

Original Article

Serum Vitamin D and Osteoarthritis

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ABSTRACT

Objective: To determine whether the serum vitamin D level is associated with increasing age in female OA patients.

Study Design: Experimental and Observational Study.

Place and Duration of Study: This study was conducted at the Department of Orthopaedic, Civil Hospital, Karachi from Feb. 2006 to Jan. 2008.

Materials and Methods: Sixty female patients who were suffering from OA were studied. Patients were classified according to their stage of severity of OA in knee joints. Serum vitamin D was measured in serum by ELISA technique.

Results: According to distribution patients of group 3 having the age between 61 – 70 years. Serum vitamin D was detected in serum. Group 3 has high serum Vitamin D levels as compared to group 1 and 2 ($P < 0.5$).

Conclusions: The age group of between 61 years and 70 years has low vitamin D levels, indicating that old age may be one of risk factor for OA.

Key Words: Vitamin D, Age, Osteoarthritis.

INTRODUCTION

Osteoarthritis (OA) is a chronic degenerative disorder of multifactorial etiology characterized by loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis and range of biochemical and morphological alterations of the synovial membrane and joint capsule¹. OA is the most common cause of musculoskeletal disability depends on the presence of vitamin D. Sub-optimal levels of vitamin D have been shown to have adverse effects on calcium metabolism, osteoblastic activity, matrix ossification, bone density and articular cartilage turn over^{2,3}. A study of radiographic knee osteoarthritis showed that low levels of serum and dietary vitamin D were associated with increase in radiographic progression⁴. Vitamin D plays multiple roles that ultimately may have affect on OA. The hormonal form of vitamin D [1, 25 (OH)₂ – D] Inhibits collagen synthesis by osteoblasts and promotes bone resorption. Hormonal vitamin D therefore may contribute to OA status in so far as OA is determined by bone mineral density⁵.

MATERIALS AND METHODS

The study was conducted on sixty female patients suffering from OA with age group of 41 – 70 years (mean age 55.5 years). The patients were selected on the basis of signs, symptoms, history and severity of disease at particular site and X-Ray of the joints. Patients taking any hormone replacement therapy (HRT), having any metabolic disease, rheumatoid arthritis (RA), gout, systemic lupus erythromatosis (SLE) were excluded from the study. All the subjects answered a questionnaire concerning medical history, present medications, menstrual state and age at menopause. Those with uncertain menstruation history were excluded from the study. The specimens were collected from DOW University of Health Sciences, Karachi, Pakistan.

The patients were divided into three groups. Group 1 have the patients having age 41 to 50 years (Mean age 45.5 years), group 2 having age 51 to 60 years (Mean age 55.5 years), group 3 having age 61 – 70 years (Mean age 65.5 years). A summary grade of radiographic OA was defined for knee joint in terms of the combination of radiographic features present (6, 7). Grade 2 required the presence of either definite osteophytes or joint space narrowing plus 1 other definite features (definite osteophytes or narrowing, or sclerosis, cysts, or deformity grade ≥ 1). Grade 3 or greater required the presence of either definite osteophytes or joint space narrowing plus 2 or more other features. We considered grade ≥ 2 to represent definite radiographic knee OA (8).

Blood samples were drawn between 08:00 Am and 2:00 PM and serum was immediately frozen (-70 °C). Vitamin D was estimated by enzyme linked Immunosorbent assay technique, Kat # EIA-4193 supplied by Germany.

Statistical analysis was done by student test. Statistical significance was defined as P value of less than 0.05.

RESULTS

Table 1 shows the characteristics of female knee OA patients. Table 2 shows the age distribution according to radiological classification. Serum Vitamin D levels of group 3 was statistically low ($P < 0.05$) as compared to group I and group 2, as shown in table 3. While radiological staging of OA, according to David classification was shown in table 4.

Table No.1: Characteristics of the Patients

Variable	Mean±SEM
Age (Year)	55.5 ± 2.50
Duration of menopause (years)	9.4 ± 1.90
Body Weight (Kg.)	55.6 ± 1.10
Body mass Index (Kg / m ²)	20.5 ± 0.92

Table No.2: Age Distribution according to Radiological Classification

Age (Years)	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4	Total	%age
Group 1 41-50	1	2	7	3	2	10	26.6
Group 2 51-60	-	3	5	9	2	19	26.6
Group 3 61-70	-	1	5	7	12	25	41.6
Percent (%)	1.6	10	28.3	31.6	26.6	100	
Total	1	6	17	19	16	60	100

Table No.3: Status of Serum Vitamin D in Patients in there different Age Groups

Group	Age (Years)	n	Serum Vitamin D (pg/ml)
1	41-50	(16)	18.10 $\pm$ 1.01
2	51-60	(19)	15.20 $\pm$ 0.48
3	61-70	(25)	*14.92 $\pm$ 0.32

Values are the mean $\pm$ S.E.M.

*Values expressed as P < 0.05 Significant.

Table No.4: Radiological Staging of QA according to Classification by David (1987)

1.Grade 0	No radiological abnormality.
2.Grade 1	Slight narrowing of joint space, minimum formation of osteophytes and slight sclerosis.
3.Grade 2	Moderate narrowing of joint space, formation of Spurs Sclerosis.
4.Grade 3	Bone changes and sclerosis but not sever loss of bone.
5.Grade 4	Sever sclerosis, loss of bone stock and obliteration of joint.

DISCUSSION

The association of vitamin levels with OA may occur through on effect on either cartilage metabolism or bone metabolism or both. Our study suggest an effect on cartilage metabolosim as indicated radiographically by joint space narrowing. In table 2 we classified the patients in groups, according to their joint grade. According to radiological classification in grade zero 1(1.6%) cases, grade I, 6(10%) cases, grade II, 17 (28.3 %) cases, grade III, 19(13.6%) cases and grade IV, 16 (26.6%) cases. The cases in all grades in respect to age groups between 41 – 50 years : 10(26.6%). The turn over of articular cartilage is a continuous and tightly coupled process (9). The chondrocytes synthesize both the proteins that make up the articular cartilage matrix and the matrix metalloproteinases enzymes that degrade the cartilage. In normal cartilage this process is tightly coupled such that the same amount of cartilage matrix is synthesized as broken down. However in OA that balance is lost and more degardative enzymes than articular cartilage matrix components are synthesized, which results in loss of cartilage¹⁰. Other studies have demonstrated that vitamin D is associated with several aspects of articular cartilage metablosim^{11,12}. Vitamin D has been shown to stimulate proteglycan synthesis by

mature chondrocytes in tissue culture. Also it has been shown to modulate the activity of metalloprotenases enzymes that degrade cartilage (13). Low levels of 1, 25 dihydroxy vitamin D increase metalloproteinases activity (14,15). In our study, therefore low serum levels of vitamin D may have attend the balance of articular cartilage metabolism by increasing production of enzymes and decreasing the synthesis of proteoglycan matrix protein leading to cartilage loss.

CONCLUSION

The age group of between 61 years and 70 years has low vitamin D levels, indicating that old age may be one of risk factor for OA.

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