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Patterns of Asthma Control among Asthmatic Patients Presenting at Tertiary Care Hospital, Larkana

Mubarak Ali Jakhrani[1], Nazia Faraz Shaikh[1], Nazimuddin[1], Mehak[2], Vijia Kumar Gemnani[3*] and Shanti Lal Bhojwani[1]

[1]Children Hospital, Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Pakistan
[2]Women Health Officer, District Health Officer, Larkana, Pakistan
[3]Department of Community Medicine, Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Pakistan

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Corresponding Author:
Vijia Kumar Gemnani
Department of Community Medicine, Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Pakistan
gemnanivijay@yahoo.com

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ABSTRACT

Asthma is the most prevalent pediatric chronic condition and the leading cause of preventable pediatric hospitalization. Despite its prevalence, asthma is a poorly managed condition. Effective therapies to enhance and sustain asthma control are required. **Objective:** To determine the frequency of patterns of asthma control among asthmatic patients presenting at a tertiary care hospital, Larkana. **Methods:** The descriptive cross-sectional study was conducted at the Children's Hospital in Larkana between January 21 and June 23. Quantitative and qualitative data were gathered, presented, and evaluated. Effect modifiers were controlled via stratification to determine their impact on the result variable. The chi-square test was used after post-stratification, with a p-value of ≤0.05 considered significant. **Results:** The study involved 143 patients, with an average age of 7.14 ± 3.49 years and a duration of 25.72 ± 10.24 months, with 72 (50.3%) men and 71 (49.7%) women. Of the 143 patients, 45.5%, 30.1%, and 24.5% had well, partially, and poorly controlled asthma, respectively. **Conclusions:** It was concluded that 45.5% achieved well-controlled asthma, 30.1% exhibited partial control, and 24.5% had poorly controlled asthma. These findings highlight the need for personalized interventions, emphasizing the importance of exploring factors influencing suboptimal control.

INTRODUCTION

Asthma, a common chronic non-communicable illness, affects 280 million people worldwide and is estimated to kill half a million people by 2022, including children and adults [1]. Childhood asthma is defined as children with medically diagnosed asthma based on clinical history by a physician for more than six months (at least two previous episodes of wheezing), physical examination (musical, high-pitched, whistling sound), and the improvement of symptoms on treatment with B2 agonist. In Pakistan, the world's fifth-most populated country, 4.3% of its 221 million people are suspected of having asthma. Seasonal asthma is more common in specific areas, impacted by indoor and outdoor allergens, occupational asthma, environmental pollutants, and lifestyle changes [2]. Asthma, a common chronic non-communicable illness, affects over 260 million people and claims over 450,000 lives each year. According to the Global Initiative for Asthma (GINA) study, the prevalence in adult's ranges between 1% and 21%, with potentially greater rates in children [2, 3]. Countries with prevalence rates in this range include Pakistan (13.07%), Kuwait (13.66%), and Libya (12.55%), with certain populations having prevalence rates ranging from 8 to 11% [4]. Research conducted in Karachi in 2006 indicated that asthma incidence was 18% among teenagers aged 13 to 14, while Pakistan's GINA report indicates a prevalence of 4-5% [3, 4]. Rising urbanization, air pollution, tobacco smoke exposure, and antibiotic usage, genetics, and other modern lifestyle variables continue to contribute to the expanding asthma

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pandemic [5, 6]. It is generally documented that effective asthma control depends on the patient's commitment to daily medication regimens. Taboos and misunderstandings about asthma in our culture are additional risk factors that impede good asthma care [7]. Adherence to asthma drug regimens varies widely, with studies reporting adherence rates ranging from 30% to 70%. Bad adherence to treatment regimens reduces the effectiveness of prescription drugs and hence raises the chance of bad outcomes [8]. The literature identifies many measures that are now in use to explicitly assess asthma control in adults and children based on patient symptoms, rescue medicine usage, and daily activity limitations. The Asthma control questionnaire (ACQ), Asthma control test (ACT), and Asthma therapy assessment questionnaire (ATAQ) are commonly used clinical instruments in assessing asthma control, therapy, and control [9]. Asthma is diagnosed based on clinical presentation, history, physical assessment, and diagnostic tests, including spirometry and PEFR. Similar tests are required to monitor sickness progression, severity, and changes in duration and intensity. Reliable and accurate results require adequate abilities and high-quality spirometry [10]. In study conducted by Mansoor et al., 33 (25.58%) of patients had asthma control category A on ACT, indicating that their asthma was well managed; 65 (50.38%) had asthma control category B on ACT, indicating that their asthma was somewhat controlled; and 31 (24.01%) had asthma control category C on ACT, indicating that their asthma was badly controlled [11]. Previously, the Global Initiative for Asthma (GINA) guidelines divided asthma severity into categories based on the number of symptoms, airway limitation, and variability. However, it is vital to note that asthma severity comprises both the severity of the underlying illness and the response to treatment. As a result, the amended GINA recommendations propose that asthma control be assessed regularly rather than just based on severity. The Asthma Control Test (ACT) questionnaire can assist us in assessing the pattern of asthma control in resource-limited settings. Furthermore, the majority of patients are uneducated, and even those who are read lack awareness. Simple questionnaires like the Asthma Control Test (ACT) are essential for timely intervention, quantifying asthma control, preventing emergency admissions, and educating patients about asthma management, making them cost-effective, understandable, and accessible to illiterate patients. Asthma is a prevalent chronic respiratory condition worldwide, affecting patients' quality of life and burdening healthcare systems. Effective asthma control is crucial to prevent exacerbations, reduce hospital admissions, and improve patient outcomes. However, asthma control patterns can vary due to factors like treatment adherence, environmental triggers, and comorbidities. Tertiary care hospitals often have diverse patients with varying asthma severity, making understanding the frequency and patterns of asthma control essential for identifying management strategies and optimizing care delivery. Limited data exists on specific trends and factors influencing asthma control among patients.

Asthma remains a highly prevalent yet poorly controlled chronic pediatric respiratory disease in Pakistan, with limited regional data on actual asthma control patterns among children in tertiary care settings. Existing studies have inadequately explored the proportions of well-controlled, partially controlled, and poorly controlled asthma, particularly in resource-limited populations where awareness, adherence, and socioeconomic factors may influence outcomes. This study aimed to assess the frequency and patterns of asthma control among pediatric asthmatic patients in Larkana and identify demographic and clinical factors associated with suboptimal asthma management to support more personalized intervention strategies.

METHODS

A descriptive cross-sectional study was carried out during the period from January 2021 to June 2023 at the Department of Pediatrics, Children's Hospital, Larkana. This study was approved by the hospital's ethical review committee and the College of Physicians and Surgeons of Pakistan with Ref No: CPSP/REU/PED-2020-221-5990. The required sample size was calculated to be 143 patients; by assuming the frequency of 24.01% poorly controlled asthma [11], the margin of error is 7%, and the confidence level 'C.I.' is 95%. This sample size was determined using WHO software. Consecutive (non-probability) sampling was used during the sampling process. Patients between 4-12 years of age, either gender, having had childhood asthma for more than six months were selected. The study included patients with a history of allergic rhinitis, pneumonia, or tuberculosis; those who have a history of cleft lip & palate, congenital heart disease, or drug allergy were excluded. Patients known to have childhood asthma, meeting inclusion criteria, were documented in the study from the Outpatient Department (OPD) of Pediatrics, Children's Hospital, Larkana. Parents were informed about the risks, benefits, and purpose of the study. Before being included, written informed permission was obtained. All data obtained during the study was kept confidential in a computer that was password protected. A brief demographic history was obtained. The parents filled out the questionnaire in the presence of the researcher. Patients were categorized into the category of asthma control and were assessed by applying the Asthma Control Test (ACT) questionnaire. All patients were classified as A,

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B, or C based on their asthma control test. Asthma scores of ≥20 were classified as well-controlled (category A), 16-19 as partially controlled (category B), and ≤15 as poorly controlled (category C). The results of quantitative variables (age and childhood asthma duration) and qualitative variables (gender, residential status, family history of asthma, family monthly income status, maternal educational status, and pattern of asthma control) were noted in the performance. The data were processed using SPSS Version 22.

RESULTS

The study involved 143 patients aged 4-12 years at Children's Hospital Larkana. In the study, the mean age and duration of asthma were 7.14 ± 3.49 years and 25.72 ± 10.24 months, respectively. In the study, different demographic frequencies were observed; for example, in gender distribution, out of 143 patients, 72 (50.3%) and 71 (49.7%) were male and female, while in age distribution, 47 (32.9%) in 4-8 years and 96 (67.1%) in 9-12 years' patients, respectively. Out of 143 patients, 116 (81.1%) and 27 (18.9%) had urban and rural residences, respectively. Additionally, 50 (35%) and 93 (65%) had asthma durations of ≤24 months and >24 months, respectively. Frequency distribution of family history of asthma showed that out of 143 patients, 14 (9.8%) and 129 (90.2%) had and did not have a family history of asthma, and other variables such as frequency distribution of family monthly income status and frequency distribution of educational status (Table 1).

Table 1: Frequency Distribution of Demographic and Other Variables (n=143)

Baseline Characteristics	Categories	n (%)
Mean Age	7.14 ± 3.49 Years	
Duration of Asthma	25.72 ± 10.24 Months	
Gender Distribution	Male	71 (49.65%)
	Female	72 (50.35%)
Age Distribution	4-8 Years	47 (32.87%)
	9-12 Years	96 (67.13%)
Residence Status	Urban	116 (81.12%)
	Rural	27 (17.88%)
Asthma Duration	<2 Months	50 (34.97%)
	>2 Months	93 (65.03%)
Family History of Asthma	Yes	14 (09.79%)
	No	129 (90.21%)
Family Monthly Income Status	<50000	71 (49.65%)
	>50000	72 (50.35%)
Educational Status	Illiterate	07 (04.90%)
	Primary	15 (10.49%)
	Secondary	52 (36.36%)
	Higher	69 (48.25%)

Out of 143 patients, 65 (45.5%) and 78 (54.5%) had and did not have well-controlled asthma, and 43 (30.1%) and 100 (69.9%) patients had and did not have partially controlled asthma, while 35 (24.5%) and 108 (75.5%) patients had and did not have poorly controlled asthma (Figure 1).

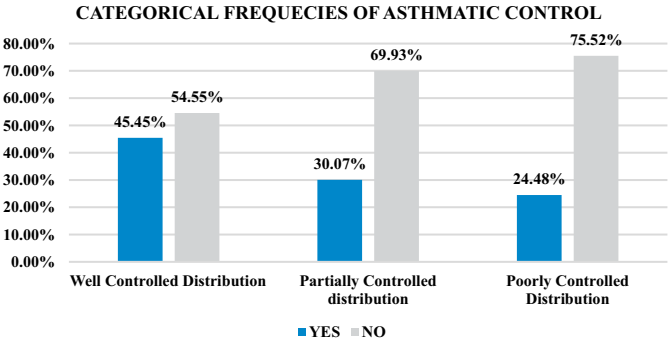


Figure 1: Frequencies of Asthmatic Control Categories in Study Population

The study found that 55.3% of patients aged 4-8 years had well-controlled asthma, while only 40.6% of patients aged 9-12 years had well-controlled asthma. In contrast, 44.7% and 59.4% of patients aged 4-8 years and 9-12 years, respectively, had poorly controlled asthma, with no significant relation. (p-0.09). Within the well-control stratum for men, females and males are almost evenly split at 33 (45.8%) and 39 (54.2%), respectively. In the female group, 32 (45.1%) and 39 (54.9%) had and did not have well-controlled asthma, respectively; the p-value was not significant (0.92). Stratification by residence status in relation to well-controlled asthma revealed that among urban residents, 54 (46.6%) had well-controlled asthma, while 62 (53.4%) did not. In contrast, among rural residents, 11 (40.7%) had well-controlled asthma, while 16 (59.3%) did not. The difference between the two groups was not statistically significant (p=0.58). In stratification of asthmatic duration, it was revealed that 40% of patients with asthma for ≤24 months had well-controlled asthma, while 48.4% of those with asthma for >24 months had well-controlled asthma. No significant difference was observed in well-controlled asthma based on duration with a p-value. The study found that 50% of subjects with an asthmatic family history had and did not have well-controlled asthma, while 45% and 55% of those without a family history had and did not have well-controlled asthma. 43.7% and 56.3% of patients with monthly incomes of ≤50000 and >50000 had well-controlled asthma, while 47.2% and 52.8% did not have well-controlled asthma in patients with monthly incomes of ≤50000 and >50000, respectively, with p-value (0.66). Stratification by education level about well-controlled asthma showed that among the patients belonging to illiterate, primary, and secondary categories, 05 (71.4%), 07 (46.7%), 22 (42.3%), and 31 (44.9%) had well-controlled asthma in the illiterate, primary, secondary, and higher education groups. On the other hand, among the patients belonging to the illiterate, primary, and secondary groups and above, 02 (28.6%), 08 (53.3%), 30 (57.7%), and 38

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(55.1%) had well-controlled asthma. p-value (0.54) (Table 02).

Table 2: Stratification Distribution of Different Variables with Well-Controlled Asthma Patients

Baseline Characteristics	Categories	Well Controlled Distribution		p-value
		Yes	No	
Gender Distribution	Male	33 (45.8%)	39 (54.2%)	0.92
	Female	32 (45.1%)	39 (54.9%)	
Age Distribution	4-8 Years	26 (55.3%)	21 (44.7%)	0.09
	9-12 Years	39 (40.6%)	57 (59.4%)	
Residence Status	Urban	54 (46.6%)	62 (53.4%)	0.58
	Rural	11 (40.7%)	16 (59.3%)	
Asthma Duration	< 02 Months	20 (40.0%)	30 (60.0%)	0.33
	> 02 Months	45 (48.4%)	48 (51.6%)	
Family History of Asthma	Yes	07 (50.0%)	07 (50,0%)	0.66
	No	58 (45.0%)	71 (55,0%)	
Family Monthly Income Status	< 50000	31 (43.7%)	40 (56.3%)	0.66
	>50000	34 (47.2%)	38 (52.8%)	
Educational Status	Illiterate	05 (71.4%)	02 (28.6%)	0.54
	Primary	07 (46.7%)	08 (53.3%)	
	Secondary	22 (42.3%)	30 (57.7%)	
	Higher	31 (44.9%)	38 (55.1%)	

Statistical analysis of the relationship not seen in age stratification of partially managed asthma indicated that 15 (31.9%) and 28 (29.2%) people in the age groups (4-8 years and 9-12 years) had partially controlled asthma. In comparison, 32 (68.1%) and 68 (70.8%) patients aged 4-8 and 9-12 years old did not have partially controlled asthma. (p=0.09). Statistical analysis revealed that 25 (34.7%) of males had some control over their asthma, but 47 (65.3%) did not. In the female group, 18 (25.4%) had partially controlled asthma, whereas 53 (74.6%) did not. (p=0.22). In comparison, among rural residents, 10 (37.0%) had moderately managed asthma, whereas 17 (63.0%) did not. The difference between the two groups was statistically insignificant (p=0.38). Stratification for the duration of asthma concerning partially controlled asthma observed that patients who had asthma for ≤24 months, 14 (28%) and 36 (72%), had and did not have partially controlled asthma, respectively. Whereas patients who had asthma for >24 months, 29 (31.2%) and 64 (68.8%) had and did not have partially controlled asthma. The p-value was 0.69, indicating no statistically significant difference in the prevalence of partially controlled asthma between the two groups. The stratification analysis not reveal that among patients with a family history of asthma, 7 (50%) had partially controlled asthma, while 7 (50%) did not. In contrast, among patients without a family history of asthma, 36 (27.9%) had partially controlled asthma, and 93 (72.1%) did not. These results suggest no statistically significant relationship between family history of asthma and partially controlled asthma, as indicated by a p-value of 0.080. Stratification by family monthly income showed that among patients with a monthly income of ≤50,000, 23 (32.4%) had partially controlled asthma, whereas 48 (67.6%) did not. Similarly, among patients with a monthly income of > 50,000, 20 (27.8%) had partially controlled asthma, and 52 (72.2%) did not. The analysis did not reveal a statistically significant relationship between family monthly income and partially controlled asthma, with a p-value of 0.54. The stratification analysis revealed that stratification based on educational status for partially controlled asthma revealed that 00 (00%), 02 (13.3%), 28 (53.8%), and 13 (18.8%) of patients from illiterate, primary, secondary, and higher educational groups, respectively, had partially controlled asthma. In comparison, 07 (100%), 13 (86.7%), 24 (46.2%), and 56 (81.2%) patients with illiteracy, elementary, secondary, and higher education levels had partially managed asthma (p-0.01), respectively (Table 03).

Table 3: Stratification Distribution of Different Variables with Partially Controlled Asthma Patients

Baseline Characteristics	Categories	Partially Controlled Distribution		p-value
		Yes	No	
Gender Distribution	Male	25 (34.7%)	47 (65.3%)	0.22
	Female	18 (25.4%)	53 (74.6%)	
Age Distribution	4-8 Years	15 (31.9%)	32 (68.1%)	0.73
	9-12 Years	28 (29.2%)	68 (70.8%)	
Residence Status	Urban	33 (28.4%)	83 (71.6%)	0.38
	Rural	10 (37.0%)	17 (63.0%)	
Asthma Duration	< 02 Months	14 (28.0%)	36 (72.0%)	0.69
	> 02 Months	29 (31.2%)	64 (68.8%)	
Family History of Asthma	Yes	07 (50.0%)	07 (50.0%)	0.08
	No	36 (27.9%)	93 (72.1%)	
Family Monthly Income Status	< 50000	23 (32.4%)	48 (67.6%)	0.66
	>50000	20 (27.8%)	52 (72.2%)	
Educational Status	Illiterate	00 (00.0%)	07 (100.0%)	0.01
	Primary	02 (01.3%)	13 (86.7%)	
	Secondary	28 (53.8%)	24 (46.2%)	
	Higher	13 (18.8%)	56 (81.2%)	

Age stratification of poorly managed asthma revealed that 16 (34%) and 19 (19.8%) individuals in the age groups (4-8 years and 9-12 years) had poorly controlled asthma, respectively. In contrast, 31 (66%) and 77 (80.2%) patients aged 4-8 and 9-12 years did not have poorly managed asthma, respectively. The p-value (0.06). In terms of poorly managed asthma, gender stratification revealed that 20 (27.8%) and 52 (72.2%) males had and did not have it, respectively. In the female group, 15 (21.1%) had poorly managed asthma, whereas 56 (78.9%) did not. The p-value was 0.35. Significant association not observed between residence status and poorly controlled asthma revealed that 25 (21.6%) and 91 (78.4%) who lived in cities had and did not have poorly controlled asthma, respectively, whereas 10 (37%) and 17 (63%) who lived in rural areas and did not

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have poorly controlled asthma. p-value (0.09). Asthmatic duration about poorly controlled asthma seemed that patients who had asthma for ≤ 24 months, 15 (30%) and 35 (70%), had and did not have poorly controlled asthma, respectively. Of patients who had asthma for >24 months, 20 (21.5%) and 73 (78.5%) had and did not have poorly controlled asthma, respectively. p-value (0.26). Family history of asthma with regards to poorly controlled asthma showed that patients who had a family history of asthma, 00 (00%) and 14 (100%), had and did not have poorly controlled asthma, respectively. Of the patients who did not have a family history of asthma, 35 (27.1%) and 94 (72.9%), had and did not have poorly controlled asthma, respectively (p=0.02). Family monthly income status concerning poorly controlled asthma showed 14 (19.7%) and 57 (80.3%) had poorly controlled asthma in patients who belonged to a monthly income of ≤50000 and >50000, respectively. Whereas 21 (29.2%) and 51 (70.8%) did not have poorly controlled asthma in patients who belonged to monthly incomes of ≤50000 and >50000 (p=0.18). For poorly controlled asthma, stratifying for educational status, 00 (00%), 02 (13.3%), 06 (11.5%), and 27 (39.1%) had poorly controlled asthma in patients belonging to illiterate, primary, secondary, and higher educational categories. While 07 (100%), 13 (86.7%), 46 (88.5%), and 42 (60.9%) have poorly controlled asthma in patients of illiterate, primary, secondary, and higher educational groups, therefore it is a statistically significant association between educational status and poorly controlled asthma (p-0.01) (Table 4).

Table 4: Stratification Distribution of Different Variables with Poorly Controlled Asthma Patients

Baseline Characteristics	Categories	Poorly Controlled Distribution		p-value
		Yes	No	
Gender Distribution	Male	20 (27.8%)	52 (72.2%)	0.35
	Female	15 (21.1%)	56 (78.9%)	
Age Distribution	4-8 Years	16 (34.0%)	31 (66.0%)	0.06
	9-12 Years	19 (19.8%)	77 (80.2%)	
Residence Status	Urban	25 (21.6%)	91 (78.4%)	0.09
	Rural	10 (37.0%)	17 (63.0%)	
Asthma Duration	<2 Months	15 (30.0%)	35 (70.0%)	0.36
	>2 Months	20 (21.5%)	73 (78.5%)	
Family History of Asthma	Yes	00 (00.0%)	14 (100%)	0.08
	No	35 (27.1%)	94 (72.9%)	
Family Monthly Income Status	<50000	14 (19.7%)	57 (80.3%)	0.18
	>50000	21 (29.2%)	51 (70.8%)	
Educational Status	Illiterate	00 (00.0%)	07 (100%)	0.01
	Primary	02 (13.3%)	13 (86.7%)	
	Secondary	06 (11.5%)	46 (88.5%)	
	Higher	27 (39.1%)	42 (60.9%)	

DISCUSSION

Asthma, a prevalent chronic inflammatory respiratory disorder affecting 8-9% of the global population, presents significant challenges in diagnosis and treatment [12, 13]. The National Health Insurance Scheme (NHIS) estimates have experienced a significant decrease in recent years, dropping from 8.4% in 2017 [14] to 7.5% in 2018 [15], 7.0% in 2019 [16], and 5.8% in 2020 [17]. The study aims to evaluate the frequency of different patterns of asthma control among a cohort of asthmatic patients, shedding light on the variability in control levels within the population. By understanding these patterns, healthcare providers can enhance individualized treatment strategies, contributing to improved overall asthma management and patient outcomes. The study involved 143 patients with asthma, with a mean age of 7.14 ± 3.49 years and a duration of 25.72 ± 10.24 months, with a majority of male 72 (50.3%) and female 71 (49.7%). Out of 143 patients, 45.5%, 30.1%, and 24.5% had well-controlled, partially controlled, and poorly controlled asthma, respectively. The survey was completed by 2429 children diagnosed with asthma (or their caretakers). The frequency of uncontrolled asthma was 46 percent. Patients examined for a non-respiratory ailment had a 35% frequency of uncontrolled asthma, compared to 54% for respiratory complaints. Children with uncontrolled asthma who were examined for a non-respiratory-related complaint had a higher likelihood of missing one or more school days in the preceding four weeks than children with managed asthma (53% vs 24%) [18]. Urban vs. rural healthcare disparities reveal barriers like socioeconomic disparities, overcrowding, and lack of education. Rural areas have limited access, fewer specialists, and longer travel distances, impacting disease management and outcomes. Understanding these differences can inform care delivery strategies [19]. The study found that 67.9% of patients had uncontrolled asthma, with a clear link between asthma management and quality of life. The cut-off for quality of life was 4.97. Most patients were using two or three anti-asthmatic medications, with oral pills and Short-acting beta 2-agonists (SABA) inhalers being the most popular combination. Uncontrolled asthma is associated with several characteristics, including male gender, marital status, comorbidities, and oral SABA usage. In middle-aged individuals, male gender, intermittent asthma, oral corticosteroid usage, and SABA use are all linked to poor asthma-related quality of life. Male gender, intermittent asthma, and usage of oral corticosteroids are all associated with poor asthma-related quality of life. These findings emphasize the need to control asthma in persons to enhance their quality of life [20].

The study was limited by its single-center cross-sectional design, relatively small sample size, non-probability consecutive sampling, and reliance on questionnaire-based assessment, which may introduce selection and reporting bias while limiting generalizability. Additionally,

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environmental triggers, medication adherence, and long-term clinical outcomes were not comprehensively evaluated. Future research should involve larger multicenter longitudinal studies incorporating objective pulmonary function monitoring, treatment adherence assessment, and environmental risk analysis to better understand determinants of poor asthma control and improve pediatric asthma management protocols.

CONCLUSIONS

Notably, the findings demonstrated that 45.5% of the participants had well-controlled asthma, indicating successful management strategies for a substantial proportion of the study population. However, 30.1% exhibited partially controlled asthma, suggesting a need for further intervention and optimization of treatment plans. Importantly, 24.5% of patients experienced poorly controlled asthma, signalling a subset that may require more intensive monitoring and tailored therapeutic approaches. These results underscore the heterogeneity of asthma control within the studied population and emphasize the importance of individualized management strategies. While a considerable number of patients achieved optimal control, a significant proportion still faces challenges in attaining the desired asthma control levels. The findings from this study contribute valuable insights to the understanding of asthma control patterns in the specific patient population.

Authors' Contribution

Conceptualization: MAJ
Methodology: MAJ, N, M, VKG
Formal analysis: N
Writing and Drafting: NFS, SLB, MAJ, N, M, VKG
Review and Editing: NFS, SLB, MAJ, N, M, VKG

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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