

ASSOCIATION BETWEEN VITAMIN D LEVELS AND PRIMARY OSTEOARTHRITIS IN DIABETIC PATIENTS

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ABSTRACT

Introduction: Knee osteoarthritis (OA) is a significant public health concern associated with chronic pain and disability. It is often observed alongside Vitamin D deficiency. Hence, our study was conducted at an Indian Medical College to evaluate serum Vitamin D levels in patients with osteoarthritis. The aim of this study was to evaluate serum Vitamin D levels and Kellgren-Lawrence grading in patients with Primary Osteoarthritis.

Methods: This observational study was conducted on diabetes mellitus patients presenting with knee joint Osteoarthritis who agreed to participate were interviewed regarding age, sex, history of inflammatory arthritis or rheumatic disease, celiac disease, malabsorption syndrome, or any medications affecting serum Vitamin D levels. Serum samples were collected and analyzed for routine biochemical parameters. Patients with abnormal renal and liver function tests were excluded, and Vitamin D, PTH, Calcium, and Phosphorus levels were documented for those with normal results.

Results: Among 169 participants, the majority were aged 51-60 years, with ages ranging from 36 to 75 years. The mean age was 56.47 years, and the male-to-female ratio was 0.79:1. Most

patients were categorized as Vitamin D deficient, followed by insufficient, and only a minority had normal Vitamin D levels. The majority of cases were classified as Kellgren-Lawrence grade 3, followed by grade 2. Grade 0 cases were the least common, followed by grade 1.

Conclusion: The study revealed a high prevalence of Vitamin D deficiency among patients with Osteoarthritis. However, further research comparing this prevalence with that in the general population, including age- and sex-matched healthy controls, is needed. Future studies can explore this aspect in greater detail.

Keywords: Vitamin D, osteoarthritis, Diabetes Mellitus, Kellgren-Lawrence grading.

INTRODUCTION

Osteoarthritis stands as the most prevalent disease affecting articulating joints, characterized by extracellular matrix degradation and marked by symptoms such as pain, tenderness, restricted movement, crepitus, and varying degrees of inflammation without systemic effects. While osteoarthritis can affect any synovial joint, the hip, knee, hand, foot, and spine are among the most commonly affected sites [1,2].

Knee osteoarthritis (OA) represents a significant public health concern, leading to chronic pain and disability. Projections indicate that knee OA could rank as the fourth most important global cause of disability in women and the eighth in men. The primary clinical manifestation of knee OA is pain [3-6]. Although numerous studies have focused on factors influencing knee pain, including older age, female gender, and physically demanding occupations [7-10], there is ongoing investigation into additional contributory factors.

Research has indicated that vitamin D may stimulate the synthesis of proteoglycan by mature articular cartilage in vitro, suggesting a potential direct impact of vitamin D on cartilage metabolism [11]. Previous studies have explored various roles of 25-hydroxy vitamin D (25-OHD), including its relationship to pain, cartilage metabolism, proteoglycan synthesis by mature articular cartilage in vitro, modulation of metalloproteinase production, and its influence on the degradative capacity of tissue macrophages [12,13]. This has led to significant debate regarding the role of 25-OHD as a contributing factor to osteoarthritis [14,15], particularly considering the frequent co-existence of osteoarthritis with vitamin D deficiency and diabetes mellitus.

Therefore, our study was conducted to evaluate serum vitamin D levels in diabetes mellitus patients with osteoarthritis, aiming to contribute to the understanding of the potential relationship between vitamin D status and diabetes mellitus and osteoarthritis.

MATERIALS AND METHODS

The study was conducted at Birsa Munda Government Medical College and Hospital on OPD and IPD patients by Departments of Medicine, Orthopedics and Psychiatry collectively. Diabetes mellitus patients with complaints of knee joint osteoarthritis who agreed to participate were interviewed regarding age, sex, history of inflammatory arthritis, rheumatic disease, celiac disease, malabsorption syndrome, or any medications affecting serum Vitamin D levels. Following a comprehensive history and ruling out interfering factors, patients were clinically examined for signs and symptoms. General and local examinations were performed by a certified Orthopedician.

Blood samples were collected from the ante-cubital vein after overnight fasting in plain vials, ensuring proper clot formation and separation of clear serum. The samples were centrifuged at 2500 rpm for 5 minutes to obtain clear serum without disturbing the clot. Quality controls were performed for Vitamin D and PTH and routine biochemical parameters were measured on automated counter. Serum Vitamin D, PTH, Calcium, and Phosphorus levels were documented for patients with normal renal and liver function tests.

The obtained results were entered into an Excel spreadsheet (Microsoft Office Excel 2007) and statistically analyzed by EPI Info software.

RESULTS

In our study, the highest proportion of patients (71, 42.01%) fell within the age group of 51-60 years, with ages ranging from 37 to 70 years. The mean age was 56.47 years with a standard deviation of 8.15 years. There were more female patients (94) compared to males (75), and the majority of them were in the age group of 51-60 years. The male-to-female ratio was 0.79:1, indicating a slightly higher prevalence of female patients (Table 1).

The average serum Vitamin D level was 19.50 ± 8.43 ng/ml, with a range of 5.1-45.08 ng/ml. Most patients (56.21%) were categorized as Vitamin D deficient, followed by 36.69% with insufficient levels, and only 7.10% had Vitamin D levels above the normal range (Table 2).

When comparing the distribution of Kellgren-Lawrence grades by sex, it was noted that the highest number of cases in both males and females were classified as grade 3. The mean Kellgren-Lawrence grading was approximately 3.05 ± 0.75 for males and 2.45 ± 1.25 for females (Table 3).

Table 1: Age and Gender of diabetic patients with OA of knee joint

Age Group	Male		Female		Total	
	n	%	n	%	n	%
31-40 years	0	0.00	6	3.55	6	3.55
41-50 years	17	10.06	26	15.38	43	25.44
51-60 years	32	18.93	39	23.08	71	42.01
61-70 years	26	15.38	23	13.61	49	28.99
Total	75	44.38	94	55.62	169	100.00

Table 2: Gender wise Vitamin D status in patients

Vitamin D Levels	Males	Females	Total	%
Sufficient (30-100 ng/100ml)	9	3	12	7.10
Insufficient (20-30 ng/100ml)	28	34	62	36.69
Deficient (<20 ng/100ml)	38	57	95	56.21
Total	75	94	169	100.00

Table 3: Gender wise Kellgren- Lawrence grade

Grade	Male	Female
0	0	4
1	6	8
2	24	30
3	24	33
4	21	19
Total	75	94

DISCUSSION

Osteoarthritis is a degenerative condition that cannot be reversed once the pathological process initiates. In cases where knee osteoarthritis (OA) progresses to a debilitating stage, joint replacement surgery becomes the primary treatment option. Hence, it is crucial to identify factors associated with the severity of the disease to understand their potential role in preventing osteoarthritis. One such factor under investigation is the serum level of vitamin D.

In our study, the majority of patients (71, 42.01%) fell within the age group of 51-60 years, with ages ranging from 37 to 70 years. The mean age was 56.47 years with a standard deviation of 8.15 years. These findings are consistent with previous research. For instance, Ahmed Lotfi A et al. reported a mean age of 52.42 ± 9.80 years, and Al-Jarallah et al. found a mean age of 56.5 ± 9.1 years in their studies on knee osteoarthritis [16,3]. Aging individuals, especially those above 65 years, often exhibit radiographic evidence of knee osteoarthritis, and there is a statistically significant correlation between age and the severity of knee OA.

Regarding gender distribution, our study showed a slightly higher prevalence of female patients, with a male-to-female ratio of 0.79:1. This indicates that gender may not significantly influence the prevalence of osteoarthritis in our population. However, other studies have reported a clear preponderance of females over males in osteoarthritis cases. This gender difference could be attributed to factors such as sunlight exposure and vitamin D levels, especially in populations with reduced sunlight exposure among females.

Our study revealed a mean vitamin D level of 19.50 ± 8.43 ng/ml, with a range of 5.1-45.08 ng/ml in diabetic patients with osteoarthritis. This differs from findings in other studies where mean vitamin D levels varied, such as 11.4 ± 6.07 ng/ml in the study by Al-Jarallah et al. and 35.77 ± 14.6 ng/ml in the study by Ahmed Lotfi A et al. [21,3]. However, our study found no significant difference in vitamin D levels between males and females. The majority of our patients had deficient or insufficient vitamin D levels, similar to findings in other studies.

Furthermore, our study assessed the Kellgren-Lawrence grading for osteoarthritis, with a mean score of 2.68 ± 1.01 . This aligns with results from the study by Al-Jarallah et al., where the mean Kellgren-Lawrence grading was 2.75 ± 0.79 [3]. Additionally, a significant proportion of our patients exhibited significant joint space narrowing, similar to findings in the study by Al-Jarallah et al. These results highlight the high prevalence and severity of knee osteoarthritis in our diabetic patient population.

CONCLUSION

The high prevalence of Vitamin D deficiency observed in osteoarthritis patients with diabetes mellitus in our study underscores the need for comparative research with age- and sex-matched healthy controls from the general population. This comparative analysis would provide a clearer understanding of the extent of Vitamin D deficiency in osteoarthritis patients relative to the general population. Additionally, based on our findings, we propose that Vitamin D supplementation could potentially play a role in mitigating the progression or preventing radiological arthritis.

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