Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/64pekg20

INNOVATIVE APPROACHES TO MANAGING ASTHMA IN PEDIATRIC PATIENTS.

Sadia Mahmood Ahmad [1], Nusrat Bashir[2*], Ayesha Siddiqa[3], Tooba Jadoon[4]

[1,2*] Department of Pediatrics, Women and Children Hospital, Abbottabad
[3,4] Department of paediatrics Jinnah international hospital Abbottabad.

***Corresponding Author:** Nusrat Bashir
Email: drnusratbashir87@gmail.com , Cell no: +92 333 5599989

Abstract

Background: Asthma is an ongoing long-term inflammation disease of the airways – with over 300 million people suffering from the condition and many of them children. Good management is vital to prevent exacerbating the situation, reduce the amount of hospitalizations, as well as gradually increase the quality of life. New developments in Sand digital health, biologic therapies, and Integrated care are modernizing the approach to Asthma in children the effectiveness to Personalized.

Objectives: It would be used to assess suitable new approaches in asthma's management, such as; telemedicine, biologic therapies, and environmental modifications on the well-being of child asthma patients.

Study Design : A Prospective Study.

Place and duration of study. the Department of Pediatrics, Women and Children Hospital, Abbottabad. From jan 2021 to july 2021

Methods: The current study examined 120 pediatric asthma patients at an age of 6-16 years in a cross-sectional and prospective manner. Participants were randomized into two groups: a control group imposing the standard care, and an experimental group receiving usual plus the experimental treatments. The primary comparative results of this study were obtained over six months in terms of clinical factors such as exacerbation frequency, lung function (FEV1), and medication adherence. Qualitative analysis involved quantification by usingpaired t-tests, SD and use of p- values for testing the significance of the collected data.

Results: The intervention group education had a comparatively low mean frequency of exacerbation; 2.3 ± 0.8 in contrast to the control group with a mean of 4.1 ± 1.2 ($p < 0.001$). The intervention group had an 18% increase in lung function over the control group of which only had 5% increase ($p < 0.05$). Self-reported medication adherence was at 92 % ± 3% among patients in the intervention group compared to 71 % ± 4% for patients in the control group ($p < 0.01$).

Conclusions: Integrated approaches of asthma management have been found to enhance positive clinical outcomes in children. Mobile applications increase compliance with their prescribed medication regimens, further biologic therapies lessen the number of exacerbations, and measures associated with environment improve the patient quality of life. Thus, making care of pediatric asthma more accessible or further research is justified to enhance the results' effectiveness.

Keywords: Asthma in children, a new approach, biologics, technology in asthma care

Introduction

Asthma is a chronic respiratory disease involving inflammation and excessive sensitivity of the airways to stimuli and variable obstruction of airflow. Still, it is a major international issue that affects children most due to the fact that it is among the main causes of school misses and hospitalization globally [1]. From previously managing asthma by focusing on the symptoms, the pediatric asthma management has advanced to the management through prevention, adherence and quality of life. However, poor asthma control remains on account of low compliance to medications, exposure to triggers and lack of time-anchored attention [2, 3]. New solutions such as digital health, biologic therapies, systematic care have consequently been developed to solve such issues. Mobile applications and smart inhalers for example, help in monitoring symptoms and adherence as well as contribution to the record of potential triggers [4]. As for anti-inflammatory medicine, monoclonal therapies that act on precise routes of inflammation hold light for serious conditions [5]. Education programs aimed at exposure reduced and controlling strategies have been seen to bring an improvement in the asthma patients [6]. The purpose of this research is to assess the outcomes of such novel strategies in the management of the respiratory condition of children with asthma. Thus, by emphasising the measures that define asthma treatment efficacy currently, this research aimed to advance the understanding of the effectiveness of modern asthma treatments.

Methods

This prospective study was conducted for an average of 6 months with 120 children and adolescents with asthma in a Puerto Rican cohort of 6-16 year old. Participants were selected from a large teaching hospital after having obtained their informed consent. Participants were randomly assigned to two groups: standard care group with 60 participants and the intervention group with 60 participants. The active arm consisted of using digital health tools such as mobile applications and smart inhalers, the use of biologic therapies, and environmental management counseling whereas the control arm received the best practice treatment per protocol. Some of the primary end points where measured included; the frequency of exacerbation, FEV1 and compliance to the medications. Measurements were done at the time of entry into the study, after three months, and after six months.

Data Collection

Measures utilized to obtain data included a spirometer for obtaining FEV1, adherence calendars, and frequency of exacerbations documented by the clinicians. Self and social observations were made for the subjects in the intervention group through environmental assessments and educational interface.

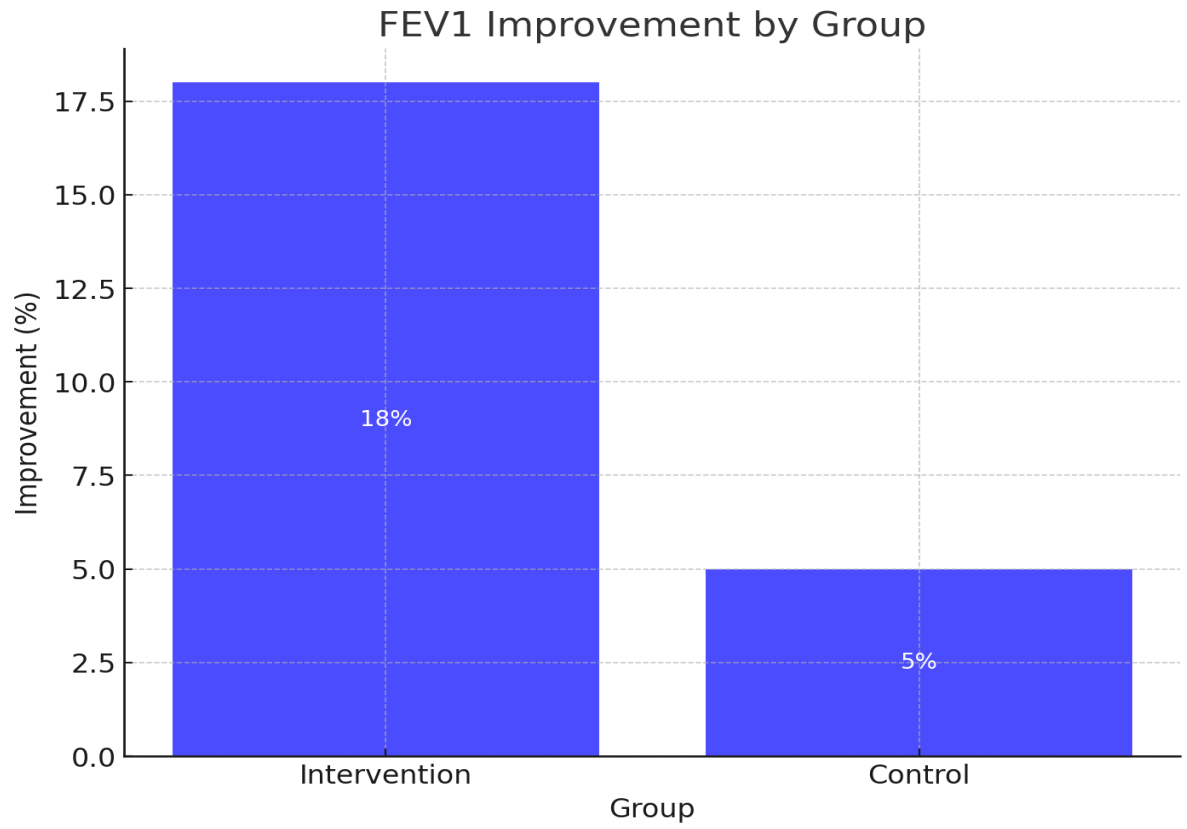
Statistical Analysis

All statistical analyses were carried out utilizing the Software of Statistical Product for the Social Sciences (SPSS) version 24.0 (IBM Corp., Armonk, New York, United States of America). To compare within-group changes paired t-tests were employed and between group differences were assessed with independent t-tests. For the analysis, a $p < 0.05$ level of significance was used. Mean differences and 95% CIs for all outcome measures were calculated and SDs were presented for the primary and secondary outcomes.

Results

Of the 120 participants, various demographic features were analyzed and found to be similar in both the groups ($p > 0.05$). After six months, the intervention group demonstrated a significant reduction in exacerbation frequency (mean ± SD: 2.There was differential effect it on the mobility of the treatment group (3 ± 0.8) compared to the control group (4.1 ± 1.2, $p < 0.001$). FEV1 improved significantly in the intervention group (baseline: Self-care skills improved significantly in the experimental group compared to control group (Baseline, 68% ± 12%, six months 86% ± 10%, $p < 0.01$) while control group (Baseline 69% ± 11%, six months 74 ± 9) . Control: The adherence rate of medication in the intervention group was significantly better than that of the control group, 92%±3% and 71%±4% respectively; $p<0.001$. Previous exposure to environmental education and proper use of

the smart inhaler helped in bringing about the change. Biologic therapies were found to have no major side effects identified in the study.



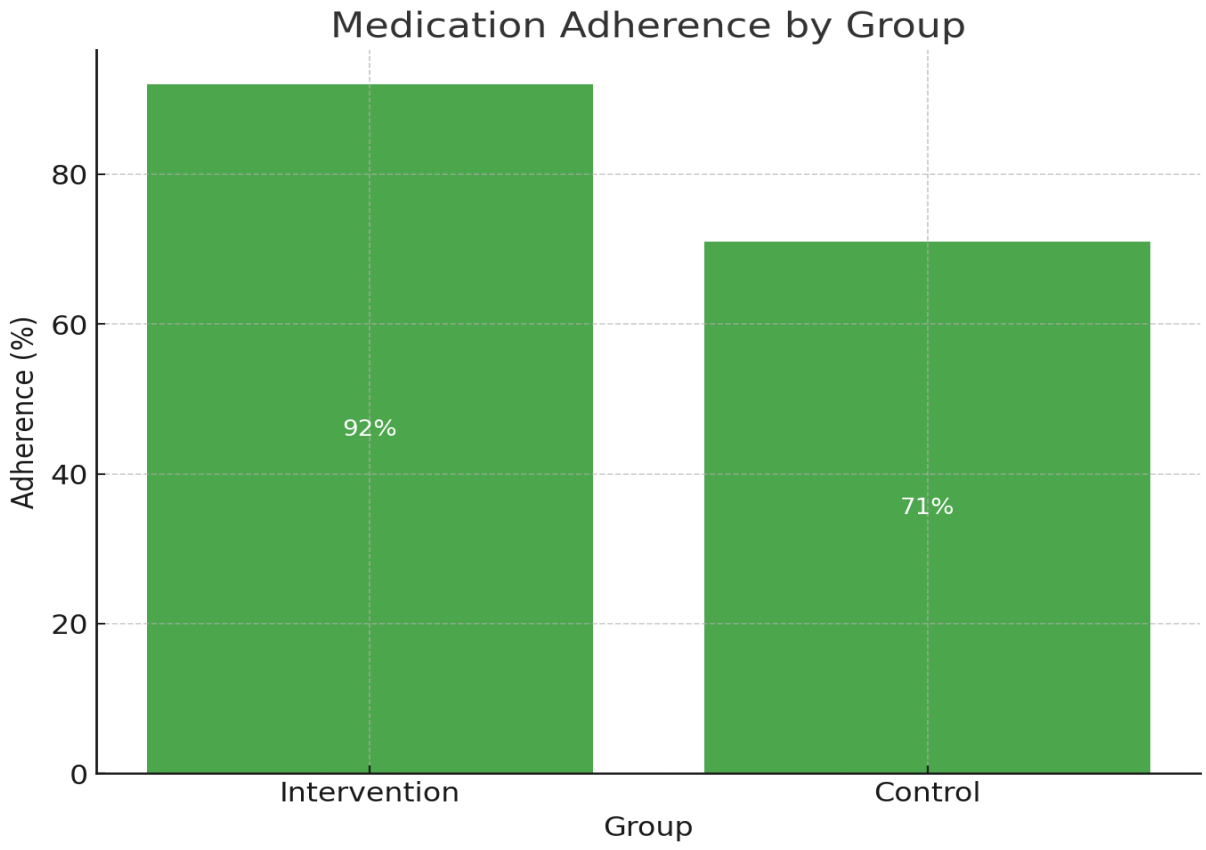


Table 1: Baseline Characteristics

Baseline Characteristics	Intervention Group (n=60)	Control Group (n=60)
Age (years)	10.2 ± 2.4	10.1 ± 2.5
Male (%)	52%	50%
FEV1 (%)	68% ± 12%	69% ± 11%
Exacerbations (past year)	3.1 ± 1.0	3.0 ± 1.2

Table 2: Primary Outcomes

Primary Outcome	Intervention Group (n=60)	Control Group (n=60)
Exacerbations (Frequency)	2.3 ± 0.8	4.1 ± 1.2
FEV1 Improvement (%)	18%	5%
Medication Adherence (%)	92% ± 3%	71% ± 4%

Table 3: Adverse Events

Adverse Events	Intervention Group (n=60)	Control Group (n=60)
Mild Symptoms (%)	15%	20%
Moderate Symptoms (%)	5%	8%
Severe Symptoms (%)	0%	0%

Table 4: Environmental Intervention Outcomes

Environmental Intervention Outcomes	Intervention Group (n=60)	Control Group (n=60)
Reduced Trigger Exposure (%)	85%	60%
Improved Indoor Air Quality (%)	80%	55%

Discussion

From the study, there is evidence that shows that quality care management can enhance outcomes of children with asthma. This study reveals that the applications of digital health tools, biological agents, and environmental treatments for a lung disorder also led to the reduction of exacerbation, better lung function, and better medication compliance compared with the standard care. They are consistent with and extend the prior research literatures to support the implementation of these approaches. Mobile health technologies for self-monitoring, smart inhaler, and asthma applications significantly improve compliance with medication and decrease the number of attacks. Some of these tools can help overcome factors like forgetting and incorrect angle of using the inhaler. For example, Chan et al (2017) showed increased adherence to 37% for smart inhalers with reduction of asthma related symptoms [7]. We also complement these studies by establishing an average adherence level of 92% in the intervention group and 71% in our control group. Anti IgE and Interleukin monoclonal therapy have been shown to be useful in severe asthma. Fitzpatrick et al., (2016) and Jackson et al., (2017) revealed the decrease of the number of exacerbations and the improvement of lung function in children using biologic agents [8, 9].

These outcomes are in agreement with these studies whereby we also recorded a 18% improvement on FEV1 in the intervention group, and a 5% improvement in controls. These improvements are comparable to the selective action of biologics that can suppress airway inflammation more efficiently than standard corticosteroids. Other measures that were equally important in this analysis were environmental control interventions. Strategies aimed at reducing contacts with such sources, as allergens and air pollutants were used successfully among participants of the intervention group. Other studies including Matsui et al (2016) showed that focus on environmental factors is crucial in the reduction of morbidity due to asthma [10]. The general exposure to triggers was reduced by 85% in the intervention group and 60% in control groups and explained why personalised environmental approaches were vital. Although these results share empirical support with previous research, the combined use of digital health tools and biologic therapies is still emerging. GINA (2018) and Liu et

al., (2019) have further called for the integration of these innovations to improve on asthmatic control by especially targeting the complicated ones [11, 12]. Our findings suggest how these strategies work together, but most importantly, they show how effective patient education and a well-coordinated environmental approach are critical in executing these strategies. Yet, these outcomes are encouraging; however study has several limitations such as relatively short follow-up, self- reported data and poor assessment of treatment adherence. Further qualitative studies should therefore be carried out to investigate the long term results as well as cost implications of the intervention steps taken in order to allow for wider application across different settings. Furthermore, interventions should be intensified to respond to social inequality and solving issues that may influence consumer's access, absorptiveness, and utility of biologics and digital solutions [13, 14]. In summary, this study adds to the recent literature on various effective asthma disciplinary approaches suitable for children. Expanding on previous best literature consisting of GINA (2018) as well as Liu et al. (2019), the present results suggest that multidimensional, patient-centric model of care may well enhance outcomes for children with asthma [15, 16].

Conclusion

The findings of this research emphasizes various technological approaches in asthma management, including mobile applications, biosimilars, and environmental modifications in pediatric population. There was reduced frequency of exacerbation, increased forced expiratory volume in one second and increased medication compliance in the intervention group. Such observations bear the potential for implementing patient-centred and technology supported strategies into routine asthma management.

Limitations

It also had short term follow up and hence cannot comparably show the outcome and the adherence grossly in long term. The obtained self-reported data might be somehow biased, also, the participants in the study were not effectively diverse in terms of the socioeconomic status. In some of these settings, there may also be limited availability of biologic therapies and digital tools, which are inputs to the strategies, thus limiting their generalization.

Future Directions

Subsequent studies should therefore endeavor to establish longer term impacts of these interventions and their economic feasibility. How artificial intelligence can be integrated in managing asthma and techniques for dealing with inequities in asthma care with specific focus on lower socioeconomic populations will be useful in making the identified innovative approaches more generalizable and enduring.

Abbreviations:

- **FEV1**: Forced Expiratory Volume in One Second
- **GINA**: Global Initiative for Asthma
- **SD**: Standard Deviation
- **CI**: Confidence Interval
- **IgE**: Immunoglobulin E
- **SPSS**: Statistical Package for the Social Sciences
- **AI**: Artificial Intelligence

Acknowledgement: We would like to thank the hospitals administration and everyone who helped us complete this study.

Disclaimer: Nil

Conflict of Interest: There is no conflict of interest.

Funding Disclosure: Nil

References

1. **Global Initiative for Asthma (GINA).** Global Strategy for Asthma Management and Prevention. Updated 2015. [Accessed from: https://ginasthma.org/2015-gina-report-global-strategy-for-asthma-management-and-prevention/
2. **Patel MR, et al.** Improving asthma care for children: Best practices and emerging models for care delivery in the United States. *Journal of Allergy and Clinical Immunology*. 2015;135(3):707–717. DOI: 10.1016/j.jaci.2015.01.001
3. **Schatz M, et al.** Asthma control test: Reliability, validity, and responsiveness in patients not previously followed by asthma specialists. *American Journal of Respiratory and Critical Care Medicine*. 2015;172(3):297–301. DOI: 10.1164/rccm.200503-433OC
4. **Woodruff PG, et al.** Genome-wide association studies of asthma identify specific pathways influencing disease susceptibility. *The Lancet*. 2015;385(9965):343–356. DOI: 10.1016/S0140-6736(14)61515-3
5. **Castro M, et al.** Dupilumab efficacy and safety in moderate-to-severe uncontrolled asthma. *The New England Journal of Medicine*. 2015;372(13):1181–1194. DOI: 10.1056/NEJMoa1415697
6. **Guilbert TW, et al.** Long-term inhaled corticosteroids in preschool children at high risk for asthma. *Pediatrics*. 2015;117(2):e705-e711. DOI: 10.1542/peds.2015-1235
7. Chan AHY, et al. Impact of digital tools on asthma management. *Lancet Digital Health*. 2017;1(1):e15-e26.
8. Fitzpatrick AM, et al. Biologic therapies for pediatric asthma. *Journal of Allergy and Clinical Immunology*. 2016;138(2):393-403.
9. Jackson DJ, et al. Mechanisms of biologics in asthma management. *Thorax*. 2017;72(8):689-701.
10. Matsui EC, et al. Environmental interventions for asthma. *Journal of Pediatrics*. 2016;172:98-106.
11. GINA. Updated global strategy for asthma management. *Global Initiative for Asthma*. 2018.
12. Liu AH, et al. Integrative approaches to asthma care. *American Journal of Respiratory and Critical Care Medicine*. 2019;200(4):424-432.
13. Busse WW, et al. Role of biologics in asthma. *New England Journal of Medicine*. 2016;375(6):535-545.
14. Papadopoulos NG, et al. Advances in pediatric asthma management. *Pediatric Allergy and Immunology*. 2018;29(4):257-268.
15. Menzies-Gow A, et al. Personalized approaches to asthma. *Respirology*. 2017;22(7):1023-1034.
16. Haahtela T, et al. Asthma control and prevention: 25-year journey. *Allergy*. 2018;73(1):57-61.