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A RETROSPECTIVE CROSS-SECTIONAL STUDY ON VITAMIN D DEFICIENCY AND IT'S CORRELATION WITH LOW BACK PAIN IN OT PERSONNEL

Dr Chavi Sethi[1*] Dr Chitrangana Gupta[2,] Dr Amit Sehgal[3], Dr. RK Verma[4]

[1*]Associate Professor Department: Anesthesiology, Institute: MLBMC Jhansi Jhansi, Uttar Pradesh
[2]Assistant Professor Department: Anesthesiology, Institute: MLBMC Jhansi Jhansi, Uttar Pradesh
[3]Professor Department: Orthopedic, Institute: MLBMC Jhansi Jhansi, Uttar Pradesh
[4]Junior resident Department: Anesthesiology, Institute: MLBMC Jhansi Jhansi, Uttar Pradesh

***Correspondence Author:** Dr Chavi Sethi
[*]Associate Professor Department: Anesthesiology, Institute: MLBMC Jhansi Jhansi, Uttar Pradesh

ABSTRACT

Introduction: The yearly prevalence of lower back pain among healthcare professionals, nurses, and operating room staff has increased to 40-50%. Study was done to determine vitamin D status in OT personnel with LBP and its correlation with VAS severity of pain. All OT personnel with LBP who presented to the outpatient department from October 2023 to February 2024 were retrospectively examined.

Material and Methods: The study included 140 OT personnel who experienced LBP. between the ages of 18 and 65, of both sexes with LBP were included in the study. Participants were categorized into three groups: those with deficient levels of Vitamin D (Group 1) and those with insufficient levels (Group 2) as well as those with sufficient levels (Group 3), with a cutoff value of 30 ng/mL for Serum Vitamin D. The participants demographic data and VAS scores were recorded. The study investigated the relationship between Vitamin D levels and VAS scores using the Spearman coefficient. Results with a P value of ≤ 0.05 were considered statistically significant.

Result: Majority of the participants were adults, females, married, vegetarians, overweight or obese, and reported an average sun exposure time of twenty minutes. In Group 1, a majority of the patients (78%) had significantly lower mean vitamin D levels compared to the other groups ($P < 0.001$). The correlation between vitamin D and VAS was found to be negative (-0.452), with a significant P value of less than 0.001.

Conclusion: The study revealed a strong correlation of vitamin D deficiency among OT personnel experiencing LBP, and a significant negative correlation between vitamin D levels and the severity of pain.

Introduction

Low back pain (LBP) is a prevalent and challenging issue among work related musculoskeletal disorders in health care system, specifically referring to pain or discomfort in the region between the 12th rib and the inferior gluteal folds. [1-4] It is worth mentioning that there has been a rise in the occurrence of lower back pain among healthcare workers, nurses, and operating room personnel, with an annual prevalence rate of 40-50%.[5] Upon reviewing the literature, it appears that there are limited studies suggesting that there is no correlation between chronic musculoskeletal pain and vitamin D. On the other hand, some studies have indicated a strong association between vitamin D status and

chronic pain syndromes. Given the contrasting opinions, it is crucial to thoroughly assess the relationship between Vitamin D and lower back pain. [6-8]

Aims and Objectives

The aim of this study was to examine the vitamin D levels Operation theatre (OT) personnel from central India who experience nonspecific chronic low back pain. The objective was to determine if there is a correlation between vitamin D levels and the severity of low back pain, as measured by the Visual Analogue Scale (VAS) in operating room personnel.[9]

Material and Methods

This was a hospital based retrospective observational study conducted in Maharani Laxmi Bai Medical College located in Bundelkhand region from October 2023 to February 2024. The study was initiated after obtaining approval from the Institutional Ethics Committee. The study was registered with the Clinical Trial Registry of India and followed the revised principles outlined in the declaration of Helsinki. An analysis was conducted on the records of all patients who presented to our institute's outpatient department with LBP between October 2023 to February 2024.Participants in this study included individuals aged 18–65 years, of both genders, who have been experiencing low back pain for at least 12 weeks and have Vitamin D levels recorded in their hospital records, as well as the assessment of low back pain severity using the VAS scale score. It is important to note that participants should not have any radiculopathy and should have a minimum of 2 years of work experience as OT staff which was determined from their hospital record. Patients who were excluded from the study were having various medical conditions, such as disc herniations, spondyloarthritis, osteoporosis, symptomatic osteoarthritis of joints of the lower extremity, psychiatric disorders, metabolic bone disease, chronic renal problems, disorders of vitamin D metabolism like gastric surgery, chronic liver problems, malabsorption syndrome, severe infections, tumors, patients taking drugs affecting the metabolism of bone like bisphosphonates or corticosteroids, pregnant and lactating mothers, and persons taking supplements with vitamin D throughout the last three months prior to presenting to the hospital. We carefully examined the hospital records to retrieve relevant information on sociodemographic characteristics, dietary habits, sunlight exposure time, serum vitamin D level, and VAS score After obtaining the results, the vitamin D levels were classified as vitamin D deficiency when the 25(OH) D level is less than 20 ng/ml, vitamin D insufficiency when the 25(OH) D level is in the range of 21 to 29 ng/ml, and vitamin D sufficiency when the 25(OH) D level is $\geq$30 ng/ml.[10] The participants' body mass index (BMI) was assessed and classified into different categories based on their measurements.[11] The severity of low back pain was be assessed by noting the Visual Analogue Scale score (VAS). It involves patients marking a horizontal line, with "0" representing no pain and "10" representing the most severe pain.[9]

Statistical Analysis

We utilised mean ± SD and median for continuous variables, while number and percentage (%) were employed for categorical variables. A Kolmogorov-Smirnov test was used to assess the normality of the data. Krusal wallis test was be used to compare quantitative variables, while the Chi-Square test was used for qualitative variables. Values with a $P \leq 0.05$ was considered to be statistically significant at 95% CI. Correlation was investigated using either the Spearman coefficient depending on the normality of the data. The analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

Results:

During the study period, a total of 342 cases presented in the OPD of our institute with complaints of LBP. Out of these, 140 cases met the eligibility criteria for the study, of whom 78 were male (55.71%) and 62 were female (44.29%). The majority of the patients, 79 (56.42%), were married, while 61 (43.58%) were unmarried. The mean age of the participants was 31.84 ± 4.56 years. Participants were

categorized into three groups based on their vitamin D levels. The sociodemographic data of the groups, including the mean age, gender, BMI, and marital status, were compared, and no statistically significant difference (P>0.05) was found between the groups. However, upon comparing the mean sun exposure time between the groups, it was found that participants in Group 1 had a shorter duration of sunlight exposure compared to the other groups. This difference was found to be statistically significant (P<0.05).

Group 1 included patients who had a deficiency in Vitamin D, while Group 2 consisted of patients with insufficient levels of Vitamin D. Group 3, on the other hand, comprised participants who had sufficient levels of Vitamin D. Out of the participants, 110 (78%) were found to have a deficiency (Group 1 in Vitamin D. In 14 (10%) of the patients, Vitamin D levels were insufficient (Group 2), while 16 (12%) had sufficient (Group 3) levels of Vitamin D.

The levels of D vitamin in Group 1 (14.73 ± 3.05 ng/mL) were found to be significantly lower (P < 0.001) compared to Group 2 (25.79 ± 2.29 ng/mL) and Group 3 (39.19 ± 6.39). When comparing the VAS scores of the groups, it was found that Group 1 had a significantly higher score (8.14 ± 1.07) compared to Group 2 (6.00 ± 1.03) and Group 3 (3.13 ± 1.08) (P < 0.001).

There was a significant negative correlation between the level of D vitamin and VAS score, as indicated by Spearman's rho coefficient (r = -0.452, P < 0.001).

Discussion

The objective of this study was to determine the relationship between vitamin D levels and the severity of low back pain in operating room personnel. The severity of low back pain was assessed using the Visual Analogue Scale (VAS). Our findings demonstrated a strong correlation between patients suffering from lower back pain and a level of Vitamin D. Furthermore, we observed a statistically significant negative correlation between the level of Vitamin D and the severity of pain experienced. It was observed that a significant number of participants who suffered from lower back pain had a vitamin D deficiency. Therefore, it is crucial to emphasize that low levels of vitamin D play a significant role in the development of lower back pain.

There is limited research on the relationship between vitamin D levels and the degree of severity of low back pain. According to studies conducted by different investigators, it has been found that there is a significant correlation between the severity of pain and serum 25 (OH) D levels. [12-14] However, there are also studies that have found no relationship between these variables. [15,16] Our study found that Group 1, which had a deficiency in vitamin D, had a significantly higher VAS score compared to the other groups. This suggests a negative correlation between pain severity and vitamin D levels, which is consistent with previous research. [13,14]

For people of Indian ethnicity, it is recommended to have at least 45 minutes of direct sun exposure daily. This should be done by exposing the bare face, arms, and legs to the sun's UV rays with a wavelength of 290–310 nm. Many Indians do not receive enough sun exposure to naturally produce sufficient amounts of vitamin D unless they are required to work outdoors in the sun.[17] In the current study, the average duration of sun exposure was quite significant among participants in Group 3, highlighting the significance of sunlight exposure for maintaining adequate vitamin D levels. There is a correlation between the duration of time spent in the sun and hypovitaminosis D. However, it has also been observed that some individuals may have low vitamin D levels even with sufficient sun exposure.[18]

The study revealed that a significant number of OT personnel were found to have a vitamin D deficiency. Similar studies conducted in different regions of the world have also reported a notable prevalence of vitamin D deficiency among medical residents, though to varying degrees. Our study analysed the data for the winter season, a period characterized by extreme temperatures that often lead to discomfort. As a result, people tend to spend more time indoors and cover their skin. This may potentially contribute to a vitamin D deficiency.

The BMI in all groups was similar, and no statistically significant difference was observed in this study. Another study conducted by Mendoza et al. yielded a similar outcome, indicating that there

was no notable correlation between vitamin D levels and BMI. The main treatment of LBP in younger and middle age group is on counter analgesics, physiotherapy and interventional pain management is required in few cases.[19-21] All of these treatment modality possess some or other side effects.[22,23] This study has certain limitations, as it only includes data from a single instance of vitamin D and is retrospective in nature. We did not include a control group in our study. Additionally, the study did not assess serum phosphorus levels, serum PTH (parathormone) levels, and other biomarkers such as alkaline phosphatase (ALP). Further research can be conducted to strengthen the cause-effect relationship by using randomized controlled trial designs, larger sample sizes, longer durations, and focusing on specific age groups.

Conclusion

The study revealed that a considerable number of patients with LBP were found to have a deficiency in Vitamin D. Additionally, it was observed that individuals with lower levels of Vitamin D experienced more severe pain. It is recommended that all medical professionals undergo testing for vitamin D levels. Once it's confirmed, it is essential to provide a vitamin D supplement for correcting and preventing complications. It is recommended to consider ensuring regular exposure to sunlight for improved well-being.

Table 1: Distribution of the general characteristics of the low back pain patients

Variable	Group 1 (n=110)	Group 2 (n=14)	Group 3 (n=16)	P
Age (in years)	31.86 (4.51)	31.79 (5.23)	31.69 (4.60)	.989
Gender				
Male	58 (53)	9 (64)	11(69)	1.916
Female	52 (47)	5 (36)	5 (31)	
Marital Status				
Married	62 (57)	8 (57)	9 (56)	.998
Unmarried	48 (43)	6 (43)	7 (44)	
Diet				
Vegetarian	64 (58)	6 (43)	12 (75)	.200
Non vegetarian	46 (42)	8 (53)	4 (25)	
Sunlight Exposure (in minutes)	19.96 (5.932)	40.07 (7.985)	91.94 (20.101)	**<.001**

Data represented as mean (Standard deviation), n=number of patients. Group 1 represents patients with Vitamin D deficient levels Group 2 were with vitamin D insufficient levels Group 3 represents with vitamin D sufficient levels.

Table 2. Vitamin D status in both groups

Variable	Group 1 (n=110)	Group 2 (n=14)	Group 3 (n=16)	P
Vitamin D (in ng/ml) Mean (std dev)	14.73 (3.05)	25.79 (2.29)	39.19 (6.39)	**<.001**
Median	14.50	26.00	37.50	
IQR (Inter Quartile Range)	5	4	2	

Data represented as mean (Standard deviation), n=number of patients. Group 1 represents patients with Vitamin D deficient levels Group 2 were with vitamin D insufficient levels Group 3 represents with vitamin D sufficient levels.

Table 3. VAS status in both groups & Correlation of VAS according to vitamin D level

Variable	Group 1 (n=110)	Group 2 (n=14)	Group 3 (n=16)	P
VAS Score Mean (std dev)	8.14 (1.07)	6 (1.03)	3.13 (1.08)	**<.001**
Correlation of VAS according to vitamin D level Spearman's correlation coefficient = -0.452				

Data represented as mean (Standard deviation), n=number of patients. Group 1 represents patients with Vitamin D deficient levels Group 2 were with vitamin D insufficient levels Group 3 represents with vitamin D sufficient levels.

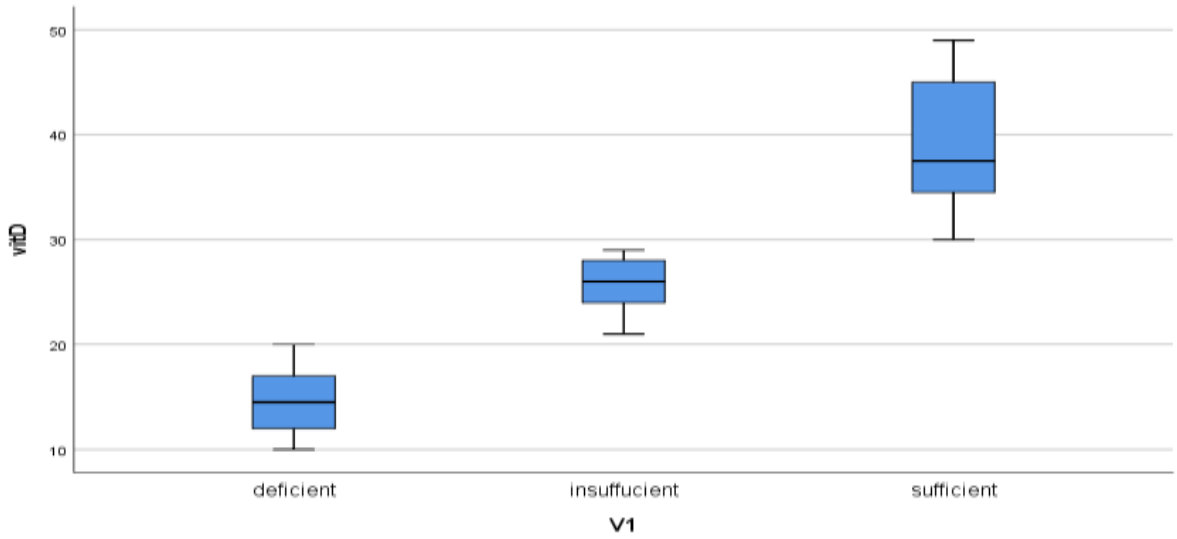
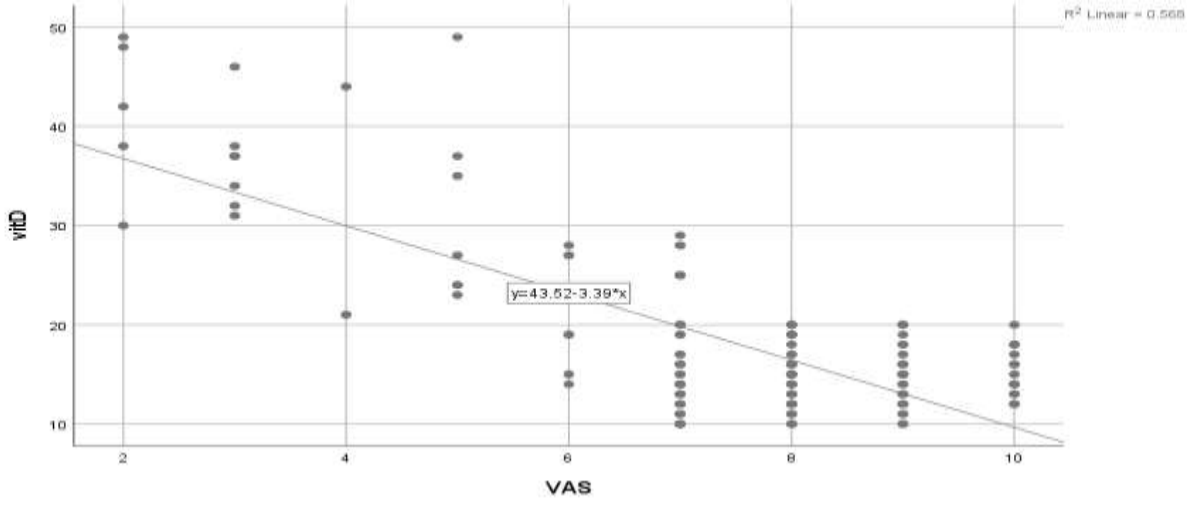


Figure 2: Box and whisker plot showing vitamin D levels (ng/mL). Deficient vitamin D level: 25(OH) D levels ≤20 ng/mL. Insufficient vitamin D level: 25(OH) D levels 21-30 ng/mL. Sufficient vitamin D level: 25(OH)D levels ≥30 ng/mL.

Figure 2: Association between scores obtained in 25-hydroxyvitamin D and in the VAS



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