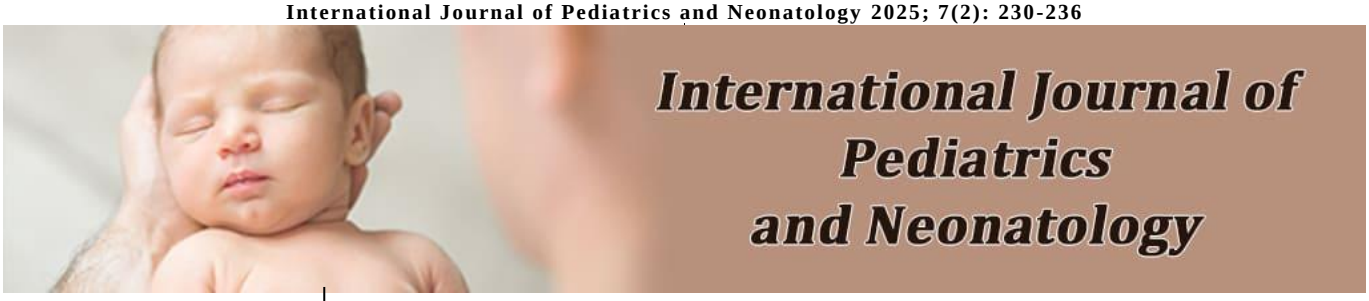

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Faiz Hussein Ali
Ministry of Health, Basra Health Directorate, Al-Madinah General Hospital, Basrah, Iraq

Haider M Abdulhussein
Ministry of Health, Basra Health Directorate, Al-Madinah General Hospital, Basrah, Iraq

Abbas Ali A Alkinani
Ministry of Health, Wasit Health Directorate, Kut, Iraq

Corresponding Author:
Faiz Hussein Ali
Ministry of Health, Basra Health Directorate, Al-Madinah General Hospital, Basrah, Iraq

Unmasking the triggers: A case-control study on determinants of acute asthma exacerbations in young children at Basrah maternity and children hospital

Faiz Hussein Ali, Haider M Abdulhussein and Abbas Ali A Alkinani

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Abstract
Background: Asthma exacerbations impose significant morbidity on preschool children, particularly in resource-variable settings. In Basrah, Iraq, where wheezing prevalence reaches 15.8% among children aged 1-6 years, region-specific trigger data remain scarce.
Objective: To identify modifiable and non-modifiable risk factors associated with acute asthma exacerbations in children aged 1-6 years in Basrah, Iraq.
Methods: A case-control study conducted between January and August 2024 enrolled 208 children at Basrah Maternity and Children Hospital and primary health centers. Cases included 100 children with recurrent wheeze and clinically diagnosed asthma; controls comprised 108 healthy children without chronic respiratory disease. Structured questionnaires assessed demographics, medical history, environmental exposures, and family history. Statistical analysis employed Chi-square tests with significance set at $p<0.05$.
Results: Strong genetic predisposition was evident, with maternal (OR=11.8) and paternal (OR=7.09) allergy history significantly associated with asthma. Rural residence conferred protection (OR=0.535). Comorbid GERD (OR=12.43) and overweight status (OR=3.78) increased risk. Indoor environmental hazards showed striking associations: cooking/heating fumes (OR=44.31), passive tobacco smoke (OR=8.54), and cockroach infestation (OR=11.05). Outdoor triggers demonstrated extreme significance: weather variability (OR=494.3), upper respiratory tract infections (OR=44.6), physical exertion (OR=32.6), pollen (OR=22.8), and cold air (OR=22.6). Psychological triggers including strong crying (OR=14.46) and anxiety (OR=9.05) were notable. Pet ownership and food allergies showed no significant association.
Conclusions: Acute asthma exacerbations in Basrah's preschool children result from complex interactions between genetic susceptibility and environmental triggers. Modifiable indoor air quality factors and climatic exposures represent critical intervention targets. These findings provide essential evidence for developing targeted, context-specific prevention strategies in resource-variable Middle Eastern settings.

Keywords: Basrah, Iraq, Asthma exacerbations, preschool children, risk factors, environmental triggers, case-control study

Introduction

Asthma exacerbations impose a profound burden on young children, manifesting as terrifying episodes of respiratory distress that disrupt development, strain families, and drive urgent healthcare demands [1]. This burden falls disproportionately on vulnerable populations, particularly preschool children (1-6 years old) in resource-variable settings like Basrah, Iraq, where a community survey revealed a striking 15.8% prevalence of wheezing history in this age group [2]. Understanding the specific triggers within their environment is paramount to preventing these acute crises [3, 4].

Asthma is a chronic inflammatory airway disorder characterized by variable airflow obstruction, bronchial hyperresponsiveness (AHR), and recurrent symptoms. [4] While anti-inflammatory therapies reduce symptom burden, acute exacerbations ("asthma attacks") remain common, often triggered by factors such as viral infections (especially rhinovirus), aeroallergens (pollens, molds, dust mites), environmental tobacco smoke (ETS), air pollutants, and irritants [5]. Diagnosing true asthma in preschoolers is notoriously challenging due to heterogeneous wheezing phenotypes and immature respiratory physiology [6].

Globally, risk factors for persistent childhood asthma include male gender, atopy, maternal asthma, ETS exposure, and early severe respiratory infections or sensitization [7]. Consequently, identifying and mitigating modifiable triggers through avoidance strategies (e.g., rigorous allergen control, strict ETS elimination) is a cornerstone of management and prevention [8].

However, critical knowledge gaps hinder effective prevention strategies in specific regions like Basrah. While global triggers are recognized, their relative importance, exposure levels, and unique combinations within Basrah's distinct environment-characterized by factors such as local pollution profiles (e.g., related to oil industry, dust storms), extreme climate (heat, humidity), prevalent allergens, cultural practices (e.g., incense use), housing conditions, and healthcare access-remain largely unexplored [9]. Fundamental mechanisms driving preschool wheezing and exacerbations are also less defined than in older groups. Consequently, the lack of region-specific data on key modifiable risk factors impedes the development of tailored, evidence-based interventions to reduce exacerbations in Basrah's vulnerable preschool population [2].

This case-control study therefore aims to identify the specific modifiable and non-modifiable risk factors associated with acute exacerbations of asthmatic attacks among children aged 1-6 years in Basrah, Iraq. By defining the predominant drivers of attacks within this unique context, our findings will provide essential evidence to inform targeted prevention programs and optimize acute management protocols, ultimately reducing the significant morbidity associated with asthma in Basrah's youngest children.

Subjects and Methods

Subjects

This case-control study was conducted between January and August 2024 at Basrah Maternity and Children Hospital, with additional recruitment from AL-Razi and AL-Batool Primary Health Centers. A total of 208 children aged 1-6 years were enrolled: 100 patients with recurrent wheeze and cough, clinically diagnosed with asthma (64 males, 36 females), and 108 healthy controls without wheeze or chronic respiratory disease (63 males, 45 females). Controls were selected from children attending the health centers for vaccination or minor illnesses during the same period.

Data Collection

A structured questionnaire gathered information on:

- **Demographics:** Name, sex, age, residence.
- **Medical history:** Atopy (dermatitis, allergic rhinitis), gastroesophageal reflux disease, lower respiratory infections in infancy.
- **Environmental exposures:** Food allergies (milk, egg, fish, eggplant, peanut), pet ownership, cockroach exposure, household fumes, tobacco smoke, weather changes, cold air, pollen, and exercise-induced wheeze.
- **Psychological triggers:** Anxiety, strong crying.
- **Drug history:** Medications linked to asthma exacerbation (aspirin, NSAIDs, penicillins, beta-blockers).
- **Family history:** parental atopy or allergy.

Physical Examination

All children underwent physical examination. Patients were assessed for respiratory distress (retractions, nasal flaring, accessory muscle use) and chest auscultation for rhonchi. Controls had clear chest findings. Height and weight were measured for Body Mass Index (BMI) was calculated using the World Health Organization's Anthro program, version 1.01, which provides BMI for age (BAZ) Z-scores. According to the WHO Growth Reference for ages 5 to 19 years, the classification criteria are as follows:

- **< 5th percentile:** Underweight
- **5th-84th:** Normal weight
- **85th-94th:** At risk of overweight
- **≥ 95th:** overweight

Sample Size Calculation:

The sample size for this case-control study was calculated using the formula for comparing two proportions as described by Fleiss, Levin & Cho Paik [2004]. Based on regional literature, (2, 11) the assumptions included a significance level of 0.05 ($Z\alpha/2$= 1.96), statistical power of 80% ($Z\beta$= 0.84), an expected exposure proportion of 50% among cases (P_1=0.50), 25% among controls (P_2=0.25), and an anticipated odds ratio of approximately 3.0 with a case-to-control ratio of 1:1. Using these parameters, the calculated minimum sample size was 58 participants per group. After adjusting for a 15% potential non-response rate, the required sample size increased to 70 cases and 70 controls (N=140). To strengthen the analysis and allow for subgroup comparisons, we ultimately enrolled 100 cases and 108 controls (total N=208), thereby exceeding the minimum requirement and achieving over 90% statistical power to detect odds ratios of 3.0 or higher for common exposures while maintaining adequate precision for less frequent risk factors.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki and received ethical approval from the Institutional Review Board of Basrah Maternity and Children Hospital (Approval Number: [1124], Date: [11/12/2023]) and the Basrah Health Directorate Ethics Committee. Written informed consent was obtained from parents or legal guardians of all participants after detailed explanation of study objectives, procedures, and the voluntary nature of participation. For parents with limited literacy, consent forms were read aloud with witnessed documentation. All personal identifying information was kept strictly confidential using unique identification codes, with data stored securely and accessible only to the research team. Children underwent only non-invasive procedures (questionnaire and routine physical examination) that posed minimal risk, with examinations conducted by qualified pediatricians in child-friendly environments with parents present. All families received educational materials about asthma triggers and prevention, and children with undiagnosed respiratory conditions were referred for appropriate care.

Statistical Analysis

Data were analyzed using SPSS version 26. Proportions were compared between cases and controls using Chi-square tests, and the strength of association was expressed as Odds Ratios (OR) with 95% Confidence Intervals (CI). A P-value

of < 0.05 was considered statistically significant; $p<0.01$ highly significant; and $p<0.001$ extremely significant.

Results

Demographic Characteristics and Distribution by Age and Gender

This study included a total of 208 children, comprising 100 cases diagnosed with acute wheeze and 108 healthy controls. Participants ranged in age from 1 to 6 years. Of the case group, 64 were boy (64%) and 36 girl (36%), while the control group included 63 boys (58.3%) and 45 girls (41.7%). Children aged 1-3 years formed the majority in both groups: 72% of cases and 66.6% of controls, whereas those aged > 3-6 years accounted for 28% of cases and 33.3% of controls (Table 1). Statistical analysis revealed no significant difference between cases and controls with respect to age ($p>0.05$) or gender ($p>0.05$). The male predominance observed in both groups is consistent with global trends of higher asthma prevalence among males in early childhood, though not statistically significant in this cohort.

Table 1: Selected demographic factors among cases and control samples

Variables	Cases		Control		95% CI	P-Value
	No	%	No	%		
Age						
(1-3) Yr.	72	72	72	66.6	(0.71-2.32)	>0.05
(>3-6) Yr.	28	28	36	33.3		
Gender						
Boy	64	64	63	58.3	0.72-2.22	>0.05
Girl	36	36	45	41.6		
Total	100		108			

Note: CI: Confidence Intervals, Yr.: Years

Risk Factors and Medical History Analysis

The analysis of risk factors revealed strong and statistically significant associations for several variables. A maternal history of allergy was reported in 45% of cases versus only 6.5% of controls (OR=11.8; 95% CI: 4.98-27.93; $p<0.01$), while paternal history of allergy was present in 42% of cases versus 9.2% of controls (OR=7.09; 95% CI: 3.31-15.2; $p<0.01$). These findings underscore the critical role of genetic and familial predisposition in asthma pathogenesis (Table 2).

Interestingly, rural residence appeared to have a protective effect (OR=0.535; 95% CI: 0.309-0.99; $p<0.05$), with more children in the control group residing in urban areas. This contradicts many global findings where urban pollution and allergens are major risk contributors, indicating potential differences in environmental exposures or reporting patterns. Gastroesophageal reflux disease (GERD) was significantly more common in the case group (19%) compared to controls (2%), with an odds ratio of 12.43 (95% CI: 2.81-54.91; $p<0.01$). The mechanistic association may involve vagally mediated reflexes or microaspiration leading to bronchial irritation. Children with a history of other allergic diseases (e.g., allergic rhinitis, dermatitis) were more likely to develop acute wheeze (15% in cases vs. 5.5% in controls; OR=3.01; 95% CI: 1.115-8.07; $p<0.05$), further highlighting the interconnected nature of atopic disorders. Notably, being overweight was a significant risk factor. Thirty percent of cases fell into the overweight category, compared to only 10.2% of controls (OR=3.779; 95% CI: 1.774-8.05; $p<0.01$), suggesting a potential role of systemic inflammation, altered lung mechanics, or lifestyle-related exposures. A history of lower respiratory tract infections during the first year of life did not show a statistically significant association ($p>0.05$), though 25% of cases reported such a history, compared to 13.9% of controls.

Table 2: Selected demographic factors and past medical problems among cases and control samples

Variables	Cases (No)	(%)	Control (No)	(%)	OR	95% CI	P-Value
Family hx. of allergy							
Mother hx. Yes	45	45.0	7	6.5	11.8	4.98-27.93	<0.01
Mother hx. No	55	55.0	101	93.5	-		
Father hx. Yes	42	42.0	10	9.2	7.09	3.311-15.2	<0.01
Father hx. No	58	58.0	98	90.7	-		
Residence							
Rural	59	59.0	47	43.5	-		
Urban	41	41.0	61	56.5	0.535	0.309-0.99	<0.05
Hx. of GERD							
Yes	19	19.0	2	2.0	12.43	2.81-54.91	<0.01
No	81	81.0	106	98.0	-		
Hx. of lower respiratory tract infection in first year							
Yes	25	25.0	15	13.9	2.067	1.017-4.19	>0.05
No	75	75.0	93	86.1	-		
Hx. of another allergy							
Yes	15	15.0	6	5.6	3.01	1.115-8.07	<0.05
No	85	85.0	102	94.5	-		
Overweight							
Yes	30	30.0	11	10.2	3.779	1.774-8.05	<0.01
No	70	70.0	97	89.8	-		
Total	100		108				

Note: CI: Confidence Intervals, Hx: History.

Indoor Environmental Triggers

Passive exposure to tobacco smoke was among the strongest indoor risk factors, reported in 56% of cases and only 13% of controls (OR=8.54; 95% CI: 4.32-16.97; $p<0.01$). This association is well-documented in literature and reflects the harmful impact of secondhand smoke on pediatric airways

(Table 3). Cockroach exposure was significantly more prevalent in the case group (23% vs. 7.7%; OR=11.05; 95% CI: 3.24-38.04; $p<0.05$), indicating the importance of pest control in asthma prevention strategies. Fume exposure (e.g., from cooking, heating, or industrial sources) was an exceptionally strong risk factor. A staggering 78% of cases were exposed to fumes versus only 7.4% of controls (OR=44.31; 95% CI: 18.7-104.9; $p<0.001$), underscoring the urgent need for improved indoor air quality. Pet ownership and food allergies were not significantly associated with acute wheeze in this cohort ($p>0.05$), which could reflect differing allergen sensitization patterns or underreporting.

Table 3: Selected indoor triggers among cases & controls

Variables	Cases (No)	(%)	Control (No)	(%)	OR	CI (95%)	P-Value
Passive smoking							
Present	56	56.0	14	13.0	8.54	4.32-16.97	<0.01
Absent	44	44.0	94	87.0	-		
Pets							
Present	15	15.0	13	12.0	1.29	0.58-2.86	>0.05
Absent	85	85.0	95	87.9	-		
Cockroaches							
Present	23	23.0	30	27.7	11.05	3.24-38.04	<0.05
Absent	77	77.0	105	97.2	-		
Effect of fumes							
Present	78	78.0	8	7.4	44.31	18.7-104.9	<0.001
Absent	22	22.0	100	92.5	-		
Effect of food allergy							
Present	20	20.0	13	12.0	1.82	0.85-3.9	>0.05
Absent	80	80.0	95	87.9	-		
Total	100		108				

Outdoor Environmental Triggers

Outdoor environmental triggers demonstrated highly significant associations with asthma exacerbations. Cold air exposure was reported in 95% of cases versus just 1.8% of controls (OR=22.6; 95% CI: 9.59-53.2; $p<0.001$), suggesting airway hyperresponsiveness to thermal changes (Table 4). Weather variability was noted by 96% of the case group and only 3.7% of the controls (OR=494.3; 95% CI: 128.8-189.3; $p<0.01$), reflecting the impact of climatic fluctuations on airway inflammation. Pollen exposure, especially during seasonal shifts, affected 70% of cases compared to 9.2% of controls (OR=22.8; 95% CI: 10.49-49.8; $p<0.01$), aligning with global evidence linking seasonal allergens to asthma attacks. Physical exertion was another strong trigger, with 88% of asthmatic children affected versus 18.5% of controls (OR=32.62; 95% CI: 14.86-69.9; $p<0.01$), consistent with exercise-induced bronchospasm. Upper respiratory tract infections preceded symptoms in 82% of cases versus only 9.2% of controls (OR=44.6; 95% CI: 19.52-78.7; $p<0.01$), highlighting their role as a common precipitant of asthma exacerbations.

Table 4: Selected outdoor triggers among cases and controls

Variables	Cases (No)	(%)	Control (No)	(%)	OR	CI (95%)	P-Value
Effect of cold air							
Present	95	95.0	2	1.8	22.6	9.59-53.2	<0.001
Absent	5	5.0	106	98.1	-		
Effect of weather							
Present	96	96.0	4	3.7	494.3	128.8-189.3	<0.01
Absent	4	4.0	104	96.2	-		
Effect of pollen							
Present	70	70.0	10	9.2	22.8	10.49-49.8	<0.01
Absent	30	30.0	98	90.7	-		
Effect of exercise							
Present	88	88.0	20	18.5	32.62	14.86-69.9	<0.01
Absent	12	12.0	88	81.5	-		
Effect of upper respiratory tract infection							
Present	82	82.0	10	9.2	44.6	19.52-78.7	<0.01
Absent	18	18.0	98	90.7	-		
Total	100		108				

Psychological Factors and Behavioral Triggers

Psychological and emotional stressors showed significant associations. Anxiety-related episodes were reported in 42% of cases compared to 7.4% of controls (OR=9.05; 95% CI: 3.97-20.6; $p<0.05$). These findings support the growing body of evidence linking emotional distress to asthma exacerbations, possibly via neuroimmunological mechanisms (Table 5). Strong crying episodes, noted in 70% of cases versus 13.8% of controls (OR=14.46; 95% CI: 7.23-28.9; $p<0.01$), reinforce the impact of intense emotional expression on respiratory physiology in young children. Collectively, these results illustrate that childhood

asthma in Basrah is influenced by a complex interplay of genetic, environmental, behavioral, and emotional factors. Identification and modification of these risk factors are crucial for effective clinical management and public health strategies.

Table 5: Selected psychological and drug effects on cases and controls

Variables	Cases (No)	(%)	Control (No)	(%)	OR	CI (95%)	P-Value
Anxiety							
Yes	42	42.0	8	7.4	9.05	3.97-20.6	<0.05
No	58	58.0	100	92.5	-		
Strong cry							
Yes	70	70.0	15	13.8	14.46	7.23-28.9	<0.01
No	30	30.0	93	86.1	-		
Total	93	100.0	108	100.0			

Discussion

Asthma exacerbations in young children are known to result from a complex interplay of genetic predisposition, environmental exposures, and comorbid conditions. In the present study in Basrah, the strong association between parental history of allergy maternal (OR ≈11.8) and paternal (OR ≈7.09) underscores the role of heredity. These findings align with numerous studies globally: for example, in Saudi Arabia, family history of asthma was found to be one of the strongest predictors of wheezing in school-aged children [12]. The result also resonates with systematic reviews showing that allergic disease in parents significantly increases asthma risk in offspring.

Residence in rural vs. urban settings emerged in our study as protective, with rural residence associated with lower odds of asthma exacerbations. Similar patterns are seen in Saudi Arabia, where urban children show higher prevalence of allergic respiratory symptoms compared to their rural counterparts [13]. This may reflect differences in environmental exposures, microbial biodiversity, indoor pollution, and lifestyle, including perhaps exposure to farm animals or more ventilation in rural homes. Study results add to this evidence by showing that rural protection in Basrah coincides with the absence of significant associations for pet ownership and food allergies, diverging from Western literature and pointing to context-specific sensitization patterns.

Comorbid conditions such as GERD and other allergic diseases were also significantly associated with asthma attacks in Basrah. This finding is reinforced by evidence from Italy, where early-life GERD (treated or untreated) was shown to raise the risk of asthma in later childhood (HR ≈1.40) in a large cohort of over 86,000 children. [14] Furthermore, a systematic review found that the prevalence of GERD among asthmatic children varies but is often significantly higher than among non-asthmatic peers, and that GERD can worsen asthma control. [15]

Nutrition and growth factors are also relevant: in Basrah, overweight status was associated with higher risk (OR≈3.78). This is consistent with broader literature such as meta-analyses and systematic reviews indicating that obesity increases asthma susceptibility in children across many countries. [15] The mechanisms may include chronic systemic inflammation, mechanical impacts on lung volumes, and lifestyle factors (e.g., reduced physical activity, dietary habits) that co-associate with overnutrition.

Our findings about indoor environmental risks-passive tobacco smoke, cockroach infestation, indoor fumes mirror findings in other Middle Eastern contexts. In the Eastern Province of Saudi Arabia, household smoking and use of incense were significantly associated with wheezing in school children [12]. In Iran, studies from the CASPIAN series have documented high prevalence of passive smoking and its strong link to respiratory symptoms among children and adolescents [16]. These modifiable exposures are some of the most actionable in terms of public health interventions. Importantly, this study quantified their effects, showing extraordinarily high odds ratios for cooking/heating fumes (OR=44.31) and cockroach infestation (OR=11.05), values that far exceed those commonly reported in Western literature, underscoring the severity of exposure intensity in Basrah's domestic environment.

The strong associations in Basrah between outdoor or climatic triggers (cold air, weather variability, pollen, URTIs, physical exertion) and asthma exacerbations are supported by evidence elsewhere. A study in Iran showed that lower temperature, higher relative humidity, and other weather fluctuations were linked to increased hospital admissions for wheezy chest among younger children. [17] In Haikou, China, asthma hospital visits rose significantly when daily mean temperatures dropped below certain thresholds, especially in cooler seasons. [18] Globally, a systematic review concluded that extreme weather events, temperature variability, and air pollution are consistently associated with worsened asthma outcomes in children. [19] The unprecedented odds ratio for weather variability in Basrah (OR=494.3) not only highlights the unique climatic vulnerability of the region but also raises questions about potential residual confounding or measurement validity, requiring replication and mechanistic investigation.

The psychological/emotional triggers stress, crying highlighted in Basrah suggest that non-physical triggers are important. There is somewhat less direct evidence in the literature quantifying emotional stress as a specific risk factor in young children, but studies in broader pediatric asthma research acknowledge that stress, anxiety, and emotional upheaval can precipitate exacerbations, likely via effects on inflammation, immune response, and behavior (e.g., medication adherence). Study findings reinforce the importance of integrating behavioral and psychological support into asthma management alongside pharmacotherapy.

Finally, the non-significant association of pet ownership and food allergies in this Basrah cohort contrasts with findings in many Western studies, where food allergy or pet exposure are sometimes implicated. For example, systematic reviews have found pet exposure to be variably associated with asthma or allergic sensitization in different contexts. The discrepancy in Basrah may reflect different levels of exposure, genetic susceptibility, or cultural/environmental

differences (e.g., types of pets, indoor vs. outdoor pet keeping). Future research in Basrah should therefore investigate unmeasured protective rural mechanisms, conduct objective sensitization testing, and explore dose-response relationships for key exposures, while also testing interventions such as clean cooking stoves, air purifiers, and weather-based early warning systems to translate these findings into effective prevention strategies.

Strengths and Limitations

This study's strengths include addressing a critical local knowledge gap on asthma exacerbations in Basrah's preschool children using a well-powered case-control design, systematic data collection through structured questionnaires and pediatric examinations, and clear statistical analysis with odds ratios. However, limitations include reliance on parental reporting without objective exposure measures, absence of spirometry or viral testing, potential recall and selection bias, and lack of multivariable adjustment or dose-response analyses, which restrict causal inference and the precision of findings.

Conclusions

This study highlights that acute asthma exacerbations in preschool children in Basrah result from a combination of genetic predisposition and strong environmental triggers. Parental allergy history establishes a baseline risk, while indoor exposures (cooking fumes, tobacco smoke, cockroaches) and outdoor factors (weather variability, infections, cold air, exertion, and pollen) exert the greatest influence. Protective effects of rural residence point to urban-rural disparities, whereas comorbid conditions (GERD, overweight) and psychological triggers (crying, anxiety) further elevate risk. Unlike Western findings, pet ownership and food allergies showed no significant impact, reflecting Basrah's unique context. Overall, most determinants are modifiable, emphasizing opportunities for targeted prevention and environmental interventions.

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Conflicts of Interest

There are no conflicts of interest.

References

1. Pijnenburg MW, Fleming L. Advances in understanding and reducing the burden of severe asthma in children. Lancet Respir Med. 2020;8(10):1032-1044.
2. Alsajri AH, Al-Qerem W, Mohamed Noor DA. Asthma prevalence among Iraqi children. Al-Salam J Med Sci. 2023;3(1):17-21.
3. Klain A, Dinardo G, Salvatori A, Indolfi C, Contieri M, Brindisi G, *et al*. An overview on the primary factors that contribute to non-allergic asthma in children. J Clin Med. 2022;11(21).
4. Wark PAB. We need to understand why viral infections lead to acute asthma. Eur Respir J [Internet]. 2022;60(1):17-9. Available from: http://dx.doi.org/10.1183/13993003.00194-2022
5. Levy ML, Crooks MG. Anti-inflammatory reliever therapy (AIR) for asthma. ERJ Open Res [Internet]. 2024;10(5):12-5. Available from: http://dx.doi.org/10.1183/23120541.00494-2024
6. Chung HL. Diagnosis and management of asthma in infants and preschoolers. Clin Exp Pediatr. 2022;65(12):574-584.
7. Zhou W, Tang J. Prevalence and risk factors for childhood asthma: A systematic review and meta-analysis. BMC Pediatr. 2025;25(1).
8. Pham D Le, Le KM, Truong DDK, Le HTT, Trinh THK. Environmental allergen reduction in asthma management: An overview. Front Allergy [Internet]. 2023;4(October):1-11. Available from: https://doi.org/10.3389/falgy.2023.1229238
9. Shehabalden SH, Azeez NM. Air quality index over Basra Province, South of Iraq. Int J Tech Res Appl [Internet]. 2020;5(2):112-114. Available from: www.ijtra.com
10. Fleiss JL, Levin B, Cho Paik M. Statistical methods for rates and proportions. 3rd Ed. John Wiley & Sons; 2004. p. 1-760.
11. Alahmadi TS, Hegazi MA, Alsaedi H, Hamadallah H, Atwah AF, Alghamdi AA, *et al*. Prevalence and risk factors of asthma in children and adolescents in Rabigh, Western Saudi Arabia. Children. 2023;10(2):1-15.
12. Yaqoob MJ, Aqroof HA, Busehail MJ, Abdali NM, Alkhayat HA, Alasfoor YH, *et al*. Prevalence of asthma symptoms and environmental triggers among school-aged children in the Eastern Province of Saudi Arabia. Cureus. 2025;17(4):1-9.
13. Hussain SM, Ayesha Farhana S, Alnasser SM. Time trends and regional variation in prevalence of asthma and associated factors in Saudi Arabia: A systematic review and meta-analysis. Biomed Res Int; 2019, p. 1.
14. Cantarutti A, Amidei CB, Valsecchi C, Scamarcia A, Corrao G, Gregori D, *et al*. Association of treated and untreated gastroesophageal reflux disease in the first year of life with the subsequent development of asthma. Int J Environ Res Public Health. 2021;18(18):1-13.
15. Hamed NF, Alahmad Al Sakran WM, Serhan AI, Eladwy MFM, Elshahhat TMM, *et al*. Association between childhood asthma and gastroesophageal reflux disease in children: A systematic review. Cureus. 2024;16(7).
16. Aghdam HMR, Shafiee G, Ebrahimi M, Ejtahed HS, Yaseri M, Motlagh ME, *et al*. Trend of passive smoking and associated factors in Iranian children and adolescents: The CASPIAN studies. BMC Public Health [Internet]. 2022;22(1):1-10. Available from: https://doi.org/10.1186/s12889-022-13045-8
17. Kadhim Yousif M, Ali Al-Muhyi AH. Impact of weather conditions on childhood admission for wheezy chest and bronchial asthma. Med J Islam Repub Iran. 2020;(October 2019).
18. Zhang Y, Yang J, Chen S, Zhang M, Zhang J. Effects of meteorological factors on asthma hospital visits in

Haikou City, China. Atmosphere (Basel). 2024;15(3):1-13.
19. Wang J, Cortes-Ramirez J, Gan T, Davies JM, Hu W. Effects of climate and environmental factors on childhood and adolescent asthma: A systematic review based on spatial and temporal analysis evidence. Sci Total Environ; 2024 August, 951.

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