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Original Research Article

Dietary factors and associated health effects among patients with vitamin D deficiency

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ABSTRACT

Background: Vitamin D deficiency is prevalent among men and women alike and is often left untreated in developing countries. Vitamin D deficiency and its associated health problems can be controlled if dietary intake is properly maintained. The study objective was to understand the dietary habits and the problems faced by patients of a hospital in Dhaka due to vitamin D deficiency.
Methods: Total 133 patients were selected through convenience sampling, and their vitamin D levels were collected from the medical records. Other data were collected from a previously set questionnaire.
Results: Total 56 (42.1%) were men, and 77 (57.9%) were women among the patients. 42 (31.6%) of the vitamin D-deficient people were obese in this study. 17 (12.8%) people still had severe (level <12 ng/ml) vitamin D deficiency even after receiving treatment and needed more. The egg and meat intake among the participants was satisfactory, but milk intake was low among them. 88 (66.1%) patients took vitamin D supplements at the time of study. However, there is no significant association between dietary intake and vitamin D deficiency. Vitamin D status is associated with chronic health problems, such as hypertension and diabetes mellitus, as well as with the intake of vitamin D and calcium supplements ($p<0.05$). Bone pain, joint pain, hair fall, anxiety, depression, etc., were some of the problems that the patients faced before receiving treatment.
Conclusions: Those who are suffering from vitamin D deficiency should get their bodies checked regularly to diagnose the associated diseases.

Keywords: Association, Dietary habits, Health problems, Supplements, Vitamin D deficiency

INTRODUCTION

Vitamin D, a fat-soluble micronutrient, is an important nutrient that, together with calcium, supports bone density and metabolism in the human body. It is important for people of all ages, but crucial for children and growing adolescents. The recommended amount of Vitamin D intake for an adult is around 600-800 IU, but the quantity may increase if the individual is deficient.[1] Serum concentration of active vitamin D or 25(OH)D is the main indicator of Vitamin D status in human body. There are specific ranges that indicate the sufficiency level of Vitamin D. Vitamin D level <12 ng/ml is considered to be severe vitamin D deficiency, vitamin D <20 ng/ml is classified as deficient, and the range of 30-50 ng/ml is identified as a normal level.[2] When the human body gets vitamin D from any source, like food or sunlight, it undergoes chemical changes in the liver and kidneys to have its active form.[3]

However, vitamin D deficiency has been a public health problem forever, that is seen among both men and women recently. Another problem with vitamin D deficiency among people is that it is often undiagnosed and left untreated, especially in developing countries. Studies

showed that around 47% African-Americans suffer from vitamin D deficiency. The prevalence is even higher in developing countries, such as Bangladesh, Iran, Pakistan, and India, nearly 80%.[4]

Vitamin D deficiency and the associated health outcomes can be reduced by exposure to sunlight and proper dietary intake of vitamin D-rich foods.[5] As the USA was also facing a high prevalence of vitamin D deficiency among its population, it started fortifying milk with Vitamin D to reduce it.[6] Some other associated factors with vitamin D deficiency found are gender, age, obesity, exposure to sunlight, and the presence of melanin in skin, according to studies.[7] Specific studies have shown that the prevalence of vitamin D deficiency are 90% and 92%, respectively, in Qatar and Pakistan, living with chronic liver disease.[8] Some cross-sectional studies have found an association between the presence of chronic disease, such as chronic kidney disease, in the human body and vitamin D deficiency.[9] Other diseases that are seen among vitamin D deficiency patients are cancer, autoimmune diseases, diabetes, cardiovascular problems, and tumors.[10]

The study aimed to determine the dietary factors and other associated health outcomes of vitamin D deficiency among deficient patients who were taking treatment at a hospital in Dhaka, Bangladesh. Few studies in Bangladesh examine specific dietary components, such as fatty fish or fortified dairy, and their role in vitamin D deficiency health effects. Longitudinal trials that assess interventions, like supplements or diets, on outcomes like cardiovascular disease or other non-communicable diseases are scarce in Bangladesh.

METHODS

Study area and study period

The study was done at the Bangladesh Center for Rehabilitation, Dhaka, Bangladesh, and the study duration was from May 2024 to May 2025.

Sample size

The sample size of this study was 133 people, diagnosed with vitamin D deficiency and taking treatment at the hospital at the time of the study. A total of 200 people were diagnosed with vitamin D deficiency at BCR, but only 133 people agreed to participate in our study.

Inclusion criteria

The people who were diagnosed with vitamin D deficiency before getting their treatment started were included in this study.

Sampling method

Convenience sampling, a non-probability sampling method, was used in this study for availability and participants' consent because the hospital authority did not allow us to have the list of patients taking treatment for vitamin D deficiency.

Ethical consideration

Ethical approval was taken from Govt. College of Applied Human Science as the study was a part of academics.

Data collection

Personal information was collected from respondents using a previously set questionnaire. The Food frequency questionnaire was used as the study considered the dietary habits of the participants. On the other hand, biochemical data, such as recent vitamin D levels of the patients, were collected from the medical reports from the Bangladesh Centre for Rehabilitation.

Dietary assessment method

Participants self-reported via a pre-set questionnaire, with FFQ capturing how often they consumed items like vegetables, fish, meat, eggs, and milk. Frequencies were categorized, alongside overall diet types (vegan, etc.). A vegan diet excludes all animal products (no meat, dairy, eggs, or honey), relying on plants like fruits, vegetables, grains, legumes, nuts, and seeds; a low-carb diet indicates limited carbohydrate intake, such as rice, sugar, etc. A normal diet is without restrictions, including good frequencies of vegetables, fish, and meat; a balanced diet implies a well-rounded intake across food groups (e.g., including limited eggs/milk daily alongside plants and proteins.[21]

Data analysis

The software SPSS v 27 was used for data analysis, and Chi-Square tests were done to determine the association between the variables.

RESULTS

This study was not gender, age, or occupation specific; the participants were aged 15-75 years old. According to the study results, 93% of the total study population had less sun exposure due to the indoor workplace. 77 out of 133 participants were women, and 56 of the patients were men, which indicates that men are equally at risk of being vitamin D deficient.

A normal diet is an individual taking a usual diet without any restrictions. The frequency of vegetables, fish, and meat was good among the participants. But only 6 and 7 out of 133 participants, respectively, took eggs and milk every day.

Table 1 summarizes the food-frequency patterns of vitamin D deficient patients for major vitamin D related

or generally healthy food groups: fish, red meat, whole egg, milk and milk products, and fruits/vegetables. Most participants consumed fish regularly; nearly half ate fish 2-4 times per week, and only a small minority never ate fish. Red meat intake was also frequent, with around half of the respondents consuming it 2-4 times per week and very few reporting no intake.

Table 1: Food frequency among the participants.

Variables	Category	Number	Percent
Fish intake	Never	4	3.0
	A few times a month	52	39.1
	2-4 times a week	60	45.1
	Daily	17	12.8
Red meat intake	Never	2	1.5
	A few times a month	55	41.4
	2-4 times a week	68	51.1
	Daily	8	6.0
Whole egg intake	Never	8	6.0
	A few times a month	5	3.8
	2-4 times a week	16	12.0
	Daily	104	78.2
Milk and milk product intake	Never	13	9.8
	A few times a month	36	27.1
	2-4 times a week	49	36.8
	Daily	35	26.3
Fruits and vegetables intake	Never	6	4.5
	A few times a month	2	1.5
	2-4 times a week	60	45.1
	Daily	65	48.9

Egg consumption was high; the large majority reported daily egg intake, and only a small proportion never consumed eggs. Milk intake was more modest and variable, with daily consumption reported by about 1/4th, while some participants consumed milk only a few times per month or not at all. Intake of fruits and vegetables was generally adequate, with almost half consuming them 2-4 times per week and a similar proportion consuming them daily, while only a small fraction reported very low or no intake.

Table 2 shows no association between vitamin D deficiency and diet type, as the p value is >0.05. The probable reason for the non-significance is that other factors can affect an individual's vitamin D level. According to the table, vitamin D deficiency is associated with both insulin resistance and hypertension. Apart from chronic conditions, the study found that sun exposure, clothing, sunscreen use, and vitamin D and calcium supplementation are associated with vitamin D deficiency.

Table 2: Association of vitamin D deficiency with type of diet, insulin resistance, and hypertension.

Variables	Chi-square	df	P value
Type of diet	10.573	12	0.566
Insulin resistance	17.491	6	0.008
Hypertension	9.027	3	0.029

Figure 1 illustrates the respondents' nutritional status according to the BMI range, and it shows that most of the study population with vitamin D deficiency were either overweight or obese, which indicates a double burden of malnutrition.

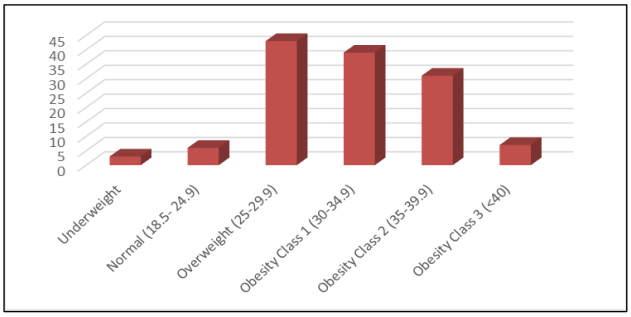

Figure 1: BMI level of respondents.

According to the pie chart (Figure 2), a total 57% of the participants were still deficient in vitamin D despite taking treatment. 13% of 133 participants were severely deficient, and only 15% reached the normal serum vitamin D level after treatment.

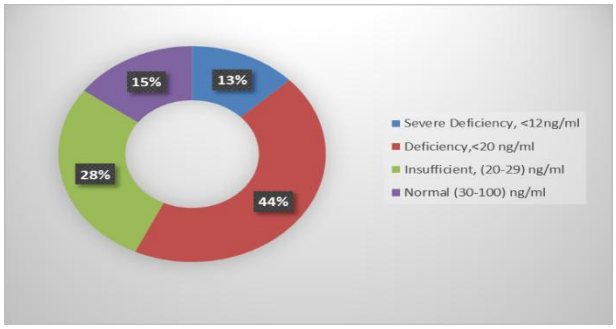

Figure 2: Vitamin D status of the participants.

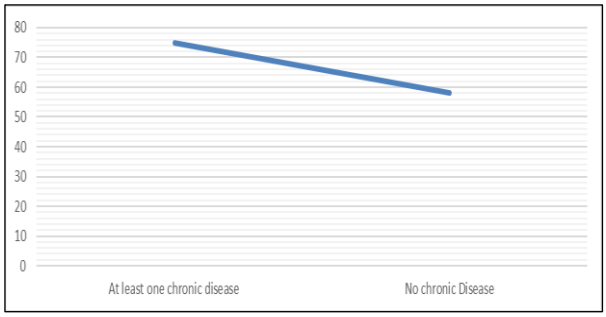

Figure 3: Presence of chronic disease among patients.

Figure 3 shows the prevalence of chronic diseases among patients with vitamin D deficiency, with 75 of 133 participants having at least one non-communicable disease. The chronic diseases among the study population are hypertension, diabetes mellitus, cancer, arthritis, and kidney disease.

DISCUSSION

A study conducted on the citizens of Tabuk, Saudi Arabia, shows a high prevalence of vitamin D deficiency, around 74.6%, nearly similar to that of this study. A possible reason for the high prevalence among the population is low sun exposure due to covered clothes.[11] Another study in Malaysia found some risk factors, such as clothing, exposure to sunlight, and the presence of melanin in skin, but they did not consider the dietary factors and chronic health outcomes associated with vitamin D deficiency, like our study.[12] A cross-sectional study done on the self-reported vitamin D-deficient patients has found the relationship between chronic diseases and vitamin D deficiency.[13]

A review article on the prevalence of vitamin D deficiency showed that the prevalence was higher among pregnant women, children, adolescents, and menopausal women, ranging from 21-75%. Rickets was prevalent among children and osteomalacia in adults due to micronutrient deficiency, but we could not find these diseases among our study participants.[14] A pilot study done in Bangladesh compared the prevalence of vitamin D deficiency among the rural and urban populations in Bangladesh. It found the prevalence was above 70% in the urban population, but the rural population had only 32% prevalence; we did not differentiate the prevalence rate in rural and urban areas.[15] Another study done on patients receiving treatment at a specific hospital also found an association of vitamin D deficiency and hypertension, like us, but our study did not find an association with cardiovascular disease or osteomalacia, as the researchers did.[16]

According to a study done in Poland, cholecalciferol is the key component for vitamin D deficiency treatment. The use or dose of cholecalciferol should depend on an individual's age, sex, medical condition, and requirement.[17] Oily fish like sardines, tuna, egg yolks, and mushrooms are some key food sources of vitamin D. Food fortification is also another way to meet the requirement of vitamin D, such as milk, soy milk, cereals, and orange juice.[18] Promoting planned meals, containing vitamin D-rich foods in each meal, will help; prioritizing breakfast and lunch for vitamin D-rich food items may reduce the deficiency of vitamin D.[19] Our study draws attention to the high prevalence of vitamin D deficiency among the population, along with their eating habits and other chronic diseases. There was no association found between vitamin D level and type of diet (p value >0.05) despite low intake of milk and eggs.

However, our study population does not represent the whole nation, and the findings cannot be generalized like most studies done in Bangladesh. It is recommended to test the serum vitamin D levels of people from both urban and rural areas, though the vitamin D test is quite expensive. The results will be more representative if the sample size is larger and the participants are selected randomly. Cross-sectional studies always limit causal and temporal relationships between dietary factors, sun exposure, and health outcomes like infections or metabolic disorders. Some confounding factors include sun exposure duration, urban living, and seasonal variations' association with fatigue and muscle pain.[20] There should be more studies done on people with insufficient vitamin D so that the risk factors can come to light, and the correct approach can be taken to improve the health situation.

According to the study results, one should try to have a balanced diet every day and take calcium-vitamin D supplements to avoid deficiency. Moreover, people should have exposure to the sun in the morning so that vitamin D can be produced in their bodies. Lesser use of sunscreen and an umbrella during sunlight may also help reduce the prevalence of vitamin D deficiency. The association between vitamin D deficiency and insulin resistance and hypertension in our study. Those who have non-communicable diseases like kidney disease, diabetes, and hypertension should get their micronutrient level checked, especially vitamin D, as they are at a high risk.

CONCLUSION

Those who are suffering from vitamin D deficiency should get their bodies checked regularly to diagnose the associated diseases.

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REFERENCES

1. Pludowski P, Holick MF, Grant WB, Konstantynowicz J, Mascarenhas MR, Haq A, Povoroznyuk V, Balatska N, et al. Vitamin D supplementation guidelines. J Steroid Biochem Mol Biol. 2018;175:125-35.
2. Bikle DD. Vitamin D metabolism, mechanism of action, and clinical applications. In: Feingold K, Anawalt B, and Boyce A, editors. Chemical Biology. South Dartmouth, MA: Endotext; 2021;319-29.

3. Palacios C, Gonzalez L. Is vitamin D deficiency a major global public health problem? J Steroid Biochem Mol Biol. 2014;144:138-45.
4. Czernichow S, Fan T, Nocea G, Sen SS. Calcium and vitamin D intake by postmenopausal women with osteoporosis in France. Curr Med Res Opin. 2010;26(7):1667-74.
5. amy AlHetar M, Mahfoudh AM, Baobaid MF, Ruhi S. Prevalence, predictors, and gender-based risk factors of vitamin D deficiency: a retrospective cross-sectional study. J Angiother. 2024;8(11):1-9.
6. Polzonetti V, Pucciarelli S, Vincenzetti S, Polidori P. Dietary intake of vitamin D from dairy products reduces the risk of osteoporosis. Nutrients. 2020;12(6):1743.
7. Dix CF, Bauer JD, Martin I, Rochester S, Duarte Romero B, Prins JB, et al. Association of sun exposure, skin colour and body mass index with vitamin D status in individuals who are morbidly obese. Nutrients. 2017;9(10):1094.
8. Kaur J, Khare S, Sizar. Vitamin D Deficiency. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025.
9. Wang H, Chen W, Li D, Yin X, Zhang X, Olsen N, et al. Vitamin D and chronic diseases. Aging Dis. 2017;8(3):346-53.
10. Siddiqee MH, Bhattacharjee B, Siddiqi UR, Meshbahur Rahman M. High prevalence of vitamin D deficiency among the South Asian adults: a systematic review and meta-analysis. BMC Publ Heal. 2021;21(1):1823.
11. Altowijri A, Alloubani A, Abdulhafiz I, Saleh A. Impact of nutritional and environmental factors on Vitamin D deficiency. Asian Pac J Cancer Prev. 2018;19(9):2569-74.
12. Gill S, Adenan AM, Thomas EE, Haleelur Rahman A, Rahim NBA, Ismail NAS. Beyond the tropics: unraveling the complex relationship between Sun exposure, dietary intake, and vitamin D deficiency in Coastal Malaysians. Nutrients. 2024; 16(6):830.
13. Wang Y, Hu C, Li Y, Liu Q, Gao L, Zhang D, Cao L. Association between serum vitamin D and the risk of diabetic kidney disease in patients with type 2 diabetes. Front Med (Lausanne). 2024;11:1445487.
14. Islam MZ, Bhuiyan NH, Akhtaruzzaman M, Allardt CL, Fogelholm M. Vitamin D deficiency in Bangladesh: A review of prevalence, causes and recommendations for mitigation. Asia Pac J Clin Nutr. 2022;31(2):167-80.
15. Priyanka AS, Progga TT, Nasher S. Comparison of vitamin D status in healthy Bangladeshi urban and rural individuals and their association with serum calcium and alkaline phosphatase: A pilot study. Nutrition Bullet. 2024;50(1):82-90.
16. Mozos I, Marginean O. Links between vitamin D deficiency and cardiovascular diseases. Biomed Res Int. 2015;2015:109275.
17. Płudowski P, Kos-Kudła B, Walczak M, Fal A, Zozulińska-Ziółkiewicz D, Sieroszewski P, et al. Guidelines for Preventing and Treating Vitamin D Deficiency: A 2023 Update in Poland. Nutrients. 2023;15(3):695.
18. Holick MF. Evidence-based D-bate on health benefits of vitamin D revisited. Dermatoendocrinol. 2012;4(2):183-90.
19. Office of Dietary Supplements. Fact Sheet: Vitamin D, 2025. Available at: https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/. Accessed 01 January 2026.
20. Alam S, Siam MM, Khan MA, Islam N, Rahman MM, Kabi SS, et al. Vitamin D Deficiency and its Clinical Implications in Adults. SAS J Med. 2025;11(9): 886-91.
21. Martyn K. Understanding nutrition research for better patient care. BMJ Nutr Prev Heal. 2025;8(1):e001241.

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