Original paper

Prevalence of Vitamin D Deficiency of Females in Karbala, Iraq, 2017

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Abstract

Background: Vitamin D deficiency is a significant public health problem in both developed and developing countries. women have higher rate of vitamin D deficiency than men because of inadequate exposure to sunlight and low nutritional intake so put them at risk of many vitamin D deficiency related diseases and have clinical implications for the growth of children and adolescents, for pregnant women and their offspring, and is important for public health authorities. **Aim & objectives:** the aim of the study is to determine the prevalence of vitamin D status of females in Karbala and to identify some risk factors for vitamin D deficiency.
Methods: this cross-sectional study included 355 female aged 12-30 years in Karbala city and was carried out in primary health care centers which were randomly selected, from the beginning of March to the end of July 2017. females were included from rural and urban areas. Laboratory testing was done for all females of the study group.
Results: The results showed (87%) of the females had low level of vitamin D in front of only 13% of them had sufficient vitamin D**.** There was a statistically significant association between vitamin D level among females conducted in the study and economic status of them**,** amount of milk taking per week, parity and with the duration of sun exposure.
Conclusion: the high prevalence of vitamin D deficiency and insufficiency among females in Holly Karbala City and the sole factors that affect vitamin D level include the following: Economic status, amount of milk taking per week, parity and duration of sun exposure.
Key words: Vitamin D, Karbala, female.

Introduction

Vitamin D deficiency is widespread and consider as a major health problem globally. It is a significant public health problem in both developed and developing countries [(1,2)].

Prevalence of vitamin D deficiency is much higher in Asia. A total of 30-50% of people in India, Lebanon, and Turkey and also 45% of females in China had vitamin D deficiency [(3)].

Middle-Eastern countries have the highest prevalence of vitamin D deficiency and insufficiency, women have higher rate of vitamin D deficiency than men because of inadequate exposure to sunlight and low nutritional intake so put them at risk of many vitamin D deficiency related diseases [(4)].

Vitamin D deficiency among women of reproductive age is of particular concern because it can have adverse consequences for the mother, fetus, infant and child [(5)]. If females were vitamin D deficient during their first few years of life, their pelvis would be flat and deformed making it difficult if not impossible for childbirth [(6)].Peak bone mass occurs around age of 30 so that interventions to increase peak bone mass are more effective at preventing osteoporosis than interventions later in life [(7)].

Vitamin D deficiency in pregnancy has been associated with an increased risk of

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pre-eclampsia, gestational diabetes mellitus, preterm birth, small-for-gestational age infants, impaired fetal skeletal formation causing infant rickets (softening of bones commonly leading to deformities and/or fractures) and reduced bone mass, as well as other tissue-specific conditions [8]. Adequate vitamin D is required to up regulate calcium absorption in times of increased requirement (growth, pregnancy) and when dietary calcium intake is low [9].

Vitamin D deficiency or insufficiency is common in pregnancy in some populations. Pregnant women who are vitamin D deficient have five times the risk of suffering a potentially fatal condition known as preeclampsia; it may be the cause of 70% of deaths during pregnancy in Third World countries [10].

Vitamin D deficiency was associated with a 2.66-fold increase in gestational diabetes (GDM) risk [11].

In pregnant ladies, higher levels of vitamin D were considerably associated with a lower risk of infection, preterm labor & preterm birth [12]. Breast milk is correlated strongly with the mother' plasma vitamin D concentration [13].

Method

This cross-sectional study was carried out in primary health care centers which were randomly selected from all PHC in Karbala, (Al-Hindiya, Al-Khairat, Al-Jadwal Al-Gharbi, Al-Ghadeer, Al-Abassia Al-Sharqia, and Al-Shohadaa') of Karbala city, from the beginning of March to the end of July 2017. The samples were Randomly selected sample (every 2 females we chose the third one) and included 355 females from rural and urban areas. Laboratory testing was done for all females of the study group. From each participant 5 ml of blood were drawn from a cubital vein by using disposable syringe while the participant in the sitting position. A blood sample was obtained to measure the level of serum vitamin D. vitamin D assay was measured by enzyme-linked immune sorbent assay (ELISA) technique. Vitamin D deficiency for the study group was categorized into deficiency (less than 20 ng/ml), not sufficient (20-30 ng/ml), and sufficient (more than 30 ng/ml). The data were statistically analyzed by using (SPSS version 20). The frequency data was expressed in suitable tables. To determine independent risk factors, logistic regression analysis was applied. A p-value equal to or less than 0.05 was considered statistically significant to determine independent risk factors, logistic regression analysis was applied.

Inclusion criteria:

1. Female resident in Karbala.
2. Aged 12-30 years.
3. Agree to participate in the study.

Exclusion criteria:

1. Internally displaced female.
2. Female from other cities rather than Karbala.
3. Female has pre-existing conditions affecting vitamin D deficiency including liver or kidney disease and eating disorders.
4. Female has sever eczema in face, arms and legs.
5. Any female taking glucocorticoids, antifungals, antiretroviral, bile acid-binding medications, rifampicin, anticonvulsant drugs and weight reduction medication.
6. Any female taking vitamin D containing supplements.
7. Any female used sunscreen.

Location of the study:

Karbala is a city in Iraq country, in Middle East region, located about 100 km (62mi) southwest of Baghdad. Latitude: 32˚ 36'57"N, Longitude: 44˚ 01'29"E, Elevation above sea level: 32 m=104 ft. There are four health districts in Karbala province (Al-Marqaz, Al-Hur, Al-Hussaynia and Al-Hindiya districts). Two health districts were selected randomly (Al-Marqaz and Al-Hindiya districts) and from them six primary health care centers were also randomly selected (Al-Hindiya, Al-Khairat, Al-Jadwal Al-Gharbi, Al-

Ghadeer, Al-Abassia Al-Sharqia, and Al-Shohadaa' PHCCs).

Questioner form:

Especially designed questionnaire (appendix) has been prepared it was quoted from Canadian questionnaire (4) and was validated and evaluated by 7 specialists and translated, with some revision, adding or deleting to fit with Iraqi cortexes. The 23-item questionnaire was used gathered data regarding the socio-demographic, health and cultural risk factors that may affect the vitamin D deficiency of the study group; BMI was determined by measuring weight (in kilograms) divided by the square of height (in meters). BMI below18.5 underweight, 18.5-24.9 normal, 25-29.9 overweight, 30-34.9 obesity.

Ethical approval:

The participants were briefly informed about the study and an oral consent was taking from each participant prior to interview

Results

This study included a total of 355 females, providing 100% response rate, about two thirds of them (63.4%) aged more than 20 years and same percentage had acceptable economic state. More than half of them were living in urban areas, and about half of them, were housewives, had low educational level.

Of the total 355 female included in the study, about two thirds of them had deficiency of vitamin D in front of only 13% of them had sufficient vitamin D, as shown in table (1).

As shown in diagram (1) 47% of the females conducted in the study had vitamin D less than 10 ng/ml, 23% (10-20ng/l), 17% (21 – 30 ng/ml) and only 13% of them had no deficiency of the vitamin (more than 30ng/l). Deficiency was found more among those with good or acceptable economic condition in front that poor females had more sufficient vitamin D than the others in the sample. There was no statistically significant association, between vitamin D level and residence (P=0.285) although more sufficient vitamin D was found among those from rural area, occupation (0.082), Education (0.461), and the age of the females (P=0.170) On applying binary logistic regression analysis, increased parity (OR=1.346, P=0.043), decreased milk intake (OR= 2.105, P= 0.003) and decreased Daily sun exposure (OR=1.801, P=0.001), were the sole factors significantly associated with increased odds of high prevalence of vitamin D deficiency among female, primary health care centers , Karbala city/ Iraq- 2017 (table 2).

Discussion

Vitamin D deficiency remains a problem globally [(14)], several studies have demonstrated that populations worldwide, including those located in sunny regions of the world are at risk of vitamin D deficiency [(4,5,17)]. The high prevalence of 25(OH) D <30 ng/dl is likely to have clinical implications for the growth of children and adolescents, for pregnant women and their offspring, and is important for public health authorities [(15)].

The present study which was population-based cross-sectional study to measure the prevalence of vitamin D deficiency among females aged (12 -30) years old in Karbala city, showed that high prevalence (85.9%) of vitamin D deficiency and insufficiency of the females conducting in this study as shown in figure (1), which was close to the finding of another case–control hospital based study in Karbala (2016) which was found that low serum level of vitamin D present in (84.7%) of the samples [(16)].

Table 1. Distribution of sample according to the socio-demographic characteristic primary health care centers in Karbala city/ Iraq- 2017.

Variables		No.	Percent
Age groups	12- 20	130	36.6
	21 – 30	225	63.4
Educational level	Illiteracy ,read and write	57	16.1
	prim + intermediate school	123	34.6
	Sec school and above	175	49.3
Occupation	student	83	23.4
	house wife	199	56.1
	employed	73	20.6
Economic state	poor	74	20.8
	Acceptable	246	69.3
	Good	35	9.9
Marital state of parents	Single	112	31.5
	Married	238	67.0
	divorce or widow	5	1.4
Residence	Rural	150	42.3
	Urban	205	57.7
Total		355	100%

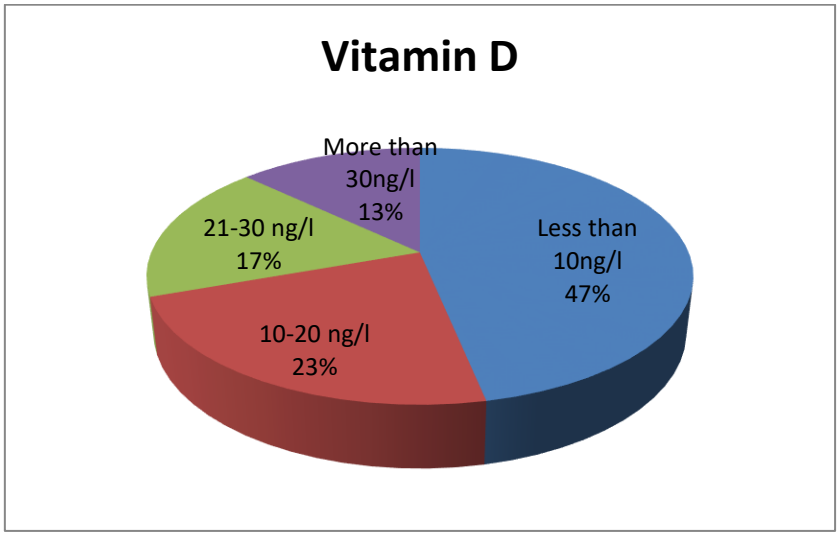

Diagram 1. Vitamin D levels of females, primary health care centers in Karbala city/ Iraq- 2017.

Table 2. Logistic regression analysis (OR with 95% CI) for factors related to vitamin D deficiency of female, primary health care centers, Karbala city/ Iraq- 2017.

Variables	P	OR	95% CI	
			Lower	Upper
Parity	.043	1.346	.497	1.209
Economic status	.262	1.29	0.827	2.012
Milk intake	.003	2.105	1.295	3.422
Sun exposure per week(in days)	.292	1.292	.802	2.080
Daily sun exposure (in minutes)	.001	1.801	1.284	2.528

Another study in Iraq which had done in Sulaimani in 2017, found that over 79% among the studied group were below the standard range value for serum vitamin D level, a significant proportion of the Kurdistan women involved in the study had

suboptimal vitamin D status. Cultural factors appear to affect negatively the vitamin D status of women in Sulaimani, such as avoiding the sunshine to maintain a light skin tone and wearing conservative clothes by most of the women [5]. Also, a study was conducted in Saudi Arabia, found that female gender, and younger age, were independent predictors of vitamin D deficiency or relative insufficiency [17].

The high prevalence of this study also similar to the finding of studies [4,5,17] on hypovitaminosis D in developing countries where the female in these countries had the same kind of eating habits, skin pigmentation, luck of sun exposure and conservative covered clothing style [4]. These results suggest that vitamin D deficiency is common even in very sunny areas. Karbala is one of the cities with sun exposure approximately all year round, women residing in these areas tend to spend small time in the sunlight due to cultural and social reasons.

A number of factors like socio-demographic factors, Diet, Health and Cultural factors affect the high prevalence of vitamin D deficiency in healthy females [18], which was covered by study questionnaire to determine different risk factors for vitamin D deficiency.

This study shows a statistically significant association between vitamin D level among females conducted in the study and economic status of them. Deficiency was found more among those with good or acceptable economic condition, similar result was reported by the study in India [19], but this was not significant in a study in Turkey [20]. A significant association with low socioeconomic status was observed in a study in Germany [21]. However, variation in the results is common and may be due to different culture, norms, diet and life style characteristics. in this study, women of low socioeconomic state may have more outdoor work so exposed to the sun more than those with high socioeconomic.

The amount of vitamin D made in the skin depends on exposure of the skin to the UV-B radiation and efficiency of cutaneous synthesis of exposed skin, which affected by number of factors like duration of exposure, clothing and others [22].

Multi parity is estimated to be a risk factor for vitamin D deficiency due to depletion of the vitamin D reserves in the body especially if there is a lack of vitamin D supplementation or faulted dietary behaviors within the pregnancy spacing periods. A study done by Gharaibeh and Stoecker, 2009 suggest that women who delivered five or more children had much lower vitamin D concentration compared with primiparous women [23,24]. This is also found in other study which was done in 2013 by Andersen [25]. In the current study increased parity was significantly associated with vitamin D deficiency as show in table (2).

Investigated the problem of vitamin D insufficiency in Emirati female student through a dietary intake assessment are found that over 70% of them did not consume enough milk and other vitamin D rich foods [14].

A study in Canada 2014 among Middle East university student found that a positive relationship between serving size of milk and vitamin D values. By increasing the serving size of milk or foods fortified with vitamin D, vitamin D values increased [4]. This was consistent with Saudi studies which found that daily ingestion of two or more serving of milk were less likely to be vitamin D deficient [26,27]. Similarly in this present study there was a statistically significant association between vitamin D level among female conducted in the study and amount of milk taking per week, deficiency was found more among those who took 2 cups or less per week in front that females taking more than 2 cups of milk weekly and more sufficient vitamin D than the others in the sample. Vitamin D is present in many food products but rather in low concentration so that non-fortified dietary intake cannot suffice the need and influence vitamin D status. This may explain why there was no statistically significant association between vitamin D level and fish, meat, egg, and other foods. However, data

is lacking if the milk / yoghurt in Karbala markets contain enough vitamin D.
The current study is supported by the application of the binary logistic regression analysis, which revealed that increased parity, decreased milk intake and decreased daily sun exposure, were the sole factors significantly associated with high prevalence of vitamin D deficiency among female table 2.

Conclusion

In conclusion, the high prevalence of vitamin D deficiency and insufficiency among females in Holly Karbala City and the sole factors that affect vitamin D level include the following: Economic status, amount of milk taking per week, parity and duration of sun exposure.

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