

Study of Vitamin D Deficiency in Adolescent Females (10-18 years old) In Cairo

Thesis

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By

Yara Hesham Elsaid Elmeligy

M.B.B.Ch

Supervised by

Prof. Raef Malak Botros

*Professor of Internal Medicine
Endocrinology and Metabolism Department
Ain-Shams University*

Prof. Yara Muhammed Eid

*Professor of Internal Medicine
Endocrinology and Metabolism Department
Ain-Shams University*

Dr. Bassem Murad Mostafa

*Lecturer of Internal Medicine
Endocrinology and Metabolism Department
Ain-Shams University*

**Faculty of Medicine
Ain Shams University**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سببناك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

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List of Abbreviations

Abb.	Full term
μg	<i>Microgram</i>
$1,25\text{ (OH)}_2\text{D}$	<i>1,25-dihydroxyvitamin D</i>
25(OH)D	<i>25-hydroxyvitamin D</i>
<i>AAP</i>	<i>American Academy of Pediatrics</i>
<i>ADP</i>	<i>Adenosine Diphosphate</i>
<i>AI</i>	<i>Adequate Intake</i>
<i>ALP</i>	<i>Alkaline phosphatase</i>
<i>APCs</i>	<i>Antigen-presenting cells</i>
<i>ATP</i>	<i>Adenosine Triphosphate</i>
<i>BBM1</i>	<i>Brush border myosin I</i>
<i>BMD</i>	<i>Bone Mineral Density</i>
<i>BMI</i>	<i>Body mass index</i>
<i>BNP</i>	<i>B-type natriuretic peptide</i>
<i>BP</i>	<i>Blood pressure</i>
<i>Ca</i>	<i>Calcium</i>
<i>Ca-ATPase</i>	<i>Calcium ATPase</i>
<i>CaBP</i>	<i>Calcium Binding Protein (calbindin)</i>
<i>CaM</i>	<i>Previously known as CaT1</i>
<i>CaSR</i>	<i>Calcium sensing receptor</i>
<i>CaT1</i>	<i>Calcium transient1</i>
<i>CHF</i>	<i>Congestive heart failure</i>
<i>CKD</i>	<i>Chronic kidney disease</i>
<i>COPD</i>	<i>Chronic Obstructive Lung Disease</i>
<i>CT</i>	<i>Computed tomography</i>
<i>CVD</i>	<i>Cardiovascular disease</i>
<i>CYP27B1</i>	<i>Cytochrome P27B1</i>
<i>DCs</i>	<i>Dendritic cells</i>
<i>DM</i>	<i>Diabetes mellitus</i>

List of Abbreviations (cont...)

Abb.	Full term
<i>DRI</i> s.....	<i>Dietary Reference Intakes</i>
<i>EDTA</i>	<i>Ethylenediaminetetraacetic acid</i>
<i>ELISA</i>	<i>Enzyme Linked Immunosorbent Assay</i>
<i>ER- α</i>	<i>Estrogen receptor-alpha</i>
<i>ER- β</i>	<i>Estrogen receptor-beta</i>
<i>FEV1</i>	<i>Forced expiratory volume</i>
<i>FGF23</i>	<i>Fibroblast growth factor 23</i>
<i>FMD</i>	<i>Fibromuscular dysplasia</i>
<i>FNB</i>	<i>Food and Nutrition Board</i>
<i>FVC</i>	<i>Forced vital capacity</i>
<i>GC</i>	<i>Glucocorticoids</i>
<i>GH</i>	<i>Growth hormone</i>
<i>GHD</i>	<i>Growth hormone deficient</i>
<i>GHRH</i>	<i>GH releasing hormone</i>
<i>HAART</i>	<i>Highly active antiretroviral therapy</i>
<i>HB</i>	<i>Hemoglobin</i>
<i>HIV</i>	<i>Human immunodeficiency virus</i>
<i>HOMA IR</i>	<i>Homeostatic model assessment insulin resistance</i>
<i>HPT</i>	<i>Hypothalamus-pituitary-thyroid</i>
<i>IFNγ</i>	<i>Interferone γ</i>
<i>IGF-1</i>	<i>Insulin-like growth factor</i>
<i>IGFBP-3</i>	<i>Insulin-like growth factor binding protein-3</i>
<i>IL</i>	<i>Interleukin</i>
<i>IOM</i>	<i>Institute of Medicine</i>
<i>IU</i>	<i>International Unit</i>
<i>KSA</i>	<i>Kingdom of Saudi Arabia</i>
<i>LDL-C</i>	<i>Serum low density lipoprotein cholesterol (LDL-C) levels</i>

List of Abbreviations (cont...)

Abb.	Full term
<i>MARRS</i>	<i>Membrane-associated rapid response steroid binding protein</i>
<i>Mcg</i>	<i>Microgram</i>
<i>m-CSF</i>	<i>Macrophage colony-stimulating factor</i>
<i>Mg</i>	<i>Milligram</i>
<i>MI</i>	<i>Mild deficiency</i>
<i>MO</i>	<i>Moderate deficiency</i>
<i>MS</i>	<i>Multiple sclerosis</i>
<i>NAFLD</i>	<i>Non-alcoholic fatty liver disease</i>
<i>NaPi-IIb</i>	<i>Sodium-phosphate cotransporter IIb</i>
<i>NCX1</i>	<i>Sodium / calcium exchanger</i>
<i>Ng / ml</i>	<i>Nanogram / millileter</i>
<i>NHANES III</i>	<i>National Health and Nutrition Examination Survey III</i>
<i>NIDDM</i>	<i>Noninsulin-dependent diabetes mellitus</i>
<i>NIDE</i>	<i>National institute of diabetes and endocrinology</i>
<i>NKs</i>	<i>Natural killer cells</i>
<i>Nmol / L</i>	<i>Nanomol / liter</i>
<i>NNK</i>	<i>Nicotine-derived nitrosamine ketone</i>
<i>OCPC</i>	<i>Ortho-cresolphthalein complexone</i>
<i>OV / BV</i>	<i>Osteoid volume / bone volume</i>
<i>PD1A3</i>	<i>Protein disulfide isomerase associated protein 3</i>
<i>pg</i>	<i>Picogram</i>
<i>PPAR</i>	<i>Peroxisome Proliferator-activated receptor</i>
<i>PTH</i>	<i>Parathormone hormone</i>
<i>PVN</i>	<i>Paraventricular nucleus</i>
<i>RA</i>	<i>Rheumatoid arthritis</i>
<i>RANKL</i>	<i>Receptor activator of nuclear factor-κB ligand</i>
<i>RCTs</i>	<i>Randomized Clinical Trials</i>

List of Abbreviations (cont...)

Abb.	Full term
<i>RDA</i>	<i>Recommended Dietary Allowance</i>
<i>RhGH</i>	<i>Recombinant human GH</i>
<i>RTI</i>	<i>Respiratory Tract Infections</i>
<i>RXR</i>	<i>Retinoic acid X receptor</i>
<i>S.Ca</i>	<i>Serum calcium</i>
<i>s.creat.</i>	<i>Serum creatinine</i>
<i>SE</i>	<i>Severe deficiency</i>
<i>SGA</i>	<i>Small for gestational age</i>
<i>SPF</i>	<i>Sunscreen protection factor</i>
<i>SPSS</i>	<i>Statistical Package for the Social Sciences</i>
<i>SU</i>	<i>Sufficient</i>
<i>T.B</i>	<i>Tuberculosis</i>
<i>T2DM</i>	<i>Type 2 Diabetes Mellitus</i>
<i>T3</i>	<i>Triiodothyronine</i>
<i>T4</i>	<i>Tetraiodothyronine</i>
<i>TNF-α</i>	<i>Tumor Necrosing Factor alpha</i>
<i>TRH</i>	<i>Thyrotropin releasing hormone</i>
<i>TRPV6</i>	<i>Transient Receptor Potential Cation Channel Subfamily V Member 6.</i>
<i>TSH</i>	<i>Thyroid stimulating hormone</i>
<i>U.S</i>	<i>United States</i>
<i>UL</i>	<i>Upper Intake Level</i>
<i>UVB</i>	<i>Ultra violet B rays</i>
<i>VDDR</i>	<i>Vitamin D deficiency rickets</i>
<i>VDI</i>	<i>Vitamin D intoxication</i>
<i>VDR</i>	<i>Vitamin D receptor</i>
<i>VDREs</i>	<i>Vitamin D response elements</i>
<i>Vitamin D</i>	<i>Vitamin D</i>
<i>WHO</i>	<i>World health organization</i>

INTRODUCTION

Vitamin D deficiency became a global problem in most age groups. Clinical diseases (rickets, osteomalacia) appears at times of life when demands are increased, eg. early years of growth, adolescence, pregnancy and lactation (**Palacios and Gonzalez, 2013; Holick et al., 2011**).

Vitamin D deficiency is endemic in many countries such as: KSA, Kuwait, USA, Europe and Egypt (**Palacios and Gonzalez, 2013**). In Egypt, a recent study reported that 70% of females are vitamin D deficient, 50% of males are vitamin D deficient (**Botros et al., 2015**).

Vitamin D deficiency is a common problem among Egyptian adolescent girls (**Amr et al., 2012**) for whom contributing factors include inadequate sun exposure eg. (extreme age, seasonal variations, being female, dark skin pigmentation, clothing style and obesity) and insufficient dietary calcium (**Amr et al., 2012; Arabi et al., 2010**). Also photosynthesis in turn depends upon latitude, time of day, season and UVB intensity (**Arabi et al., 2010**).

The most recent Endocrine Society guidelines recommend the use of the 25-OH vitamin D test for the screening and diagnosis of vitamin D deficiency (**Holick et al., 2011**). Other parameters, such as low serum calcium and phosphate levels or elevated alkaline phosphatase and

parathormone hormone can also indicate vitamin D deficiency (*Lips, 2010*).

Based on the most recent Endocrine Society guidelines, vitamin D deficiency has been defined as a 25-OH vitamin D3 level below 50 nmol/L (20 ng/dl), while an insufficiency is considered to exist at levels of 51---74 nmol/L (21---29 ng/dl) as showed by several studies worldwide (*Holick et al., 2011*).