

Original article

## Prevalence and Deficiency of Vitamin D, Vitamin B12, and Calcium, and the Effect of a Limited Preventive Intervention among Adults in Gharyan City and Surrounding Areas

Khadija Hamed\*<sup>ID</sup>, Aisha Abdullah<sup>ID</sup>, Asila Al-Abyad<sup>ID</sup>, Farah Al-Thalouthi<sup>ID</sup>, Noha Bilhaj<sup>ID</sup>, Aya Talib<sup>ID</sup>, Ibtihaj Abdul Salam<sup>ID</sup>, Noor Al Karati<sup>ID</sup>, Khadija Al-Harari<sup>ID</sup>

Department of Clinical Nutrition, College of Health Sciences, University of Garyan, Garyan, Libya

Corresponding email. [khadijaalbriky@gmail.com](mailto:khadijaalbriky@gmail.com)

### Abstract

In recent years, we have observed a widespread deficiency in essential nutrients, most notably vitamin D, B12, and calcium, across all age groups. This has led to an increase in chronic diseases and mortality rates among adults. Consequently, we have investigated the causes of these deficiencies and sought to develop preventative, therapeutic, and awareness-raising strategies to mitigate this phenomenon and reduce the prevalence of these nutrient deficiencies among adults. The results showed that vitamin D deficiency was the most common (~58.1%) in both sexes, specifically (56.25 %) in males and (59.26%) in females. This was followed by calcium deficiency (48.96%) in males and (54.81%) in females, and vitamin B12 deficiency (16.5%) in males and (11.01%) in females. This study involved collecting random samples of vitamin D, B12, and calcium test results from routine health records of medical laboratories in Gharyan and its suburbs for 704 adults aged between 40 and 80 years, and estimating the prevalence of these vitamin deficiencies. A general paper questionnaire was administered to 100 adults to identify their financial and social status, the most common chronic diseases they suffer from, the types of vitamins they are deficient in, and the methods used to treat this deficiency, 55% of participants reported using dietary supplements. Then we selected 7 adults who had a severe vitamin deficiency under study, and we carried out therapeutic and nutritional interventions and introduced a separate dietary regimen consisting of dried figs and olive oil. These cases were followed up for a period of 3 to 4 months, and the rate of increase in these vitamins and the percentage of all cases were recorded. We found that the greatest improvement was observed in the case that relied on the use of dried figs and olive oil. The results showed a significant increase in both vitamin D and B12 levels. We also noted that the elevated iron stores (ferritin) in the blood results were associated with increased vitamin D levels. In addition, most cases that relied on supplements, injections, or tablets showed a significant increase in vitamin D levels.

**Keywords:** Vitamin D Deficiency, Vitamin B12 Deficiency, Calcium Deficiency, Dried Figs, Olive oil.

### Introduction

Dietary supplements play an important role in maintaining normal vitamin D levels, which in turn helps prevent chronic diseases in the elderly and thus reduces mortality rates [1]. Most recent studies confirm that daily supplementation for people with deficiencies provides a sound and safe approach [2]. Dr. Joan Manson confirmed that adults only need small amounts for bone health and other health benefits [3]. The elderly and pregnant women are among the groups most susceptible to vitamin B12 and vitamin D deficiencies because they require larger amounts of these vitamins [4]. Most studies have shown that vitamin D deficiency is widespread across all age groups, reaching up to 94% [5]. Using nutritional supplements in recommended daily doses is a sound and safe procedure to avoid deficiencies in essential nutrients in case of deficiency [6], as low levels of vitamin D are an indicator of increased mortality rates among adults [1].

While some global studies have confirmed that the use of vitamin D supplements did not reduce the occurrence of cancer and heart disease [7], calcium supplements are the most cost-effective option for those suffering from heartburn [8]. Most recent studies have found that about 50% of the elderly suffer from vitamin D deficiency [9], which represents a major problem among this group and leads to increased weakness and deterioration of health status. Vitamin D deficiency has been linked to many chronic diseases, such as diabetes and heart disease [10,11]. The World Health Organization indicates the need to meet the nutritional needs of the elderly to promote health and prevent chronic diseases [2]. A recent study in the city of Gharyan showed that 55% of the population suffers from vitamin D deficiency and 50% suffer from calcium deficiency [12]. Exposure to sunlight is an important source for the biosynthesis of vitamin D in the body, which is needed by the elderly, especially in winter [13]. Fortified foods rich in micronutrients provide most of the nutrients that help meet the basic needs of the elderly [14].

**Methods**

This study involved collecting the results of vitamin D, B12, and calcium tests for adults aged 40 to 80 years. The total sample size was approximately 704 cases, distributed between 435 serum tests for vitamin D and calcium, and 269 serum tests for vitamin B12. Vitamin D and B12 deficiency levels were assessed in a sample of male and female patients using the percentage of deficiency, the range, the standard deviation, Arithmetic average. The chi-squared was used to investigate the associations between age and vitamin D and B12 deficiency, t-tests for Sex differences, and Pearson Correlation Coefficients. In addition to blood tests, a general survey was conducted on 100 people of the same age group, and information was collected regarding their socioeconomic status, diet, and level of health awareness regarding the use of nutritional supplements. Regular medical checkups were also conducted to detect and treat deficiencies early.

The study also included a limited preventive intervention for 7 people suffering from vitamin D and B12 deficiency. A specific health regimen was implemented for each case. The regimens relied on the use of nutritional supplements (tablets, injections), the application of a healthy diet, the integration of a diet and supplements, as well as the adoption of a dietary approach consisting of dried figs and olive oil. The treatment plan for each case continued for 3 months with monitoring of the increase and improvement in vitamin levels on a monthly basis.

**Results**

**Descriptive Statistics** The study sample consisted of 704 participants (350 males, 354 females) 94) The following three--with a mean age of  $55.6 \pm 12.4$  years (range 40 present the descriptive statistics for vitamin D, calcium, and Tables Females by sex and for the total sample B12 stratified Vitamin showed slightly lower mean vitamin D and higher mean B12 compared to males, but the differences were not statistically significant.

**Table 1. Descriptive Statistics of Female Participants**

Variable	Vitamin D (ng/mL)	Calcium (mg/dL)	Vitamin B12 (pg/mL)
N	221	221	133
Range	55.93	5.9	1095.7
Minimum	2.57	6.0	100.3
Maximum	58.5	11.9	1196
Mean	18.2	8.9	458.3
Std. Dev.	12.4	1.2	325.7

Vitamin D deficiency below 30 ng/mL reached 59.62 % among females and 56% among males. Calcium deficiency (<8.5 mg/dL) was present in 54.81% of females and 48.96% of males. Vitamin B12 deficiency (<200 pg/mL) was found in 11.01% of females and 16.5% of males. No statistically significant associations were found between sex and vitamin D status ( $\chi^2 = 0.78$ ,  $p = 0.677$ ), nor between sex and vitamin B12 status ( $\chi^2 = 0.15$ ,  $p = 0.698$ ). Age groups (40–60, 61–80, >80) did not show significant associations with vitamin D ( $\chi^2 = 1.37$ ,  $p = 0.850$ ) or vitamin B12 ( $\chi^2 = 1.35$ ,  $p = 0.509$ ). Additionally, there was no significant association between vitamin D and vitamin B12 deficiencies among the 269 participants with measurements of both ( $\chi^2 = 1.99$ ,  $p = 0.158$ ). Independent t-tests revealed no significant differences between males and females for vitamin D ( $t = 1.05$ ,  $p = 0.294$ ), calcium ( $t = 1.48$ ,  $p = 0.139$ ), or vitamin B12 ( $t = 1.39$ ,  $p = 0.166$ ). Weak but statistically significant positive correlations were observed between vitamin D and calcium ( $r = 0.21$ ,  $p < 0.001$ ) and between vitamin D and vitamin B12 ( $r = 0.12$ ,  $p = 0.048$ ). Age did not correlate significantly with either vitamin D ( $r = -0.09$ ,  $p = 0.062$ ) or vitamin B12 ( $r = -0.04$ ,  $p = 0.512$ ).

**Table 2. Descriptive Statistics of Male Participants**

Variable	Vitamin D (ng/mL)	Calcium (mg/dL)	Vitamin B12 (pg/mL)
N	214	214	136
Range	54.4	10.3	1473
Minimum	3.7	1.6	100
Maximum	58.1	11.9	1573
Mean	19.5	9.1	512.6
Std. Dev.	13.1	1.4	340.2

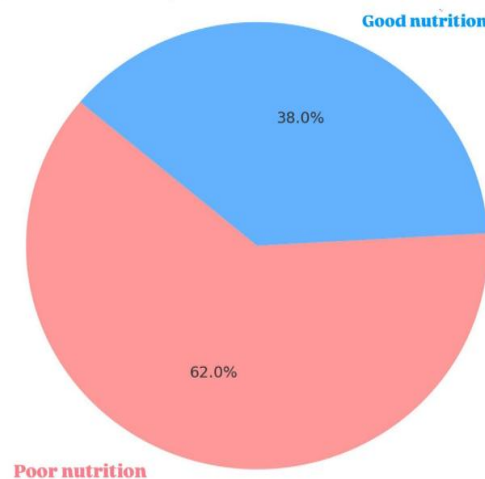
Based on the survey data from 100 participants, we found that only 38% follow a healthy diet, while 62% do not pay attention to healthy eating habits. 55% of participants reported taking nutritional supplements, while 45% do not. Figure 3 illustrates the distribution of financial status by age group, and Figures 4 and 5 show the age distribution in relation to chronic diseases.

**Table 3. Descriptive Statistics of All Participants**

Variable	Vitamin D (ng/mL)	Calcium (mg/dL)	Vitamin B12 (pg/mL)
N	435	435	269
Range	56.03	10.3	1473
Minimum	2.57	1.6	100
Maximum	58.6	11.9	1573
Mean	18.8	9.0	485.5
Std. Dev.	12.8	1.3	333.2

Figure 1 shows that 38% of participants follow healthy diets, while 62% do not have any specific diet. This is one of the reasons for the deficiency in essential nutrients, but it is due to a lack of health awareness or financial and social circumstances.

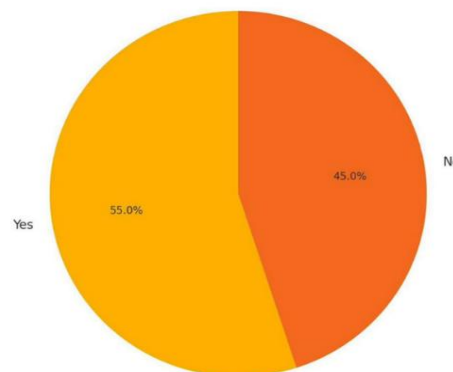
**The ratio of good nutrition versus poor nutrition**



**Figure 1. Distribution of nutritional status (good vs. poor nutrition)**

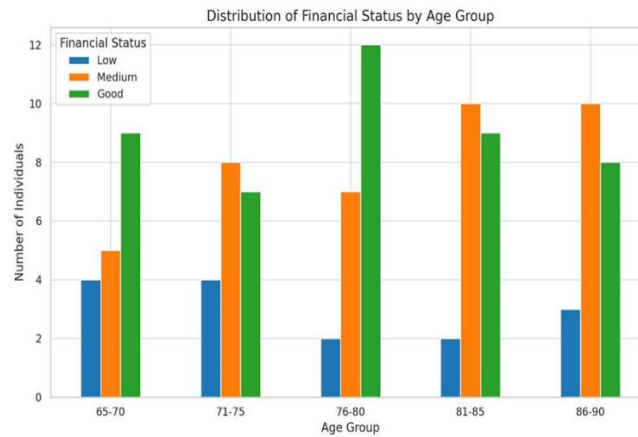
Figure 2 shows that 55% of participants reported using dietary supplements, while 45% did not, citing concerns about potential harm and side effects.

**Percentage of People Who Use Vitamins vs. Don't Use Vitamins**



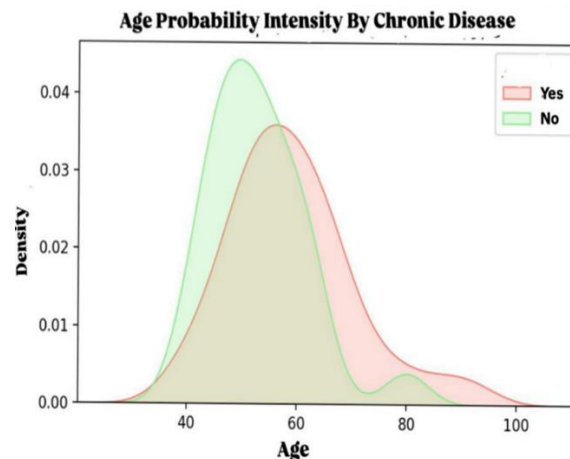
**Figure 2: Distribution of vitamin supplement use among participants**

Figure 3 explains the correlation between marital status and age, showing that the 65-70 and 76-80 age groups had a good financial situation, while the 71-75 and 81-90 age groups had an average financial situation, and marital status could not be directly linked to advancing age.



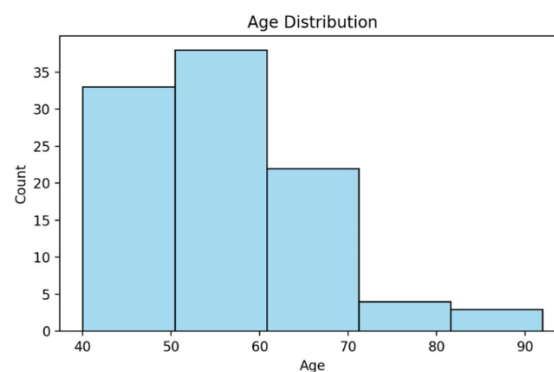
**Figure 3: Distribution of financial status by age group**

We observe the age distributions among chronic diseases, and a significant proportion of those affected are older adults (Figure 4).



**Figure 4: Age probability intensity by chronic disease**

In Figure 5, we observe that most participants are between 50 and 60 years old. This is due to the sample not being distributed equally across all age groups.



**Figure 5: Age distribution within the sample**

A practical interventional component was conducted on a subset of elderly participants (n=7) with confirmed vitamin D deficiency to evaluate the efficacy of different therapeutic and dietary approaches over a 3–4-month follow-up period. Participants were allocated into four intervention groups based on the type and intensity of the intervention.

**Group 1 (Pharmaceutical + Dietary Intervention):** A 56-year-old female with severe vitamin D deficiency (13.9 ng/mL) received monthly vitamin D injections, weekly oral supplements, and lifestyle modifications including sunlight exposure and dietary adjustments. After three months, serum vitamin D levels increased to 36.33 ng/mL (161% improvement), accompanied by complete resolution of chronic bone pain, fatigue, and mobility limitations.

**Group 2 (High-Dose Supplementation):** Three participants received high-dose vitamin D<sub>3</sub> either orally (50,000 IU/week) or intramuscularly (200,000 IU/month). The results demonstrated clear and significant improvements in vitamin D status across several cases and intervention groups. In the first case, vitamin D levels rose from 9.0 to 70.0 ng/mL, accompanied by an increase in ferritin from 195.9 to 221.7 µg/L, suggesting a possible role of vitamin D in iron metabolism. In the second case, vitamin D increased from 14.99 to 58.85 ng/mL over four months, while in the third case, levels improved from 5.0 to 27.52 ng/mL within two months.

In Group 3, which involved a natural intervention of dried figs combined with olive oil, a 49-year-old female consumed two dried figs with one tablespoon of olive oil daily on an empty stomach, without any other dietary changes or supplements. After three months, her vitamin D levels rose from 3.9 to 30.5 ng/mL, representing a 682% improvement. Monthly monitoring also revealed increases in vitamin B12 from 417 to 569 pg/mL and calcium from 8.8 to 9.0 mg/dL. These findings highlight the nutritional value of this simple formula, which relies on the healthy fats in olive oil and the micronutrients and fiber in dried figs, contributing to enhanced vitamin D absorption.

In Group 4, two participants adopted a diet rich in vitamin D that included eggs, fatty fish, dairy products, sesame, and dried figs, combined with daily sunlight exposure for 15 to 20 minutes. One participant's vitamin D levels increased from 3.6 to 33.6 ng/mL after three months, while the other's rose from 14.0 to 50.0 ng/mL after four months of adherence to the regimen.

## Discussion

Statistics show clear differences in vitamin D, B12, and calcium deficiency levels among the elderly. Vitamin D deficiency reached 58%, B12 deficiency 14%, and calcium deficiency 52.38% for both sexes in the studied sample. This is attributed to the relationship between the levels of these vitamins and advancing age, in addition to the lack of adherence to healthy diets to prevent deficiencies in these nutrients, as well as insufficient exposure to sunlight, which is responsible for the biosynthesis of vitamin D in the skin.

Through the results of the various preventive interventions for all cases under medical follow-up, we observed a clear and significant improvement in the levels of the studied elements in all cases. The best results were obtained, with a 682% increase in vitamin D levels, in the case that adopted the dietary approach consisting of dried figs and olive oil after a three-month period of implementing the regimen. Interestingly, vitamin B12 levels also increased from 417 to 569 picograms/mL, demonstrating the nutritional value of this combination, which is represented in increased absorption of fat-soluble vitamins. The calcium level increased from 8.8 to 9.0 mg/dL in the same case involving dried figs and calcium. This increase indicates that normal vitamin D levels play important physiological roles in regulating the levels of most elements and vitamins. In other cases, suffering from vitamin D deficiency, a significant increase in ferritin was also observed, from 195.9 to 221.7, indicating the regulatory role of vitamin D in iron metabolism.

## Conclusion

This study included an important segment of society and demonstrated a severe and widespread deficiency in the studied vitamins and minerals, linked to most of the chronic diseases suffered by this group. We found no statistically significant differences between genders, with the deficiency rate reaching approximately 80%. Based on this study, we recommend the necessity of conducting regular medical tests to ensure early detection of deficiencies in these nutrients and avoid the resulting health problems. We also recommend that adults pay attention to healthy nutrition and adopt natural dietary interventions such as dried figs and olive oil to ensure normal levels of these nutrients and avoid most of the health problems associated with this deficiency

**Conflict of interest.** Nil

## References

1. Pirrotta F, Cavati G, Mingiano C, Merlotti D, Nuti R, Gennari L, Palazzuoli A. Vitamin D deficiency and cardiovascular mortality: Retrospective analysis "Siena Osteoporosis" Cohort. *Nutrients*. 2023;15(15):3303. doi:10.3390/nu15153303
2. Giustina A, Bouillon R, Dawson-Hughes B, Ebeling PR, Lazaretti-Castro M, Lips P, Bilezikian JP. Vitamin D in the older population: A consensus statement. *Endocrine*. 2023;79(1):31-44. doi:10.1007/s12020-022-03208-3
3. Manson JE, Cook NR, Lee IM, Christen W, Bassuk SS, Mora S, Buring JE. Vitamin D supplementation and prevention of cancer and cardiovascular disease. *N Engl J Med*. 2019;380(1):33-44. doi:10.1056/NEJMoA1809944
4. Allen LH. How common is vitamin B-12 deficiency? *Am J Clin Nutr*. 2009;89(2):693S-696S. doi:10.3945/ajcn.2008.26947A
5. Elwafa A, Hawad A, Mrami S. The prevalence of vitamin D deficiency among students of Faculty of Engineering and Technical Sciences in Brack Al-Shatti. *Wadi Alshatti Univ J Pure Appl Sci*. 2025;2(1):84-89. Available from: <https://waujpas.com/index.php/journal>
6. Institute of Medicine (US) Committee to Review Dietary Reference Intakes for Vitamin D and Calcium. *Dietary reference intakes for calcium and vitamin D*. Ross AC, Taylor CL, Yaktine AL, Del Valle HB, editors. Washington (DC): National Academies Press; 2011.
7. Younis MYG. Vitamin D in relation to other health disorders. *Metab Target Organ Damage*. 2024;4:13. doi:10.20517/mtod.2023.36
8. Straub DA. Calcium supplementation in clinical practice: A review of forms, doses, and indications. *Nutr Clin Pract*. 2007;22(3):286-296. doi:10.1177/0115426507022003286
9. Bischoff-Ferrari HA. Vitamin D beim geriatrischen Patienten [Vitamin D in geriatric patients]. *Internist*. 2020;61(6):535-540. doi:10.1007/s00108-020-00803-2
10. Gana W, De Luca A, Debacq C, Poitau F, Poupin P, Aidoud A, Fougère B. Analysis of the impact of selected vitamins deficiencies on the risk of disability in older people. *Nutrients*. 2021;13(9):3163. doi:10.3390/nu13093163
11. World Health Organization. *Nutrition for older persons*. Geneva: WHO; 2002.
12. Alafi AB, Ashtawa A, Al Mabrok M, Taweel A, Mohammed R, Bushra S. Prevalence of Vitamin D and Calcium Deficiency among a Sample of People in the Gharyan City, Western Libya. *AlQalam J Med Appl Sci*. 2026;9(2):348-351. doi:10.54361/ajmas.269206
13. Engelsen O. The relationship between ultraviolet radiation exposure and vitamin D status. *Nutrients*. 2010;2(5):482-495. doi:10.3390/nu2050482
14. Mangels AR. Bone nutrients for vegetarians. *Am J Clin Nutr*. 2014;100(Suppl 1):469S-475S. doi:10.3945/ajcn.113.071423