Prevalence of Vitamin D Deficiency for Obese Women in Western of Libya

(Original Research Article)

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Abstract: Today, an association between vitamin D deficiency and obesity is well known, but the mechanisms are not clear yet. This study was designed to investigate the effect of body weight on serum vitamin D levels in obese women. This study has been carriedout between 1st of April and 20th of Jun 2021 for obese women (BMI ≥ 30 kg/m2). The obese women diagnosed with vitamin deficiency were aged from 18 to 60 years. The study was performed in government and private clinics of Nutrition and Dietetics for weight loss in Tripoli, Libya. This subjects' sociodemographic features, anthropometric measurements (height, weight, body mass index (BMI), hip and waist circumference, body composition (body fat mass in kg, body water content in kg) and biochemical parameter measurements calcium (Ca), vitamin D,TG was analyzed through face-to-face interview method. Serum vitamin D level was measured in all obese women by obtaining 2 milliliter blood samples. A standard interview-based questionnaire form was to obtain data on demography. The questions provide details about personal characteristics include age, occupation, income social status, illness, medication, using vitamin D, calcium and another laboratories investigation such as Lipid Profile. A statistically significant relation (p=0.02) was found between serum vitamin D and BMI values in obese women. Also, there was a high relation between serum calcium values and vitamin D values (p= 0.008). This indicates that women diagnosed with vitamin D values from 10 to 20 have the highest level of calcium.

Key Words: Obesity, BMI, Vitamin D Deficiency, Obese Women.

Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health. People are generally considered obese when their body mass index (BMI), a measurement obtained by dividing a person's weight by the square of the person's height, is over 30 kg/m^2, with the range 25–30 kg/m^2 defined as overweight. Obesity increases the probability of several diseases and conditions, principally cardiovascular diseases, type 2 diabetes, obstructive sleep apnea, certain types of cancer, osteoarthritis and depression. The increase in obesity rates presents a major public health concern. In Europe, its frequency is in the range of 10–25% in men and 10–30% in women. [1] Obesity remains stigmatized in much of the modern world (particularly in the Western world), though it was seen as a symbol of wealth and fertility at other times in history and still is in some parts of the world. In 2013, the American Medical Association classified obesity as a disease. [2] Although there are genetic, behavioral and hormonal effects on body weight, obesity happens when you take in more calories than you burn through exercise and normal daily activities. The body stores these excess calories as fat. Obesity can sometimes be traced to a medical cause, such as Prader-Willi syndrome, Cushing's syndrome, and other diseases and conditions. [2,4,5] Obesity usually results from a combination of causes and contributing factors, counting Genetics, Family lifestyle, Inactivity, Unhealthy diet, medical problems, certain medications and financial issues Age, Pregnancy, Quitting smoking, Lack of sleep. Due to obesity, it is likely to develop a number of potentially serious health problems, including high triglycerides and low high-density lipoprotein (HDL), type 2 diabetes, high blood pressure, heart disease, stroke, gallbladder disease, and Osteoarthritis. [6,7]

Vitamin D works mainly as a steroid hormone called hydroxyl coli,such as capitol or calcitriol. It works by interacting with vitamin D receptors in cells, affecting gene replication, affecting more than 50 genes, including the protein gene. The most important function of vitamin D in the body is its role in the balance of calcium and phosphorus.in the intestinal wall, which absorbs it, it also stimulates calcium channels to absorb it.[8] In the absorption of phosphorus, re-absorb k of calcium and phosphorus in the kidneys. Additionally, to its role with thyroid hormone, the thyroid gland stimulates the release of calcium from the bones and the release of phosphorus in the urine if the level of calcium in the blood decreases. [8,9]. Many recent studies have a role for vitamin D in regulatingimmune system responses, as immune system dysfunction occurs in some autoimmune diseases, such as type 1 diabetes, scleroderma, inflammatory bowel disease and rheumatism caused by autoimmune disorders. There are many reasons why a large number of women are exposed tovitamin D deficiency.[10].

Obesity and overweight, Inadequate exposure to sunlight, Use of sunscreen, Avoiding the focus on nutritional sources of vitamin D, Poor absorption of vitamin D in the intestine, Women with dark skin. (11,12) There are many sources where vitamin D can be obtained from [13,14) Exposure to the sun: and eat foods that contain vitamin D naturally: such as fish includingsalmon, tuna, whale liver oil, and yolks. Vitamin D deficiency is linked to obesity

and weight gain. There is a hormone called leptin produced by fat cells in the body. Its function is to send a signal to stop eating. Vitamin D helps the hormone in its function and sends signals in an effective way. Previously, will give a sense of stop eating, and thus can control food consumption, moreover to it increases the metabolism of fat cells, and reduces the incidence of inflammation that causes weight gain. Causes ofvitamin D deficiency live in places that do not get enough sunlight. Intense a little vitamin D, those who are allergic to milk, vegetarians, and dark-skinned people are more likely to have vitamin D deficiency. The incapability of the kidneys to convert vitamin D to its active form as a person progresses in age, leading to a decrease in the body.[15]. The Aim of the study was to evaluate the association between vitamin D deficiency and obesity and to detect changes in the level of vitamin D and other factors such asage, education and exposed to the sun.[16].

Materials and Methods

This study has been carried out between 1st of April and 20th June 2021 on obese (BMI ≥ 30 kg/m2) premenopausal women with vitamin deficiency aged between 18 and 49 years, who have applied to government and private clinic of Nutrition and Dietetics for weight loss in Tripoli city, Libya. Throughout the study, a total number of110 subjects who complied with the study The subjects' sociodemographic features, anthropometric measurements (height, weight, body mass index (BMI), hip and waist circumference, body composition (body fat mass in kg, body water content in kg) and biochemical parameter measurements (F.B.S, vitamin D, TG, LDL, HDL was analyzed through face-to-face interview method. Serum vitamin D level was measured in all obese women by obtaining 2 milliliter blood samples_.If vitamin D deficiency was defined as a serum vitamin D level lower than 30mg/dl.

Study Design

A standard interview-based questionnaire was used toobtain data on demography, clinical and family history. The questionnaire consists of 3 sections each section including many questions. Section I including personal characteristics (age, Education, income social status), section II including (illness and types, medication, using vitamin D, Calcium and another laboratories investigation such as FBS, HBA1C and Lipid Profile).

Statistical Analyses

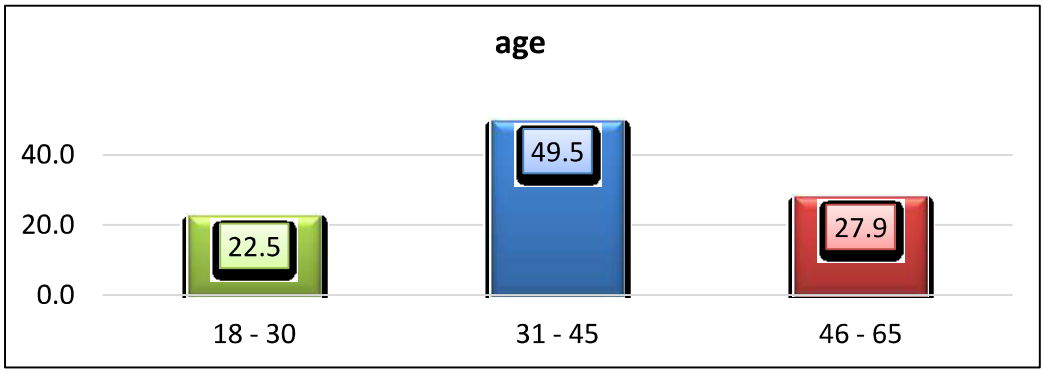
Data of the questionnaire and results of blood tests were analyzed using software program statistical statraphics (version, 24). N (110), the percentages were performed to investigate the significance in the association of the different variables and the prevalence of vitamin D deficiency. Our findings were given in tables as arithmetic mean and standard deviation. Difference between groups was assessed with one-way ANOVA and Correlations between variables were assessed using Pearson's coefficient of correlation. In all cases, $p<0.05$ was considered significant.

Results

First: Personal Information

Age and Vitamin D Level

22.5% of individuals were aged between 18 and 30 years and 49.5% were between 31 and 45 years of age and 27.9% of subjects were 46-65years Figure 1.



Figuer.1 The Percentage of Patients Related to their Age.

From data analysis, there were a high correlation between vitamin D level and age especially for the subjects aged 18-30 years (M=10.85, Std= 4.66) (p=0.000). It was a strong relation between obese women who aged 18-30 and TG value (M=142.84, Std= 61.465, r=.421, P= 0.000) > (0.05). As well as there were a high significant between BMI and participants who aged 18-30 (M=39.48, Std= 5.283, P=0.000<0.05). It was found that, a strong relation between age and BMI (M=39.48, Std= 5.28, P value=0.000<0.05). From the analysis there were no relation between age and TG, HDL, LDL investigations (Tables 1, 2).

Table 1: Relation between Age and Vitamin D level.

Vit.D level					
	N	Average	Std. Deviation	F	p value
18 – 30yr	25	10.85	4.653	11.731	0.000 *
31 – 45yr	55	17.53	10.398		
46 – 65yr	31	26.06	17.093		
Total	111	18.41	12.936		

Table 2: The Relationship between Age and BMI.

BMI	N	Mean	Std. Deviation	F	p value
18 - 30	25	39.48	5.283	12.704	0.000 *
31 - 45	55	35.93	5.784		
46 - 65	31	32.24	4.578		
Total	111	35.70	5.905		

* Significant at the 0.05 level.

N: Number of cases.

Education and Vitamin D level

In relation to statistical analysis, there were a high correlation between vitamin D level and education, whereas a strong relation between non educated obese women and vitamin D level (M=13.06, Std=7.735, P value=.008<0.05) Figure 2.

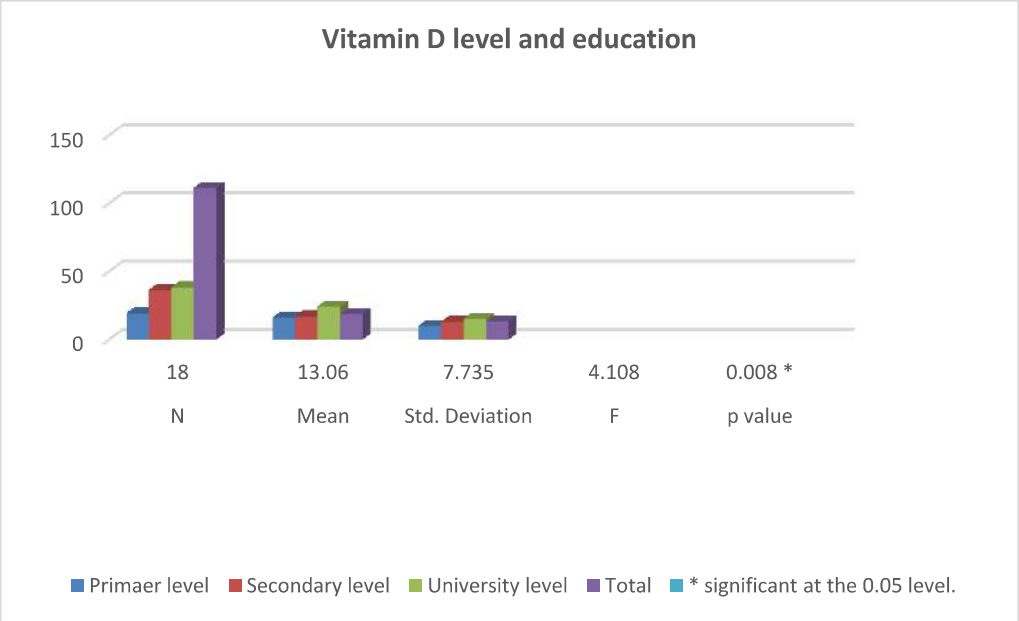


Figure 2: The relationship between vitamin D level and education. [N: Number of cases].

Second: Medical History

Laboratory Investigations

According to laboratory investigation obese women, we were found that, minimum level

from vitamin D is 3.00 and the maximum level was 85.00. Furthermore, BMI, the minimum was 20 and the maximum was 53.33 (Table 2).

Table 2: The Minimum and Maximum Levels of Laboratory Investigations**.**

	Minimum	Maximum	Mean	Std. Deviation
Vit.D level	3.00	85.00	18.41	12.936
TG	32.00	300.00	125.98	58.758
HDL	9.00	150.00	47.56	19.588
LDL	27.00	260.00	107.41	37.360
Wight	61.00	135.00	91.37	14.933
Height	147.00	171.00	159.59	5.821
BMI	20.00	53.33	35.70	5.905

Vitamin D level and Age

From data analysis there were a high relation between the obese women who age 18-30 years and vitamin D (M=10.1085, SD=4.653, p value=0.000<0.05) (Table 3).

Table 3: The Relation between Age and Vitamin D level.

Vit.D level					
	N	Mean	Std. Deviation	F	p value
18 – 30yrs	25	10.85	4.653	11.731	0.000 *
31 – 45yrs	55	17.53	10.398		
46 – 65yrs	31	26.06	17.093		
Total	111	18.41	12.936		

* Significant at the 0.05level.

Third: Vitamin D level and BMI

From analysis, there were a strong relation low vitamin D level and BMI, the obese women there vitamin D level between 0-29 nm 85% and there were a high correlation between BMI & vitamin D (mean=34.84, SD=4.88,p value=0.000<0.05) (Tables 4, 5).

Table 4. The Percentage of Vitamin D Deficiency

Vit.D level	Frequency	Percent
0 – 29yrs	95	85.6
30 +yrs	16	14.4
Total	111	100.0

Table5. Correlation between vitamin D deficiency and BMI

		N	Mean	Std. Deviation	t	P-Value
BMI	0 - 29	95	34.84	4.883	-3.988	0.000
	30 +	16	40.81	8.592		

Vitamin D level and Exposed to the Sun

In this study, it discovered that, about 50% of the participants who suffer from vitamin D deficiency are not exposed to the sun, meaning that there is a strong relationship between lack of sun exposure and vitamin D deficiency (Table 6).

Table 6: The Relation between Vitamin D level and Sun Exposure.

Vit.D level	N	Mean	Std. Deviation	T	p value
Yes	52	25.86	14.277	6.764	0.000 *
No	59	11.83	6.657		
Total	111	18.41	12.936		

Discussion

Geographic location played a significant role in the vitamin D status. Libya is one geographic area where vitamin D deficiency is highly prevalence. In spite of Libya is summary, warm climate which is supposed to be less liable developing vitamin D deficiency among its population. In the present study, it found that a positive association between vitamin D deficiency and obesity. The concept of maintaining an increased vitamin

D status for decreasing adiposity also warrants further evaluation. In this study, there was no significant difference between vitamin D levels and education, age. Relationship was found between obese women and vitamin D, that is, BMIlevel increased as vitamin D levels decreased. However, the relationship was not significant because of the low number of samples. When comparing these results with the study in Turky 2017, it was discovered that vitamin D level was insufficient in 93.2% of individuals and this level has increased to 97.7% after the study. Otherhand, the study in Benghazi,2018 they found that a high significant relation between serum vitamin D and BMI values in obese women and it was same our results. [19و18].

Number of epidemiological studies proving the relation between Obesity and vitamin D is continuously increasing. An important study related to this issue is claiming that there is an adverse relation between body fat ratio and 25 (OH) D concentrations and that there is an independent relation between low serum level 25(OH) D and increased BMI and body fat mass. When comparing this study with Astudy by Ambaraka Elferjani et.al 2018 in Benghazi, Results found that a high significant relation (p= 0.02) between serum vitamin D and BMI values in obese women. It is found that 60% of obese women were less than 10 Mg/dl and 45% from women their vitamin D values 10-20mg/dl and 32%their vitamin D values less than 3omg/dl and were discovered that a high relation between serum calcium values and vitamin D values (p= 0.008). It found that the women who vitamin D values 10-20 they have the highest level from calcium.[19].

Another study comparing obese and healthy overweight individuals has found out that vitamin D deficiency and obesity are interrelated and that, according to vitamin D deficiency, obese individuals are under 3.36 relative risk compared to normal weight individuals. [38] The study by Abdelkarem, et al. on obese women vitamin D levels were found to be inadequate in 59.6% of obese women, 19.3% were moderate inadequate and 21.3% were found adequate.

Similarly, Raja Kumar, et al. have found out that serum 25(OH)D level has inverse relation with BMI, total body fat percentage, visceral fat tissue and subcutaneous fat tissue [37]. The possible explanation, the mechanisms that link excess body weight and vitamin D are not fully elucidated. The possible explanation maybe that certain vitamin D receptor (VDR) polymorphisms are associated with obesity, expression of human VDR in mature mice adiposities lead to expression of VDR in preadipocyte cell lines, thereby inhibited adiposity differentiation and increased adipose mass.

Alternatively, some experimental data have suggested that vitamin D deficiency can cause greater adiposity by promoting parathyroid hormone levels and overflow of calcium into adipocytes, thereby increasing lipogenesis. On the other hand, leptin plays a very important role in the occurrence and development of obesity and vitamin D is an essential factor of generating this leptin, which can cause obstacles of leptin synthesis. Thus, depletion of vitamin D can increase appetite and lead to obesity. Additionally, outdoor activity, food intake and exercise levels can influence 25(OH) D levels. In this study, there was a negative

correlation between the amount of body fat loss and PTH level after the study. A negative correlation between age, education level, TG, income level and vitamin D was also determined.[19].

A recent meta-analysis study reported the vitamin D deficiency was associated with obesity irrespective of age, latitude, cut-offs to define vitamin D deficiency and the Human Development Index of the study location. However, Saneei Pet al. included 34 studies in the meta- analysis, and their results support a significant inverse weak correlation between serum 25(OH) D levels and BMI in adult population. Our study showed that there are now consistent evidence of an association betweenthe vitamins. [20].

Conclusion

In conclusion, our results designate positive association between vitamin Ddeficiency and obesity was found. The theory of maintaining an increasedvitamin D status for decreasing adiposity also deserves extra evaluation. In this study, there was no significant difference in vitamin D levels according to education, age and sun shine.

The relationship was found between obese women and vitamin D, that is, BMI level increased as vitamin D levels decreased. However, the association was not significant because of the low number of samples.

Recommendations

Patients should follow the following instructions:

1. Get daily dose of sun.
2. Consuming Vitamin D levels tested regularly
3. Take a supplement especially during winter.
4. Maintain a healthy weight by encourage the patients to physically active and educate them about vitamin D as food source.
5. Educate the patients about vitamin D deficiency complications at risk.

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