

An overview on vitamin D status and associated factors in Saudi Arabia Elderly Population

Amira H. Mahmoud *

Geriatrics and Gerontology department; Faculty of medicine, Ain shams university, Cairo, Egypt.

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Abstract

Worldwide, nearly one billion individuals are suffering from vitamin D deficiency or insufficiency, which is mostly high among the elderly population. It remains a major health problem in Saudi Arabia. Despite having sunny weather most of the year, exposure to sunlight is inadequate due to traditional clothing style that covers almost the whole body, indoor activities especially among elderly. Vitamin D deficiency is associated with increased risk of various health problems including falls, Fractures, osteoporosis, cardiovascular disease, dementia, depression, and cancer Several studies have investigated the prevalence of hypovitaminosis-D and various associated factors among elderly in kingdom of Saudi Arabia. Vitamin D deficiency is highly prevalent among elderly population in Saudi Arabia and it remains a vital health problem. Educational interventions are needed to increase awareness about the importance of vitamin D and to promote healthy life style habits that would be effective as preventive measures for vitamin D deficiency in elderly. Integration of vitamin D testing in the primary health care centers and regular monitoring of serum levels would be helpful in developing supplementation programs that would in turn result in overall reduction of this health problem.

Keywords: Overview; Vitamin D; Associated factors; Saudi Arabia; Elderly

1 Introduction

Worldwide, nearly one billion individuals are suffering from vitamin D deficiency or insufficiency, which is mostly high among the elderly population. (1)

Vitamin D deficiency is common in Middle East countries and occurs in 80% of Middle East Population. (2)

There is an increasing need to identify potentially modifiable risk factors for Disease and disability with a growing elderly population.

Elderly are more liable to develop vitamin D deficiency [(25OH)D] because of various risk factors including, diminished sunlight exposure, reduced skin thickness, decreased dietary intake, impaired intestinal absorption and impaired hydroxylation in the liver and kidneys. (3,4)

Vitamin D deficiency remains a major health problem in Saudi Arabia, despite having sunny weather most of the year. Exposure to sunlight is inadequate due to traditional clothing style that covers almost the whole body, indoor activities especially among elderly.

Vitamin D deficiency is associated with increased risk of various health problems including falls, fractures, osteoporosis, cardiovascular disease, dementia, depression, and cancer. (5,6)

* Corresponding author: Amira Hanafey Mahmoud

2 Vitamin D Sources and Metabolism

Vitamin D (calcitriol) is a hormone that consists of vitamin D₂ (ergocalciferol) and vitamin D₃ (cholecalciferol).

The main sources of vitamin D are endogenous production of dermal synthesis due to solar ultraviolet (UV) B light exposure and it also could be obtained through food and supplementation such as salmon fish, sardine, cod liver oil, egg yolk and fortified milk products. (7,8)

Vitamin D₂ from dietary ingestion and D₃ from skin undergoes first hydroxylation in the liver to 25 hydroxyvitamin D which then circulates to the kidneys where it undergoes a second hydroxylation to 1,25-dihydroxyvitamin D which is the biologically active form of vitamin D and is called calcitriol.

2.1 Biological actions of vitamin D

Almost all body cells have receptors to vitamin D which become stimulated by increasing vitamin D concentrations. The interaction between vitamin D and receptor sites in various body organs produce numerous biological actions which include regulation of calcium and phosphorus in the intestine and bones, insulin sensitivity and secretion, regulation of cellular growth and angiogenesis, renin expression, inhibition of vascular smooth muscle proliferation, amyloid deposition in brain and is also essential for muscle contraction and nerve conduction (9).

In addition, it exerts benefits on immune system through cell differentiation and immuno-modulatory properties. (10) All these biological actions can explain how vitamin D has been linked to various health problems, including osteoporosis, diabetes, hypertension, cardiovascular disease, cognitive decline, and certain cancers like cancer breast, prostate and colon.(9,11)

2.2 Hypo-Vitaminosis D

According to Scientific Advisory Committee on Nutrition 2007 and Cancer Research UK 2010, blood 25(OH)D levels below 25 nmol/l (or 10 ng/ml) qualify as 'deficient' 25(OH)D levels but beyond this there is currently no standard definition or agreement as to 'optimal' 25(OH)D levels.(12,13)

The Committee of the Institute of Medicine (IOM, USA) and the Endocrine Society, defined vitamin D values lower than 50 nmol/L (20 ng/mL) as vitamin D deficiency, values between 50 and 75 nmol/L as vitamin D insufficiency and values equal or above 75 nmol/L (30 ng/mL) described as adequate or sufficient vitamin D. (14,15)

There is generally a lack of consensus and definitions between countries that has given rise to a range of terminology and associated values to describe vitamin D status, including the terms of deficiency, insufficiency, adequacy or optimal. Inconsistency in the cut-off levels used and the interchangeable use of terminology makes it difficult to have accurate comparisons of vitamin D deficiency prevalence rates between studies. (16,17)

According to The International Osteoporosis Foundation ,it is recommended for older adults aged 60 years and over to take a supplement of vitamin D at a dose of 800 to 1000 IU/day, as this is associated with greater muscle strength and improved bone health.(18,19)

2.3 Vitamin D Current Studies in Kingdom of Saudi Arabia

Several studies have investigated the prevalence of hypovitaminosis-D and various associated factors among elderly in kingdom of Saudi Arabia.

A cross sectional study by *Al-Othman et al*, conducted on 264 elderly individuals in Riyadh, 2012, reported that 88% of participants had vitamin D deficiency and that 6% had insufficiency. (20)

Another study conducted on 300 elderly individuals in Jeddah city, 2017, reported that 83.3% of the participants had vitamin D deficiency and 11.7% had insufficiency.(21)

Out of 400 elderly individuals, 76.8% of elderly individuals had vitamin D deficiency and 19.2% had insufficiency in another study in Makkah city, 2018.(22)

Prevalence of vitamin D deficiency was 60.9% and vitamin D insufficiency 29.9% in a study conducted on 335 elderly at National Guard Hospital, in Jeddah city, 2022. (23)

Moreover, Some factors such as female sex, age, being housebound, obesity, and inadequate sunlight exposure were significantly associated with vitamin D deficiency in several studies. (20,21,24,25)

Muscle function and strength related to vitamin D status in Saudi elderly women aged ≥ 60 years has been studied by *Ardawi et al* suggesting that correcting hypo-vitaminosis D to a serum [25(OH)D] levels ≥ 50 nmol/L would improve muscle function and strength. (26)

Vitamin D deficiency has been linked to endothelial dysfunction in patients with type 2 diabetes in a study of by *Akbar et al.*(27)

A case-control study conducted on 120 breast cancer cases and 120 controls admitted to King Fahd Hospital in Jeddah, 2011, demonstrated a statistically significant relationship between higher serum concentrations of [25(OH)D] and lower risk of breast cancer. (28)

Ardawi et al established the association between vitamin D receptor gene polymorphisms and fracture risk among Saudi postmenopausal women. A significant association between the *Bsm1* polymorphism and the risk of falling among participants was found which may explain the high fracture risk associated with VDR genotypes. (29)

Also, the association between vitamin D status and different measures of adiposity was reported in a study by *Hussein et al*, authors findings suggested that vitamin D correlates inversely with body mass index (BMI) in Saudi postmenopausal women (30).

3 Conclusion and recommendations

- Vitamin D deficiency is highly prevalent among elderly population in Saudi Arabia and it remains a vital health problem. Inadequate sunlight exposure, cultural practices are the major contributing factors to this deficiency.
- Educational interventions are needed to increase awareness about the importance of vitamin D and to promote healthy life style habits that would be effective as preventive measures for hypovitaminosis-D in elderly.
- Integration of vitamin D testing in the primary health care centers and regular monitoring of serum levels would be helpful in developing supplementation programs that would in turn result in overall reduction of this health problem.

Critical appraisal of current vitamin D research

- The lack of standard cutoffs used to define deficient and sufficient serum levels of vitamin D makes it difficult to compare prevalence rates of hypovitaminosis-D between studies.
- Efforts are needed to standardize cutoff values which will improve accuracy of study results and prevalence rates.
- Also, more multi-centric studies addressing elderly group are needed.

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