Vitamin D level in a sample of Egyptian Females in Child Bearing Period Attending a Family Medicine Center

Thesis

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Abb.	Full term
7-DHC	7-dehydrocholesterol
AMPs	Antimicrobial peptides
BMI	Body mass index
CDC	Centers of Diseases Control and Prevention
CF	Cystic fibrosis
CPD	Cyclobutane pyrimidine dimers
DNA	Deoxyribonucleic acid
IQR	Inter quartile range
MENA	Middle East and North Africa
PTH	Parathyroid hormone
RIF	Rifampicin
SD	Standard deviation
SPF	Sunburn protective factor
TLR	Toll-like receptor
UVB	Ultraviolet B
VDR	Vitamin D receptor

INTRODUCTION

Vitamin D is a steroid hormone modulating several molecular and cellular functions, especially in the musculoskeletal system, besides its extra-skeletal role on the immune system, metabolism, cardiovascular system diseases and cancer. In addition, its association with decreased mortality was evident ***(Bassil et al., 2013).***

Vitamin D deficiency is a common public-health problem. Deficiency is more common in women than men, and the childbearing period is known to represent a particularly high-risk situation ***(Hyppo¨nen and Boucher, 2010).*** High rates of poor vitamin D status are found among women during the childbearing period throughout the world ***(Halicioglu et al., 2012).***

Middle East and North Africa (MENA) region registers some of the highest rates of hypovitaminosis D worldwide with taking into consideration female gender, multi-parity, clothing style, season, socio-economic status and urban living are recognized predictors of hypovitaminosis D in adults ***(Bassil et al., 2013).***

Bodnar et al. (2007) had stated that women during the childbearing period, with a body mass index (BMI) greater than 30 are at increased risk of vitamin D deficiency

More over severe vitamin D deficiency can occur in young women, due to some calcium loss during pregnancy through fetal

demands and increased urinary calcium excretion, which increases with advancing pregnancy ***(Khadilkar et al., 2013).***

Several factors have been identified in women with vitamin D deficiency like the lack of exposure to sunlight, the culture, (e.g. wearing long garments), the skin pigmentation, along with a low vitamin D dietary intake. Long lactation periods, the use of skin sun blockers, tobacco smoking and obesity. However, women at reproductive age are a group that can be susceptible at earlier age for vitamin D deficiency and its complications as increase the risk of osteopenia, osteoporosis, muscle weakness, osteomalacia and pathological fractures and can worsen other chronic conditions, such as the polycystic ovary syndrome; it is also a risk factor for cardiovascular diseases, metabolic syndrome, some types of cancers and some autoimmune diseases ***(Contreras-Manzano et al., 2017).***

More over factors affecting serum vitamin D level includes age, sex, pubertal status, latitude, season, race, and ethnicity ***(El-Sagheer et al., 2016),*** dark skin or concealing clothing, which may lead to limited exposure even though living in tropical areas where sun-exposure is adequate, can cause vitamin D deficiency ***(Robinson et al., 2006).***

Vitamin D deficiency is defined as a 25(OH)D below 20 ng/ml (50 nmol/liter), and vitamin D insufficiency as a 25(OH)D of 21–29 ng/ml (525–725 nmol/liter) ***(Holick et al., 2011).***

Most of studies worldwide used 25(OH)D to assess serum vitamin D level because 1,25-dihydroxyvitamin D {1,25(OH)2D} can be normal, high, or low in vitamin D deficiency. So, the most commonly used and most sensitive index for assessing vitamin D status is 25-hydroxy vitamin D {25(OH)D} ***(Marwaha et al., 2005).***

El Rifai et al. (2014) had stated that maternal vitamin D deficiency is a real problem in Egypt; this is generally related to high BMI, low fish consumption, low educational level, and limited skin exposure**.** So, this problem needs more investigations because also ***(El-Sagheer et al., 2016)*** stated that in Egypt, data on clinical and subclinical vitamin D deficiency status are scarce.

Despite the abundant sunlight in Saudi Arabia, 100% of participants of 465 young adult Saudi females aged 19 to 40 years old in a study carried out in one of the primary care units had hypovitaminosis D with serum 25(OH) D ≤ 50 nmol/L which should be considered a public health problem ***(Al-Mogbel et al., 2012).***

A large exploring study of vitamin D status in Arabian Gulf on 7942 participants shown 85.4% deficiency in vitamin D level among all age groups and in both sexes with mean level of 25(OH) D was ≤ 20 ng/mL ***(Yammine et al., 2016).***

Several studies have identified a surprisingly high prevalence of vitamin D deficiency in all age groups such as in Europe after 14 population study ***(Cashman et al., 2016),*** United States, Canada and Australia ***(Holick, 2008).***

In India, 48% of 98 mothers and 52% of 98 infants have 25(OH)D less than 25 nmol/L ***(Jain et al., 2011).***

In China, 89% of 323 adolescent girls in Beijing have serum 25(OH)D <50 nmol/L ***(Foo et al., 2009).***

In Hong Kong, hypovitaminosis D, defined by a 25(OH)D concentration <50 nmol/L, has also been shown in 90% of 441 women ***(Woo et al., 2008)*** and 60% of 504 Indonesian women ***(Green et al., 2008).***

Despite reported prevalence of vitamin D deficiency and insufficiency depend on the cut-off values used that vary between studies, an estimated 1 billion people worldwide have vitamin D deficiency or insufficiency or hypovitaminosis D ***(Laillou et al., 2013).***

AIM OF THE WORK

1. To measure vitamin D level among a sample of females during the child-bearing period attending a family medicine center.
2. To identify the factors affecting vitamin D level among studied females.

Chapter 1

THE BIOLOGY OF VITAMIN D

Vitamin D, a steroid hormone, has been traditionally considered as a key regulator of bone metabolism, and calcium and phosphorous homeostasis through a negative feedback with the parathyroid hormone (PTH). However, during the last 20 years, the role played by vitamin D has been largely revised by recognizing its pleiotropic action on a wide spectrum of systems, apparatuses and tissues. Thus, vitamin D has growingly been involved as a primary determinant of biological modifications and specific clinical conditions ***(Cesari et al., 2011)***.

A- Sources of vitamin D:

Vitamin D is a vitamin obtained by the body from three sources. Endogenous synthesis of vitamin D occurs in the skin and is induced by UV radiation. Vitamin D may also be obtained exogenously through dietary intake. Only a few foods naturally contain appreciable amounts of vitamin D3 that have an impact on dietary intake: fish liver, fish liver oils, fatty fish, and egg yolks. Oily fish such as salmon, mackerel and blue fish are excellent sources of vitamin D3. Farmed salmon, the most widely consumed fish in The United States, contains about one quarter of the vitamin D3 found in wild-caught salmon from Alaska. Some countries practice fortification of certain foods with vitamin D, most often milk, margarine, and/or butter. The mean intakes of

vitamin D in different studies vary with age group, food, supplementation habits and gender ***(Lu et al., 2007)***.

B-Metabolism of the vitamin D compounds:

Vitamin D (the sunshine vitamin) is normally produced in skin through a photolytic process; exposure of skin to sunlight catalyzes the first step in vitamin D3 biosynthesis. Ultraviolet B (UVB) photons (290-320nm) rupture the 9-10 bond of 7-dehydro-cholesterol generating pro-vitamin D3, which spontaneously isomerizes to vitamin D3 (**Figure 1**). The solar radiation intensity, which varies with latitude and season, determines the cutaneous vitamin D synthesis rate, and hence vitamin D nutrition. The cutaneous vitamin D synthesis rate decreases with increasing skin pigmentation, advancing age, clothing and sun screen use ***(DeLuca, 2004)***.

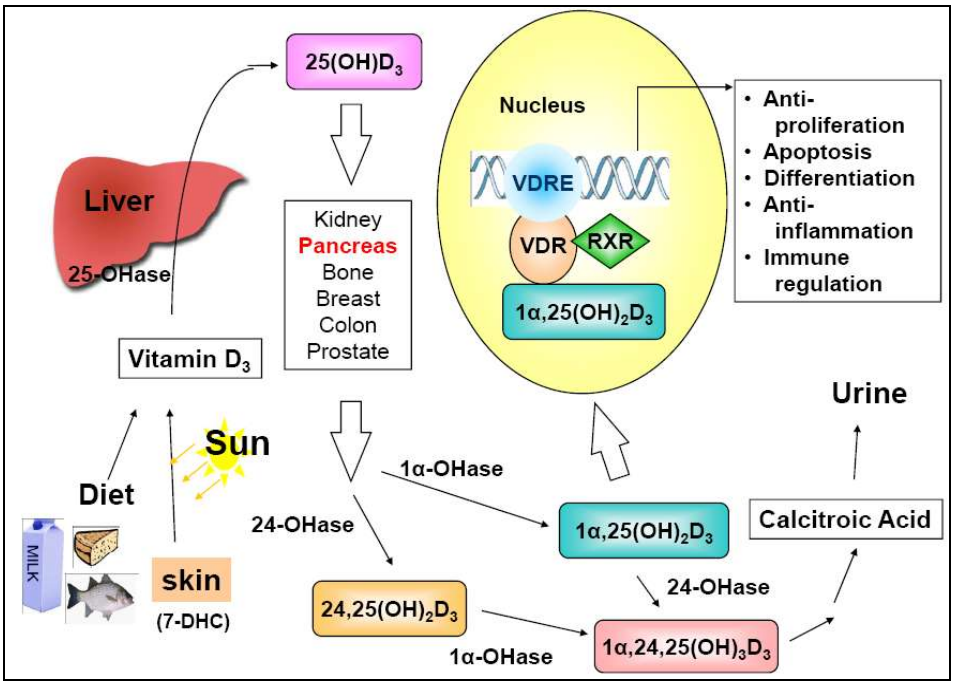

Figure (1): Vitamin D sources, metabolism, mechanism of action, and biological functions ***(Chiang et al., 2011).***

Vitamin D3 is the natural form of vitamin D produced in skin, and vitamin D2 (ergocalciferol) is derived from irradiation of ergosterol, which occurs to some degree in plankton under natural conditions and is used to produce vitamin D2 from the mold ergot. Another important fact is that vitamin D is required throughout life; it is not only needed for the formation of bone but also likely plays an important role in several other physiologic systems. Its use may well prevent several degenerative diseases, and it may also play a role as an anticancer agent ***(Schuster, 2001)***.

Two enzymatic activation steps are required to produce 1α, $25(OH)_2D_3$, the biologically active vitamin D hormone. The