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Impact of Clinical Pharmacist-Led Parent Education on Asthma Control in Children: A Prospective Interventional Study in Tripoli, Libya

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Abstract

Background: Childhood asthma is a common chronic illness often worsened by poor management and frequent exacerbations. Parent education is essential to improve control and reduce emergency visits. **Objective:** To assess the impact of a clinical pharmacist-led parent education program on asthma outcomes in children. **Methods:** A prospective interventional study included 36 children aged 3-17 years with asthma. Parents in the intervention group received structured education on trigger avoidance, inhaler/spacer use, and monitoring. Follow-up was conducted over six months. Primary outcomes were emergency visits, compliance, and symptom control. **Results:** Children in the intervention group had significantly fewer emergency department visits compared with controls (P = 0.01). Compliance with pharmacist instructions correlated with better asthma control (P = 0.02). Dust, pollen, smoke, exercise, and climate changes were the main triggers, while allergic rhinitis and gastroesophageal reflux contributed to poor control when unmanaged. **Conclusion:** Clinical pharmacist-led education improves parental knowledge, enhances asthma control, and reduces acute exacerbations in children. Incorporating pharmacists into multidisciplinary pediatric asthma care offers substantial benefits.

Keywords: *Asthma, Children, Clinical pharmacist, Parent education, Emergency visits, Disease management, Libya*

1. Introduction

Asthma is the most common chronic respiratory disorder in childhood, with a global prevalence ranging between 10-20% depending on the region, and its incidence has risen significantly over the last three decades

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(Global Initiative for Asthma (GINA), 2024; Cloutier *et al.*, 2020). Childhood asthma is associated with increased healthcare utilization, higher direct and indirect costs, school absenteeism, parental work loss, and, in severe cases, premature morbidity and mortality (BTS/SIGN, 2024; Abrams *et al.*, 2024). Despite advances in understanding its pathophysiology, asthma remains a complex disease influenced by genetic, environmental, and immunological factors, and there is still no clear strategy to prevent its development (Abrams and Szefler, 2022).

Environmental triggers, including poor housing conditions, allergen exposure, and indoor pollutants, are strongly linked to poor asthma control (Doong *et al.*, 2021). Several interventions, such as allergen-proof bedding, reduction of environmental triggers, and better management of comorbidities like Gastroesophageal Reflux (GER) and chronic rhinosinusitis, have been shown to improve outcomes (Cabana *et al.*, 2019; Sobieraj *et al.*, 2018; Elliott *et al.*, 2022). Comorbidities such as GER and allergic sinusitis exacerbate asthmatic symptoms through multiple mechanisms including micro-aspiration, inflammatory pathways, and immunologic dysregulation involving eosinophilia and Th2 cytokine release (Lionis *et al.*, 2022; Nguyen *et al.*, 2023).

Successful asthma management requires not only pharmacological therapy but also comprehensive education for families and caregivers. International guidelines emphasize the importance of parent training in inhaler technique, correct medication use, recognition of exacerbations, and preventive lifestyle measures (Uche *et al.*, 2019). Patient and caregiver education have been associated with improved adherence, better asthma control, and reduced emergency visits (Abdulrhman *et al.*, 2024; Burbank *et al.*, 2015).

In recent years, the role of the clinical pharmacist in asthma care has gained growing recognition. Clinical pharmacists provide individualized counseling, reinforce proper inhaler technique, optimize medication use, and deliver structured education programs tailored to parents and children (Hsu *et al.*, 2016). Evidence shows that pharmacist-led interventions reduce asthma exacerbations, improve quality of life, enhance adherence to controller medications, and significantly lower healthcare costs (Welch *et al.*, 2015; Wei *et al.*, 2022; Durr *et al.*, 2020). In pediatric asthma, pharmacists play a crucial role in bridging communication between physicians, patients, and families by providing ongoing monitoring, identifying medication-related problems, and empowering parents to take an active role in disease management (Van Aalderen and Sprikkelman, 2020; Atherly *et al.*, 2020).

Given this background, the current study aims to evaluate how parents manage asthma attacks in children and to assess the impact of clinical pharmacist interventions in improving parental knowledge, modifying the course of attacks, and enhancing overall asthma control.

2. Methods

2.1. Study Design and Participants

This prospective interventional study was conducted at the Pediatric Respiratory Disease Clinic, Tripoli University Hospital. Children aged 3-17 years with a history of bronchial asthma were recruited between July 2019 and June 2020, each child was followed for six months post-enrollment to assess outcomes. A total of 36 children were included: 21 in the intervention group and 15 in the control group. Children in the intervention group were selected during routine follow-up visits, while those in the control group were assigned randomly during October 2020. Children with comorbid conditions that could interfere with asthma management were excluded.

2.2. Intervention

Parents of children in the intervention group participated in a structured education program focused on asthma management, including:

- Recognition and management of asthma symptoms and attacks.
    - Proper use of inhalers and spacers.
    - Avoidance of environmental triggers.
    - Monitoring of activity and nutrition.
    - Follow-up procedures and emergency response.

Parents received interactive guidance during clinic visits and follow-up calls at three and six months. Control group children received usual care only.

2.3. Outcome Measures

- **Primary Outcome:** Change in the number of Emergency Department (ED) visits during the six-month follow-up.
- **Secondary Outcomes:**
  - Parental knowledge and compliance regarding asthma management.
  - Adherence to prescribed therapy.
  - Reduction in asthma symptom frequency and severity.

2.4. Statistical Analysis

Data were analyzed using SPSS version 26 (IBM Corp., Armonk, NY, USA). Descriptive statistics including frequencies and percentages summarized categorical data. Comparisons between intervention and control groups were performed using chi-square or Fisher's exact test. A *P*-value <0.05 was considered statistically significant.

3. Results

3.1. Participant Characteristics

36 children were included (56% male, 44% female; Table 1). Age distribution: 3-6 years (42%), 7-11 years (39%), 12-17 years (19%). Parental education: university level (53%), high school (25%), other (22%). Most children had asthma symptoms >1 year before diagnosis.

Table 1: Participant Demographics and Parental Education (n = 36)

Characteristic	Frequency	Percent
Gender		
Male	20	56
Female	16	44
Age Group		
3–6 years	15	42
7–11 years	14	39
12–17 years	7	19
Parental Education		
High school	9	25
University	19	53
Other	8	22

3.2. Asthma Symptoms and Triggers

Common symptoms: wheezing, cough, shortness of breath, chest tightness. Multiple triggers included exercise, climate change, cold weather; nighttime symptoms were predominant (47%). Seasonal asthma mostly during winter (56%) (Table 2).

3.3. Medication Use and Parental Knowledge

All children received inhalers; 70% received combination therapy. Parents instructed by physicians (91.7%), but only 56% initially knew what to do during attacks. Post-education, knowledge improved markedly (Table 3).

Table 2: Asthma Symptom Patterns, Triggers, Seasonal Distribution, and Allergic Profile

Variable	Frequency	Percent
Symptoms		
All symptoms (cough, wheeze, SOB, chest tightness)	19	53
Cough + wheeze + shortness / tightness	6	17
Cough + wheeze	5	14
Single symptoms	6	17
Symptom Triggers		
Exercise	6	17
Climate change	5	14
Cold weather	3	8
Multiple triggers	22	61
Seasonal Distribution		
Winter	10	56
Winter & Spring	7	39
Winter & Summer	1	6
Allergens		
Dust	8	22
Dust + pollen + pets	8	22
Other allergens	20	56
Comorbid allergic rhinitis	19	53

Table 3: Inhaler Prescription, Parental Knowledge, and Education Outcomes

Variable	Frequency	Percent
Children prescribed inhaler	36	100
Type of Inhaler		
Steroid	4	13
Salbutamol	5	17
Combination	21	70
Parent received explanation on proper inhaler use	33	92
Parent had background knowledge of asthma medication	20	56
Parent knew what to do during an asthma attack	21	58

3.4. Emergency Department Visits

ED visits decreased significantly post-intervention. Intervention group: 1-2 visits increased from 33% → 43%, >6 visits decreased from 24% → 10%. Control group remained largely unchanged (Table 4).

Table 4: ED Visits Before and After Clinical Pharmacist Intervention

Time Period	1–2 Visits	3–5 Visits	≥6 Visits	No Visits
Before education (intervention group)	7 (33%)	8 (38%)	5 (24%)	1 (5%)
After education (intervention group)	9 (43%)	2 (10%)	2 (10%)	8 (38%)
Control group	3 (20%)	6 (40%)	5 (33%)	1 (7%)

3.5. Parent Compliance and Problem Resolution

High parental compliance (91%). Clinical pharmacist identified and resolved barriers: trigger exposure, poor technique, poor adherence. Improvement corresponded with fewer ED visits and better asthma control (Table 5).

Table 5: Problem Resolution and Parental Compliance

Problem Type	First Month (%)	Last Month (%)		
Exposure to triggers	71	24		
Associated disease	24	14		
Poor technique	19	0		
Poor adherence	14	10		
Late therapy initiation	10	5		
Parental Compliance	Emergency Visits (1–2)	Emergency Visits (3–5)	Emergency Visits ≥6	No Visit
Compliant (n=19)	9 (47%)	1 (5%)	1 (5%)	8 (42%)
Non-compliant (n=2)	0	1 (50%)	1 (50%)	0

3.6. Summary

Engagement of a clinical pharmacist through parent-focused education and follow-up substantially improved knowledge, compliance, and asthma management, leading to reduced symptom severity and emergency visits. This highlights the crucial role of clinical pharmacists in childhood asthma care.

4. Discussion

Childhood asthma remains a significant public health challenge, with high rates of morbidity, frequent emergency visits, and substantial caregiver burden (Putman-Buehler *et al.*, 2024). Our study evaluated the impact of a clinical pharmacist-led parent education program on asthma control among 36 children aged 3-17 years. The intervention demonstrated clear benefits in reducing the frequency of acute exacerbations and enhancing parental competency in managing asthma symptoms.

Children in the intervention group experienced significantly fewer emergency department visits compared to the control group. This reduction reflects not only the effectiveness of the educational program but also the proactive involvement of the clinical pharmacist in guiding parents to identify early warning signs, respond appropriately to symptoms, and adhere to prescribed therapy (van der Kolk *et al.*, 2025; Kamps *et al.*, 2015). The program emphasized recognizing common asthma triggers, including exercise, climate changes, cold weather, dust, pollen, smoke, and allergens, which are known to exacerbate symptoms (Elliott *et al.*, 2022; Raymond *et al.*, 2020; Van Sickle *et al.*, 2021). By educating parents about environmental and allergenic triggers, the clinical pharmacist helped minimize exposure and reduce preventable attacks, mitigating both physical suffering and psychological stress for children and their caregivers.

Symptom recognition and proper use of asthma medications were central to the intervention. Parents were trained on inhaler and spacer techniques, differentiating between reliever (salbutamol) and preventer (steroid) medications, and adhering to dosing schedules. This training addressed common barriers such as poor inhaler technique, delayed therapy initiation, and concerns about steroid use. By providing tailored instructions, reinforcement, and follow-up calls over six months, the clinical pharmacist ensured that parents could confidently manage symptoms at home, significantly decreasing reliance on emergency care (Jones *et al.*, 2023; Basheti *et al.*, 2020; Hossny *et al.*, 2020).

Our results further show that associated conditions, including allergic rhinitis and Gastroesophageal Reflux Disease (GERD), contributed to worsening asthma symptoms when uncontrolled. The clinical pharmacist incorporated strategies to monitor and manage these comorbidities, emphasizing the importance of holistic care. Parents were guided to recognize overlapping symptoms and adjust care accordingly,

demonstrating how multidisciplinary education can improve overall disease management (Global Initiative for Asthma (GINA), 2023; Drotar and Bonner, 2018).

Compliance with the educational program was a critical determinant of success. Parents who followed the guidance consistently achieved better outcomes, including fewer emergency visits and improved symptom control. Interestingly, compliance was not significantly influenced by parental education level, highlighting that personalized support and clear communication from the clinical pharmacist were more impactful than formal education. Non-compliant parents showed higher rates of emergency visits, reinforcing the importance of continuous engagement, monitoring, and reinforcement by trained professionals (Putman-Buehler *et al.*, 2024; Kamps *et al.*, 2015).

Finally, the study highlights that early recognition of asthma symptoms, prompt administration of medications, and avoidance of triggers are crucial steps that clinical pharmacists can instill in caregivers. This proactive approach reduces the frequency and severity of asthma attacks, alleviates the burden on healthcare facilities, and improves the child's quality of life. Our findings support integrating clinical pharmacists into pediatric asthma care teams as educators, counselors, and follow-up coordinators to optimize long-term outcomes and enhance family-centered care (Putman-Buehler *et al.*, 2024; van der Kolk *et al.*, 2025; Kamps *et al.*, 2015; Elliott *et al.*, 2022; Raymond *et al.*, 2020; Van Sickle *et al.*, 2021; Jones *et al.*, 2023; Basheti *et al.*, 2020; Hossny *et al.*, 2020; Global Initiative for Asthma (GINA), 2023; Drotar and Bonner, 2018).

5. Conclusion

A clinical pharmacist-led parent education program is an effective strategy for improving asthma control in children. Structured counseling, continuous monitoring, and targeted interventions significantly reduce acute exacerbations and empower parents to manage symptoms confidently. These findings underscore the vital role of clinical pharmacists in pediatric asthma management and advocate for their inclusion in multidisciplinary care teams.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

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