

# Study of vitamin D deficiency among menopausal women in Basrah city

Weaam F. Almahfooth

Department of obstetrics and gynecology, college of medicine, university of Basrah.

## ABSTRACT

**Background:** Vitamin D deficiency is well-recognized worldwide. It is common in older adults, especially in women. Vitamin D deficiency is the most underdiagnosed medical condition in menopausal women. There are few epidemiological studies on the vitamin D status of menopausal women in Basra City, Iraq. **Aim:** The aim of the study is to determine the prevalence of vitamin D deficiency among menopausal women in Basra City and its correlation with various factors that lead to vitamin D deficiency in menopausal women. **Methods:** A prospective cross-sectional study was conducted on 200 menopausal women in the age group 46–65 years attending the gynecological outpatient clinic of Al Mawany Teaching Hospital and the gynecological clinic in Basra City, between September 2019 and August 2020. The level of vitamin D was assessed for each woman. A level of less than 30 ng/ml is considered vitamin D deficiency and a level of 30–100 ng/ml is considered a sufficient level of vitamin D. **Results:** There was a prevalence of vitamin D deficiency among 83% of menopausal women in Basra city, and the majority of menopausal women with vitamin D deficiency were in the age group of 51–60. Vitamin D deficiency has a significant correlation between sun exposure and dietary intake at 83.1% and 61.4%, respectively. Vitamin D levels had no correlation with hypertension and diabetes in menopausal women. **Conclusion:** This study helped us to evaluate the baseline vitamin D level among post-menopausal women and concluded a high prevalence of vitamin D deficiency in menopausal women in Basra city. There is a statistically significant correlation between vitamin concentration and age in the late menopausal period. All menopausal women ought to be advised on the advantages of taking vitamin D supplements, eating a healthy diet, and getting enough sun exposure.

**Keywords:** vitamin D, diet, sun exposure, menopause

**Corresponding author:** Weaam F. Almahfooth. E-mail: [weamfaik@yahoo.com](mailto:weamfaik@yahoo.com)

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## INTRODUCTION

During the past decade, vitamin D has received increasing attention and has been associated with various health benefits in addition to its recognized effects on bone health. One of the areas of interest is the status of vitamin D among menopausal women. Vitamin

D is significant in facilitating calcium absorption from the diet for bone strength. Vitamin D belongs to the group of fat-soluble secaroid, which helps in increasing intestinal absorption of calcium, iron, magnesium, phosphate, and zinc. The prohormone of vitamin D exists in two forms:

vitamin D<sub>3</sub> (cholecalciferol) and vitamin D<sub>2</sub> (ergocalciferol). These are important compounds and can be ingested through diet and supplements. The skin's ability to synthesize vitamin D, particularly cholecalciferol, depends on sun exposure. The most accurate measure of vitamin D status is serum 25(OH)D<sup>1,2</sup>. Vitamin D is also considered to influence a wide range of fundamental biological functions such as cell differentiation and immunomodulation that explain the epidemiological and observational data, linking it to a variety of clinical disorders such as diabetes and hypertension. Vitamin D deficiency results from several factors including inadequate sun exposure, poor nutrition, and certain medications such as anticonvulsants.<sup>3</sup> Muslim women, including menopausal women, commonly cover their whole body except the face, hands, and feet; therefore, they are not exposed to sufficient amounts of sunlight. As a result, most of their dwellings are not able to receive direct sunshine, preventing them from getting any sun exposure. Furthermore, there aren't many possibilities for outdoor activities due to the lack of space. A woman's lifestyle depends on several daily activities, like nutrition and dietary habits, vitamin D intake, and physical activity. A desirable lifestyle contributes to levels of vitamin D within the normal range, while a lifestyle devoid of exposure to sunlight and low vitamin D intake harms health.<sup>2,4</sup> Vitamin D deficiency is the most under-diagnosed medical condition in menopausal women. This is largely because patients do not heed the clinical signs and symptoms until the deficiency is severe and prolonged. postmenopausal women who suffer from vitamin D deficiency are more at risk of osteoporosis, muscle weakness and fractures.<sup>5,6</sup> Vitamin D deficiency is more frequently observed during menopause due to a decrease in the precursor of vitamin D in skin 7 dehydrocholesterol, the rise of fat content, and the decrease in bioavailability of vitamin D.<sup>7,8</sup> inadequate exposure to sunlight and/or poor diet in elderly women is one of the possible reasons of vitamin D deficiency. Moreover, aging decreases the skin's capacity to produce vitamin D.<sup>9</sup> There is also a decrease in the hydroxylation of vitamins and the responsiveness of intestinal mucosa to circulating vitamin D in elderly individuals.<sup>8</sup> Even though there are several studies on vitamin D status, there are not many studies about vitamin D status among postmenopausal women. This study evaluates vitamin D deficiency among menopausal women and its correlation with diet and environmental factors. Vitamin

D deficiency is a preventable disorder, but it is a common and important public health problem faced by women, especially menopausal women.

#### **Aim and objectives:**

This study aims to evaluate the prevalence of vitamin D deficiency among the studied group and to assess the correlation of vitamin D levels with diet and environmental factors.

## **MATERIALS AND METHODS**

After the approval of the scientific and ethical committee at the Department of Obstetrics and Gynecology, the study was conducted at the gynecological outpatient clinic at Al Mawany Teaching Hospital and the private gynecological clinic in Basrah City/ Iraq, between September 2019 and September 2020. It is a prospective cross-sectional study. 200 menopausal women in the age group 46–65 years old, who attended the clinics for other gynecological problems, were enrolled in this study. Each menopausal woman was subjected to testing serum vitamin D after counselling and informed consent. Data collection: Data about 200 menopausal women were included in the study. Information on age, education, occupation, level of physical activity, exposure to the sun, and dietary intake of vitamin D were obtained using a questionnaire. The exclusion criteria were a history of any disease known to alter vitamin D level metabolites, such as renal or hepatic disease, a history of malabsorption syndrome or gastric surgery, thyroid and parathyroid disease, or any metabolic bone disorder. Blood samples were collected from the subjects for measurement of 25(OH)D levels, by using an enzyme-linked immunosorbent assay (ELISA) kit. The analysis was carried out according to serum vitamin D value. The deficiency value of vitamin D was less than 30 ng/ml, and the sufficiency value of vitamin D was more than 30 ng/ml. The postmenopausal period is divided into two: the early post-menopausal period, which is defined as the first five years of menopause, and the duration after this, which is called the late post-menopausal period.

Statistical analysis: Data were collected using the SPSS version 16.0 and expressed as numbers and percentages. Statistical differences between categorical variables were assessed by the chi-square test/ Fisher exact test. A P-value of 0.05 or less was considered statistically significant.

## RESULTS

A total of 200 postmenopausal women were included in the study. The maximum number of menopausal women were in the age group 51–60 years 95 (47.5 %), and the least number of women were in the age group 61–70 years 28 (14%). The majority of studied women were illiterate and housewives 100 (50%) and 166 (83 %,) respectively. In our study, 148 (74%) of menopausal women had inadequate exposure to sunlight, 112 (56%) had inadequate dietary intake and most of the menopausal women involved in this study were living in a central city 168 (84%) (Table 2). 166 (83%) of studied women had vitamin D deficiency (Table 1).

The majority of the studied women (120 women, 60%) were in the postmenopausal period between 5–10 years. It was also found that those women were the highest among the studied women having vitamin D deficiency (65%) (Table 3). Therefore, postmenopausal years of more than 5 years and vitamin D deficiency have a significant correlation. Vitamin D deficiency was high in the age group 51–60 (54.21%) (Table 4). The majority of postmenopausal women with vitamin D deficiency had inadequate exposure to sunlight (83.1%). Since the majority of studied women with a deficient level of vitamin D had inadequate exposure to the sun, there is a significant relationship between vitamin D deficiency and sun exposure (Table 5). Regarding the level of education, vitamin D deficiency was high among illiterate and primary school-educated women (55.4%) (Table 6). Among the studied women, vitamin D deficiency was found high in housewives and menopausal women than in working women (86.7%) (Table 7).

Compared to women who live in rural regions (16%), the majority of postmenopausal women in the research who were living in the center of the city had vitamin D deficiencies (87.9%) (Table 8). Dietary intake was found to be inadequate in 56% of studied menopausal women; 102 women with vitamin D deficiency were found to have inadequate dietary intake, but 41% with adequate dietary intake had sufficient levels of vitamin D. Therefore, it is significant that adequate dietary intake is necessary for sufficient levels of vitamin D (Table 9).

**Table 1:** Vitamin D status

Vitamin D status	Number	Percentage
< 30 ng/ml	166	83%
≥ 30 ng/ml	34	17%
Total	200	100%

**Table 2:** Demographic characteristics of studied populations

Characteristics	Number	Percentage
Age		
46–50 years	77	38.5 %
51–60 years	95	47.5 %
61–70 years	28	14 %
Level of education		
Illiterate	100	50%
Primary-secondary school education	80	40%
College and higher education	20	10%
Occupation		
Housewife	166	83%
Working	34	17%
Exposure to sunlight		
Adequate	52	26%
Inadequate	148	74%
Dietary intake		
Adequate	88	44%
Inadequate	112	56%
Address		
Rural area	32	16%
Center of Basra	168	84%

Among the studied women, only 30 (15) % were found to be diabetic, only 16 (9.63%) among the studied women with deficient vitamin D levels were diabetic, and 14 (41.1%) were diabetic among the sufficient group (Table 10). Therefore, no significant relation was found between vitamin D levels and diabetes.

40 women (20%) were found to be hypertensive and 160 (80 %) were found to be non-hypertensive. The association between hypertension and vitamin D levels is negligible, with just 24 (14.45%) women having inadequate vitamin D levels and 16 (47%) women in the sufficient group having hypertension. (Table 11).

**Table 3:** Distribution of the study population according to the number of postmenopausal years and its relation to vitamin D levels

Postmenopausal years	Frequency and percentage	Vitamin D levels	
		Deficiency (n=166)	Sufficiency (n=34)
Early/ < 5 years	80 (40%)	58 (35%)	22 (64.7%)
Late/ ≥ 5 years	120 (60%)	108 (65%)	12 (35.3%)

The P-value is 0.04. The result is significant at  $p < .05$

**Table 4:** The relationship between the age of the studied women and vitamin D deficiency

Age	Vitamin D deficiency		Vitamin D sufficiency		Total
	N	%	N	%	
46–50 years	52	31.32%	15	44.1	77
51–60 years	90	54.21%	15	44.1	95
61–70 years	24	14.45%	4	11.76%	28
Total	166	83%	34	17%	200

The chi-square statistic is 0.5806. The p-value is 0.748026. The result is **not** significant at  $p < .05$

**Table 5:** Relation between vitamin D levels and exposure to sunlight in studied women

Exposure to sunlight	Vitamin D deficiency		Vitamin D sufficiency		Total
	N	%	N	%	
Adequate	28	16.86%	24	70.58%	52
Inadequate	138	83.1%	10	29.4%	148
Total	166	83%	34	17%	200

The chi-square statistic is 42.3288. The p-value is  $< .00001$ . The result is significant at  $p < .05$ .

**Table 6:** The relationship between the level of education and vitamin D level among the studied women

Level of Education	Vitamin D deficiency		Vitamin D sufficiency		Total
	N	%	N	%	
Illiterate	92	55.4%	8	23.5%	100
Primary-secondary	64	38.55	16	47%	80
Higher education	10	6%	10	29.4%	20
Total	166	83%	34	17%	200

The chi-square statistic is 21.6867. The p-value is .00002. The result is significant at  $p < .05$ .

**Table 7:** The relationship between vitamin D levels and occupation of the studied women

Occupation	Vitamin D deficiency		Vitamin D sufficiency		Total
	N	%	N	%	
Housewife	144	86.7%	22	64.7%	166
<	<	<	<	<	<
Total	166	83%	34	17%	200

The chi-square statistic is 9.7162. The p-value is .001827. The result is significant at  $p < .05$ .

**Table 8:** Relation between address and levels of vitamin D in studied women

Address	Vitamin D deficiency		Vitamin D sufficiency		Total
	N	%	N	%	
Center of Basra	146	87.9%	22	64.7%	168
Rural area	20	12.1%	12	35.3%	32
Total	166	83%	34	17%	200

The chi-square statistic is 11.3462. The p-value is .000756. The result is significant at  $p < .05$ .

**Table 9:** The relation between dietary intake and vitamin D levels

Dietary intake	Vitamin D deficiency		Vitamin D sufficiency		Total
	N	%	N	%	
Adequate	64	38.5%	14	41%	78
Inadequate	102	61.4%	20	59%	122
Total	166	83%	34	17%	200

The chi-square statistic is 10.0816. The p-value is less than 0.001. The result is significant at  $p < .05$ .

**Table 10:** Vitamin D levels of people with diabetes among the studied women

Diabetes Mellitus	Frequency and percentage	Vitamin D deficiency		Vitamin D Sufficiency	
		N	%	N	%
Non-diabetic	170 (85%)	150	90.36%	20	58.9%
Diabetic	30 (15%)	16	9.63%	14	41.1%
Total	200	166		34	

The chi-square statistic is 0.5806. The p-value is 0.7 and is not significant. The result is significant at  $p < .05$

**Table 11:** Relation between vitamin D levels and hypertension among the studied women

Hypertension	Frequency and percentage	Vitamin D deficiency		Vitamin D Sufficiency	
		N	%	N	%
Hypertensive	40 (20%)	24	14.45%	16	47%
Non-hypertensive	160 (80%)	142	85.54%	18	53%
Total	200	166		34	

The chi-square statistic is 0.5456. The p-value is 0.724. The result is not significant at  $p < .05$ .

## DISCUSSION

For the best indication of vitamin D status, a serum 25(OH)D concentration is used. It represents both the amount of vitamin D derived from food and supplements and the amount created cutaneously.<sup>10</sup> According to the current study, postmenopausal women have a high frequency of vitamin D insufficiency. A total of 200 women (83%) were found deficient in vitamin D similar to a study conducted by S. Shukar et.al and Anita et.al, which also shows that 63% and 73%, respectively, of menopausal women, had deficient vitamin D levels.<sup>3, 11</sup>

The current study revealed a strong association between vitamin D deficiency and inadequate dietary intake, with vitamin D deficiency being considerable (61%), among menopausal women with inadequate dietary consumption. This result goes with the study done by Nithya P et.al.<sup>12</sup> Studies from different parts of India have also reported vitamin D deficiency in women belonging to different age groups.<sup>13</sup> Among the postmenopausal women, 90% showed a decrease in vitamin D, which was correlated with the present study.<sup>14</sup> The low levels of vitamin D in elderly women may be related to inadequate exposure to sunlight and/or poor diet. According to the results of the present study, vitamin D deficiency had a significant correlation with inadequate

sun exposure and poor diet. Additionally, aging decreases the skin's capacity to produce vitamin D, as reported by Mac Laughlin et.al.<sup>15</sup>

In the studies by Sharma et.al and Nithya P et.al, no significant relation was found between vitamin D and diabetes. Similarly, in the present study, no relation was found between vitamin D and diabetes.<sup>12</sup> Type II diabetes was found to be prevalent in individuals with vitamin D deficiency and severe vitamin D deficiency predicts an increased risk of cardiovascular mortality in type II diabetes patients.<sup>16</sup> In the study by Nithya P et.al, most of the patients were in the age group of 51–60, and it corresponded with the result in our study where most menopausal women were in the age group of 51–60 years.<sup>12</sup> Similar to a study by Benotos A et al., we observed no significant association between hypertension and vitamin D deficiency in our current study, and we also identified vitamin D deficiency as a significant risk factor for hypertension in postmenopausal women.<sup>12,17</sup> while Shine et al. found that vitamin D deficiency was a significant risk factor for hypertension in postmenopausal women.<sup>18</sup> Our current study's correlations between vitamin D insufficiency and diabetes and hypertension are not statistically significant, which may be explained by the limited sample size.

In the present study, the risk of vitamin D deficiency was higher in housewives and people in the center of the city who mostly preferred to live indoors and had reduced exposure to direct sunlight. The sunlight exposure-dependent vitamin D deficiency also has a predilection for religion. The burqa practice in the Muslim community contributes to vitamin D deficiency.

Vitamin D status decreases with age, mainly as a result of restricted sunlight exposure, reduced capacity of the skin to produce vitamin D, and reduced dietary intake of vitamin D. A study done by Vav der Wielen showed that regardless of geographical location, free-living elderly Europeans were at substantial risk of inadequate vitamin D during winter. Similarly, in our study, we found a significant correlation between inadequate sun exposure and vitamin D deficiency.<sup>15,19</sup> Another cause of vitamin D deficiency may be a decrease in the hydroxylation of vitamin D and responsiveness of the intestinal mucosa to circulating levels of vitamin D in elderly individuals.<sup>20</sup>

Postmenopausal women are the primary concern for vitamin D inadequacy, as these women are already at risk of osteoporosis due to decreased estrogen levels. Therefore, supplementation could help increase the mineral density of bones.<sup>21</sup>

## CONCLUSIONS

The results of this study showed that postmenopausal women in Basrah, Iraq, had a high prevalence of vitamin D deficiency. Additionally, a strong correlation was discovered between vitamin D deficiency and inadequate dietary consumption and sun exposure. There was no apparent connection found between vitamin D insufficiency, diabetes, and hypertension. Menopausal women should be made aware of the consequences of vitamin D insufficiency because osteoporosis prevention relies heavily on getting enough calcium and vitamin D. All postmenopausal patients should be counselled on the advantages of vitamin D supplementation, and we advise changing lifestyle habits, avoiding confinement indoors, getting enough sunlight, and eating a healthy diet. Menopausal women have a high frequency of vitamin D insufficiency; hence, measuring vitamin D concentration is essential for healthy postmenopausal women.

## REFERENCES

- Holi, Holick MF. High prevalence of vitamin D inadequacy and health implications. *Mayo Clin Proc.* 2006 Mar; 81(3):353–373.
- Holick MF. Vitamin D is the underappreciated Delightful hormone that is important for skeletal and cellular health. *Curr opin Endocrinal Diabetes.* 2000; 9:87–98.
- S Shurkar – U din, R Tabassum: Prevalence of vitamin D inadequacy in peri and postmenopausal women present at DOW University Hospital, Ojha Campus, A cross-sectional study.
- Khol GL, Chee WS, Shariff ZM, Pouth M., et al. High prevalence of vitamin D insufficiency and its association with BMI for age among primary school children in Kuala Lumpur, Malaysia *BMC Public Health.* 2011; 11:95.
- Holick MF. Vitamin D deficiency. *N Engl J Med* 2007; 19; 357(3):266–81.
- Verhaar HS, Samson MM, Jansen PA, et al. Muscle strength, functional mobility, and vitamin D in older women. *Aging.* 2000; 12:405–406.
- Caruso S, Rapisarda AMC, Cianci S. Sexuality in menopausal women. *Curr Opin Psychiatry.* 2016; 29:323–30.
- Heaney RP. Lesson for nutritional science from vitamin D. *Amm J Clin Nutr.* 1999; 69:1327–1351.
- MacLaughlin J, Holick MF. Aging decreases the capacity of human skin to produce vitamin D3. *J Clin Invest.* 1985; 76(4):1536–1538
- Jone G. Pharmacokinetics of vitamin D toxicity. *Am J Clin Nutx.* 2008; 88(2):552–556.
- Anita Kumari, Vinita Kumari. The study of Vitamin D deficiency in Peri and Postmenopausal Women of Jamshedpur, Jharkhand. *International Journal of Contemporary Medical Research.* 2018; 12(5):14–16.
- Nithya P Jayakumar, Bharathi Rao, Nikil Shetty. Study of Vitamin D Status among Postmenopausal Women. *Journal of South Asian Federation of Menopause Societies,* 2017 January-June;5(1):28–34
- Rachna Bachhel, Navyug Raj Singh, Jagtesh Singh Sidhu. Prevalence of vitamin D deficiency in North- West Punjab population: A cross-sectional study.
- Goswami R, Gupta M, Goswami D. Prevalence and significance of low 25(OH) vitamin D concentration in healthy subjects in Delhi. *Am J Clin Nutr.*2000;72:472–75.
- Mac Laughlin J, Holick MF. Aging decreases the capacity of human skin to produce vitamin D3. *J Clin Invest* 1985; 76:1536–1538.
- Joergensen C, Gall M-A, Schmedes A, Tarnow L, Parving H-H, Rossing P. Vitamin D levels and mortality in type 2 diabetes. *Diabetes Care.* 2010 Oct; 33(10):2238–2243.
- Benetos A, Rudnichi A, Safar M, Guize L. Pulse pressure and cardiovascular mortality in normotensive and hypertensive subjects. *Hypertension [Internet].* 1998; 32(3):560–564. Available from: <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db>.
- Shin MY K. IS. Vitamin D: Is it a vitamin or a hormone? *J Clin Biochem Nutr.* 2012; 17:1–6.
- R.P.J. van der Wielen, W.A. van Staveren, et. al. Serum vitamin D concentrations among elderly people in Europe. *Lancet.* 1995; 346(8969):207–210.
- Heaney RP, Recker RR, Stegman MR, Moy AJ. Calcium absorption in women: relationships to calcium intake, estrogen status, and age. *J Bone Miner Res* 1989; 469–75.
- Perez-Lopez FR, Brincat M, C. Tamer Erel , Florence Tremollieres ,Marco Gambacciani , Irene Lambrinouadaki ,et al. Position statement: Vitamin D and postmenopausal health. *Maturitas.* 2012; 71(1):83– 8.