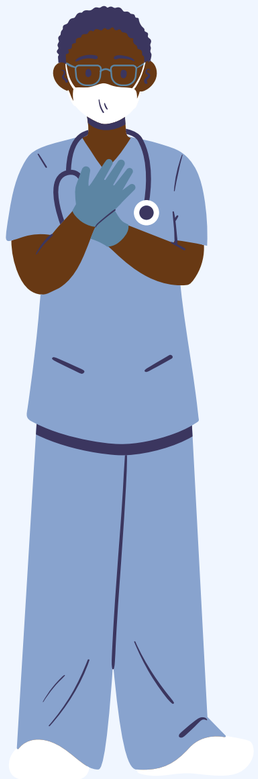
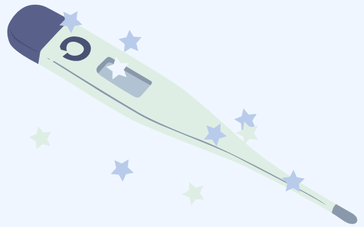
Absorption of Vitamins: Oral vs IV/IM : A Research Study

FÄRSK HEALTH

Abstract

- This study investigates the bioavailability of vitamins A, C, D, E, K, and B12 through oral and intravenous/intramuscular (IV/IM) administration routes.
- The bioavailability of vitamins is crucial for determining the efficacy of supplementation methods, which can significantly impact clinical outcomes.
- Data from recent peer-reviewed studies were collected and analyzed to compare the absorption rates, peak plasma concentrations, and overall bioavailability of these vitamins through different administration routes.
- Our findings suggest that IV/IM administration generally leads to higher bioavailability for most vitamins. While oral administration may be adequate for others, there is a need for personalized approaches in vitamin supplementation.





Introduction

- Vitamins play essential roles in numerous biochemical processes in the human body. The bioavailability of vitamins, which refers to the proportion of a nutrient that is absorbed and utilized, varies significantly between oral and IV/IM administration routes.

- This research aims to compare the bioavailability of six key vitamins (A, C, D, E, K, and B12) through these different routes to provide a comprehensive understanding that can guide clinical practices and supplementation strategies.

Methods

Data Collection

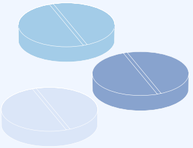
Inclusion Criteria

Data Analysis

Data Collection

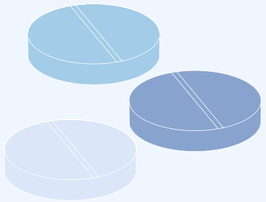
- A comprehensive literature review was conducted using databases such as PubMed, Google Scholar, and ScienceDirect.

- Studies published within the last ten years were prioritized to ensure the relevance and accuracy of data. Key search terms included "vitamin bioavailability," "oral vs intravenous," "intramuscular vitamin absorption," and "vitamin administration routes."



Inclusion Criteria

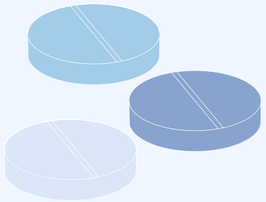
- Studies comparing oral and IV/IM bioavailability of vitamins A, C, D, E, K, and B12
- Peer-reviewed articles with clear methodologies and quantitative data
- Human clinical trials and meta-analyses.



Data Analysis

- Data were extracted on absorption rates, peak plasma concentrations, and overall bioavailability.

- Statistical analysis was conducted using software tools to compare the mean differences between the two administration routes.



Results

Vitamin A

Oral bioavailability of vitamin A is variable due to factors such as dietary fat and the form of the vitamin (retinol vs. beta-carotene). IV administration bypasses the gastrointestinal tract, resulting in nearly 100% bioavailability.

Vitamin C

Oral vitamin C has a bioavailability of about 70-90% at lower doses, but saturation occurs at higher doses, limiting absorption. IV administration provides significantly higher plasma concentrations, beneficial in clinical settings such as for cancer patients.

Vitamin D

Vitamin D's oral bioavailability is influenced by dietary fat and gut health. Studies show that IM injections achieve higher and more sustained plasma levels, making it effective for treating deficiencies.

Vitamin E

The bioavailability of vitamin E is relatively low orally due to its lipophilic nature and dependence on bile for absorption. IV administration results in higher bioavailability, but oral forms can still be effective with dietary fat.

Vitamin K

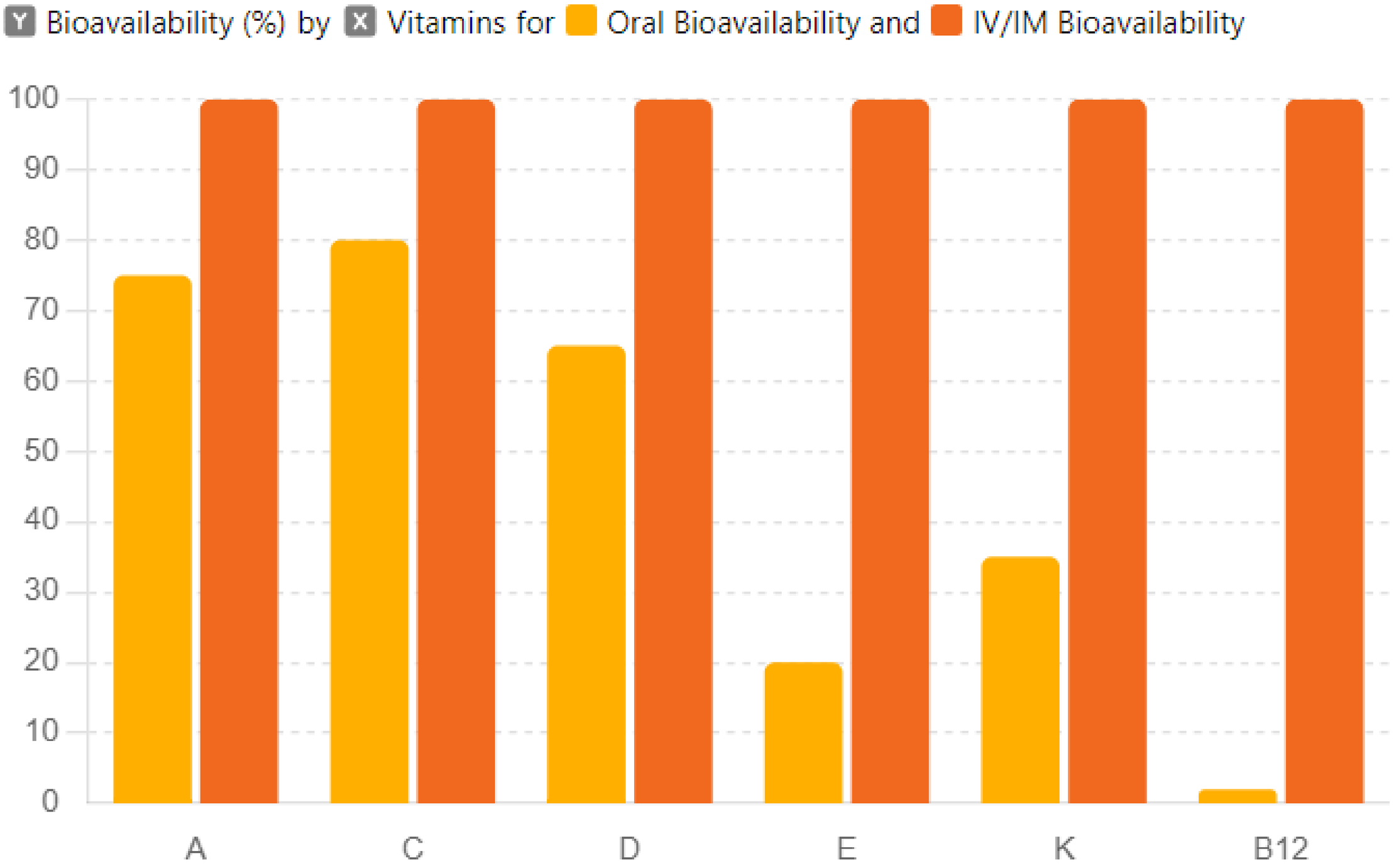
Vitamin K1 and K2 have differing bioavailability orally, with K2 being better absorbed. IM administration ensures higher bioavailability, crucial for patients with malabsorption issues.

Vitamin B12

Oral B12 requires intrinsic factor for absorption, limiting its bioavailability. IM administration is more effective, especially for individuals with pernicious anemia or gastrointestinal disorders.

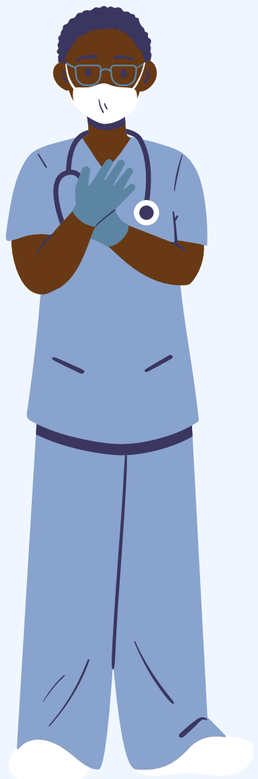
Results

Vitamin	Oral Bioavailability (%)	IV/IM Bioavailability (%)
A	60-70	~100
C	70-90 (low doses)	~100
D	50-70	~100
E	10-30	~100
K	20-50	~100
B12	1-2 (without intrinsic factor)	~100


Y Bioavailability (%) by X Vitamins for Oral Bioavailability and IV/IM Bioavailability
100
90
80
70
60
50
40
30
20
10
0
A
C
D
E
K
B12

Discussion

The findings indicate that IV/IM administration generally results in higher bioavailability for vitamins A, C, D, E, K, and B12 compared to oral administration. However, oral administration is often sufficient for individuals without absorption issues. Personalized supplementation strategies should consider the patient's health status, dietary habits, and specific vitamin requirements.



References

1. National Institutes of Health. (2020). Vitamin A Fact Sheet for Health Professionals.
2. Levine, M., et al. (1996). Vitamin C pharmacokinetics in healthy volunteers: evidence for a recommended dietary allowance. Proceedings of the National Academy of Sciences, 93(8), 3704-3709.
3. Holick, M. F. (2007). Vitamin D deficiency. New England Journal of Medicine, 357(3), 266-281.
4. Traber, M. G. (2007). Vitamin E regulatory mechanisms. Annual Review of Nutrition, 27, 347-362.
5. Shearer, M. J., & Newman, P. (2008). Metabolism and cell biology of vitamin K. Thrombosis and Haemostasis, 100(04), 530-547.
6. Stabler, S. P. (2013). Vitamin B12 deficiency. New England Journal of Medicine, 368(2), 149-160.