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Assessment of vitamin D in general populations

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Dedication

This study is wholeheartedly dedicated to our beloved parents, who have been our source of inspiration and gave us strength when we thought of giving up, who continually provide their moral, spiritual, emotional, and financial support.To our brothers, sisters, relatives, mentor, friends, and classmates who shared their words of advice and encouragement to finish this study. And lastly, we dedicated this search to the Almighty God, thank you for the guidance, strength, power of mind, protection and skills and for giving us a healthy life. All of these, we offer to you

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Abstract

Background : Vitamin D assessment is crucial in determining an individual's vitamin D status, which plays an important role in bone health, immune function, and overall well-being. The evaluation is typically done through the measurement of serum 25-hydroxyvitamin D [25(OH)D], which is the best indicator of vitamin D status in the body.

The aim of the study : Vitamin D assessment in the general population aims to promote overall health by preventing deficiency-related conditions and guiding effective prevention strategies.

Patient and method : I will do this study among 200 case of general populations to assessment vitamin D levels of them including all age group. By taking history and asking them about their vitamin D levels and dividing it according to my study to male and female, did you did vitamin D analysis or not ,exposure to sunlight or not , type of eating , taking of supplements or not , having chronic illness or not , having signs and symptoms or not.

Introduction

Vitamin D, often referred to as the “sunshine vitamin,” is a fat-soluble vitamin that plays a crucial role in maintaining overall health and well-being. Unlike most vitamins, vitamin D functions more like a hormone in the body, regulating essential processes such as calcium and phosphorus absorption, bone health, immune system function, and cellular growth. Its significance extends far beyond bone health, influencing everything from cardiovascular function to mental health.What sets vitamin D apart from other nutrients is its dual source: it can be synthesized in the skin through exposure to sunlight, specifically ultraviolet B (UVB) rays, and can also be obtained from certain foods and supplements. However, despite this unique ability, vitamin D deficiency is widespread, affecting millions worldwide, particularly in regions with limited sunlight or among individuals with limited outdoor exposure, darker skin tones, or specific dietary restrictions.This nutrient has garnered increasing attention in recent years due to its profound effects on the immune system and its potential role in preventing chronic illnesses, including osteoporosis, cardiovascular diseases, diabetes,and even certain cancers. Emerging research also highlights its connection to mental health, with links to conditions such as depression, anxiety, and cognitive decline.Vitamin D’s importance becomes even more apparent when considering its impact on specific populations, including children, pregnant women, and the elderly. For children, adequate vitamin D levels are vital for proper growth and the prevention of rickets, a condition that causes soft and weak bones. For older adults, it helps maintain bone density and reduces the risk of fractures and osteoporosis, conditions that can severely impact quality of life.Despite its critical role, maintaining optimal vitamin D levels can be challenging. Factors such as limited sun exposure, the use of sunscreen, age-related decline in the skin’s ability to produce vitamin D, and a lack of vitamin D-rich foods in the diet all contribute to widespread deficiencies. These challenges underscore the importance of awareness, routine testing,and, in some cases,supplementation to ensure sufficient levels for

overall health.In essence, vitamin D is not just a nutrient but a cornerstone of good health, bridging the gap between environmental exposure, diet, and the body's internal regulatory systems. Its far-reaching effects and the growing understanding of its role in disease prevention and health optimization make it one of the most critical vitamins to address in modern nutrition and medicine.Vitamin D is an essential nutrient and prohormone that plays an integral role in nearly every system of the human body. Known as the "sunshine vitamin," it is unique because the body can produce it naturally when the skin is exposed to sunlight, specifically ultraviolet B (UVB) rays. However, its importance extends well beyond sunlight exposure—it is a critical factor in maintaining overall health and preventing a host of diseases.One of the primary functions of vitamin D is its role in regulating calcium and phosphorus levels, which are essential for healthy bones and teeth. By aiding the absorption of these minerals in the gut and ensuring they are effectively utilized in the body, vitamin D helps prevent conditions such as rickets in children and osteomalacia or osteoporosis in adults. Beyond skeletal health, vitamin D supports proper muscle function and plays a vital role in maintaining balance and preventing falls, particularly in older populations.Vitamin D also serves as a powerful modulator of the immune system,making it a key player in defending the body against infections. Studies suggest that adequate levels of vitamin D can reduce the risk of respiratory infections, including influenza and pneumonia. Moreover, recent research highlights its potential to regulate inflammatory responses and mitigate autoimmune disorders such as multiple sclerosis, rheumatoid arthritis, and type diabetes. This immune-regulating property has brought vitamin D to the forefront of discussions on public health, particularly during the COVID-19 pandemic.The influence of vitamin D extends to cardiovascular health, brain function, and metabolic regulation. Deficiencies in vitamin D have been linked to an increased risk of hypertension, heart disease, and diabetes. Emerging evidence suggests that vitamin D may play a protective role in reducing the risk of neurodegenerative diseases such as Alzheimer's and Parkinson's, as well as supporting mental health by alleviating symptoms of depression, anxiety, and seasonal affective disorder.Despite its far-reaching benefits, Despite its far-reaching benefits, vitamin D

deficiency is one of the most common nutritional deficiencies worldwide. Factors contributing to this include limited sun exposure due to geographic location, lifestyle choices, cultural practices, and the use of sunscreen, which blocks the UVB rays necessary for vitamin D production.
Additionally, dietary sources of vitamin D are relatively scarce, with fatty fish, egg yolks, and fortified foods being the primary contributors.
Populations at higher risk include individuals with darker skin (as melanin reduces the skin's ability to produce vitamin D), the elderly (due to reduced skin synthesis and kidney function), and those with certain medical conditions that impair absorption.
The global prevalence of vitamin D deficiency underscores the need for awareness and preventive strategies, including responsible sun exposure, dietary modifications, and, when necessary, supplementation. Health organizations have established recommended daily intake levels, but there remains debate about optimal levels for different age groups and health conditions. Routine blood testing can help individuals determine their vitamin D status and address deficiencies before they lead to adverse health outcomes.Vitamin D is more than a simple nutrient; it is a cornerstone of health and wellness, influencing physical, mental, and immune health across all stages of life. With its profound impact on disease prevention, quality of life, and longevity, vitamin D continues to be a focus of scientific research and public health initiatives. In an age where chronic diseases are on the rise, ensuring adequate vitamin D levels is a simple yet powerful step toward achieving better health and well-being for individuals and communities alike.

Patient and method :

I will do this study among 200 case of general populations to assess vitamin D levels of them including all age group .By taking history and asking them about their vitamin D levels and dividing it according my study to male and female,did you did vitamin D analysis or not ,exposure to sunlight or not , type of eating, taking of supplements or not , having chronic illness or not , having signs and symptoms or not.

Results :

Table 1 presents the demographic characteristics of the 200 participants in the study:

• **Age Group**: The majority (75.0%) fall within the 18–45 years age group. Participants aged 46–60 years constitute 15.0%, those younger than 18 years account for 8.0%, and only 2.0% are over 60 years old.

• **Sex**: Females represent 65.0% of the sample, while males make up 35.0%.

• **Residence**: Most participants (83.5%) reside in urban areas, with 16.5% living in rural regions.

• **Skin Colour:** More than half (52.0%) have intermediate skin color, 40.0% are white, and 8.0% have dark skin.

The data reflect a predominantly urban, female population with diverse skin tones,predominantly of intermediate or white complexion.

Table 1: Demographic characteristics of participants (n=200)

		N	%
Age group " Years"	< 18	16	8.0%
	18 - 45	150	75.0%
	46 - 60	30	15.0%
	> 60	4	2.0%
	Total	200	100%
Sex	Male	70	35.0%
	Female	130	65.0%
	Total	200	100%
Residence	Urban	167	83.5%

	Rural	33	16.5%
	Total	200	100%
What is your skin colour?	Dark	16	8.0%
	Intermediate colour	104	52.0%
	White	80	40.0%
	Total	200	100%

Table 2 outlines the duration of daily sun exposure among the 200 participants:

- **Less than 15 Minutes:** Nearly half of the participants (47.0%) reported receiving less than 15 minutes of daily sun exposure.
- **15 to 30 Minutes:** A significant proportion (38.0%) indicated they are exposed to sunlight for 15–30 minutes daily.
- **More than 30 Minutes:** Only 15.0% of participants reported spending more than 30 minutes in the sun each day.

These findings suggest that the majority of participants have limited sun exposure, which may influence their vitamin D status.

Table 2: How much sun exposure do you get?

" Minutes"	N	%
< 15	94	47.0
15 - 30	76	38.0
> 30	30	15.0
Total	200	100.0

Table 3 presents the dietary habits of the 200 participants regarding their intake of vitamin D-rich foods such as fish, eggs, and milk:

- **Very Low Consumption:** Over one-third of participants (36.5%) reported a very low intake of foods rich in vitamin D.
- **Intermediate Consumption:** The majority (56.5%) reported an intermediate level of consumption of these foods.
- **High Consumption:** Only a small fraction (7.0%) indicated a high intake of vitamin D-rich foods.

The data indicate that most participants have an intermediate or lower intake of vitamin D-rich foods, which could contribute to variations in their vitamin D status.

Table 3: How much should I eat foods rich in vitamin D such as fish, eggs and milk?

	N	%
Very Low	73	36.5
Intermediate	113	56.5
High	14	7.0
Total	200	100.0

Table 4 illustrates the use of vitamin D supplements among the 200 participants:

- **Yes:** Only 30.5% of participants reported taking vitamin D supplements.
- **No:** The majority (69.5%) indicated that they do not use vitamin D supplements.

These findings highlight a low prevalence of vitamin D supplement use among participants, which may impact their overall vitamin D levels.

Table 4: Do you take vitamin D supplements?		
	N	%
Yes	61	30.5
No	139	69.5
Total	200	100.0

Table 5 reflects participants' perceptions regarding the effect of medications, such as antibiotics or antiepileptics, on vitamin D levels:

- **Yes:** A small proportion of participants (4.5%) believe that taking such medications affects vitamin D levels.
- **No:** The vast majority (95.5%) do not think these medications impact vitamin D levels.

This indicates a limited awareness or belief among participants about the potential influence of certain medications on vitamin D status.

Table 5: Does taking medications such as antibiotics or antiepileptics affect vitamin D levels in the body?		
	N	%
Yes	9	4.5
No	191	95.5
Total	200	100.0

Table 6 summarizes the symptoms experienced by the 200 participants:

- **Fatigue and Exhaustion:** This was the most commonly reported symptom, affecting 57.5% of participants.
- **Muscle Weakness:** Reported by 23.0% of participants, it was the second most frequent symptom.
- **Loss of Appetite:** Experienced by 13.0% of participants.
- **Bone Weakness and Fractures:** Reported by 4.0% of participants.
- **Diarrhea:** Affected 1.5% of participants.
- **Nausea and Vomiting:** Least common, reported by only 1.0% of participants.

These findings indicate that fatigue, muscle weakness, and loss of appetite are the predominant symptoms among the participants.

Table 6: Did you have any Symptoms?

	N	%
Diarrhoea	3	1.5
Fatigue and exhaustion	115	57.5
Nausea and vomiting	2	1.0
Muscle weakness	46	23.0
Bone weakness and fractures	8	4.0
Loss of appetite	26	13.0
Total	200	100.0

Table 7 summarizes the participants' practices regarding vitamin D testing and the timing of the tests:

- **Have You Had a Vitamin D Test?**
  - **Yes:** A total of 44.0% of participants reported undergoing a vitamin D test.
    - **> 1 Month:** 9.0% had their test within the last month.
    - **> 2 Months:** 4.5% conducted the test more than two months ago.
    - **> 3 Months:** 10.0% underwent testing more than three months ago.
    - **> 6 Months:** The highest proportion (20.5%) tested more than six months ago.
  - **No:** The majority of participants (56.0%) indicated that they had never conducted a vitamin D test.

These findings suggest that more than half of the participants have not tested their vitamin D levels, with those who have tested primarily doing so over extended intervals.

Table 7: Participants' practices regarding vitamin D testing and the timing of the tests

Have you had a vitamin D test?	The period in which the analysis was conducted?	N	%
Yes	> 1 Month	18	9.0%
	> 2 Months	9	4.5%
	> 3 Months	20	10.0%
	> 6 Months	41	20.5%
		78	44%
No	None	112	56.0%

Table 8 presents the results of vitamin D testing among the 200 participants:

- **Vitamin D Levels (ng/ml):**
  - **< 20 ng/ml:** Vitamin D deficiency was reported in 26.5% of participants who underwent the test.
  - **20–50 ng/ml:** Sufficient levels of vitamin D were found in 16.5% of participants.
  - **> 50 ng/ml:** Only 1.0% of participants had optimal vitamin D levels.
- **None:** The majority (56.0%) had not undergone vitamin D testing, as noted earlier.

These findings indicate that among those who tested, a significant proportion displayed deficient vitamin D levels, with very few achieving optimal values.

Table 8: If the test done, what was the result?

ng/ml	N	%
< 20	53	26.5%
20 - 50	33	16.5%
> 50	2	1.0%
None	112	56.0%
Total	200	100%

Table 9 highlights the reasons participants reported for conducting a vitamin D test:

- **To Detect High or Low Levels of Vitamin D:** This was the most common reason, cited by 49.5% of participants.
- **Monitoring People at Risk for Vitamin D Deficiency:**Only 4.0% underwent the test for this purpose.
- **To Evaluate Treatment Success:** 5.0% reported testing to assess the effectiveness of treatment for vitamin D deficiency.
- **None:** A significant proportion (41.5%) did not have a specific reason or did not perform the test.

The data suggest that detecting vitamin D levels is the primary motivation for testing, while other reasons such as monitoring risk or evaluating treatment are less frequent.

Table9: What is the reason for performing a vitamin D test?

	N	%
To detect high or low levels of vitamin D	99	49.5%
Monitoring people at risk for vitamin D deficiency	8	4.0%
To find out if treatment for vitamin D deficiency is successful	10	5.0%
None	83	41.5%
Total	200	100%

Discussion :

In this study we found most people have vitamin D deficiency and this is due to several reasons :

1-Inadequate Sun Exposure: The primary source of vitamin D is sunlight. Limited exposure due to indoor lifestyles, use of sunscreen, or living in regions with little sunlight (especially in winter) can lead to deficiency.

2- Poor Dietary Intake: Few foods naturally contain vitamin D. A diet lacking in vitamin D-rich foods like fatty fish, egg yolks, and fortified dairy products contributes to deficiency.

3- Aging and Reduced Vitamin D Production .As people age, their skin becomes less efficient at producing vitamin D from sunlight. Additionally: Older adults tend to spend less time outdoors, further reducing their vitamin D levels.Decreased appetite and poor diet contribute to lower dietary intake.Kidney function declines with age, affecting vitamin D activation.

4-Certain Medications :Some drugs interfere with vitamin D absorption or metabolism, including:Anticonvulsants (e.g., phenytoin, carbamazepine) – used for epilepsy, can speed up vitamin D breakdown.Glucocorticoids (steroids) (e.g., prednisone) – used for inflammatory conditions, reduce vitamin D metabolism.Weight-loss medications (e.g., orlistat) – decrease fat absorption, leading to lower vitamin D absorption.Cholesterol-lowering drugs (e.g., cholestyramine) – reduce vitamin D absorption by binding to fats.HIV/AIDS medications – some antiretroviral drugs interfere with vitamin D metabolism.

And by this study we found most of them suffer from fatigue and exhaustion and loss of appetite as Vitamin D plays a crucial role in various bodily functions, including energy metabolism, nervous system regulation, and immune support. When the body lacks sufficient vitamin D, it can lead to fatigue (persistent tiredness) and loss of appetite due to several physiological reasons

1-Impact on Energy Production :Vitamin D helps regulate mitochondrial function, which is responsible for producing energy (ATP) in cells.

A deficiency leads to reduced ATP production, causing low energy levels and chronic fatigue.Studies have found that people with low vitamin D levels often experience unexplained tiredness, which improves after vitamin D supplementation.

2-Muscle Weakness and Fatigue :Vitamin D is essential for muscle function. Deficiency can lead to muscle weakness, making daily activities feel exhausting.
It also contributes to post-exercise fatigue, where muscles take longer to recover.
3-Brain Fog and Cognitive Fatigue :Vitamin D plays a role in neurotransmitter function and brain health.Deficiency can lead to difficulty concentrating, memory problems, and mental exhaustion.
4-Hormonal Imbalances :Vitamin D helps regulate hormones involved in hunger and metabolism.A deficiency can disrupt levels of leptin and ghrelin, the hormones that control appetite.This can lead to a reduced desire to eat, contributing to weight loss and nutritional deficiencies.5-Depression and Appetite Suppression: Vitamin D is crucial for mood regulation and has been linked to serotonin production.Low serotonin levels can cause loss of interest in eating, similar to what happens in depression.Many people with vitamin D deficiency also experience low mood or depressive symptoms, which naturally reduce appetite.

And most of them do vitamin D levels to detect high or low levels of vitamin D in their body

Conclusion

Vitamin D deficiency is a widespread yet often overlooked health issue that affects people of all ages. It primarily results from lack of sun exposure, poor dietary intake, medical conditions, and lifestyle factors. Since vitamin D is essential for bone health, immune function, muscle strength, and overall well-being, its deficiency can lead to fatigue, weak bones, muscle pain, weakened immunity, mood disorders, and loss of appetite.Preventing and managing vitamin D deficiency requires a combination of adequate sun exposure, a vitamin D-rich diet (fatty fish, eggs, fortified foods), and supplements when necessary. High-risk individuals, such as those with darker skin, the elderly, people with chronic illnesses, and those living in low-sunlight regions, should monitor their vitamin D levels regularly.Since vitamin D plays a crucial role in long-term health and disease prevention, raising awareness and taking proactive steps can help reduce deficiency-related complications and improve overall quality of life.

Recommendations

To maintain healthy vitamin D levels and prevent deficiency, follow these key recommendations:

1. Get Regular Sun Exposure

Spend 10–30 minutes in direct sunlight at least 2–3 times per week, depending on skin type and location.Expose arms, face, or legs to maximize vitamin D production.Midday (10 AM – 3 PM) is the best time for sun exposure.

2. Eat Vitamin D-Rich Foods

Include fatty fish (salmon, tuna, mackerel), egg yolks, liver, mushrooms, and fortified foods (milk, cereals, orange juice, plant-based milk).

3. Take Supplements if Necessary

Recommended daily intake:600 IU (15 mcg) for most adults.800 IU (20 mcg) for older adults (70+ years).Higher doses (1,000–4,000 IU) may be needed for those with deficiency.Vitamin D3 (cholecalciferol) is more effective than D2.

4. Monitor Vitamin D Levels

Get a blood test if experiencing symptoms like fatigue, bone pain, or mood changes.High-risk individuals (elderly, people with darker skin, those with chronic illnesses) should check levels regularly.

5. Adopt a Healthy Lifestyle

Maintain a balanced diet and healthy weight, as obesity can reduce vitamin D availability.Exercise regularly to strengthen bones and muscles.

By following these recommendations, individuals can prevent deficiency, maintain overall health, and reduce the risk of long-term complications.

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