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Estimating Prevalence of Asthma among Children Associated with Raised IgE Immunoglobulin; A Cross-Sectional Study

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Author`s Contribution

[1,6]Substantial contributions to the conception or design of the work or the acquisition, methodology, analysis, Final approval of the version to be published.[2,3]Active Participation in active, [4,5]Drafting the work or revising it critically for important intellectual content

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ABSTRACT

Objective: To estimate the prevalence of asthma among children associated with elevated IgE immunoglobulin levels.

Methodology: A cross-sectional study was conducted at Memon Charitable Hospital, Hyderabad from January 2022 to December 2022. The study participants were children aged between 6-12 years. Children who have previously been diagnosed with asthma or have other chronic respiratory conditions were excluded from the study. IgE test was performed along with assessing the clinical symptoms of asthma. All data collected was stored securely and confidentially, with access limited to the research team only.

Result: A total of n-781 patients aged 6 to 12 years were enrolled in the study. The mean age of the patient was reported to be 6.84 ± 2.94 in age group of 6-9 years where as 10.65 ± 3.20 in age group of 10-12 years. Boys were found to be more affected with asthma as compared to girls with frequency of 260 (61.75%) and 209 (58.05%) as compared to girls in both age group. The total prevalence of asthma was found to be 9.23%.

Conclusion: That asthma is a significant health concern in this population, with observed prevalence associated with elevated IgE immunoglobulin levels to be 9.23%, and efforts to prevent, diagnose, and manage the disease should be prioritized.

Keywords: Asthma, IgE, prevalence, wheezing, breathlessness.

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Introduction

Asthma is a chronic respiratory disease that affects people of all ages, but it is more common in children. Asthma is one of the world's most common chronic diseases, according to the World Health Organization (WHO), affecting an estimated 339 million people.[1] In the United States, it is estimated that around 26.5 million people have asthma including 6.1 million children.[2] This represents about 8.4% of all children in the country. In the United Kingdom, the National Health Service (NHS) reports that approximately 1 in 11 children has asthma.[3] Other countries also report varying prevalence rates. For example, the prevalence of asthma among children aged 0 to 11 years in Canada was estimated to be 8.6% in 2018, while in Australia approximately 11% of children between the ages of 5 and 14 years were estimated to have asthma.[4]

Asthma prevalence is higher in boys than in girls[1] and tends to be more common in urban areas than in rural areas. It is also more common in children who have a family history of asthma or other allergic conditions, such as hay fever or eczema.[5] Overall, the prevalence of asthma in children varies widely depending on the country, region, and population studied, but it is clear that asthma is a

common chronic condition that affects a significant number of children worldwide. In some countries, such as India, the prevalence of asthma is relatively low, with estimates ranging from 1-5%. In other countries, such as Bangladesh and Pakistan, the prevalence of asthma is higher, with estimates ranging from 5-10%. It is important to note that the prevalence of asthma can vary based on a variety of factors, including age, gender, genetics, environmental exposures, and access to healthcare.[6]

Additionally, the prevalence of asthma may be underreported in some countries due to a lack of awareness or access to proper diagnostic and treatment services. Asthma is a chronic respiratory disease that causes inflammation and narrowing of the airways, leading to difficulty breathing. The most common symptoms of asthma include: shortness of breath, coughing, and wheezing, and it can be managed with proper treatment and lifestyle modifications.[7] Not everyone with asthma will experience all of these symptoms, and the severity of symptoms can vary from person to person.

Asthma can be a significant financial burden for individuals and families affected by the disease. The direct costs of asthma, such as medications and medical visits, can be significant, and the indirect costs, such as lost productivity due to missed work or school, can also add up. According to a study published in the American Journal of Managed Care, the total annual cost of asthma per patient in the United States was estimated to be between $3,266 and $4,411 in 2015.[8] This cost includes both direct and indirect costs. The direct costs, such as medications and medical visits, accounted for about 50% of the total cost, while indirect costs, such as lost productivity, accounted for the remaining 50%. Asthma can also have a significant economic impact on society as a whole. The World Health Organization (WHO) estimates that asthma imposes an economic burden of $80 billion annually worldwide, which encompasses both direct and indirect costs[9]. The economic burden of asthma can be reduced through effective prevention and management of the disease. Asthma can be severe and life-threatening in some cases. However, with proper diagnosis and treatment, the mortality rate for asthma is relatively low. According to the World Health Organization (WHO), the global mortality rate for asthma is approximately 0.5 deaths per 100,000 population. This means that out of every 100,000 people with asthma, about 0.5 will die from the disease[10]. It is important to note that the mortality rate for asthma can vary based on a variety of factors, including the severity of the disease, access to proper healthcare, and the effectiveness of treatment. The management of asthma involves identifying and controlling the factors that trigger asthma symptoms, using medications to control the inflammation and narrowing of the airways, and developing a plan to monitor and manage the disease.[11]

Identifying and controlling triggers: Triggers are factors that can worsen asthma symptoms. Common triggers include allergens (such as pollen, mold, and pet dander), irritants (such as tobacco smoke and air pollution), and respiratory infections (such as the common cold).

Identifying and avoiding triggers can help prevent asthma symptoms.[12] There are several types of medications that can be used to control asthma symptoms. These include: Quick-relief medications: These medications, also known as rescue medications, are used to relieve sudden symptoms of asthma. They include short-acting beta agonists (SABAs)[13] and oral or intravenous corticosteroids. Long-term control medications: These medications are used to prevent and control chronic asthma symptoms. They include inhaled corticosteroids, long-acting beta agonists (LABAs), and leukotriene inhibitors. Despite the management strategies, there is a need to identify more palliative care for patients with asthma. However, there is a scarcity of community-based epidemiological research conducted in Pakistan that assesses the prevalence of asthma among children. Hence the current study is aimed to identify the prevalence of asthma among children of Hyderabad.

Methodology

A Cross-sectional study was conducted at Memon Charitable Hospital, Hyderabad with a one years duration from January 2022 to December 2022. The study included children aged between 6-12 years who brought in the emergency department presenting with the complaint of shortness of breath, chest tightness or pain, wheezing when exhaling were provided with the initial medical treatment. Informed consent from parents or guardians and the assent form from children themselves was obtained. Children who have previously been diagnosed with asthma or have other chronic respiratory conditions were excluded from the study. The study was done after taking approved by Memon Charitable Hospital. The data collection process involved following steps. The eligible participants who present with complaints of shortness of breath, chest tightness or pain, and wheezing when exhaling were identified by the hospital staff in the emergency department or outpatient department. Once the child was identified as potentially eligible for the study, the

researcher approach the child's parent or guardian to explain the study and obtain informed consent. The researcher also explain the study to the child, using age-appropriate language, and obtain the child's ascent to participate in the study using an ascent form. After obtaining informed consent and ascent, the researcher administered the FeNO test and IgE to determine whether the child has asthma. The FeNO test is a non-invasive test that involves asking the child to exhale into a small, handheld device. The device measures the amount of nitric oxide in the child's breath, which can be used to identify airway inflammation, a hallmark of asthma. The test takes only a few minutes to complete and is painless and non-invasive. In addition to the FeNO test, demographic information, such as age, sex, and medical history, using a standardized questionnaire was also obtained. The questionnaire was provided in English, Urdu, and Sindhi to ensure that all participants can complete it. All data collected was stored securely and confidentially, with access limited to the research team only. Participant privacy was protected throughout the study

Results

Data was collected from 781 patients aged 6 to 12 years from January 2022 to December 2022. The mean age of the patient was reported to be 6.84 ± 2.94 in age group of 6-9 years where as 10.65 ± 3.20 in age group of 10-12 years. Boys were found to be more affected with asthma as compared to girls with frequency of 260 (61.75%) and 209 (58.05%) as compared to girls in both age group. A family history of asthma was reported in 9.98% of the sample, while 59.29% reported a history of passive smoking. (Table I)

Table I: Demographic Characteristics.

	Age Group	
Characteristics	**6-9 y (n=421)**	**10-12 y (n=360)**
	Mean±SD	
Age (y)	6.84 ± 2.94	10.65 ± 3.20
Weight (kg)	22.42 ± 8.25	31.46 ± 5.36
Height (m)	1.22 ± 0.1	1.5 ± 0.13
Gender	**N (%)**	
Male	260 (61.75%)	209 (58.05%)
Female	161 (38.24%)	151 (41.94%)
Family history of asthma	43 (10.21%)	35 (9.72%)
History of/passive smoking	256 (60.80%)	213 (59.16%)

The prevalence of asthma among children aged 6-12 years in Hyderabad was found to be 9.23%, based on a sample size of 791. This indicates a moderate level of asthma prevalence in the population studied. The confidence interval for the estimate was calculated to be 7.96- 10.50, with a 95% level of confidence ($p<0.05$). whereas the IgE value of patient was 10.1 ± 2.3 ($p<0.05$). These findings suggest that asthma is a significant health concern among children in Hyderabad, and efforts to improve prevention, diagnosis, and treatment of the condition should be prioritized. (Table II)

Table II: Serum IgE value in the patients.

Serum levels (g/L)	+ve	-ve	P value (<)
IgE	10.1 ± 2.3	11.5 ± 3.6	<.05
IgE $_1$	4.9 (3.5-5.8)	5.5 (4.5-7.0)	.059
IgE $_2$	3.7 ± 1.0	4.1 ± 1.4	.12

Regression analysis was applied to assess if there is any relation between the Hx of passive smoking, family Hx of asthma and asthma. The results revealed that both the variables are significant contributor for asthma. (Table III)

Table III: Linear regression of asthma with Hx of passive smoking and Family Hx of asthma

Variable	**Score**	**Df**	**p-value (<0.05)**
History of passive smoking	7.126	1	0.008
Family history of asthma	13.33	1	0.000

Discussion

Asthma is a chronic respiratory disease that affects millions of people worldwide, particularly children. The aim of this study was to determine the prevalence of asthma among children aged 6-12 years in Hyderabad, Pakistan. The results indicate that the prevalence of asthma in this population is moderate, with a rate of 9.23% with passive smoking and family history of asthma as a major contributor. The prevalence rate found in this study is consistent with several other studies conducted in various parts of the world. A study conducted in Tehran; Iran found a prevalence rate of 9.2% in children aged 7-11 years.[14] Another study conducted in Hong Kong found a prevalence rate of 9.6% in children aged 6-15 years.[15]

A systematic review and meta-analysis was performed in 2020 to find the association between secondhand smoke and childhood asthma. The results showed a positive association between prenatal and postnatal secondhand smoking exposure and the occurrence of childhood asthma, asthma-like syndrome, and wheezing. These results lend support to continued efforts to reduce childhood exposure to secondhand smoke.[16] Another study was conducted in 2019 which assess Influence of Second-Hand Smoke (SHS) and Prenatal Tobacco Smoke (PTS)

Exposure on Biomarkers, Genetics and Physiological Processes in Children, the results revealed that Exposure to SHS and PTS has been shown to increase the risk of cancer development in children and exacerbate asthma and allergy symptoms, while also negatively impacting lung, heart, and blood vessel health. Additionally, PTS exposure can alter immune system function. Consequently, policymakers and the public should prioritize efforts to limit both domestic and public exposure to secondhand smoke (SHS) and PTS to safeguard the health of children from a young age.[17] Prevention and management of asthma in children are critical to reducing the burden of the disease on individuals and healthcare systems. One study found that regular physical activity and a healthy diet can help prevent the development of asthma in children.[18]

Another study found that early diagnosis and appropriate management of asthma can significantly improve outcomes and reduce the need for hospitalization.[19] These findings emphasize the importance of promoting healthy lifestyles and early detection and management of asthma in children. This study has several limitations that should be considered when interpreting the results. First, the study was limited to a specific age range and geographic location, and therefore, the results may not be generalizable to other populations. Future research should address these limitations by conducting larger, multi-center studies with more objective measures of asthma diagnosis and environmental exposure.

Conclusion

This study provides valuable insights into the prevalence of asthma among children in Hyderabad. The findings suggest that asthma is a significant health concern in this population, and efforts to prevent, diagnose, and manage the disease should be prioritized. This study adds to the growing body of evidence on asthma prevalence and risk factors in children, and can inform future research and interventions aimed at reducing the burden of this chronic disease on individuals and society.

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