# Prevalence and Correlates of Vitamin D Inadequacy in a Sample of Iraqi People

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## Abstract

**Background:** Vitamin D had been identified as a common metabolic/endocrine abnormality. Middle East countries had a very high rate of vitamin D inadequacy, vitamin D deficiency was associated with non-communicable and infectious diseases.

**Objective :** To identify the prevalence of Vitamin D level and its correlates among Iraqi people in Al-Hilla city-Babylon province

**Methods** :. A cross-sectional study was conducted on a convenient sample of individuals from all age groups and both genders who attended eight primary health care centers and individuals in Al-Hilla city\Babylon province\Iraq, the study period was started from May through October , 2019. A pretested questionnaire was used for data collection , the questionnaire included information regarding socio demographic characteristics of participants and their history of chronic diseases. The following measurements were done: level of serum vitamin D , blood pressure, blood sugar , body weight and weight and the serum of vitamin D .

**Results: The** sample included 188 participants their mean age was 64.8 ± 17.25 years.The female to male ratio 1.7:1, More than half of participants (56%) resident in urban areas . Vitamin D mean level was (20.7 ng/mL ± 14.9 SD). The vast majority (80%) of the sample have vitamin D inadequacy in which (66% have deficiency and 14% have insufficiency), while 37 (20%) of the sample have vitamin D adequacy.

A significant inverse relationship between vitamin D serum level and hypertension, type two diabetes mellitus, increase body weight.

**Conclusion:** there was a high prevalence of vitamin D inadequacy among Iraqi people mainly in females, a significant association between low vitamin D level and hypertension, type two diabetes mellitus, and obesity.

***Keywords:*** *Prevalence, Vitamin D inadequacy, associated factors, Iraq*

## Introduction

Vitamin D inadequacy is a high priority public health problem globally and affected all ages. Vitamin D inadequacy (both deficiency and insufficiency) was a problem even in sunny countries. This problem particularly was high in the Middle East, especially among females, it had been estimated that 20–100% of USa, Canadian and European elderly men and women were vitamin D deficient. Additionally, other age groups such as; children, young adults and the middle aged are also at risk of vitamin D deficiency. [1,2] Prevalence of Vitamin D deficiency was common among elders nursing home residents [3] Low levels of vitamin D have been implicated in a wide variety of conditions and highly prevalent in the geriatric population, including fractures, functional limitations, cancer, cardiovascular disease.

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Evidence suggests that vitamin D supplementation may decrease mortality rates [4]. The prevalence of vitamin D inadequacy varied not only between different countries, but there were intra country variations. It may be as low as 3% [5] and 11.3% [6] or as high as 87.8% and 98% [8,9]. Information from different studies on the vitamin D serum levels among Iraqis over the last years indicate a resurgence of vitamin D inadequacy in otherwise healthy and non-healthy members both males and females in all age groups of the population [10-21]. An inverse relationship was identified between vitamin D serum levels and a number of chronic disease-predisposing conditions such as metabolic syndrome insulin resistance , hypertension ,and obesity [22-25]. This suggests that vitamin D insufficiency/deficiency may play a role at the early stages of the natural history of many chronic diseases [26,27]. This study was done to measure the prevalence of vitamin D in adequacy among Iraqi population and to identify the associations between vitamin D levels and certain chronic diseases such as hypertension , type two diabetes mellitus , and obesity or overweight**.**

## Methodology

This is across sectional observational descriptive study which includes a convenient sample of apparently healthy individuals from all age groups and both genders living in Al- Hilla City, Babylon province, Iraq, the period of the study started from the first of May through September 2019, the sample size was calculated according to the sample size calculation equation with 95% confidence level, 188 individuals who are the attendees of eight randomly selected primary health care centers and the residents of Babylon elders home are participated voluntarily in this study after obtaining their informed oral consents , after explaining the objectives and the measurements procedures of the study . This study was approved by the Ethics Committee of College of nursing - University of Babylon. A pretested questionnaire( contained questions about demographic characteristics of the participants , their past medical history and history of individual life style habits), this tool was used to interview the participants . Measurements of mean systolic and diastolic blood pressure of each participant were done single handy by one of the researchers. Blood pressure was measured in the sitting position. Patients were kept seated quietly for at least 5 min in a chair**.** Blood pressure was measured using a sphygmomanometer with an appropriate cuff the cutoff values, blood pressure more than 140\90 considered hypertension or those who diagnosed previously as hypertensive and taking antihypertensive drugs. Peripheral venous blood samples were collected from each participant to measure Serum level of Vitamin D which was measured by chemo immunoassay method (maglumi instrument) and the random blood sugar, blood sugar level above 200mg/dL considered diabetic as well as individual who was previously diagnosed as type 2 diabetes mellitus. Vitamin D levels are divided into three categories .deficient < 20ng/ml, insufficient between 23-29ng/ml and the normal level is 30-100 ng/ml [28,29]. body weight and height were measured to calculate body mass index according to the WHO classification [30].

Data were analyzed by using (spss) version (23). Continuous quantitative data were expressed as mean and ±SD, while non-parametric numerical data were expressed as median , with the value of categorical data presented as a number (percentage), t student test and analysis of variance were calculated . Chi square test was done and the Kruskal–Wallis and Mann–Whitney tests were used to compare non-parametric and quantitative variables between groups. P-value < 0.05 considered statistically significant.

## Results

A sample of 188 individuals from different settings were participated their mean age ± SD was 64.8 ± 17.25 years ranged from 3 to 89 years; older people ≥ 60 years formed 83% of them as shown in figure [1]. Female to male ratio 1.7:1, figure [2]. More than half of participants (56%) resident in urban, figure [3]. Vitamin D mean level was (20.7 ng/mL ± 14.9 SD). The vast majority 151 (80%) of the sample have vitamin D inadequacy in which (66% have deficiency with level ≤ 20 ng/mL and 14% have insufficiency with level 21-29 ng/mL), while 37 (20%) of the sample have vitamin D adequacy with level ≥ 30 ng/mL, figure [4].

Table 1: shows the mean rank differences for vitamin D level according to the demographic characteristics depending on Mann- Whitnny ranking statistical test, women have asignificant low vitamin D level, vitamin D inadeqaucy increased significantly with advancing age while no significant difference was detected in place of residency.

Mean ± SD differences of blood pressure, blood sugar and BMI among participants with vitamin D inadequacy . Low vitamin D is associated significantly and inversly with blood pressure both systolic and diastolic together with high random blood sugur and the Body Mass Index table(2).Table (3) and figures 6,7,8 and figure 9 reveal the inverse correlation between serum vitamin D and blood pressure (systolic , diastolic), blood sugar and the Body Mass Index respectively while there is a positve correlation between vitamin serum leve and age (figure 5).

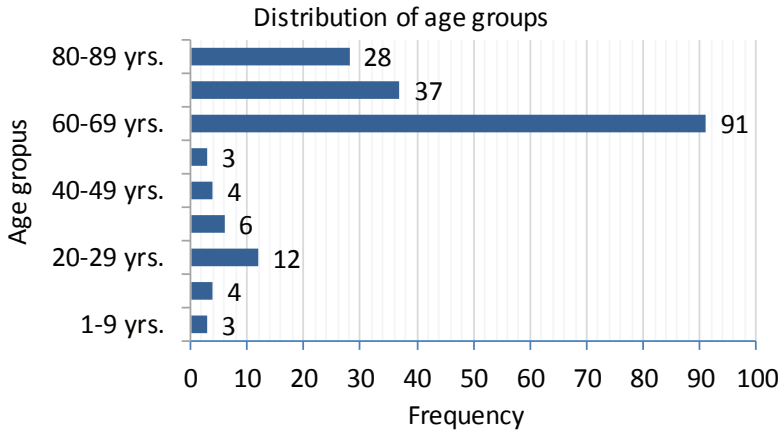
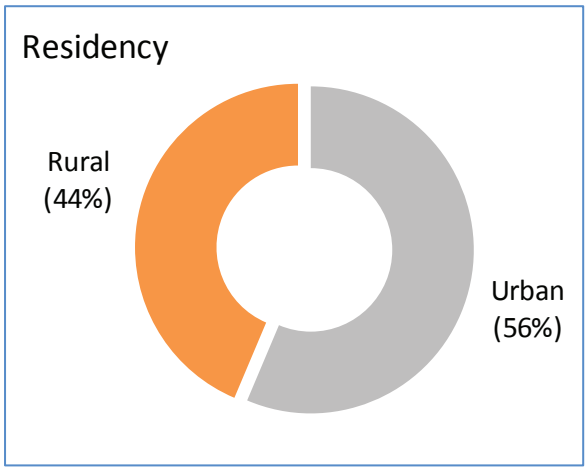



**Figure 1: Frequency distribution of sample according to age groups (N=188).**



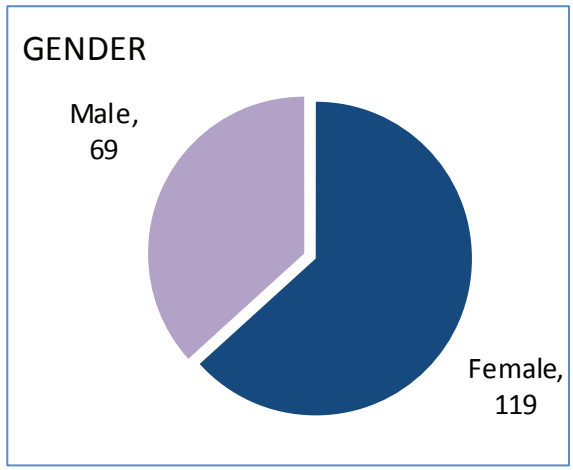




**Figure 2: Gender distribution (N=188) Figure 3: Urban-rural distribution (N=188)**

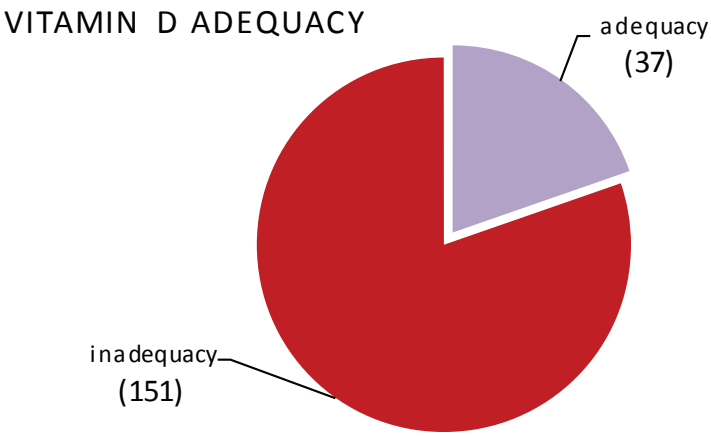



**Figure 4: Sample distribution based on vitamin D adequacy (N=188)**

**Table 1: Mean rank differences for vitamin D level according to the demographic characteristics (N=188).**

| Demographic , | | Vitamin D level | Mann-Whitney U | Sig. |
|---|---|---|---|---|
| Gender | male (n=69) | 106.51 | 3277.000 | 0.021 |
| | female (n=119) | 87.54 | | |
| Age groups (years) | ≤ 59 (n=32) | 74.69 | 1862.000 | 0.024 |
| | > 60 (n=155) | 98.56 | | |
| Residency | urban | 93.47 | 4236.500 | 0.767 |
| | rural | 95.84 | | |

**Table 2: Mean ± SD differences of blood pressure, blood sugar and BMI among participants with vitamin D sufficiency, insufficiency and deficiency (N=188).**

| Measurements , | Vitamin D levels | | | F* | Sig. |
|---|---|---|---|---|---|
| | Sufficiency (n=37) | Insufficiency (n=27) | Deficiency (n=124) | | |
| Systolic BP (mmHg) | 130 ± 10.7 | 138 ± 14.6 | 144 ± 16.2 | 13.44 | 0.0001 |
| Diastolic BP (mmHg) | 84.0 ± 5.7 | 86.0 ± 7.7 | 90.5 ± 9.1 | 9.83 | 0.0001 |
| blood sugar level (mg/dL) | 135 ± 47.6 | 176 ± 53.6 | 216 ± 64.7 | 26.97 | 0.0001 |
| BMI | 26.8 ± 4.8 | 30.3 ± 7.3 | 35.1 ± 8.8 | 15.90 | 0.0001 |

* ANOVA Test

**Table 3: Correlation of Vitamin D level with age, systolic/ diastolic blood pressure, blood sugar and BMI (N=188)**

| Correlation Coefficient* | | Variables , | | | | |
|---|---|---|---|---|---|---|
| | | **Age** | **Systolic** | **Diastolic** | **B. sugar** | **BMI** |
| Vit. D | r | 0.156 | -0.386- | -0.384- | -0.429- | -0.348- |
| | Sig. | 0.033 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Age | r | | 0.054 | 0.026 | -0.014- | -0.200- |
| | Sig. | | 0.461 | 0.726 | 0.848 | 0.010 |
| Systolic | r | | | 0.792 | 0.555 | 0.290 |
| | Sig. | | | 0.0001 | 0.0001 | 0.0001 |
| Diastolic | r | | | | 0.515 | 0.231 |
| | Sig. | | | | 0.0001 | 0.0001 |
| B. sugar | r | | | | | 0.350 |
| | Sig. | | | | | 0.0001 |
| * Correlation is significant at the 0.05 level (2-tailed). | | | | | | |

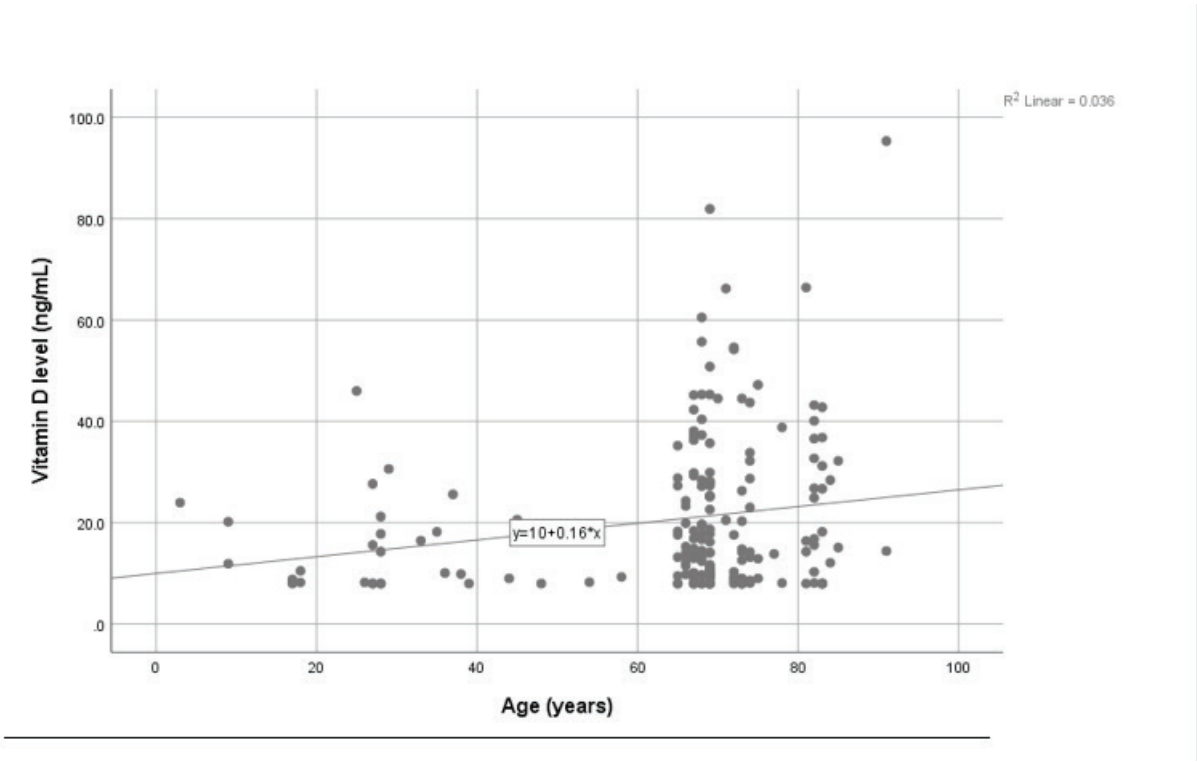



**Figure 5: Correlation between age (years) and vitamin D level (ng/mL), (N=188).**

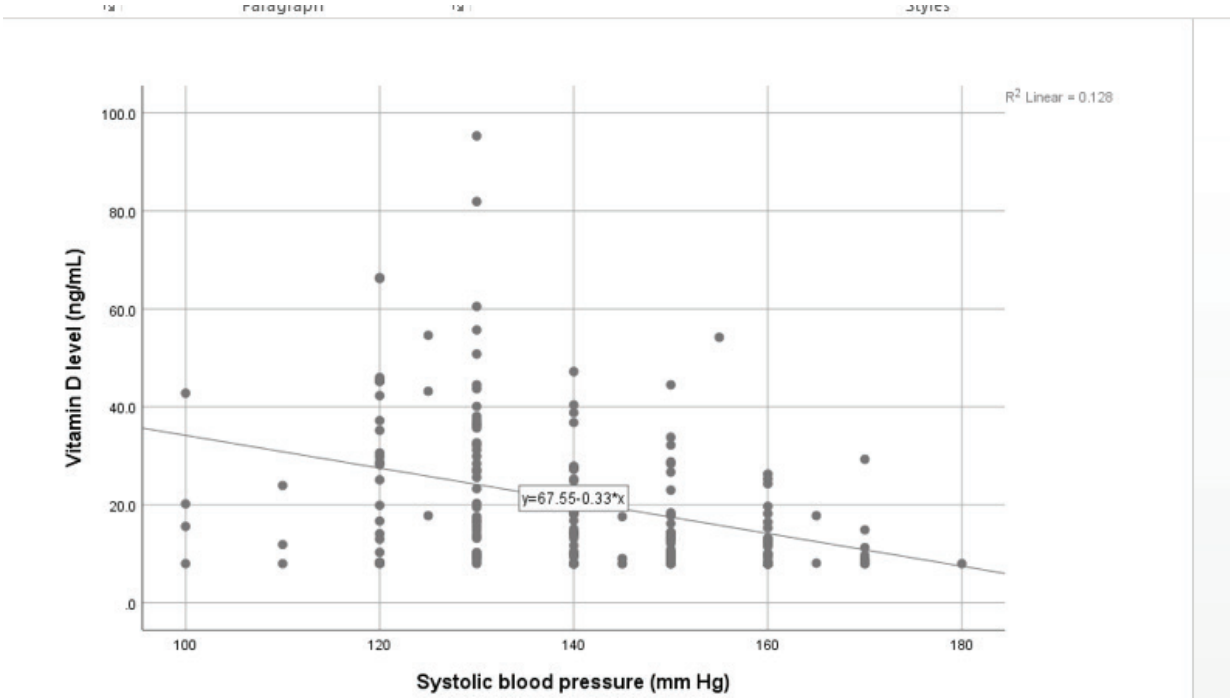



**Figure 6: Correlation between systolic blood pressure (mm Hg) and vitamin D level (ng/mL), (N=188).**

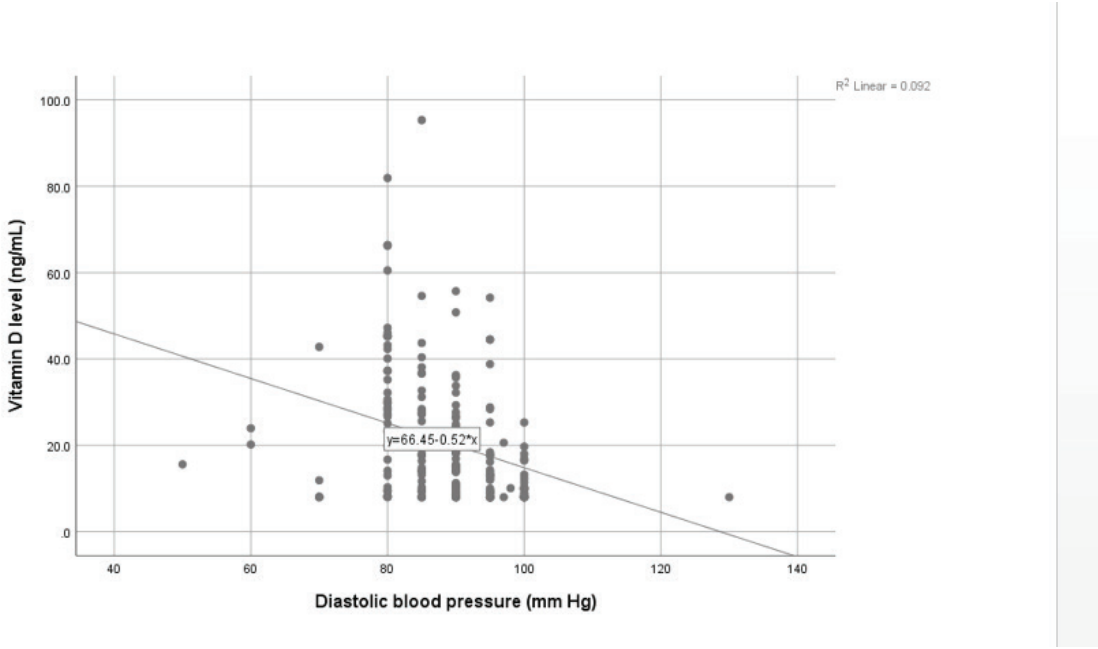



**Figure 7: Correlation between diastolic blood pressure (mm Hg) and vitamin D level (ng/mL), (N=188).**

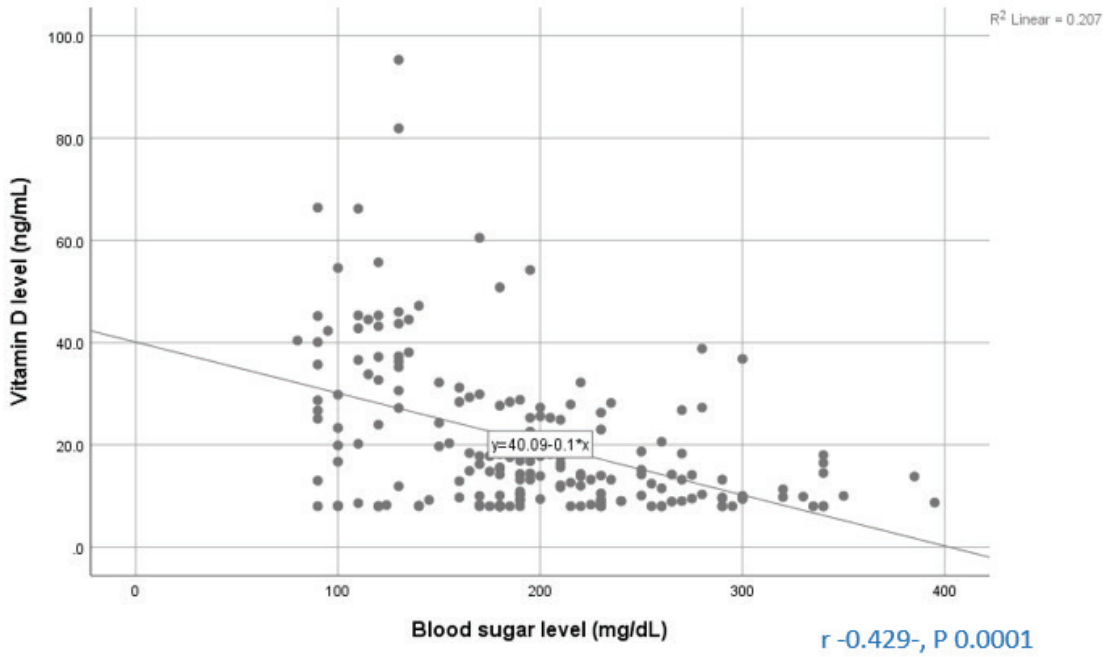



**Figure 8: Correlation between blood sugar level (mg/dL) and vitamin D level (ng/mL), (N=188).**

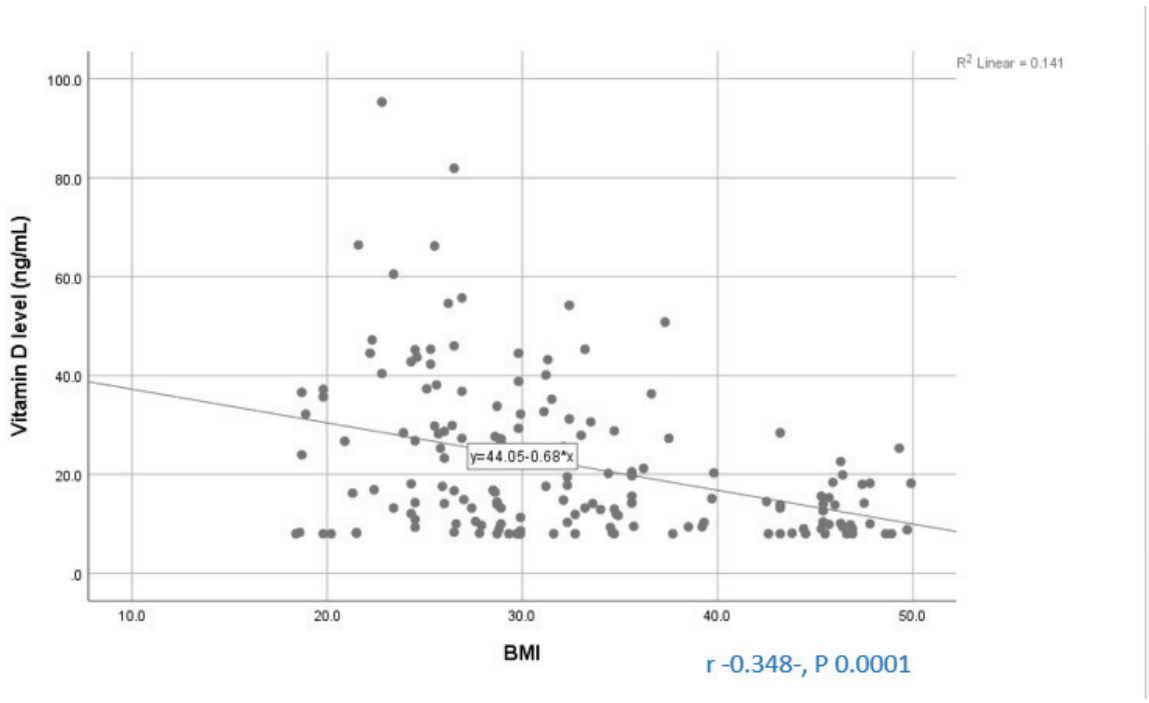



**Figure 9: Correlation between BMI and vitamin D level (ng/mL), (N=164). **

## Discussion

This study reveals that there is alarming high prevalence(80%) of vitamin D inadequacy in a sample of Iraqi people, vitamin D inadequacy varied between different countries, It may be as low as 3% [5] and 11.3% in Irbid in Jordan [6] or as high as 87.8% among healthy Saudi Arabian men [7]. About 90% of the Qatari population may have insufficient levels of serum vitamin

D [27]. in the United States, approximately 25% were at risk of vitamin D insufficiency and 8% were deficient [17]. Our estimate is similar, if not higher, than that reported from other Arab and Gulf countries like United Arab Emirate [32] .Prevalence among adolescent Saudi girls and women indicates the severity of the insufficiency with up to 80% [33]. This high prevalence of low vitamin D status is thought to be linked to socio-cultural factors, the habit of not fortifying dairy products, and poor vitamin D supplementation [32-35]. The prevalence of vitamin D inadequacy in this study is slightly less than what was reported in recent study among females in Karbala Province – Iraq [14] but it is a bit higher than what was reported by other local study conducted on women at their reproductive age [18]. The finding of the current study depicts an inverse correlation between low serum vitamin D and both systolic and diastolic blood pressure, random blood sugar and obesity this findings are similar to the findings of other studies [15,16,26,27].

In conclusions alarming high prevalence of vitamin D deficiency among Iraqi people specially among females have been demonstrated , a positive significant associations between vitamin D inadequacy and hypertension, type 2 diabetes mellitus and obesity, we suggested the carrying out of large scale, studies that might lead to effective reforming actions by policy makers in Iraq regarding vitamin D food fortification and the establishment of interventional preventive local program. Health professionals, policy makers, and the general public in Iraq should be aware of the high prevalence of vitamin D deficiency and the associated health risks.

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**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the University of Babylon and all experiments were carried out in accordance with approved guidelines.

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