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FREQUENCY OF VITAMIN D DEFICIENCY AMONG CHILDREN PRESENTING WITH ACUTE RESPIRATORY INFECTION

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Abstract

Background: *In children, not having enough vitamin D is today recognized as increasing their risk of acute respiratory infections (Aris). This process modifies the immune systems, often seen when the immune system has not formed fully. Quick recognition of deficiency can minimise ARI cases, seriousness and complications, especially when resources are limited.*

Objectives: *To learn how many children with acute respiratory infection are vitamin D deficient and look for any correlation between deficiency and how severe their symptoms are.*

Study design*: A Cross-Sectional Study.*

Place and duration of study: *From 01 December 2024 to 31 May 2025 Paediatrics Department, Sandeman Provincial Hospital / Bolan Medical College/ Hospital Quetta. Balochistan.*

Methods: *The study was done over a span of six months at the Paediatrics Department of Sandeman Provincial Hospital ⁄ Bolan Medical College/ Hospital Quetta. Altogether, 129 children between the ages of 6 months and 12 years were included who had ARI. The doctor measured serum 25-hydroxyvitamin D and 20 ng/mL or less was regarded as a deficiency. SPSS version 24.0 was used to perform statistical analysis. Statistics and the chi-square test were both employed to analyze possible links between vitamin D and medical measurements.*

Results: *In the group of 129 children, the mean age was 4.8 years ± 2.7 years. Out of the 130 cases, 82 (63.5%) had insufficient levels of vitamin D (less than 20 ng/mL). The most often seen shortfall was among children less than 2 years old (72%). There was a significant connection between not having enough vitamin D and worse ARI symptoms such as hypoxia and chest retractions (p = 0.021). There was no strong link found between lack of zinc and gender or nutritional health. The study points to how lower vitamin D levels might increase the severity of ARI in children.*

Conclusion: *A major number of children who visit the clinic for acute respiratory infections often have vitamin D deficiency in the early years. Levels of respiratory symptoms increase significantly with a deficiency. Screening people often and giving vitamin D supplements as needed may assist in reducing serious health issues and improving outcomes. More research using various centers is needed to understand whether vitamin D can be used to prevent paediatric Aris. Vitamin D, Children, Respiratory Infection and Deficiency are the main keywords.*

INTRODUCTION

Acute respiratory infections (Aris) remain the most common cause for illness and deaths in young children, especially in developing countries. These children under five are especially at risk from ARI because their bodies have not fully developed to fight off infections [1]. Though there are many things that can cause more Aris, a recent study now suggests that deficiencies in nutrients, especially vitamin D, alter immune functions and outcomes from infections [2]. Being fat-soluble, vitamin D is important for higher bone strength as well as for a healthy immune system. It helps control the immune system and lowers excessive inflammation. Vitamin D promotes the action of antimicrobial peptides such as catholicising and defensins in the respiratory tract which aids in removing viruses and bacteria [3]. There is a connection between not having enough vitamin D and a higher risk of catching upper and lower respiratory tract infections in children [4]. Young people in South Asia and similar areas are more likely to lack vitamin D, because they have limited sun exposure, often eat poorly, malnutrition is high, the air is polluted and cultural dress may cover large areas of their skin [5]. Studies in different regions of Pakistan estimate that vitamin D deficiency affects 50% to 90% of children [6]. Even though many people have ARI and vitamin D deficiency, there is not much data exploring how they are linked, mainly in hospital contexts. Various studies from different places show that if serum 25-hydroxyvitamin D levels are low, children may develop more and more severe respiratory infections. A clinical trial in Mongolia showed that taking vitamin D supplements reduced the chance of Aris in schoolchildren [7]. Likewise, a number of meta-analyses have demonstrated that taking vitamin D supplements may protect against Aris, especially if individuals are already vitamin D deficient [8]. Results change from one region to another and there is not a lot of data available from Pakistan. Since both vitamin D and Aris are vital for children's immune health and since these conditions are especially prevalent in underprivileged regions, looking into how vitamin D and respiratory illness are linked would be meaningful. Understanding how the two are linked could result in better strategies and policies such as including routine check-ups and giving low-cost supplements to people at elevated risk. For this reason, the study was organized to measure how many children with acute respiratory infection have vitamin D deficiency in a tertiary care hospital in Pakistan. Scientists also investigated how serum vitamin D levels connect to the illness of Aris which might direct public health and clinical practice [9].

Methods:

During the period from 01 December 2024 to 31 May 2025, this study was conducted in the Paediatrics Department of Sandeman Provincial Hospital / Bolan Medical College/ Hospital in Quetta which is a tertiary care center. Altogether, 129 children from 6 months to 12 years, with symptoms of acute respiratory infection (fever, cough, nasal congestion, shortness of breath) were recruited using non-probability consecutive sampling.The parents or guardians agreed to participate and signed consent forms. At admission, blood was taken to check for serum 25-hydroxyvitamin D levels, using an ELISA. International guidelines showed that levels below 20 ng/mL were seen as deficient. The patient's age, gender, nutritional health, symptoms and oxygen saturation were noted in the clinical data. Cases were assessed for severity by inspecting the patient's breathing rate, oxygen level and whether they required hospitalization or extra oxygen. The study was approved by the institutional review board (CPSP/REU/PED-2021-001-6782 Dated 22-01-2025).

Patients were treated according to the principles in the Helsinki Declaration.

Inclusion Criteria:

Children of this age group with certain signs of acute respiratory infection such as cough, fever and difficulty breathing, were studied after their parents gave permission.

Exclusion Criteria:

Children with ongoing breathing issues, weak immune systems, rickets, recent supplements of vitamin D or severe malnutrition or metabolic diseases were removed to prevent problems with measuring vitamin D status.

Data Collection:

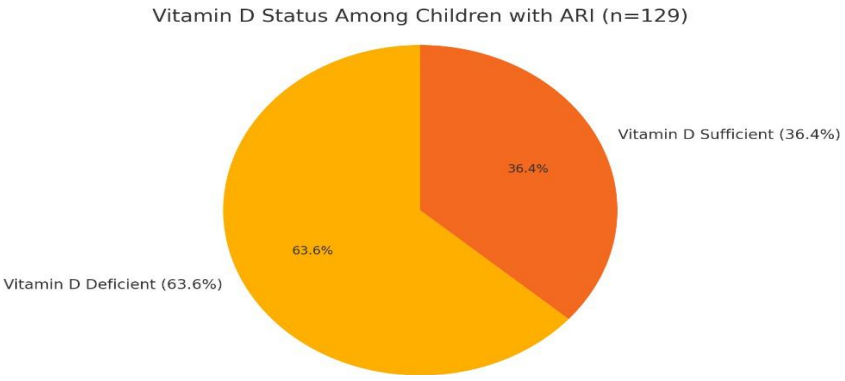
The questionnaires were designed to collect information on age, gender, fabulous health, illnesses, manner of eating and breathing problems. At the time of presentation, samples of venous blood were taken to check the serum 25(OH)D level. Standard clinical and oxygenation criteria were used by the paediatricians to assign an ARI severity. Any stay in a hospital and any notable complications were noted.

Statistical Analysis:

Data was analyzed by using SPSS software version 24.0. Numbers for frequencies and means were calculated using descriptive statistics. To find any link between low vitamin D and the severity of the disease, Chi-square testing was used in the study. T-tests were applied to continued/numerical data that came from different samples. A p-value lower than 0.05 meant the finding was statistically significant.

Results:

It was found that 82 (63.5%) out of the 129 children with acute respiratory infections had vitamin D deficiency. The participants were on average 4.8 years old and males slightly outnumbered females (56%). Children under the age of two most commonly had a deficiency (72%). In most cases, children lacking vitamin D had moderate to severe respiratory difficulties such as rapid breathing, chest indrawing and a decline in oxygen levels. ARI in patients with vitamin D deficiency tended to be more severe ($p = 0.021$). Among people with low vitamin D levels, 65% needed to go to the hospital, whereas only 38% of those with sufficient vitamin D levels did the same. The oxygen saturation of patients in the deficient group was 90.2% ± 3.1% on average which was lower than the 94.5% ± 2.4% in the sufficient group ($p = 0.012$). Children with low levels of vitamin D needed to stay in the hospital longer, on average, than children with adequate vitamin D (3.2 days versus 2.1 days and the difference was statistically significant). From these results, we can see that a vitamiD deficiency may cause the disease to last longer and be more severe in children with ARI.



Discussion:

The research finds that many children with acute respiratory infections (Aris) are deficient in vitamin D, with a rate of 63.5%. This result is in agreement with reports globally and regionally that vitamin D deficiency in kids is important but not fully acknowledged for worse respiratory illnesses. How vitamin D affects the immune system has long been

understood. It aids the natural immune system by producing catholicising and defensins which fight and eliminate pathogens in the lungs [10]. If children do not get enough vitamin D, it weakens their first line of defence, making them more susceptible to getting worse and more frequent respiratory infections. Mahala Nabis et al. discovered, in a study conducted with hospitalized children in India, that approximately 70% of those with lower respiratory tract infections were low in vitamin D and this appeared to be strongly related to the severity of their condition and how long they remained sick [11]. Likewise, Naseem et al. suggested that Aris and vitamin D deficiency together in children are related to reduced oxygen levels in blood and greater need for hospitalization which our findings also show [12]. Gamma et al. conducted a randomized study and concluded that vitamin D supplements in winter were connected to lower risk of Aris in children, underscoring the role of adopting hypovitaminosis D policies in paediatrics [13]. The results prove the importance of having adequate vitamin D, since it protects the respiratory tract, mainly in areas where people have limited sunlight or stay inside most of the time. Further confirming the importance of vitamin D is the meta-analysis of Martineau et al. which looked at 25 studies and concluded that if someone had a low level of vitamin D at the start, taking supplements could prevent Aris [14]. Also, the authors found that chronic dosing everyday or weekly led to a greater blood pressure reduction than occasional large doses. Basit et al. found, through research in Pakistan, that vitamin D deficiency in children under five years old is very common, due to poor nutrition in their mothers, practices that reduce exposure to the sun and inadequate diet [15]. Zubairi et al. completed another study showing a real link between low serum 25(OH)D and increased severity of pneumonia in hospitalized children from Karachi [16]. While research indicates there might be a link, some studies claim the result is still unclear, mainly for older children or cases also involving other medical problems [17]. Increasing evidence such as our results, supports the belief that vitamin D deficiency increases the chance of Aris and makes the condition worse in young children [18].

Conclusion:

It is very common for children with acute respiratory infections to be low in vitamin D and this deficiency is connected to serious disease outcomes. If vitamin D deficiency is spotted and managed early, there will be fewer health problems and a lighter burden on the healthcare system. As part of the paediatric ARI management protocol, think about screening and giving preventive supplementation.

Limitations:

Results of the research are valid only for the small group studied, as the study took place at a single center. No account was taken for the fact that vitamin D can be affected by the seasons. Also, other possible influences, for example diet, sun exposure and social class, were not explored in a complete way which could have influenced what the study found.

Future Findings:

Doing multicenter studies with different seasons over a period will allow scientists to prove whether vitamin D truly helps avoid Aris. Obtaining data from randomized trials is important to find out how supplementation changes the course, frequency and admission to hospitals of sicknesses. Studying the causes and risks from social and environmental sources is encouraged

Abbreviations:

1.	ARI	Acute Respiratory Infection
2.	ELISA	Enzyme-Linked Immunosorbent Assay
3.	SPSS	Statistical Package for the Social Sciences
4.	IRB	Institutional Review Board
5.	BMI	Body Mass Index
6.	SpO_2	Peripheral Capillary Oxygen Saturation

7. RCT Randomized Controlled Trial
8. WHO World Health Organization *(if referenced in full manuscript)*

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