

Assessment of Vitamin D Deficiency in Patients Presenting with Osteoarthritis in a Tertiary Care Hospital

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ABSTRACT

Objective: To measure the frequency of Vitamin D deficiency in those patients who are presenting with osteoarthritis in a tertiary healthcare unit.

Study Design: cross sectional (single center) study

Place and Duration of Study: This study was conducted at the General Medicine department at Liaquat National Hospital Karachi from July 2018 to Dec 2018.

Materials and Methods: Two hundred osteoarthritis patients were put into the inclusion criteria of this study. Then venous blood sample of each patient was obtained by using 5cc BD syringe. Samples were then sent to the hospital's laboratory for assessment of level of vitamin D in blood. All procedures were noted on proforma.

Results: The mean age of the respondents came out to be 57.57±9.91 years. There were 121(60.5%) male and 79(39.5%) female. Vitamin D deficiency's frequency in patients presenting with osteoarthritis was observed in 56% (112/200) patients.

Conclusion: High percentage of deficiency of vitamin D was revealed. Vitamin D deficiency's frequency increased significantly with increasing age and was found to be greater in female patients. It is needed to take instant measures for tackling this increasing public health issue.

Key Words: Osteoarthritis, Vitamin D, serum 25-hydroxy vitamin D

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INTRODUCTION

Osteoarthritis (OA) is a major public health issue that causes chronic pain and disability although at present the pathogenesis of this condition remains largely unknown. Several environmental factors have been associated with OA, including obesity previous injury knee-bending occupations and other metabolic factors.¹ Throughout the body, Vitamin D has the major role to play in many places i.e. calcification and development of bones. Deficient serum levels of 25-hydroxy vitamin D (25-OHD) or vitamin D level affects the joint cartilage and it leads to progression and development of Osteoarthritis². It has been indicated that severity of bony pain is increased by the deficiency of vitamin D especially in females³.

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The greater occurrence of deficiency of vitamin D indicated that greater number of adults who look healthy apparently are at risk of emerging musculoskeletal disorders and further chronic diseases⁴. OA and deficiency of vitamin D, both are observed as the common health issues in elderly patients. Around 25% of people, whose age was greater than 55 years were suffering from knee pain on most of the days of month last year; from those people, around half of them were having radiographic knee OA; therefore, they were indicated to suffer from symptomatic OA⁵. In Pakistan, 71.5 percent people are reported to suffer from the deficiency of vitamin D⁶.

One study reported that the vitamin D deficiency was present in 23.7% of cases with OA.⁷ One more study supported these results and reported that 24.5% cases of OA have vitamin D deficiency.⁸ But another study reported that vitamin D deficiency was present in 64.3% of cases with OA.⁹

Rationale of present research was to measure the frequency of deficiency of Vitamin D in patients having osteoarthritis in a tertiary healthcare center. Through literature, it was observed that the frequency of vitamin D deficiency is high among patients of OA. However, one study has reported very high rate of vitamin D deficiency in OA cases. IT was also observed that the reported rate of vitamin D deficiency in local Pakistani population is high, but no study was found regarding the vitamin D deficiency in OA patients.

Therefore, this study was conducted in order to find the frequency of vitamin D deficiency in OA in local inhabitants. This would help us to gain local data and update guidelines to early diagnose and manage patients OA with vitamin D deficiency and can prevent the patients from severe conditions.

Criteria for the selection of patients

Inclusion criteria:

- Patients of 40-80 years age of either gender presenting with osteoarthritis (as per operational definition) for >6 months.
- Patient having minimum sun exposure of 30 min per day confirmed by history.

Exclusion criteria:

- Patients with history of inflammatory arthritis or any rheumatic disease rather than OA.
- Patients with medical record of celiac disease, malabsorption syndrome
- Patients taking medications known to affect 25-OHD level (anticonvulsants, antituberculous drugs, 25-OHD, or analogues) or who used glucosamine, chondroitin, doxycycline, or intra-articular injections within 3 months.
- Patients with chronic medical conditions like hypertension (BP ≥ 140/90 mmHg), DM (BSR > 186 mg/dl and medical record), hypothyroidism (TSH > 5 IU/L), deranged LFT (ALT > 40 IU, AST > 40 IU) and RFT (creatinine > 1.2 mg/dl).
- Alcohol user or smoker.

MATERIALS AND METHODS

200 patients fulfilling selection criteria was selected through OPD of Department of Medicine, Liaquat National Hospital, and Karachi. Informed consent and demographics (name, age, gender, and contact) was obtained. Then venous blood sample of each patient was obtained by using 5cc BD syringe. Samples were then sent to the hospital's laboratory of the hospital for the assessment of level of vitamin D in blood. Serum 25-OHD (vitamin D) was measured using radioimmunoassay kits DiaSorin (Stillwater, Minnesota, USA). Reports were assessed and vitamin D level was noted. Vitamin D deficiency was labeled if level was low, as per operational definition. All procedures were written on questionnaire/proforma (attached in the end).

Statistical analysis: Statistical Package for Social Sciences (SPSS) version 22 was used for the data analysis. Descriptive statistics (mean + standard deviation) of the quantitative variables i.e. age, duration of OA, duration of sun exposure and vitamin D level was calculated. All qualitative variables i.e. gender, nature of job and vitamin D deficiency was presented in the form of count and percentages. Data was stratified for age (45-60, 61-75, >75 years), gender (male, female), duration of OA (1-5, 6-10, 11-15, >15 years) duration of sun exposure, nature of job and severity of

pain (on VAS 3-7, 8-10). Chi-square test was applied to compare the stratified groups, and to see the effect on outcome variable.

RESULTS

Two hundred osteoarthritis patients were included in this study. It was observed that most of the patients were 45 to 75 years of age as presented in figure-1. The average age of the patients was 57.57 ± 9.91 years. Mean duration of osteoarthritis and pain score was 10.34 ± 4.02 years and 5.03 ± 0.82. Similarly mean duration of sun exposure, and vitamin D level of the patients is also given in table 2. There were 121 (60.5%) male and 79 (39.5%) female as shown in Table-2. Most of the patients were doing indoor job as shown in figure-2.

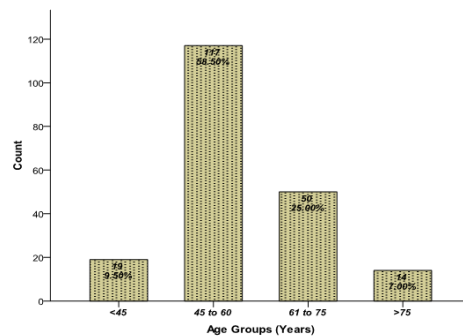


Figure No.1: Age distribution of the patients n= 200

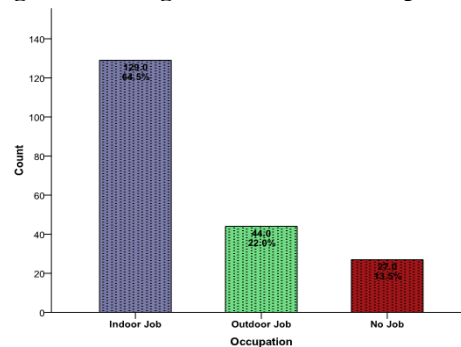


Figure No.2: Job nature of the patients n=200

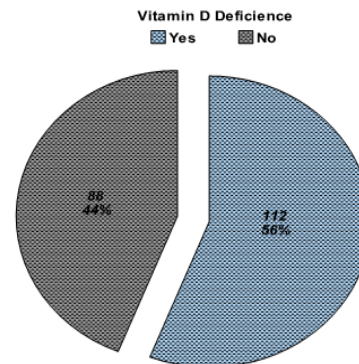


Figure No.3: Frequency of vitamin d deficiency in patients presenting with osteoarthritis n=200

Table No.1: Descriptive statistics of study patients n=200

Variables	Mean ± SD	95% Confidence Interval for Mean		Median (IQR)
		Lower Bound	Upper Bound	
Age (Years)	57.57±9.91	56.18	58.95	56(14)
Duration of sun exposure (minutes)	14.48±10.02	13.08	15.88	20(20)
Duration of Osteoarthritis (Years)	10.34±4.02	9.77	10.90	10(4)
Pain	5.03±0.82	4.92	5.14	5(1)
Vitamin D3 Level (ng/ml)	11.09±6.92	10.12	12.05	8(10)
Gender	Frequency n=(200)	Percentage (%)		
Male	121	60.50%		
Female	79	39.50		
Total	200	100%		

Table No.2: Frequency of vitamin d deficiency in patients presenting with osteoarthritis with respect to age groups and gender n=200

Age Groups (Years)	Vitamin D Deficiency		Total	P-value
	Yes n=112	No n=88		
≤ 45 Years	7(36.8%)	12(63.2%)	19	0.099
46 to 60 Years	68(58.1%)	49(41.9%)	17	
61 to 75 Years	26(52%)	24(48%)	50	
>75 Years	11(78.6%)	3(21.4%)	14	
Gender	Vitamin D Deficiency		Total	P-value
	Yes n=112	No n=88		
Male	56(46.3%)	65(53.7%)	121	0.001
Female	56(70.9%)	23(29.1%)	79	

Frequency of vitamin D deficiency in patients presenting with osteoarthritis was observed in 56% (112/200) patients as shown in figure-3. Rate of vitamin D deficiency was high in above 75 years of age but there were no significant difference among different age groups as shown in table 2. Rate of vitamin D deficiency was significantly high in female as compare to male (p=0.001, table 2). Similarly rate of vitamin D deficiency was also significantly high in those cases who was working indoor job and those who are not doing job (p=0.0005) likely vitamin D deficiency was

also high in those patients whose sun exposure was less than 10 minutes (p=0.0005) and duration of OA was above 10 years (p=0.0005) as shown in table 3 and 4 respectively. Rate of vitamin D deficiency was not significant with respect to pain score as shown in table 4.

Table No.3: Frequency of vitamin d deficiency in patients presenting with osteoarthritis with respect to job nature and duration of sun exposure n=200

Job Nature (Occupation)	Vitamin D Deficiency		Total	P-value
	Yes (n=112)	No (n=88)		
Indoor Job	83(64.3%)	46(35.7%)	129	0.0005
Outdoor job	13(29.5%)	31(70.5%)	44	
No Job	16(59.3%)	11(40.7%)	27	
DURATION OF SUN EXPOSURE	Vitamin D Deficiency		Total	P-value
	Yes n=112	No n=88		
<10 minutes	45(76.3%)	14(23.7%)	59	0.0005
10 to 20 minutes	53(57%)	40(43%)	93	
21 to 25 minutes	14(29.2%)	34(70.8%)	48	

Table No.4: Frequency of vitamin d deficiency in patients presenting with osteoarthritis with respect to duration of osteoarthritis and pain n=200

Duration of OA	Vitamin D Deficiency		Total	P-value
	Yes n=112	No n=88		
≤ 5 Years	10(45.5%)	12(54.5%)	22	0.0005
6 to 10 Years	36(40.9%)	52(59.1%)	88	
11 to 15 Years	53(70.7%)	22(29.3%)	75	
>15 Years	13(86.7%)	2(13.3%)	15	
Pain	Vitamin D Deficiency		Total	P-value
	Yes n=112	No n=88		
3 to 7	98(55.4%)	79(44.6%)	177	0.61
8 to 10	14(60.9%)	9(39.1%)	23	

DISCUSSION

Osteoarthritis (OA) was thought to be a typical outcome of being aged before, which lead to "degenerative joint ailment." However, it is presently understood that osteoarthritis is the outcome of the interaction of various variables i.e. genetics, joint integrity, mechanical forces, local inflammation and cellular biochemical procedures. With the increasing age the

cartilage volume is decreased, proteoglycan content, vascularization of cartilage, and perfusion of cartilage. These progressions may result in different radiologic characteristics i.e. marginal osteophytes limited joint space. Notwithstanding, from the biochemical and pathophysiologic discoveries bolster the idea that age alone is a deficient reason for osteoarthritis.

Number incorporated patients in this study was 200. The age of the respondents was from 40-80 years. We saw that the greater part of the patients were from the age of 45 to 75 years and their mean age came out to be 57.57 ± 9.91 years. Based on the osteoarthritis's radiographic criteria, >50% older patients than 65 are suffering from this disease¹⁰. Symptoms regularly don't wind up observable until after the human come to the age of 50 years. The commonness of the disease increments drastically among people whose age is >50 years, in the same way, due to the modifications because of the age in proteoglycans and collagen that reduce the elasticity of the joint ligament and in view of a lessened supply of vitamin to the cartilage¹¹. In people whose age is more than 55 years, the pervasiveness of osteoarthritis is greater in females as compared to that in males¹¹. Women likewise have the knee joints' osteoarthritis of more much of the time than men do, with a female-to-male frequency proportion of 1.7:1. Ladies are additionally more inclined to erosive osteoarthritis, with a female-to-male proportion of around 12:1¹². On the contrary, it was revealed in this research that the percentage of suffering males and females from osteoarthritis was taken out to be 60.5% and 39.5% respectively.

Vitamin D has numerous natural capacities in these structures by following up on the receptors of vitamin D¹³, and might have the useful effects on these structures of joint in OA¹⁴. Vitamin D adequacy is evaluated by estimating concentrations of 25-hydroxy vitamin D (25[OH] D or calcidiol). In present research, it was indicated that if the concentration of vitamin D was <10ng/ml or <40nmol/L of blood test. The ideal serum 25(OH) D focus for skeletal wellbeing is questionable. In light of the preliminaries of supplementation of vitamin D and the systematic review of Institute of Medicine (IOM)¹⁵, a few specialists, support keeping up the concentration of serum 25 (OH) D somewhere in the range of 20 and 40 ng/mL (50 to 100 nmol/L), though other specialists, support keeping up 25(OH) D levels somewhere in the range of 30 and 50 ng/mL (75 to 125 nmol/L)^{16,17}. Vitamin D frequency inadequacy in patients giving osteoarthritis was seen in 56% patients in our investigation. Lower serum vitamin D has been appeared to be related with OA in numerous investigations. In a recent report in Ireland (2010) of rheumatology outpatients, 70% were observed to be vitamin D insufficient (<21 ng/mL) and 26% were extremely lacking (<12 ng/mL)¹⁸.

The investigation likewise noted 62% of OA patients experienced hypovitaminosis D and 13% were extremely influenced. As a major aspect of the Osteoporosis Fractures in male study in the United States, research found a high commonness of vitamin D

inadequacy or deficiency in hip OA patients and revealed that these patients were twice as probable for having hip OA¹⁹. An Iranian investigation indicated a positive relationship between serum 25(OH) D3 and knee OA in patients below the age of 60 years and noticed a more grounded relationship in participants who were younger in age²⁰.

Contrary to these outcomes an extensive partner investigation of 5,274 free from OA demonstrated that low serum 25(OH)D3 levels were not related with an expanded danger of creating hip or knee OA over the period of 10 years²¹. For bone health vitamin D is quite useful⁵ and causes the mortality reduction elderly females¹³. We found that the rate of vitamin D insufficiency was essentially high in female in the comparison of males.

As indicated by surveys that has been carried out in our country, over 85 percent of both pregnant and non-pregnant moms have been indicated to be vitamin D deficient²². Another investigation from that city (Faisalabad) revealed greatest commonness vitamin D inadequacy in females. Research demonstrated that 87% of pregnant females were suffering from the deficiency of Vitamin D, 10% were suffering from the problem of insufficiency of vitamin D; while just 3% of the females had the normal levels of vitamin D²³. Another research from Karachi, Pakistan in 305 premenopausal females, indicated 90.1 % vitamin D deficiency²⁴.

Vitamin D is usually called as "the daylight vitamin", and all things considered. It is produced in the human's skin and different warm blooded creatures when presented to daylight. The time which is needed to yield vitamin D from the skin relies upon the quality of the UVB beams (i.e, place of living arrangement), the time span spent under the sun, and the measure of shade in the skin. In consideration of these announcements, correlation was found between the deficiency of vitamin D and the exposure to sunlight in this research. vitamin D deficiency rate was altogether high in those cases who were not exposed to sunlight because of not having any job or having indoor job; and it was likewise high patients who were having the exposure of sun light <10 minutes (p=0.0005). and length of OA was over 10 years.

CONCLUSION

High percentage of deficiency of vitamin D was revealed. Vitamin D deficiency's frequency increased significantly with increasing age and was found to be greater in female patients. It is needed to take instant measures for tackling this increasing public health issue.

Author's Contribution:

Concept & Design of Study:	Muhammad Abid Khalid Ahmed Tareen, Muhammad Hussain Baloch
Drafting:	
Data Analysis:	Amir Bakhsh, Hamid Ali Kalwar, Abdul Zahir

Revisiting Critically: Muhammad Abid,
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Final Approval of version: Muhammad Abid

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

- Muraki S, Dennison E, Jameson K, Boucher B, Akune T, Yoshimura N, et al. Association of vitamin D status with knee pain and radiographic knee osteoarthritis. *Osteoarthr Cartilage* 2011; 19(11):1301-6.
- Heidari B, Heidari P, Hajian-Tilaki K. Association between serum vitamin D deficiency and Knee osteoarthritis. *Int Orthop* 2011;35(11):1627-31.
- Heidari B, Shirvani JS, Firouzjahi A, Heidari P, Hajian-Tilaki KO. Association between nonspecific skeletal pain and vitamin D deficiency. *Int J Rheumat Dis* 2010;13(4):340-6.
- Mansoor S, Habib A, Ghani F, Fatmi Z, Badruddin S, Mansoor S, et al. Prevalence and significance of vitamin D deficiency and insufficiency among apparently healthy adults. *Clin Biochem* 2010; 43(18):1431-5.
- Ding C, Cicuttini F, Parameswaran V, Burgess J, Quinn S, Jones G. Serum levels of vitamin D, sunlight exposure, and knee cartilage loss in older adults: the Tasmanian older adult cohort study. *Arthr Rheumat* 2009;60(5):1381-9.
- Khan H, Ansari M, Waheed U, Farooq N. Prevalence of vitamin D deficiency in general population of Islamabad, Pakistan. *Ann Pak Inst Med Sci* 2016;9(1):45-7.
- Jansen J, Haddad F. High prevalence of vitamin D deficiency in elderly patients with advanced osteoarthritis scheduled for total knee replacement associated with poorer preoperative functional state. *Ann Royal Coll Surg Engl* 2013;95(8):569-72.
- Ghosh B, Pal T, Ganguly S, Ghosh A. A study of the prevalence of osteoporosis and hypovitaminosis D in patients with primary knee osteoarthritis. *J Clin Orthop Trauma* 2014;5(4):199-202.
- Lotfi A, Abdel-Magied R, El-Shereef R, Saeddi A, Abdel Gawad E. Relationship between serum 25-hydroxyl vitamin D levels, Knee pain, radiological osteoarthritis, and the western Ontario and Mc Master Universities Osteoarthritis Index in patients with primary osteoarthritis. *Egypt Rheumatol Rehab* 2014;14(2):66.
- Pereira D, Peleteiro B, Araújo J, Branco J, Santos RA, Ramos E. The effect of osteoarthritis definition on prevalence and incidence estimates: a systematic review. *Osteoarthritis Cartilage* 2011; 19(11):1270-85.
- Roberts J, Burch TA. Osteoarthritis prevalence in adults by age, sex, race, and geographic area. *Vital Health Stat* 1966;11:1-27.
- Bos SD, Slagboom PE, Meulenbelt I. New insights into osteoarthritis: early developmental features of an ageing-related disease. *Curr Opin Rheumatol* 2008;20(5):553-9.
- Holick MF. High prevalence of vitamin D inadequacy and implications for health. *Mayo Clin Proc* 2006;81:353-73.
- Wolff AE, Jones AN, Hansen KE. Vitamin D and musculoskeletal health. *Nat Clin Pract Rheumatol* 2008;4:580-8.
- Open Books [Online]. 2009 [cited 8, Dec 2015] Available From: URL: http://books.nap.edu/openbook.php?record_id=13050
- Trivedi DP, Doll R, Khaw KT. Effect of four monthly oral vitamin D3 (cholecalciferol) supplementation on fractures and mortality in men and women living in the community: randomised double blind controlled trial. *BMJ* 2003;326:469.
- Sanders KM, Stuart AL, Williamson EJ. Annual high-dose oral vitamin D and falls and fractures in older women: a randomized controlled trial. *JAMA* 2010;303:1815.
- Haroon M, Bond U, Quillinan N, Phelan MJ, Regan MJ. The prevalence of vitamin D deficiency in consecutive new patients seen over a 6-month period in general rheumatology clinics. *Clin Rheumatol* 2011;30(6):789-94.
- Chaganti RK, Parimi N, Cawthon P, Dam TL, Nevitt MC, Lane NE. Association of 25-hydroxyvitamin D with prevalent osteoarthritis of the hip in elderly men: the osteoporotic fractures in men study. *Arthritis Rheum* 2010;62(2):511-4.
- Heidari B, Heidari P, Hajian-Tilaki K. Association between serum vitamin D deficiency and knee osteoarthritis. *Int Orthopaedics* 2011;35(11): 1627-31.
- Konstari S, Kaila-Kangas L, Jaaskelainen T. Serum 25-hydroxyvitamin D and the risk of knee and hip osteoarthritis leading to hospitalization: a cohort study of 5274 Finns. *Rheumatol* 2014;53(10): 1778-82.
- Sahibzada AS, Khan MS, Javed M. Presentation of osteomalacia in Kohistani women. *J Ayub Med Coll Abbottabad* 2004;16:63-5.
- Aslam M, Masood Z, Sattar A, Qudsia M. Vitamin D Deficiency; prevalence in pregnant women. *Professional Med J* 2012;19(2):208-13.
- Khan AH, Iqbal R, Naureen G, Dar FJ, Ahmed FN. Prevalence of vitamin D deficiency and its correlates: results of a community-based study conducted in Karachi, Pakistan. *Arch Osteoporos* 2012;7(1- 2):275-82.