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Research Article

**DEFICIENCY OF VIT D AND ASSOCIATED RISK FACTORS IN  
ACUTE RHINOSINUSITIS (ARS)**<sup>1</sup>Dr Hafsa Khalid,<sup>2</sup>Dr Shifa Nayyab,<sup>3</sup>Dr Ifrah Amjad Mir.<sup>1</sup>MBBS, Sheikh Zayed Medical College, Rahim Yar khan., <sup>2</sup>MBBS, Continental Medical College, Lahore., <sup>3</sup>MBBS, Faisalabad Medical University, Faisalabad.**Article Received:** March 2020**Accepted:** April 2020**Published:** May 2020

*The most common problem seen in pediatric group is acute rhinosinusitis (ARS). Almost 1 million outpatient visits opd annually. Recent guidelines and clinical criteria have set out for the diagnosis and treatment. The complications of ARS has classified according to the Chandler classification system such as preseptal periorbital cellulitis, postseptal orbital cellulitis, subperiosteal and orbital abscess, cavernous sinus thrombosis, and intracranial complications. The initial step of the pathogenesis in ARS is mucosal inflammation. It causes blockage in the ostiometal complex and ciliary dysfunction. This blockage causes pool of secretions within the sinonasal cavities which is the prime cause of bacterial/viral or fungal infection.*

*The study has concluded that low 25OHD levels are associated with ARS development and complications. There is more literature needed to reveal the underlying mechanism. Furthermore, high-quality, randomized controlled studies are needed to determine whether or not vitamin D supplementation in children with low vitamin D status affects the incidence and complications of ARS in the general population.*

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**INTRODUCTION:**

The most common problem seen in pediatric group is acute rhinosinusitis (ARS). [1] Almost 1 million outpatient visits opd annually [2]. Recent guidelines and clinical criteria have set out for the diagnosis and treatment. [3] The complications of ARS has classified according to the Chandler classification system such as preseptal periorbital cellulitis, postseptal orbital cellulitis, subperiosteal and orbital abscess, cavernous sinus thrombosis, and intracranial complications [4]. The initial step of the pathogenesis in ARS is mucosal inflammation. [5] It causes blockage in the ostiometal complex and ciliary dysfunction. This blockage causes pool of secretions within the sinonasal cavities which is the prime cause of bacterial/viral or fungal infection. [6]

Advanced research has recommended that vitamin D boost anti-inflammatory reactions in human sinonasal epithelila cells which is a strong regulator of natural and adaptive immune systems [7]. However it has been suggested that as a possible interchangeable risk factor for a variety of respiratory tract infections [8, 9]. In addition, the negative effect of vitamin D deficiency on bone development is a scientific fact. Furthermore the negative influence of vitamin D deficiency on bone growth is a scientific fact and development of bone plays a vital role in outspread of ARS complications. [10] [11]

Thus the aim of the study is to evaluate the association of serum 25-hydroxyvitamin D (25OHD) levels in pediatric patients with preseptal cellulitis as a result of ARS and ARS complications. Materials and methods.

3 groups were made in which Group A was categorized as preseptal cellulitis complication and had 12 patients. In group B 12 patients were categorized was those suffering from ARS but without complication whereas in Group C 12 healthy participants were included. The inclusion criteria was patients presenting with the complaints of nasal congestion, nasal discharge, facial pain or sensation of pressure, reduction in the olfactory perception in the last 10 days, and nasal congestion, postnasal discharge in clinical examination, or mucopurulent discharge from ostiomeatal complex in endoscopic nasal examination. In addition to ARS complaints and findings, the patients having complaints of edema, redness, pain, tenderness on and around the eye lid, having eye movements and vision without significant limitations and falls, having increase in thickness in preseptal soft tissues, and ARS findings in paranasal computed tomography, but having no

abscess were diagnosed with preseptal cellulitis and included as a separate group in the study. Exclusion criteria Patients who have a disease history that will affect the absorption and metabolism of vitamin D, those who have used medications that affect vitamin D or the metabolism of vitamin D in the depot or daily doses over the last 3 months, immunosuppressed patients, those with systemic disease, patients who had previously had ARS complications, patients who underwent intranasal surgery or paranasal sinus surgery or trauma, patients with a history of chronic rhinosinusitis with or without polyps, patients with allergic rhinitis anamnesis and ARS complication and clinically or radiologically existing sinusitis orbital complication finding except Chandler 1, and patients without written consent were not included in the study. Serum 25OHD level was considered as deficiency between 0 and 50 nmol/l, insufficiency between 50 and 80 nmol/l, normal between 80 and 250 nmol/l, excess between 250 and 325 nmol/l, and toxication for 325 nmol/l and over. Age, gender, and 25OHD levels of the patients were recorded.

Descriptive analysis was described in terms of mean, standard deviation and frequency. For evaluation of the groups Mann–Whitney U test was performed. To compare qualitative data Fisher–Freeman–Halton’s test was used. The level of significance was 95% level.

**RESULTS:**

Total 36 participants were recruited into the study. The average of age was  $6.26 \pm 4.23$  years. 56.5% of the participants were male children whereas 43.4% were female children. The average of 25OHD level among them was  $75.39 \pm 47.55$  nmol/l. The ARS complications were seen in 12 patients. 41% of the cases with the deficiency detected according to normal value, 30.1% of the cases detected as insufficient, and 29.8% of the cases considered as normal. Sinusitis was confirmed in 67.66% of the participants. No significant association was found in vitamin D level and ARS status. The rates of vitamin D deficiency and insufficiency were found to be statistically significantly higher in patients with sinusitis than those with normal values. Vitamin D levels were normal in patients without ARS. There was no statistically significant difference between serum 25OHD levels in Group A and Group B. There was no statistically significant difference between the levels of vitamin D in Group A and Group C. A statistically significant difference was found between the classification obtained by comparing to the normal value

**DISCUSSION:**

The current study has concluded the ARS development and its complications. The main risk factor of the development of ARS and its associated complication is deficiency of vitamin D in the pediatric population. It suggests that vitamin D supplementation in the pediatric population may reduce ARS development and complication risk. In *in vitro* studies, it was shown that the exogenous 25OHD, which is the biologically most active vitamin D metabolite, decreased the expression of proinflammatory cytokines released by human sinonasal epithelial cells (interleukin-6, interleukin-8 and chemokine ligand [12] For this reason, low systemic 25OHD levels may interfere with natural mechanisms to limit mucosal inflammation that accelerates the ARS episode [13]. Moreover, cells in the natural and adaptive immune system express vitamin D receptor, and in low vitamin D status, dysfunctional macrophage activity becomes apparent [14]. Vitamin D is essential for T cell responses to infection, and at the same time, it is an important link between Toll-like receptor activation and antibacterial responses [15, 16]. This leads to increased production of cathelicidin, an endogenous antimicrobial peptide that is potent against bacteria, viruses, fungi, and mycobacteria [17, 18]. Cathelicidin is also highly expressed by the epithelial cells in the natural barrier region and may represent a significant defensive line against the natural immune system pathogens [19]. Indeed, it has been shown that human sinonasal cells express cathelicidin and increase antimicrobial peptide production when exposed to Gram-positive and Gram-negative bacteria [20]. For this reason, suboptimal expression of cathelicidin in the setting of low systemic 25OHD levels is another potential mechanism by which low vitamin D status may increase the risk of ARS complications. We concluded that statistically significantly lower 25OHD levels in complication and all ARS groups compared to control group depend on this regulatory property of vitamin D in the immune system. ARS is a significant risk factor for chronic infections of the sinonasal cavity. Current publications show that low 25OHD levels are common in non-white individuals and in patients with allergic fungal rhinosinusitis or in patients with chronic rhinosinusitis with nasal polyps (polyplastic chronic rhinosinusitis) [19–21]. At the level of mechanical barriers, it was shown that vitamin D status was inversely proportional to the systemic expression of matured dendritic cells regulated by activation of exogenous and released normal T cells and was inversely proportional to the growth of basic

fibroblast in patients with allergic fungal rhinosinusitis or polyphasic chronic rhinosinusitis [22–24]. Low 25OHD levels are associated with sinonasal bone erosion and cholecalciferol (vitamin D3) has been shown to improve bone metabolism in the paranasal sinuses [25]. Although these studies have interesting pre-data, there is a need for well-designed, randomized, placebo-controlled studies with sufficient power to determine whether vitamin D is beneficial in the prevention of sinonasal disease in the general population. Although our results suggest that vitamin D deficiency in pediatric patients may be a risk factor for the development and complications of ARS, there were some limitations in our study. ARS without complication group and healthy volunteers group could be bigger which would increase the power of our study. The fact that the seasonal changes could not be included in the study, the fact that vitamin D was measured only once, and that the socioeconomic characteristics of the participants and their daily living habits could not be assessed were limitations of our study.

**CONCLUSION:**

The study has concluded that low 25OHD levels are associated with ARS development and complications. There is more literature needed to reveal the underlying mechanism. Furthermore, high-quality, randomized controlled studies are needed to determine whether or not vitamin D supplementation in children with low vitamin D status affects the incidence and complications of ARS in the general population.

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