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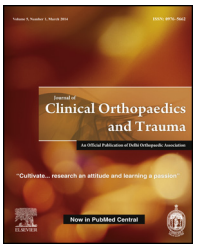

Original Article

A study of the prevalence of osteoporosis and hypovitaminosis D in patients with primary knee osteoarthritis

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ABSTRACT

Introduction: Osteoarthritis and Osteoporosis are highly prevalent disease, so is hypovitaminosis D. We tried to find out prevalence of osteoporosis and hypovitaminosis D in patients suffering from primary knee Osteoarthritis. We also compared the prevalence of oseotoporosis between general population and patients of primary osteoarthritis.

Methods: Patients suffering from primary knee OA were taken from Rheumatology OPD of Medical College Hospital and SSKM Hospital Kolkata, India. For each patient age and sex matched friend or relative of same locality was taken in the study as controls. Hospital staffs that come from different part of state was taken in the study as controls. The control population was the representative of general population.

Results: Total number of participants in this study was 206. Out of which there were 98 cases and 108 controls. BMD status correlates significantly with Primary OA. Serum Vitamin D3 status correlates significantly with Osteoarthritis. Age of the patients correlated significantly with both BMD Status and Knee OA but not with the vVitamin D level. There were significant correlation between the Serum Vitamin D3 status and BMD of the subjects.

Conclusion: Osteoporosis is prevalent both in general population and patients suffering from Knee Osteoarthritis and may increase the disability. The matter is complicated by the fact hypovitaminosis D is also prevalent in the population and positively correlated with both Osteoporosis and osteoarthrosis, though we cannot comment on further pathogenesis because of cross sectional design of the study.

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1. Introduction

Osteoartritis and osteoporosis are highly prevalent diseases. Several investigators have suggested that osteoarthritis (OA) and osteoporosis are mutually exclusive. This hypothesis was originally based on a retrospective radiographic study by Foss and Byers in 1972 documenting the absence of osteoarthritic changes in subjects with hip fracture and several reports on increased bone mineral density (BMD) in subjects with OA.[1] However, recent studies question these earlier results. It was found that increased BMD is present only in the OA-affected joint and not at other sites in a study of monozygotic and dizygotic twins.[2] Similarly, a recent study among post-menopausal women undergoing total hip replacement for advanced OA documented that 25% of these women had occult osteoporosis.[3] And most relevant, in a large prospective cohort study, osteoporotic fracture rates were not reduced in persons with OA.[4] Thus, patients with OA with low BMD at sites other than the affected joint may be at increased risk for fractures.

Hypovitaminosis D may be a risk factor for fractures in older persons with OA.[5] In addition, Vitamin D deficiency may indirectly increase risk of OA progression by contributing to low bone density. Data from the Framingham Study showed that low bone density was associated with an increased risk of OA progression among persons with knee OA.[6] Therefore, low BMD in persons with OA raises two concerns, increased disease progression and increased fracture risk.

We hypothesize that serum 25-hydroxy vitamin D (25[OH] D) levels are positively associated with BMD among persons with OA. If so, Vitamin D supplementation may favourably affect persons with OA through 2 mechanisms. First, Vitamin D may increase BMD and thereby reduce fracture risk. Second, Vitamin D may decrease disease progression in OA, as previously found in the Framingham cohort study.[7]

We tried to find out prevalence of osteoporosis and hypovitaminosis D in patients suffering from primary knee Osteoarthritis. We also compared the prevalence of oseotoporosis between general population and patients of primary osteoarthritis.

2. Material and methods

A. Definition of population
   a. Definition of cases: Patients suffering from knee OA.
   b. Definition of control: For each patient age and sex matched friend or relative of same locality not having osteoarthritis clinically will be taken in the study. Some hospital staffs who come from different part of the state will be taken in the study as controls. The control population is the representative of the general population.
B. Inclusion criteria
   1. Age more than 50
   2. Knee OA
   3. Non smoker, non alcoholic
C. Exclusion criteria
   1. Inflammatory arthritis
   2. Uncontrolled DM, HTN, CKD, uncorrected Hypo/hyperthyroidism
   3. Patients taking steroids or any drug that influence bone health.

Patients suffering from primary knee OA were taken from Rheumatology OPD of Medical College, Kolkata and SSKM Hospital, Kolkata, India. For each patient age and sex matched friend or relative of same locality was taken in the study as controls. Hospital staffs that come from different part of state was taken in the study as controls. The control population was the representative of general population.

Diagnosis of Osteoarthritis was confirmed by ACR criteria. After routine examinations and investigations all patients and controls were subjected to DXA (Dual energy X-ray absorptiometry) scan. Blood samples were taken for Vitamin D measurement.

The study got clearance from Institutional Ethics Committee. Informed consent was taken from all the patients. Patients were diagnosed as having Knee Osteoarthritis using ACR Radiologic and clinical criteria for knee OA.

2.1. *Design*

Hospital based, cross sectional, observational and non randomized study.

2.2. *Statistical analysis*

The analyses were performed with the SPSS (version 16.0).

3. Results and analysis

Total number of participants in this study was 206. Out of which there were 98 cases and 108 controls. Out of the cases, 40.82% were males and 59.18% are females. And among the controls, there were 50% male and 50% female subjects. Majority of the patients were between 50 and 70 years of age both in the case and control group. This age group included 71.43% of the study population and 69.44% of the control population (Table 1).

Table shows that BMD status correlates significantly with Primary OA (p value: 0.000).

18.37% of the subjects in the study group and 19.44% of the subjects in the control group have normal Bone Mineral Density. 32.65% among the cases group and 58.3% among the controls are osteoporotic. And 49.98% among the cases and 22.22% of the controls have osteopenia. Therefore, 81.63% among the cases and 80.55% of the controls have BMD less than 1 standard deviation below the mean for young healthy

Table 1 – Age distribution of the cases.

Age group	Cases	Controls
<50 years	19 (19.39%)	27 (25%)
50–70 years	70 (71.43%)	75 (69.44%)
>70 years	09 (9.18%)	6 (5.56%)

adults of the same sex. There was significant correlation between the BMD status and the age group of the subjects.

Table shows that Serum Vitamin D3 status correlates significantly with Osteoarthritis.

Among the cases, 45.92% have normal serum Vitamin D3 level; 29.59% have Vitamin D3 insufficiency and 24.49% have Vitamin D3 deficiency. Among the controls, 66.66% have normal serum Vitamin D3 level; 13.89% have Vitamin D3 insufficiency and 19.44% have Vitamin D3 deficiency.

There was significant correlation between the presence of Primary OA and the age group of the subjects, p value is 0.001. 41.3% of the subjects of <50 years age group; 48.27% of 50–70 years age group and 60% of >70 years age group of this study population were suffering from primary OA.

There was no significant correlation between the Serum Vitamin D3 status and the age groups of the subjects in this study, p value 0.157.

However, significant correlation between the Serum Vitamin D3 status and the sex group of the subjects was found, p value is 0.005. Among males, 65.96% have normal Vitamin D3 level; 22.34% have Vitamin D insufficiency and 11.7% are Vitamin D deficient. Whereas, 49.1% of the females have normal serum Vitamin D level; 20.5% have Vitamin D insufficiency and 30.36% are Vitamin D deficient.

There were significant correlation between the Serum Vitamin D3 status and BMD of the subjects in this study, p value is 0.017. There was significant correlation between the BMD status and the age group of the subjects as the p value is 0.005.

4. Discussion

In this hospital based study we have found that a significant proportion of the subjects suffering from Primary Knee Osteoarthritis have low bone density. Among the cases, 32.65% have Osteoporosis and 48.98% have Osteopenia. The Chi square test shows significant correlation between Primary Osteoarthritis and the Bone Mineral Density status of the patients. The findings from this study demonstrate that a significant proportion of patients with Primary knee OA have OP. OA is generally assumed to be associated with an increase in BMD but there is evidence that there is no linear relationship between increasing severity of radiographic knee OA and increasing BMD.

Vitamin D3 insufficiency and deficiency is more prevalent in the subjects with Knee OA than subjects without OA. Among the cases, 45.92% have normal serum Vitamin D3 level; 29.59% have Vitamin D3 insufficiency and 24.49% have Vitamin D3 deficiency. Among the controls, 66.66% have normal serum Vitamin D3 level; 13.89% have Vitamin D3 insufficiency and 19.44% have Vitamin D3 deficiency.

From the Chi square test, Serum Vitamin D3 status correlates significantly with Osteoarthritic status of the subjects.

Given the positive association between Vitamin D status and BMD and the high prevalence of suboptimal 25(OH)D levels in this study, there may be 2 possible incentives to correct suboptimal Vitamin D levels in persons with knee OA. A first incentive may be prevention of disease progression. Both higher BMD and higher 25(OH)D levels (73, 74) have been found to be associated with a decrease in disease progression in persons with knee OA. Zhang and colleagues, in a prospective analysis, found that high BMD as well as BMD gain decreased the risk of progression of radiographic knee OA in the Framingham study.[8] In the same cohort, McAlindon and colleagues reported that the risk of progression of knee OA was increased 3 fold for persons in the middle and lower tertiles of both Vitamin D intake and serum levels.[9] A second incentive for the correction of suboptimal 25(OH)D levels in persons with knee OA may be the prevention of falls and fractures.

Findings from our study, together with previous reports and evidence from RCTs performed in the general older population, support the notion of correcting suboptimal Vitamin D levels in persons with knee OA, which may reduce disease progression, falls, and fractures.[10] This suggestion, despite the lack of evidence from RCTs performed in persons with OA, is especially attractive because correcting 25(OH)D levels by Vitamin D supplementation (cholecalciferol) is simple, safe, well tolerated, and inexpensive.

This study did not show any significant correlation between the serum Vitamin D3 level and age of the subjects. But the percentage of Vitamin D deficiency is more common as the age progresses and percentage of Vitamin D normalcy is more common at lesser age groups.

Vitamin D deficiency is commoner among the female subjects than males. And male subjects have more normal serum Vitamin D level.

Prevalence of osteoporosis increases as the age progresses. There is significant correlation between the BMD status and the age group of the subjects in this study (p value is 0.005).

The study shows statistically significant correlation between serum Vitamin D3 status and BMD status among the subjects.

Osteopenia and OP do occur in patients with severe knee OA. This study raises many clinical questions for further work. Firstly, does early detection and treatment of OP in patients with knee OA have an effect on the progression of OA? Secondly, does early detection and treatment of OP in patients with knee OA have an effect on the outcome of joint replacement, particularly loosening and fracture?[11] The present study is important because it demonstrates the complex relationship between OA and OP in both men and women. It is timely to study the association of OP and osteoarthritis, the implications for treatment and the impact on joint replacement, as the demographic and epidemiological trends predict an increasing burden on health care resources due to these diseases.

Table 2 – BMD status of the subjects among the cases and the controls.

BMD status	Cases	Controls	Total
Normal	18	21	39
Osteoporosis	32	63	95
Osteopenia	48	24	72
Total	98	108	206

Table 3 – Status of serum Vitamin D3 level among the cases and controls.

Vit D3 status	Cases	Controls	Total
Normal	45	72	117
Insufficiency	29	15	44
Deficiency	24	21	45
Total	98	108	206

Table 4 – Osteoarthritis in subjects of different age groups in this study.

	<50 years	50–70 years	>70 years	Total
Osteoarthritis	19	70	9	98
Normal	27	75	6	108
Total	46	145	15	206

Table 5 – Serum Vitamin D3 level in subjects with different BMD status in our study group.

Vit D3 status	Normal BMD	Osteporosis	Osteopenia	Total
Normal	14	64	39	117
Insufficiency	11	16	17	44
Deficiency	14	15	16	45
Total	39	95	72	206

One intriguing finding of this study is that the control population has more incidences of osteoporosis than cases (Table 2). We did not enquire or search osteoarthritis in control population. They did not present to orthopaedics or rheumatology OPDs with complaints pertaining to osteoarthritis or osteoporosis. The above mentioned finding supports the Govt. Funding in such research projects which will attract more such studies including community based epidemiological studies to find out the burden of such diseases in our country.

Also, BMD in individuals with primary radiographic knee OA is positively associated with Vitamin D status. Future RCTs are needed to address the effect of Vitamin D on BMD, disease progression, and fractures in persons with OA. Until then, given the high prevalence of suboptimal 25(OH)D levels in persons with knee OA and the documented positive association between 25(OH)D and BMD in these individuals, Vitamin D supplementation may be warranted in persons with OA (Tables 3–5).

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Conflicts of interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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