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The Study of Vitamin D Status in Population Referred to Clinical Laboratories in Ilam, West of Iran

Masoumeh Shohani[1], Akram Mansouri[2], Milad Azami[3], Ali Soleymani[4], Gholamreza Badfar[5*]

Abstract

Objectives: Among different micronutrient deficiencies, vitamin D deficiency (VDD) is nowadays considered pandemic. Therefore, the present study aims to investigate vitamin D status in the population referred to the laboratories of Ilam from 2014 to 2015.

Materials and Methods: This cross-sectional population-based survey was conducted among the patients who referred to five laboratories of Ilam from July 2014 to July 2015. The samples were selected by a random procedure. 25-hydroxyvitamin D [25OHD] levels were determined by enzyme-linked immunosorbent assay (ELISA) method. Cut-off points for serum levels of 25OHD were defined as normal (>30 ng/mL), vitamin D insufficiency (VDI) (10-30 ng/mL) and VDD (<10 ng/mL). Data were analyzed using SPSS version 17.0 by descriptive and analytical statistics (chi-square test).

Results: In total, 7725 subjects (5273 females and 2452 males) with a mean age of 34.96±18.10 years were investigated. The prevalence of VDD/VDI combined was estimated to be 65.8%. Its prevalence was 67.3% among females, and 62.8% among the males. The prevalence of VDD and VDI was 12.1% and 53.7%, respectively. The highest prevalence of VDD combined with VDI was estimated for ages between 18 and 60 years (68.3%). The mean 25OHD concentration was 27.02±18.04 ng/mL and this concentration for male and female was 28.39±16.48 and 26.41±18.60, respectively. The relationship between VDD and age and sex was statistically significant ($P<0.001$).

Conclusions: The results suggested that VDD and VDI are very prevalent in this region. Accordingly, it is necessary to take certain intervention measures such as medication and vitamin D-enriched nutrition to decrease VDD and VDI.

Keywords: Prevalence, Deficiency, Vitamin D, Iran

Introduction

Among different micronutrient deficiencies, vitamin D deficiency (VDD) is nowadays considered pandemic (1). World statistics show that more than 1 billion people suffer from VDD (2). Vitamin D is a fat-soluble secosteroid with hormonal activity and is widely known for its role in the homeostasis of calcium, phosphorous, and bone metabolism (3).

The main source of vitamin D is the sun and is produced in the skin from 7-dehydrocholesterol. In addition to sunlight, geographic altitude and latitude, season, age and skin pigmentation affect the production of vitamin D. The food sources of vitamin D are limited to eggs and fish oil (4).

Vitamin D is involved with a wide range of physiological functions of skeletal and extra-skeletal tissues. In addition to being effective in preventing diseases, it is important in the treatment of some diseases such as osteoporosis, obesity and type II diabetes ((5). Moreover, VDD is known for the pathogenesis of many chronic diseases including type I diabetes (6), autoimmune disorders (7), lupus (8), multiple sclerosis (9), malignancy (10), frailty (11), atrial fibrillation (12) and dementia (13).

Based on the Endocrine Society of America, serum levels of vitamin D lower than 20 ng/mL mean severe deficiency, 21-29 ng/mL mean insufficiency, and 30-100 ng/mL mean normal (14).

VDD is reported to be very prevalent in the cities of Iran (15-18). However, there are no accurate statistics about the prevalence of VDD in the city of Ilam. The present study aims to investigate vitamin D status in population who referred to the laboratories of Ilam from 2014 to 2015.

Materials and Methods

Study Design and Participants

Ilam is a temperate and semi-arid city located in the western part of Iran (Figure 1). At the census in 2016, its population was 235144. This study was conducted

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[1]Department of Nursing, Faculty of Allied Medical Sciences, Ilam University of Medical Sciences, Ilam, Iran. [2]School of Nursing and Midwifery, Ahvaz Jundishapour University of Medical Sciences, Ahvaz, Iran. [3]Student Research Committee, Ilam University of Medical Sciences, Ilam, Iran. [4]Faculty of Medicine, Dezful University of Medical Sciences, Dezful, Iran. [5]Department of Pediatrics, Behbahan Faculty of Medical Sciences, Behbahan, Iran.

***Corresponding Author:** Gholamreza Badfar, Email: gh_badfar@yahoo.com

among population who referred to 5 public and private laboratories of Ilam from July 2014 to July 2015. The samples were selected by a random procedure. Inclusion criteria included Iranian population referring to certain public and private laboratories and exclusion criteria included the use of vitamin D supplements, anti-seizure medication, corticosteroids, having calcium metabolism disorders, endocrine, liver and kidney, and metabolic bone diseases.

Biochemical Parameter

Blood sampling was carried out between 8:00 and 9:00 AM in the laboratories. About 5 mL of venous blood samples were taken from the antecubital vein and kept at -20°C. 25-hydroxyvitamin D [25OHD] concentrations were determined by enzyme-linked immunosorbent assay (ELISA) method (IDS Company, England).

Definition

Cut-off points for serum concentrations of 25OHD vitamin D were defined as normal (≥30 ng/mL), vitamin D insufficiency (VDI) (10-30 ng/mL) and VDD (<10 ng/mL) (15,17).

Statistical Analysis

Data were analyzed using SPSS version 17.0 (SPSS Inc., Chicago, USA). Population characteristics were reported as the mean and standard deviation (SD), and frequency/percentage. The relationship between sex and age variables and VDD were examined using chi-square test. A *P* value less than 0.05 was considered significant.

Results

General Characteristics

During the study, 7725 samples were studied. A total of 2452 were males (31.7%), and 5273 (68.3%) were females. The age range of the participants was 1 to 93 (mean ± SD: 34.96±18.1). The distribution of the participants according to their age was as follows: 1-7 (7%), 7-18 (13%), 18-60 (71.6%), and more than 60 (8.4%).

Prevalence of VDD and VDI

The prevalence of VDD/VDI combined in population who referred to the laboratories of Ilam was 65.8%. Its prevalence was 67.3% among females, and 62.8% among the males. The prevalence of VDD and VDI was 12.1% and 53.7%, respectively (Figure 2). The highest prevalence of VDD/VDI combined was 68.3% among the age range of 18 to 60. The distribution of VDD and VDI based on age and sex is illustrated in Table 1. The relationship between age and sex and VDD and VDI was significant ($P<0.001$).

Serum 25(OH)D Concentrations

The mean serum 25OHD concentration of all participants was 27.02±18.04 ng/mL. Serum 25OHD concentrations based on age and sex are shown in Table 2.

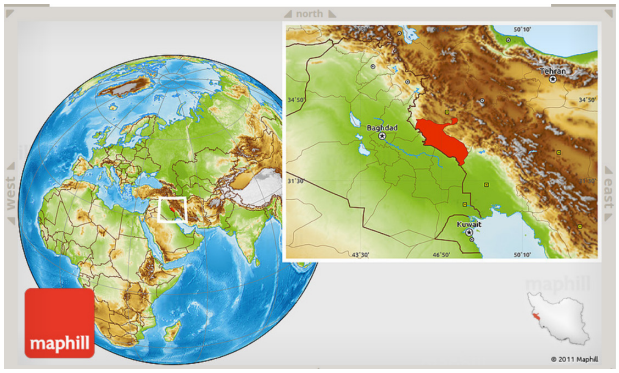

Figure 1. Physical Map of Ilam.
Source: http://www.maphill.com/iran/ilam/maps/physical-map.

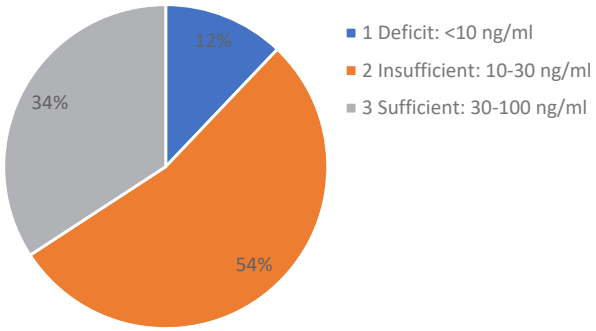

Figure 2. Distribution of Vitamin D Deficiency and Vitamin D Insufficiency in Population Referred to Clinical Laboratories.

Discussion

This study examined the prevalence of VDD and VDI among 7725 people who referred to the laboratories of Ilam and the results showed that the prevalence of VDD/VDI combined was high (68%). Other studies estimated a high prevalence of VDD/VDI combined in different cities of Iran such as Tabriz (68.5%), Tehran (44.8%), and Eyvan (located in Ilam province) (62%) (16-18). Saeidnia et al examined the prevalence of VDD/VDI combined in different regions of Iran and estimated that the deficiencies are 40% to 60% in the western regions of Iran. This is consistent with the results of the present study (19).

In this study, the prevalence of VDD and VDI was 12.1% and 53.7%, respectively. This is consistent with other studies (16,19). According to other studies, the causes of VDD include spending time indoors, clothing, nutrition, and geographic location (19,20).

The prevalence of VDD/VDI combined among women and men were 67.3% and 62.8%, respectively. Rahmati et al examined VDD among 2919 people in the city of Eyvan and found that 61.1% of women and 58.2% of men suffer from VDD/VDI combined, which is consistent with the results of present study (18). A meta-analysis in Iran shows that 72.1% of women and 76.1% of men suffer from VDD/VDI combined (21). In addition, according to a meta-analysis study conducted by Azami et al, the prevalence of VDD/VDI combined in Iranian pregnant

Table 1. Distribution of Vitamin D Deficiency and Vitamin D Insufficiency Based on Age and Sex

Variable		Deficiency		Insufficiency		Normal		Total		*P* Value
		No.	%	No.	%	No.	%	No.	%	
Age	1-6	15	2.7	225	41.5	301	55.6	541	100	<0.0001
	7-17	101	10	587	58.2	319	31.6	1007	100	
	18-60	781	14.1	3059	55.3	1686	30.4	5529	100	
	>60	40	6.1	276	42.3	335	51.4	651	100	
Sex	Man	141	5.7	1397	56.9	914	37.2	2452	100	<0.0001
	Female	796	15	2750	52.1	1727	32.7	5273	100	

Table 2. The Mean Serum 25OHD Concentration and SD of All Participants Based on Age and Sex

Variable		Mean (ng/mL)	SD
Age	1-6	36.22	19.47
	7-17	26.38	16.36
	18-60	25.28	17.12
	>60	35.33	21.66
Sex	Male	28.39	16.48
	Female	26.41	18.60

women was reported to be 84.4% (22). Greer showed that the prevalence of VDD/VDI combined among the women living in the Mediterranean regions is higher compared to those living in Europe and America, probably because of their clothing. Accordingly, it can be noted that some of the causes of VDD include the use of sunscreen creams and Islamic clothing (20).

The highest prevalence of VDD/VDI combined was in the age range of 18 to 60 (69%). In the study conducted on VDD/VDI combined in Eyvan by Rahmati et al, the highest prevalence belonged to the age range of 18 to 60 (74%) (18). Hovsepian et al showed that VDD and VDI is highly prevalent among the youth (15). However, other studies reported different findings probably because of the decrease in the production of vitamin D caused by age and hormonal system disorders (23, 24).

In this study, the mean serum 25OHD concentration in all samples was estimated to be 27.02±18.04 ng/mL, which is lower than the results in the study conducted in Eyvan (36.25 ± 18.79 ng/mL) (18). In a study in Isfahan (located in the center of Iran), mean serum 25OHD concentration was examined among the 6-year-old children and it was reported to be 46.01±17.0 ng/mL (25), which is higher than the results obtained in this study for 1 to 6 year-old (36.22 ± 19.47 ng/mL). Therefore, VDD and VDI is more prevalent in the city of Ilam. In a systematic review in Iran, the mean serum 25OHD concentration in pregnant women was reported to be 36.22 ± 19.47 (26), which is similar to present result about women.

Conclusions

The results suggested that VDD and VDI is very prevalent. Accordingly, it is necessary to take certain intervention measures such as medications and vitamin D-enriched nutrition to decrease VDD and VDI.

Conflict of Interests

Authors declare that they have no conflict of interests.

Ethical Issues

This cross-sectional population-based survey was approved by Behbahan Faculty of Medical Sciences.

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