RELATION BETWEEN VITAMIN D DEFICIENCY AND ACUTE LOWER RESPIRATORY TRACT INFECTION

Thesis

Submitted for Partial Fulfillment of Master Degree

In Pediatrics

By

Radwa Mohamed Kamel Bedair

M.B.B.CH

Faculty of Medicine – Ain Shams University

Supervised By

Prof./ Mohammed Mohammed Farid

Professor of Pediatrics

Faculty of Medicine – Ain Shams University

Dr./ Mohamed Farouk Allam

Assistant Professor of Community Medicine

Faculty of Medicine – Ain Shams University

Dr./Asmaa Alhusseiny Ahmed

Assistant Professor of Pediatrics

Faculty of Medicine – Ain Shams University

Faculty of Medicine

Ain Shams University

2018

سورة البقرة الآية: ٣٢

Acknowledgement

First and foremost, I feel always indebted to **ALLAH**, *the Most Kind and the most Merciful.*

I would like to express my sincere gratitude to ***Dr. Mohammed Mohammed Farid,*** *Professor of Pediatrics, Faculty of Medicine, Ain Shams University, under his supervision, I had the honor to complete this work, I am deeply grateful to him for his professional advice, guidance and support.*

I wish also to express my gratitude to ***Dr. Mohamed Farouk Allam,*** *Assistant Professor of Community, Faculty of Medicine, Ain Shams University, for his great efforts, kind advice, support and encouragement throughout the whole work.*

I am also greatly indebted to ***Dr. Asmaa Alhusseiny Ahmed*** *Assistant Professor of Pediatrics, Faculty of Medicine, Ain Shams University, for her tremendous effort she has done, enthusiasm and help.*

Also, I would like to thank ***Dr. Sanaa Youssef Shabaan*** *Professor of pediatrics, Faculty of Medicine, Ain Shams University for her support, advice and help.*

Finally, I can't forget to thank my father and my husband; for them I will find no adequate words to express my gratitude.

Radwa Mohamed Kamel Bedair

List of Contents

List of Tables

List of Figures

List of Figures (Cont...)

List of Figures (Cont...)

List of Abbreviations

Abb.	Full term
(OH)2D	*Dihdroxy vitamin D*
(OH)D	*Hydroxy vitamin D*
7-DHC	*7 Dehdroxy cholesterol*
AAFP	*American academy of family physians*
AAP	*American academy of pediatrics*
ABG	*Arterial blood gas*
ACCP	*American collage of family physians*
AIDS	*Human immunodeficiency virus infection and acquired immune deficiency syndrome*
ALP	*Alkaline phosphatase*
ALRTI	*Acute lower respiratory tract infection*
ALSPAC	*Avon longitudinal study of parents and children*
AP	*Anterioposterior*
ARDS	*Acute respiratory distress syndrome*
ATS	*American thoracic society*
BAL	*Bronchoalveolar lavage*
BF	*Breast feeding*
CaBP	*Calcium binding protein*
CA-MRSA	*Community associated methicillin-resistant staphlococcus aureus*
CAP	*Community acquired pneumonia*
CBC	*Complete blood count*
CDC	*Centers for disease control and prevention*
CFU	*Colony formating unit*
CI	*Confidence interval*
CMV	*Cytomegalo virus*
CRP	*C-reactive protein*
CSF	*Cerebrospinal fluid*
CT	*Computated tomography*

List of Abbreviations (Cont...)

Abb.	Full term
CYP	*Cytochrome P 450*
D2	*Vitamin D2*
D3	*Vitamin D3*
DBP	*D binding protein*
DRI	*Dietary referance intake*
E coli	*Esherchia coli*
ECaC	*Epithelial calcium channel*
ECG	*Electocardiography*
ELISA	*Enzyme linked immuniassay*
ER	*Emergancy room*
ESR	*Erythrocyte sedimantation rate*
FGF-23	*Fibroblast growth factor 23*
FNB	*Food and nutrition board*
Hib	*Haemophilus influenza type B*
hMPV	*Human Metapeuomic virus*
HSV	*Herpes simplex virus*
I^2	*Chi-square*
ICU	*Intensive care unit*
IDSA	*Infectious disease society of America*
Ig	*Immunoglobuline*
IL	*Interlukine*
IM	*Intra muscular*
IU	*International unit*
LRTI	*Lower respiratory tract infection*
MRSA	*Methicillin-resistant staphlococcus aureus*
NHNES	*National heath and nutrition exammination survey*
OHase	*Hydroxylase*
OR	*Odds ratio*

List of Abbreviations (Cont...)

Abb.	Full term
PBB	*Protected bacterial bronchitis*
PCR	*Polymerase chain reaction*
PEEP	*Postive end expiratory pressure*
PIV2	*Para influenza virus type 2*
PPV	*Pneumococcal polysaccharide vaccine*
PT	*Preterm*
PTH	*Parathyroid hormone*
RANK	*Receptor avtivator of nuclear factor Kappa B*
RANKL	*Receptor activator of nuclear factor Kappa -B ligand*
RBC	*Red blood cell*
RSV	*Respiratory syncytial virus*
RXR	*Retinoid X receptor*
SD	*Standard deviation*
SPF	*Sun protective factor*
TB	*Tuberculosis*
TRPV	*Transient receptor potent vanilloid family*
UL	*Upper level*
US	*Ultra sonography*
UV	*Ultra vilote*
VDR	*Vitamin D receptor*
WBC	*White blood cell*
WHO	*World health organization*

INTRODUCTION

Vitamin D is a key nutrient for both healthy children and those with chronic illnesses. Understanding its roles in health and disease has become one of the most important issues in the nutritional management of children ***(Wagner et al., 2013).***

Vitamin D is well known for its classic role in the maintenance of bone mineral density. However, vitamin D also has an important "non-classic" influence on the body's immune system ***(Bergman et al., 2013).***

This role is by modulating the innate and adaptive immune system, influencing the production of important endogenous antimicrobial peptides such as cathelicidin, and regulating the inflammatory cascade ***(Stoll et al., 2013).***

Vitamin D metabolites enhance immunity to a wide range of respiratory pathogens in vitro. Numerous observational studies have investigated whether vitamin D deficiency is a risk factor for acute respiratory infection ***(Porojnicu et al., 2012).***

Acute lower respiratory infections are a leading cause of sickness and mortality both in children and adults worldwide ***(Aliberti and Blasi, 2012).***

From an epidemiological point of view, the definition of acute lower respiratory infections usually includes acute bronchitis and bronchiolitis and pneumonia ***(Nair et al., 2011).***

Multiple epidemiological studies in adults and children have demonstrated that vitamin D deficiency is associated with increased risk and greater severity of infection, particularly of the respiratory tract ***(Brehm et al., 2012).***

Although the exact mechanisms by which vitamin D may improve immune responses to infection continue to be evaluated, vitamin D supplementation trials of prevention and adjunct therapy for infection are under trial. Given its influence on the immune system and inflammatory cascade, vitamin D may have an important future role in the prevention and treatment of infection ***(Hewison, 2011).***

A number of clinical trials of vitamin D supplementation for the prevention of acute respiratory infection have recently been conducted ***(Leis et al., 2012).***

Moreover, Observational studies predominantly reported statistically significant associations between low vitamin D status and increased risk of both upper and lower respiratory tract infections. Results from randomized controlled trials were conflicting however, reflecting heterogeneity in dosing regimens and baseline vitamin D status in study populations ***(Berry et al., 2011).***

On the other hand, Studies have reported that vitamin D deficiency has a negative impact on the prevalence of LRTI and

disease severity and increases intensive care and oxygen requirements of LRTI patients ***(Arikoglu et al., 2015).***

In these studies, no significant correlation was found between vitamin D status and LRTI or disease severity, but the fact that vitamin D levels was below normal in part of all children included in these studies suggested that this result was important for our community in which both LRTIs and vitamin D deficiency are prevalent ***(Dogrib et al., 2014).***

Although no correlation was found between LRTI and vitamin D in these studies, it is recommended that vitamin D level should be measured in children with LRTI and all children should be given vitamin D supplementations especially in winter months considering the effects of vitamin D on infections, pulmonary functions and immunity ***(Imam et al., 2011).***

Vitamin D was identified in the early 20th century. It is a nutrient its main functions are the regulation of calcium and phosphate metabolism and so for the maintenance of bone health.

Other health effects of vitamin D have been proposed for children and adolescents; including prevention of immune-related diseases (asthma) infectious diseases (lower respiratory tract infection).

We therefore will conduct a meta-analysis of clinical studies that investigated the association between vitamin D deficiency and susceptibility of acute lower respiratory infection in children.

Aim of the Work

The aim of our study is to summarize available data on vitamin D deficiency and it's positive and negative effect on acute lower respiratory tract infections.