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Dietetic Cross Section Study on Vitamin D Deficiency in Tobruk, Libya

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Abstract: ***This study provides a review on vitamin D deficiency in Tobruk city, and offers information about a cross section study carried out on random participants to identify the nutritional status of participants during one year before having vitamin D deficiency. 61 cases (24 males and 37 females) aged 17 to 75 years were randomly selected for vitamin D test. 89 participants (48 females (53.9%) and 41 males (46.1%)) were interviewed for a cross sectional study. They were asked to detail their nutritional habits throughout one year before suffering vitamin D deficiency. Questions were focused on family history, sunlight exposure, food allergy, exercise, smoking status and food intake from the major dietary containing vitamin D sources. Also, anthropometric measurements including weight, height, Body Mass Index (BMI) and Ideal Body Weight (IBW) were measured in multiple special laboratories. Among 61 cases, 24 (39.3%) women diagnosed with vitamin D deficiency, whereas 13 (21.3%) were with normal vitamin D level. As well as, 11 (18%) males were diagnosed with vitamin D deficiency and 13 (21.3%) were diagnosed with normal vitamin D level. One finding showed that women aged from 30 to 35 years mostly had lower vitamin D level than men because they are less exposure to sunlight than men due to social cultural issue. Approximately, 35 (57.4%) of 61 cases had vitamin D deficiency. Also, among 89 interviewed participants, 55 (61.8%) participants did not mostly expose to sunlight and didn't eat foods containing vitamin D including meats, dairy foods, oily fish, egg yolk, mushroom , and cod liver oil. The results revealed that more than half of population in Tobruk city may have low vitamin D level. A clear connection between living style, good nutritional habits and sunlight exposure may enhance vitamin D level.***

Keywords: Vitamin D Deficiency, A Cross Section Study, Nutritional Status, Sunlight Exposure

1. Introduction

When you submit your paper print it in two-column format, including figures and tables [1]. In addition, designate one author as the "corresponding author". This is the author to whom proofs of the paper will be sent. Proofs are sent to the corresponding author only [2]. Vitamin D is produced in the skin as a vitamin D3 (cholecalciferol) when exposed to ultraviolet B (UVB) radiation in sunlight. Also, small amounts are obtained from animal foods such as oily fish, egg and meat [1]. Insignificant quantities of vitamin D are obtained as vitamin D2 (ergocalciferol) from plant sources [2]. Vitamin D is essential for calcium homeostasis and for optimal skeletal health. The most important function of vitamin D is to raise the efficiency of calcium absorption from the small intestine. Vitamin D as well improves the absorption of phosphorus from the distal small bowel. Adequate calcium and phosphorus absorption from the intestine is vital for appropriate mineralization of the bone [3]. The serum concentrations of 25-hydroxyvitamin D (25(OH)D) represents top clinical indicator of vitamin D availability which considers a sign of sunlight exposure, diet, and supplements. The normal value of vitamin D in adults arranged from 30 to 100 ng/ml [4], [5], [6]. Synthesis of vitamin D3 depends on environmental factors (atmospheric conditions, geographic latitude, location, and season); behavioral factors (clothing, time spent outdoors, and use of sunscreen, as well as physiological factors (skin type and age) [7]. There are many critical illness may have an effect on synthesis of the vitamin D including obesity , diabetes, metabolic disorders, as well as hyperlipidemia [8]. Also, the consequences of vitamin D deficiency (VDD) take account of poor bone development and unwell health in addition to increased risk of many serious diseases together with some common cancers, cardiovascular diseases, type one diabetes, autoimmune diseases, high blood pressure, age-related cognitive decline, Parkinson's disease, and multiple sclerosis and arthritis. In patients who diagnosed with hypocalcaemia, calcium will leave the bones and also may offer rise to the secondary hyperparathyroidism [9]. Body should acquire more vitamin D by eating abundance of vitamin D rich foods, including: oily fishes such as salmon, sardines, pilchards, trout, herring, kippers and eel contain reasonable amounts of vitamin D; cod liver oil restrains a lot of vitamin D, egg yolk, meat, milk, some breakfast cereals, infant formula milk and some yoghurts 'fortified' with vitamin D [10]. The present work is aimed to provide a summary on vitamin D deficiency in Tobruk City, Libya to give information about a cross section study performed on random participants and to identify the nutritional status of participants during one year before having vitamin D deficiency.

2. Methodology

2.1 Data Collection and Analysis

Data were collected by researchers and obtained from Ibn Roshid Special laboratory and Ibn Nafees Special laboratory, Tobruk Specialist Center, Tobruk, Libya. All personal identifiers were stripped from the data and only significant parameters were analyzed. A total of 61 cases (24 males and 37 females) were randomly selected for vitamin D test during the period from 1th Jan to 31th Dec, 2017. The tested cases aged between 17 to 75 years with weight ranged from 15 to 130 Kg and height ranged from 130 to 172 cm. Data were computerized in a data sheet and percentage formulas of people diagnosed with and without vitamin D deficiency were calculated using Microsoft office excel 2016 program. Tobruk city represents capital of Butnan province, Libya. It

is located on the Libyan's eastern Mediterranean coast, sharing about 140 km long Mediterranean coastline, and it has internal border with Egypt in the east. The laboratories used in this study serve the neighboring cities as well as Tobruk city.

2.2 Cross Section Study

A cross sectional study was designed to investigate vitamin D status and identify factors that may affect vitamin D level. A cross sectional study was performed on about 89 participants at several places including Ibn Rashid Laboratory, Ibn Al Nafees laboratory and Tobruk Specialist Center, Tobruk, Libya to help collecting data related to vitamin D deficiency (VDD). This study was performed during the period from March 1st to April 30th, 2018. Data was collected on a form (questionnaire) during the interview with each participant. The questionnaire was given to 89 participants. Before filling the questionnaire, the necessary questions were given by researches.

Data were collected using a survey form composed of two parts. First part included questions on age, gender, weight and height, and the second half focused on vitamin D. All the participants have receiving treatment course for vitamin D or had received their last treatment less than one month before the present study were excluded. The 6-question-multiple-choice survey took about 10 minutes or less to complete. The main objective of the survey was to assess vitamin D knowledge among random participants. Participants were asked to detail their nutritional habits throughout one year before suffering from vitamin D deficiency.

Data was gathered by trained researchers who are undergone training sessions on interviewing the specific skills. The anthropometric measurements including weight, height, BMI and IBW were measured in multiple special laboratories**.** The questions were focused on medical history, sunlight exposure, food allergy, exercise, smoking status and life style factors including food intake from major dietary vitamin D sources such as meat and their products, dairy foods, egg yolk, mushroom, fortified foods, and oily fishes. Also the questions were focused on other foods consumed including fast foods, drinking gaseous beverages, drinking water and eating fruits and vegetables.

2.3 Statistical Study

Data for all participants were analyzed. The percentage formulae of anthropometric measurements were calculated using Microsoft office excel 2016 program. BMI was calculated as weight (kg) divided by height (m^2) (kg/m^2). IBW for male's participants is calculated as height multiplies 400 and divided by 1000, while IBW for female's participants is calculated as height multiplies 350 and divided by 1000 [11], [12].

3. Results and Discussion

3.1 Random Participants for Vitamin D Test

Of the 61 cases, about 24 (39.3%) males and 37 (60.7%) females were randomly selected for vitamin D test. The estimated concentrations of vitamin D were from 11 – 40 ng/ml. Among 37 females, there were 24 (64.9%) women diagnosed with vitamin D deficiency, whereas 13 (35.1%) women had normal vitamin D level. Amongst 24 males, about 11 (45.8%) males were diagnosed with the vitamin D deficiency, while 13 (54.2%) males had normal vitamin D level. Moreover, among 24 women diagnosed with vitamin D deficiency, there were 8 (33.3%) pregnant women had low vitamin D deficiency. Of 13 females diagnosed with normal vitamin D level, there were 5 pregnant women. In comparison, among 24 of males, there were 13 (54.2%) cases diagnosed with normal vitamin D level, while 11 (45.8%) cases diagnosed with vitamin D deficiency. One of our finding illustrated that women were frequently diagnosed with lower vitamin D level than men. This is because Libyan females are less exposure to sunlight than men due to social and cultural issues. A previous study designated that oily fish, meat, meat products, spreads, fish liver oil, fortified milk, egg yolk, cereal and cereal products, and wild mushroom, enhance the vitamin D level in adults and consider contributions of all food groups. However, foods that in the nature abundance in vitamin D is few in the number and is not often consumed by many populaces [13].

3.2 Anthropometric Measurements

The weight of the 61 participants was arranged from 15 to 130 Kg, while the height varied from 130 to 172 cm. The participants aged from 17 to 75 yrs (Table 1). The body mass index (BMI) for participants was estimated to relate body weight to height. In the present study, BMI ranged from 13.1 to 39.9 kg/m2 and 11.2 to 32 kg/m2 for females and males, respectively.

Table 1: Frequency of Participants Diagnosed with Vitamin D Deficiency According to Age Groups

Age Groups	*Males*	*Females*
15 - 20	2	2
20 - 25	1	3
25 - 30	3	3
30 - 35	1	7
35 - 40	0	1
40 - 45	0	1
45 - 50	1	2
50 - 55	2	0
55 - 60	0	2
60 - 65	1	0
65 - 70	0	2
70 - 75	0	1
Total	11	24

These results show the highest prevalence of the vitamin D deficiency among females who were aged from 30 to 35 yrs. This may be related to the some significant factors such as bad dietary program, pregnancy, life style factors, body stress, and inadequate exposure to the sunlight due to heavy home responsibility and cultural issues.

In short, among the 61 cases, there were about 35 (57.4%) cases diagnosed with vitamin D deficiency. Since the 61 cases were randomly selected; therefore, this implied that

about more than half of population in Tobruk city may have vitamin D deficiency. But, in a comparison, a previous study indicated that about 24% of participants in India had vitamin D deficiency [3], [13]. Also, results revealed that most males diagnosed with vitamin D deficiency had BMI ranged from 23 to 25 kg/cm^2 (normal weight).

In comparison, most females diagnosed with vitamin D deficiency had the BMI from 25 to 30 kg/cm^2 (over weight) and BMI from 30 to 35 kg/cm^2 (obesity I) (Table 2). An earlier work reported that vitamin D deficiency was considerably associate with a BMI over weight and and obese people, pointed to the requirement to clinical monitoring [14]. The rate of recurrence of men and women diagnosed with vitamin D deficiency is shown in Table 2.

Table 2: Frequency of Participants Diagnosed with Vitamin D Deficiency According to Body Mass Index.

BMI Kg/m2	*Males*	*Females*
Below 18.5	1	5
18.5 - 22	2	5
23 - 25	4	6
25 - 30	1	6
30 - 35	2	1
35 - 40	1	1
Total	*11*	*24*

Among 24 women diagnosed with vitamin D deficiency there were about 16 non pregnant women. Approximately, they had weight ranged from 45 to 130 kg and height ranged from 144 to 176 cm, and had ideal body weight (IBW) varied from 50.4 to 58.5 Kg. Among the 16 non pregnant women diagnosed with vitamin D deficiency, approximately 2 cases were under weight, while others were overweight with IBW varied from 1.6 to 73.3 Kg. The frequency of the ideal body weight of non pregnant women is shown in Table 3.

In comparison, along with 24 women diagnosed with vitamin D deficiency, there were about only 8 pregnant women suffering from vitamin D deficiency. The height, the weight and the ideal body weight of 8 pregnant women diagnosed with vitamin D deficiency were 55 to 87 kg, 155 to 166 cm and 54.3 to 58.1 Kg, respectively. The frequency of the ideal body weight of pregnant women diagnosed with vitamin D deficiency is shown in Table 4.

Table 3: Frequency of Non Pregnant Women Diagnosed with Vitamin D Deficiency According to IBW.

IBW	*Weight*	*Height*	*Over Kg*	*Under Kg*
50.4	45	144		5.4
52.5	48	150		4.5
54.3	59	155	4.7	
54.6	78	166	23.4	
56.0	77	160	21	
56.0	100	160	44	
56.0	78	160	22	
56.7	130	165	73.3	
57.4	59	164	1.6	
57.8	68	165	10.2	
57.8	70	165	12.2	
57.8	130	165	72.2	
58.1	93	166	34.9	
58.1	68	166	9.9	
58.1	90	166	31.9	
58.5	80	176	21.5	

Table 4: Frequency of Pregnant Women Diagnosed with Vitamin D Deficiency According to IBW.

IBW	*Weight*	*Height*	*Over (Kg)*
57.8	66	165	8.2
54.3	55	155	0.7
56	78	160	22
58.1	85	166	26.9
57.8	76	165	18.2
58.1	77	166	18.9
57.8	59	165	1.2
56	87	160	31

3.3 Interviewed Participants

The study analyzed the data of 89 participants (53.9% females and 46.1% males). The results of the survey revealed that 4.5% of participants had medical history of chronic diseases, and 13.5% of participants had food sensitivity to food rich in vitamin D. Also, about 58.4% of participants were frequently drink water through the day. Approximately, 92.1% of participants mostly ate lots of fruits and vegetables. The results in this study demonstrated that 85.4% of participants preferred milk and milk products, while 89.9% and 83.1% of participants liked to eat meat and nuts, respectively. Among the participants, the average exposure to the sunlight was 79.8%. Moreover, participant's intake of antibiotic medications was about 31.4% as shown in Figure 1.

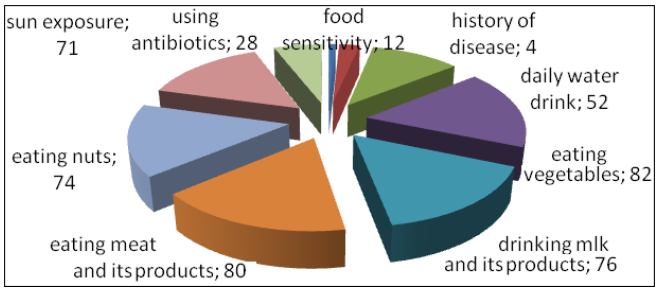

Figure 1: Participant Habits in the Cross Section Study.

On other hand, among 89 interviewed participants, 95.5%, and 86.5% did not have any medical history of a chronic disease and did not have any food sensitivity, respectively. About 41.6% cases drank a little of water daily, and 7.9% cases did not prefer eating vegetables and fruits. Also, 14.6% of participants did not like milk and milk products, while 10.1% and 16.9% cases did not eat meat, nuts and oily fishes respectively.

One of our finding that 55 (61.8%) cases didn't mostly expose to sunlight and did not consume foods rich in vitamin D including meats, dairy foods, oily fishes, egg yolk, mushroom , and cod liver oil. This indicated that that a noticeable connection between living style, nutritional habits and sunlight exposure may enhance vitamin D level.

4. Recommendations

The present study advises the sunlight exposure as one of the greatest natural source for curing from the vitamin D deficiency. Also, the government should offer public health agencies to provide a consistent information evaluation, prevention, guidelines, and treatment for the vitamin D insufficiency. This will enhance awareness about sufficient intake of vitamin D for recovering overall health. People should also consume fortifies products with vitamin D and foods rich in vitamin D [12], [14]. Further research are needed to detect the main reason of vitamin D deficiency and to support monitoring the treatment.

5. Conclusion

Vitamin D deficiency is often caused by inadequate exposure of the skin to sunlight, followed by decreasing the amount of vitamin D absorbed via diet. This may lead to the decrease in the absorption of calcium by the intestines, resulting in increased break down in a person's bone matrix. The normal range of vitamin D is 30-100 ng/ml, while in this study, among 61 cases, the concentration of vitamin D level varied from 11 to 40 ng/ml. This study reported that among 61 cases, there were 24 women and 11 men diagnosed with vitamin D deficiency. The most affected participants and diagnosed with low vitamin D level was in females aged from 30 to 35 years. Of the 89 interviewed participants**,** 55 (61.8%) cases did not mostly expose to sunli Tght and didn't consume foods rich in vitamin D including meat, dairy foods, mushroom, cod liver oil, oily fishes as well as egg yolks. This indicates that a visible connection between living style, nutritional habits and sunlight exposure may affect vitamin D Level. In brief, this implied that more than half of population in Tobruk city may have low vitamin D Level. Further researches are needed to study the causes and the management of vitamin D deficiency in the society.

6. Ethical Considerations

The present study is a part of food related vitamin D deficiency studies. The study protocol was approved by the ethics committee of the Scientific Research in Tobruk University. All participants were informed about the research and gave oral consent. No patient refused our aim for this study.

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