Prevalence of Vitamin D Deficiency Among Orthopedic Attendances at Azadi Teaching Hospital in Kirkuk City

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ABSTRACT

Vitamin D deficiency is a major global health issue, affecting one billion people and impacting about fifty percent of the population across various regions. Risk factors include older age, female gender, limited sunlight exposure, winter months, malnutrition, dark skin, covered clothing, obesity, and being hospitalized or residing in nursing homes. This study aimed to assess the prevalence of vitamin D deficiency and its association with sociodemographic factors and chronic diseases in orthopedic patients. A cross-sectional, prospective study was conducted among outpatients of all ages at the orthopedic department of Azadi Governmental Hospital in Kirkuk City from December 1, 2023, to August 28, 2024. Data were collected through interviews and analyzed using SPSS version 24, with statistical significance set at $P \leq 0.05$. The mean age of participants was 34.6 ± 17.3 years. Most were Kurdish (80.4%), and 78.6% reported sufficient income. Nearly two-thirds suffered from arthritis (39.4%) or lethargy (31.7%), while 24% had chronic diseases. Vitamin D insufficiency was found in 62.1% of participants. Significant associations were noted between older age ($P < 0.001$), male gender ($P = 0.004$), obesity ($P = 0.003$), and chronic disease ($P < 0.001$) with arthritis. Vitamin D deficiency prevalence was high, particularly among women. The study found significant links between orthopedic diseases and older age, female gender, obesity, and chronic diseases. Educational strategies to raise awareness and treatment of vitamin D deficiency are crucial for all age groups.

Keywords: Vitamin D, Prevalence, Deficiency, Orthopedic, Chronic diseases.

INTRODUCTION

Vitamin D is a fat-soluble composite separated into two structures: cholecalciferol (D_3) and ergocalciferol (D_2) for human health, derived from diets, like fatty fish. At the same time, D_3 and Cod liver oil are created in the skin from the forerunner as uncovered by ultraviolet irradiation[1]. The satisfactoriness of vitamin D improves the dietary absorption of phosphorus by 80% and calcium by 30-40%, vitamin D is required by the human body to guarantee worthy well-being, thus it is significant for the construction of teeth and bone. Vitamin D deficiency is a worldwide epidemic; yet, it remains an issue unfamiliar to most people[2]. Vitamin D deficiency is a global community health problem which impacts one billion individuals globally, while vitamin D insufficiency affects fifty percent of the public[3]. Vitamin D supports calcium absorption in the maintains and gut with suitable serum phosphate and calcium concentrations to allow mineralization of normal bone and to avoid hypocalcemia tetany (spontaneous shrinkage of muscles, resulting in spasms and cramps). It is also necessary for bone restoration and growth by osteoclasts and osteoblasts[4]. Hypovitaminosis D touches both developed as well as developing countries. Its risk influences are regardless of the topographical status or location of the country. Commonly, the risk features comprise old age, female gender, sunlight deficiency, winter seasons, malnutrition, dark skin pigmentation, covered clothing style, obesity[5], hospitalized patients and nursing home residents. Vitamin D deficiency might be connected to people with advanced skin melanin content and general skin coverage, predominantly in Middle Eastern states[3]. Over the last decades, huge numbers of articles have been published worldwide, confirming several Vitamin D deficiency health problems, for instance, India[6,7], Sweden[8] and China[9,10], besides other studies in neighborhoods such as Somalia[11], Iran[12], in Jordan[13,14] and Turkey [15,16] had been conducted in various objectives and different population, To our knowledge, there is limited data on the prevalence of Vitamin D deficiency among the general population in Iraq, in general, such that in the review of the system[17], for adults in Babylon[18], in Erbil[19,20,21], Sulaymaniyah[1], and Baghdad[22], for this purpose particularly there is no any study conducted in the city of Kirkuk which is necessary and has important implications for general public health. Therefore, this study aimed to determine the levels of vitamin D among Kirkuk populations and determine associated risk factors associated with chronic diseases among orthopedic patients. The Objectives of the study to identify the prevalence of vitamin D deficiency in orthopedic outpatients who attended Azadi Hospital of Kirkuk City. To assess the association between the features (signs and symptoms) of chronic diseases and the sociodemographic characteristics of the studied samples with blood tests.

MATERIALS AND METHODS

Design and setting: The current prospective hospital-based study was used to determine samples of patients who attended an orthopedic outpatients Department investigation of all ages at Azadi governmental hospitals in Kirkuk City, Iraq. The study was conducted from December 1st, 2023 to August 28th, 2024.

Data collection: For the study of the relevant subject data collection was performed from direct interviews with the clients using a particular

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questionnaire organized by the researcher to include all the possible variables that address the study's objective for the research subject. Designing the questionnaire after presented to a group of experts in the fields and changes done accordingly was to attain data on variables related to the research such as socio-demographic profile (age, sex, marital status, education, and occupation). Moreover, for measurement of the vitamin D evaluation criteria, according to Gao et al., in 2024[9] a vitamin D status of <12 ng/mL (30 nmol/L) was accepted as vitamin D deficiency, 12-20 ng/mL (30-50 nmol/L) as insufficiency, and >20 ng/mL (50 nmol/L) as sufficiency.18 In 2011, the Institute of Medicine in the US recommended that a vitamin D status of <12.5 ng/mL (31.25 nmol/L) should be considered as a vitamin D deficiency[17], The blood sample was taken from outpatients and centrifuged at 5000 rpm for 5 min then the serum was separated and stored at -20°C in deep freeze until they were used for analyzing serum 25 dihydroxy Vitamin D quantity. Serum Vitamin D level was carried out using Roche Cobas e411 immunoassay analyzer using the Roche Elecsys Vitamin D_3 assay (Roche Diagnosis, Mannheim, Germany).

Ethical consideration: The larger study received approval from the Kirkuk Directorate of Health/ Human Sources Department, and Ethics Committee, followed by additional approval from the Azadi Teaching Hospitals allow the measurement of vitamin D levels and monitor reinfection rate, participants gave a direct interview informed consent for their voluntary participation in the study, besides the right to privacy and confidentiality of medical information. A pilot study was done and the final draft of the questionnaire was equipped. The income had been selected According to a study conducted in 2021 by Hamid[23], to identify topographical exploration of the poor residents in Kirkuk governorate for the year 2017, the poverty proportion was 11.8%, the other details illustrated in a study reported by Rashid and Ismail in Erbil[24], after being associated with other advanced salary families were additionally predominant in Kirkuk (16 %).

Data analysis: For data entry and analysis SPSS version 24 was used. Cross-tabulations, frequency distributions, and Chi-Square (X^2) analysis were performed, and statistically, the association was significant at $P \leq 0.05$.

Sample size: In this study, the Epi-info[25] was used to calculate and measure sample size supposing that the prevalence of vitamin D deficiency is similar to the previously reported in the Kurdistan Region of Iraq at 51.9% from a study conducted in Erbil[20], with population size. It was found that the size of the sample of 384 was adequate to reach a 95% confidence interval for the prevalence (±1%) of these residents and cluster 1, with an acceptance margin of errors of 5%. The sample was increased to 390 individuals for non-response. It had been assumed that taking 384 would have the recommended participants for some reason and would produce a sample of around 390, finally, the population size reported in 2024 by Al-Jazeera was 1650000 people[26].

Table 1. Distribution of study sample (N=388) by their sociodemographic characteristics.

Variables	Characteristics	Frequency	(%)
Age group	<10	30	(7.7)
	10-19	47	(12)
	20-29	79	(20.4)
	30-39	90	(23.2)
	40-49	60	(15.5)
	50-59	43	(11.1)
	>60	39	(10.1)
Sex	Male	118	(30.4)
	Female	270	(69.6)
Residency	Inside City	337	(86.9)
	Outside City	51	(13.1)
Weight	Weak	70	(18.0)
	Normal	191	(49.2)
	Obese	127	(32.7)
Marital status	Single	83	(21.4)
	Married	257	(66.2)
	Divorced	1	(0.3)
	Widow	1	(0.3)
	Child	46	(11.9)
Ethnicity	Kurdish	312	(80.4)
	Arabic	71	(18.3)
	Turkmen	5	(1.3)
Economic status	Not Enough	61	(15.7)
	Enough	305	(78.6)
	Exceed Need	22	(5.7)
Educational level	Illiterate	109	(28.1)
	Primary	50	(12.9)
	Secondary	31	(8.0)
	University	41	(10.6)
	Diploma	95	(24.5)
	≥Bachelor	56	(14.4)
	Read and write	6	(1.5)
Total		**388**	**(100)**

RESULTS

For detecting diseases of vitamin D deficiency in nine months a total of 388 participants were taken in Azadi Teaching Hospital in Kirkuk City, nearly one-fourth 90(23.2%) of them were aged 30-39 years and less than a tenth year reported below a tenth 30(7.7%) participants, more than three-fourth 270 (69.6%) were females and less than one-third 118(30.4%) were males. The mean age ± SD of them was 34.6 ±17.3 years, most of the victims 312(80.4%) were Kurdish, more than three-fourths had enough income 305 (78.6%) and were living inside the City of Kirkuk were 337(86.9%) (Table 1.)

In the present hospital study (Table 2.), nearly two-thirds of the participants were either suffered from arthritis 153 (39.4%) or from lethargy 123 (31.7%), chronic diseases reported among about one-

Table 2. Distribution of study sample (N=388) by some disease circumstances features

Variables	Characteristics	Frequency	(%)
Signs and symptoms	Arthritis	153	(39.4)
	Lethargy	123	(31.7)
	Hair loss	77	(19.8)
	Headache	31	(8.0)
	others	4	(1.0)
Chronic diseases	Yes	93	(24.0)
	No	295	(76.0)
Season	Winter	140	(36.1)
	Spring	166	(42.8)
	Summer	82	(21.1)
Results Category	Deficiency	241	(62.1)
	Insufficient	77	(19.9)
	Sufficient	66	(17.0)
	Toxic	4	(1.0)
Total		**388**	**(100)**

Table 3. Signs and symptoms association with sociodemographic features and other variables

Variables	Characteristics	Signs and symptoms					Total	P-value
		Arthritis	Lethargy	Hair loss	Headache	Others		
		No.(%)	No.(%)	No.(%)	No.(%)	No.(%)		
Age group	<10	9(30.0)	17(56.7)	1(3.3)	3(10.0)	0(0.0)	30(100)	
	10-19	12(25.5)	22 (46.8)	8(17.0)	5(10.6)	0(0.0)	47(100)	
	20-29	25(31.6)	22(27.8)	26(32.9)	6(7.6)	0(0.0)	79(100)	
	30-39	36(40.0)	23(25.6)	21 (23.3)	8(8.9)	2(2.2)	90(100)	<0.001
	40-49	22(36.7)	15(25.0)	17(28.3)	5(8.3)	1(1.7)	60(100)	
	50-59	25(58.1)	15(34.9)	1(2.3)	2(4.7)	0(0.0)	43(100)	
	>59	24(61.5)	9 (23.1)	3 (7.7)	2(5.1)	1(2.6)	39(100)	
Gender	Male	52(44.1)	37(31.4)	12(10.2)	16(13.6)	1(0.8)	118(100)	
	Female	101(37.4)	86(31.9)	65(24.1)	15(5.6)	3(1.1)	270(100)	0.004
	Total	153(39.4)	123(31.7)	77(19.8)	31(8.0)	4(1.0)	388(100)	
Address	Inside City	128(38.0)	110(32.6)	70(20.8)	25(7.4)	4(1.2)	337(100)	
	Outside City	25(49.0)	13(25.5)	7(13.7)	6(11.8)	0(0.0)	51(100)	0.304
Weight	Weak	22(31.4)	24(34.3)	18(25.7)	5(7.1)	1(1.4)	70(100)	
	Normal	61(31.9)	64(33.5)	47(24.6)	17(8.9)	2(1.0)	191(100)	0.003
	Obese	70(55.1)	35(27.6)	12(9.4)	9(7.1)	1(0.8)	127(100)	
Marital Status	Single	31(37.3)	25(30.1)	20(24.1)	6(7.2)	1(1.2)	83(100)	
	Married	108(42.0)	70(27.2)	54(21.0)	22(8.6)	3(1.2)	257(100)	
	Divorced	0(0.0)	1(100)	0(0.0)	0(0.0)	0(0.0)	1(100)	0.94
	Widowed	1(100)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(100)	
	Child	13(28.3)	27(58.7)	3(6.5)	3(6.5)	0(0.0)	46(100)	
Nationality	Kurdish	122(39.1)	102(32.7)	61(19.6)	26(8.3)	1(0.3)	312(100)	
	Arabic	29(40.8)	19(26.8)	15(21.1)	5(7.0)	3(4.2)	71(100)	0.265
	Turkmen	2(40.0)	2(40.0)	1(20.0)	0(0.0)	0(0.0)	5(100)	
Educational Level	Illiterate	51(46.8)	40(36.7)	11(10.1)	6(5.5)	1(0.9)	109(100)	
	Read/write	2(33.3)	2(33.3)	1(16.7)	1(16.7)	0(0.0)	6(100)	
	Primary	21(42.0)	17(34.0)	7(14.0)	4(8.0)	1(2.0)	50(100)	
	Secondary	11(35.5)	9(29.0)	9(29.0)	1(3.2)	1(3.2)	31(100)	
	University	8(19.5)	14(34.1)	11(26.8)	7(17.1)	1(2.4)	41(100)	0.076
	Diploma	38(40.0)	29(30.5)	19(20.0)	9(9.5)	0(0.0)	95(100)	
	≥Bachelor	22(39.3)	12(21.4)	19(33.9)	3(5.4)	0(0.0)	56(100)	
Family Income	Not Enough	25(41.0)	24(39.3)	8(13.1)	3(4.9)	1(1.6)	61(100)	
	Enough	122(40.0)	94(30.8)	61(20)	26(8.5)	2(0.7)	305(100)	0.191
	Exceed Need	6(27.3)	5(22.7)	8(36.4)	2(9.1)	1(4.5)	22(100)	
Chronic diseases	Yes	57(61.3)	26(28.0)	6(6.5)	3(3.2)	1(1.1)	93(100)	<0.001
	No	96(32.5)	97(32.9)	71(24.1)	28(9.5)	3(1.0)	295(100)	
Season	Winter	53(37.9)	50(35.7)	28(20.0)	8(5.7)	1(0.7)	140(100)	
	Spring	62(37.3)	4728.3 ()	35(21.1)	19(11.4)	3(1.8)	166(100)	0.313
	Summer	38(46.3)	26(31.7)	14(17.1)	4(4.9)	0(0.0)	82(100)	
Results	Deficiency	87(36.1)	77(32)	53(22.0)	22(9.1)	2(0.8)	241(100)	
	Insufficient	33(42.9)	26(33.8)	12(15.6)	5(6.5)	1(1.3)	77(100)	
	Sufficient	30(45.5)	19(28.8)	12(18.2)	4(6.1)	1(1.5)	66(100)	0.867
	Toxic	3(75.0)	1(25.0)	0(0.0)	0(0.0)	0(0.0)	4(100)	

fourth 93 (24%) of participants, and nearly two-thirds of 241 (62.1%) showed insufficiency of vitamin D.

According to Table 3, a statistically significant association was recorded between the participants' senior age group (P<0.001) nearly two-thirds 24 (61.5%) percent, male gender (P=0.004), obese individuals (P=0.003), and victims of chronic diseases (P<0.001) with features of the arthritis diseases. A non-significant association was reported between the participants' addresses (P=0.304), marital status (P=0.94), nationality (P=0.265) educational level (P=0.076) and results (P=0.867) of blood tests.

DISCUSSION

Universally, vitamin D deficiency is becoming a mutual disorder, and numerous important studies and scientific research have highlighted its close relationship with acute and chronic illnesses. Studies have recognized that vitamin D shortage is due to a mixture of features, with the maximum significant ones being reduced ultraviolet B obtainability, slowing from lesser solar radiation contact, and low nutritional consumption[9]. The prevalence of vitamin D deficiency in the current finding is reported by nearly two-thirds of 241(62.1%) and 77(19.9%) of insufficiency. Contrary a study showed the prevalence of vitamin status levels varied depending on their thresholds; the highest prevalence was

severe vitamin D deficiency, which accounted for 45.9%, followed by vitamin D deficiency, which accounted for 41.8%[11]. According to our findings increase in age showed an increase in injuries of Arthritis and statistically a significant association was reported (P<0.001) between age group and signs and symptoms of diseases. These findings were in agreement with a retrospective study by

This result disagreed with another one[6] conducted in Tamil Nadu which reported that the prevalence was 40% among 281 clients <20 years who have attended an orthopedic outpatient unit. This inconsistency in the results from environmental factors, and social and eating lifestyles contributes to different findings. This study explored the association between signs and symptoms of diseases like Vitamin D deficiency and some variables including the investigation of blood tests. More than two-thirds of respondents were females 270 participants had signs and symptoms of this disease including 101(37.4%), 86(31.9%), 65(24.1%), 15(5.6%), and 3(1.1%) were found Arthritis, lethargy, hair loss, headache and other conditions and significant association reported between the signs and symptoms of the disease and sex. These findings were in agreement with a retrospective study by Petrie et al. (2022)[27] reported that women had a significantly higher percentage of chronic injuries than men (30.7% vs. 10.9%). Besides, another retrospective study illustrated a significant association between females and vitamin D deficiency[11].This study showed different results in other areas like Northern Andhra Pradesh among 468 adult patients attending the orthopedic department of a tertiary care hospital with non-specific complaints of general body pain/back pain/tiredness/weakness on working was 41.9% [28].Finally, according to the results of this study, a significant association (P=0.003) was reported between being obese and suffering from arthritis by more than a half percent, while more than one-third percent reported lethargy among normal and weak people. In agreement with our results, a cross-sectional study[29] was conducted among <18 years old people with overweight, stage I, and stage II/III obesity, respectively (P=0.0367).Current study illustrated a significant association between signs and symptoms of diseases and having chronic diseases (P<0.001), this is reported in a meta-analysis study and found that musculoskeletal conditions may increase the risk of chronic disease[30]. Another study in 2021 by Asahi et al.[31] agreed with our results and reported a significant association between chronic disorders and musculoskeletal problems. Most studies conducted in Iraq related condition of infectious diseases[32-38] and less studies reported non-communicable diseases[18,21,24,39,40] which efforts should focus on research on self-medication[41] to increase awareness about insufficiency of Vitamin D.

CONCLUSION

In Current findings, the prevalence of vitamin D deficiency was extremely high, mainly among women. Moreover, the study established the association between orthopedic diseases and age group, female gender, obesity, and suffering from chronic diseases.

Authorship Contribution: All authors have contributed to data gathering and article writing. Karzan Majid was the anatomist and helped to date collecting from the hospital of Azadi and made up blood investigations. Tara Khorsheed shared in designing and investigating the manuscript as a whole after the writing processing done by Dr. Hayman Rashid and statistics were completed.

Potential Conflicts of Interest: None

Competing Interest: None

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