

## Determination of Relationship among recurring wheezing and Vitamin D position in infants at Bhuj, Kutch

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### Abstract

**Aim:** To explore relationship among recurring wheezing and Vitamin D position in infants.

**Materials and Methods:** Fifteen infants with recurring wheezing and 23 healthy analogous aged infants without any history of acute or chronic disease were incorporated in the current research. The clinical signs of infants were documented and serum 25-hydroxyvitamin D levels were measured.

**Results:** The mean levels of 25(OH) D were  $22.1 \pm 8.9$  IU/L for the control and  $18.8 \pm 11$  recurring wheezing group correspondingly. 73.29% of participants with recurring wheezing had vitamin D positions in the deficient range ( $<20$  ng/ml) and 47.8% had vitamin D levels beneath  $<19.9$  ng/ml in the control faction. 4 subjects had extremely poor vitamin D levels.

**Conclusion:** The current findings not express important relationship among vitamin D level and recurring wheezing in the infants.

**Keywords:** Kutch, Infant, Vitamin D, Wheezing.

### Introduction

Vitamin D is a fat-soluble vitamin that plays an important function in bone metabolism and largely acquired through endogenous amalgamation in the skin following contact today light. Within the body, Vitamin D acts as a hormone and it is well recognized for its role in calcium and phosphorus homeostasis, bone mineralization and skeletal health. The recent identification of Vitamin D receptors in most tissues and cells in the human body, combined with the demonstration that several cells in the body are capable of converting the primary circulating form of Vitamin D, 25-hydroxyvitamin D (25(OH)D), to vigorous appearance 1,25-dihydroxyvitamin D (1,25(OH)<sub>2</sub>D).

There is an increasing awareness of the important position of vitamin D in the upholding of general immune and respiratory health.<sup>(1,2)</sup> The diseases conventionally connected with vitamin D absence are rickets and osteomalacia, but emergent data proposed that it plays a significant job in the lung expansion and it is argue as a jeopardy issue for respiratory infections, recurring puffed and asthma.<sup>(3-6)</sup>

Few researches examine the association between recurring wheezing and vitamin D levels and these studies accounts the relationship between maternal vitamin D ingestion and premature infant wheezing.<sup>(7,8)</sup>

Consequences of vitamin D producing antimicrobial proteins such as cathelicidin, its protective role against respiratory tract infections and its importance in regulating chronic inflammation in the lung are potential mechanisms to clarify the connection amid vitamin D level and wheezing.<sup>(9-11)</sup>

### Materials and Methods

The present study was performed at Department of Pediatrics, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat, India. The infants followed by Infancy Service for 6 months were enrolled in the present study during period Nov 2015-16. The study group formed of fifteen infants diagnosed as recurrent wheezing aged between 1-24 months without any history of congenital heart disease, chronic lung disease, and immunodeficiency. The control faction formed of 23 healthy infants. Serum 25-(OH) D level were measured and clinical features were analyzed in all the 38 infants. Serum 25(OH) D levels were measured using RIA method. Two different cut off levels were used in the study to categorize 25(OH) D concentrations. The levels above 30 ng/ml (75 nmol/L) were accepted as sufficient, the levels under  $<20$  ng/ml (50 nmol/L) as vitamin D deficiency and under  $<10$  ng/ml as extreme deficient (25 nmol/L).<sup>(12-14)</sup>

The research was accepted by Ethical Committee of the institute and informed consent was obtained from the parents of infants.

### Statistical Analysis

Qualitative data will be expressed as percentages and proportions. Quantitative data will be expressed as mean and standard deviation. The differences between two groups with respect to continuous variables will be analyzed using t-test while categorical variables will be analyzed using chi-square test. All the statistical tests will be performed in SPSS version 15 software. P value  $<0.05$  will be considered as statistically significant while p value  $<0.01$  will be considered as statistically highly significant.

## Results

There were 38 cases (15 infants with more than 3 attacks and 23 control cases). The mean age of the control group was  $12.52 \pm 6.95$  months and recurrent attack group was  $1.9 \pm 4.35$  mo. The mean value of serum 25 (OH)D vitamin levels were  $22.1 \pm 8.9$  IU/L and  $18.8 \pm 11$  IU/L for the control and recurring attack group, respectively. 73.3% of subjects with recurrent wheezing had vitamin D levels in the deficient range ( $<20$  ng/ml) and 47.8% had vitamin D levels under  $<20$  ng/ml in the control group (Table 1). The percentage of insufficient vitamin D levels ( $<30$  ng/ml) were 93.3 and 78.2 for the patient and control group respectively. Four infants in the control and wheezing group had extremely deficient vitamin D ( $<10$  ng/ml) levels. The index results did not show statistical significance between the groups in terms of the distribution of 25 (OH) D levels. ( $p=0.98$ )

**Table 1: Comparison of Serum 25 (OH) D levels in recurrent wheezing and control groups**

Vitamin D level (ng/ml)	Control Group	>3 attacks
<10	2	2
11-20	9	9
21-30	7	3
>31	5	2

## Discussion

Vitamin D deficit are extensive and recognized from different parts of the world despite of leeway, sun exposure or socioeconomic factors. There is increasing agreement that value less than approximately 30 to 32 ng/ml be identified as "low". When this cut point is applied, low vitamin D status is extremely common worldwide.<sup>(15)</sup>

Serum 25(OH) D is the most reliable marker of vitamin D standing sufficient level of serum 25(OH)D are essential to maintain the claim pleiotropic consequences, each skeletal or extraskeletal. Entrance for adequate vitamin D condition communicates to the least serum 25(OH) D level essential to regulate, 25(OH) 2D, avoid derivative hyperparathyroidism, and evade bone histology irregularity's. On the basis of this, the majority foremost specialists describe vitamin deficiencies levels among 50 and 75 nmol/L, vitamin absence as levels less than 50 nmol/L and tremendous deficit as less than 25-30 nmol/L and quarrel that levels of 25(OH)D  $>50$  nmol/L are necessary for most favorable musculoskeletal health.<sup>(17-19)</sup> Seventy-two percent of all the infants had subclinical vitamin D shortage differentiated by an insufficient vitamin D status without overt specific signs and symptoms referred to altered mineral homeostasis,

Vitamin D emerges to cooperate a position in immune system and lung growth in the<sup>20</sup>Lung technicalities considered in rat's demonstrated reduced conformity in those born to

mother's underprivileged of vitamin D.<sup>(21)</sup> These research esdemonstrate that vitamin D absence causes a vulnerability to respiratory infections starting from the foetal phase.

Several researches have established a relationship among pregnant women with inferior vitamin D ingestion and an advanced jeopardy of wheeze in offspring. In a recent research, superior maternal circulating 25 (OH) absorptions in pregnancy were separately connected with inferior peril of lower respiratory infections in progeny in the first year of life but no relationship was found with breathless at 1 year or 4 year, or asthma at age 4-6 years.<sup>(22)</sup> The authors have no knowledge about the maternal vitamin D levels but suggest that vitamin D levels of the infants hospitalized for serious infections and recurrent wheezing should be followed carefully.

Recent studies have shown a potential physiologic function of vitamin D in adaptable usual in born and adaptive immunity.<sup>(23)</sup> Vitamin D metabolites contribute to defense at epithelial surfaces by stimulating production of antimicrobial peptides such as defensins and cathelicidin.<sup>(24)</sup> Janssen et al. recently showed significant associations of a number of innate immunity genes (including the VDR) with the severity of Respiratory Syncytial Virus (RSV) bronchiolitis.<sup>(25)</sup> Roth et al. found the association between two VDR gene polymorphisms and ALR in juvenile children.<sup>(26)</sup> Jarti et al. establish that serum 25(OH)D levels were reversely connected with RSV, Rhinovirus and multiple viral cause, by contrast no association was found with other viral infections.<sup>(27)</sup> Taken together, these studies point out the important role of vitamin D in the relation between respiratory viruses and their link to recurring wheezing.

A research in a huge group of children with asthma in Costa Rica demonstrated a relationship between low vitamin D levels and asthma harshness in conditions of hospitalizations, medication utilize and airway responsiveness.<sup>(28,29)</sup> The precise role of Vitamin D in the pathogenesis of asthma is still debated and needs further assessment. Published studies on the topic have had conflicting results and most of them are observational.<sup>(30)</sup>

## Conclusion

In the present study, no correlation between vitamin D levels and recurring puffed in infants was found but this may be due to the few numbers of patients that we studied with. The current findings not express important relationship among vitamin D level and recurring wheezing in the infants.

## References

1. Black PN, Scragg R. Relationship between serum 25-hydroxyvitamin D and pulmonary function in the third national health and nutrition examination survey. *Chest*. 2005;128:3792-8.

2. Hollams EM, Hart PH, Holt BJ, et al. Vitamin D and atopy and asthma phenotypes in children: A longitudinal cohort study. *Eur Respir J*. 2011;38:1320-7.
3. Lange NE, Litonjua A, Hawrylowicz CM, Weiss S. Vitamin D, the immune system and asthma. *Expert Rev Clin Immunol*. 2009;5:693-702.
4. Liu PT, Stenger S, Tang DH, Modlin RL. Cutting edge: Vitamin D-mediated human antimicrobial activity against *Mycobacterium tuberculosis* is dependent on the induction of cathelicidin. *J Immunol*. 2007;179:2060-3.
5. Karatekin G, Kaya A, Salihoglu O, Balci H, Nuhoglu A. Association of subclinical vitamin D deficiency in newborns with acute lower respiratory infection and their mothers. *Eur J Clin Nutr*. 2009;63:473-7.
6. Ginde AA, Mansbach JM, Camargo Jr CA. Vitamin D, respiratory infections and asthma. *Curr Allergy Asthma Rep*. 2009;9:81-7.
7. Camargo Jr CA, Rifas-Shiman SL, Litonjua AA, et al. Maternal intake of vitamin D during pregnancy and risk of recurrent wheeze in children at 3 year of age. *Am J Clin Nutr*. 2007;85:788-95.
8. Devereux G, Litonjua AA, Turner SW, et al. Maternal vitamin D intake during pregnancy and early childhood wheezing. *Am J Clin Nutr*. 2007;85:853-9.
9. Taylor CE, Camargo CA Jr. Impact of micronutrients on respiratory infections. *Nutr Rev*. 2011;69:259-69.
10. Sandhu MS, Casale TB. The role of vitamin D in asthma. *Ann Allergy Asthma Immunol*. 2010;105:191-202.
11. Majak P, Olszowiec-Chlebna M, Smejda K, Stelmach I. Vitamin D supplementation in children may prevent asthma exacerbation triggered by acute respiratory infection. *J Allergy Clin Immunol*. 2011;127:1294-6.
12. Misra M, Pacaud D, Petryk A, et al. Vitamin D deficiency in children and its management: Review of current knowledge and recommendations. *Pediatrics*. 2008;122:398-417.
13. Plotkin H, Lifshitz F. Rickets and osteoporosis. In: Lifshitz F, ed. *Pediatric Endocrinology*, 5th ed. New York: Informa Healthcare; 2007. pp.531-57.
14. Cianferotti L, Marcocci C. Subclinical vitamin D deficiency. *Best Pract Res Clin Endocrinol Metab*. 2012;26:523-37.
15. Binkley N, Ramamurthy R, Krueger D. Low vitamin D status: definition, consequences and correction. *Endocrinol Metab Clin N Am*. 2010;39:287-301.
16. Holick MF. Vitamin D deficiency. *N Engl J Med*. 2007;357:266-81.
17. Holick MF, Binkley NC, Bischoff-Ferrari HA, et al., Endocrine Society. Evaluation, treatment, and prevention of vitamin D deficiency: An Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*. 2011;96:1911-30.
18. Dawson-Hughes B, Heaney RP, Holick MF, Lips P, Meunier PJ, Vieth R. Estimates of optimal vitamin D status. *Osteoporos Int*. 2005;16:713-6.
19. Vieth R. Why the minimum desirable serum 25-hydroxyvitamin D level should be 75 nmol/L (30 ng/ml). *Best Pract Res Clin Endocrinol Metab*. 2011;25:681-91.
20. Nguyen TM, Guillozo H, Marin L, Tordet C, Koite S, Garabedian M. Evidence for a vitamin D paracrine system regulating maturation of developing rat lung epithelium. *Am J Physiol*. 1996;271:L392-9.
21. Gaultier C, Harf A, Balmain N, Cuisinier-Gleizes P, Mathieu H. Lung mechanics in rachitic rats. *Am Rev Respir Dis*. 1984;1130:1108-110.
22. Morales E, Romieu I, Guerra S, et al. Maternal vitamin D status in pregnancy and risk of lower respiratory tract infections, wheezing, and asthma in offspring. *Epidemiology*. 2012; 23:64-71.
23. Hewison M. Vitamin D, and the immune system: New perspectives on an old theme. *Endocrinol Metab N Am*. 2010; 39:365-79.
24. Wang TT, Dabbas B, Laperriere D, et al. Direct and indirect induction by 1,25-dihydroxyvitamin D3 of the NOD2/CARD 15-defensing beta2 innate immune pathway defective in Crohn disease. *J Biol Chem*. 2011;285:227-31.
25. Janssen R, Bont L, Siezen CL, et al. Genetic susceptibility to respiratory syncytial virus bronchiolitis is predominantly associated with innate immune genes. *J Infect Dis*. 2007;196:826-34.
26. Roth DE, Jones AB, Prosser C, Robinson JL, Vohra S. Vitamin D receptor polymorphisms and the risk of acute lower respiratory tract infection in early childhood. *J Infect Dis*. 2008;197:676-80.
27. Jartti T, Ruuskanen O, Mansbach JM, Vuorinen T, Camargo CA Jr. Low serum 25-hydroxyvitamin D levels are associated with increased risk of viral coinfections in wheezing children. *J Allergy Clin Immunol*. 2010;126:1074-6.
28. Bosse Y, Maghni K, Hudson TJ. 1alpha,25-dihydroxyvitamin D3 stimulation of bronchial smooth muscle cells induces autocrine, contractility and remodeling processes. *Physiol Genomics*. 2007;29:161-8.
29. Brehm JM, Celedon JC, Soto-Quiros ME, et al. Serum vitamin D levels and markers of severity of childhood asthma in Costa Rica. *Am J Res Crit Care Med*. 2009;179:765-71.
30. G Paul, JM Brehm, JF Alcorn, F Holguin, SJ Aujla, JC Celedón. Vitamin D and asthma. *Am J Respir Crit Care Med* 15,185:124-32 (2012).