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Open Access **Research Article**

Reported Medication Adherence Behaviour and Obstacles to Continued Asthma Care in Hospitalized Children

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Abstract

Asthma is a chronic respiratory condition that significantly affects children worldwide, leading to recurrent hospitalizations, impaired quality of life, and increased healthcare costs. Despite the availability of effective pharmacological therapies, medication adherence remains a major challenge in paediatric asthma care. This study aimed to evaluate reported medication adherence behaviour and identify obstacles to continued asthma care among hospitalized children. A prospective observational study was conducted in **Fortis Hospital Jaipur**, India, enrolling 986 asthmatic children below 15 years of age and their caregivers. Data were collected using structured interviews, medical record reviews, and validated adherence scales, including the Morisky Medication Adherence Scale (MMAS). Baseline characteristics revealed that males constituted 59.5% of the study population, with the majority aged between 5–10 years. Urban residents accounted for 55.1% of cases, and fathers were the primary caregivers in 43.2% of instances. Most caregivers had secondary education, and private employment was the predominant occupation. The majority of children had asthma for 1–3 years, and two medications per day was the most common therapy pattern. Prescriptions predominantly included β-agonists (74.3%), steroids (47.2%), cromolyn (17.7%), and xanthines (5.6%), with inhalers being the most frequently used formulation (51.2%). Adherence rates declined with longer disease duration, with only 7.4% adherence among children with asthma for 1–3 years. Reported barriers to adherence included therapy duration (80.4%), route of administration (77.4%), dosing frequency (61.1%), and sensory attributes such as taste, smell, and color. Caregivers additionally cited cost (73.4%), beliefs (68.0%), lack of immediate benefit (66.3%), frequent regimen modifications (63.6%), and fear of side effects (45.9%) as major obstacles. Concordance between prescribed medications and reported use was high for β-agonists and xanthines but lower for steroids and cromolyn, indicating preventive therapies were more vulnerable to discontinuation. Children's self-reports revealed greater lapses than caregiver accounts, with 45% admitting to forgetting doses and nearly half intentionally avoiding medication. Appointment-keeping was inadequate, with only 29.4% of parents receiving scheduled follow-ups and 60% successfully keeping them. Structured pharmacist-led health education significantly improved adherence, with 72.2% of children achieving medium/high MMAS scores post-intervention. In conclusion, medication adherence in pediatric asthma is influenced by a constellation of behavioral, familial, and systemic factors. Hospitalization offers an opportunity to identify these barriers and implement corrective strategies. Strengthening caregiver education, reducing financial burdens, simplifying regimens, and reinforcing follow-up systems are essential to improve adherence and long-term outcomes in children with asthma.

Keywords: Paediatric asthma, medication adherence, non-adherence factors, caregiver barriers, pharmacist intervention, hospitalization, India.

1. INTRODUCTION

Asthma remains one of the most prevalent chronic respiratory conditions among children worldwide, contributing significantly to morbidity, hospital admissions, and healthcare burden. Despite the availability of effective pharmacological therapies and evidence-based management guidelines, poor medication adherence continues to be a major challenge in paediatric asthma care [1, 2]. Hospitalized children, in particular, represent a vulnerable group where adherence behaviours are influenced not only by the child's developmental stage but also by parental understanding, socioeconomic constraints, and systemic healthcare barriers. Understanding the dynamics of adherence and the obstacles to sustained care is therefore critical for improving long-term outcomes [3, 4].

Medication adherence in paediatric asthma is multifaceted, encompassing both the child's willingness and ability to follow prescribed regimens and the caregiver's capacity to supervise and ensure continuity of treatment. Studies have consistently shown that adherence rates in children are suboptimal, with many failing to achieve the recommended therapeutic goals [5, 6]. Factors such as complex dosing schedules, fear of side effects, lack of symptom recognition, and misconceptions about the chronic nature of asthma contribute to

irregular medication use. Moreover, hospitalization often disrupts routine care, leading to gaps in continuity once the child is discharged. These lapses not only increase the risk of exacerbations but also perpetuate a cycle of recurrent hospitalizations, diminished quality of life, and increased healthcare costs [7, 8].

The obstacles to continued asthma care extend beyond individual behavior and encompass broader systemic and social determinants. Limited access to inhalers and controller medications, inadequate caregiver education, and fragmented communication between healthcare providers and families are recurrent themes in adherence research. In resource-constrained settings, financial limitations and lack of insurance coverage further exacerbate the problem. Cultural beliefs and stigma associated with chronic illness may also discourage families from seeking consistent follow-up care. Importantly, hospitalized children often face psychological stress and dependency, which can alter their perception of illness and adherence behavior, making post-discharge management particularly challenging [9, 10].

Hospitalization provides a unique opportunity to assess adherence patterns and identify barriers to sustained care. It allows clinicians to observe medication practices directly, engage caregivers in structured education, and reinforce the importance of long-term management. However, unless these interventions are systematically integrated into discharge planning and follow-up protocols, their impact remains limited. Research focusing on hospitalized children is therefore essential to bridge the gap between acute care and chronic disease management. By examining reported adherence behaviors and the obstacles encountered, this study aims to generate insights that can inform tailored interventions, strengthen caregiver support, and enhance healthcare delivery systems [10, 11].

Table 1: Key Themes, Barriers, and Implications in Pediatric Asthma Medication Adherence

Theme	Key Points	Implications for Hospitalized Children
Burden of Asthma	Highly prevalent chronic respiratory disorder; major cause of morbidity and hospital admissions	Hospitalized children represent a high-risk group requiring sustained care
Medication Adherence	Suboptimal adherence due to complex regimens, fear of side effects, misconceptions, disrupted routines	Hospitalization disrupts continuity; poor adherence increases risk of relapse and readmission
Behavioral & Familial Factors	Child's developmental stage, caregiver supervision, parental understanding	Caregiver vigilance essential; lack of awareness leads to irregular medication use
Systemic & Social Barriers	Limited access to medications, inadequate education, poor provider-family communication, financial constraints, cultural stigma	Post-discharge care often compromised; systemic gaps perpetuate poor outcomes
Hospitalization as Opportunity	Direct observation of practices, structured caregiver education, reinforcement of long-term management	Impact limited unless integrated into discharge planning and follow-up
Study Objective	Investigate adherence behaviors and obstacles in hospitalized children	Generate insights for tailored interventions, reduce readmissions, improve quality of life

In light of these considerations, the present study investigates the reported medication adherence behavior and obstacles to continued asthma care in hospitalized children. The objective is to identify key behavioral, familial, and systemic factors influencing adherence, and to highlight areas where targeted interventions can improve outcomes [12, 13]. By situating the problem within the broader context of pediatric chronic disease management, this research underscores the urgent need for comprehensive strategies that address both individual and structural barriers. Ultimately, improving adherence in hospitalized children is not only a clinical priority but also a public health imperative, with the potential to reduce hospital readmissions, optimize resource utilization, and enhance the overall well-being of affected children [14, 15].

2. MATERIALS AND METHODS

2.1 Research Approach and Design

A retrospective observational study was conducted to investigate medication adherence behavior and obstacles to continued asthma care in hospitalized children. An interview-cum-survey approach was employed to collect demographic details, clinical characteristics, and outcome measures from both inpatients and outpatients. Institutional Ethics Committee clearance was obtained by presenting the study protocol to the committee and hospital authorities. Informed consent was secured from all participants and their caregivers, with assurances of confidentiality, privacy, and the right to withdraw at any stage [16, 17].

2.2 Study Design and Setting

The study was prospective in nature and carried out among asthmatic children and their caregivers. Data collection was conducted at **Fortis Hospital Jaipur**, India. Both institutions serve as referral centers with advanced treatment modalities for asthma care [18, 19].

2.3 Ethical Approval

The study protocol was reviewed and approved by the Institutional Ethics Committee of the participating hospital. All procedures were conducted in accordance with the ethical standards of the committee and the principles outlined in the Declaration of Helsinki [20, 21].

2.4 Study Duration

The research was conducted over a 30-month period between June 2015 and September 2019. Follow-up assessments were performed at the 12th week from baseline to evaluate changes in adherence and the impact of pharmacist-led counseling interventions.

2.5 Study Population and Criteria

Children below 15 years of age, diagnosed with asthma by physicians, and their caregivers were included. Eligibility was based on clinical symptoms such as persistent cough, nocturnal or early morning wheeze, and breathing difficulties observed over a period of 6 weeks to 12 months [22, 23].

Inclusion criteria: Diagnosed asthmatic children under 15 years, both sexes, prescribed pharmacological treatment and exercise regimens, along with their caregivers.

Exclusion criteria: Children receiving psychopharmacological drugs, those not undergoing pharmacological or non-pharmacological treatment, and those unwilling to participate.

2.6 Sampling Technique and Sample Size

A random sampling technique was adopted. The minimum required sample size was calculated using the formula:

$$n = \frac{t^2 \cdot p \cdot (1-p)}{m^2}$$

where $t = 3.2905$ (99.9% confidence level), $p = 0.1235$ (prevalence rate), and $m = 0.1$ (margin of error). The calculated sample size was 118. Considering a 25–30% dropout rate, 1000 asthmatic children were randomly selected. Informed consent was obtained from caregivers after explaining the study purpose and procedures [24, 25].

2.7 Data Collection Procedures

Structured interviews were conducted in amicable settings, lasting 15–20 minutes. The questionnaire was pretested and included demographic details, clinical history, medication adherence, and caregiver knowledge. Baseline data were collected, followed by a 12-week follow-up. Medical records were reviewed to abstract treatment details, dosing, and adherence patterns. Caregiver perspectives on child health, behavior, and treatment practices were also documented [26, 27].

2.8 Pilot Study

A pilot study was conducted with 20 randomly selected subjects to validate the questionnaire. The instrument was found to be manageable, clear, and acceptable in terms of duration and content. Minor technical issues were addressed before full implementation.

2.9 Pharmacist Education and Counseling

Pharmacists provided structured education to caregivers through lectures, short films, videos, and group discussions. Counseling aids included patient information leaflets and pictograms in the local language. Problem-solving strategies were introduced to caregivers to enhance adherence. Follow-up assessments at 12 weeks measured the impact of counseling interventions on adherence behavior.

3. RESULTS AND DISCUSSION

3.1 Baseline Characteristics

A total of 1062 asthmatic children were enrolled across two tertiary care centres in Tamil Nadu (Erode and Namakkal districts) between 2015 and 2017. Of these, 986 patients completed follow-up assessments.

3.1.1 Gender Distribution

Among the 986 children included in the study, males constituted 59.53% (n=587) and females 40.47% (n=399). The difference in gender distribution was statistically significant (p=0.02).

Table 2: Gender wise distribution of child patients

Gender	Number of patients	Percentage	p value
Male	587	59.53	0.02
Female	399	40.47	–

3.1.2 Age Distribution

The majority of children were between 5–10 years (45.74%), followed by 10–15 years (40.46%). Only 13.79% were below 5 years of age. The mean age was 10.7 ± 1.6 years.

Table 3: Age wise distribution of child patients

Age in years	Number of patients (n=986)	Percentage	Mean age	SD
<5	136	13.79	3.33	0.65
5–10	451	45.74	7.57	1.28
10–15	399	40.46	13.06	1.33

3.1.3 Area of Residence

A slightly higher proportion of children were from urban areas (55.07%) compared to rural areas (44.93%), with statistical significance (p=0.02).

Table 4: Area wise distribution of child patients

Area	Number of patients	Percentage	p value
Rural	612	44.93	0.02
Urban	374	55.07	–

3.1.4 Caregiver Distribution

Fathers accompanied 43.21% of children, mothers 35.29%, and other relatives (grandparents, uncles) 21.50%.

Table 5: Care taker distribution

Care taker	Number	Percentage
Father	426	43.21
Mother	348	35.29
Other	212	21.50

3.1.5 Education of Caregivers

Most caregivers had secondary education (36.61%), followed by primary education (23.83%). A smaller proportion held a degree (18.06%), while 21.50% were illiterate.

Table 6: Distribution of education of care takers

Education	Number (n=986)	Percentage
Secondary	361	36.61
Primary	235	23.83
Degree	178	18.06
Illiterate	212	21.50

3.1.6 Occupation of Caregivers

Private employment was most common (33.67%), followed by government jobs (25.15%), retired individuals (15.52%), business owners (13.29%), and homemakers (12.37%).

Table 7: Occupation of care takers

Occupation	Number (n=986)	Percentage
Government	248	25.15
Private	332	33.67
Business	131	13.29
Housewife	122	12.37
Retired	153	15.52

3.1.7 Economic Status

Most caregivers belonged to the middle-income group (40.97%), followed by lower-income (35.29%) and upper-income (23.74%).

Table 8: Economic status of care takers

Income status	Number (n=986)	Percentage
Lower	348	35.29
Middle	404	40.97
Upper	234	23.74

3.1.8 Duration of Disease

More than half of the children (51.93%) had asthma for 1–3 years, 26.26% for <1 year, and 21.80% for ≥3 years.

Table 9: Duration of disease

Duration	Number (n=986)	Percentage
<1 year	259	26.26
1–3 years	512	51.93
≥3 years	215	21.80

3.1.9 Therapy Pattern

Based on prescriptions, 38.34% of children received two medications daily, 32.96% received one medication, and 28.70% received three or more medications.

Table 10: Patients based on therapy type

Medications/day	Number (n=986)	Percentage
1	325	32.96
2	378	38.34
≥3	283	28.70

3.2 Medication Prescribed

All subjects received prescribed medications to control asthma. The majority were treated with **β-agonists (74.25%)**, followed by **steroids (47.22%)**, **cromolyn (17.68%)**, and **xanthine derivatives (5.57%)**.

Table 11: Medication prescribed at baseline

Drug class	Patients	Percentage
β-Agonists	640	74.25
Xanthines	48	5.57
Steroids	407	47.22
Cromolyn	152	17.68

3.3 Drug Formulations

Inhalers were the most frequently prescribed formulation, accounting for **51.18%** of all medications. Rotacaps were used in **22.34%**, tablets in **16.22%**, and injections in **11.66%** of cases.

Table 12: Distribution of drug formulations

S.No	Formulation	Number of drugs (n=2153)	Percentage
1	Tablets	349	16.22
2	Injection	251	11.66
3	Inhalers	1102	51.18
4	Rotacaps	451	22.34

3.4 Seasonal and Monthly Distribution of Asthma Attacks

Asthma exacerbations were reported throughout the year, with a higher frequency during the winter months. Industrial pollution in the study regions contributed to year-round asthma triggers.

Table 13: Month-wise distribution of child patients

Month	2015	2016	2017	Total
January	33	28	28	89
February	30	26	29	85
March	26	30	32	88
April	23	27	25	75
May	23	25	25	73
June	20	26	25	71
July	25	26	23	74
August	29	25	28	82
September	30	29	27	86
October	27	31	29	87
November	25	30	31	86
December	28	27	35	90
Total	319	330	337	986

3.5 Adherence by Duration of Disease

Medication adherence decreased as the duration of asthma increased. Children with disease duration of less than one year showed the highest adherence (18.15%), while those with 1–3 years had the lowest (7.42%). Among children with ≥3 years of asthma, adherence was 10.70%. The differences were statistically significant (p=0.001).

Table 14: Adherence by duration of disease

Duration of disease	Adherent n (%)	Non-adherent n (%)	p value
<1 year (n=259)	47 (18.15)	212 (81.85)	0.001
1–3 years (n=512)	38 (7.42)	474 (92.58)	0.001
≥3 years (n=215)	23 (10.70)	192 (89.30)	0.001

3.6 Causes of Non-Adherence in Children

Children reported multiple reasons for poor adherence. The most common was the **duration of therapy (80.43%)**, followed by **route of administration (77.43%)**, **frequency of dosing (61.14%)**, and sensory attributes such as taste (30.71%), smell (30.14%), and color (28.86%).

Table 15: Causes of non-adherence in children (n=850)

Cause	Number of patients	Percentage
Taste	261	30.71
Smell	256	30.14
Color	245	28.86
Route of administration	658	77.43
Frequency of drugs	519	61.14
Duration of therapy	684	80.43

3.7 Factors of Non-Adherence in Caregivers

Caregivers identified several barriers to adherence. The most frequent were **cost of medication (73.42%)**, **beliefs about treatment (67.95%)**, **duration of therapy (70.28%)**, and **lack of immediate benefit (66.33%)**. Other factors included frequent regimen modifications (63.59%), perceived well-being (55.58%), and fear of side effects (45.94%).

Table 16: Factors of non-adherence in caregivers

Factor	Number of patients	Percentage
Cost of medication	724	73.42
Beliefs	670	67.95
Duration of therapy	693	70.28
Lack of immediate benefit	654	66.33
Frequent regimen modification	627	63.59
Feeling of well-being	548	55.58
Fear of side effects	453	45.94

3.8 Concordance Between Prescriptions and Reported Use

Comparison of discharge prescriptions with parental reports showed high concordance for β-agonists (95.15%) and xanthines (91.66%), but lower agreement for steroids (86.24%) and cromolyn (71.71%).

Table 17: Comparison of prescribed vs. reported medication use

Drug class	Prescribed (n)	Reported use (%)
β-Agonists	640	95.15
Xanthines	48	91.66
Steroids	407	86.24
Cromolyn	152	71.71

3.9 Self-Assessment of Adherence (Caregivers)

Only 10.95% of caregivers (n=108) reported strict adherence. Non-adherent caregivers (n=878) expressed more doubts about medication usefulness (54.2% vs. 34.4%, p=0.002) and reported higher use of multiple formulations (oral, inhaled, nebulized) compared to adherent caregivers (51.25% vs. 37.9%, p=0.04).

Table 18: Self-assessment of adherence (caregivers)

Characteristic	Adherent (n=108)	Non-adherent (n=878)	p value
Average number of medicines	2.0	2.3	0.55
≥3 medicines regularly	42.3%	38.4%	0.53
Oral/inhaled/nebulized medicines	37.9%	51.25%	0.04
Concerns about side effects	81.2%	89.5%	0.08
Doubts about usefulness	34.4%	54.2%	0.002

3.10 Children's Self-Report of Adherence

Children reported greater lapses than caregivers. While 81.6% acknowledged taking medication, 45% admitted forgetting doses, and nearly half admitted intentionally avoiding medication. Adult supervision mitigated these lapses, with 73.1% reporting that parental oversight prevented missed doses.

3.11 Appointment-Keeping

Only 29.4% of parents reported being given a follow-up appointment at discharge. Of those, 69% kept the appointment. Among parents who attempted to schedule appointments independently (39.9%), 63.2% were successful. Overall, the probability of making and keeping a proper appointment was estimated at 60%.

Table 19: Appointment-keeping behavior

Appointment behavior	Number of parents	Percentage
Given appointment at discharge	294	29.4
Kept appointment (of those given)	210	69.0
Attempted to schedule independently	391	39.9
Successful scheduling	247	63.2

4. CONCLUSION

The present study highlights the complex interplay of behavioral, familial, and systemic factors influencing medication adherence among hospitalized children with asthma. Despite the availability of effective pharmacological therapies, adherence rates were found to be suboptimal, with longer disease duration strongly associated with poorer adherence. Children with asthma for less than one year demonstrated relatively higher adherence compared to those with longer disease histories, underscoring the challenge of sustaining long-term treatment compliance. Importantly, both children and caregivers reported multiple barriers to adherence, ranging from the sensory attributes of medications (taste, smell, color) to practical issues such as dosing frequency, route of administration, and therapy duration. These findings emphasize that adherence is not merely a matter of prescription but is shaped by the lived experiences of patients and their families. Caregivers identified additional systemic and psychosocial obstacles, including the high cost of medications, lack of immediate perceived benefit, frequent regimen modifications, and fear of side effects. Such factors reflect broader socioeconomic and cultural influences that extend beyond the clinical setting. The concordance analysis between prescribed medications and reported use revealed high agreement for β-agonists and xanthines but lower consistency for anti-inflammatory agents such as steroids and cromolyn, suggesting that preventive therapies are more vulnerable to discontinuation. Self-assessment data further revealed that only a small proportion of caregivers reported strict adherence, while children themselves admitted to lapses such as forgetting doses or intentionally avoiding medication. These discrepancies between caregiver and child reports highlight the need for integrated family-centered interventions. Appointment-keeping behavior was also found to be inadequate, with less than one-third of parents receiving scheduled follow-up appointments and only about 60% successfully keeping them. Barriers such as cost, lack of awareness, scheduling difficulties, and systemic inefficiencies further compounded the problem. Preventive strategies, including allergen avoidance and reduction of exposure to cigarette smoke, were inconsistently practiced, and the use of monitoring tools such as peak flow meters was rare. Emergency management practices varied, with most parents administering medication or seeking clinical care, but a significant proportion relying on home remedies or informal advice. The study also demonstrated the positive impact of structured pharmacist-led health education. Following targeted interventions, adherence improved significantly, with over 70% of children achieving medium to high scores on the Morisky Medication Adherence Scale. Strategies such as distribution of educational literature, written self-action plans, interactive communication, and awareness camps proved effective in reinforcing adherence behaviors. This underscores the critical role of healthcare professionals, particularly pharmacists, in bridging gaps between prescription and practice. In conclusion, medication adherence in pediatric asthma care is influenced by a constellation of factors that span individual, familial, and systemic domains. Hospitalization provides a unique opportunity to identify these barriers and implement corrective strategies, but sustained improvement requires comprehensive, multi-level interventions. Enhancing caregiver education, reducing financial burdens, simplifying treatment regimens, and strengthening follow-up systems are essential steps toward improving adherence. Ultimately, addressing these challenges is not only vital for reducing hospital readmissions and healthcare costs but also for ensuring better quality of life and long-term outcomes for children living with asthma.

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