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Assessment of Vitamin D Level in a Sample of Iraqi Obese Women

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Abstract

Background High prevalence of both vitamin D (vit. D) deficiency and obesity in world population as reported by many studies drown attention to establish the association and its direction between these two modifiable risk factors and their impact on health status which are still uncertain.

Objective To measure vit. D levels among a sample of obese women, describing some factors that may contribute for vit. D values in this sample and assess the correlation between vit. D levels and body mass index (BMI).

Methods A cross-sectional study was carried out among 100 obese women. Their age ranged between (20-50) years, during the period from 1st February to 1st August 2019. The sample was gathered from laboratory of private medical center at Palestine Street in Baghdad. vit. D was measured by (Ichroma vit D), which is a fluorescence immunoassay.

Results The mean±SD of vit. D values of the participants were found to be (16.05±6.9) ng/ml. Only two women from the sample had sufficient vit. D level of more than 30 ng/ml, (72%) of the participants found to have insufficient vit. D level 10-29.9 ng/ml and the remaining had deficiency in vit. D level <10 ng/ml. A significant association was found between vit. D levels and the age participants and beverages drinking (P≤0.01). Indirect correlation was found between vit. D values of the participants, their BMI values, and waist/ hip ratios and was significant with the last P≤0.012.

Conclusion No association was found between vit. D and BMI, but there is indirect correlation between vit. D and waist/hip ratio. Highest deficiency of vit. D among age group (30-39) years old and among those who were drinking carbonated beverage.

Keywords Obese, women, vitamin D, body mass index

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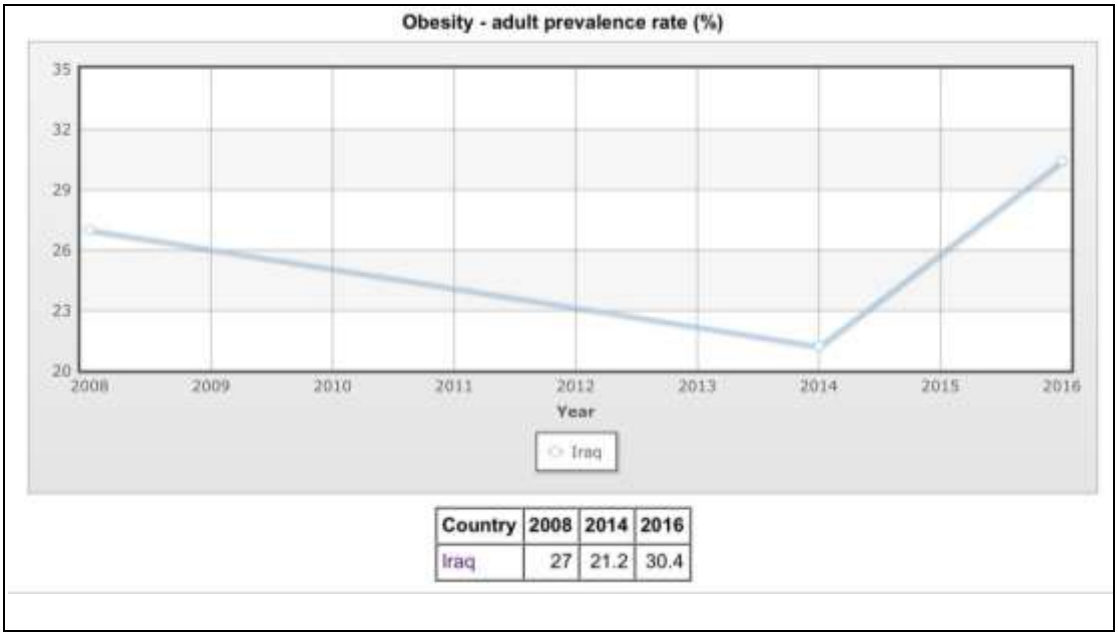
List of abbreviations: BMI = Body mass index, HT = Height, SD = Standard deviation, UV = Ultraviolet light, vit. D = Vitamin D, WHR= Waist hip ratio, WT = Weight

Introduction

Obesity has been known to be a major health problem worldwide [(1)], and considered to be a risk factor for many medical conditions such as cardiovascular disease and type 2 diabetes mellitus [(2)] . As the prevalence of obesity is increasing worldwide [(1)] and in Iraq [(3)], so it has been of great importance to study the possible associated factors with obesity and type of its relation such as vitamin D (vit. D), which is a fat-soluble vitamin synthesized in the body and taken from diet and supplements [(4)]. Vit. D and its metabolites have a wide range of important biological functions in the body, and its linkage with obesity has been a subject of interest by many studies trying to define their relationship as this current study that spotted the light on vit. D level in obese women [(5)] as showed in figure 1.



Country	2008	2014	2016
Iraq	27	21.2	30.4

Figure 1. Prevalence of obesity in Iraq [3]

Definition of Obesity - adult prevalence rate
This entry gives the percent of a country's population considered to be obese. Prevalence rate in Iraq was found to be 27% in (2008), this rate decreased to 21.2% in (2014), but increased to 30.4 % in (2016).

Study objectives
1. To measure vit. D levels in a sample of obese women.
2. To describe factors that may contribute for vit. D values in this sample of obese women.
3. To assess the correlation between vit. D levels and body mass index (BMI) of this sample of obese women.

Methods
A descriptive cross-sectional study was conducted in a laboratory of private medical center at Palestine Street in Baghdad. This center has nutrition and weight healthcare department visited by obese patients.
Data was collected using a convenient sampling technique during the time frame from February 1st till August 1st 2019. Eligible participants include all adult obese women (BMI ≥30), their age range 20 to 50 years old. Women with bone mineralization, malabsorption disorder, parathyroid disorders, genetic disorders of vit. D metabolism, pregnant and lactating women, chronic kidney or liver disease, diabetes mellitus and participants using tonics contain vit. D supplementations were excluded.

Data collection tools
A) Questionnaire
Each participant was interviewed by the researcher to collect information through a questionnaire designed especially for this research after reviewing the literature. It covered some socio-demographic data and some of the risk factors related to vit. D deficiency.

Questionnaire:
1. Serial no. (vit. D).
2. Age
3. Years of education
4. Occupation
5. Address
6. Marital status
7. GPA (gravida, parity, abortion)
   - Marriage duration
   - Years of infertility
8. Wearing Hijab: yes/no
9. Habits

Smoking: yes/no

10. Eating
    - Unhealthy food, fast food
    - Fish such as salmon, tuna
    - Milk and its products.
    - Beverages (cola)
11. Sedentary lifestyle (Physical activity): Yes/No
12. Sun exposure: Yes/No
    - (5-30 min /day) from 10 AM -3 PM
13. Drug history

B) Anthropometric measures

Weight and height were measured using mechanical weight machine with height measuring scale (RGZ-160), also waist and hip circumferences were measured using a holtain flexible metallic tape to determine the waist/hip ratio (WHR).

BMI ranges according to WHO classification [6]:

- ❖Underweight: BMI <18.5 kg/m^2
- ❖Normal weight: BMI 18.5-24.9 kg/m^2
- ❖Overweight: BMI 25-29.9 kg/m^2
- ❖Obese: BMI ≥30 kg/m^2
- ❖Obesity
  - class I 30-34.9 kg/m^2
  - Class II 35-39.9 kg/m^2
  - Class III ≥40 kg/m^2

WHR ranges according to WHO classification [7]:

- ❖Underweight: WHR >0.80 in female, >0.72 in male
- ❖Normal weight: WHR is <0.90 in female, <0.80 in male.
- ❖Overweight: WHR 0.80-0.84 in female, 0.90-0.99 in male.
- ❖Obese: WHR > 0.85 in female, >1.00 in male.

C) Vit. D measurement

This study adopted the quantitative determination of total 25 vit. D level in human serum by fluorescence immunoassay (FIA) using Ichroma vit. D tool.

The cut-off (reference range) of vitamin D [8]:

- ❖<10 ng/ml (<25 nmol/l) - deficiency
- ❖10-30 ng/ml (25-75 nmol/l) - insufficiency
- ❖30-100 ng/ml (75-250 nmol/l) - sufficiency

Ethical consideration

Participant's consent was taken after explaining to them the nature and goals of our study that may help them and the community for better health care, promising the participants to protect their private information but only the necessary information will be used to serve for educational purposes only, for which participants fully understood and agreed.

Statistical analysis

Analysis of data was carried out using SPSS (statistical package for social sciences) version 25. Data were presented as tables and figures, frequency, percentage, mean, standard deviation and range (minimum-maximum values). The significance of association of qualitative data was tested using parson chi-square test (X2-test) with fisher exact test used whenever applicable. Statistical significance was considered whenever the P value was equal or less than 0.05.

Results

A total of 100 obese women were recruited for this study. The age of participants ranged from 20-50 years with age group of 30-39 years forming the highest percentage 37%, 73% lived in Risafa side of Baghdad city, 67% were unemployed, 42% of the sample had finished college education and 75% of the sample were currently married.

The mean±SD of the BMI of the participants was found to be (34.83±3.99). More than half (60%) of the participants were of class 1 obesity (BMI = 30-34.9 Kg/m^2), 29% of class 2 obesity (BMI = 35-39.9 Kg/m^2) and the remaining were of class 3 (BMI ≥40 Kg/m^2). While less than half (47%) had high WHR ≥0.85. The mean±SD of the WHR of the participants was found to be (0.8±0.17) as showed in figures 2 and 3.

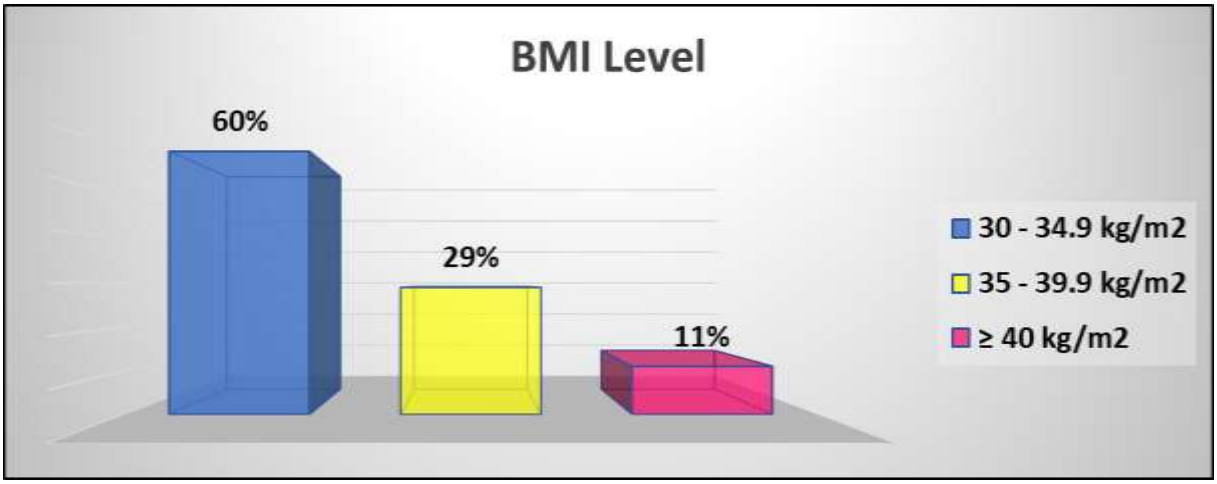


Figure 2. Distribution of study participants by body mass index (BMI)

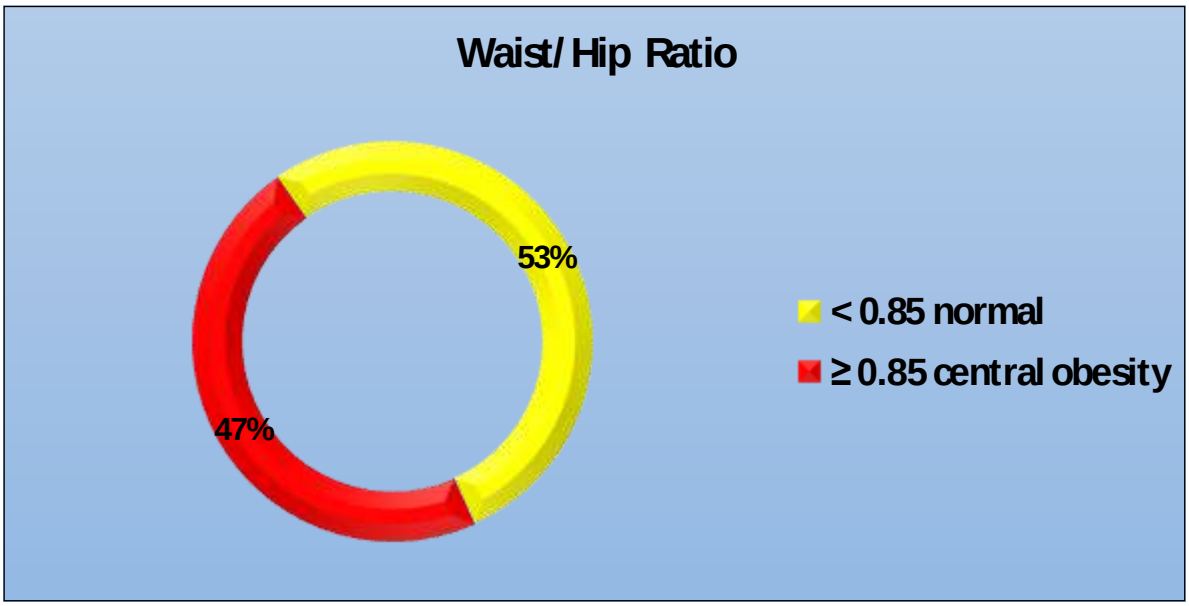


Figure 3. Distribution of study participants by waist/hip ratio (WHR)

The mean±SD of vit. D values of the participants was found to be (16.05±6.9) ng/ml; and only two women from the sample had sufficient vit. D level of more than 30 ng/ml who were excluded from the association tests for its validity (Figure 4).

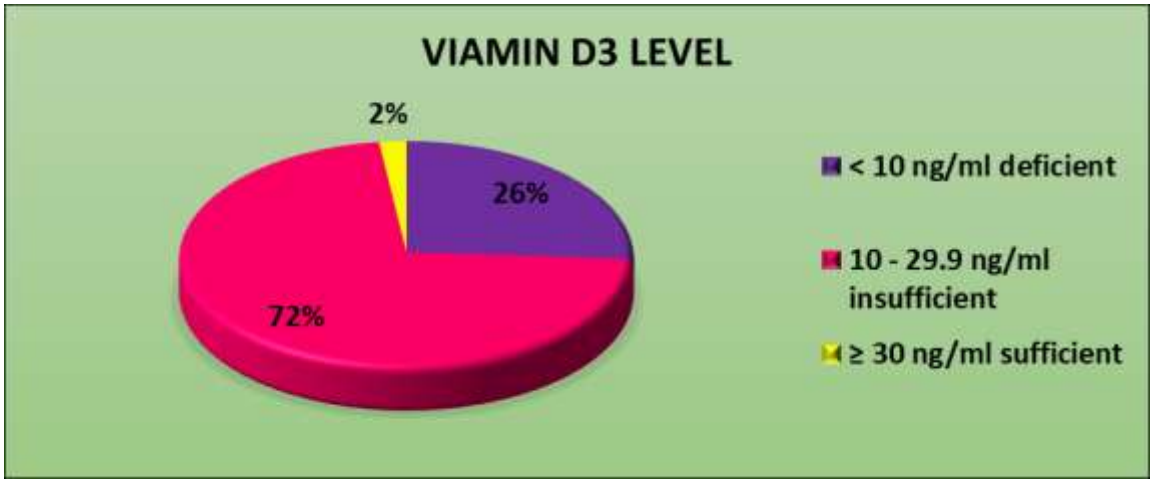


Figure 4. Distribution of study participants by vitamin D level

Although no significant association was found between vit. D levels and the other socio-demographic characteristics, but vit. D was more deficient among unemployed (31.3%), those with primary education (35.7%), and unmarried women (33.3%) (Table 1).

Table 1. Distribution of vitamin D level of study participants according to socio-demographic characteristics

Variable		Vitamin D Level <10 n= 26 (%)	Vitamin D Level 10-29.9 n= 72 (%)	Total (%) n= 98	P value
Age (Year)	20-29	5 (18.5)	22 (81.5)	27 (27.6)	**0.013**
	30-39	16 (43.2)	21 (56.8)	37 (37.8)	
	≥40	5 (14.7)	29 (85.3)	34 (34.7)	
Address	Risafa	19 (26.8)	52 (73.2)	71 (72.4)	0.981
	Karkh	7 (25.9)	20 (74.1)	27 (27.6)	
Occupation	Unemployed	21 (31.3)	46 (68.7)	67 (68.4)	0.308
	Student	1 (20.0)	4 (80.0)	5 (5.1)	
	Employee	4 (15.4)	22 (84.6)	26 (26.5)	
Years of education	Primary or less	10 (35.7)	18 (64.3)	28 (28.6)	0.670
	Middle	4 (22.2)	14 (77.8)	18 (18.4)	
	Secondary	3 (25.0)	9 (75.0)	12 (12.2)	
	College or higher	9 (22.5)	31 (77.5)	40 (40.8)	
Marital status	Currently married	18 (24.3)	56 (75.7)	74 (75.5)	0.429
	Unmarried	8 (33.3)	16 (66.7)	24 (24.5)	

Chi-square test (x2-test)

A significant association was found between vit. D levels and beverages drinking with highest deficiency being in participants who reported drinking beverages 17 (40.5%) (P≤ 0.01). Although no significant association was found between vit. D levels and other lifestyle

factors, but vit. D was more deficient among those wearing hijab 23 (28%), those without sun exposure 17 (32.7%) compared to those reported exposed to the sunlight P=0.142. Those reported eating fast food 15(33.3%), not eating fish 7(29.2%), not drinking milk 17 (34.0%), and had sedentary lifestyle 23 (28.4%) were deficient with vit. D more but without a significant association. out of the 100 participants 82% were wearing hijab, 47% reported sufficient sun exposure, 14% were smokers, 47% of the sample reported eating fast food, (75%) eating fish, 50% drinking milk, and 42% drinking beverage (on daily basis). Also, 83% of the sample reported having sedentary life style (Table 2).

Table 2. Distribution of vitamin D level of study participants according to their lifestyle

Variable		Vitamin D Level <10 n= 26 (%)	Vitamin D Level 10-29.9 n= 72 (%)	Total (%) n= 98	P value
Wearing hijab	Yes	23 (28.0)	59 (72.0)	82 (83.7)	0.548
	No	3 (18.8)	13 (81.2)	16 (16.3)	
Sun exposure	Yes	9 (19.6)	37 (80.4)	46 (46.9)	0.142
	No	17 (32.7)	35 (67.3)	52 (53.1)	
Smoking	Yes	3 (21.4)	11(78.6)	14 (14.3)	0.754
	No	23 (27.4)	61 (72.6)	84 (85.7)	
Fast food	Yes	15 (33.3)	30 (66.7)	45 (45.9)	0.160
	No	11 (20.8)	42 (79.2)	53 (54.1)	
Eating fish	Yes	19 (25.7)	55 (74.3)	74 (75.5)	0.763
	No	7 (29.2)	17 (70.8)	24 (24.5)	
Drinking milk	Yes	9 (18.8)	39 (81.2)	48 (49.0)	0.087
	No	17 (34.0)	33 (66.0)	50 (51.0)	
Drinking beverages	Yes	17 (40.5)	25 (59.5)	42 (42.9)	**0.007**
	No	9 (16.1)	47 (83.9)	56 (57.1)	
Sedentary lifestyle	Yes	23 (28.4)	58 (71.6)	81 (82.7)	0.547
	No	3 (17.6)	14 (82.4)	17 (17.3)	
Drug history	Yes	3 (23.1)	10 (76.9)	13 (13.3)	0.930
	No	23 (27.1)	62 (72.9)	85 (86.7)	

Fisher's Exact Test

Indirect significant (P=0.012) correlation was found between vit. D values of the participants and WHR as 51% of them had WHR <0.85, while non-significant indirect correlation was found with their BMI values (Figures 5 and 6).

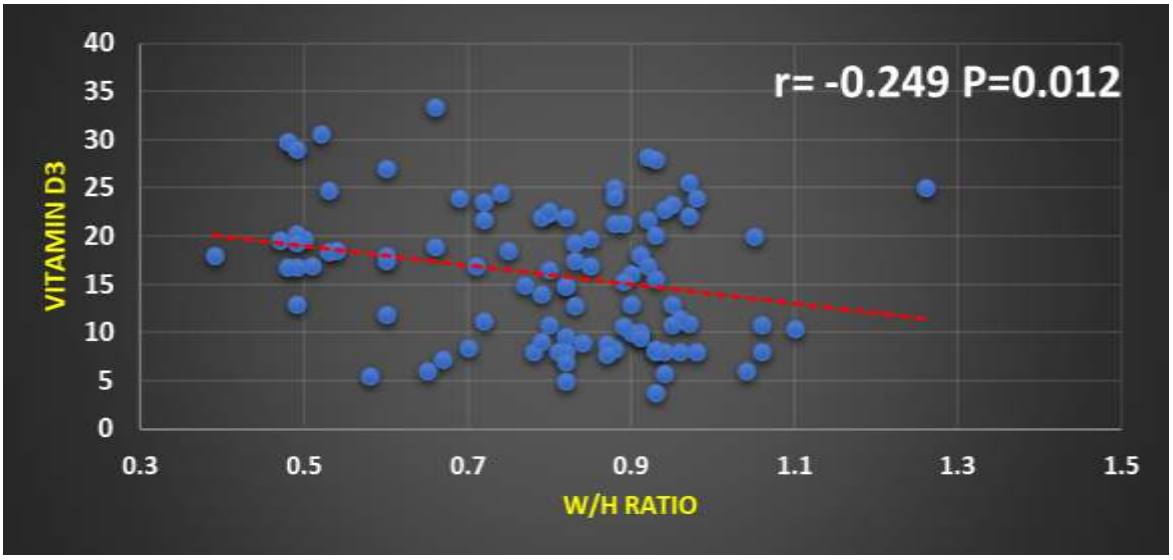


Figure 5. The correlation between vitamin D and waist/hip ratio

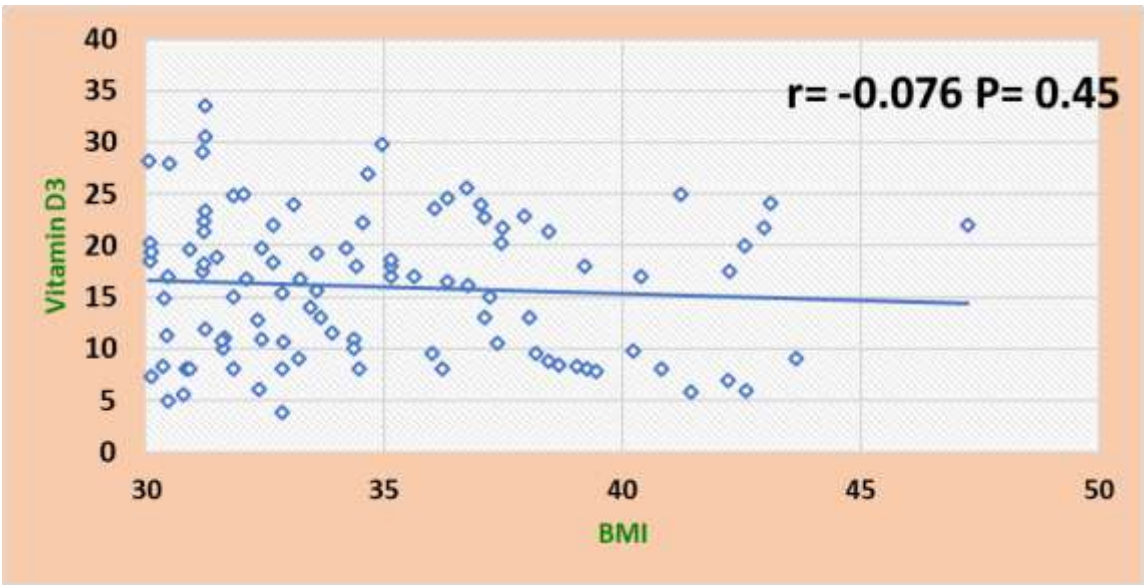


Figure 6. The correlation between vitamin D and body mass index

Discussion

Vit. D and its metabolites are known to play directly or indirectly an important role in many body functions through a wide range of mechanisms and interactions. Because of this, vit. D drew the attention of many researchers trying to determine the type and direction of the relation between vit. D and its possible affecting factors especially its diagnosis and treatment are relatively achievable. This cross-sectional descriptive study spotted the light on the relation between vit. D and BMI with other effecting factors, the most accurate way to measure vit. D using total 25-hydroxy level in human serum by blood test, fluorescence immunoassay (FIA). The advantages of this method include higher sensitivity detection of the analyte, simplified reagents and simpler assay designs [9]. The study sample consisted of 100 obese healthy females, most of them were aged between (30-39) years, finished college, married, multigravida and unemployed. Clearly

vit. D deficiency is highly prevalent among this study subjects, 98% of them are below serum vit. D (29.9 ng/ml), and 26 % of study subjects were below serum vit. D level (10 ng/ml) with mean serum vit. D level (16.05±6.9 ng/ml). These results agreed with a recent study conducted in Basrah during 2019 [10] on 57 healthy subjects, in a study conducted in Karbala during 2016 [11] on 60 healthy women, and in study was conducted in Qatar in 2017 [12] conducted on 102342 subjects. These results of high vit. D level deficiency among different study samples is not surprising since these were mentioned in many previous studies [10-11] locally, regionally [12] and worldwide [13], which necessitate for further workup to reveal vit. D relation to its determinant factors especially the modifiable factors, and this was the focus of the current study. This study found a significant association between serum vit. D level and participants age at P value of (0.013) with highest deficiency among (30-39) years old, these results are in consistent with studies conducted in Kufa city 2018 [14] and in Duhok study [15]. On the other hand, Basrah [10], Qatar [12] and Oman [13] studies found serum vit. D level increased with increasing age. These variations in the studies results may be attributed to the sample size, subjects' age range, methods of assay use and other factors intersecting with each other's. In the current study, no significant correlation between serum vit. D and BMI was found, this is in accordance with results of previous studies in Kufa [14], Babil [16] and Oman [13], in contrast to other studies that found a significant inverse correlation in Baghdad [17], Qatar [12] and Spain [18]. Positive correlation was found between vit. D and BMI in studies from Basrah [10] and Iran [19]. On other hand, in this study, central obesity seems to play an important role in serum vit. D level as shown by the significant correlation between serum vit. D level and WHR, as with the increase of WHR, there was decrease in serum vit. D level. This may be explained by the fact that adipose tissue as it is a storage site for vit. D, sequester more vit. D as it is increased, limiting its serum availability. These results were consistent with previous studies conducted in Oman [13], Spain [18] and Boston [20], in contrast to other studies in Babil [16] and Iran [21], which found no association with WHR. Ultra violet light (UV) provided by sunlight is essential for endogenous vit. D synthesis produced by skin; outdoor sun exposure and physical activity important to increase vit. D concentration. In this study, results showed that vit. D deficiency was more among those not exposed to sunlight, and reporting sedentary lifestyle despite non-significant association, but was similar to previous studies that found a positive linear association between physical activity and sun exposure with vit. D level in Basra [10], Karbala [22], Qatar [12], and France [23]. Apparently, sun exposure and hijab wearing clothes were adherently related, vit. D level was lower in those wearing hijab, clearly for the same reason of low sun exposure. This finding was also reported in previous studies from Basra [10], Oman [13], and Iraq [24]. The later study from Iraq in 2016 also found that hand and face in hijab wearing participants exposed to sunlight is not enough for sufficient vit. D synthesis [24]. This current study found no association between smoking and vit. D level, in contrast to Basra study [10] that found an increase of vit. D level in smoking participants that was attributed to the outdoor activity of this group. In the current study, no association was found between dietary intake and vit. D, this agreed with study conducted in Jordan 2016 [24] while In korea 2017 [25] found that a positive association between dietary intake and vit. D concentration. In this current study, it was found that vit. D was significantly more deficient among carbonated beverages consumers (P≤0.001), this agreed with study in Canada 2014 [26] whom found that women with higher intake beverages had lower concentration of vit. D. carbonated beverages contain a higher concentration of fructose, which derived from corn syrup and used as sweetener. Fructose may have an effect on vit. D metabolism.

In conclusion, no association between vitamin D and body mass index was found. There is indirect correlation between vit. D and central obesity (WHR) was found. Highest deficiency of vit. D were among age group (30-39) years old

and among those who drinking carbonated beverages.

Authors recommend that multi-level educational strategies should be implemented to prevent and intervent in the modifiable risk factors for vit. D deficiency in the community as for adequate sun exposure and avoiding carbonated beverage. Also, enhancement of routine vit. D checking among risky groups in the community. In addition to promote people for achieving optimal weight through increasing physical activity and adopting healthy life style and foods.

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Author contribution

Dr. Abdulkader: collection of data, statistical analysis, interpretation and writing of manuscript. Dr. Al-Saffar: the research plan and study design, final revision of the manuscript.

Conflict of interest

The author declares no conflict of interest.

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