

# Vitamin D Deficiency and Insufficiency among Adult's Cohorts, Clinico-Epidemiological Profile and Associated Factors, an Approach to Clinical Audit

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## Abstract

Vitamin D deficiency is the most common nutritional deficiency worldwide in both children and adults which lead to increases the risk of many chronic diseases, including cancer, autoimmune diseases, type 2 diabetes, heart disease and hypertension, and infectious diseases, objective of the study is to study the prevalence of Vit D Insufficiency and Deficiency among Adult cohort in Dubai, to study the epidemiological profile and associated factors Methodology: a cross sectional study carried out on (80) Adult patient, age range (15-70 y) randomly selected from Vitamin deficiency and insufficiency cohorts registered and attending primary health care facilities at Dubai health authority, full socioe demographic and clinical data has been collected through data collection interview questionnaire, patients follow up has been extended for up to one year in relation to lab investigation follow up, vitamin D therapy, health education, life style intervention and physical examination (operational definitions of variables, inclusion-exclusion criteria, scale of measurement and ethical considerations has been addressed properly throughout the research course: Results: The study showed that about 75% of the total participant showed vitamin D insufficiency and 25% of the total sample showed vitamin D deficiency means one third of abnormal vitamin D level was deficiency below (<10) and two third are between (10-30). The most affected age segment was the age class 45-54 consist about 29% of the total sample and the least affected age group was 15-24 about (7%). The study showed that about 67.5% of the total sample with abnormal serum Vitamin D level was among females and 32.5% of them were males). Among affected females, the study revealed that about 28% were shown vitamin D insufficiency and 72% showed vitamin D Deficiency. About 91.25% of the abnormal serum Vitamin D level was shown to be UAE nationals and 9.75% were shown to be expatriate. Vitamin D deficiency was more among cohorts of BMI within range of (26-30) overweight group which showed about 53% followed by BMI (>30) obese group (37.75%) while it was the least among normal BMI cohorts about 21.25%. The study showed that only 22.5% of the total sample size was having a history of exposure to health education and awareness about the diseases.

## Keywords

Vit D, Deficiency, Patterns, Clinical Audit

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## 1. Introduction

Vitamin D deficiency is the most common nutritional deficiency worldwide in both children and adults. In the US and Europe, >40% of the adult population >50 years of age is

vitamin D-deficient, increases the risk of many chronic diseases, including cancer, autoimmune diseases, type 2 diabetes, heart disease and hypertension, and infectious diseases (including upper respiratory tract infections and tuberculosis), as well as osteoarthritis. Vitamin D deficiency,

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which classically manifests as bone disease (either rickets or osteomalacia), is characterized by impaired bone mineralization. More recently, the term vitamin D insufficiency has been used to describe low levels of serum 25-hydroxyvitamin D that may be associated with other disease outcomes. Vitamin D deficiency results in abnormalities in bone metabolism [1, 2] and in calcium and phosphorus homeostasis [3, 4] and is increasingly recognized as a key factor in many chronic diseases [5, 6]. Bone pain due to osteomalacia primarily affects the bones between the joints, whereas arthritis usually causes predominantly joint pain, and fibromyalgia causes more diffuse muscle and soft tissue pain; however, it can be difficult to distinguish between these disorders. Proximal muscle weakness and gait instability are often present. Because the growth plates have closed in adults, the radiographic features differ from those typical of rickets. Radiography may reveal pseudo fractures of the pelvis, femurs, metatarsals, or lateral margins of the scapulae [7]. Evidence of a positive association between BMD and serum 25(OH)D concentrations in adolescents is fair, but the evidence for a positive association in infants is inconsistent [8, 9]. Serum 25(OH)D concentration was related to hip BMD (Bone Mass Density) in community-dwelling women and men aged at least 20 years who participated in the US NHANES III survey. [10] Higher calcium intake was significantly associated with higher BMD only for women with 25(OH)D values less than 20 ng/mL. One of the limitations of a cross-sectional study like the NHANES survey is that it can demonstrate only associations, not cause-and-effect relationships. Another confounding factor may be associated with low vitamin D intake and low bone density. For example, healthier people who exercise more outside in the sun may have greater bone density because of their exercise and higher 25(OH)D levels because of sun exposure. In a prospective observational study of adults older than 65 years participating in NHANES III, the risk of death was 45% lower in those with 25(OH)D values greater than 40 ng/mL compared with those with values less than 10 ng/mL (hazard ratio [HR], 0.55; 95% CI, 0.34-0.88). [11] The observational Nurses' Health Study found that vitamin D supplementation and calcium supplementation were both associated with a reduction in risk of type 2 diabetes. [12] Several lines of evidence demonstrate the effects of vitamin D on proinflammatory cytokines, regulatory T cells, and immune responses, with conflicting interpretation of the effects of vitamin D on allergic diseases. [13, 14, 15, 16]

## 2. Objective

To study the prevalence of Vit D Insufficiency and Deficiency among Adult cohort in Dubai, To study the

epidemiological profile and associated factors.

## 3. Methodology

A cross sectional study carried out on (80) Adult patient, age range (15-70) randomly selected from Vitamin deficiency and insufficiency cohorts registered and attending primary health care facilities at Dubai health authority, full socioe-demographic and clinical data has been collected through data collection interview questionnaire, patients follow up has been extended for up to one year in relation to lab investigation follow up, vitamin D therapy, health education, life style intervention and physical examination operational definitions of variables, inclusion-exclusion criteria, scale of measurement and ethical considerations has been addressed properly throughout the research course:

## 4. Results

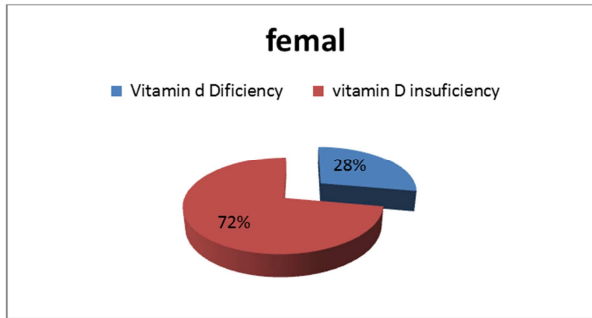
The study showed that about 75% of the total participant showed vitamin D insufficiency and 25% of the total sample showed vitamin D deficiency means one third of abnormal vitamin D level was deficiency below (<10) and two third are between (10-30). As reflected by table 1. The most affected age segment was the age class 45-54 consist about 29% of the total sample and the least affected age group was 15-24 about (7%). The study showed that about 67.5% of the total sample with abnormal serum Vitamin D level was among females and 32.5% of them were males as shown in the table 2. Among affected females, the study revealed that about 28% were shown vitamin D insufficiency and 72% showed vitamin D Deficiency as reflected by figure 1. About 91.25% of the abnormal serum Vitamin D level was shown to be UAE nationals and 9.75% were shown to be expatriate as per table 3. Vitamin D deficiency was more among cohorts of BMI within range of (26-30) overweight group which showed about 53% followed by BMI (>30) obese group (37.75%) while it was the least among normal BMI cohorts about 21.25% as reflected by table 4. The study showed that only 22.5% of the total sample size was having a history of exposure to health education and awareness about the diseases.

**Table 1.** Frequency distribution of Vitamin D deficiency according to the age.

Age group	Vitamin D Insufficiency		Vitamin D Deficiency	
	NO	%	No	%
15-24	5	6.25%	2	2.5%
25-34	6	7.5%	3	3.7%
35-44	12	15.0%	6	7.5%
45-54	26	32.5%	3	3.7%
>55	11	13.75%	7	8.7%
Total	60	75%	20	25%

**Table 2.** Frequency distribution of Vitamin D Deficiency according to gender.

Category	Vitamin D Deficiency		Vitamin D Insufficiency	
	No	%	No	%
male	9	11.25%	17	21.25%
female	15	18.75	39	48.75%
Total	24	30%	56	70%



**Figure 1.** Vitamin D deficiency and insufficiency among Females.

**Table 3.** Frequency distribution of Vitamin D Deficiency according to nationality.

Category	Vitamin D Deficiency		Vitamin D Insufficiency	
	No	%	No	%
UAE	24	30%	49	61.25%
Non UAE	2	2.5%	5	6.25%
Total	26	32.5%	54	67.5%

**Table 4.** Frequency distribution of Vitamin D Deficiency according to the BMI in UAE.

Category	BMI<18		BMI 18-25		BMI 26-30		BMI >30	
	No	%	No	%	No	%	No	%
male	0	6	7.5%	12	15%	9	11.25%	
female	0	11	13.75%	31	38.75%	11	13.75%	
Total	0	17	21.25%	43	53.75%	20	25 %	

**Table 5.** Frequency distribution of Vit D Deficiency according to health education.

Category	Health education given		No health education	
	No	%	No	%
Male	4	5.0%	18	22.5%
Female	14	17.5%	44	55.0%
Total	18	22.5%	62	77.5%

## 5. Discussions

This study shows that, the prevalence of vitamin D deficiency was significantly more among females gender comparing to the prevalence among males, this finding was in similar to Austrian study (Robin. 2012) Prevalence of vitamin D deficiency and its determinants in Australian adults aged 25 years and older: a national, population-based study [17] which concluded that, women being more than twice as likely as men to have low levels (men 26% vs women 56%, P

<0 001), Yet, on the contrary to other study (Al-Dabhani K, 2017) in Qatar showed that Approximately 64% of participants were vitamin D deficient (<20 ng ml<sup>-1</sup>) with more men being deficient (68.6%) than women (61.3%). [18]. A Saudi Arabian study performed on 10 709 participants reported more females being severely vitamin D deficient (<10 ng ml<sup>-1</sup>) compared to males. [19] A Bahraini and Lebanese study also reported lower mean serum vitamin D in females compared to males. [20, 21].

Current study showed that affected age groups was 35-45 years old similar to other studies (Cameron, 2003) which showed in the contrary to other studies which showed that decreased with advancing age in both genders (P for trend, < 0.001) The high prevalence of vitamin D deficiency in our study may also be associated with increasing prevalence of obesity in Australia. Like many developed countries worldwide, Australia has experienced an approximate 2Æ5-fold increase in the prevalence of overweight and obesity over the past 20 years, 29 and adiposity is a well-known risk factor for vitamin D deficiency [22] Obesity, measured as BMI, waist circumference, and waist-to-hip ratio were positively associated with vitamin D deficiency with stronger associations observed with waist circumference. Similar results were found in both prospective and cross-sectional studies, including the Aus-Diab study, [23] the British Birth Cohort, Middle Eastern populations [25.26] and in other populations around the world. [27, 28, 29]Conversely, several cross-sectional studies did not report a correlation between obesity and vitamin D deficiency. [30, 31, 32] However, these are mainly small studies with limited power to observe associations. [33, 34]. Serum vitamin D was 8% lower in individuals with metabolic syndrome (RR: 0.92, 95%CI: 0.87-0.98, P-value: 0.01) compared to individuals without metabolic syndrome. Waist circumference and HDL as well as high triglyceride levels were also significantly positively associated with vitamin D deficiency.

Multivariate analysis also showed that the odds for vitamin D deficiency increased progressively with advancing age and tended to be greater in women compared with men across all age categories. In women aged ‡75 years, the odds of vitamin D decency was over four-fold greater compared with women aged 25–34 years and was nearly double that of men ‡75 years. Ethnicity, These findings are consistent with previous studies [35, 36] and have been attributed to decreased cutaneous production of vitamin D3 with ageing and increased melanin, and impaired vitamin D absorption in the intestine. [37, 38] The higher prevalence of vitamin D deficiency in women is also consistent with previous findings and may relate to gender differences in the time spent outdoors and/or clothing coverage.

## 6. Conclusions

Vitamin D deficiency and insufficiency proved to be associated with many factors like elder age groups, female gender, high BMIs (Presence of metabolic syndrome was associated with presence of vitamin D deficiency). And absence of health education and awareness.

## Recommendations

Structured operational intervention programs based on targeting high risk cohorts has to be top priority of health care services to be addressed by national health care system.

## Conflict of Interest

The authors declare no conflict of interest.

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