

# **Vitamin D in Egyptian obese children and its relation to insulin resistance and sensitivity**

Thesis

Submitted for Fulfillment of Master Degree in Pediatrics

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2012



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا  
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة آية (32)



## **Acknowledgment**

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### **Acknowledgment**

*First and foremost thanks to **ALLAH** the most kind and merciful, to whom I related any success in achieving any work in my life and making me capable of finishing this work.*

*I would like to express my deepest thanks and gratitude to **Prof. Dr. Nermin Salah El Din Metwally**, Professor of Pediatrics, Faculty of medicine, Cairo University, for her kind supervision, generous advice and continuous help to put this work in the present form.*

*I would like also to express my special appreciation and sincere thanks to **Prof. Dr. Wafaa Abd-El Samie Kandeel** Professor of Biological Anthropology National Research Center for her great efforts, helpful suggestion, standing beside me and helping me at any time.*

*I am also indebted to **Dr. Maha Mohsen Mohamed Amin** Assistant Professor of Pediatrics, Faculty of medicine, Cairo University, for her great care, valuable instructions, constant help and helpful advice.*

*I would also like to thank **Prof. Dr. Hana Hamdy Ahmed**, Professor and Head of Hormones Dept., National Research Centre for her great efforts, valuable instructions and kind cooperation in this study with a special thank to the members of the hormone department.*

## **Acknowledgment**

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*I would like to convey my genuine thanks to **Prof. Dr. Moushira Erffan Zaki**, Professor of Human Genetics, National Research Center for her great efforts in the statistical analysis of the whole thesis and her valuable advices.*

*I would like to express my deep appreciation to **Prof. Dr.Abeer Atef** and **Prof. Dr.Lerine Bahi El Din** for accepting to discuss my thesis.*

*My deep thanks to all my colleagues in the Biological Anthropology department for their support through the whole work.*

*Also I would like to thank all the working staff of the Diabetes Endocrine and Metabolism Pediatric Unit (DEMPU) clinic for their cooperation through the whole work.*

*I would like to show my sincere thanks and appreciations to the patients and their parents for their cooperation and participation in the study.*

### *Abstract*

**Abstract:** It is now known that insufficient serum 25(OH) D alters metabolic functions causing perturbation of many cellular functions including that of the pancreas. Recently there has been a resurgence of hypovitaminosis D3 in many populations. In parallel there has been a worldwide increase in the prevalence of obesity. Links between obesity and hypovitaminosis D has been reported.

**Objective:** to assess vitamin D status in obese Egyptian children and adolescents and to determine the effect of vitamin D on metabolic problems already linked to obesity.

**Design:** The study was a cross sectional study conducted on 50 obese subjects (BMI  $\geq$  95th percentile) aged 8 to 15 years recruited from Diabetes Endocrine and Metabolic Pediatric Unit at Cairo University Pediatric Hospital which were compared to 50 healthy children and adolescents age and sex matched included as controls.

**Method:** All subjects were subjected to general examination, anthropometric assessment (weight, height, waist circumference, and hip circumference), body composition (using bioelectrical impedance device) and laboratory tests (Serum 25(OH) D, serum lipid profiles, serum fasting insulin, serum fasting glucose and C-reactive protein).Indices of insulin sensitivity and resistance (HOMA-IR, HOMA  $-\beta$  and QUICKI) were calculated from fasting insulin and fasting glucose.

**Results:** Among 50 child with simple obesity, 3 (6%) were vitamin D deficient

## *Abstract*

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and 47 (94%) were vitamin D insufficient. On correlating 25(OH) D with variables among obese subjects it showed a significant negative correlation between vitamin D and waist circumference, hip circumference, fat % and fat mass and a significant positive correlation between vitamin D and Lean% and TG. No correlation was found between vitamin D and BMI z score, Systolic BP, Diastolic BP, insulin, glucose, HDL, LDL, cholesterol, TG, CRP, HOMA-IR, HOMA-B and QUICKI.

When classifying the 50 obese children according to the IDF definition of metabolic syndrome, 26(52%) had metabolic syndrome while 24(48%) were non metabolic. The comparison between both groups showed that the metabolic syndrome group had higher significant values regarding fasting blood glucose and HOMA-IR while lower significant values regarding HOMA- $\beta$  and QUICKI were present.

**Conclusion:** 100% of the obese children had hypovitaminosis D and the vitamin D level was negatively correlated to the fat% and fat mass of the obese subjects highlighting the role of obesity in causing vitamin D deficiency. Vitamin D was neither correlated to the metabolic risk factors (Systolic BP, Diastolic BP, insulin, glucose, HDL, LDL, cholesterol, TG and CRP) nor the indices of insulin resistance and sensitivity (HOMA-IR, HOMA-B and QUICKI) which may show the need for further researches to elucidate such relation.

### **Key words:**

Obese children – vitamin D – insulin

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## *List of Abbreviations*

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AgRP	Agouti-related peptide
Bax	Bcl-2–associated X protein
Bcl2	B-cell lymphoma 2
BIA	Bioelectrical impedance analysis
BMI	Body mass index
BP	Blood pressure
CART	Cocaine and amphetamine-regulated transcript
CKD	Chronic kidney disease
CRP	C-reactive protien
CVS	Cardiovascular system
CYP	Cytochrome P
DEMPU	Diabetes Endocrine and Metabolism Pediatric Unit
DEXA	Dual energy X-ray absorptiometry
Fas-L	Fas- ligand
FBG	Fasting blood glucose
FDA	Food and drug administration
FFAs	Free fatty acids
FGF-23	Fibroblast growth factor 23
FSIVGTT	Frequently Sampled Intravenous Glucose Tolerance Test
GERD	Gastroesophageal reflux disease
G/I ratio	Glucose/insulin ratio
HDL	High-density lipoprotein
HOMA	Homeostasis model assessment
IDF	International Diabetes Federation
IGF-I	Insulin-like growth factor I
IL	Interleukin
IST	Insulin suppression test
JIS	Joint Interim Statement
KATP	ATP-sensitive K <sup>+</sup>
LDL	Low-density lipoprotein
LH	Lateral hypothalamus

## *List of Abbreviations*

Mc3r	Melanocortin-3 receptors
Mc4r	Melanocortin-4 receptors
MCH	Melanin concentrating hormone
NAFLD	Non-alcoholic fatty liver disease
NCX1	Na <sup>+</sup> /Ca <sup>2+</sup> exchanger
NPY	Neuropeptide Y
OGTT	Oral Glucose Tolerance Test
OHS	Obesity hypoventilation syndrome
OPG	Osteoprotegerin
OSAS	Obstructive sleep apnea syndrome
PAI-1	Plasminogenactivator inhibitor-1
PC1	Prohormone convertase 1
PCOS	Polycystic ovary syndrome
PMCA1b	Plasma membrane Ca ATPase
POMC	Pro-opiomelanocortin
PPAR- $\delta$	Peroxisome proliferator activated receptor $\delta$
PTH	Parathyroid hormone
PVN	Paraventricular nucleus
QUICKI	Quantitative insulin sensitivity check index
RAAS	Renin-angiotensin-aldosterone system
RANK	Receptor nuclear factor- $\kappa$ B
RANKL	Receptor activator of nuclear factor- $\kappa$ B ligand
RXR	Retinoid x receptor
SCFE	Slipped capital femoral epiphysis
SSPG	Steady-state plasma glucose
SSPI	Steady-state plasma insulin
TG	Triglyceride
Th	T helper
TLRs	Toll like receptors
TNF	Tumor necrosis factor
Treg	T regulatory
TRPV5	Transient receptor potential cation channel, subfamily V, member 5
TRPV6	Transient receptor potential cation channel, subfamily V, member 6

## *List of Abbreviations*

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US	Ultrasound
UV	Ultraviolet
VDCC	Voltage-dependent Ca <sup>2+</sup> channels
VDR	Vitamin D receptor
VDRE	Vitamin D response element
VDR-RXR	Vitamin D receptor–retinoic acid x-receptor complex
VSMCs	Vascular smooth muscle cells
WC	Waist circumference
WHO	World health organization
WHR	Waist hip ratio



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# INTRODUCTION

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