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# Ischemic Heart Diseases and Vitamin D3 Deficiency, Baghdad, Iraq, 2022

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## ABSTRACT

**Introduction**: Ischemic heart diseases (IHD) are prevalent worldwide and they are considered a rapidly increasing common reason for death. Vitamin D3 plays a role in cardiovascular health and its deficiency is also prevalent.

**Objectives**: To measure the prevalence of vitamin D3 deficiency among Iraqi patients with IHD and to explore any potential relation of this deficiency with other variables.

**Patients and Methods:** Vitamin D3 level was determined among fifty patients with IHD who attended the Iraqi Center for Heart Diseases in Baghdad, to evaluate its role in this group of patients through a cross-sectional study.

**Results:** The mean age of all participants was 55.2 ± 8.9 years, while for those with vitamin D3 deficiency was 57.55 ± 7 years. 66% of the participants were males, 82% were living in urban areas, 58% were smoking, 76% had a family history of IHD, 52% and 62% of them were hypertensive and diabetic sequentially, 58% had a high total cholesterol, 22% had a low HDL, 38% had a high LDL, and 42% had a high TG level. The vitamin D3 mean value for the ischemic participants was 21.8 ng/dl. Among those patients, 14% had sufficient vitamin D3 levels, 24% had insufficient levels, and 62% had a deficiency. **Conclusion:** The deficiency of vitamin D3 exists in 62% of Iraqi ischemic patients. Vitamin D3 deficiency is associated with an increased prevalence of IHD.

**Keywords:** Ischemic heart diseases, Vitamin D3 deficiency, Ischemia.

## INTRODUCTION

Ischemic heart diseases (IHD) are at a great rate increasingly common reason for death in the world. An imbalance between oxygen supply and demand results in the insufficient status of oxygen within the cardiac muscles [(1)]. Vitamin D3 at a recent time has been suggested to play a crucial role in a wide extent of organ functions, involving cardiovascular health; nevertheless, the cardiovascular evidence-base about that is still restricted [(2)]. IHDs are caused by arteriosclerosis, then arteries that deliver blood to the heart itself may lead to angina pectoris or myocardial infarction [(3)]. The main risk factors for it are hypercholesterolemia, hypertension, diabetes, and other factors [(4)]. The clinical syndromes of IHD give rise to more mortality, morbidity, and financial burden in many societies than any other group of diseases [(5)].

The old patients are at a very high risk of bad outcomes as a result of acute coronary syndrome, and nutritional deficiencies, including vitamin D3 deficiency, may also play a role. The vitamin D3 extra-skeletal effects "particularly, its role in maintaining a healthy cardiovascular system" is receiving increased attention [(6)]. Many studies have revealed that vitamin D3 deficiency might be related to increased cardiovascular disease risk, including heart failure, hypertension, and IHD [(7)]. This deficiency generally is highly prevalent worldwide, and it is a treatable condition that has been possibly associated with coronary artery disease and its risk factors [(8)]. Moreover, vitamin D3 deficiency is prevalent among patients with myocardial diseases since sun-induced vitamin D synthesis in the skin and the dietary intake of that vitamin among those patients are commonly insufficient. Studies have also reported that children with rickets who have severe heart failure could be successfully treated by vitamin D3 supplementation with the addition of calcium. In adults, about all patients with heart failure reveal reduced 25-OH vitamin D levels (the primary circulating form of vitamin D). Many prospective studies reported that vitamin D3 deficiency is an independent risk factor for mortality; this result from heart failure and sudden cardiac death as many prospective studies reported. Various effects of vitamin D on the contractility, electrophysiology, and structure of the heart propose that vitamin D3 deficiency might be a causal factor for myocardial diseases. Data from interventional trials are uncommon and critically required to explain whether vitamin D3 supplementation is beneficial for the treatment of myocardial diseases or not [(9)].

Recent evidence supports a possible relationship between vitamin D3 deficiency and diabetes mellitus, metabolic syndrome, hypertension, peripheral vascular disease, coronary artery disease, and heart failure. Furthermore, several studies proposed that vitamin D3 deficiency was associated with decreased survival and a significant risk of CV disease. On the other hand, recent studies noticed that vitamin D3 supplementation was significantly associated with better survival, specifically in patients with proven deficiency [(10)]. The vitamin D receptors have a wide tissue distribution that includes vascular smooth muscle, cardiomyocytes, and endothelium. There are many studies suggesting that deficiency of this vitamin is related to incident cardiovascular disease [(11)]. Observational researches



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strongly relate that deficiency with different cardiovascular diseases beyond defects in calcium and bone metabolism. Therapies directed at the replacement of that vitamin may be useful due to vitamin D3 deficiency is common. Nowadays, although, studies evaluating vitamin D3 supplementation are few. Some studies propose that this vitamin is now known as important for cardiovascular health through various mechanisms, and its deficiency is a possible risk factor for many CV disease processes as well as ischemia [12].

**Objectives:**

(1) To measure the prevalence of vitamin D3 deficiency in Iraqi patients with IHD.

(2) To look for any potential association between vitamin D3 deficiency and ischemic heart diseases with other variables among those patients.

## METHODOLOGY

**Study design:** It is a cross-sectional study.

**Study setting:** This work was achieved in Iraqi Center for Heart Diseases in Medical City Complex, Baghdad, Iraq.

**Study population:** All Iraqi patients with IHD who were admitted to the above center.

**Sampling design:** Convenience sampling was achieved for patients who were admitted to the mentioned center for three months (April-June 2022), in which 50 participants were chosen.

**Exclusion criteria:** Those patients with prevalent CV diseases (such as heart failure, arrhythmia, stroke, etc.) and renal diseases (serum creatinine > 1.6 mg/dl) were not included.

**Tools of the study**

The study involved looking for some personal, sociodemographic, medical, and laboratory variables among the included cases, which are: - (1) Age, sex, marital status, living area, occupation, education, smoking, and family history for IHD. (2) The level of serum vitamin D3 was determined and considered as follows; sufficient if ≥ 30 ng/dl, insufficient if 21-29 ng/dl, and deficient if ≤ 20 ng/dl [13]. (3) Measurements of lipid profile; including total cholesterol, high-density lipoprotein cholesterol (HDL), low-density lipoprotein cholesterol (LDL), and Triglyceride (TG) were done. High total cholesterol level (if > 200 mg/dl), Low HDL level (if < 40 mg/dl), high LDL level (if > 160 mg/dl), and high TG level (if > 150 mg/dl) were determined [14, 15]. (4) Status of having hypertension (if blood pressure ≥140/90 mmHg or already receiving antihypertensive drugs) or diabetes (if fasting blood sugar ≥126 mg/dL or already receiving antidiabetic drugs) was also considered [14, 15].

**Ethical and administrative considerations:**

**Approval to engage in this work and informed written consent were taken from each participant in this study. Confidentiality was approved for each participant. Administrative permission in the study setting was taken from Ethics Board of Ministry of Health, Baghdad, Iraq.**

**Statistical analysis:**

1) The SPSS (statistical package for social sciences), was used for coding, processing, and analyzing the collected data. 2) Both qualitative and quantitative data were summarized and presented as tables and charts. 3) Means, standard deviations (SD), and other statistics were calculated for the quantitative data, while frequencies and percentages were calculated for the qualitative data. 4) Both t-test and chi-square tests were done to assess any statistical association between the status of vitamin D3 deficiency and other variables among the ischemic enrolled participants. 5) A P-value of 0.05 or less was considered to be significant.

## RESULTS

The mean age among the participants in this study was 55.28 years as appeared in **Table 1**.

**Table (1):** Age distribution among the participants, N=50

| | Mean | Median | SD | Minimum | Maximum |
|---|---|---|---|---|---|
| **Age (years)** | 55.28 | 57 | 8.9 | 31 | 71 |

The mean value of participants' serum level of vitamin D3 was 21.8 ng/dl as appeared in **Table 2**. The status of vitamin D3 levels among the ischemic enrolled participants in this study was as follows: 7 patients (14%) had a sufficient level, 12 patients (24%) had an insufficient level, and 31 patients (62%) had a deficit level of vitamin D3. The situation of the studied patients concerning whether they have vitamin D3 deficiency or not is appeared in **Figure 1** (where patients with both sufficient and insufficient levels were considered not to have a deficiency).

**Table (2):** Distribution of vitamin D3 level among the participants, N=50

| | Mean | Median | SD | Minimum | Maximum |
|---|---|---|---|---|---|
| **Serum level of vitamin D3 (ng/dl)** | 21.81 | 18.9 | 7.7 | 13.1 | 41.7 |

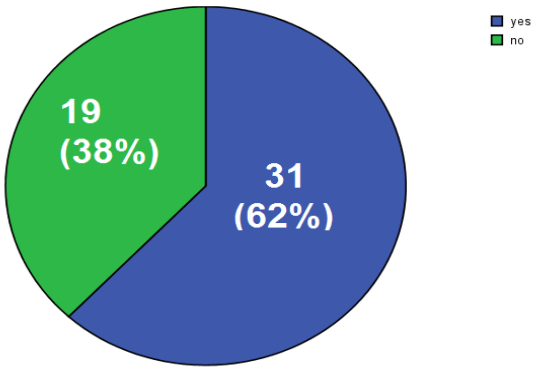


**Figure (1):** The status of vitamin D3 deficiency among the participants, N=50.

The distribution of variables of the socio-demographic characteristics and the medical and laboratory conditions among the ischemic enrolled participants is illustrated in Table 3, which also shows the association between vitamin D3 status and those variables. Also, the age of patients, their type of living area, and the presence of hypertension among them are statistically associated with vitamin D3 deficiency.

**Table (3):** The statistics, numbers, and percent among the participants regarding their sociodemographic characteristics, medical and laboratory conditions, with the association between the status of vitamin D3 deficiency and those variables, N=50.

| Variable | | Vitamin D3 | | Total no. (%) | Statistical test | p-value |
|---|---|---|---|---|---|---|
| | | Deficit n=31 | Not deficit n=19 | | | |
| **Age (years)** | | 57.55 ± 7 | 51.58 ± 10.6 | 50 (100%) | t= 2.38 | 0.02 * |
| **Gender** | Male | 22 | 11 | 33 (66%) | $\chi^2$= 0.89 | 0.34 |
| | Female | 9 | 8 | 17 (34%) | | |
| **Marital status** | Single | 8 | 12 | 20 (40%) | $\chi^2$= 6.88 | 0.07 |
| | Married | 11 | 3 | 14 (28%) | | |
| | Divorced | 6 | 2 | 8 (16%) | | |
| | Widowed | 6 | 2 | 8 (16%) | | |
| **Living area** | Urban | 24 | 17 | 41 (82%) | $\chi^2$= 1.16 | 0.28 * |
| | Rural | 7 | 2 | 9 (18%) | | |
| **Education** | Read and write | 3 | 1 | 4 (8%) | $\chi^2$= 7.28 | 0.06 |
| | Primary | 11 | 4 | 15 (30%) | | |
| | Secondary | 13 | 5 | 18 (36%) | | |
| | Institute/university | 4 | 9 | 13 (26%) | | |
| **Occupation** | No job/household | 8 | 5 | 13 (26%) | $\chi^2$= 1.98 | 0.57 |
| | Governmental work | 9 | 8 | 17 (34%) | | |
| | Own job | 6 | 4 | 10 (20%) | | |
| | Retired | 8 | 2 | 10 (20%) | | |
| **Smoking** | Yes | 18 | 11 | 29 (58%) | $\chi^2$= 0.00 | 0.991 |
| | No | 13 | 8 | 21 (42%) | | |
| **Family history of IHD** | Yes | 24 | 14 | 38 (76%) | $\chi^2$= 0.09 | 0.76 |
| | No | 7 | 5 | 12 (24%) | | |
| **Hypertension** | Yes | 20 | 6 | 26 (52%) | $\chi^2$= 5.12 | 0.02 * |
| | No | 11 | 13 | 24 (48%) | | |
| **Diabetes** | Yes | 19 | 12 | 31 (62%) | $\chi^2$= 0.017 | 0.89 |
| | No | 12 | 7 | 19 (38%) | | |
| **High level total cholesterol** | Yes | 19 | 10 | 29 (58%) | $\chi^2$= 0.36 | 0.54 |
| | No | 12 | 9 | 18 (42%) | | |
| **Low level HDL** | Yes | 5 | 6 | 11 (22%) | $\chi^2$= 1.63 | 0.201 |
| | No | 26 | 13 | 39 (78%) | | |
| **High level LDL** | Yes | 11 | 8 | 19 (38%) | $\chi^2$= 0.21 | 0.64 |
| | No | 20 | 11 | 31 (62%) | | |
| **High level TG** | Yes | 16 | 5 | 21 (42%) | $\chi^2$= 3.09 | 0.07 |
| | No | 15 | 14 | 29 (58%) | | |

$\chi^2$: Chi-square, *: Significant.

## DISCUSSION

This study included (50) participants who were suffered from IHD and admitted to Iraqi Center for Heart Diseases in Baghdad Medical City. Their mean age of them was 55.2 ± 8.9 years; this could be due to the risk age group of ischemia which is usually above 45-55 years [3].

In this work, among the enrolled ischemic patients, the vitamin D3 deficiency prevalence was 62% which is relatively high. This finding is approximate to that of a similar Iraqi case-control study carried out in Erbil "at the north" which was 67,6% [16], also to that of a Jordanian cross-sectional study which was 69.7% [17], and to that of an Indian cross-sectional study which was 67.5% [8]. Other ischemic patients in our study appeared to have either sufficient levels of vitamin D3 (14%) or insufficient levels (24%). The association between vitamin D3 deficiency and age appeared to have a statistical significance, the older aged patients lie more in the group of vitamin D3 deficiency than the group of those who have no such deficiency. This significant relation between age and vitamin D3 deficiency was agreed with an Iraqi study [16].

The socio-demographic characteristics of the enrolled ischemic patients in the current study appeared as following: two thirds of them were male, 40% of them were single, most of them (82%) were living in urban areas, 36% and 30% of them graduated from secondary and primary school respectively, and about one-third of them had a governmental work. All those socio-demographic characteristics have no significant association with vitamin D3 deficiency except the type of living area, where patients living in urban areas had vitamin D3 deficiency more than those who are living in rural areas; this could be attributed to the more complicated lifestyles among people living inside cities and their type of consumed diet. Regarding the medical characteristics among the participating patients, more than half of them (58%) were smoking, most of them (76%) had a family history of IHD, and 52% and 62% of them were hypertensive and diabetic sequentially. Among those medical characteristics, only the status of having hypertension appeared in this study to have a significant association with vitamin D3 deficiency, where patients who had hypertension seemed to have a deficiency of vitamin D3 more than those who had no hypertension, in contrast to other studies done in Canada and Iran which showed no such significant relation [18, 19].

Concerning the obtained lipid profile among the studied patients, only 58% of them had a high level of total cholesterol, 22% of them had a low serum level of HDL, 38% of them had a high level of LDL, and 42% of them had a high serum level of TG. In this work, all the obtained values of lipid profile for the participants appeared not to have a statistical association with vitamin D3 deficiency, in contrast to an Iranian study which showed an association between total cholesterol level and vitamin D3 deficiency [19], while an Indian study showed that only the total cholesterol level among the lipid profile values has such relation, but the low HDL, high LDL, and high TG levels have no significant association with vitamin D3 deficiency (as the findings of our study) [8].

## CONCLUSION

(1) The deficiency of vitamin D3 is existing in 62% of Iraqi ischemic patients, this prevalence is considered high. (2) An increased prevalence of IHD vitamin is associated with vitamin D3 deficiency. Moreover, the variables that appeared to have a significant association with vitamin D3 deficiency among patients with IHD are age, type of living area, and hypertension.

## RECOMMENDATIONS

(1) Correction of vitamin D3 deficiency among IHD patients.

(2) Screening of vitamin D3 levels among elderly ischemic patients, who are living in urban areas and suffering from hypertension. (3) Further similar widespread national studies in all Iraqi governorates are required.

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**Author Contribution:**
Besmah Mohammed Ali, Najah Salman Abd, and Ziyad Hazim Ibrahim contributed equally to the present work.

**Conflict of Interest:**
The author declares no conflict of interest.

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