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Outcomes of Vitamin D Deficiency among Women in Saudi Arabia

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Abstract

Introduction: Although sun exposure is considered a major source of vitamin D, the prevalence of its deficiency is paradoxically much higher in the countries with sunny climate, such as Saudi Arabia, Egypt, Oman, United Arab Emirates and Jordan. This discrepancy has been attributed to cultures and traditions that may limit exposure to the sun in these countries. Hence, this review aimed to investigate the magnitude of vitamin D deficiency among Saudi women.

Methods: An online databases were searched to identify articles related to vitamin D deficiency among women in Saudi Arabia. Articles addressed the problem among children or males population were excluded. The resulted articles were reviewed by 3 independents reviewers to ensure their eligibility and further exclusion of ineligible articles. The data regarding vitamin D deficiency were excluded from this review. The extracted data were synthesized in the form of a narrative review. The results were discussed in the following section.

Results: A total of 12 studies were eligible in this review, as they discussed vitamin D deficiency among women. The high prevalence of vitamin D deficiency in the Kingdom of Saudi Arabia has been well established in several subpopulations. Vitamin D deficiency may result from one and/or more of the following including decreased cutaneous synthesis, decreased dietary intake, impaired hepatic and/or renal activation, or resistance to vitamin D action. Vitamin D level was not influenced by lifestyles, dietary habits, education level or household income. However, none of the predictors was significant enough to predict serum Vit D level. These results suggest that Vit D deficiency is common even in very sunny areas emphasizing the importance of screening for Vit D deficiency in these populations.

Conclusions: Vitamin D deficiency in Saudi women is further impacted during pregnancy itself, with a noted deteriorating vitamin D status, which may arise in part due to the increased nutritional demands of the growing fetus . This decline in vitamin

D levels is also common in Arab Gulf countries, where many mothers about a half of their neonates, at the time of delivery, have sub-optimal serum levels of 25(OH)D, highlighting that in Saudi Arabia the answer may be more complicated than sunlight exposure alone.

Keywords: Vitamin D, Pregnancy, Practices, Osteoporosis, Women, Saudi

Introduction

Vitamin D is essential for life as it is the most important biological regulators of calcium metabolism. Low vitamin D level has been associated with variable chronic diseases, especially Rickets in children and osteoporosis in adults. Vitamin D has a critical role in bone metabolism and many cellular and immunological processes. Its deficiency has been associated with cancer, infection, asthma, dermopathies [1].

Vitamin D is an essential fat-soluble vitamin that is required for regulation of calcium metabolism and to maintain good health . It is obtained through either dietary sources or synthesis in the human skin by exposure to ultraviolet B (UVB) radiation . There are two main forms of vitamin D: vitamin D 2 (ergocalciferol) and vitamin D 3 (cholecalciferol). Vitamin D 2 is a plant sterol found in foods such as cod-liver oil, fatty fish, and egg yolk. Vitamin D 3 is manufactured in human skin through photochemical conversion of 7-dehydrocholesterol via pre-vitamin D 3 to vitamin D 3 . In the human body, vitamin D is converted to 25-hydroxy vitamin D (25(OH)D), the major storage and circulating form of vitamin D, and then to 1,25-dihydroxy vitamin D, the active form of vitamin D, by enzymes in the liver and kidney [2,3].

Vitamin D deficiency has been recognized as an international public health problem due to its important role in health and disease, mainly for the skeletal system where vitamin D deficiency causes rickets, osteomalacia, and osteoporosis . Even in countries with plentiful sunshine, epidemic prevalence of vitamin D deficiency has been reported in the general population and especially in women and children [4]. Pregnant women are more susceptible to vitamin D deficiency than any other human groups . Vitamin D deficiency is a universal problem, with an estimate of about 1 billion people suffering from its worldwide. However, the prevalence is widely variable among countries. Although sun exposure is considered a major source of vitamin D, the prevalence of its deficiency is paradoxically much higher in the countries with sunny climate, such as Saudi Arabia, Egypt, Oman, United Arab Emirates and Jordan [5]. This discrepancy has been attributed to cultures and traditions that may limit exposure to the sun in these countries, especially among women. Dietary factors have an important role in this problem, with the intake of food low in vitamin D content being shown as one of the main risk factors, in addition to the lack of vitamin D supplementation [6].

The gender differences in vitamin D deficiency have seldom been investigated. Some studies reported the prevalence by gender, but with no actual comparisons adjusting for confounding variables. The prevalence is even higher among migrants from these countries living in less sunny climates, compared with the Aborigines. Nonetheless, multiple risk factors contribute to the low vitamin D level state other than the customs that lead to lack of sunlight exposure, such as clothing style, veils, long sleeves outdoors, housing designs and outdoor activities [7]. Moreover, vitamin D is postulated to have a potential effect on several pregnancy outcomes including fetal skeletal outcome, hypertensive disorders, and gestational diabetes mellitus (GDM) [8]. To our knowledge, there is a limited data on the relation of low vitamin D and pregnancy, or fetal development, in the Saudi population. Hence, this review aimed to investigate the magnitude of vitamin D deficiency among Saudi women.

Methods

An online databases were searched to identify articles related to vitamin D deficiency among women in Saudi Arabia. Articles addressed the problem among children or males population were excluded. The resulted articles were reviewed by 3 independents reviewers to ensure their eligibility and further exclusion of ineligible articles. The data regarding vitamin D deficiency were excluded from this review. The extracted data were synthesized in the form of a narrative review. The results were discussed in the following section.

Results and discussion

A total of 12 studies were eligible in this review, as they discussed vitamin D deficiency among women. The high prevalence of vitamin D deficiency in the Kingdom of Saudi Arabia has been well established in several subpopulations. Vitamin D deficiency may result from one and/or more of the following including decreased cutaneous synthesis, decreased dietary intake, impaired hepatic and/or renal activation, or resistance to vitamin D action . Vitamin D insufficiency may lead to secondary hyperparathyroidism resulting in greater bone turnover, bone loss, and consequent increased bone fragility and/or osteoporosis [9]. Moreover, vitamin D insufficiency may increase postural imbalance due to increased body sway, muscle weakness, and diminished ability to respond to falls, thus increasing the risk of fracture(s) . Serum 25-hydroxyvitamin D (25 (OH)D) level is considered to be the best indicator of vitamin D nutritional status; it has been suggested that serum 25(OH)D values <50 nmol/L indicate vitamin D deficiency and <75 nmol/L indicate vitamin D insufficiency . Moderate to severe vitamin D deficiency (serum 25 (OH)D<20 nmol/L) may be associated with rickets or histologically evident osteomalacia [10]. However, some authors suggest that serum 25(OH)D value of 50 nmol is the threshold for optimal vitamin D status . Significant association between serum 25(OH)D levels and total hip bone mineral density (BMD) in young and older adults have been reported . Several studies have demonstrated that Saudi women exhibited generally low serum 25(OH)D values due to low vitamin D dietary supplementation and/or limited exposure to sunlight due to lifestyle or clothing habits , however, there is no detailed studies on the effects of vitamin D deficiency or insufficiency on bone metabolism and BMD in Saudi women [11]. Moreover, some studies suggest that vitamin D receptor (VDR) genotypes may play a role in the changes of serum 25(OH)D values in relation to bone turnover and thus affecting the rates of fracture in patients undergoing therapeutic supplementation with vitamin D and calcium , however, there is no information on the possible influence of VDR genotypes on vitamin D status in Saudi women.

Routinely screening pregnant women for sleep-related problems and the presence of potentially modifiable risk factors may contribute substantially to improvements in maternal and fetal/neonatal health outcomes [12]. This finding suggests that patients with a higher second-trimester vitamin D concentration experienced fewer sleep problems than those with a lower vitamin D concentration. This prospective study reveals a high percentage of poor sleep and short sleep duration throughout pregnancy among pregnant Saudi women [13]. Furthermore, it remains uncertain whether the presence of metabolic syndrome and IR are linked to the greater rates of hypovitaminosis D observed in Saudi postmenopausal women . The results presented show that abdominal obesity IR, and hypovitaminosis D were highly prevalent among our cohort of 300 postmenopausal women with and without metabolic syndrome as defined by the AHA/NHLBI. The high prevalence of metabolic syndrome observed in our cohort may have obscured the impact of other coronary risk factors. The study was approved by the ethical review board of KAUH. All subjects gave their informed consent for the study, which was performed in accordance with the guidelines proposed in the Declaration of Helsinki [14]. To avoid subjective error, all measurements were taken by the same trained staff. Conversely, a study conducted in 2012 indicated that intake of vitamin D supplements had no effect in alleviating depression in women. Therefore, more studies are extremely encouraged to define the relationship between the vitamin D levels and depressive symptoms especially in Saudi Arabian females, wherein studies are limited. The results reveal an inverse association between 25(OH)D levels and depression [15].

Gestational diabetes mellitus (GDM) has a serious short-and long-term adverse health outcomes for both mothers and offspring. Vitamin D deficiency was also identified as a risk factor for obesity and T2DM in women at late reproductive age. Here may be other dietary sources contributing to blood vitamin D and calcium levels (milk and cheese) and preventing low BMD but were not significant in the final model, for example, recently, use of green tea is proven to be protective against LBMD. Future studies can recommend a dietary plan based on local food items to prevent women from developing low BMD [16]. A tool called QUS was used as baseline screening test to identify "at risk" women before referring them for a much costlier and radiation exposed investigation DXA. Recent studies found QUS to be a reliable screening instrument for low BMD/fractures and recommended its use in primary care settings [17].

Vitamin D deficiency is supposed to identify at risk population for low BMD but our results conclude that vitamin D may not be a reliable indicator for women in Saudi Arabia as majority were suffering from vitamin D deficiency, in fact low BMD women had higher values as compared to normal group. Although comparison of the characteristics of those tested and not tested with DXA revealed no significant difference except for husbands occupation, however, the groups may have differed on some characteristics that we did not ascertain. In addition, frequency of dietary items and physical activity may have been subjected to information bias [18, 19]. Thus, it is possible that residual uncontrolled confounding may have played a role in our findings. In conclusion, low BMD poses a high public health burden in Saudi Arabia which can be identified through screening and risk factors assessment at primary care level [20].

Conclusions

Vitamin D deficiency should be suspected and treated in all subjects with osteopenia and osteoporosis. Saudi Arabia is sunny most of the year; hence, the level of Vit D is expected to be adequate. Vitamin D level was not influenced by lifestyles, dietary habits, education level or household income. However, none of the predictors was significant enough to predict serum Vit D level. These results suggest that Vit D deficiency is common even in very sunny areas emphasizing the importance of screening for Vit D deficiency in these populations. Vitamin D deficiency in Saudi women is further impacted during pregnancy itself, with a noted deteriorating vitamin D status, which may arise in part due to the increased nutritional demands of the growing fetus . This decline in vitamin D levels is also common in Arab Gulf countries, where many mothers about a half of their neonates, at the time of delivery, have sub-optimal serum levels of 25(OH)D, highlighting that in the Gulf states the answer may be more complicated than sunlight exposure alone.

Conflict of interests

The authors declared no conflict of interests

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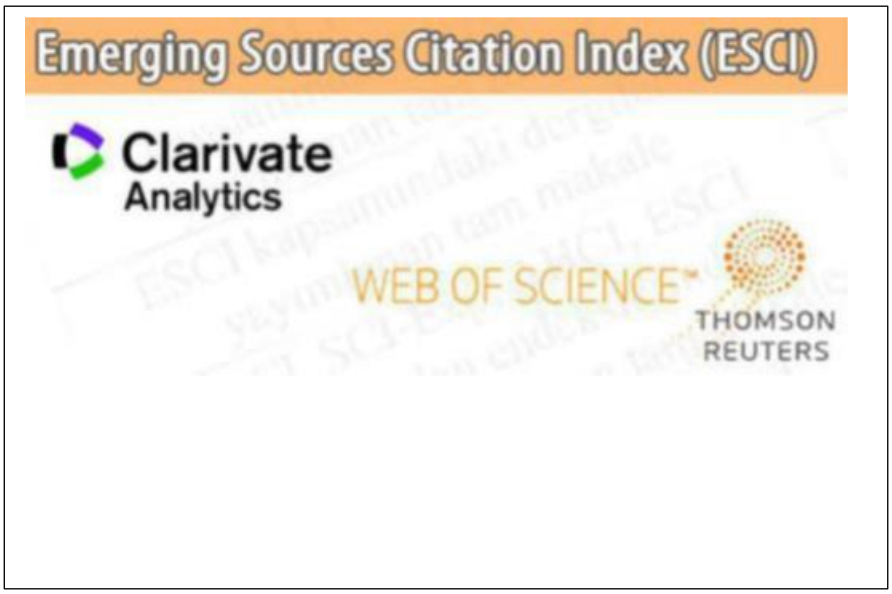
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