Thi-Qar Medical Journal (TQMJ):Vol.(17),No.(1),2019
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN (Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/17/1/13/0

Period-Prevalence Of Vitamin D Deficiency Among Referral Individuals In Sulaimanyah Province

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Abstract

BACKGROUND AND OBJECTIVE:

Vitamin D deficiency is recognized as a global public health problem which has effect on the health of the skeletal and extra skeletal tissues. The goal of this study was to determine the prevalence of Vitamin D deficiency in the Sulaimanyah population and to compare different age groups, gender and season of the year.

MATERIALS AND METHODS:

This was a cross sectional study that involved 19,267 patients who visited Sulaimanyah (private and governerate) clinical laboratories, of which 6304 males and 12,963 females their ages ranged between (1-95) years in the period between January 2013 and January 2017, all vitamin D measured by electrochemiluminescence (ECL) techniques were enrolled in this study.

RESULTS:

A total of 19,267 persons were analyzed, the overall vitamin D deficiency (below 20 ng/ml) was 68.1%. The prevalence of vitamin D deficiency was increased in those patients their age groups between 30-39 years (13.6%), was greater among women (48.8%) and more common during winter (19.6%).

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CONCLUSION:

The currently available study on the Sulaimanyah population suggests that the Vitamin D deficiency is common. This indicates that strategies are needed at the population level to improve vitamin D status of Sulaimanyah province.

KEYWORDS: Vitamin D; Sulaimanyah; Deficiency

INTRODUCTION:

Vitamin D deficiency is a worldwide health problem that affects the health of musculoskeletal system such as osteomalacia, rickets, and osteoporotic fractures, also it is associated with a variety of acute and chronic conditions like various types of cancers, cardiovascular disease, respiratory infections, and autoimmune diseases(1).

An 80%–100% of the vitamin D requirements of the body is provided from vitamin D3 which is synthesized in the skin from 7-dehydrocholetserol on exposure to sunlight by ultraviolet B-rays (UV-B rays 290-315 nm)(4). Hence, factors such as season, latitude, clothing, skin color, time of day , age and body weight could influence vitamin D level (5); There is controversy regarding the definition of vitamin D deficiency but most of the experts define vitamin D deficiency as a 25(OH)Dlevel of less than 20 ng/ml, a level of 21-29 ng/ml can be considered a relative insufficiency, a level of 30 ng/ml or greater can be considered to indicate sufficient, vitamin D intoxication is observed when serum levels of 25(OH)D are greater than 150 ng/ml(10).

Important factors that lead to vitamin D deficiency is reduced skin synthesis due toinadequate exposure to sunlight, or any factor that interferes with the penetration of UVB radiation will affect the cutaneous synthesis such as: dark skin, use of sun screen and aging (11), the other factors for vitamin D deficiency are decreased bioavailability of vitamin D as seen in obese individuals or those suffering from malabsorption(Cystic fibrosis, Celiac disease, Whipple's disease, Crohn's disease and bypass surgery), also increased catabolism of vitamin D because of medications like (anticonvulsants and glucocorticoids), breastfed infants, liver failure, increased urinary loss of vitamin D as in nephrotic syndrome and sedentary life style (10).For those patients at risk of vitamin D deficiency; The Institute of Medicine (IOM) brought forth Recommended Dietary Allowances (RDAs) for vitamin D which were 400 IU for infants, 600 IU for children and adults up to age 70 years, and 800 IU for adults over 70 years(12), The typical recommendation for "modest" UV exposure of arms and legs is 5–30 minutes three times weekly, depending on skin type, location, and season (13).

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However, prevalence of vitamin D deficiency is still uncertain worldwide, but several reviews have revealed high prevalence, they discovered that about 1 billion people have low vitamin D levels among different races and age groups(14). Moreover, previous research in middle east countries showed high prevalence of hypovitaminosis D, based on this evidence it is expected that people live in Sulaimanyah have high percentage of vitamin D deficiency, in addition there are preliminary clinical data showing vitamin D deficiency in Sulaimanyahprovince but there are no published study on the prevalence of vitamin D deficiency among people in this province in spite of sunny climate and adequate diet, thus with this background the objectives of the current research areto determine vitamin D deficiency among population of Sulaimanyah province and to compare different age groups, gender and season of the year regarding vitamin D level.

MATERIALS AND METHODS:

Study design

This cross sectional, multi-centered study was performed on 19267 patients, their ages ranged between 1-95 years of which 6304 males and 12963 females who visited Sulaimanyah clinical laboratories (private and governaerate), in the period between January 2013 and January 2017, patient's information regarding age, sex and time of performing the test was recorded according to the availability of those information in the laboratory, 25(OH)D was measured by Electrochemiluminescence (ECL) methods using (Cobas e411 and LIAISON, DiaSorin).

Inclusion and Exclusion Criteria

All the vitamin D was measured by electrochemiluminescence (ECL) techniques were included, results of tests done by a technique other than ECL were excluded from the study.

Statistical analysis

The data were analyzed with statistical package for social science version 20 (SPSS Inc., Chicago, IL, USA) program for the analysis, the results are displayed as percentages (%) and means (M) with corresponding standard deviations (SD), median and P-value. X^2 test used to compare different variables.

RESULTS:

Table 1 Vitamin D levels among studied population.

Vitamin D level (ng/dl)	Frequency	Percent (%)
Deficient (<20)	13120	68.1
Insufficient (20-29)	3111	16.1
Normal (30-150)	2988	15.5
Toxic (>150)	48	0.2
Total	19267	100

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A total of 19,267 results of vitamin D were collected from Sulaimanyah (private and governorate) clinical laboratories and included in this study during a period of 4 years from January 2013 to January 2017 are shown in (Table 1). Of the collected 19,267 results, 68.1% had vitamin D deficiency, 16.1% had vitamin D insufficiency, 15.5% had sufficient vitamin D level, and 0.2% had toxic level of vitamin D.

According to the official website of the Kurdistan Region Statistics Office (KRSO; www.krso.net, accessed January 28, 2018), the average population of Sulaymaniyah Governorate from January 1st 2013 to January 1st 2017 was (2018155). Moreover, I collected all the cases who performed vitamin D level assessment in clinical laboratories resided in Sulaymaniyah Governorate during the same period – they were 19267 samples. Furthermore, The period prevalence of vitamin D deficiency in Sulaymaniyah Governorate was (6.5) per 1000 people during January 1st 2013 to January 1st 2017 while the period prevalence of vitamin D insufficiency was (1.6) per 1000 people and the period prevalence of both vitamin D deficiency and insufficiency together was (8.1) per 1000 people. However; the period prevalence of vitamin D toxicity was (0.3) per 10000 people.

Table 2 Frequency of persons among different age group regarding vitamin D measurement.

Age groups (year)	Frequency	Percent (%)
1-9	1155	15.7
10-19	859	11.6
20-29	867	11.7
30-39	1289	17.5
40-49	1195	16.2
50-59	874	11.8
60-69	730	9.9
70-79	310	4.2
≥ 80	105	1.4
Total	7384	38.3
Not known	11883	61.7

From 19,267 vitamin D results, the age of 11,883 persons (61.7%) were not known, only 7,384 persons (38.3%) presented with identified their ages (Table2). For the known age group; their ages ranged from (1-95) years with mean age ± SD (Standard Deviation) = (35.4 ± 21.3) years.

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Table 3 Age distribution of vitamin D level among participants.

Age groups (year)	Vitamin D level (ng/dl)				Total	P-value
	Deficient (<20)	Insufficient (20-29)	Normal (30-150)	Toxic (>150)		
1-9	432 (5.9%)	283 (3.8%)	438 (5.9%)	2 (0.03%)	1155 (15.6%)	<0.001
10-19	579 (7.8%)	170 (2.3%)	110 (1.5%)	0 (0%)	859 (11.6%)	
20-29	705 (9.6%)	83 (1.1%)	77 (1%)	2 (0.03%)	867 (11.7%)	
30-39	1006 (13.6%)	162 (2.2%)	120 (1.6%)	1 (0.01%)	1289 (17.5%)	
40-49	966 (13.1%)	130 (1.8%)	98 (1.3%)	1 (0.01%)	1195 (16.2%)	
50-59	652 (8.8%)	131 (1.8%)	91 (1.2%)	0 (0%)	874 (11.8%)	
60-69	536 (7.3%)	113 (1.5%)	81 (1.1%)	0 (0%)	730 (9.9%)	
70-79	204 (2.8%)	56 (0.8%)	50 (0.7%)	0 (0%)	310 (4.2%)	
≥80	70 (1%)	12 (0.2%)	23 (0.3%)	0 (0%)	105 (1.4%)	
Total	5150 (69.8%)	1140 (15.4%)	1088 (14.7%)	6 (0.08%)	7384 (100%)	

The prevalence of vitamin D deficiency in relation to different age groups were calculated from7,384 results, the most frequent age group with higher prevalence of vitamin D deficiency (13.6%) was between (30-39) years, while those at or above 80 years old presented with (1.0%) of vitamin D deficiency; with a P-value below 0.001.

Table 4 Frequency of male and female in this studied population.

Gender	Frequency	Percent (%)
Male	6304	32.7
Female	12963	67.3
Total	19267	100

This table showed that of the collected 19267 participants, 67.3%were females and 32.7% were males, with the female to male ratio=2.

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Table 5 Vitamin D level among sex groups.

Vitamin D level (ng/dl)	Gender		Total	P-value
	Male	Female		
Deficient (<20)	3725 (19.3%)	9395 (48.8%)	13120 (68.1%)	<0.001
Insufficient (20-29)	1340 (7%)	1771 (9.2%)	3111 (16.2%)	
Normal (30-150)	1219 (6.3%)	1769 (9.2%)	2988 (15.5%)	
Toxic (>150)	20 (0.1%)	28 (0.2%)	48 (0.3%)	
Total	6304 (32.7%)	12963 (67.3%)	19267 (100%)	

High prevalence of vitamin D deficiency was detected among (48.8%) of female participants, while vitamin D deficiency among male participants was (19.3%) with a P- value < 0.001 was considered statistically very highly significant.

Table 6 Seasonal frequency of vitamin D measurement.

Season of the year in which the test was performed	Frequency	Percent (%)
Winter (December 1 to February 28)	5185	26.9
Spring (March 1 to May 31)	4166	21.6
Summer (June 1 to August 31)	4773	24.8
Autumn (September 1 to November 30)	5143	26.7
Total	19267	100

This table shows the clinical importance of vitamin D level in various seasons of the year. December through February was astronomically specified as Winter, March through May as Spring, June through August as summer, and September through November as fall or Autumn.

Table 7 Seasonal distribution of vitamin D level.

Vitamin D level (ng/dl)	Season of the year in which the test was performed				Total	P-value
	Winter (December 1 to February 28)	Spring (March 1 to May 31)	Summer (June 1 to August 31)	Autumn (September 1 to November 30)		
Deficient (<20)	3768 (19.6%)	2877 (14.9%)	2956 (15.3%)	3519 (18.3%)	13120 (68.1%)	<0.001
Insufficient (20-29)	691 (3.6%)	620 (0.3%)	946 (4.9%)	854 (4.4%)	3111 (16.2%)	
Normal (30-150)	711 (3.7%)	669 (3.5%)	857 (4.5%)	751 (4%)	2988 (15.5%)	
Toxic (>150)	15 (0.08%)	0 (0%)	14 (0.07%)	19 (0.1%)	48 (0.3%)	
Total	5185 (26.9%)	4166 (21.6%)	4773 (24.8%)	5143 (26.7%)	19267 (100%)	

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Table 7 presents the results of vitamin D level in various seasons of the year,Winter(19.6%) and Autumn (18.3%) represented the seasons during which vitamin D status declines and reaches its nadir, with a P-value less than 0.001.

DISCUSSION:

Vitamin D deficiency is defined as serum 25(OH)D levels < 20 ng/ml (50 nmol/l) and vitamin D insufficiency as serum 25(OH)D levels < 30 ng/ml (75 nmol/l) and normal serum 25(OH)D levels > 30 ng/ml is crucial for maintaining a good overall health(15).

There were some clinical and laboratory data showed that hypovitaminosis D was high in this province which make a condition of fear in general population and some physician were making irrational to treat hypovitaminosis D.

To the best of our knowledge this is the first study in Sulaimanyah province to estimate prevalence of vitamin D deficiency between January 2013- January 2017.

Distribution of vitamin D deficiency from studied population

In the current study, 19,267 results of vitamin D were collected in Sulaimanyah (private and governerate) clinical laboratories. Vitamin D deficiency was detected from (68.1%) of the studied population.

This wasnearly in agreement with Haneen Al- Alyani from healthy Saudi Arabians (63.6%)(16); Ase R Eggemoen from Norway-Oslo; in a study on recently arrived immigrants from Africa and Asia which revealed that the prevalence of vitamin D deficiency from Middle East (81%), South Asia (75%) and South Sahara Africa (73%)(17); Shafinaz study in Malaysia – Kuala Lampur (67.4%)(18); Kirtikar Shukla in a hospital based retrospective study from apparently healthy Indian population (59%) (19); and Mathilde Touvier in a study from French adults (72.6%) (20).This high percentage of vitamin d deficiency in this study and others can be explained by restricted sun exposure, low dietary intake, skin pigmentation, use of sun screen, and most of the people spend most of the time indoors.

The present finding was not in consistent withHenry W. Nabeta from tropical Africans (5-20%)(21); G. van Grootheest from Netherland (26.5%) (22);Amin Zittermann on Europian populations (37%)(23); Edu B. Suárez-Martinez from a study in Puerto Ricans, Island (24.9%) (24); Robin M. Daly from Australian adults study (31%) (25); and Deborah M. Mitchell in study from Boston, Massachusetts, united states (39%) (26). This variation may be explained by the use of vitamin D supplements according to the different age groups, their diets rich in vitamin D, genetic variations, sample size,

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different technique of assessment, different laboratory and technician, and different selection criteria.

Vitamin D deficiency is highly prevalent among population that leads to health problem and requires a good protocol for its treatment and prevention.

Distribution of vitamin D deficiency in relation to different age groups

In this research, maximum of overall deficiency rate was higher among adults between 30-39 years old (13.6%), while minimum of overall deficiency rate was detected among elderly ≥ 80years.

This recent study was not in accordance with Ibrahim M. Kaddam study in three regions of Saudia Arabia which detected that prevalence of hypoviotaminosis D was (47.6%) of participants between 30-39 years and (45%) of those at or above 40 years of age (27); Leticia Hernández Dávila study in adults from San Juan, Puerto revealed that (54.6%) of females between (26-39 years) and (45.5%) of males between (25-34)years had vitamin D deficiency (28); andHanadikhamisAlhamad in a study among the elderly in Qatar (72%) had vitamin D level below 20 ng/ml (29). This variation in the prevalence might be due to that majority of our samples were in the age groups between 30-39 years, effect of latitude and seasons, improper life style and unhealthy nutritional habits.

Although the ability of skin to synthesize vitamin D decrease with increasing age, impaired intestinal absorption, low dietary intake, improper hydroxylation of vitamin D in liver and kidneys in the elderly; the finding of this research showed that the age was positively associated with 25(OH)D level; this finding is in line with Sridhar at el study among multiethnic population of the United Arab Emirates (5.4%) of elderly above 60 years had vitamin D deficiency (30); and kevin D Cashman among elderly (>61 years) of Europian population was (1-8%) (31). This difference might be due to the small size of the participants of this age group in this recent study.

Distribution of vitamin D deficiency in relation to sex groups

In recent study the number of the refereed female subjects for vitamin D measurement was more than male subjects and high prevalence of vitamin D deficiency was more also among the females (48.8%) in comparison to the males (19.4%).

This finding was in parallel with Xiaoningyan from Taiyuan-China; in which the prevalence of vitamin D deficiency among female subjects (40.9%) and of male subjects (20.5%) (32), and Robin M. Daly among Australian adult females and males were (39% and 22%) respectively (25).The explanation of that may be revealed by dressing pattern (trational or religious one), more sedentary jobs, diet behavior, and sun avoidance.

Tuffaha study in Kingdom of Saudi Arabians disagreed with this finding, in this study higher prevalence of vitamin D deficiency detected from (62.7%) females

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and (40.6%) males (33). Despite of that KSA is one of the sunniest countries but their religions, their dressing habits for both males and females, also reduced outdoor activities results in limited exposure to sunlight.

Kevin D Cashman reported vitamin D deficiency from (12.9%) females and (13.1%) males among general European population; this was not in line with the study as consumption of vitamin D supplement from early childhood, their light clothes and exposure to sunlight in summer months explain these differences (31).

However, Some studies showed that vitamin D level higher in female subjects than male subjects like; G. van Grootheest from Netherland in a study revealed that the prevalence of vitamin D deficiency among female subjectswas (22.5%) and in males (33.4%), this was not in agreement with this research; this may be explained by selection of healthy subjects not random blood sample collection and (42%) of them had young ages below 35 years (22), and Deborah M. Mitchell in a study from Boston, Massachusetts detected that (55%) of the males and (36%) of the females had vitamin D deficiency (26). This variation may be explained by the effect of race and season, different method of measuring vitamin D, different definition of vitamin D which used.

Seasonal distribution of vitamin D deficiency

The result of present study showed that there was a little difference in the percentage of vitamin D deficiency between various seasons of the year, with the higher percentage had been determined in the winter (19.6%) and then the autumn (18.3%).

Many previous studies recorded the higher percentage of vitamin D deficiency in Winter/autumn like this study, Adele Chirita-Emandi from Romania; which revealed a decreasing trend from (October to March)and slow increase from (April to September) (34) and Kevin D Cashman in a study among general Europian population detected that prevalence of vitamin D deficiency was (17.7%) in the winter and (8.2%) in summer (31). The explanation of that is the effect of geographic region and latitude which affect the quality and the quantity of solar radiation especially the intensity of UVB radiation reaching the earth surfaces. In region with maximum latitude, UVB has no sufficient intensity to synthesize adequate vitamin D in the autumn or in the winter. In addition in the winter wearing more clothes and less duration of outdoor sunlight exposure may affect serum 25(OH)D level. Also in sunny days of hot weather, they were stay for a while outsides instead they stay in shade, wear protective clothing (long sleeves, hat with brim) or fear from skin cancer encourage people to use anti-solar on their face.

However many researchers in their studies concluded that the peak level of vitamin D was reached in in Summer if compared to Winter months, like: Zittermann et al from Northern Germany revealed that vitamin D deficiency was about 10% in summer , while 40% in Winter(23); Amrein et al from

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Austria determined that the prevalence of vitamin D deficiency in August and in or after Winter months was 29% and more than 80% respectively(35); and also MettemErol from Istanbul found that the prevalence of vitamin D deficiency at the end of Winter was 80.36%, while vitamin D deficiency had regressed to 23.44% at the end of Summer(36).

This variation may be explained by that, in addition to the effect of geographical region and latitude, in the hot weather they stay for longer time outside, at the weekend they spend most of the times at the beach directly under the light of sun, wearing of light clothes, their skin types, and consumption of milk, vitamin D supplements, and difference in the 25(OH)D reference range or cut off level.

From the study, a high prevalence of vitamin D deficiency in Sulaimanyah province was concluded also the deficiency was higher among females than males, but there was no significant difference between age groups and in various seasons of the year. Therefore, regular serum 25(OH) D check-up, required sun exposure, and the use of supplementation may assist in improving vitamin D level. Moreover, the limitations in this study were only ECL technique was enrolled, limited information regarding age, no information about medication and vitamin D supplement.

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Thi-Qar Medical Journal (TQMJ):Vol.(17),No.(1),2019
Web Site: https://jmed.utq.edu.iq Email:utjmed@utq.edu.iq
ISSN (Print):1992-92 18, ISSN (Online):1992-92 18
DOI: https://doi.org/10.32792/utq/utjmed/17/1/13/0

دورية انتشار نقص فيتامين (د) بين أفراد الإحالة الطبية في محافظة السليمانية

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الخلاصة

الخلفية والاهداف:
كمشكلة صحية عامة عالمية تؤثر على صحة الهيكل العظمي والأنسجة D يتم التعرف على نقص فيتامين في سكان D الهيكلية الإضافية. كان الهدف من هذه الدراسة هو تحديد مدى انتشار نقص فيتامين السليمانية ومقارنة الفئات العمرية المختلفة والجنس وموسم السنة.

المواد والأساليب:
كانت هذه دراسة مقطعية متقاطعة شملت ١٩،٢٦٧ مريضاً زاروا المختبرات السريرية (الخاصة والحكومية) ، منهم ٦٣٠٤ ذكور و ١٢،٩٦٣ إناث تتراوح أعمارهم بين (١-٩٥) سنة في الفترة ما بين يناير ٢٠١٣ ويناير ٢٠١٧ ، جميع الفيتامين تم قياس D تقاس تقنيات electrochemilumcence في هذه الدراسة.

النتائج:
تم تحليل ما مجموعه ١٩٢٦٧ شخص ، وكان نقص فيتامين (د) العام (أقل من ٢٠ نانوغرام / مل) ٦٨,١ ٪. ازدادت نسبة انتشار نقص فيتامين (د) في هؤلاء المرضى الذين تتراوح أعمارهم بين ٣٠-٣٩ سنة (١٣,٦ ٪) ، وكان أكبر بين النساء (٤٨,٨ ٪) وأكثر شيوعا خلال فصل الشتاء (١٩,٦ ٪).

الاستنتاج:
تشير الدراسة المتوفرة حالياً حول سكان السليمانية إلى أن نقص فيتامين D شائع. هذا يشير إلى أن هناك حاجة إلى استراتيجيات على مستوى السكان لتحسين حالة فيتامين د في محافظة السليمانية.
كلمات البحث: فيتامين د ؛ السليمانية. نقص