Burden, Determinants, and Clinical Aspects of Allergic Disorders Among Children in Jeddah, Saudi Arabia: A Community-Based Cross-Sectional Study

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Abstract
Objectives: To determine the prevalence, risk factors, and clinical features of allergic disorders among children under the age of seven in Jeddah, Saudi Arabia.
Methods: A community-based cross-sectional study was conducted among 178 children aged ≤6 years using an online questionnaire distributed via Google Forms. Sociodemographic data and clinical information regarding allergic conditions were collected. Data analysis was performed using SPSS version 24.
Results: Among the 178 participating children, the prevalence of physician-diagnosed bronchial asthma was 22.5%, hay fever was 7.5%, and eczema was 24.1%. There was no significant gender difference in asthma prevalence. A maternal history of asthma was significantly associated with the development of asthma in children ($p < 0.05$). Wheezing was significantly more common among asthmatic children. Additionally, children with asthma were more likely to suffer from hay fever or eczema ($p < 0.05$).
Conclusion: Allergic disorders, particularly asthma, eczema, and hay fever, are prevalent among children under seven years in Jeddah. A family history of asthma, especially maternal, significantly increases the risk. These findings underscore the need for early detection and the implementation of national awareness programs focused on allergic disorders in early childhood across Saudi Arabia.

Keywords: Allergic disorders, asthma, hay fever, eczema, children under seven, Jeddah, Saudi Arabia

Introduction

The prevalence of allergic disorders has increased considerably over the past five decades. In industrialized nations, over one-fourth of all children are now estimated to suffer from some form of allergy, most commonly asthma, allergic rhinitis, and atopic dermatitis (1). Reported prevalence rates in children are 4.2% for asthma, 5.3% for allergic rhinitis, and 8.4% for atopic dermatitis, with only 0.22% experiencing all three (2). Asthma, the most prevalent chronic condition in childhood, is diagnosed based on a history of variable airflow obstruction and symptoms such as coughing, wheezing, chest tightness, and shortness of breath. Diagnosis is supported by symptom improvement after using inhaled corticosteroids (ICS) or short-acting β2-agonists (SABA) (3). Treatment options include as-needed ICS with SABA, single maintenance and reliever therapy (SMART), and add-on long-acting muscarinic antagonist (LAMA) therapy (5). Allergic rhinitis (AR) is defined by nasal inflammation causing symptoms like obstruction, rhinorrhea, sneezing, and pruritus, and is confirmed by serum-specific IgE or skin prick testing (3). Management includes allergen avoidance, pharmacotherapy, and immunotherapy (1).
Atopic dermatitis (AD) is diagnosed based on criteria such as pruritus, typical distribution, chronicity, and a personal or family history of allergy (3). Emollients and soap-free cleansers form the basis of maintenance, with topical corticosteroids for flares (4). The global burden of allergic diseases has risen significantly, with AR prevalence reaching up to 45% in some populations, making it one of the leading causes of pediatric morbidity (6). These diseases are multifactorial, influenced by genetic predisposition, environmental factors like indoor allergens, pollution, and tobacco smoke (6,7). In Jeddah, rapid climate changes and dust storms may exacerbate allergic conditions, yet few studies have investigated the prevalence and risk factors of asthma in this region. This study aims to assess these variables among children under seven years in Jeddah (8).

Methodology

Study Design: Community-based cross-sectional study.

Setting: Online survey using Google Forms, distributed among the population in Jeddah, Saudi Arabia.
Sampling Method: Non-probability convenience sampling.

Sample Size: Estimated using G-Power with effect size 0.4, $\alpha=0.05$, power=0.95, degrees of

freedom = 5. Required sample size: 166. Enrolled: 178 children.
Inclusion Criteria: Children aged ≤6 years.

Data Collection Tool: A validated questionnaire on pediatric allergic diseases (9), including 6 questions each on asthma, hay fever, and eczema.

Ethical Considerations: IRRB approval obtained from ISNC. Informed consent was acquired from all parents/guardians. Confidentiality and voluntary participation were ensured.

Statistical Analysis: Conducted using SPSS. Chi-square test of significance was used to identify associations. Significance was set at 0.05.

Results

The present study comprised 178 children, aged 6 years and less, in Saudi Arabia (Fig 1). The proportion of males, 56.7% , was slightly higher than that of the females , 43.3%, (Fig. 2).

The prevalence of doctor diagnosed bronchial asthma among these children was 22.5%. Although, asthma was not reported among children less than one year, and was more common among those aged 3 years and over, however these findings were not statistically significant ($X^2 = 8.16$; $p < 0.148$). Although bronchial asthma was more diagnosed in male children compared to female ones (Fig. 2), these differences were not statistically significant ($X^2 = 2.98$; $p < 0.138$). Among the sociodemographic characteristics of the studied children (table 1), only family history of asthma among the mom was significantly associated with occurrence of asthma in the children ($X^2 = 14.09$, $p < 0.002$). Having wheezes in the chest was a significant finding in children with asthma , particularly in the past 12 months, where p value less than 0.05. (Table 2) Wheezes in the chest also during exercise and dry cough without cold were significant findings in children with asthma compared to those without asthma ($p < 0.05$). Children with asthma had significantly more nasal symptoms such as sneezing, and stuffy nose without being suffering from cold compared to the children without asthma. ($p < 0.05$). Hay fever, was significantly associated with having asthma in the studied children where $X^2 = 5.591$, and $p < 0.010$. (Table 3). Eczema was significantly associated with bronchial asthma among the studied children where $X^2 = 7.98$, and $p < 0.005$. (Table 4)

Discussion

This study presents an updated profile of allergic disorders among young children in Jeddah, with findings both consistent and divergent from existing literature. We observed a higher prevalence of asthma among male children, reflecting global trends that link male gender with increased asthma risk due to airway size and hormonal differences (1,2). In contrast to prior studies, our findings showed higher asthma rates among Saudi nationals, suggesting possible environmental or lifestyle influences unique to this group (3,4). Asthma was more prevalent in owned homes versus rented ones, contrary to research indicating that substandard housing in rentals may contribute to asthma (5,6). Urban living within Jeddah, compared to peri-urban or rural areas, was also associated with more asthma cases, suggesting urban exposures such as pollutants or allergens may be contributory (7). Unexpectedly, children without pets had higher asthma prevalence, which aligns with studies supporting the "hygiene hypothesis" and the protective role of early-life animal exposure (8). Similarly, exposure to indoor plants and birds showed a protective association, despite past reports linking such exposures to increased allergens (9). Maternal history of allergy had a significant association with asthma, emphasizing the genetic and epigenetic influences mothers may impart (10,11). Passive smoke exposure, a well-documented risk factor, was confirmed in our population as contributing to asthma burden (12,13). Wheezing and related symptoms were strong indicators of asthma, especially nocturnal symptoms and those triggered by exercise (14,15). However, severe wheezing limiting speech showed no statistical association, differing from findings in more severe asthma cohorts (16).

Comorbid symptoms like allergic rhinitis were strongly associated with asthma, as reported extensively in the literature (19). Seasonal variation showed peaks in spring and winter, differing from typical autumn peaks seen elsewhere (20). Although hay fever and general itchy rashes were not strongly linked to asthma in our findings, specific AD features—such as flexural rashes and nocturnal itching—were significantly associated, partially supporting the "atopic march" concept (23–25). Notably, physician-diagnosed eczema was not associated with asthma in our study, contradicting global data (26).

Limitations

There are some limitations to this study: As this study is cross-sectional, the causal relationship remains unknown, and we do not know if the relationship of these variables with asthma and allergic disorders will persist in the long term. It is also a non-probability convenient sample, and its generalization to the population may be defective; however, it is an exploratory study.

Conclusion

Our study highlights the significant burden of asthma and allergic diseases among children in Jeddah. While some findings align with global patterns, others reflect unique local dynamics, emphasizing the need for context-specific interventions. Future longitudinal research should further elucidate these associations and support targeted public health

policies.

Acknowledgments
We thank all the participants for their cooperation throughout the study.

Author Contributions
F El-G contributed to study design, analyzing data and writing the draft. JA, FA, JA, LA contributed to collecting data, and writing the draft. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement
The study was approved by the IRRB of Ibn Sina National College for medical studies (IRRB-#- 03-20092022).

Informed Consent Statement
Informed consent was obtained from all subjects involved in the study.

Funding
This study has not received any external funding.

Conflict of interest
The authors declare that there is no conflict of interests.

Data and materials availability
All data sets collected during this study are available upon reasonable request from the corresponding author

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Fig 1: Distribution of children 6 years or less by Doctor diagnosed asthma

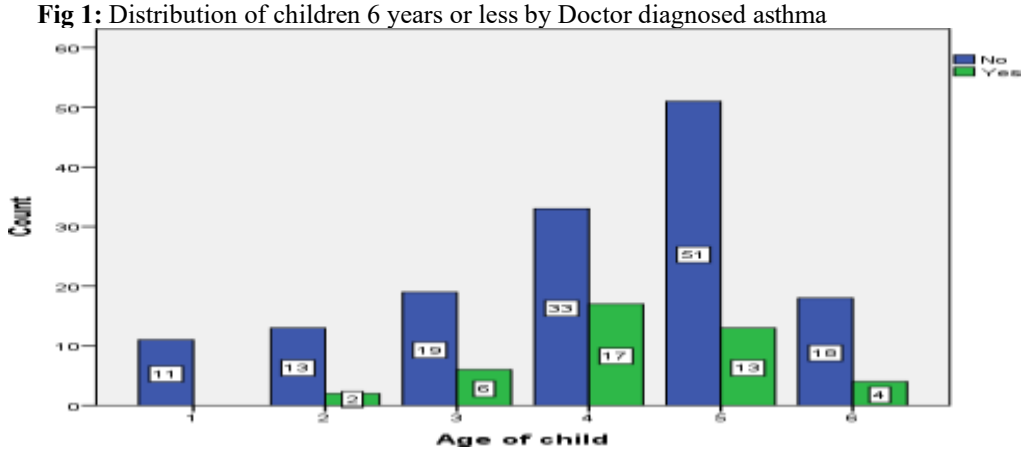

Fig 2: Distribution of children by Doctor di agnosed asthma and gender

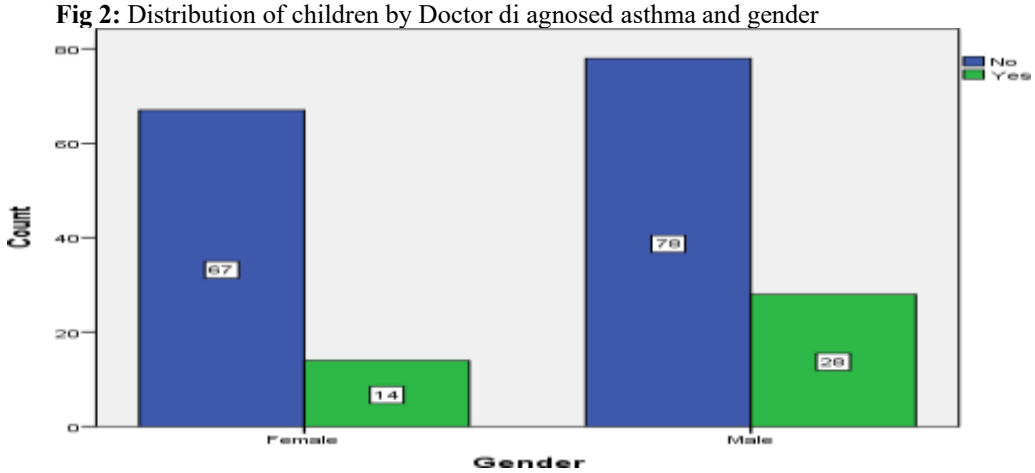

Table 1: Asthma and socio-demographic characteristics in the children

Variable	Categories	Dr Diagnosed Asthma		Total (187)	X2 P-Value
		No (145)	Yes (42)		
		%	%	%	
Gender	Male	53.8%	66.7%	56.7%	2.198 0.138
	Female	46.2%	33.3%	43.3%	
Nationality	Saudi	80.7%	81%	80.7%	0.001 0.970
	Non-Saudi	19.3%	19%	19.3%	
Property type	Owned	52.4%	69%	56.1%	3.660 0.056
	Rented	47.6%	31%	43.9%	
Residential area	Jeddah	77.9%	78.6%	78.1%	0.008 0.930
	Outside Jeddah	22.1%	21.4%	21.9%	
Keep pets at home?	No	83.4%	71.4%	80.7%	3.027 0.082
	Yes	16.%	28.6%	19.3%	

Keep plants at home?	No	64.8%	54.8%	62.6%	1.409 0.235
	Yes	35.2%	45.2%	37.4%	
keep birds at home?	No	82.8%	81%	82.4%	0.073 0.787
	Yes	17.2%	19%	17.6%	
Family history of allergies:	No	54.5%	33.3%	49.7%	14.38 0.002
	Dad	22.1%	14.3%	20.3%	
	Mom	11.7%	33.3%	16.6%	
	Siblings	11.7%	19.0%	13.4%	
Smoking habit	Smoker	78.6%	71.4%	77%	0.951 0.329
	Non-smoker	21.4%	28.6%	23%	

Table 2: Asthma and clinical symptoms and lifestyle in children

Variable	Categories	Dr Diagnosed Asthma		Total (187)	X2 P-Value
		No (145)	Yes (42)		
		%	%	%	
Has your child ever had wheezing or wheezing in the chest at any time in the past?	No	73.8%	14.3%	60.4%	48.227
	Yes	26.2%	85.7%	39.6%	0.000
Has your child experienced wheezing or wheezing in the chest in the past 12 months?	No	47.4%	22.2%	35.1%	5.129
	Yes	52.6%	77.8%	64.9%	0.024
During The past 12 months, how often has your baby's sleep been disturbed on average	Never	15.0%	10.7%	12.5%	
due to wheezing?					
	<one night/week	40.0%	25.0%	31.3%	1.783
					0.410
	>= one night per week	45.0%	64.3%	56.3%	
Over the past twelve months, has the whistling been intense enough to limit your child's speech to just one breath?	No	70.0%	50.0%	58.3%	1.920 0.166
	Yes	30.0%	50.0%	41.7%	
In the past 12 months, has your baby's chest seemed to wheeze during or after exercise?	No	87.6%	42.9%	77.5%	37.413
	Yes	12.4%	57.1%	22.5%	0.000
In the past 12 months, has your child had a dry cough at night, except for cough related to cold or chest inflammation?	No	71.7%	40.5%	64.7%	13.924 0.000
	Yes	28.3%	59.5%	35.3%	

Table 3: Asthma and nasal symptoms in children

Variable	Categories	Dr Diagnosed Asthma		Total (187)	X2 P-Value
		No (145)	Yes (42)		
		%	%	%	
Has your child ever had a problem with sneezing, cold or stuffy nose when they don't have a cold or flu?	No	50.3%	16.7%	42.8%	15.090 0.000
	Yes	49.7%	83.3%	57.2%	
In the past 12 months, has your child had a problem with sneezing, cold or stuffy 0se when they haven't had a cold or flu?	No	15.3%	20.0%	16.8%	1.783 0.410
	Yes	84.7%	80.0%	83.2%	
In the past 12 months, has your child's nose problem been accompanied by itching and tears in the eyes?	No	49.2%	32.1%	43.8%	2.263 0.133
	Yes	50.8%	67.9%	56.2%	
In which of the last 12 months has this nasal problem occurred with your baby?	Winter	62.3%	35.7%	53.9%	
	Autumn	19.7%	17.9%	19.1%	
					11.288
	Spring	9.8%	39.3%	19.1%	0.010
	Summer	8.2%	7.1%	7.9%	
Over the past 12 months, to what extent has this nasal problem affected your child's daily	Not at all	14.8%	7.1%	12.4%	
activities?					
	A little	52.5%	46.4%	50.6%	
					2.046
	A moderate amount	21.3%	28.6%	23.6%	0.563
	A lot	11.5%	17.9%	13.5%	
Has your child ever had hay fever?	No	95.2%	83.3%	92.5%	6.591 0.010
	Yes	4.8%	16.7%	7.5%	

Table 4: Asthma and eczema and skin manifestations in children

Variable	Categories	Dr Diagnosed Asthma		Total (187)	X2 P-Value
		No (145)	Yes (42)		
		%	%	%	
Has your child ever had an itchy rash that has been coming and going for at least 6 months?	No	80.7%	59.5%	75.9%	7.984

	Yes	19.3%	40.5%	24.1%	0.005
Has your child had this itchy rash at any time in the past 12 months?	No	28.6%	5.9%	20.0%	3.403
	Yes	71.4%	94.1%	80.0%	0.065
Has this itchy rash in your child ever affected any of the following places: the folds of the elbows, behind the knees, in front of the ankles, under the buttocks, or around the neck,	No	25.0%	18.8%	22.2%	0.201
	Yes	75.0%	81.3%	77.8%	0.654
ears or eyes?					
Has this rash completely disappeared from your baby at any time in the past 12 months?	No	35.0%	25.0%	30.6%	0.419
	Yes	65.0%	75.0%	69.4%	0.517
In the past 12 months, how many times on average have your baby stayed awake at night	Never	40.0%	37.5%	38.9%	
due to this itchy rash?					2.792
	< one night per week	25.0%	6.3%	16.7%	0.248
	>=1 nights per week	35.0%	56.3%	44.4%	