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Examining the Relationship between Parental Smoking and Asthma Severity in Children with Bronchial Asthma

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Author`s Contribution

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ABSTRACT

Objectives: To determine frequency of parental smoking in children with asthma and its association with asthma severity in children.

Methodology: This cross-sectional study was conducted at Pediatrics department of Children Hospital, Pakistan Institute of Medical Sciences, Islamabad, Pakistan from October-2024 to April-2025. A total of 120 children, male and female, diagnosed with childhood asthma through standard procedure and of any severity based on NAEPP Asthma Severity Classification were included. After that a detailed parental history was taken to determine the smoking status in either of the parent.

Results: A total of 120 children were included with a median age of 8 years. There were 81 (67.50%) male and 39 (32.50%) female patients. Median duration of asthma was 8 months. Positive parental smoking history was observed in 66 (55%) children with asthma. Among children with positive parental smoking history (n = 66), 3 (4.54%) had intermittent, 13 (19.70%) had mild persistent, 29 (43.94%) had moderate persistent and 21 (31.82%) had severe persistent asthma while in children with negative parental smoking history (n = 54), 12 (22.22%) had intermittent, 31 (57.41%) had mild persistent, 5 (9.26%) had moderate persistent and 6 (11.11%) had severe persistent asthma, ($p < 0.001$).

Conclusion: Frequency of parental smoking in children with asthma was 55% and it was found to be strongly associated with the severity of childhood asthma.

Keywords: Asthma, Bronchial, Parental, Smoking.

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Introduction

Asthma is a prevalent chronic inflammatory disease of the airways which is characterized by sporadic airflow restriction and hyper-responsive bronchial tissue. Common symptoms with which asthmatic patients commonly present at a healthcare facility include wheezing, shortness of breath, coughing, and tightness in the chest. [1] Around the world, it is a highly prevalent condition in all the age groups and the prevalence of this common bronchial condition has been reported to be increasing on the global scale. [2] while in Pakistan, it has been found that approximately 4.3% of general pediatric population are impacted by this common respiratory morbidity. [3]

Asthma has a complex etiology and environmental factors as well as genetics have a role in its development and can results in frequent hospitalizations and if it is not treated promptly there is a significant risk of death in children related to asthma.[4] Asthma in children is a highly prevalent which has poor impact on the quality of life of a child due to disruption in their social life, schooling (in the form of excessive absenteeism), repeated admissions to hospitals and continuous use of medications. [5] There are several triggering factors that can precipitate an asthma attack like dust, obesity, insects, plants, pollen, exercise, chest infections and chemical fumes. [6] Factor that is hypothesized to play an important role in pathogenesis of asthma in childhood is exposure to tobacco smoke secondary to parental smoking. Maternal smoking affects the development of

lungs in the developing fetus. [7] At the same time exposure to paternal smoking after birth leads to certain epigenetic changes that alter the expression of genes contributing to the pathophysiological process of asthma development. [8]

The main rationale for conducting the present study was that, although many studies have linked smoking to asthma, few have specifically addressed the relationship between parental smoking and asthma severity in the Pakistani population. This study was therefore conducted to determine the frequency of parental smoking among children with asthma and its association with asthma severity. Understanding this relationship will help identify how parental smoking affects the severity of childhood asthma. In turn, this will enable pediatricians not only to emphasize inquiring about parents' smoking status as an essential part of the medical history but also to educate parents about the risks to their children and support them in quitting this harmful habit.

Methodology

This cross-sectional study was conducted after obtaining approval from the institutional ethical committee (Ref No: F.1-1/2015/ERB/SZABMU/1329 dated 23-10-2024). The sample size was calculated using the WHO sample size calculator with the following parameters: a confidence level of 95%, absolute precision of 7.6%, and an anticipated frequency of parental smoking in children with asthma of 18.4%.[9] This yielded a required sample size of 120 participants. Study participants were selected using a non-probability consecutive sampling technique.

Children of both genders, aged 5 to 12 years, diagnosed with asthma were included. Exclusion criteria were: children with congenital cardiac or pulmonary disease (assessed through previous medical records), history of preterm birth, family history of asthma, presence of pets at home, home carpeting, parental history of atopy, inability to perform spirometry, current use of asthma medications, and parents who were unwilling or refused to provide personal history or participate in the study.

Asthma diagnosis was made clinically through detailed history and physical examination. For confirmation, the bronchodilator reversibility (BDR) test was performed, with a cut-off improvement value of >12%. Prior to inclusion, all parents were informed about the study's purpose and methodology. Baseline demographic data—including age, gender, duration of asthma, and severity—were documented using a pre-approved, predesigned proforma. Asthma severity was classified according to the National Asthma Education and Prevention Program (NAEPP) Expert Panel Report into intermittent, mild persistent, moderate persistent, and severe persistent categories (Table I).

A detailed parental history was obtained to assess smoking status. Positive parental smoking history was defined as the consumption of ≥2 cigarettes per day inside the house (indoor smoking).

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 22. Normality of quantitative variables was assessed using the Shapiro-Wilk test, which showed that age and duration of asthma were not normally distributed; these were therefore presented as median and interquartile range (IQR). Qualitative variables (child's gender, asthma severity, and parental smoking history) were presented as frequencies and percentages. The association between parental smoking and childhood asthma severity was evaluated using the Chi-square test. A p-value of ≤0.05 was considered statistically significant.

Results

In this study, 120 patients were included. Median age was 8.0 years. There were 81 (67.50%) male and 39 (32.50%) female patients. Median duration of asthma was 8.0 months. Amongst these children, 15 (12.50%) had intermittent asthma, 44 (36.70%) had mild persistent asthma, 34 (28.30%) had moderate persistent asthma and 27 (22.50%) had severe persistent asthma. Patient demographics are given in Table II.

Positive parental smoking history was observed in 66 (55.00%) children with asthma while in remaining 54 (45.00%) children, parental smoking history was negative. Among smokers (n = 66), paternal smoking history was positive in 64 (96.97%) while maternal smoking history was positive in 2 (3.03%). Parental smoking status is demonstrated in Table III.

Symptoms Severity	Days with Symptoms	Nights with Symptoms	PEFR / FEV_1	PEF Variability
Step 4: Severe Persistent	Continual	Frequent	≤ 60%	> 30%
Step 3: Moderate Persistent	Daily	> 1/week	> 60% – < 80%	< 30%
Step 2: Mild Persistent	> 2/week but < 1/day	> 2/month	≥ 80%	20–30%
Step 1: Mild Intermittent	≤ 2/week	≤ 2/month	≥ 80%	< 20%

Figure: NAEPP Asthma Severity Classification [10]

Among children with positive parental smoking history (n = 66), 3 (4.54%) had intermittent, 13 (19.70%) had mild persistent, 29 (43.94%) had moderate persistent and 21 (31.82%) had severe persistent asthma while in children with negative parental smoking history (n = 54), 12 (22.22%) had intermittent, 31 (57.41%) had mild persistent, 5 (9.26%) had moderate persistent and 6 (11.11%) had severe persistent asthma, ($p < 0.001$). Association of parental smoking history and asthma severity in children is give in Table IV.

Table II: Patient demographics. (n = 120)

Demographic	Median (IQR); n (%)
Median age	8.0 years
5-8 years	67 (55.83%)
9-12 years	53 (44.17%)
Gender	
Male	81 (67.50%)
Female	39 (32.50%)
Median duration of asthma	8.00 (3.00) months
Asthma severity	
Intermittent	15 (12.50%)
Mild persistent	44 (36.70%)
Moderate persistent	34 (28.30%)
Severe persistent	27 (22.50%)

Table III: Parental smoking status. (n = 120)

Parental smoking history	n (%)
Positive	66 (55%)
Negative	54 (45%)
Smoker parental distribution (n = 66)	
Positive paternal smoking history	**Positive maternal smoking history**
64 (96.97%)	2 (3.03%)

Table IV: Association of parental smoking history and asthma severity in children. (n = 120)

Asthma severity	Parental smoking history		p-value
	Positive (n = 66)	Negative (n = 54)	
Intermittent	3 (4.54%)	12 (22.22%)	
Mild persistent	13 (19.70%)	31 (57.41%)	<
Moderate persistent	29 (43.94%)	5 (9.26%)	0.001
Severe persistent	21 (31.82%)	6 (11.11%)	

Discussion

Tobacco smoke contains a variety of noxious substances that can initiate an inflammatory response in the respiratory mucosa, potentially triggering underlying airway hyper-reactivity conditions such as asthma.[11] The association between smoking whether through personal consumption or exposure to second-hand smoke—and the onset of acute asthma attacks in previously asthmatic individuals is well established.[12,13] The present study, however, explored a more specific link: the association between parental smoking and asthma severity in children. In this study, the bronchodilator response (BDR) test was used for asthma diagnosis, a well-validated diagnostic modality in the pediatric population due to its ease of administration and reproducibility. [14,15] For classification of asthma severity, the Global Initiative for Asthma (GINA) guidelines were employed, which provide the most current and evidence-based recommendations for managing this common respiratory illness.[16,17]

Upon analysis of the demographic variables of the included patients it was observed that there was male predominance regarding the presence of asthma in children since most of the children with childhood asthma were male that constituted more than half of the asthma affected population, 67.5% to be exact. Compared to this, a study was conducted by Otido *et al(p value <0.001)*. [18] in which they studied the clinical characteristics of children with asthma and they found similar male predominance with male children constituting 52.5% of the asthmatic children. In another study conducted by Jakhrani *et al*. [19], however, the distribution of asthma across genders was equal. One possible reason for this male predominance can be attributed to the differences in the developmental process of lungs, hormones and genetic modifications between genders also contribute to

Table V: Association of asthma severity with parent having positive smoking history. (n = 120)

Asthma Severity	Paternal smoking status (n = 111)		p-value
	Positive (n = 64)	Negative (n = 47)	
Intermittent	2 (3.13%)	11 (23.41%)	
Mild persistent	13 (20.31%)	28 (59.57%)	< 0.001
Moderate persistent	28 (43.75%)	3 (6.38%)	
Severe persistent	21 (32.81%)	5 (10.64%)	
	Maternal smoking status (n = 9)		
Asthma severity	**Positive (n = 2)**	**Negative (n = 7)**	**p-value**
Intermittent	1 (50.00%)	1 (14.29%)	
Mild persistent	0 (0.00%)	3 (42.86%)	0.522
Moderate persistent	1 (50.00%)	2 (28.56%)	
Severe persistent	0 (0.00%)	1 (14.29%)	

this gender differences of asthma in children. [20]

Upon assessment of parental smoking status through a detailed personal history, it was found that among children diagnosed with asthma, 55% had a positive history of parental smoking. In comparison, a recent study using data from the National Survey of Children's Health in the United States reported significantly lower rates ($p < 0.001$).[9] This study evaluated 36,954 children for asthma, finding an asthma prevalence of 15.1%, and reported that 15.4% of these children had parents who smoked, which is considerably lower than in the present study.[9] In another study conducted by Ismail et al. ($p < 0.001$),[21] 47.5% of asthmatic children had a positive parental smoking history, which is slightly lower but still comparable to the findings of the present study. This trend of a high frequency of parental smoking suggests a general rise in smoking habits among populations in low socioeconomic countries.[22]

Unique aspect of current study was the evaluation of association between the parental smoking and the severity of childhood asthma. Upon analysis of this particular aspect, it was observed that positive parental smoking history was strongly associated with having more severe forms of asthma in children ($p < 0.001$). Similar trend of significant impact of parental smoking on asthma severity in children was reported by Boskabady *et al*. [8] despite a slight difference between the study settings of two studies. They specified the exposure time to three years but in present study, time duration of parental smoking was not taken into account. In another study conducted by Jung *et al*. [23], it was observed that association of parental smoking with asthma and its severity in children was only significant in case of high levels of urinary conitine levels while in lower urinary conitine levels no such association was observed. Compared to this, in present study urinary conitine levels were not taken into consideration, yet a strong association was found between parental smoking and childhood asthma severity.

Based on the results of present study, it is evident that parental smoking can have significantly detrimental effects on the asthma status of a child. Therefore, a thorough counseling session of parents should be conducted as well as mandated in case of asthma diagnosis in their child and they should be encouraged to minimize the exposure of these noxious substances to their children. Only limitation of the study was inability to definitively determine whether parents were truthful regarding their smoking status due to lack of availability of urinary conitine levels test and thus research team had to rely upon the word of parents in this regard.

Conclusion

In conclusion, frequency of parental smoking was 55% in present study. In addition, asthma was of more severe forms in children with positive parental smoking history indicating strong association of parental smoking and severity of asthma in childhood.

References

1. Agache I, Eguiluz-Gracia I, Cojanu C, Laculiceanu A, Del Giacco S, Zemelka-Wiacek M, *et al*. Advances and highlights in asthma in 2021. Allergy. 2021;76(11):3390-3407. https://doi.org/10.1111/all.15054.
2. Taherian MR, Fatemian F, Halimi A, Soleimani Y, Jorjani G, Nozari P, *et al*. Prevalence of asthma among children and adolescents in WHO's Eastern Mediterranean Region: a meta-analysis of over 0.5 million participants. BMC Public Health. 2024;24(1):2148. https://doi.org/10.1186/s12889-024-18716-2.
3. Khan MA. Monthly and seasonal prevalence of asthma and chronic obstructive pulmonary disease in the District Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. Egypt J Bronchol. 2022;16(1):63. https://doi.org/10.1186/s43168-022-00166-2.
4. Pijnenburg MW, Frey U, De Jongste JC, Saglani S. Childhood asthma: pathogenesis and phenotypes. Eur Respir J. 2022;59(6):2100731. https://doi.org/10.1183/13993003.00731-2021.
5. Pande V, Thakur M. Emphasis on quality of life in children and adolescents with bronchial asthma. Cureus. 2024;16(9):e68762. https://doi.org/10.7759/cureus.68762.
6. Luedders J, Poole JA. Influence of Rural Environmental Factors in Asthma. Immunol Allergy Clin North Am. 2022;42(4):817-830. https://doi.org/10.1016/j.iac.2022.05.008.
7. Boskabady M, Hajizadeh AA, Ahanchian H, Memarzia A, Jafarnezhad M, Golafshani A, *et al*. The effect of 3-year parental smoking on asthma status of their children. Clin Respir J. 2022;16(5):394-401. https://doi.org/10.1111/crj.13492.
8. Wu CC, Hsu TY, Chang JC, Ou CY, Kuo HC, Liu CA, Wang CL, Chuang H, Chen CP, Yang KD. Paternal Tobacco Smoke Correlated to Offspring Asthma and Prenatal Epigenetic Programming. Front Genet. 2019;10:471. https://doi.org/10.3389/fgene.2019.00471.
9. Ogbu CE, Ogbu SC, Khadka D, Kirby RS. Childhood asthma and smoking: moderating effect of preterm status and birth weight. Cureus. 2021;13(4):e14536. https://doi.org/10.7759/cureus.14536.
10. Khajotia R. Classifying asthma severity and treatment determinants: national guidelines revisited. Malays Fam Physician. 2008;3(3):131-136. Available online at: https://pmc.ncbi.nlm.nih.gov/articles/PMC4170364/

11. Kamga A, Rochefort-Morel C, Guen YL, Ouksel H, Pipet A, Leroyer C. Asthma and smoking: A review. Respir Med Res.2022;82:100916. https://doi.org/10.1016/j.resmer.2022.100916.
12. Rakhshanda S, Abedin M, Wahab A, Barua L, Faruque M, Banik PC, *et al*. Self-reported prevalence of asthma and its associated factors among adult rural population in Bangladesh: a cross-sectional study using WHO PEN protocol. BMJ Open. 2023;13(12):e074195. https://doi.org/10.1136/bmjopen-2023-074195.
13. Korsbæk N, Landt EM, Dahl M. Second-hand smoke exposure associated with risk of respiratory symptoms, asthma, and COPD in 20,421 adults from the general population. J Asthma Allergy. 2021;14:1277-1284. https://doi.org/10.2147/JAA.S328748.
14. Sottile G, Ferrante G, Cilluffo G, Fasola S, Malizia V, Muggeo VMR, *et al*. A model-based approach for assessing bronchodilator responsiveness in children: The conventional cutoff revisited. J Allergy Clin Immunol. 2021;147(2):769-772.e10. https://doi.org/10.1016/j.jaci.2020.07.029.
15. Chawes B, Elenius V. Pulmonary function testing for the diagnosis of asthma in preschool children. Curr Opin Allergy Clin Immunol. 2022;22(2):101-106. https://doi.org/10.1097/ACI.0000000000000815.
16. Levy ML, Bacharier LB, Bateman E, Boulet LP, Brightling C, Buhl R, *et al*. Key recommendations for primary care from the 2022 Global Initiative for Asthma (GINA) update. NPJ Prim Care Respir Med. 2023;33(1):7. https://doi.org/10.1038/s41533-023-00330-1.
17. Reddel HK, Bacharier LB, Bateman ED, Brightling CE, Brusselle GG, Buhl R, *et al*. Global Initiative for Asthma Strategy 2021: Executive summary and rationale for key changes. J Allergy Clin Immunol Pract. 2022;10(1S):S1-S18. https://doi.org/10.1016/j.jaip.2021.10.001.
18. Otido S, White DA. A descriptive study of children admitted with acute severe asthma to a tertiary hospital in Johannesburg, South Africa. Curr Allergy Clin Immunol. 2024;37(3):126-133. https://doi.org/10.10520/ejc-caci-v37-n3-a3.
19. Jakhrani MA, Shaikh NF, Nizamuddin, Mehak, Gemnani VK, Bhojwani SL. Patterns of asthma control among asthmatic patients presenting at tertiary care hospital, Larkana. Pak J Health Sci. 2025;6(2):2-8. https://doi.org/10.54393/pjhs.v6i2.2563.
20. Chowdhury NU, Guntur VP, Newcomb DC, Wechsler ME. Sex and gender in asthma. Eur Respir Rev. 2021;30(162):210067. https://doi.org/10.1183/16000617.0067-2021.
21. Ismail NY, Rabie MM, Al-Awadi I, Twfeeq HG. Frequency of asthma in children born by cesarean section compared to those delivered vaginally. Al-Azhar Med J. 2017;46(2):455-462. https://doi.org/10.12816/0038268.
22. Theilmann M, Lemp JM, Winkler V, Manne-Goehler J, Marcus ME, Probst C, *et al*. Patterns of tobacco use in low and middle income countries by tobacco product and sociodemographic characteristics: nationally representative survey data from 82 countries. BMJ. 2022;378:e067582. https://doi.org/10.1136/bmj-2021-067582.
23. Jung J, Park HJ, Jung M. Association between parental cotinine-verified smoking status and childhood asthma: a population-based nationally representative analysis. J Korean Med Sci. 2021;36(30):e193. https://doi.org/10.3346/jkms.2021.36.e193.