamin D levels reported significantly higher levels of pain intensity compared to those with normal Vitamin D levels. This finding aligns with the hypothesis that adequate levels of Vitamin D might play a crucial role in managing the severity of low back pain. Our study highlighting that individuals with lower Vitamin D levels experienced more intense and debilitating pain, possibly due to the role of Vitamin D in maintaining musculoskeletal integrity and reducing inflammation. Further research is necessary to explore the direct impact of Vitamin D supplementation on pain reduction and its potential as a preventive measure for low back pain.

Conclusion

This study highlights the high prevalence of vitamin D deficiency in low back pain patients and the association between lower vitamin D levels and increased pain severity. Future research should also explore the underlying mechanisms by which Vitamin D influences pain, as well as the role of different factors such as muscle function, inflammation, and the central nervous system.

Limitations of the Study

While our study found an association between Vitamin D deficiency and pain intensity, several confounding factors could influence the results. For example, lifestyle factors such as physical activity levels, diet, and smoking habits may contribute to both pain perception and Vitamin D status. Future studies should attempt to control for these factors more rigorously to determine whether Vitamin D deficiency is an independent risk factor for increased pain.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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References

- Khadgawat, R., & Narang, S. (2014). The role of Vitamin D in the musculoskeletal system. *Indian Journal of Endocrinology and Metabolism*, 18(1), 1-5.
- Champe PC, Harvey A FD. In: Lippincott's Illustrated reviews Series. 3rd ed. Ulukaya E, editor. Nobel Medicine Bookstores; 2007.
- Holick MF. Vitamin D: A D-lightful health perspective. *Nutr Rev*. 2008;66: S182-94. DOI: 10.1111/j.1753-4887.2008.00104.x PMID: 18844847
- Hyppönen E, Boucher BJ, Berry DJ, Power C. 25-hydroxyvitamin D, IGF-1, and metabolic syndrome at 45 years of age: A cross-sectional study in the 1958 British birth cohort. *Diabetes*. 2008; 57:298-305. DOI: 10.2337/db07-1122 PMID: 18003755
- Vos T, Allen C, Arora M. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016.
- Institute for Health Metrics and Evaluation. What health problems cause the most disability? 2018. Available: <http://www.healthdata.org/nepal>. Accessed: 14 June 2018.
- Duplancic D, Cesarik M, Poljak N, Radman M, Kovacic V, Radic J, Rogosic V: The influence of selective vitamin D receptor activator paricalcitol on cardiovascular system and cardio-renal protection.
- Heidari B, Shirvani JS, Firouzjahi A, Heidari P, Hajian-Tilaki KO: Association between nonspecific skeletal pain and vitamin D deficiency. *Int J Rheum Dis*. 2010, 13:340-346. DOI: 10.1111/j.1756-185X.2010.01561.x PMID: 21199469
- DeLuca HF: Overview of general physiologic features and functions of vitamin D. *Am J Clin Nutr*. 2004, 80:1689-1696. DOI: 10.1093/ajcn/80.6.1689S PMID: 15585789
- Fidan F, Alkan BM, Tosun A. Pandemic of the Era: Vitamin D Deficiency and Insufficiency. *Türk Osteoporoz Derg*. 2014; 20:71-4. DOI: 10.4274/tod.94830
- Sharma S, Jensen MP, Pathak A, Sharma S, Pokharel M, Abbott JH. State of clinical pain research in Nepal: a systematic scoping review. *Pain Rep*. 2019 Dec 6;4(6): e788. DOI: 10.1097/PR9.0000000000000788 PMID: 31984293 PMCID: PMC6903326
- Poudel N, Dhakal SS, Sukhupayo R, Karki DB. Vitamin D Deficiency among Patients Visiting a Tertiary Care Hospital: A Descriptive Cross-sectional Study. *JNMA J Nepal Med Assoc*. 2020 Nov 22;58(231):839-842. DOI: 10.31729/jnma.5645 PMID: 34506404 PMCID: PMC7775021
- Forrest KY, Stuhldreher WL. Prevalence and correlates of Vitamin D deficiency in US adults. *Nutr Res*. 2011; 31:48-54. DOI: 10.1016/j.nutres.2010.12.001 PMID: 21310306
- Al Faraj S, Al Mutairi K. Vitamin D deficiency and chronic low backpain in Saudi Arabia. *Spine (Phila Pa 1976)* 2003; 28:177-9. DOI: 10.1097/00007632-200301150-00015 PMID: 12544936
- Badsha H, Daher M, Ooi Kong K. Myalgias or non-specific muscle pain in Arab or Indo-Pakistani patients may indicate Vitamin D deficiency. *Clin Rheumatol*. 2009; 28:971-3. DOI: 10.1007/s10067-009-1146-7 PMID: 19277814
- Parikh K, Devani D, Modi H. To study on low back pain and its association with levels of vitamin d3. *Int J Med Sci Clin Res Rev*. 2023;6(01):265-275. Available from: <https://ijmscrr.in/index.php/ijmscrr/article/view/435/320>
- Movsesian S, Amini M, Aminorroaya A, Amini P, Iraj B. Prevalence of Vitamin D deficiency among adult population of Isfahan city, Iran. *J Health Popul Nutr* 2011; 29:149-55 DOI: 10.3329/jhpn.v29i2.7857 PMID: 21608424 PMCID: PMC3126987
- Gokcek E, Kaydu A. Assessment of relationship between Vitamin D deficiency and pain severity in patients with low back pain: A retrospective, observational study. *Anesth Essays Res* 2018; 12:680-4. DOI: 10.4103/aer.AER_96_18 PMID: 30283175 PMCID: PMC6157211

19. Kumar M, Ahmed M, Hussain G, et al. Assessment of Vitamin D Levels in Patients Presenting with Chronic Low Back Pain at a Tertiary Care Hospital.