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A Cross-Sectional Study on Assessment of Vitamin D in Pediatric Allergic Rhinitis

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ABSTRACT

Allergic Rhinitis, a prevalent and chronic respiratory ailment, significantly impacts quality of life, academic performance, productivity and the economy. Its close link with Asthma further emphasizes its importance. Recent findings indicate a rise in allergic diseases linked to low serum vitamin D levels. Vitamin D deficiency has been associated with allergic rhinitis and asthma. This study involved 124 subjects aged 6-18 years. Sixty Two individuals with Allergic Rhinitis were selected from the outpatient department, while 62 healthy controls were chosen based on predefined criteria. Vitamin D levels were measured using the ECLIA method. The discerned vitamin D levels exhibited a statistically significant reduction within the cohort afflicted by Allergic Rhinitis when contrasted against the control group. The outcomes gleaned from this present inquiry distinctly underscore the diminished levels of vitamin D evident in instances of Allergic Rhinitis as opposed to the control group. This diminished presence of vitamin D serves to heighten the susceptibility to allergic rhinitis.

INTRODUCTION

Allergic rhinitis, a symptomatic nasal disorder triggered by IgE-mediated immunological reactions upon allergen exposure, leads to inflammation of nasal airways due to allergen-induced mucosal irritation, e.g., pollen, dust and mites. This global ailment constitutes a prevalent chronic condition, incurring substantial medical expenses and compromising quality of life. Its status as a significant chronic respiratory disease is underscored by its widespread prevalence, impact on well-being, disruption of work/school activities, economic implications and association with Asthma. The repercussions extend to cognitive faculties, particularly in schoolchildren, resulting in reduced energy levels, impaired memory, and academic performance[1,2].

Allergic rhinitis co-occurs with sinusitis and conjunctivitis, and its pronounced correlation with asthma is notable. Symptoms encompass rhinorrhea, nasal obstruction, nasal itching, sneezing and headaches[3]. Notably, 40% of allergic rhinitis patients also suffer from asthma, with 80% of asthmatics exhibiting allergic rhinitis[4]. A compelling connection between heightened allergic rhinitis rates and Vitamin D deficiency has emerged, with numerous investigations demonstrating widespread deficiency in Vitamin D[5]. Solar exposure serves as the primary source of Vitamin D. This observation has spurred speculation that the global escalation of allergic diseases, including allergic rhinitis and asthma, could be linked to Vitamin D insufficiency[6].

Previous research underscores Vitamin D's pivotal role in diseases like diabetes, asthma and allergic disorders[7,8], indicating its significance in averting allergic rhinitis and related ailments. Childhood experiences the greatest burden of allergic diseases and asthma. This study seeks to elucidate the correlation between Vitamin D levels and allergic rhinitis. Notably, both Vitamin D deficiency and allergic rhinitis exhibit high prevalence in the general populace, possibly affecting the susceptibility to Allergic rhinitis development[8]. Within India, Vitamin D deficiency has emerged as a prominent non-infectious epidemic, functioning as an immune modulator. The compound contributes to fetal lung maturation and oversees airway smooth muscle cell proliferation and differentiation[9].

The global ramifications of allergic rhinitis and asthma elicit public health concern[10]. Vitamin D assumes a vital role in both innate and adaptive immune responses[11]. In this context, we conducted an appraisal of vitamin D levels in children afflicted by allergic rhinitis as well as in healthy controls.

MATERIAL AND METHODS

This research centered on a cohort of 124 pediatric participants, encompassing both male and female individuals aged 6-18 years. Among these, 62 children afflicted with allergic rhinitis were designated as cases, while a counterpart group of 62 healthy pediatric participants were identified as controls, following stringent adherence to predetermined inclusion and exclusion criteria.

Inclusion criteria comprised the age bracket of 6-18 years, confirmation of allergic rhinitis diagnosis for patient cases and the deliberate choice of physically and mentally sound young male and female children to serve as control subjects. Essential attributes also encompassed the participant's overall fitness, cooperative disposition and capacity to comprehend procedural intricacies. Participation in the study was predicated on voluntary consent, affirming a commitment to engagement. Exclusion criteria encompassed the deliberate omission of patients concurrently afflicted with diverse medical conditions, including but not limited to coronary artery disease, diabetes mellitus, Liver Disease, Tuberculosis, carcinoma and renal disease. The study adhered to non-invasive methodologies. Comprehensive written consent was collected from all participants, underscoring their informed willingness to partake in the research endeavors.

Participants were grouped as under:

- **Group AR:** Children aged 6-18 years with a confirmed diagnosis of allergic rhinitis (n = 62)
- **Group NAR:** Children aged 6-18 years without a diagnosis of allergic rhinitis, serving as controls (n = 62)

Approximately 2 mL of blood specimens were meticulously drawn into plain vials for the subsequent assessment of Vitamin D levels. These collected samples were subjected to centrifugation at 3000 rpm for a duration of 10 min, resulting in the separation of serum, which was promptly stored at a temperature of 0°C within a freezer until the subsequent analysis phase.

For the determination of vitamin D levels the most precise method involves measuring the concentration of 25-hydroxyl vitamin D. This particular form predominates in the bloodstream and serves as the inert precursor to the active state of vitamin D (1,25-Dihydroxy vitamin D). Quantification of vitamin D levels was executed through the employment of the Electrochemi Luminescence Immunoassay (ECLIA) method, leveraging Beckman's commercially available kit.

RESULTS

A notable observation emerges from the data, indicating a substantial reduction in vitamin D levels among children afflicted with allergic rhinitis.

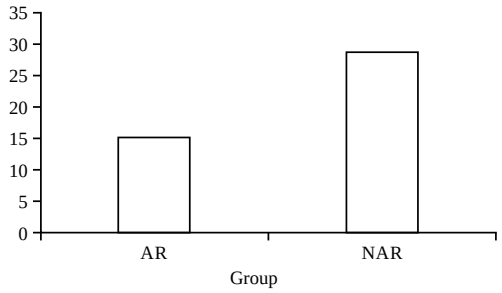

Fig. 1: Mean vitamin D levels in study groups (ng mL^{-1})

Table 1: Comparison of vitamin D levels in study groups

	Group-AR (n = 62)	Group-NAR (n = 62)	p-value
Mean vitamin D (ng mL^{-1})	15.2±1.1	28.8±4.3	<0.05

Moreover the incidence of severe vitamin D deficiency exhibited a statistically significant elevation within the group of patients diagnosed with allergic rhinitis, in comparison to the levels recorded in the control group. This discernible trend is depicted in Table 1 and further elucidated through Fig. 1.

DISCUSSIONS

Allergic rhinitis represents a prevalent health concern with far-reaching implications. While not posing immediate threats to life, it significantly impacts an individual's personal life, work capabilities and overall performance. This predicament imposes a substantial burden on public health, evident in economic terms. Recent investigations have identified a link between the upsurge in allergic rhinitis cases and diminished vitamin D levels[12]. In congruence with these findings, our present study has unveiled vitamin D deficiency in individuals affected by allergic rhinitis.

On a global scale, allergic rhinitis, asthma and related allergic ailments constitute substantial public health challenges[13]. The worldwide prevalence of vitamin D deficiency has escalated, emerging as a significant contributing factor across various disorders including maternal complications, diabetes, asthma, and allergic rhinitis[8]. Emphasizing its potential in safeguarding against viral infections and mitigating allergic diseases' severity in children.

Numerous investigations have established a link between vitamin D insufficiency and heightened susceptibility to allergic rhinitis symptoms and asthma[14]. Our findings harmonize with this growing body of research. Vitamin D's multifaceted role has garnered attention across diverse maladies, from cancer to fertility to longevity[15]. Addressing these risk factors entails straightforward solutions such as augmenting sun exposure and dietary supplementation. Existing reviews substantiate vitamin D's protective role in allergic rhinitis, asthma, and their associated morbidities[14].

Allergic rhinitis holds global significance, manifesting as a substantial source of illness and disability on an international scale, impairing social interactions, sleep patterns and academic or occupational performances[16]. Recent studies have shed light on vitamin D's correlation with allergic rhinitis development, underscoring its pivotal immune system role. Emerging research suggests the involvement of Th17 and T reg cells in allergic rhinitis progression. Vitamin D curbs T reg cell proliferation, tilts the Th1-Th2 balance towards Th2 dominance and facilitates T reg cell induction. Such insights establish the nexus between vitamin D and allergic rhinitis morbidity[17].

In light of these revelations, vitamin D estimation offers a valuable avenue for assessing allergic rhinitis severity. Proposing vitamin D supplementation as a therapeutic strategy holds potential for mitigating allergic disease's impact. This multifaceted approach holds promise in managing the challenges posed by allergic rhinitis.

CONCLUSION

The findings from the current investigation demonstrate a reduction in vitamin D levels among individuals with allergic rhinitis in comparison to the control group. This decrement in vitamin D levels is implicated in elevating the susceptibility to allergic diseases.

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