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# FACTORS ASSOCIATED WITH FREQUENT EMERGENCY DEPARTMENT VISITS FOR ACUTE EXACERBATION OF ASTHMA, IN A TERTIARY CARE HOSPITAL, KARACHI

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**ABSTRACT**
**Objective:** To identify the factors associated with frequent emergency department (ED) visits among children presenting with acute asthma exacerbations in a tertiary care hospital in Karachi.
**Study Design:** Cross-sectional study.
**Place and Duration of Study:** Paediatric Emergency Department, Indus Hospital and Health Network (IHHN), Karachi, from June 2025 to December 2025.
**Methodology:** A total of 189 children aged 2–14 years presenting with acute asthma exacerbation were enrolled through consecutive sampling. Demographic characteristics, socioeconomic status, environmental exposures, ICS compliance, inhaler technique, and follow-up practices were recorded using a structured proforma.
**Results:** Poor ICS compliance (72% vs. 30%, $p<0.01$), incorrect or unskilled inhaler technique (65% vs. 34%, $p<0.02$), passive smoking exposure (62% vs. 38%, $p<0.03$), and biomass exposure (67% vs. 45%, $p<0.05$) were significantly associated with frequent ED visits (≥3 visits/year). Lower parental education, longer duration of illness, and follow-up intervals exceeding three months were also significant predictors.
**Conclusion:** Frequent ED visits among children with asthma were primarily associated with modifiable factors, including poor treatment adherence, incorrect inhaler technique, smoke exposure, and irregular follow-up.

**KEYWORDS:** Asthma, Emergency department visits, Inhaled corticosteroid compliance, Passive smoking

## INTRODUCTION

Acute asthma is a common medical emergency that continues to be a leading factor in both emergency department (ED) visits and hospital admission [1-3]. One hundred and fifty million individuals in the world have asthma, and it increases in number by half every decade [4]. In Asia, asthma has been seen to be prevalent between 0.7 to 11.9% [5]. Previously, in Pakistan, there is considerable regional disparities in the reported prevalence of asthma, which is reported to range between 4.3% and 31.58% [6,7]. The respiratory disease most prevalent among children of all ages is childhood asthma. A survey was conducted in 1997 to establish the prevalence of asthmatic children in Pakistan and the outcome revealed that 10 % of children were affected by the disease. The survey was again carried out in 2006 and it was discovered that the prevalence of asthma has risen to 18 % among children between the age of 13 to 14 years [8].

Asthma has many symptoms with the most common symptoms being nasal congestion, sleeping disturbance, and tightness at the chest. The next in terms of frequencies are wheezing and breathlessness with a combination of symptoms (i.e. wheezing, dyspnea, chest tightness, and cough) being the most prevalent among patients [9]. Though the degree of asthma severity may be mild or severe, however, everyone is vulnerable to the occurrence of an acute severe asthma exacerbation [10]. Mild intermittent asthma is described as the manifestation of symptoms not more than two days a week and not more than two nights a month in a patient. Mild persistent asthma is characterized by the symptoms that persist more than two nights/month or more than two days/week, but not daily. Children who have moderate persistent asthma have their everyday symptoms along with nighttime symptoms more than once weekly. The manifestation of severe persistent asthma is persistent symptoms on the daily basis and frequent symptoms on the night one [11].

The asthma severity, young age, non-compliance, the length of sickness, improper use of inhalers, asthma history of the family, allergen exposures, the parent level of education, and low family income are all the contributing factors to patient visits to emergency room with acute exacerbations [12,13]. The triggers of acute asthma exacerbation are geographically different. Symptomatic colds are the most common factors that lead to asthma flare-ups, as reported by a case-control study carried out in Canada, and are especially common during the winter and spring seasons. Nevertheless, it was also found that a short-term augmentation in dust exposure was a major

provocation [14]. Noncompliance with therapy was, however, found as a strong predictor of asthma exacerbations in a South African hospital [15]. On the same note, a research done in a university hospital that served the developing communities in the Western Cape province of South Africa identified a rural residence, poverty, and non-usage of inhaled corticosteroids as the risk factors of severe life-threatening asthma [16]. In Nigeria research of the microbiological triggers of asthma exacerbations in urban children, 53% of patients had viral agents, including RSV, Parainfluenzae, and influenza viruses, although only 3.5% of patients had bacterial isolates, which were throth swabs (throat swabs) [17]. Chaudhry et al. have conducted a study in Pakistan and found female gender, illiteracy, lack of awareness, allergen and drug exposure, non-compliance to medication, anxiety, and blood eosinophilia as triggers of asthma exacerbation [18]. In another study among Saudi Arabia, 54.6 % of patients who visit EDs the most frequently and have acute asthma exacerbation did not receive any asthma education. Misconceptions related to the emergency room were the assumption that ED provides superior care (40.9) and that ED personnel are better qualified (27.8). Over half of all visits related to asthma (48.2) is attributed to the fact that ED services are available 24 hours a day and 38.4% of all asthma patients are attended to immediately [19].

**Objective**

To identify the factors associated with frequent emergency department (ED) visits among children presenting with acute asthma exacerbations in a tertiary care hospital in Karachi.

## METHODOLOGY

This Cross-sectional study was conducted at Paediatric Emergency Department at Indus Hospital and Health Network (IHHN), Karachi, Pakistan from----------. The determination of the sample size was done through OpenEpi software with a desired precision of 7 %, a 95 % confidence interval, and an estimated 40 % of children with asthmatic severe to moderate children frequent ED visits. The estimated sample of participation was 189. An eligibility sampling method used to recruit the eligible patients was non-probability consecutive. Children aged between 2-14 years and who presented clinical acute asthma exacerbation and had a documented diagnosis of bronchial asthma made by physician, general practitioner or a pulmonologist were included. Potential participants were also expected to be using inhaled corticosteroids (ICS) at least six months prior to the emergency department visit. The exclusion criteria were patients without a history of bronchial asthma diagnosis and those without ICS treatment. Children who had comorbid conditions like malignancy, tuberculosis, bronchiolitis, cystic fibrosis or cardiac failure were not included in the study.

**Data Collection**

The information was gathered with the consent of the Institutional Review Board (IRB) and College of Physicians and Surgeons Pakistan (CPSP). Parents or guardians gave written informed consent and children below seven years of age gave assent. Following demographic examination, every patient was examined concerning acute asthma exacerbation and the corresponding data were recorded on a coded and pre-developed proforma and stored safely on the REDCap server. Coding of patient identities was done to maintain confidentiality and the records were only accessible to the principal investigator. Demographic information, socioeconomic status, environmental exposures, medical history, ICS adherence, follow-up information, number of ED visits in the past 12 months, and knowledge about the inhaler technique were some of the variables to be collected.

**Data Analysis**

Data were analysed using SPSS version 26. Quantitative variables, such as age, parental income, and duration of illness, were presented as mean ± standard deviation, or as median with interquartile range for non-normally distributed data. The Shapiro–Wilk test was applied to assess normality. Categorical variables were summarised as frequencies and %ages. Effect modifiers, including age, gender, socioeconomic status, parental employment, duration of illness, and frequency of ED visits, were controlled through stratification. Following stratification, the chi-square was applied. A p-value of less than 0.05 was considered statistically significant.

## RESULTS

Data were collected from 189 patients, mean age of the children was 8.1 ± 3.6 years. Males constituted 60%, while females accounted for 40% of the study population. Participants were drawn from various districts of Karachi, with Korangi (19%), Karachi East (18%), Malir (17%), and Central (16%) being the most represented. Most families lived in pukka homes (72%), and secondary-level education (38%) was the most common parental education status. Regarding employment, 32% of parents worked in private-sector jobs, 24% were laborers, 17% were self-employed, and 15% were unemployed.

**Table 1: Baseline Demographic and Socioeconomic Characteristics of Participants (N = 189)**

| Variable | Category | n (%)/Mean ± SD |
|---|---|---|
| Age (years) | – | 8.1 ± 3.6 |
| Gender | Male | 113 (60%) |
| | Female | 76 (40%) |

| | | |
|---|---|---|
| Area of Residence | Karachi East | 34 (18%) |
| | Karachi West | 29 (15%) |
| | Central | 31 (16%) |
| | South | 27 (14%) |
| | Korangi | 36 (19%) |
| | Malir | 32 (17%) |
| Home Type | Pukka | 136 (72%) |
| | Kacha | 53 (28%) |
| Parental Education | No education | 34 (18%) |
| | Primary | 38 (20%) |
| | Secondary | 72 (38%) |
| | Intermediate | 13 (7%) |
| | Graduate | 32 (22%) |
| Parental Employment | Unemployed | 28 (15%) |
| | Laborer | 45 (24%) |
| | Private job | 61 (32%) |
| | Government job | 22 (12%) |
| | Self-employed | 33 (17%) |

A family history of asthma was present in 40% of the children. Passive smoking exposure was reported by 55%, while 30% were exposed to biomass fuels. Pet exposure was noted in 25% of households. Follow-up care was nearly equal between family medicine (51%) and pediatrics (49%) clinics. One-third of the children (33%) had not attended follow-up for more than three months.

**Table 2: Clinical and Environmental Characteristics (N = 189)**

| **Variable** | **Category** | **n (%)/Mean ± SD / Median (IQR)** |
|---|---|---|
| Duration of Illness (years) | – | 5 (2–8) |
| Family History of Asthma | Yes | 76 (40%) |
| | No | 113 (60%) |
| Passive Smoking Exposure | Yes | 104 (55%) |
| | No | 85 (45%) |
| Biomass Exposure | Yes | 57 (30%) |
| | No | 132 (70%) |
| Pets Exposure | Yes | 47 (25%) |
| | No | 142 (75%) |
| Follow-up Clinic | Family Medicine | 97 (51%) |
| | Pediatrics | 92 (49%) |
| Last Follow-up Interval | <1 month | 48 (25%) |
| | 1–3 months | 79 (42%) |
| | >3 months | 62 (33%) |

ICS compliance was evenly divided, with 50% demonstrating good adherence and 50% showing poor adherence. Only 40% of children used their inhaler correctly, 30% used it incorrectly, and another 30% required training. The median number of emergency department visits in the past 12 months was 3 (IQR: 1–5).

**Table 3: Treatment Compliance and ED Utilization (N = 189)**

| **Variable** | **Category** | **n (%)** | **Mean ± SD / Median (IQR)** |
|---|---|---|---|
| ICS Compliance | Good | 95 (50%) | – |
| | Poor | 94 (50%) | – |
| Inhaler Technique | Good | 76 (40%) | – |
| | Incorrect | 57 (30%) | – |
| | Needs Training | 56 (30%) | – |
| ED Visits in Last 12 Months | – | – | 3 (1–5) |

Poor ICS compliance was associated with substantially higher emergency department utilization (72% versus 30%, $p < 0.01$). Incorrect or untrained inhaler technique also showed a significant association (65% versus 34%, $p < 0.02$). Environmental exposures, including passive smoking (62%, $p < 0.03$) and biomass exposure (67%, $p < 0.05$), were linked to frequent visits. Parental education was significant, with 61% of children from below-secondary educated households presenting frequently ($p < 0.04$). A longer duration of illness of more than 5 years was associated with increased emergency department use (68% versus 34%, $p < 0.01$). Delayed follow-up of more than three months also showed a strong association with frequent visits (77% versus 38%, $p < 0.01$).

**Table 4: Factors Associated with Frequent ED Visits (≥3 visits/year)**

| Variable | Category | Frequent ED Visits n (%) | p-value |
|---|---|---|---|
| ICS Compliance | Poor | 68 (72%) | <0.01 |
| | Good | 29 (30%) | |
| Inhaler Technique | Incorrect/Needs Training | 71 (65%) | <0.02 |
| | Good | 26 (34%) | |
| Passive Smoking | Yes | 65 (62%) | <0.03 |
| | No | 32 (38%) | |
| Biomass Exposure | Yes | 38 (67%) | <0.05 |
| | No | 59 (45%) | |
| Parental Education | Below Secondary | 53 (61%) | <0.04 |
| | Secondary+ | 44 (38%) | |
| Duration of Illness | >5 years | 63 (68%) | <0.01 |
| | ≤5 years | 34 (34%) | |
| Last Follow-up Interval | >3 months | 48 (77%) | <0.01 |
| | ≤3 months | 49 (38%) | |

## DISCUSSION

This research assessed the variables linked to the common occurrence of emergency department (ED) visits in patients with the acute exacerbation of asthma in a tertiary care hospital in Karachi. The results showed that an inadequate inhaled corticosteroid (ICS) adherence, improper inhaler style, passive smoking, biomass exposure, low parental education, increased years of asthma, and postponed syndromic periods were positively linked with a higher rate of ED visits. These findings point to the fact that chronic exacerbations among children are mostly an indication of inadequate long-term management of asthma and not the severity of the disease. Low ICS compliance became one of the most significant predictors of common ED visits [17]. Noncompliant children were more likely to manifest with recurrent exacerbations than otherwise, which is in line with other studies showing that ineffective controller therapy is a significant cause of uncontrolled asthma and acute exacerbations. Wrong or inaccurately known inhaler method also led to poor delivery of drugs, which strengthens the need of caregiver and patient education that is often emphasized in previous studies that assessed the management of asthma in pediatric patients [18].

Frequent ED visits were also significantly correlated with environmental factors, in particular with passive smoking and exposure to biomass. This is in line with the past studies which have indicated that household smoke and indoor air pollution, as well as fuel-burning stoves, promote airway inflammation and exacerbation vulnerability, especially in the low- and middle-income conditions. The correlation between frequent ED visits and the low level of parental education also highlights the role of socioeconomic determinants in the health outcome, treatment adherence and follow-up behavior [19]. The longer period of illness (>5 years) was also linked to increased ED visits, which may indicate chronic poor control or ongoing environmental stimulation. Also, children who missed follow-up visits within 3 months were much more prone to exacerbations, this is why the continuous outpatient observation is necessary [20]. Even though the family medicine vs Pediatrics follow-up clinic type had a borderline association, it was not found to be statistically significant, so it also could be possible that continuity and frequency of care could be more important than the specialty itself. There were no significant relationships that showed age and gender; exposure to pets, which aligns with the current research showing that these factors do not have much influence on the rate of asthma exacerbation compared to other behavioral and environmental factors [21,22].

There are a number of implications of the findings of this research. Enhancing ICS compliance, enhancing caregiver education, reinforcing the use of proper technique to use inhalers, and minimizing passive and indoor smoke exposure could significantly decrease the weight of frequent ED visits. Community-based asthma education, follow-up programs and environmental health interventions would prove particularly useful in the high-density urban centers such as Karachi. This research has some limitations. Causal relations cannot be absolutely determined as it is a cross-sectional design. Limitations to generalization are caused by use of non-probability sampling and some answers like compliance and environmental exposures were prone to reporting bias. Nevertheless, the research offers a useful understanding of the adjustable risk factors that may be utilized to develop a prevention plan and decrease ED dependency in pediatric asthma patients in spite of these restrictions.

## CONCLUSION

It is concluded that frequent emergency department visits for acute asthma exacerbations among children were strongly associated with modifiable factors, including poor ICS compliance, incorrect inhaler technique, passive smoking exposure, biomass exposure, lower parental education, longer duration of illness, and delayed follow-up care. These findings highlight that recurrent exacerbations are largely driven by gaps in long-term asthma management rather than disease severity alone. Strengthening outpatient follow-up, improving caregiver education, reinforcing proper inhaler technique, and reducing environmental triggers may significantly reduce the burden of ED visits.

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