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Evaluation of the Correlation Between Vitamin D3 Serum Level, Age, gender and BMI in Rheumatoid arthritis Patients in Al- Kut City/Iraq

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Abstract

Rheumatoid arthritis (RA) is an auto-immune disease a chronic characterized leading to joint loss (RA) disease affects nearly 1% of the world. This study is aimed to determine the effect of age, gender and vitamin D level on the efficacy of RA. One hundred and twenty patients (twenty male and one hundred female) with RA in this study were divided, into groups according to their age. Vitamin D levels were measured in the serum using the enzyme-linked immunosorbent assay (ELISA) blood test. Assessment of the relationship between disease severity and average level of vitamin D was examined by the scale of scores in different groups with rheumatoid arthritis. At $p<0.05$, significant levels of the above tests have been detected. The current study indicates there is a significant relationship between overweight high underweight below **(18.5)** BMI and age rate **(26-36**) patients with RA with deficiency of vitamin D level in serum. The results showed a highly significant difference between patients' gender groups in as compared disease severity, female more than male with RA disease.

Keywords: *Rheumatoid Arthritis, Vitamin D3, Age, gender, Body Mass Index (BMI)*

Introduction

Rheumatoid Arthritis (RA) is an immunomodulatory disease that results in erosion, synovial soreness, and damage to the bone, leading to a direct effect on the joints [1]. Premature diagnosis and therapy are pivotal in reducing the damage of this disease, but the cause of this disease and causing rheumatoid arthritis are still unclear. Both genetic and non-genetic elements (like ecological, infectious, and hormonal components) may be the main cause of disease outbreaks [2]. It is one of the most severe diseases affecting about 1% of the world population. This disease is characterized by chronic pathway, unpredictable flares with severe pain that causes disability [3]. Vitamin D is one of the most important ecological risk agents associated with rheumatoid [4]. It is considered as a one of the most significant vitamins in cartilage and bone metabolism. The low concentration of vitamin D in the body has a negative effect on calcium metabolism, bone density, matrix staining, osteoporosis and articular cartilage [5,6]. In all patients with RA, the deficiency of vitamin D is common. Studies have confirmed that the deficiency of vitamin D increases the risk of RA [6]. However, the effect of vitamin D deficiency on pathogenesis of various illness is provocative. Vitamin D that was first recognized in the 1920, a lipid-soluble vitamin [7] is vital for neurodevelopment and neuropsychiatric disorders [8]. It is one of the four vitamins dissolve in fat (A, D, E, and K) stored in body tissues, also called calciferol. Vitamin D is generally used to describe two specific terms (vitamin D2), ergocalciferol (vitamin D3), and cholecalciferol. Vitamin D3 is made in the body when exposed to ultraviolet rays (from the sunlight), is a hormone with steroidal structure, regulates the calcium homeostasis, and bone formation with reabsorption through kidneys, parathyroid glands and bowel while vitamin D2 is a naturally occurring vitamin that is found in plants [9- 10]. Vitamin D is the only vitamin that can be manufactured by the human body. About 90% of (vitamin D3) of human requirement reliance on endogenous productions (stimulation by exposure to U.V sunlight) and exogenous sources (principally reinforced foods, diet,) to biological necessities of vitamin D [11]**.** The modulation of parathyroid hormone secretion, calcium & bone homeostasis and cell

proliferation the vital role played widely known by vitamin D in them. Another indicator shows that the receptors of vitamin D affect important parts of the brain, such as immune and nerve integrity, and maintain control of proliferation, which acts as a regulator of the proliferation and differentiation of brain cells, which enters the growth of the brain [12-13]. Vitamin D has various substantial roles in many vital processes such as cellular growth and differentiation, metabolism of calcium, bones, cardiovascular and immunity functions [14]. The main potential risk influences for vitamin D deficiency may comprise age more than 65 [15], in many studies the association among vitamin D deficiency and different diseases both observational and randomized trials have been reported [16].

Materials and Method

One hundred and twenty random cases from patients with RA (Twenty men and one hundred women) ranging in age from 15 to >70 years at **Al- Kut** Government/Iraq, were divided to many groups according to their age**,** gender, BMI and Vitamin D concentration. They have been classified into three groups shown below accordant (IOM) [28, 29] as:

(1) (> 30 ng/mL) sufficient

(2) (20–30 ng/mL) insufficient

(3) (< 20 ng/mL) deficient.

They were diagnosed by a rheumatologist. The weight and height were measured in an examination room. Body mass index (BMI) was calculated as (weight (kg)/height (m2)). The level of vitamin D in the serum was measured through by ELIZA after taking a blood sample of 5 cc.

Statistical Method

Percentages and Frequencies were equated through the use of three groups of vitamin D with Chi-square analysis. Associations between vitamin D con. s and disease severity, and BMI in various groups with RA. The considerable level of the mentioned examinations was fixed at $p<0.05$. The results were studied by using the Statistical Package for Social Sciences (SPSS) version 17.5.

Results and Discussion

In this study, we have enrolled 120 patients including (100 women), women comprised 83.3% of the study participants while (20 men) patients comprised 16.7, and a healthy volunteer as controls mean of age (31.1±6.2) years in the RA patients, the mean duration of the disease was of 5 years. There was no significant difference between age and sex groups ($p> 0.05$). Mean of the 25-OH Vitamin D conc. was 47.65±21.80 nmol/l in RA patients, 93.60±61.82 nmol/l in the healthy volunteer controls ($n = 20$). We found that the average of the 25-OH D vitamin conc. of the patients (RA) was meaningfully less high than that of controls ($p < 0.01$). Concerning the (BMI) for patients with RA, in this study, we have recorded a high overweight percentage and the largest proportion in sample was (71.7 %) while underweight percentage was recorded as below (18.5) BMI in patients' low percentage were composed (5%) as an out total number of the study sample as summarized in Table 1.

Table (1): Distribution of Study Sample by their Characteristics

Characteristics	Rating	No.	%
Age (years)	15-25	30	25.0
	26-36	34	28.3
	37-47	24	20.0
	48-58	17	14.2
	59-69	12	10.0
	70+	3	2.5

Cont... **Table (1): Distribution of Study Sample by their Characteristics**

Gender	Male	20	16.7
	Female	100	83.3
BMI	Under weight below (18.5)	6	5.0
	Normal, (18.5- 24.9)	15	12.5
	Overweight (25.0- 29.9)	86	71.7
	Obesity (30.0 and above)	13	10.8
Vitamin D3	Deficiency (<20 ng/ml)	57	47.5
	Insufficient (20-30 ng/ml)	31	25.8
	Sufficient (>30 ng/ml)	32	26.7

Considering the frequencies and percentage, Table 2 presents the sample characteristics as age, gender, body mass index, and their vitamin D3. Findings depicts that the (28.3%) of study sample are within second age groups (26-36) years old. Regarding gender, most of the study participants were female, it constituted (83.3%) out total number. In regarding with Vitamin D3, most of the study sample (47.5%) were deficiency as (< 20 ng/ml) as well as (26.7% and 25.8%) were sufficient and insufficient respectively.

Table (2): Statistically association between sample characteristics and their Vitamin D3

Charact-eristics	**Rating**	**Vitamin D3**			***Total***		**d.f**	**crit.**
		Deficiency	***Insufficient***	***Sufficient***				
Age	15-25	12	8	10	30	19.703	10	18.307
	26-36	13	9	12	34			
	37-47	13	6	5	24			
	48-58	12	3	2	17			
	59-69	6	4	2	12			
	70+	1	1	1	3			
	Total	57	31	32	120			
	P-value= 0.048→S							
Gender	Male	8	8	4	20	6.549	2	5.991
	Female	49	23	28	100			
	Total	57	31	32	120			
	P-value= 0.028 →S							
BMI	Under weight below (18.5)	6	0	0	6	13.731	6	12.592
	Normal (18.5-24.9)	6	6	3	15			
	Overweight (25.0-29.9)	39	19	28	86			
	Obesity (30.0 and above)	6	6	1	13			
	Total	57	31	32	120			
	P-value= 0.033 →S							

Chi-square observer, Chi-square critical, D_f= Degree of freedom, P-value= Probability value, S= significant, N.S= non significant

The study showed that age rating (26-58) statistically has a significant relationship with vitamin D levels deficiency in patients with RA while the mean age (57-70) was the lowest in vitamin D shortage. The results of the evaluation also showed that women are more predisposed to vitamin deficiency than men.

The study also recorded a significant decrease in the levels of vitamin D for patients with a body mass index BMI (**Overweight (25.0- 29.9)**, the mean decreases of vitamin D3 levels in the patients with RA according to their BMI, gender, and age was significant ($p<0.05$). In addition, the examination of a lack of vitamin D levels and deficiencies in previous studies identified as the level of 25 (OH) -D <20 ng / mL and < less than 30 ng / ml and sufficient (> 30 ng / ml) with Table 2. Vitamin D has a lively role in most physiological roles as well as an important role in bone balance [17]. The main function of vitamin D is to supply besides preserve calcium in addition phosphorus caffeine in the body to ease optimal metabolism. Depressed levels of vitamin D have an important association with extent of diseases and disturbance. It is well known that the incidence of vitamin D and bone diseases such as rickets and osteomalisia are well identified [18]. Findings depicts that the (28.3%) of study sample are within second age groups (26-36) years old, and it is also mean age were (2.63) with standard deviation (1.39). Regarding gender, most of the study participants were female, it constituted (83.3%) out total number. RA is a chronic inflammatory disease of its prominent epithelium (inflammation of the articular membrane) which can usually include wrists, tarsus and each joint. This disease is affected by gender and age, increasing the incidence of this disease with increasing age and hormonal changes in women [19-20]. Concerning body mass index, the overweight were the *largest* proportion (71.7%). Only small percent were composed (5%) underweight as an out total number of the study sample. Fatness is a medical disorder which means having excess body fat amassed to the range that it may have a negative influence on the health [21]. Healthy life is typically related with adequate concentrations of vitamin D in the serum, which may be described by the external action of men, that is, an increase in duration of revelation to the sun further than women may be due to the nature of life and customs of communities, including Iraq [22]. In regarding with Vitamin D3, most of the study sample (47.5%) were deficiency as (<20 ng/ml) as well as (26.7% and 25.8%) were sufficient and insufficient respectively.

Serum 25OHD below (20 ng/ml), (50 nmol/ liter) defined as insufficiency in vitamin D according of The World Health Organization. However, others have begun in the definition of deficiency of vitamin D serum level 25OHD below (20 ng / ml) and the inadequacy of vitamin D is less (30 ng / ml) (75 nmol / L) [32]**.** **T**he different lifestyles and physical activity might be the reason behind those results [23, 24]. Exposure to the sunlight is often limited by lifestyle and other options, resulting in insufficient vitamin D intake and insufficient access to the diet; therefore, Patients with a deficiency may need long-term supplements. Moreover, there was a significant correlation between patients in terms of gender, BMI, age, and their vitamin D3 levels ($p<0.05$). The results of Rajai et al., In 2017, suggested a significant inverse connection between vitamin D serum and rheumatoid arthritis acuteness based on DAS [28] increasing the severity of the disease with low vitamin D serum levels [25] .

Conclusions

There were a significant relationship, between levels of vitamin D in the serum and R.A severity based on Patients body mass index, age, and , gender have been active effected their deficiency of vitamin D3

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

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