



## EXPLORING THE SHIFTS IN VITAMIN D PRESCRIBING DURING THE COVID-19 ERA:A RETROSPECTIVE ANALYSIS FROM PRINCESS HAYA MILITARY HOSPITAL INTENSIVE CARE UNIT

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### Abstract

**1. Introduction:** Vitamin D, crucial for bone health, calcium absorption, and immune system regulation, has seen resurgence in interest due to its potential role in modulating immune responses and mitigating inflammation. The COVID-19 pandemic further emphasized its importance as research suggested that Vitamin D might help in both preventing and managing severe infections in patients. During this period, healthcare systems faced unparalleled challenges, particularly in Intensive Care Units (ICUs), where critically ill patients with COVID-19 often required substantial support for severe symptoms like acute respiratory distress syndrome and cytokine storms. Optimizing nutritional support, particularly through Vitamin D supplementation, became crucial in managing these patients.

**2. Objective:** This study aims to analyze the consumption patterns of different forms and dosages of Vitamin D specifically Cholecalciferol and Alfacalcidol within the ICU of Princess Haya Military Hospital from 2019 to 2022. By examining usage data across these years, the study seeks to uncover how Vitamin D consumption changed in response to the evolving dynamics of the COVID-19 pandemic. It intends to correlate these changes with shifting clinical guidelines and real-world responses in a critical care environment, thereby shedding light on treatment adaptations during health crises and informing future supplementation strategies.

**3. Methodology:** A retrospective study will be conducted using pharmaceutical electronic records from Princess Haya Military Hospital's ICU. The study will encompass the annual consumption data for Cholecalciferol (1000 IU, 5000 IU, and 50000 IU) and Alfacalcidol (0.25 mg, 0.5 mg and 1 mg) from 2019 through 2022. Descriptive statistics will be employed to summarize the consumption, following the descriptive analysis; a time-series analysis will be conducted to assess the trends over the years in order to reflect on the consumption and ICU's adaptive strategies in response to clinical research developments and patient needs during the study period.

**Keywords:** Vitamin D, Cholecalciferol, Alfacalcidol, intensive care units, COVID-19, Consumption Shift, Princess Haya Military Hospital.

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## 1. INTRODUCTION

**Background:** A fat-soluble vitamin, vitamin D is essential in maintaining the body's levels of calcium and phosphate, which are necessary for strong, healthy bones. Since it promotes optimum bone mineralization through facilitating intestinal calcium absorption, vitamin D's importance has traditionally been intimately associated with this function<sup>[1]</sup>.

Beyond its well-known benefits for bone health, vitamin D is essential for a healthy immune system. It reduces inflammation by adjusting the immune response and boosts the ability of monocytes and macrophages to fight pathogens. By modulating both the innate and adaptive immune systems, this immunomodulatory capacity helps to maintain a healthy immune system reaction while preventing the overabundance of inflammation that can result in immune-related illnesses<sup>[2]</sup>.

Research on vitamin D's possible role in immunological regulation has grown exponentially, with the COVID-19 pandemic serving as a prime example<sup>[3]</sup>. Early observational studies conducted during the pandemic found links between low levels of vitamin D and greater mortality rates, more severe illness courses, and a higher vulnerability to COVID-19 infections. These findings prompted more research to determine whether vitamin D supplements could be a reasonable choice to treat and prevent COVID-19, especially in cases where individuals are exhibiting severe symptoms<sup>[4,5]</sup>.

Numerous theories have been put forth regarding how vitamin D might affect COVID-19 results. According to one theory, vitamin D plays a role in controlling the formation of cytokines, which are protein molecules that mediate and control inflammation and immunity. When it comes to COVID-19, an overreaction of the immune system referred to as a "cytokine storm" has been found to be a significant contributing element in the disease's advancement to severe phases, which frequently result in critical illness and death. It may be possible for Vitamin D to prevent or lessen this hyperinflammatory disease by modifying the cytokine response<sup>[6,7]</sup>. Furthermore, it's believed that vitamin D affects the expression of ACE2, or angiotensin-converting enzyme 2, a protein that's used by the SARS-CoV-2 virus, which causes COVID-19, to infect humans. Although the clinical significance of this relationship is still being studied, vitamin D's modification of ACE2

expression may affect the virus's capacity to infect cells<sup>[8,9]</sup>.

**Importance of the Study:** Healthcare professionals faced extraordinary demands on medical resources, especially intensive care units (ICUs), during the COVID-19 pandemic as a result of managing a novel and highly contagious respiratory virus. Severe COVID-19 patients frequently had acute respiratory distress syndrome (ARDS), cytokine storms, and other severe inflammatory reactions that resulted in critical illness and frequently required intensive care unit (ICU) care<sup>[1]</sup>. A crucial part of ICU patient care in this setting became enhancing dietary support for immune function. Vitamin D's immunomodulatory qualities have made it a vital component of nutritional supplements intended to boost immunity and maybe lessen the severity of the illness<sup>[6]</sup>.

**Study Objective:** This study primarily looks into how much vitamin D is consumed in the ICU of Princess Haya Military Hospital at the Jordanian Royal Medical Services in its various pharmacological forms (Cholecalciferol and Alfacalcidol) at varied dosages. The goal of the study is to determine how the consumption of these vitamin D formulations changed prior to, during, and following the highest point of the COVID-19 crisis by looking at usage data from 2019 to 2022. The goal of the analysis is to find patterns and connections between the actual reaction at a critical care institutions and the changing clinical guidelines on the use of vitamin D. Comprehending these trends will not only illuminate the ways in which treatment approaches were modified during emergency situations, but it will also guide future methods for vitamin D administration during comparable medical emergencies.

**Relevance to Clinical Practice:** The results of the study should provide important new understandings of how clinical practice adapts to emerging guidelines and evidence. This study will demonstrate the usefulness of quickly developing medical research on treatment protocols in an intensive care unit by examining the adjustments in vitamin D consumption in the face of a global health emergency. Furthermore, the findings can provide a foundation for improving the recommendations for vitamin D supplementation for critical care nutritional support systems as well as pandemic response.

In brief, this introduction lays the groundwork for an extensive analysis of patterns in Vitamin D utilization in an ICU of a military hospital amidst

one of the most catastrophic health crises in recent history. It highlights how crucial the study is to advancing our understanding of how critical care practices change in response to emerging evidence and situational demands.

## 2. METHOD

**2.1 Data Collection:** The intensive care unit (ICU) at Princess Haya Military Hospital's pharmacological electronic records provided a systematic source of data for this retrospective observational analysis. The information includes precise yearly consumption data for Cholecalciferol and Alfacalcidol, two forms of vitamin D. The study period covers the pre-pandemic, pandemic peak and post-peak phases and covers four years, from 2019 to 2022. This period of time permits a thorough examination of consumption trends linked to changing clinical recommendations and the dynamics of healthcare related to pandemics.

The data extraction procedure was thoroughly designed and carried out to guarantee accuracy and consistency. The precise dosages of Alfacalcidol (0.25 mg, 0.5 mg, and 1 mg) and Cholecalciferol (1000 IU, 5000 IU, and 50000 IU), as well as the corresponding annual consumption totals, were important data points. In order to ensure the dataset's dependability for further analysis, data verification methods were put in place to investigate any discrepancies or data entry errors.

**2.2 Statistical Analysis:** A number of statistical techniques were used as part of the methodology for data analysis in order to identify trends and comprehend changes in vitamin D consumption throughout the given time frame. Descriptive statistics were first calculated to provide an overview of the general consumption trends for each formulation and strength of vitamin D.

A time-series analysis was carried out after the descriptive analysis to evaluate the patterns over time. This entailed computing the percentage changes year over year for every form and dosage of vitamin D, giving rise to a clear picture of how consumption has changed in response to the changing COVID-19 pandemic context.

**2.3 Ethical Considerations:** The study design was examined and approved by the Jordanian Royal Medical Services' institutional review board, ensuring adherence to all relevant ethical standards for medical research.

**2.4 Data Handling and Privacy:** Each of the data handling process was carried out in compliance

with privacy and confidentiality best practices. Only the research team had access to the data, and all analyses were carried out on safe, password-protected computers.

This analytical framework provides a strong basis for an extensive examination of trends in vitamin D consumption in the Princess Haya Military Hospital's intensive care unit. The project intends to produce meaningful insights that could impact future clinical practices and policy-making in comparable healthcare circumstances by utilizing precise data collecting and advanced analytical tools.

## 3. RESULTS

**Overview:** Over a four-year period, from 2019 to 2022, the intake of vitamin D, specifically in the forms of Cholecalciferol and Alfacalcidol, within the ICU of Princess Haya Military Hospital was examined. This period of time made it possible to evaluate consumption trends prior to, during, and following the COVID-19 pandemic's peak. The analysis focuses on annual consumption statistics for the following formulations and strengths: Alfacalcidol (0.25 mg, 0.5 mg, and 1 mg) and Cholecalciferol (1000 IU, 5000 IU, and 50000 IU).

**Statistical Analysis:** The usage data was summarized using descriptive statistics, which included total consumption and year-over-year percentage changes to identify trends in the data. These trends were then visually represented for each formulation through the creation of graphical displays (line graphs) which clearly showed the peaks and troughs corresponding to the timeline of the COVID-19 pandemic's impact on the hospital.

### Cholecalciferol Consumption Patterns:

- **Cholecalciferol 1000 IU:** There was a notable surge in the consumption of Cholecalciferol 1000 IU starting in 2020. Usage increased from 0 units in 2019 to 85 units in 2020, representing an infinite percentage increase given the lack of prior consumption. In 2021, consumption peaked at 285 units, which constitutes a 235% increase from 2020. However, in 2022, there was a significant decline to 42 units, an 85% decrease from the peak in 2021.
- **Cholecalciferol 5000 IU:** Similarly, this formulation saw an initial increase from 0 units in 2019 to 56 units in 2020. The usage slightly increased by 39% to 78 units in 2021

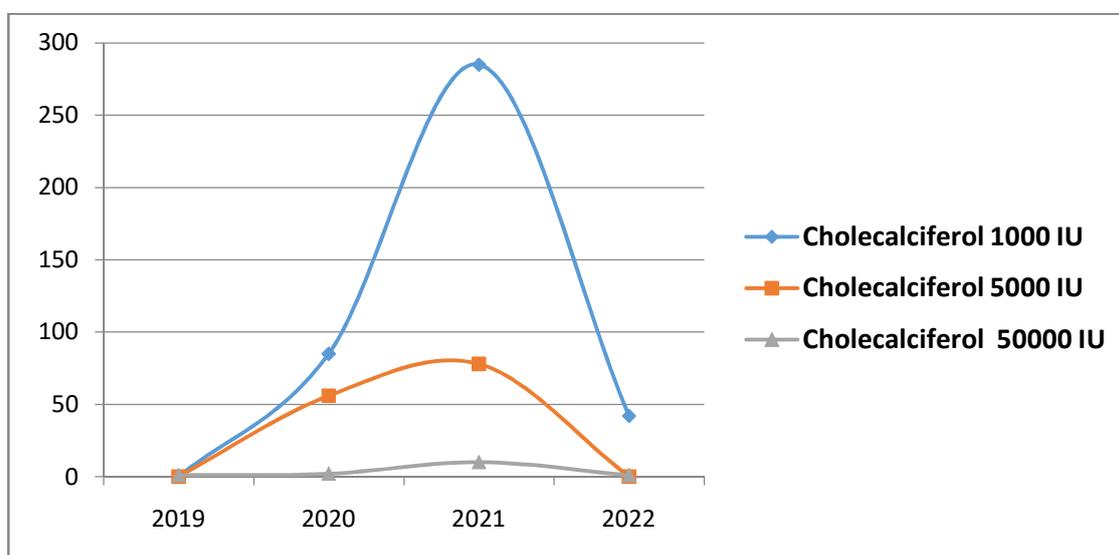
but returned to 0 in 2022, suggesting a cessation of this particular strength's use.

- **Cholecalciferol 50000 IU:** The consumption began at a low baseline of 1 unit in 2019 and rose modestly to 2 units in 2020. The highest

usage was recorded in 2021 with 10 units, a 400% increase from 2020. In 2022, consumption decreased back to 1 unit, mirroring 2019 levels (Table 1, Figure 1).

**Table 1: Patterns of Vitamin D prescription from 2019-2022**

Medication	2019	2020	2021	2022
<b>Cholecalciferol 1000 IU</b>	0	85	285	42
<b>Cholecalciferol 5000 IU</b>	0	56	78	0
<b>Cholecalciferol 50000 IU</b>	1	2	10	1



**Figure 1: patterns of vitamin D dosage prescriptions in study years**

**Alfacalcidol Consumption Patterns (Table 2, Figure 2):**

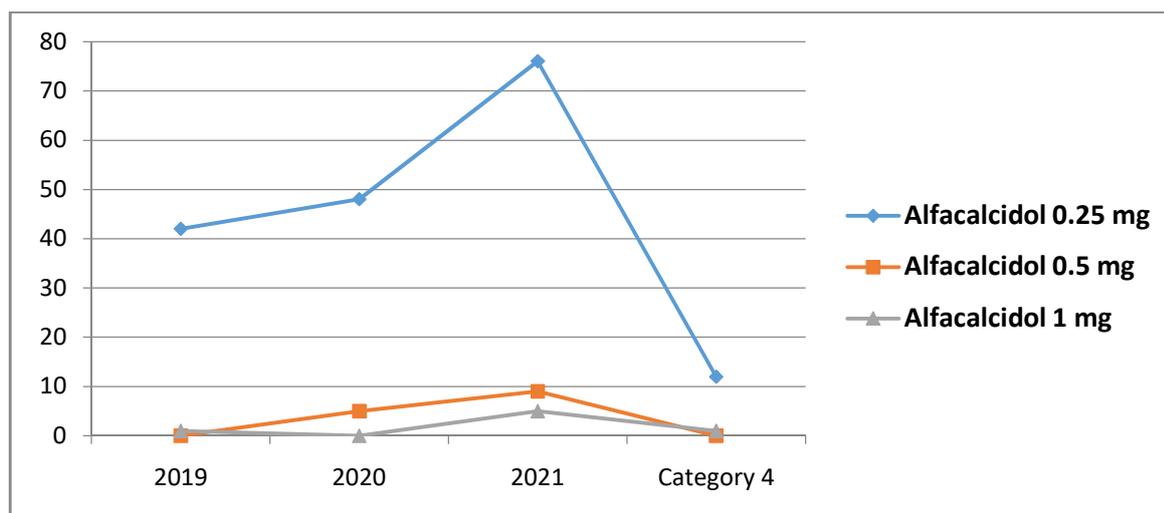
- **Alfacalcidol 0.25 mg:** Starting from 42 units in 2019, there was a gradual increase to 48 units in 2020 and a more significant jump to 76 units in 2021, marking a 58% increase from the previous year. However, consumption dropped sharply to 12 units in

2022, representing an 84% decrease from 2021.

- **Alfacalcidol 0.5 mg:** This strength saw zero usage in 2019, a rise to 5 units in 2020, and a further increase to 9 units in 2021. Like other formulations, it returned to zero in 2022.
- **Alfacalcidol 1 mg:** Usage remained low throughout the study period, with 1 unit in 2019, none in 2020, an increase to 5 units in 2021 and back to 1 unit in 2022.

**Table 2: Alfacalcidol Consumption Patterns**

Medication	2019	2020	2021	2022
<b>Alfacalcidol 0.25 mg</b>	42	48	76	12
<b>Alfacalcidol 0.5 mg</b>	0	5	9	0
<b>Alfacalcidol 1 mg</b>	1	0	5	1



**Figure 2: Alfacalcidol Consumption Patterns**

The data reveals a significant rise in the use of vitamin D between 2020 and 2021, which aligns with the times when hospital resources were most challenged as a result of the COVID-19 epidemic. The significant rise in use over these years implies that vitamin D was probably added to treatment regimens with greater intensity in response to new findings and recommendations indicating its possible advantages for COVID-19 patients. The subsequent declines in 2022 might be the result of changes in supply chain dynamics and inventory management, a stabilization of the pandemic situation, or a return to pre-pandemic prescribing practices. The variations in vitamin D forms and strengths point to potential differences in clinical preferences as well as shifts in the perceived requirement and efficacy of different dosages over time.

#### 4. DISCUSSION

**Interpretation of Results:** The significant variations in the patterns of consumption of both Alfacalcidol and Cholecalciferol over the course of the study provide a compelling narrative of how clinical approaches change in reaction to a public health emergency. The increased use of Cholecalciferol in 2020 and 2021 over a range of strengths indicates that medical professionals at Princess Haya Military Hospital were proactive in using vitamin D's possible immune-supportive qualities during the pandemic. The consumption of Cholecalciferol at 1000 IU and 5000 IU peaks corresponds with periods of high COVID-19 caseloads, which may indicate a deliberate increase in dosages to lessen the severity of the virus's effects on patients that have become severely ill<sup>[1,10]</sup>.

There could be several reasons for the subsequent drop in vitamin D consumption by 2022. First off, the urgent requirement for high-dose vitamin D supplementation may have decreased as the pandemic's acute phase subsided as a result of widespread immunization campaigns and the development of herd immunity. Secondly, the early enthusiasm surrounding high-dose vitamin D supplementation may have subsided as additional sophisticated research revealed conflicting results on its effectiveness in COVID-19 outcomes, prompting more cautious prescribing practices.

The trend of Alfacalcidol was different, showing more modest fluctuations. This could indicate that its use was less impacted by pandemic-related emergent protocols and instead continued to serve its conventional purposes, which include controlling calcium levels in patients suffering from chronic illnesses commonly found in intensive care units or renal impairment.

**Implications for Clinical Practice:** The study's data emphasize how flexible clinical recommendations must be in times of medical emergency. The quick incorporation and subsequent modification of vitamin D consumption demonstrate a health system that is responsive to the most recent findings and changing perspectives on the treatment of illness. It also highlights the need for strong, evidence-based guidelines to strike a balance between emergent and conventional medical procedures. Healthcare professionals need to balance the possible hazards of long-term or high-dose supplementation with the benefits of new therapeutic approaches.

## 5. CONCLUSIONS

**Summary of Findings:** A thorough investigation of vitamin D consumption patterns in the Princess Haya Military Hospital's Intensive Care Unit between 2019 and 2022 comes across notable variations that align with the COVID-19 pandemic timetable. The higher use of Alfacalcidol and Cholecalciferol during the pandemic's peak years, especially 2020 and 2021, suggests a strategic reaction to new research that points to the possibility that vitamin D may help lessen the severity of COVID-19. The steep drops that were seen in 2022 most likely resulted from a mix of improved pandemic care, changing clinical recommendations, and a shift back toward more conventional medical procedures as the acute crisis subsided.

### **Implications for Clinical Practice and Policy:**

This study highlights the value of adaptability and promptness in clinical settings, especially during medical emergencies. In order to effectively respond to patient demands, healthcare providers must be able to quickly incorporate new findings into clinical practice. To guarantee patient safety and the best possible results, this flexibility must be carefully weighed against a strict adherence to evidence-based therapy. These findings can be used by healthcare administrators and policymakers to enhance the processes of developing guidelines and supply chain readiness. It is crucial to make sure hospitals have the resources necessary to adapt to last-minute changes in treatment plans without sacrificing patient care. Furthermore, a top focus should be on developing methods for the quick but thorough assessment of new information and its incorporation into clinical practice.

**Recommendations for Future Research:** The long-term effects of different vitamin D supplement dosages in ICU settings should be the

subject of future research, not just for COVID-19 patients but also for patients in other critical care scenarios. Furthermore, additional thorough research is required to comprehend the distinct functions and possible advantages of various types of vitamin D, such as Cholecalciferol versus Alfacalcidol, in clinical outcomes. The goal of these researches should be to offer precise, feasible recommendations for dosage and administration in order to optimize advantages and reduce risks. To further determine the generalizability of Princess Haya Military Hospital's findings and the impact of regional differences in vitamin D usage patterns on patient outcomes, comparative studies across several institutions or geographical areas would be helpful.

**Final Thoughts:** The variations in vitamin D intake seen in this research offer a glimpse of how medical procedures can undergo significant changes in reaction to a worldwide health crisis. In order to strengthen the ability of healthcare systems to withstand future crises, continued innovation in clinical procedures and policy should be motivated by the lessons learnt during the COVID-19 pandemic. When it comes to enhancing patient outcomes in the face of changing conditions, medical practice is most dynamic when it is proactive, evidence-based, and responsive, as demonstrated by the vitamin D supplementation witnessed during the pandemic.

### **Limitations of the Study**

The primary drawbacks of this research are its retrospective design and dependence on electronic data, which may not provide an accurate picture of patient-specific consumption patterns. Furthermore, the study does not take into consideration outside factors that might have affected consumption rates, such as changes in ICU protocols or hospital admissions overall.

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