(RESEARCH ARTICLE)

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Comprehensive analysis of vitamin d deficiency in elderly patients, children, and postmenopausal women: Insights from Mohammed VI university hospital Oujda

Meryem El Halas [1, 2, *], Sara Moulay Rchid [1, 2], Imane Douichi [1, 2], Bilal Aynaou [1, 2], Dounia El Moujtahide [1, 2], El Houcine Sebbar [1, 2] and Mohammed Choukri [1, 2]

[1] Mohammed First University, Faculty of Medicine and Pharmacy of Oujda, Morocco.
[2] Biochemistry laboratory of Mohammed VI University Hospital, Oujda, Morocco.

Abstract

This comprehensive paper amalgamates findings from three extensive studies conducted at Mohammed VI University Hospital Oujda, which examine the prevalence and predictors of vitamin D deficiency across different demographic groups: elderly patients, children, and postmenopausal women. The studies, covering a period of 92 months, retrospectively analyzed serum 25(OH)D concentrations to reveal a significant prevalence of vitamin D deficiency in all three populations. The findings underscore the critical need for routine monitoring and interventions to mitigate the associated health risks.

Keywords: Vitamin D deficiency; Elderly; Children; Postmenopausal Women; Health outcomes; Public health

1. Introduction

Vitamin D is a fat-soluble vitamin crucial for maintaining bone health and overall physiological functions. It facilitates the absorption of calcium and phosphorus, essential for building and maintaining healthy bones. Beyond bone health, vitamin D plays a vital role in immune function, reduction of inflammation, and modulation of cell growth [1]. Despite its importance, vitamin D deficiency is a widespread issue that poses serious health risks across all age groups. Deficiency in vitamin D can lead to a variety of health problems including osteoporosis, fractures, diabetes, cancer, cardiovascular diseases, muscle weakness, and impaired immune function [2].

This paper synthesizes data from three separate studies focusing on elderly patients, children, and postmenopausal women to provide a comprehensive overview of vitamin D deficiency's impact on these populations. The studies were conducted at Mohammed VI University Hospital Oujda over a 92-month period, offering valuable insights into the prevalence, risk factors, and health implications of vitamin D deficiency.

2. Study 1: Elderly Patients

2.1. Objective
To investigate the prevalence and predictors of vitamin D deficiency among hospitalized patients aged 65 and older at the University Hospital Oujda.

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* Corresponding author: Meryem El Halas

2.2. Background

Vitamin D deficiency is a common condition among older adults and can lead to adverse health outcomes such as osteoporosis, hip fractures, diabetes, cancer, heart disease, arthritis, and poor overall health. The elderly are particularly vulnerable due to factors such as reduced skin synthesis, dietary intake, and limited sun exposure.

2.3. Methodology

Study Design: Retrospective analysis.

Population: 1303 elderly patients aged 65 years and older, admitted between June 2015 and February 2023.

Data Collection: Serum 25(OH)D concentrations were obtained at hospital admission using electro-chemiluminescence immunoassay and expressed as ng/ml.

Classification: Serum 25(OH)D concentrations were categorized as follows:

- Deficient: <20 ng/ml
- Insufficient: 20-29.99 ng/ml
- Sufficient: ≥30 ng/ml

Data Analysis: Conducted using the open-source data manipulation tool Pandas in the Python programming language, linked with an Excel file containing the study data for efficient data cleaning, organization, and statistical analysis.

2.4. Results

Participants' ages ranged from 65 to 98 years, with a mean age of 47.48 years and a standard deviation (SD) of 19.96 years. Females represented 12.05% of the total participants.

2.5. Prevalence

- Deficiency: 20.64%
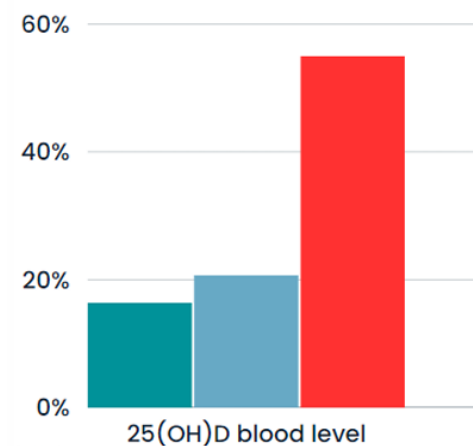- Severe deficiency: 54.87%
- Normal levels: 16.35%

Figure 1 Prevalence of Vitamin D Deficiency Among the Elderly Population at Mohammed VI University Hospital Oujda

2.6. Discussion

The study highlights a significant prevalence of vitamin D deficiency among hospitalized elderly patients. The high rate of severe deficiency is particularly concerning, given the associated risks of osteoporosis, fractures, and other comorbid conditions. The findings emphasize the necessity for routine monitoring of vitamin D levels in elderly patients, especially those who are hospitalized. Healthcare professionals should be aware of the risk factors for vitamin D deficiency and ensure that appropriate measures, such as supplementation and lifestyle modifications, are taken to prevent and treat this condition.

2.7. Conclusion

Our study indicates a high prevalence of vitamin D deficiency among hospitalized elderly patients, with over 20% of patients exhibiting deficiency and more than half experiencing severe outcomes. This underscores the importance of routine monitoring of vitamin D levels in elderly patients and the need for interventions to improve vitamin D status and prevent adverse health outcomes associated with deficiency.

3. Study 2: Pediatric patients

3.1. Objective

To assess the prevalence of vitamin D deficiency among children aged 1-15 years attending the pediatrics unit of the university hospital.

3.2. Background

In children, vitamin D is crucial for supporting bone health and calcium homeostasis. Vitamin D deficiency in children can lead to rickets, impaired bone growth, and increased risk of chronic diseases later in life [3]. Despite its importance, vitamin D deficiency is a significant public health concern, particularly in regions with limited sun exposure and dietary intake.

3.3. Methodology

Study Design: Descriptive and retrospective.

Population: 670 children (351 males and 319 females) aged 1-15 years, attending the pediatrics unit between June 2015 and February 2023.

Data Collection: Routine blood tests for serum 25(OH)D levels were performed. The electronic medical history generated by the hospital's Excel software contained all relevant medical information and analytical data.

Classification: Serum 25(OH)D concentrations were categorized as follows:

- Deficient: <10 ng/ml
- Insufficient: 10-20 ng/ml
- Sufficient: >20 ng/ml

Data Analysis: Conducted using Pandas in Python, linked with Excel for data management.

3.4. Results

The study included 670 children, with 47.61% girls and 52.39% boys.

3.5. Prevalence

- Sufficient levels: 51.07%
- Insufficient levels: 33% (221 children)
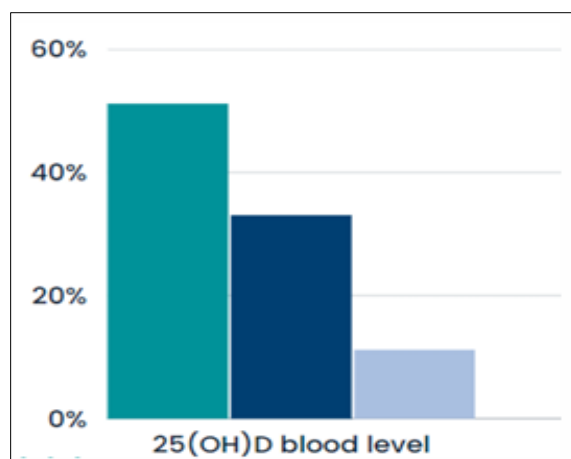- Deficient levels: 11.19% (75 children)

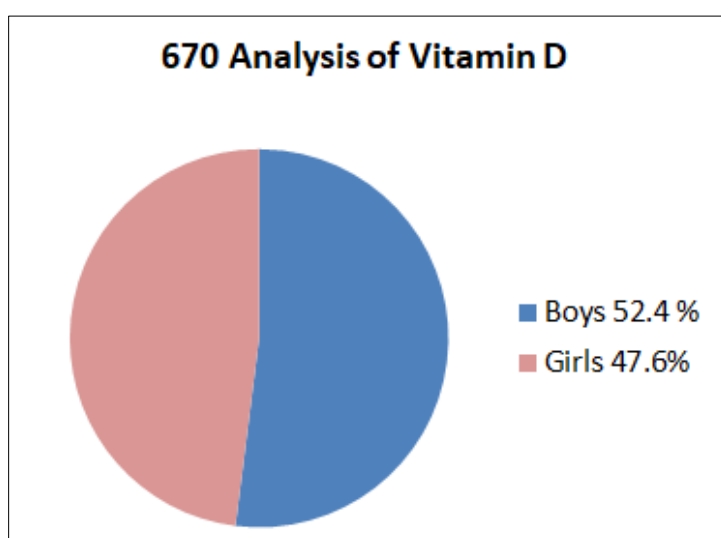**Figure 2** Prevalence of Vitamin D Deficiency Among Pediatric Patients at Mohammed VI University Hospital Oujda

Figure 3 Gender Distribution among Pediatric Patients at Mohammed VI University Hospital Oujda

3.6. Discussion

The findings reveal a high prevalence of vitamin D deficiency and insufficiency among children. The results indicate that nearly half of the children had insufficient or deficient vitamin D levels, which could have long-term health implications. These findings highlight the need for routine screening and adequate supplementation to prevent vitamin D deficiency and its associated health risks in children.

3.7. Conclusion

This study evaluated the vitamin D status of 670 children attending the pediatrics unit of the university hospital. The results indicated that vitamin D deficiency is prevalent in children, with 44.93% of the total sample presenting insufficient or deficient levels. These findings underscore the importance of routine screening and adequate supplementation to prevent long-term health consequences of vitamin D deficiency in children.

4. Study 3: Postmenopausal Women

4.1. Objective

To assess the vitamin D status of postmenopausal women and its implications on their health.

4.2. Background

Postmenopausal women are at increased risk for vitamin D deficiency due to factors such as reduced skin synthesis, decreased dietary intake, and changes in hormone levels. Vitamin D deficiency in postmenopausal women can lead to osteoporosis, increased fracture risk, muscle weakness, and falls [4].

4.3. Methodology

- **Study Design:** Cross-sectional.
- **Population:** 3221 postmenopausal women aged 51-93 years, attending the university hospital units from September 2015 to February 2023.
- **Data Collection:** Serum 25(OH)D levels were measured by competitive immunoassay with enhanced chemiluminescence technique and expressed as ng/ml.
- **Classification:** Serum 25(OH)D concentrations were categorized as follows :
  - Adequate: 30-100 ng/mL (75-250 nmol/L)
  - Insufficient: 20-29 ng/mL (50-72.5 nmol/L)
  - Deficient: <20 ng/mL (<50 nmol/L)
- Data Analysis: Conducted using Pandas in Python, linked with Excel for data management.

4.4. Results

Demographics: The mean age of 3221 postmenopausal women was 62.5 years, with a minimum age of 51 years and a maximum age of 93 years.

4.5. Prevalence

- Adequate levels: 16.61%
- Insufficient levels: 18.63%
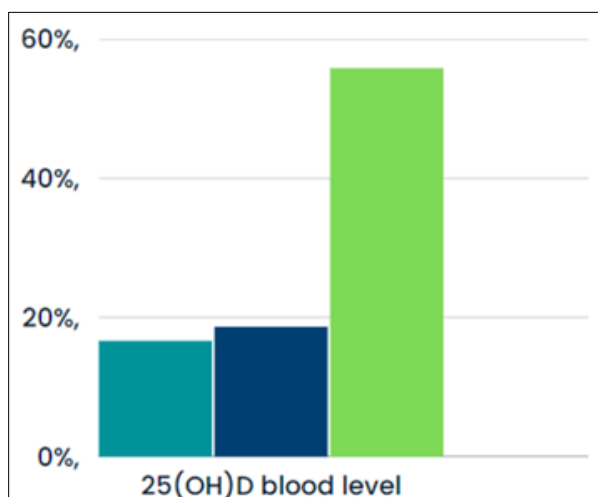- Deficient levels: 55.76%

Figure 4 Distribution of Vitamin D Levels in Postmenopausal Women at Mohammed VI University Hospital Oujda

4.6. Discussion

The study found a high prevalence of vitamin D deficiency among postmenopausal women, with over half of the participants exhibiting deficiency. Low 25(OH)D levels were associated with alterations in bone turnover markers, suggesting that vitamin D supplementation could help normalize these parameters. These findings highlight the importance of maintaining adequate vitamin D levels for bone health and overall well-being in postmenopausal women.

4.7. Conclusion

The cross-sectional study from Mohammed VI University Hospital Oujda revealed that a majority of postmenopausal women have inadequate levels of 25(OH)D, with deficiency present in more than half of the participants. The study also found that low 25(OH)D levels were associated with alterations in bone turnover markers, underscoring the importance of maintaining adequate vitamin D levels for bone health.

5. General Conclusion

The comprehensive analysis of vitamin D deficiency across different demographic groups—elderly patients, children, and postmenopausal women—at Mohammed VI University Hospital Oujda reveals a high prevalence of vitamin D deficiency in all three populations. The studies collectively underscore the critical importance of routine monitoring and appropriate interventions to mitigate the health risks associated with vitamin D deficiency.

5.1. Key Findings

- **Elderly Patients:** A significant portion of elderly patients exhibited vitamin D deficiency, with over 20% showing deficient levels and more than half experiencing severe deficiency. This group is particularly vulnerable to adverse health outcomes such as osteoporosis, fractures, diabetes, and cardiovascular diseases.
- **Children:** Nearly half of the children studied had insufficient or deficient vitamin D levels, highlighting the risk of rickets, impaired bone growth, and potential chronic diseases in later life.
- **Postmenopausal Women:** Over half of the postmenopausal women had deficient vitamin D levels, which were associated with altered bone turnover markers, indicating a high risk of osteoporosis and fractures.

5.2. Perspectives

- **Routine Screening and Supplementation:** The studies highlight the need for routine screening of vitamin D levels across all age groups, especially in vulnerable populations like the elderly, children, and postmenopausal women. Healthcare providers should prioritize vitamin D supplementation and lifestyle modifications to improve vitamin D status.
- **Public Health Initiatives:** Public health initiatives should focus on raising awareness about the importance of vitamin D, encouraging safe sun exposure, and promoting dietary sources rich in vitamin D. Policies should be implemented to ensure that high-risk populations have access to vitamin D supplements.
- **Artificial Intelligence Model for Prediction:** Leveraging the data collected from these studies, an AI model can be developed to predict future cases of vitamin D deficiency. Such a model could use patient demographics, medical history, and other relevant factors to identify individuals at risk of deficiency. This predictive model can assist healthcare providers in early intervention and personalized treatment plans.
- **Further Research:** Additional research is needed to explore the efficacy of different interventions in improving vitamin D status and reducing the associated health risks. Longitudinal studies could provide deeper insights into the long-term benefits of maintaining adequate vitamin D levels.
- **Integration with Electronic Health Records (EHR):** Integrating vitamin D screening and monitoring with EHR systems can streamline the identification of at-risk patients and ensure timely interventions.
- Automated alerts and reminders can be set up for healthcare providers to monitor and manage vitamin D levels in their patients effectively

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

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