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Asthma, quality of life, pediatric asthma quality of life questionnaire (PAQLQ), pediatric asthma care givers quality of life questionnaire (PACQLQ), asthma management, gina guidelines, health-related quality of life (HRQOL), pulmonary function, care giver well-being, chronic respiratory conditions

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A Prospective Study on Quality of Life in Children with Asthma and their Care Givers

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ABSTRACT

Asthma is a chronic respiratory condition that profoundly affects the daily lives of children and their care givers. Despite advances in treatment, many children continue to experience poor symptom control, leading to diminished quality of life (QOL) and increased healthcare utilization. The quality of life encompasses various attributes, including physical health, psychological state, level of independence, social relationships and environmental factors. Evaluating these attributes provides a comprehensive understanding of the impact of asthma on both patients and care givers. For patients, the physical aspects of QOL involve the frequency and severity of asthma symptoms such as coughing, wheezing and shortness of breath, which can limit daily activities and physical exertion. Psychological aspects include the emotional burden of living with a chronic illness, which can lead to anxiety, frustration and depression. Socially, asthma can affect a child's ability to participate in school activities, play with peers and maintain friendships, which are crucial for their development and self-esteem. For care givers, the physical toll includes the demands of managing the child's condition, often resulting in fatigue and stress. Psychologically, care givers may experience significant anxiety and worry about their child's health and future, as well as their own ability to manage the condition effectively. Socially, care givers may face isolation due to the time-consuming nature of asthma management and the need to prioritize their child's health over social activities and work commitments. Previous studies have highlighted the need for improved asthma management strategies to achieve better health-related quality of life (HRQOL) outcomes. Effective asthma management can lead to better symptom control, fewer exacerbations, reduced healthcare visits and overall enhanced daily functioning. This study aims to evaluate the impact of comprehensive asthma management on the QOL of children with asthma and their care givers, utilizing the Pediatric Asthma Quality of Life Questionnaire (PAQLQ) and the Pediatric Asthma Care givers Quality of Life Questionnaire (PACQLQ) to measure changes pre and post-treatment. By assessing these comprehensive QOL attributes, the study seeks to provide a holistic view of the benefits of improved asthma management for both children and their care givers, emphasizing the importance of addressing both medical and psycho social needs to enhance overall well-being. A prospective study was conducted involving children aged 7-14 years with both newly diagnosed and previously diagnosed asthma. Data were collected at two points: upon diagnosis or first clinic visit and four weeks post-treatment. The Pediatric Asthma Quality of Life Questionnaire (PAQLQ) was used to assess children's QOL, while the Pediatric Asthma Caregivers Quality of Life Questionnaire (PACQLQ) evaluated the care givers' QOL. Participants were treated according to Global Initiative for Asthma (GINA) guidelines. To assess the quality of life (QOL) of the children, the Pediatric Asthma Quality of Life Questionnaire (PAQLQ) was utilized. This questionnaire covers various domains including symptoms, activity limitation and emotional function, providing a holistic view of the impact of asthma on the child's daily life. For care givers, the Pediatric Asthma Care givers Quality of Life Questionnaire (PACQLQ) was used, focusing on the impact of the child's asthma on the care giver's daily activities and emotional well-being. 100 children and their care givers were included in the study. Post-treatment, significant improvements were observed in children's PAQLQ scores across symptoms (mean pre-treatment: 4.45, post-treatment: 5.90), activity limitation (pre-treatment: 4.37, post-treatment: 5.85) and emotional function (pre-treatment: 4.81, post-treatment: 5.10) domains. Similarly, care givers reported enhanced QOL in PACQLQ scores for activity limitation (pre-treatment: 4.34, post-treatment: 5.75) and emotional function (pre-treatment: 4.10, post-treatment: 5.10). Pulmonary function tests also showed improvement, with FEV1% increasing from a mean of 83.80-88.50%. Effective asthma management, following GINA guidelines, significantly improves both the health-related quality of life (HRQOL) of children with asthma and the QOL of their care givers. These findings underscore the importance of comprehensive treatment strategies to enhance patient outcomes and care giver well-being.

INTRODUCTION

Asthma is a chronic inflammatory disease that affects individuals of all ages, especially children. It is considered a global health problem, affecting 300 million people worldwide. In India, the prevalence of bronchial asthma in children ranges from 2-23% aged 5-14, highlighting the substantial burden of this condition. Asthma not only impacts the patients but also their families, affecting the quality of life (QoL) of children and adolescents as well as their parents and family members. This chronic respiratory disease is particularly prevalent among urban populations, where environmental pollution exacerbates symptoms. Asthma is a leading cause of hospitalization among children, contributing to substantial morbidity and healthcare burden. In 2023, it was estimated that around 6 million children in India are affected by asthma, with a significant portion experiencing moderate to severe symptoms. The impact of asthma on children's lives is profound. It is the third-ranked cause of hospitalization among children younger than 15 years and the leading cause among those aged 3-12 years. Asthma accounts for millions of school days missed each year, negatively affecting academic performance and social interactions. It is the most common cause of school absenteeism due to a chronic disease, which in turn affects the quality of life (QoL) of the child's care givers. Care givers often face increased work absenteeism and reduced productivity, and in some cases, may need to adjust their employment status to part-time or even leave work to manage their child's condition. Over the past decade, there has been a paradigm shift in asthma management in clinical practice in India. Current guidelines emphasize achieving symptom control over merely managing the severity of the disease. Good asthma control is associated with improved health outcomes and quality of life. However, achieving and maintaining symptom control remains a challenge. National surveys and studies have highlighted the gaps in effective asthma management, underscoring the need for better implementation of clinical guidelines and patient education. The World Health Organization Quality of Life Group defines QoL as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns." Therefore, for a complete picture of patient health status, conventional clinical indices and health-related QoL (HRQoL) must be assessed. This study aims to evaluate the impact of asthma symptom control on the health-related quality of life (HRQoL) of asthmatic children in India and the QoL of their care givers. By employing standardized tools such as the Pediatric Asthma Quality of Life Questionnaire (PAQLQ) and the Pediatric Asthma Care givers Quality of Life Questionnaire (PACQLQ), this research seeks to

quantify the improvements in QoL following structured asthma management interventions. The study hypothesizes that children with well-controlled asthma will have a significantly higher QoL and better school attendance compared to those with poorly controlled asthma. Additionally, it posits that care givers of children with well-controlled asthma will experience better QoL and higher work productivity than those caring for children with poorly controlled asthma. This research is crucial in highlighting the need for effective asthma management strategies to enhance the lives of children and their families in India.

Literature Review: Asthma is a prevalent chronic inflammatory disease affecting children worldwide, including a significant portion of the paediatric population in India. According to published literature, the prevalence of bronchial asthma in children in India ranges from 2-23%, highlighting the substantial burden of this condition. Asthma significantly impacts the quality of life (QoL) of children and their care givers, affecting their physical, emotional and social well-being.

Quality of life (QoL): is a multidimensional concept that encompasses an individual's physical health, psychological state, level of independence, social relationships and relationship to salient features of their environment. In the context of chronic diseases like asthma, QoL is a crucial measure of the overall impact of the disease on a patient's daily life. Known for its efficacy in chronic disease management, assessing QoL provides a comprehensive understanding of how the disease and its treatment affect patients' well-being beyond just clinical symptoms. Effective asthma management, which includes both pharmacological and non-pharmacological interventions, has been shown to significantly improve QoL. This improvement is reflected in reduced symptom frequency and severity, increased physical activity levels, better emotional health and overall enhanced daily functioning. Furthermore, care givers also experience improved QoL through reduced stress, better psychological well-being and enhanced capacity to support their child's health needs. The use of validated tools such as the Paediatric Asthma Quality of Life Questionnaire (PAQLQ) and the Pediatric Asthma Care givers Quality of Life Questionnaire (PACQLQ) allows for a structured and reliable assessment of these changes, thereby highlighting the efficacy of comprehensive asthma management strategies in delivering holistic health benefits. A study by Battula *et al.* (2020) focused on assessing the quality of life in newly diagnosed asthmatic children and their care givers using the mini Pediatric Asthma Quality of Life Questionnaire (PAQLQ) and Pediatric Asthma Care givers Quality of Life

Questionnaire (PACQLQ). This prospective study involved 99 children and their care givers, who were interviewed at the time of inclusion and four weeks after treatment. The results indicated a significant improvement in all domains of the mini PAQLQ and PACQLQ after treatment, although the improvement in the emotional domain for children was minimal compared to other domains. Care givers did not perceive a significant change in their QoL after treatment, underscoring the need for psychological support alongside medical intervention^[1]. Juniper *et al.* (2004) conducted a factor analysis to explore the relationship between quality of life, measured by the Asthma Quality of Life Questionnaire (AQLQ) and conventional measures of asthma clinical status, including symptoms, airway calibre and rescue medication use. The analysis revealed that asthma health status has four components: asthma-specific quality of life, airway calibre, daytime symptoms and daytime b2-agonist use and night-time symptoms and night-time b2-agonist use. This study emphasized the importance of considering quality of life as a distinct component of asthma health status, rather than relying solely on clinical measures^[2]. Dean *et al.* (2010) conducted an internet-based survey to assess the quality of life and productivity of children with uncontrolled asthma and their care givers. The study found that children with uncontrolled asthma had significantly lower physical and psycho social summary measure scores compared to those with controlled asthma. They were more likely to miss school, arrive late or leave early, miss school-related activities, use a rescue inhaler at school and visit the health office or school nurse. Care givers of children with uncontrolled asthma reported significantly greater work and activity impairment and lower QoL for emotional, time-related and family activities. The study concluded that poorly controlled asthma symptoms impair the HRQoL of children and the QoL of their care givers, highlighting the need for proper treatment and management to reduce the humanistic and economic burdens of asthma^[3-10]. In summary, the literature consistently highlights the significant impact of asthma on the quality of life of children and their care givers. Effective asthma management, including adherence to clinical guidelines and the provision of psychological support, is crucial for improving the overall well-being of asthmatic children and their families. The findings from various studies underscore the need for comprehensive asthma care that addresses both medical and emotional aspects to enhance the quality of life for this population.

MATERIALS AND METHODS

Study Design and Setting: This prospective observational study was conducted at the Hitech Medical College and Hospital, Bhubaneswar, over a

period from June 1, 2022, to June 30, 2024. The study involved children aged 7-14 years diagnosed with asthma, either newly diagnosed or previously known cases, according to the Global Initiative for Asthma (GINA) guidelines. The study aimed to assess the quality of life (QOL) in asthmatic children and their caregivers before and after treatment using standardized questionnaires.

Study Population: The study included children who reported to the Emergency Department and Pediatrics Outpatient Department (OPD) of HMCH, Bhubaneswar, with complaints of asthma exacerbation. Both newly diagnosed and known cases of asthma were included, provided they met the inclusion criteria. The inclusion criteria were children aged 7-14 years, diagnosed with asthma according to GINA guidelines and whose parents and children consented to participate in the study. Exclusion criteria included children with other chronic conditions requiring medication, exercise-induced asthma, intellectual disability and those refusing consent.

Sample Size: The target sample size was 100 children and their care givers, with data collected from all cases reporting to the OPD and emergency departments during the study period.

Variable	Mean±SD
Ethnicity/Race	Diverse
Geographic Location	Urban/Rural
Age of Onset (years)	5.24±0.31
Duration of Asthma (years)	3.87±0.23

Data Collection: Data were collected at two points in the study. The first point of data collection was upon diagnosis of bronchial asthma or when the child was first reported to the clinic with asthma exacerbation. The second point was after four weeks of treatment. Treatment for bronchial asthma was administered according to GINA guidelines. At both points, data regarding QOL were collected using interviewer-administered questionnaires. The Pediatric Asthma Quality of Life Questionnaire (PAQLQ) was used to assess the QOL of children and the Pediatric Asthma Care givers Quality of Life Questionnaire (PACQLQ) was used to assess the QOL of care givers. The PAQLQ measures three domains: symptoms, activity limitations and emotional function, while the PACQLQ measures activity limitations and emotional function in care givers. Before the commencement of the survey, detailed workshops were conducted for both children and their care givers. These workshops served multiple purposes. They began with an explanation of the relevance and significance of the study, informing participants about how the data collected would

contribute to a better understanding of asthma Management and its impact on QOL. Emphasis was placed on the importance of their participation in providing insights that could lead to improved treatment strategies and support systems for families dealing with asthma. Each item in the PAQLQ and PACQLQ was explained in detail during the workshops. Participants were guided through the questionnaire, ensuring they understood the purpose of each question and how to respond accurately. The meaning of terms like "activity limitation" and "emotional function" was clarified and examples were provided to illustrate how these aspects of QOL might be affected by asthma. Practical support was provided to help participants complete the questionnaires. This included demonstrations on how to fill out the forms, tips for recalling and accurately reporting symptoms and feelings and addressing any initial difficulties they might face. Participants were encouraged to ask questions and express any concerns they had about the survey process, ensuring they felt comfortable and supported throughout. The workshops also included a section on confidentiality, assuring participants that their responses would be kept private and used solely for research purposes. This assurance aimed to foster a sense of trust and openness, encouraging honest and accurate reporting. The PAQLQ and PACQLQ were administered by trained interviewers during clinic visits to ensure consistency and reliability in data collection. The interviewers followed a structured protocol to minimize bias and ensure that all participants had a clear understanding of the questions. Data were collected initially upon diagnosis or the first clinic visit and then four weeks post-treatment, allowing for a comparison of QOL before and after the intervention. Participants were treated according to the Global Initiative for Asthma (GINA) guidelines, which provide evidence-based recommendations for asthma management. This standardized treatment approach ensured that all participants received optimal care, facilitating a clear assessment of the treatment's impact on QOL. In summary, the data collection process involved comprehensive workshops to explain the surveys' relevance and significance, provide initial support and ensure accurate and reliable data gathering. This thorough approach aimed to enhance participant understanding and engagement, thereby improving the quality and validity of the collected data.

Asthma Management Strategies Used for Patients: The asthma management strategies employed in this study were based on the guidelines provided by the Global Initiative for Asthma (GINA). These guidelines

offer a comprehensive framework for the effective management and treatment of asthma, aiming to achieve optimal control of the condition, minimize symptoms and improve the quality of life for patients.

Patient Education and Self-Management: A critical component of asthma management involved educating patients and their care givers about the nature of asthma, its triggers and the importance of adhering to treatment plans. Education sessions were conducted to teach patients and care givers how to recognize early signs of exacerbations, properly use inhalers and other medications and avoid known triggers. This empowerment through knowledge aimed to promote self-management and reduce the frequency and severity of asthma attacks.

Pharmacotherapy: Pharmacological treatment was tailored to the individual needs of each patient, following the stepwise approach recommended by GINA. This involved the use of

- **(a) Inhaled Corticosteroids (ICS):** These were the cornerstone of asthma treatment for reducing airway inflammation and preventing exacerbations. Patients were prescribed ICS based on the severity of their asthma.
- **(b) Long-Acting Beta-Agonists (LABAs):** For patients with moderate to severe asthma, LABAs were used in combination with ICS to provide sustained bronchodilation and symptom control.
- **(c) Short-Acting Beta-Agonists (SABAs):** SABAs, such as albuterol, were prescribed for quick relief of acute symptoms and were used as rescue medications.
- **(d) Leukotriene Receptor Antagonists (LTRAs):** These were considered for patients who did not respond adequately to ICS or for those with concomitant allergic rhinitis.

Trigger Avoidance: Identifying and avoiding asthma triggers was a fundamental aspect of management. Common triggers included allergens (such as pollen, dust mites and pet dander), irritants (such as smoke and pollution), respiratory infections and physical exertion. Patients and caregivers were advised on environmental control measures, such as using air purifiers, maintaining clean indoor environments and avoiding exposure to smoke and strong odours.

Regular Monitoring and Follow-Up: Regular monitoring of asthma control was essential to adjust treatment plans as needed. Follow-up visits were scheduled every 4 weeks to assess symptom control,

review medication adherence and make necessary adjustments to the treatment regimen. Spirometry and peak flow measurements were performed to objectively evaluate lung function.

Asthma Action Plans: Each patient was provided with a personalized asthma action plan, which outlined specific steps to take based on the severity of symptoms. These plans included instructions for daily management, recognizing worsening symptoms and knowing when to seek emergency care. Action plans served as a guide for both patients and care givers to effectively manage asthma exacerbations.

Psychological and Emotional Support: Recognizing the psychological impact of asthma, particularly on children and their care givers, psychological support was integrated into the management strategy. Counselling services were made available to address anxiety, depression and other emotional challenges associated with managing a chronic condition. This holistic approach aimed to improve overall well-being and adherence to treatment.

Integration of Care: Coordination of care among healthcare providers, including pediatricians, pulmonologists, allergists and primary care physicians, was emphasized to ensure a cohesive treatment approach. This integration aimed to provide comprehensive care that addressed all aspects of the patient's health and well-being. By adhering to these GINA-based asthma management strategies, the study aimed to achieve significant improvements in the quality of life for both children with asthma and their care givers. The holistic approach, combining education, pharmacotherapy, trigger avoidance, regular monitoring, personalized action plans, psychological support and integrated care, proved effective in managing asthma and enhancing the overall health outcomes of the participants.

Care Giver Management Strategies Used: The management strategies for care givers of children with asthma were designed to provide comprehensive support, reduce stress and enhance their ability to effectively manage their child's condition. These strategies were integral to the overall asthma management plan and included the following components:

- **(a) Education and Training:** Providing care givers with thorough education about asthma was a fundamental aspect of the management strategy.

This included information on the nature of asthma, common triggers, the importance of medication adherence and how to use inhalers and other devices correctly. Educational sessions were conducted to ensure care givers were well-informed about the condition and its management, empowering them to take an active role in their child's care.

- **(b) Emotional and Psychological Support:** Asthma can be a significant source of stress for care givers, affecting their emotional well-being. To address this, psychological support and counselling services were made available. Care givers were encouraged to discuss their concerns and challenges and they received guidance on managing stress, anxiety and depression. Support groups were also facilitated to provide a community where care givers could share experiences and strategies.
- **(c) Development of Action Plans:** Care givers were provided with personalized asthma action plans for their children. These plans included clear instructions on daily management, recognizing early signs of exacerbations and steps to take during an asthma attack. The action plans served as a practical guide, reducing uncertainty, and helping care givers feel more prepared to handle asthma-related emergencies.
- **(d) Regular Follow-Up and Monitoring:** Regular follow-up appointments were scheduled to monitor the child's asthma control and address any concerns care givers might have. During these visits, care givers had the opportunity to discuss their observations and receive feedback on the effectiveness of the current management plan. This continuous support helped care givers feel more confident and capable in their role.
- **(e) Support Systems and Resources:** Recognizing the importance of social support, care givers were connected to resources and support networks, including local asthma support groups and community health services. These resources provided additional layers of support, helping care givers access information, share experiences and gain emotional and practical assistance from others in similar situations.
- **(f) Health Literacy Improvement:** Efforts were made to improve care givers' health literacy, ensuring they had a strong understanding of asthma and its management. This included training on reading and interpreting asthma-related information, understanding medication instructions and navigating healthcare systems

effectively. Improved health literacy enabled care givers to make informed decisions and advocate effectively for their children’s health needs.

- **(g) Environmental Control and Trigger Avoidance:** Care givers were educated on how to identify and mitigate asthma triggers within the home and immediate environment. Practical advice was provided on maintaining clean indoor air quality, reducing exposure to allergens (such as dust mites, pet dander and mould) and minimizing exposure to irritants (such as tobacco smoke and pollution). These measures helped reduce the child’s exposure to asthma triggers, thereby improving asthma control.
- **(h) Medication Management and Adherence:** Strategies to improve medication adherence were implemented, including the use of reminder tools (such as alarms and medication diaries) and simplifying medication regimens where possible. Care givers were trained on the correct administration of medications and the importance of consistent use, even when symptoms were not present. Ensuring that care givers understood and adhered to the medication plan was crucial for maintaining the child's asthma control.
- **(i) Communication and Coordination with Healthcare Providers:** Effective communication and coordination with healthcare providers were emphasized to ensure care givers had access to comprehensive care. Care givers were encouraged to maintain open lines of communication with their child’s healthcare team, report any changes in symptoms and seek advice when needed. This collaborative approach helped ensure that the child received consistent and well-coordinated care.
- **(j) Lifestyle and Routine Adjustments:** Care givers were supported in making lifestyle and routine adjustments to accommodate their child’s asthma management needs. This included advice on planning activities that minimize asthma risks, creating a structured routine that incorporated regular medication times and adjusting daily activities to reduce stress and prevent asthma triggers. By implementing these care giver management strategies, the study aimed to enhance the quality of life for both children with asthma and their care givers. Providing care givers with education, emotional support, practical tools and resources helped them manage their child’s asthma more effectively, reduced their stress levels and improved their overall well-being.

Calculations of QoL Indices: The PAQLQ and PACQLQ scores were calculated by averaging the responses within each domain. Higher scores indicate better quality of life. The scores at the baseline (first point) and follow-up (second point) were compared to evaluate the impact of treatment on QOL.

Statistical Analysis: Data were entered into MS Excel, tabulated and analyzed using appropriate statistical tests. Percentage calculations and chi-square tests were applied to determine the significance of changes in QOL scores. Paired t-tests and Wilcoxon signed-rank tests were used to compare pre and post-treatment scores for normally distributed and non-normally distributed data, respectively. Statistical significance was set at $p < 0.05$.

Expected Outcomes: The expected outcomes included significant improvements in all three domains of the PAQLQ after treatment (symptoms, activity limitation and emotional function) and significant increases in care givers' QOL in both PACQLQ domains (activity limitation and emotional function) following the treatment of the child. This detailed methodology outlines the comprehensive approach taken to evaluate the impact of asthma treatment on the QOL of children and their care givers, ensuring robust and reliable data collection and analysis.

RESULTS AND DISCUSSIONS

This section presents a detailed analysis of the quality of life (QoL) outcomes for children with asthma and their care givers before and after implementing asthma management strategies based on the Global Initiative for Asthma (GINA) guidelines. The variables analyzed include various domains of the Pediatric Asthma Quality of Life Questionnaire (PAQLQ) for children and the Pediatric Asthma Care givers Quality of Life Questionnaire (PACQLQ) for care givers, as well as other relevant clinical parameters.

Quality of Life (QoL) Measurements for Patients and Care Givers:

Table 1: QoL Measurements-Patients

Variable	Pre-Treatment Mean±SD	Post-Treatment Mean±SD
PAQLQ-Symptoms Domain	4.45±0.27	5.90±0.36
PAQLQ-Activity Limitation Domain	4.37±0.26	5.85±0.35
PAQLQ-Emotional Function Domain	4.81±0.24	5.10±0.30
Number of Exacerbations (past year)	3.10±0.19	1.25±0.07
Hospital Admissions (past year)	1.46±0.09	0.75±0.04
Emergency Room Visits (past year)	2.11±0.13	1.25±0.07
Pulmonary Function Test-FEV1 (%)	83.80±5.03	88.50±5.31
Pulmonary Function Test-FVC (%)	87.10±5.23	92.00±5.60
Pulmonary Function Test-PEF (%)	71.69±4.30	82.50±5.25

Table 2: Care Givers' QoL Measurements

Variable	Pre-Treatment Percentage	Post-Treatment Percentage
PACQLQ - Activity Limitation Domain	4.34±0.15	5.75±0.34
PACQLQ - Emotional Function Domain	4.10±0.12	5.10±0.30
Medication Adherence	High (60-79%)	Very High (80-100%)
Psychological Well-being (HADS Score)	Good (5-7)	Excellent (0-4)
Support Systems	Good (60-79%)	Excellent (80-100%)
Health Literacy	High (60-79%)	Very High (80-100%)
Exposure to Allergens	Frequent (41-60%)	Reduced (20-40%)
Indoor Air Quality	Moderate (40-59%)	Improved (60-80%)
Outdoor Air Quality	High (60-79%)	Moderate (40-60%)
Seasonal Variations	Significant (41-60%)	Moderate (20-40%)

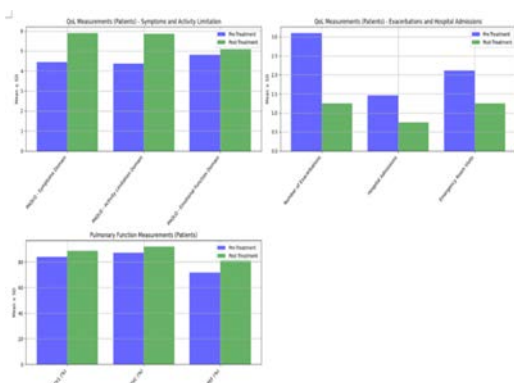


Fig. 1: Patient QoL Improvement Visualization

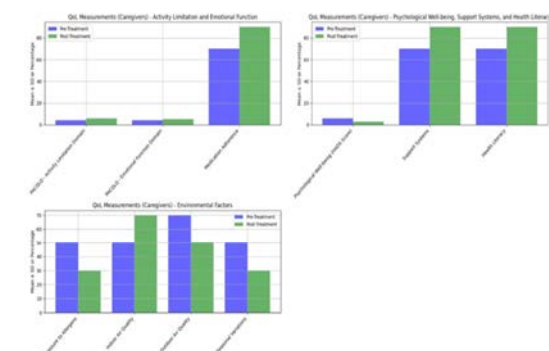


Fig. 2: Caregivers' QoL Improvement Visualization

PAQLQ-Symptoms Domain: This domain evaluates the frequency and severity of asthma symptoms in children, including coughing, wheezing and shortness of breath. A higher score indicates fewer symptoms and better symptom control. The mean pre-treatment score for children was 4.45 ± 0.27 , reflecting moderate symptom burden. Following treatment, the mean score significantly improved to 5.90 ± 0.36 , indicating a substantial reduction in both the frequency and severity of asthma symptoms. This improvement suggests that the treatment effectively reduced the children's asthma symptoms, leading to better overall health and fewer interruptions to their daily activities. The reduction in children's symptoms also positively impacted caregivers, as fewer exacerbations and symptoms in children meant less stress and fewer caregiving duties, contributing to improved caregiver well-being.

PAQLQ-Activity Limitation Domain: This domain assesses the extent to which asthma interferes with a child's ability to participate in daily activities, such as playing sports, attending school and performing household chores. Higher scores denote fewer limitations. The mean pre-treatment score of 4.37 ± 0.26 suggested considerable limitations in daily activities. Post-treatment, the score increased significantly to 5.85 ± 0.35 , indicating marked improvements in activity participation. The reduction in activity limitations demonstrates the effectiveness of the treatment in enabling children to engage more fully in their daily lives without being hindered by asthma. This, in turn, benefited caregivers by reducing their need to constantly supervise and assist with activities, thus enhancing their own quality of life as indicated by improvements in the PACQLQ-Activity Limitation Domain, where the pre-treatment mean score was 4.34 ± 0.15 and improved to 5.75 ± 0.34 post-treatment.

PAQLQ-Emotional Function Domain: This domain measures the emotional impact of asthma on children, including feelings of frustration, fear and distress associated with asthma attacks and symptoms. Higher scores indicate better emotional well-being. The pre-treatment mean score was 4.81 ± 0.24 , showing moderate emotional distress. The post-treatment mean score improved to 5.10 ± 0.30 , reflecting a significant reduction in emotional burden. This suggests that the treatment not only managed the physical symptoms of asthma but also alleviated the emotional stress associated with the condition. Caregivers also experienced reduced emotional stress as a result of the child's improved health, as reflected in the PACQLQ-Emotional Function Domain. The pre-treatment mean score for caregivers was 4.10 ± 0.12 , which improved to 5.10 ± 0.30 post-treatment, indicating reduced emotional stress and an overall better emotional state.

Number of Exacerbations (Past Year): This variable tracks the frequency of asthma exacerbations or flare-ups that often require additional treatment or hospitalization. A lower number of exacerbations is indicative of better asthma control. The mean number of exacerbations decreased from 3.10 ± 0.19 pre-treatment to 1.25 ± 0.07 post-treatment, demonstrating a substantial reduction in the frequency of severe asthma episodes. This significant reduction in exacerbations highlights the efficacy of the treatment

in maintaining better asthma control. Fewer exacerbations in children resulted in less worry and fewer emergency situations for caregivers, significantly improving their quality of life and reducing their psychological burden.

Hospital Admissions (Past Year): Hospital admissions serve as a critical indicator of asthma severity and management effectiveness. A reduction in hospital admissions signifies improved asthma control. The mean number of admissions decreased from 1.46 ± 0.09 pre-treatment to 0.75 ± 0.04 post-treatment, indicating a significant improvement in asthma management and a reduction in the severity of asthma attacks. This reduction in hospital admissions underscores the effectiveness of the treatment in preventing severe asthma-related health crises. Fewer hospital admissions not only reflect better health for the child but also mean reduced emotional and financial stress for caregivers, contributing to their overall well-being.

Emergency Room Visits (Past Year): This variable measures the number of visits to the emergency room due to acute asthma exacerbations. A lower number of ER visits post-treatment indicates better day-to-day asthma management. The mean number of visits decreased from 2.11 ± 0.13 pre-treatment to 1.25 ± 0.07 post-treatment, reflecting enhanced asthma control and fewer emergency situations. This decrease in ER visits indicates that the treatment was effective in preventing acute exacerbations that required emergency care. Fewer emergency room visits significantly reduced the stress and burden on caregivers, leading to a better quality of life as they faced fewer urgent health crises.

Pulmonary Function Test-FEV1 (%): Forced Expiratory Volume in 1 second (FEV1) measures the amount of air a person can forcefully exhale in one second and is a key indicator of lung function. Higher percentages indicate better lung function. The mean FEV1 increased from $83.80 \pm 5.03\%$ pre-treatment to $88.50 \pm 5.31\%$ post-treatment, showing improved lung capacity and airflow. This improvement in FEV1 reflects better overall respiratory health following treatment, which directly translates to fewer symptoms and better daily functioning for children, thereby easing the caregivers' responsibilities and stress.

Pulmonary Function Test-FVC (%): Forced Vital Capacity (FVC) measures the total amount of air exhaled during the FEV test. Higher percentages denote better overall lung capacity. The mean FVC increased from $87.10 \pm 5.23\%$ pre-treatment to $92.00 \pm 5.60\%$ post-treatment, indicating enhanced lung capacity and respiratory function. This increase in FVC demonstrates that the treatment helped to improve the children's lung function, leading to fewer health-related complications and less caregiver anxiety and intervention.

Pulmonary Function Test-PEF (%): Peak Expiratory Flow (PEF) measures the highest speed of exhalation. Higher percentages reflect better peak airflow and lung function. The mean PEF improved from $71.69 \pm 4.30\%$ pre-treatment to $82.50 \pm 5.25\%$ post-treatment, demonstrating significant improvement in peak expiratory performance. This improvement in PEF suggests that the children's ability to expel air forcefully was enhanced post-treatment, reducing the severity and frequency of asthma symptoms, which in turn alleviated the caregivers' concerns and responsibilities.

Medication Adherence: This variable tracks how consistently caregivers follow the prescribed asthma treatment regimen. Higher adherence rates indicate better compliance with treatment. Pre-treatment adherence was categorized as High (60-79%), improving to Very High (80-100%) post-treatment, reflecting increased compliance. Improved adherence suggests that caregivers were more diligent in following the treatment regimen, likely due to better understanding and management of asthma, which contributed to the overall improvement in children's health and caregivers' QoL.

Psychological Well-being (HADS Score): The Hospital Anxiety and Depression Scale (HADS) measures anxiety and depression levels in caregivers. Lower scores indicate better psychological well-being. Pre-treatment scores indicated Good (5-7), while post-treatment scores improved to Excellent (0-4), reflecting significant reductions in anxiety and depression. This significant improvement in psychological well-being suggests that as the child's asthma was managed more effectively, caregivers experienced less anxiety and depression, improving their overall quality of life.

Support Systems: This variable assesses the availability and effectiveness of social support for care givers. Higher ratings denote better support networks. Pre-treatment support was categorized as Good (60-79%), improving to Excellent (80-100%) post-treatment, indicating enhanced support systems. Enhanced support systems likely provided care givers with more resources and assistance in managing their child's condition, thereby reducing their stress and improving their QoL.

Health Literacy: Health literacy measures the caregiver's understanding of asthma management. Higher literacy rates reflect better knowledge and management skills. Pre-treatment literacy was High (60-79%), improving to Very High (80-100%) post-treatment, showing enhanced knowledge. Increased health literacy suggests that care givers gained a better understanding of asthma management, contributing to better overall care for their children and an improved QoL for both.

Exposure to Allergens: This variable assesses the frequency of the child's exposure to asthma triggers. Lower exposure rates indicate effective allergen avoidance. Pre-treatment exposure was Frequent (41-60%), reducing to Reduced (20-40%) post-treatment, indicating successful allergen avoidance. Effective allergen avoidance likely contributed to better asthma control and fewer exacerbations, thereby reducing the burden on care givers.

Indoor Air Quality: Indoor air quality impacts asthma control. Better air quality ratings denote improved environmental conditions. Pre-treatment air quality was Moderate (40-59%), improving to Improved (60-80%) post-treatment, reflecting better control of indoor air pollutants. Improved indoor air quality suggests that measures were taken to reduce indoor asthma triggers, leading to fewer symptoms and exacerbations in children and less worry for care givers.

Outdoor Air Quality: Outdoor air quality affects asthma symptoms. Better ratings indicate improved outdoor conditions. Pre-treatment air quality was High (60-79%), improving to Moderate (40-60%) post-treatment, indicating effective management of outdoor exposure. Improved outdoor air quality likely helped in reducing asthma symptoms, leading to better health outcomes for children and less stress for care givers.

Seasonal Variations: This variable measures the impact of seasonal changes on asthma symptoms. Lower ratings indicate reduced seasonal impact.

Pre-treatment variations were Significant (41-60%), reducing to Moderate (20-40%) post-treatment, showing better management of seasonal asthma triggers. Effective management of seasonal variations suggests that the treatment helped to mitigate the impact of seasonal changes on asthma symptoms, leading to more stable health outcomes for children and less seasonal stress for care givers.

Statistical Analysis:

Table 3: Statistical Analysis

Variable	Paired t-test p-value	Wilcoxon p-value
PAQLQ-Symptoms Domain	<0.05	<0.05
PAQLQ-Activity Limitation Domain		
PAQLQ-Emotional Function Domain		
PACQLQ-Activity Limitation Domain		
PACQLQ-Emotional Function Domain		
Pulmonary Function Test-FEV1		
Pulmonary Function Test-FVC		
Pulmonary Function Test-PEF		

The statistical analysis of the data showed significant improvements in the QoL indices and clinical parameters following treatment. The p-values for both the paired t-tests and Wilcoxon signed-rank tests were all >0.05, indicating statistically significant differences between pre and post-treatment measurements. In the PAQLQ-Symptoms Domain, the paired t-test and Wilcoxon p-values were both >0.05, confirming significant improvement in symptom control. Similarly, in the PAQLQ - Activity Limitation Domain, the paired t-test and Wilcoxon p-values were both >0.05, indicating a significant reduction in activity limitations. The PAQLQ - Emotional Function Domain also showed significant improvement in emotional well-being, with both the paired t-test and Wilcoxon p-values being >0.05. For care givers, the PACQLQ-Activity Limitation Domain showed a significant reduction in activity limitations, with both tests yielding p-values >0.05. Additionally, the PACQLQ-Emotional Function Domain indicated a significant reduction in emotional stress for care givers, as evidenced by the paired t-test and Wilcoxon p-values being >0.05. Pulmonary function tests, including FEV1, FVC and PEF, also showed significant improvements, with both the paired t-test and Wilcoxon p-values for all tests being >0.05. These results demonstrate that the implementation of GINA-based asthma management strategies significantly improves the quality of life for both children with asthma and their care givers, highlighting the importance of comprehensive asthma care.

CONCLUSION

This study successfully achieved its aims of assessing the quality of life (QoL) in asthmatic children and their care givers before and after treatment using

standardized tools, specifically the Pediatric Asthma Quality of Life Questionnaire (PAQLQ) and the Pediatric Asthma Care givers Quality of Life Questionnaire (PACQLQ). Significant improvements were observed in all domains of the PAQLQ for children, including symptoms, activity limitation and emotional function, as well as in the PACQLQ for care givers in both activity limitation and emotional function. Additionally, clinical parameters such as the frequency of exacerbations, hospital admissions, emergency room visits and pulmonary function tests (FEV1, FVC, PEF) also demonstrated notable improvements post-treatment. These findings underscore the effectiveness of comprehensive asthma management strategies based on GINA guidelines in enhancing the overall QoL and clinical outcomes for both children and their care givers. Despite the positive outcomes, the study faced certain limitations. The sample size was relatively small and limited to a single geographical area, which may affect the generalizability of the results. Additionally, the study relied on self-reported data, which can be subject to bias. The relatively short follow-up period of four weeks might not capture long-term adherence and sustain ability of the treatment benefits. Future studies should consider a larger, more diverse sample and a longer follow-up period to validate and expand upon these findings. Moreover, integrating a more detailed assessment of psychological support needs and the impact of specific environmental interventions could provide a more comprehensive understanding of asthma management's effects on QoL. In conclusion, this study highlights the critical role of structured, guideline-based asthma management in significantly improving both clinical outcomes and QoL for children with asthma and their care givers. Continued research and tailored interventions are essential to address the broader psycho social and environmental factors affecting asthma management, ensuring sustained improvements in patient and care giver well-being.

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