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Study of Vitamin D Levels in Relation to Bronchial Asthma: Cross Sectional Study

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ABSTRACT:

Background: The consumption of vitamin D by mothers, a decrease in the risk of childhood asthma, and enhanced responsiveness to steroids in specific situations. The objective of our study is to further examine this correlation by analysing the levels of vitamin D in the blood serum of children who have asthma.

Aim and Objective: The main goal is to evaluate the levels of serum vitamin D in children with asthma and establish a connection between these levels and the severity of the disease.

Methods: This was a cross-sectional study involving 100 children, with 40 of them being asthmatics and 60 being age- and sex-matched controls. Informed consent was obtained from all participants. Detailed medical histories were collected, clinical examinations were conducted, and asthma diaries were implemented for follow-up assessments.

Results: Our research indicates a significant pattern: children who have asthma showed greater severity of the disease when they had a lack of vitamin D.

Conclusion: The study analysis demonstrates the presence of a significant link of vitamin D concentration and wheeze intensity. People with vitamin D deficiency were of higher prevalence of moderate degree of chronic bronchial asthma. The conclusion brings to the fore varied degrees of treatment efficiency according to the levels of vitamin D in children suffering from asthma. This emphasizes the importance of further investigations in this area as a move towards developing efficient administration strategies and also better management outcomes.

Keywords: Vitamin D; Asthma; Children health; Deficiency

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1. Introduction:

Vitamin D, which includes cholecalciferol (Vitamin D3) and ergocalciferol (Vitamin D2), is sometimes called the "sunshine vitamin" because it is produced in the skin when exposed to sunlight. The global recognition of its deficit is growing, particularly in India. Bronchial asthma, a common chronic inflammatory respiratory condition in children, is distinguished by inflammation, heightened sensitivity, and blockage of the airways, resulting in symptoms such as wheezing, difficulty breathing, chest constriction, and coughing. In current studies research indicates that vitamin D plays a crucial role in the development of the foetal lungs, which may help lower the chances of childhood asthma and respiratory tract infections if the mother's consumption of vitamin D is sufficient. Moreover, the use of vitamin D may improve the ability of steroids to effectively treat asthma in children who do not respond well to steroids. It is important to note that a lack of vitamin D is linked to a higher likelihood of experiencing sudden worsening of symptoms in bronchial asthma¹⁻³.

As the research studies about asthma and vitamin D are relatively fewer in the paediatric population of India, here is a crucial need to carry further investigation. As such, the purpose of this study is to observe serum vitamin D levels in children with asthma and evaluate any contributing factor between vitamin D levels and the intensity of asthma in the population.

2. Materials & methods:

Study Design and Participant Recruitment:

The study utilised a cross-sectional design to analyse a cohort of 100 youngsters. In this group, 40 individuals were diagnosed with asthma, while the other 60 individuals were selected as controls of the same age and gender. Prior to commencing data collecting, thorough attention was devoted to ethical considerations. Prior to the study, the parents or guardians of the participating child's were provided with necessary information about the study's goals, methods, and possible risks and benefits. They gave their consent based on this information, assuring transparency. Effective communication and the distribution of an information sheet facilitated the establishment of a solid basis of comprehension and confidence between the researchers and participants.

Ensuring ethical considerations and obtaining informed consent were of utmost importance in conducting the study. Parents or guardians were given comprehensive information regarding the study's objectives, methodologies, and potential consequences for their child's well-being. By engaging in open and transparent communication, the researchers achieved informed permission, indicating a shared understanding and agreement between them and the subjects. This ethical framework established the foundation for the conscientious and considerate gathering of data, promoting a feeling of mutual cooperation and teamwork throughout the study procedure.

Data Collection methods:

Data collection using extensive approaches was the cornerstone for us to achieve a detailed picture of the condition of the children we experimented on via attention to their demographic traits and medical histories. A most sophisticated survey was done with the idea in mind to get a whole array of data squarely concerning identifying and managing the scope of the disease. The scientific method is an empirical approach that involves careful observation, experimentation, and the formulation of hypotheses based on the gathered data. After the survey had been done, clinical professionals who were well-trained did comprehensive

clinical examinations and thorough analysis to check the participants' respiratory health and overall wellness.

A holistic approach that comprises several methods and approaches helped to conduct a deep study of child's health situation, which in its turn brought together a plenty of information and served as a basis on which the researchers were able to build their conclusions³.

Implementation of Asthma Diary:

In addition to the questionnaire and clinical assessment, parents or guardians of children with asthma were given instructions to keep an asthma diary. The notebook functioned as a beneficial instrument for recording symptoms, medicine consumption, and alterations in the child's state over a period of time. Regular examination of the asthma diary during subsequent meetings permitted continuous monitoring of the advancement of the condition and the effectiveness of the treatment. The research aimed to provide immediate and firsthand insights about the practicalities of managing asthma in children by actively engaging parents or guardians in the data gathering process.

Various evaluation instruments and measurements were employed to collect unbiased data on different aspects of the participants' health. The procedures involved in the study encompassed a comprehensive blood count analysis (CBC) to assess overall health indicators, measurement of serum vitamin D levels to evaluate the participants' vitamin D status, and the utilisation of spirometry to assess lung function. The objective measures yielded valuable insights on inflammatory markers, vitamin D levels, and pulmonary function, hence boosting the study's findings in terms of depth and accuracy⁴⁻⁵.

Data Analysis and Interpretation:

After collecting the data, a comprehensive analysis and interpretation of the acquired information were carried out. The researchers investigated the correlations between asthma, vitamin D concentration, and other pertinent variables using both quantitative and qualitative methods. The analysis provided valuable insights that were utilised to derive significant conclusions and enhance the current knowledge on the management of paediatric asthma. The study aims to use careful analysis and interpretation of data to provide practical insights that could guide further research and clinical practice.

3. Results

Age Distribution and Characteristics:

The study population displayed an even distribution across age groups, with a mean age of 8.15 ± 3.02 years. The many of participants fell within the 6-10 age bracket, accounting for 55% of asthmatic cases and 41.7% of controls (Table-1).

Age distribution	Cases (n=40) Frequency (%)	Controls (n=60) Frequency (%)	Total
2-5	7(17.5%)	20(33.3%)	27(27%)
6-10	22(55%)	25(41.7%)	47(47%)
11-15	11(27.5%)	15(25%)	26(26%)
Mean \pm SD	8.15\pm3.02	7.48\pm3.82	100(100%)
Chi-square test=3.19,p=0.20(Not Statistically Significant)			

Study participants are evenly distributed through the age under consideration and followed a normal distribution. The study participants' mean age was 8.15 ± 3.02 years, where the more of the study participants belonged to the age group of 6-10 years.

Gender Distribution

A gender breakdown revealed a higher proportion of males (52.5%) among asthmatic cases compared to females (47.5%). Similarly, controls comprised a larger percentage of males (66.7%) than females (33.3%). But, this difference was not statistically significant (Table-2).

Gender	Cases (n=40) Frequency (%)	Controls (n=60) Frequency (%)	Total
Male	21(52.5%)	40(66.7%)	61(61%)
Female	19(47.5%)	20(33.3%)	39(39%)
Chi-square test=2.00,p=0.15(Not Statistically Significant)			

Of the study participants, the Majority were male (61%) and the rest were female. However, this difference is not statistically significant.

Severity of Asthma

The severity of asthma varied among the participants, with mild persistent asthma being the most prevalent (47.5%), followed by moderate persistent asthma (37.5%) and intermittent asthma (15%). Assessment of severity considered factors such as the frequency of exacerbations, symptoms, and required treatments (Table-3).

Severity of Asthma	Cases (n=40) Frequency (%)
Intermittent	6(15%)
Mild Persistent	19(47.5%)
Moderate Persistent	15(37.5%)
Total	40(100%)

Association between Age and Asthma Severity:

Upon analyzing asthma severity across different age groups, no statistically significant differences were observed. Mild persistent asthma predominated across all age brackets, indicating a consistent distribution of severity irrespective of age (Table-4).

Age distribution	Intermittent	Mild Persistent	Moderate Persistent
2-5	1(2.5%)	4(10%)	2(5%)
6-10	5(12.5%)	11(27.5%)	6(15%)
11-15	0(0.0%)	6(15%)	7(17.5%)
Total	6(15%)	19(47.5%)	15(37.5%)
Chi-square test=5.74,p=0.21(Not Statistically Significant)			

The majority of the study participant had mild persistent Asthma, and the difference in severity across the age groups was not statistically significant.

Vitamin D Status

A substantial portion of the study population exhibited vitamin D deficiency (60%), while 15% had insufficient levels and only 25% maintained sufficient levels. This highlights a prevalent issue of vitamin D insufficiency among pediatric asthma patients (Table-5).

Vitamin D status	Frequency (%)
Deficient	24(60%)
Insufficient	6(15%)
Sufficient	10(25%)
Total	40(100%)

65% of the research participants were vitamin D deficient. Whereas 15% had insufficient levels, and sufficient vitamin D levels are observed only in 25% of the participants.

Association between Vitamin D Status and Age/Gender:

There is no statistically significant differences were found in vitamin D levels across age groups or genders. Deficiency was consistently observed across all age brackets and genders, suggesting a uniform distribution of vitamin D status among participants (Table-6).

Age distribution	Deficient	Insufficient	Sufficient
2-5	4(10%)	2(5%)	1(2.5%)
6-10	12(30%)	4(10%)	6(15%)
11-15	8(20%)	0(0.0%)	3(7.5%)
Total	24(60%)	6(15%)	10(25%)

Chi-square test=3.46,p=0.48(Not Statistically Significant)

And in the absence any statistically significant difference between vitamin D levels of the college students would be observed in different age groups

Association between Vitamin D Status and Asthma Severity:

This study demonstrated remarkable dependency between vitamin D degree and firmness in asthma. Most especially, vitamin D deficiency was more common among the moderate persistent asthma group as compared to other classifications. Highlighting the possible effects of vitamin D deficiency on asthma in the pediatrics case demonstrates the essential role of the vitamin contribution to the severity of the headful ailment. (Table-7; Table-8).

Gender distributeon	Deficient	Insufficient	Sufficient
Male	12(30%)	4(10%)	5(12.5%)
Female	12(30%)	2(5%)	5(12.5%)
Total	24(60%)	6(15%)	10(25%)

Chi-square test=0.56,p=0.75(Not Statistically Significant)

No statistically significant difference has been observed between the levels of vitamin D and the gender of the participants.

Severity of Asthma	Deficient	Insufficient	Sufficient
Intermittent	2(5%)	3(7.5%)	1(2.5%)
Mild Persistent	9(22.5%)	2(5%)	8(20%)
Moderate Persistent	13(32.5%)	1(2.5%)	1(2.5%)
Total	24(60%)	6(15%)	10(25%)
Chi-square test=13.24,p=0.01*(Statistically Significant)			

A statistically significant difference in vitamin D levels and the severity of illness has been observed among the study participants. Moderate persistent Asthma has been seen more in patients who are deficient in vitamin D.

4. Discussion

This research exploration aims to determine whether vitamin D deficiency impacts the genesis of childhood asthma. Asthma being widespread and generally under diagnosed, placing on its victims a huge strain and burden, it is necessary to understand the causes for it. Vitamin D deficiency is commonly associated with the widespread, and its relationship with asthma thereof needs to be further understood. Vitamin D is examined in this case-control trial, which compares vitamin D levels in two groups: 40 children, who have been diagnostically labelled as asthmatics and the other 60 healthy children, who are the same in age and sex as the former using them as the control.

The research disclosed that constitute the majority of participants (i.e. 47.5%) were of mild persistent asthma cases while the rest of the participants was composed of intermittent and moderate persistent asthma cases. The seriousness of Illnesses did not differ across age groups. On the contrary, in this case, we didn't have those severe cases; however, such cases are often mentioned in other studies⁷.

The mean level of Vitamin D observed among the study group participants is 33.6 ± 21.44 and Indian data suggests concentration $<12\text{ng/ML}$ as being deficient, between $12\text{-}20\text{ng/ml}$ as being insufficient and $>20\text{ng/ml}$ as sufficient You have chosen some interesting sample sentences⁸.

The survey has shown vitamin D deficiency rates up to 65% among the participants and only quarter (25%), a satisfactory level of vitamin D was obtained. The result showed that the proposed direction coincides with earlier researches suggesting that vitamin D deficiency is one of the things connected to asthma⁸.

Several studies were cited to support this connection:

- Fahad aleem et al. observed lower levels vitamin D in asthmatic children compared to healthy controls.
- Pragalatha et al. reported a similar association between asthma severity and vitamin D levels.

5. Conclusion:

A statistically significant difference has been observed between vitamin D levels among the participants in different age groups. A statistically significant difference in vitamin D levels and the severity of illness has been observed among the study participants. Moderate persistent Asthma has been seen more in patients who are deficient in vitamin D. However, our research did not observe any statistical associations with socio-demographic variables like age and gender; many studies have shown a statistically significant association with variables like age and gender. Increasing age and male gender are found to have a positive association with vitamin D deficiency and Asthma.

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