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Vitamin D deficiency and its relation to the children

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Abstract: **Introduction: Vitamin D insufficiency is profoundly predominant among children around the world. The high rates of vitamin D inadequacy during childhood are of real general health pertinence, given the developing evidence that vitamin D insufficiency may assume a key part in the pathophysiology of numerous chronic diseases beyond rickets including immune system conditions, cardiovascular maladies, and cancer. Protein-energy malnutrition is likely to be associated with vitamin D intake deficiency among children.**
Objective: Over the past two years, the number of studies relating vitamin D deficiency among children has increased significantly. The purpose of this study is to update and examine the evidence of the vitamin D deficiency and its relationship to children.
Methodology: Electronic databases were searched (no restriction-Nov, 2015) with no language restrictions and keywords related to children and vitamin D. We included studies of children younger than 7 years.
Results/Conclusion: the pediatric population in normal nutrition status shows a high prevalence of vitamin D deficiency during the months of autumn and winter and, especially, in spring; the addition of vitamin supplements and/ or an increase in the ingestion of their natural dietary sources should be considered.

Keywords: **Protein-energy malnutrition, deficiency and its relation, Vitamin D.**

1. INTRODUCTION

Vitamin D, (25(OH) D 25-hydroxyvitamin DP), a prohormone, is converted over in the liver to 25-hydroxyvitamin D (25(OH) D), and after that in the kidney to 1,25-dihydroxyvitamin D (1,25(OH)2D), the dynamic metabolite included in calcium and phosphorus homeostasis. The expression "vitamin D" incorporates two unique types of vitamin, vitamin D2 and D3. People acquire vitamin D from dietary nourishments and supplements, or by endogenous blend. Dietary wellsprings of vitamin D incorporate greasy fish and sustenance invigorated with vitamin D2 or D3, especially strengthened dairy items, newborn child equation, and breakfast grains. Amid the endogenous amalgamation of vitamin D, the first significant step includes the retention of bright B radiation by 7-dehydrocholesterol in the skin to deliver previtamin D3, which is quickly changed over to vitamin D3. This procedure is profoundly reliant on the infiltration of bright B photons into the epidermis, which is extraordinarily lessened in the vicinity of dim skin pigmentation, sunscreen, winter season, or high scope.

Vitamin D deficiency caused as 25(OH) D, the major circling type of vitamin D, is the best outline measure of vitamin D status as it joins both endogenous and dietary wellsprings of vitamin D [5]. Among newborn children and youthful youngsters, both the Institute of Medicine (IOM) and the American Academy of Pediatrics (AAP) have defined vitamin D deficiency as a serum 25 (OH) D level below 11 ng/mL (27.5 nmol/L). Serum 25(OH) D levels of less than 11 to 15 ng/mL (27.5 to 37.5 nmol/L) have been observed among infants and children with skeletal abnormalities characteristic of vitamin D deficiency rickets. a very high varieties of causes of vitamin D deficiency which are showing in **Table1** below.

A high prevalence of vitamin D deficiency has been found across all age groups in all populations studied in countries around the globe. It is estimated that 1 billion people worldwide have either vitamin D insufficiency or deficiency. In tropical African countries the mean vitamin D values are high, but individuals with deficiencies have lower values than their peers. Collectively the prevalence averages between 5 and 20 % in most age groups.

Protein-energy malnutrition (PEM) is likely to be associated with vitamin D intake deficiency. Moreover, some individuals with seemingly adequate ultraviolet (UV) exposure have low serum vitamin D concentration, due to the varying levels of the skin pigmentation. Hyperpigmentation in black people can compromise vitamin D production and this phenomenon may be aggravated by limited sun light exposure in the young infants.

Recommended guidelines for defining vitamin D deficiency in children:

- Vitamin D status 25-OHD (nmol/L) level
- Normal >50
- Mild deficiency 26-49
- Moderate deficiency 12.5-25
- Severe deficiency <12.5

Table 1. Examples of some causes of vitamin D deficiency among children

Causes of vitamin D deficiency or resistance	
Deficient intake or absorption	➢ Dietary ➢ Inadequate sunlight exposure ➢ Malabsorption ➢ Gastrectomy ➢ Small bowel disease ➢ Pancreatic insufficiency
Defective 25-hydroxylation	➢ Liver disease/failure ➢ Alcoholic cirrhosis ➢ Anticonvulsants
Loss of vitamin D binding protein	➢ Nephrotic syndrome
Defective 1-alpha 25-hydroxylation	➢ Hypoparathyroidism ➢ Chronic kidney disease/failure ➢ 1-alpha hydroxylase deficiency (Vitamin D-dependent rickets type1)
Defective target organ response to calcitriol	➢ Hereditary vitamin D-resistant rickets (Vitamin D-dependent rickets, type 2)

2. LITERATURE REVIEW

(Xin Zhao, Jianping Xiao, Xiangpeng, in 2015) they conducted study in China to evaluate the nutritional vitamin D status of young children aged 1–3 y in Wuxi, southeastern China, and their study demonstrated that The predominance of vitamin D insufficiency was 16.1% among youthful youngsters matured 1–3 y in Wuxi China. Season and kid age were connected with their vitamin D status. It is suggested that youthful kids ought to get sufficient measures of vitamin D supplementation and invest more energy outdoor to prolong the sunlight exposure when they grow older.

Nasrin Khalessi, Majid Kalani, Mehdi Araghi, and Zahra Farahani, in 2015. They conducted an study which was cross-sectional, descriptive analytical study that was carried out in the nursery ward of 2 hospitals (Tehran-Iran) during one year (January 2011- January 2012). One hundred and two neonates were categorized into two groups, neonates with birth weight< 2500 gr (n=52) and neonates with birth weight>2500 gr (n = 50). Their study shows that maternal Vitamin D inadequacy may expand the danger of low conception weight neonate and altering maternal sustenance conduct and their Vitamin D level could be valuable on pregnancy result.

Greer FR, 2008. This study reviewed serum 25-hydroxyvitamin D [25(OH)D] concentrations and utilitarian results of vitamin insufficiency in youthful kids and breastfed and non breastfed newborn children. These results incorporate the

vicinity or absence of vitamin D deficiency rickets, bone mineral content, and serum parathyroid hormone concentration. Daily vitamin D supplements of 400 IU/L keep serum 25(OH) D concentrations higher than50 nmol/L and prevent rickets in infants and young children.

According to numerous investigators, 25(OH) D concentrations in umbilical cord blood at the time of delivery range from 68% to 108% of maternal levels. Those authors reported a strong, positive correlation between infant and maternal serum concentrations. We know that cord blood 25(OH)D concentrations in infants, as in maternal blood, vary seasonally; the seasonal impact on cord blood is greater in white than in African American infants

Few studies have measured 25(OH)D concentrations in healthy US children aged 1 to 5 y. The National Health and Nutrition Examination Study (NHANES) study measured 25(OH)D concentrations in children aged 1–5 y for the first time in 2003–2004; a preliminary study found that mean concentrations were >55 nmol/L, which was the highest mean value for any age group measured in NHANES between 2000 and 2004 [NHANES measured 25(OH)D concentrations in participants up to age 70 y or older.

Augusto A. Litonjua, in 2012. Stated that vitamin D deficiency results in increased risks for asthma and allergies continue to accumulate. However, the optimal level of vitamin D that decreases both the risk for development and severity of these disorders remains elusive. Results of ongoing clinical trials of vitamin D supplementation will be needed before recommendations can be firmly established.

3. METHODOLOGY

We conducted a systematic review and meta-analysis of prospective cohort and cross sectional studies of the association of vitamin D deficiency and its related to children. Electronic databases searched through out November 2015 (MEDLINE, EMBASE, CINAHL, AMED PsycINFO). Search terms for MEDLINE, such as: vitamin D deficiency in children. And then Search of reference lists from relevant studies. Two independent reviewers of titles, abstracts, and/or full-text.

4. OBJECTIVE

As the Vitamin D deficiency is in the background of many chronic diseases in childhood. The purpose of this study is to update and examine the evidence of the vitamin D deficiency and its relationship to children. And increase the awareness and determine the major points that related to children worldwide from this condition.

5. RESULTS

At present, vitamin D deficiency rickets in the United States is only an ailment of breastfed babies who don't get vitamin D supplements and who have restricted sun presentation. The Institute of Medicine report expressed that 200 IU vitamin D keeps up 25(OH) D focuses >27.5 nmol/L, the most minimal point in the foundation's suggested ordinary extent. However, many US breastfed infants do not receive supplemental vitamin D. as its seen in TABLE **2** bellow.

TABLE 2: Bone mineral content (BMC) in breastfed infants taking or not taking vitamin D supplements

	BMC	
	400 IU Vitamin D/d	**Placebo**
	mg/cm	
1.5 mo	81 ± 12	84 ± 12
3 mo	80 ± 13[2]	89 ± 14
6 mo	89 ± 12[2]	101 ± 18
Change in BMC between 1.5 and 6 mo	9 ± 13[2]	18 ± 18

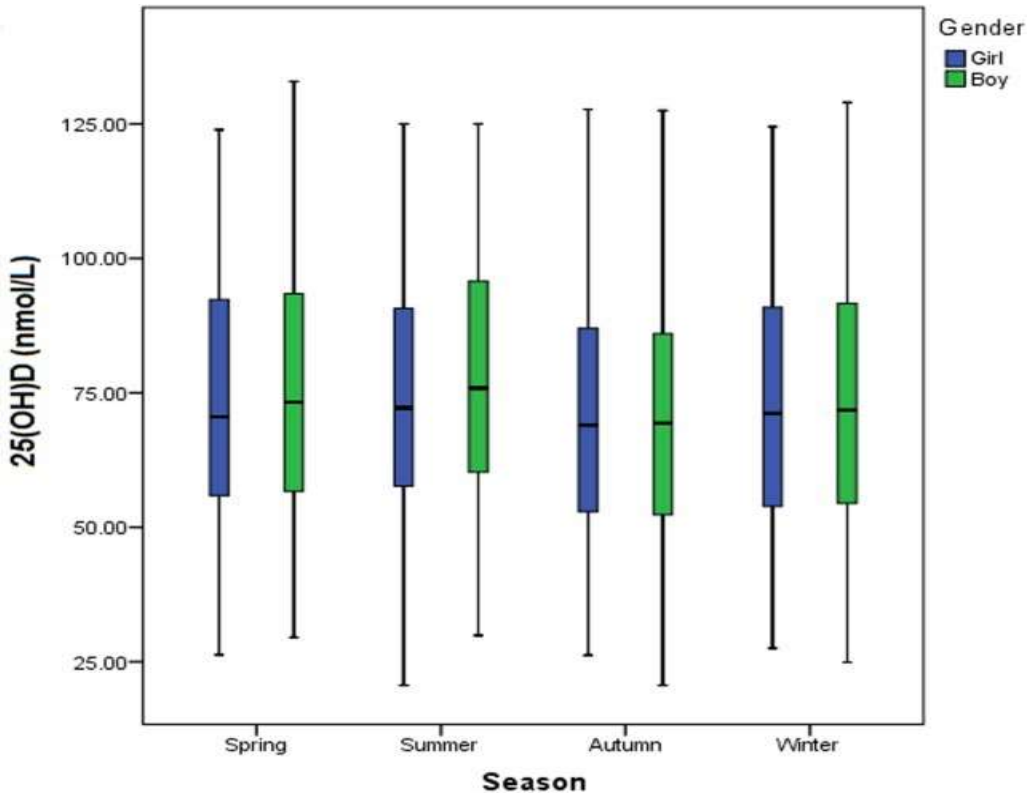
In the other research about Vitamin D deficiency in children of Punta Arena, out Of the 108 kids considered, 50% were boys, and had a mean age of 9.6±0.5 years. Healthful evaluation demonstrated that 39% had typical weight, 46% were overweight, and 15% were obese. Median 25OHD was 10.9ng/ml: 96.3% had deficiency (<20ng/ml) and 3.7%

insufficiency (20-29ng/ml). Severe deficiency was found in 62% (<12ng/ml). Baseline 25OHD was not affected by nutritional status. After supplementation, median 25OHD was 17.5ng/ml: 62% had deficiency, 36% insufficiency, and 2% sufficiency (>30ng/ml). Children with WE had a significantly lower increase in 25OHD than children with normal weight (5±5.5 vs. 7.7±4.9, p=03).

In the study of Vitamin D deficiency among children with cardiovascular diseases study demonstrated that. Qualification necessities incorporate age (>36 weeks, <18 years) and an inborn heart imperfection requiring cardiopulmonary detour surgical remedy. Enlistment of 62 members will happen at a solitary Canadian tertiary consideration focus over a time of 2 years. Children randomized to the high-dose group will receive age-based dosing that was informed by the Institute of Medicine (IOM) daily tolerable upper intake level (<1 year old = 1,600 IU/day, >1 year old = 2,400 IU/day).

In the study which was conducted in **hospital in Uganda** included One hundred fifty-eight children were selected, with 117 malnourished and 41 non malnourished. Among the malnourished, 69 (59.0 %) were male and 48 (41 %) female; while 22 (53.7 %) were male and 19 (46.3 %) female in the non malnourished gathering. In the non malnourished gathering matured 6–11 months, the middle tallness was 67.5 cm (IQR 61–68 cm); for the children matured 12–17 months, middle stature was 73.6 cm (IQR 72.4–77.5 cm); for children matured 18–24 months, median height was 73.6 cm (IQR 72.4–77.5 cm); for children aged 18–24 months, the median height was 81.5 cm (IQR 74–84 cm); $p = 0.341$. The median weight for children aged 6–11 months was 7.9 kg (IQR 6.8–8.9 kg); for children 12–17 months, median weight was 10.0 kg (IQR 9.0–11.0 kg); and children 18–24 months, median weight 10.4 kg (IQR 9.5–12.0 kg); $p \leq 0.001$). Among the malnourished, the median height for children aged 6–11 months was 67 cm (IQR 64.5–70 cm); for children aged 12–17 months median height was 70 cm (IQR 68–73.8 cm) and 75 cm (IQR 72–77 cm) for children aged 18–24 months, $p = 0.341$. The median weight for children 6–11 months was 6 kg (IQR 5.5–7.2 kg); for children 12–17 months, median weight 6.7 kg (IQR 6.0–7.0 kg) and children 18–24 months, median weight 8.0 kg (7.0–8.5 kg), $p < 0.001$. Significantly, among the non malnourished children, 5 (12.2 %) were found to have used different unspecified herbal remedies in the 3 months prior to admission, $p = 0.012$. Of the malnourished children, 58 (49.6 %) had used the herbal remedies prior to hospital presentation. Among the malnourished, 52 (44.4 %) reported a serious/long standing illness in the period of 3 months prior to admission compared to 12 (29.3 %) among the non malnourished, $p = 0.027$.

In the following chart **Comparison of the serum 25(OH)D concentration among young children in different seasons.** The serum 25(OH)D level was highest in summer and lowest in autumn in the study which took place in China.



6. DISCUSSION

The high prevalence of suboptimal vitamin D levels noted among the malnourished children could probably be attributed to nutrition habits, as the majority, 62 (53.0 %) of the children in this group were no longer breastfeeding but only fed on solid foods. In comparison, a lower proportion, 18 (43.9 %), of the well nourished children were feeding only on solid foods. The majority of the non-malnourished children, 19 (46.3 %) were fed on both solid foods and breast milk.

The mean daily exposure to sunshine among the non-malnourished children was 5.8 h compared to 4.5 h among the malnourished children. This could probably explain the difference in the vitamin D deficiency prevalence levels between these groups. Factors that include the illnesses among the malnourished children may play a role in these sick children spending time indoors, as a larger proportion of the malnourished children 52 (44.4 %) were found to have suffered from a long standing illness in the 3 months period prior to admission. In comparison, 12 (29.3 %) of the well nourished children were reported to have suffered from a significant or long standing illness.

There was also a significant difference in the vitamin D status of young children among various season and age groups ($P<0.001$) but not between genders ($P = 0.149$). The prevalence of optimal vitamin D (≥75 nmol/L) was highest in summer (49.1%) and lowest in autumn (41.4%), which was 45.9% in spring and 45.5% in winter, respectively.

7. CONCLUSION

In conclusion as high prevalence of vitamin D deficiency has been seen among children especially in developing countries, this study shows many different studies that shows the relationship of Vitamin D deficiency and several disease associated in childhood with that we come up with the related to maternal to children vitamin D deficiency. And Modifying maternal nutrition behavior and vitamin D level could be beneficial on prevention of low birth weight,

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