

## The association between 25-dehydroxy vitamin D and lower respiratory infection in children aged less than "5" years in Imam Reza hospital, Bojnurd, Iran

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### Abstract

**Objective:** To clarify the association between vitamin D deficiency and acute respiratory infection in children below age 5 years.

**Methods:** The cross-sectional study was conducted at Imam Reza Hospital in Bojnurd, Iran, in June 2013 and comprised 90 children below 5 years of age suffering from respiratory infections. They were selected on the basis of purposive sampling and were then categorised into two equal groups of 'acute' and 'non-acute' respiratory infection. Data collection was done using a questionnaire and serum level of 25-dehydroxycalciferol was measured. SPSS 11 was used to analyse and interpret the data.

**Result:** In the group of children with respiratory disorders, 9 (42.9%) exhibited vitamin D deficiency. There were no significant differences between the two groups in terms of demographic characteristics such as age, intrauterine age, weight, birth-weight, head circumference, height, gender, living area and respiratory distress ( $p > 0.05$  each). Vitamin D deficiency showed no meaningful statistical relation with acute respiratory infections ( $p > 0.05$ ).

**Conclusion:** More studies with higher sample size and are recommended.

**Keywords:** 25-dehydroxy vitamins D, Lower respiratory infection, Children below age 5 years. (JPMA 65: 1153; 2015)

### Introduction

Acute respiratory infections are one of the most important respiratory diseases in children.<sup>1</sup> The infection is the main cause for hospitalising children in intensive care unit (ICU).<sup>2</sup> It has been estimated that more than 40 million annual deaths in the developing countries are due to acute respiratory infections, including bronchitis, pneumonia and bronchiolitis as well as a combination of these.<sup>3,4</sup> Recent studies have shown the critical role of vitamin D in immunity. In seasons when there is less sunshine, and consequently there is less active vitamin D, respiratory infection occur more frequently.<sup>1,5-10</sup> Many studies have shown the critical role of Vitamin D in activating the immune system by producing antimicrobial peptides like cathelicidin,<sup>7</sup> as well as activating Th1 cells' function and cytokines function,<sup>11</sup> and it amplifies the suitable function of B cells and macrophages.<sup>10</sup> A few studies have shown that there's obvious lack of vitamin D in hospitalised children.<sup>10,12,13</sup>

A review illustrated that vitamin D can activate T cells, has anti-inflammatory effects and increases the mucosal body defence.<sup>14</sup> Another study assessed the association between the level of vitamin D and IgG level in 896 patients suffering from cystic fibrosis, and, according to the results, high levels of vitamin D could significantly decrease cystic fibrosis.<sup>15</sup> The association between vitamin D deficiency and wheezing and asthma are also well known.<sup>16</sup>

Given the importance of treating respiratory infections and its high prevalence in children, and due to the fact that there have not been such studies done in Iran, the current study was planned to assess the association between vitamin D and lower respiratory infections in children.

### Patients and Methods

The cross-sectional study was conducted at Imam Reza Hospital in Bojnurd, Iran, in June 2013 and comprised children below 5 years of age and suffering from respiratory infections who were selected using purposive sampling. We compared hospitalised children suffering from lower respiratory tract infections with those who were hospitalised for any reason except lower respiratory tract infections. The latter worked as the control group. A paediatrician diagnosed their disease statuses.

The sample size was determined based on literature according to which 28% children under-5 years suffered from vitamin D deficiency.<sup>17</sup> The estimated sample size was 322, but due to budgetary difficulties, we had to

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study 50 cases in each group.

After obtaining informed consent from the parents, data-collection was done using demographic questionnaire and serum level of 25-dehydroxycalciferol was measured. To protect and respect the rights of patients and prevent damage, the blood samples were taken by a trained nurse at admission based on physician's orders, and was then used for the study. The samples were measured using radioimmunoassay in the hospital lab.

Serum level below 30ng/ml was considered insufficient. SPSS 11 was used for data analysis. T- test was used for comparing mean in two different groups and Pearson's chi-squared test was used to find association between respiratory disease and vitamin D. Data was expressed as mean  $\pm$  standard deviation, as well as frequency and percentage.

## Results

A total of 90 children were included in the study. The demographic characteristics of the study population are shown in Table-1.

The mean differences of serum level of Vitamin D in the two groups of study population was not significant. Thus these two groups were the same according to serum level of Vitamin D (Table-2).

In this study, 34.16% of children had respiratory problems and other children had other diseases except of respiratory problems. In the group of children with respiratory problem, vitamin D serum levels in 9 (42.9%) of children were less than 20ng/dl. There were no statistically significant differences between two groups

**Table-1:** The demographic characteristics.

Variable	Mean $\pm$ Sd
Age (month)	13.71 $\pm$ 11.15
Gestational (week)	39.44 $\pm$ 3.33
Current weight (g)	9092.89 $\pm$ 2726.94
Birth weight (g)	3296.11 $\pm$ 431.24
Head round (cm)	35.20 $\pm$ 1.23
Height (cm)	50.71 $\pm$ 1.75
Vitamin D level	33.18 $\pm$ 19.66

**Table-3:** Association between respiratory disease and vitamin D.

Respiratory disease	Vitamin D less than 20(ng/dl) %(n)	Vitamin D between 20(ng/dl) to 30 (ng/dl) %(n)	Vitamin D more than 30 ng/dl %(n)	$\chi^2$ test
No	57.1(12)	67.7(21)	66.7(20)	$\chi^2=1.64$
Yes	42.9(9)	32.3(10)	52.6(18)	P=0.439

**Table-2:** Serum level of Vitamin D in two groups of study population.

Group	$\mu \pm SD$	Mann-Whitney test
Respiratory disease problems	34.16 $\pm$ 19.71	Z=0.335
No respiratory disease problems	32.49 $\pm$ 19.77	P=-0.97

(children with respiratory problem and none) according to demographic characteristics. The chi square test showed that there was no statistically significant association between respiratory disease and serum level of vitamin D (Table-3).

## Discussion

The study revealed no significant differences between vitamin D levels and respiratory disease.

However, contrary to these results, studies have shown that vitamin D deficiency significantly increases the risk of respiratory infections. According one, vitamin D level were significantly different between control group (n=147) and the intervention group (n=55).<sup>5</sup> A cohort study was done on 922 infants, of whom 20% showed levels of vitamin D less than 25nmol/dl, and these experienced respiratory system infections two times more than the others until they reached the age of 3 months.<sup>1</sup> A double-blind clinical trial was done on 453 infants 1-36 months old suffering from pneumonia (control =229, intervention =224). Vitamin D3 supplement produced clinically and statistically significant decrease in risk of pneumonia.<sup>17</sup> In another survey, 6.8% (n=21) of 305 children 0-3 years old suffered from vitamin D deficiency. Also, the study showed that there was significantly association between vitamin D and respiratory infections.<sup>13</sup>

In comparison with our study, it is evident that design, methodology and sample size of all of these studies had more power to reveal significant difference in the two groups. Since our research was restricted in terms of sample size, it is recommended that the study should be done with a larger sample.

Another valuable point obtained from this study is that the intervention group had more gestational age in comparison with the control group, therefore it can be concluded that the more vitamin D is reserved within the

infant's body, the more he/she will be immune to respiratory infections.<sup>16</sup>

It is assumed that the lack of significant differences in vitamin D is due to the gestational age and other factors except that vitamin D deficiency plays crucial roles in respiratory system infections.

Since 1800, there have been discussions on the relationship between vitamin D deficiency and respiratory system infections and finally in the 20th century this relationship was suggested to be true and it was established that in winter and autumn lack of vitamin D increases due to the decrease in sunshine.<sup>18</sup>

### Conclusion

More studies with larger sample size should be conducted to be sure if there is a relation between respiratory problem and vitamin D deficiency.

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