Original Article

Vitamin D Deficiency with Acute RTI

Association of Vitamin D Deficiency with Acute Respiratory Tract Infection in Children of Peshawar

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ABSTRACT

Objective: To identify the association of vitamin D levels on incidence of respiratory tract infection in children of Peshawar.

Study Design: Observational study

Place and Duration of Study: This study was conducted at the Paediatric Units of Mercy Teaching Hospital and Kuwait Teaching Hospital, Peshawar from 1st January 2020 to 31st July 2020.

Materials and Methods: One hundred and ninety nine children were enrolled. All male and female children in current study were between 0 weeks to 5 years. The medical history of all participants was recorded in self-made questionnaire and blood sample was collected to identify the vitamin D levels. Participant had genetic inheriditry disease such as X linked rickets, hypophosphatemia rickets were excluded.

Results: The baseline mean vitamin levels in healthy children were high 15±7 ng/mL than respiratory tract infected participants 5±3 ng/mL. 49% children were males and 52% were females. The vitamin D level was shown association with upper, lower and recurrent lower respiratory tract infections by showing $p<0.05$. The most commonly found symptom was common cold, and pneumonia in upper, lower, and recurrent lower respiratory tract infection, respectively whereas, insignificant findings were observed between vitamin D with age and gender by showing $p>0.05$.

Conclusion: Vitamin D shown association with the incidence of respiratory in children of Peshawar.

Key Words: Vitamin D Deficiency, Acute respiratory tract, Children, Infection

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INTRODUCTION

Respiratory tract infections are most prevalent other infectious illnesses in young age children globally.[1] The deficiency in Vitamin D, steroid hormone, levelis one of the possible factor to develop respiratory tract infections. Vitamin D plays key role in the synthesis of peptide cathelicidin in respiratory tract epithelium layer. This acts against microbial activity and subsequently decline disease severity. Moreover, it prevents replication of influenza virus.[2,3]

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The activated for of vitamin D, vitamin D(1,25 $(OH)_2D$), increases human immunity. Esposito et al[4] suggested that the physiological level of vitamin D may be an advantageous and economical cheap method to protect against respiratory infections in humans. Grant et al[5] conducted a randomized controlled study in the population of New Zealand and found that providing Vitamin D3 supplements in infants greatly reduce visits to primary health care units for acute respiratory infection in young age children. Nonetheless, Xiao et al[6] meta-analyzed 7 clinical trials of "British Journal of Nutrition" and found non-supportive evidences of vitamin D supplementation againstthe prevention of respiratory infections in early childhood, however, the use of these supplementation possible advantageous in children diagnosed with asthma. Moreover, growing piece of evidences concluded the use of these supplementation during pregnancy decreases respiratory infections in young infants.[7,8]

In Pakistan, vitamin D deficiency is prevalent due to inadequate diet and sun exposure of mothers during pregnancy and malnutrition in early age children. Kazi et al[9] performed study in Lahore, Pakistan, and found that 83 percent of recurrent in pulmonary infected children were vitamin D deficient. Moreover, Haider et al[10] conducted the study at department of paediatric medicine at National Institute of Child Health hospital,

Karachi and found the revealed that 74% of severe pneumonia infected patients had nutritional rickets.

Taken all together, the high prevalence of respiratory tract infections increases the focus of attention to identify the vitamin D status in young age children having respiratory tract infections in Peshawar. This will give us an estimation of the magnitude of this problem in our local paediatric population. This will be beneficial because vitamin D deficiency is a preventable condition which can be easily treated with supplementation. Thus knowledge of the vitamin D status in children having respiratory infections will help prevent and treat this condition in our local population.

MATERIALS AND METHODS

The present descriptive study was conducted in Paediatrics units of Mercy Teaching Hospital and Kuwait Teaching Hospital, Peshawar from 1st January 2020 to 31st July 2020 and 199 enrolled children. The enrolled children were < 5 years of both sex, while children diagnosed with inheriditory disease causing vitamin D deficiency (X linked rickets, hypophos-phatemic rickets, etc) were excluded. Initially, ethical approval of the study was taken from prime foundation Pakistan, institutional review board, Peshawar and necessary details of the study was provided to the patents before taking consent.

The demographic profile, history of the patient was collected via self-made questionnaire whereas serum 25-OH-vitamin D levels were identified. The patient considered as vitamin deficient at 25-OH-vitamin D levels < 10 ng/ml (25 nmol/l). The data of vitamin D level were classified as vitamin D normal and vitamin D deficient. Statistical analysis was done by using SPSS-23 by considering $p<0.05$.

RESULTS

There were 49% males and 52% were females. The baseline mean vitamin level in normal and respiratory tract infected participants was 15±7 and 5±3 unit. The respiratory infections were found associated with vitamin D deficiency. The increase infection was also shown in lower respiratory tract in vitamin D deficient children. Moreover, the recurrent lower respiratory tract was also significantly associated with vitamin D deficiency by showing $P<0.001$. Comparatively, upper respiratory infection was shown decrease incidence but associated highly deficient children (Fig.1, Tables 1-3). The commonly found symptom in upper respiratory infection was common cold in vitamin D deficient children. Secondly, nasal obstruction and sore throat were found while pharyngitis, tonsillitis, otitis media, sinusitis and laryngitis were found minimum prevalence, but they were associated with vitamin deficiency (Fig. 1, Tables 1-2).

Beside upper respiratory tract symptoms, the high incidence of lower tract was pneumonia in deficient children, which was associated with vitamin D decrease level. Furthermore, tuberculosis and bronchiolitis were the next in the high prevalence and significantly associated with vitamin D deficiency.

Table No.1: Association between respiratory tract infections with vitamin D levels in children

Variable	Normal vitamin D (Yes)	Vitamin D deficient (No)	p-value
Respiratory tract infection (%)	41	94	<0.001
Upper respiratory tract infection (%)	16	22	<0.001
Lower respiratory tract infection (%)	23	44	<0.01
Recurrent lower respiratory tract infection (%)	2	26	<0.001

Table No.2: Upper Respiratory tract infection in children

Upper respiratory tract infection	Normal vitamin D (Yes)	Vitamin D deficient (No)	p-value
Nasal obstruction (%)	14	31	<0.001
Sore throat (%)	28	34	<0.001
Tonsillitis (%)	0	5	<0.001
Pharyngitis (%)	0	11	<0.001
Laryngitis (%)	0	14	<0.001
Sinusitis (%)	0	20	<0.001
Otitis media (%)	0	14	<0.001
Common cold (%)	57	68	>0.01

Table No.3: Lower and recurrent Lower Respiratory tract infection in children

Variable	Normal vitamin D (Yes)	Vitamin D deficient (No)	p-value
Lower respiratory tract infection			
Bronchiolitis (n)	3	10	<0.001
Pneumonia (n)	6	48	<0.001
Tuberculosis (n)	1	12	<0.001
Recurrent lower respiratory tract infection			
Bronchiolitis (n)	1	5	<0.001
Pneumonias (n)	0	14	<0.001
Tuberculosis (n)	0	4	<0.001

Moreover, in recurrent lower respiratory infection, bronchiolitis, tuberculosis and pneumonia and were identified. The significantly highest prevalence of pneumonia was found in lower respiratory tract infection, and this was associated with vitamin D level. Moreover, tuberculosis and bronchiolitis were shown

moderate incidence but associated with vitamin D deficiency (Fig. 1, Tables 1, 3).

Moreover, the findings shown insignificant infection rate with age. There was no association were found between vitamin D levels with gender and age of participants by showing p-value > 0.05 (Fig. 2).

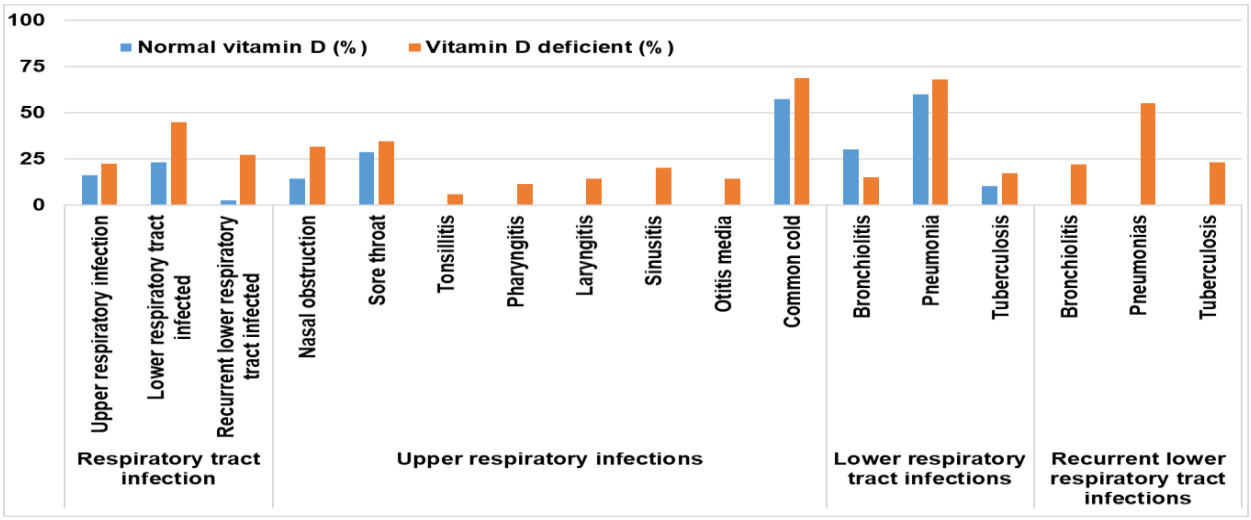

Figure No. 1: Respiratory tract infection in normal and vitamin D deficient children.

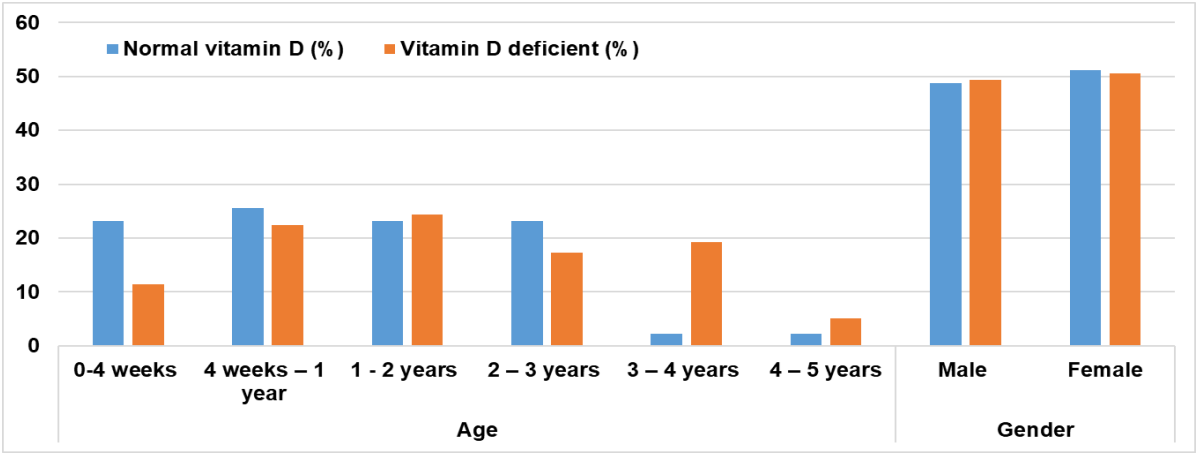

Figure No. 2: Age and gender wise distribution of children

DISCUSSION

The physiological functions needs sufficient amount of vitamin D via cutaneous synthesis initiated from the exposure of sunlight[11], whereas less amount is acquired from nutritional sources.[12] Number of social, cultural, and economic factors have been investigated that able to prevent dietary intake of vitamin D levels and adequate supply of sunlight that plays active role make the levels of 25-hydroxyvitamin D (25(OH)D) normal in the body.[13] Therefore, globally drastically increase incidence of hypovitaminosis D in number of resource-limited countries.[14] The deficiency of (25(OH)D) is one of the substantial factor in respiratory tract infection such as asthma in children of Mediterranean countries and in 9 North America. The author suggested its direct association with forced vital 10 capacities.[15] Around the globe, the great focus of attention is giving to prevent hypovitaminosis. Moreover, number of researchers are suggested to include vitamin D via dietary diversification, supplementation and fortification of foods.[16] They also considered adequate exposure of sunlight, and consumption of animal foods as sustainable strategy to maintain vitamin proportion to sustain the normal functions of the body easily.[14]

Besides, the study of Pham et al[17] suggested that 60 000 IU dose of vitamin D in monthly bolus insufficient to decline the overall susceptibility of acute respiratory infection, nonetheless it could produce slight reduction in the overall duration of symptoms to appear. They suggested that the daily consumption of vitamin D supplementation is unlikely to produce significantly relevant impact in the prevention of acute respiratory infection.[17]

In the present study, the respiratory infections including upper, lower and recurrent lower respiratory tract infection were found associated with vitamin D deficiency. The most commonly found symptom in upper respiratory infection was common cold in vitamin D deficient children. Secondly, nasal obstruction and sore throat were found. While pharyngitis, tonsillitis, otitis media, sinusitis and laryngitis were found minimum prevalence but they were associated with vitamin deficiency. Beside upper respiratory tract symptoms, the high incidence of lower tract was pneumonia in deficient children, which was associated with vitamin D decrease level. Furthermore, tuberculosis and bronchiolitis were the next in the high prevalence and significantly associated with vitamin D deficiency. Moreover, in recurrent lower respiratory infection, bronchiolitis, tuberculosis and pneumonia and were identified. The significantly highest prevalence of pneumonia was found in lower respiratory tract infection, and this was associated with vitamin D level. Moreover, tuberculosis and bronchiolitis were shown moderate incidence but associated with vitamin D deficiency. Moreover, the findings shown insignificant infection rate with age. There was no association were found between vitamin D levels with gender and age of participants.

CONCLUSION

Vitamin D levels are essential for several metabolic activities. The decrease range of vitamin D is associated with the development of acute respiratory infection in upper and lower tract in the children of Peshawar.

Author's Contribution:

Concept & Design of Study:	Amin Ullah
Drafting:	Rakshanda Kokab, Asmat Ullah Khan
Data Analysis:	Hakim Zada, Abdul Qadir Khan, Sara Ziaullah
Revisiting Critically:	Amin Ullah, Rakshanda Kokab
Final Approval of version:	Amin Ullah

Conflict of Interest: The study has no conflict of interest to declare by any author.

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