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Original Research Article

EVALUATION OF MOBILE DIRECTLY OBSERVED THERAPY (MDOT) FOR INHALER USE IN CHILDREN WITH NEWLY DIAGNOSED ASTHMA: A PILOT STUDY

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ABSTRACT

Background: Asthma is a prevalent chronic respiratory illness among children, and inadequate inhaler technique markedly undermines therapy efficacy. Mobile Directly Observed Therapy (MDOT) has arisen as a digital approach to enhance drug adherence and technique via remote monitoring. This pilot study sought to assess the efficacy of MDOT in enhancing inhaler utilization and clinical outcomes in pediatric patients with newly diagnosed asthma.

Materials and Methods: A pilot study was undertaken with 60 pediatric patients (ages 6–12 years) who were newly diagnosed with asthma. Participants were randomly assigned to two groups: the MDOT group (n=30), which utilized a mobile application for monitoring inhaler usage, and the control group (n=30), which received standard care through verbal and demonstration-based teaching. The duration of the trial was 6 months from June 2025 to December 2025. The evaluated outcomes were inhaler technique scores (utilizing a standardized checklist), medication adherence rates, symptom management (Asthma management Test – ACT score), and the frequency of exacerbations. Statistical analysis utilized paired and unpaired t-tests, with $p < 0.05$ being significant.

Results: Scores on the ACT and inhaler technique were similar between the two groups at baseline ($p > 0.05$). The inhaler technique of the MDOT group showed a notable improvement after 8 weeks (mean score went up from 5.8 ± 1.2 to 9.2 ± 0.6) in comparison to the control group (6.0 ± 1.3 to 7.4 ± 1.1; $p < 0.001$). In comparison to the control group, which had a medication adherence rate of 75.3%, the MDOT group had a significantly higher rate of 92.5%. In comparison to the controls, the MDOT group showed a significant improvement in ACT scores (from 14.2 ± 2.5 to 21.6 ± 1.8) ($p < 0.01$). With 0.6 ± 0.5 episodes, the MDOT group experienced fewer asthma exacerbations than the control group with 1.4 ± 0.7 episodes.

Conclusion: To improve inhaler technique, adherence, and clinical outcomes in newly diagnosed asthmatic children, MDOT is an effective and practicable intervention. Although larger-scale trials are necessary to validate long-term advantages, the results provide support for the use of digital monitoring systems in the therapy of pediatric asthma.

Keywords: Mobile Directly Observed Therapy, Pediatric Asthma, Inhaler Technique, Medication Adherence, Digital Health, Asthma Control.

INTRODUCTION

Recurrent symptoms of asthma include wheezing, shortness of breath, chest tightness, and coughing, as well as bronchial hyperresponsiveness and fluctuating airflow blockage. Morbidity, decreased quality of life, and increased healthcare utilization are all greatly impacted by this disease, which ranks among the most common chronic diseases in children globally. If you want to stop the disease from getting worse and avoid problems down the road, you need to start managing it now.[1-3]

The mainstay of asthma treatment is inhalation therapy, which enables the drug to be delivered directly to the lungs, resulting in a fast beginning of action and little systemic adverse effects. Proper inhaler technique and regular adherence to prescribed therapy are crucial for inhaled drug efficiency. Many pediatric patients abuse their inhalers, which increases their risk of exacerbations, leads to less than ideal drug delivery, and makes it difficult to regulate their symptoms, according to studies.[4-6]

Proper inhaler technique is not often retained after traditional patient education techniques, including as verbal instructions and in-clinic demonstrations, have been exhausted. Little comprehension, dependence on caregivers, and absence of constant monitoring all contribute to making this problem even more severe in children. To promote adherence in real-world settings and encourage correct inhaler use, novel approaches are needed.[7,8]

One innovative digital health solution is MDOT, or mobile directly observed therapy. This system allows patients to be monitored and supported remotely through the use of mobile devices. Inhaler technique can be evaluated, criticism given quickly, and adherence encouraged using video recordings or real-time observation by healthcare experts. The use of MDOT in the treatment of pediatric asthma is still mostly uncharted territory, despite its encouraging findings in enhancing medication adherence in diseases like tuberculosis.[9,10]

The growing availability of cellphones and other digital health tools makes MDOT an attractive, scalable option for filling the gaps in asthma treatment. Children with newly diagnosed asthma will participate in this pilot trial to see if MDOT is more effective than standard care in improving their inhaler technique, medication adherence, and clinical outcomes.[11]

MATERIALS AND METHODS

This was a prospective, randomized, controlled pilot study conducted over a period of 6 months from June 2025 to December 2025 in the pediatric outpatient department of a tertiary care hospital. Sixty pediatric patients, aged 6 to 12 years, newly diagnosed with asthma according to established clinical guidelines, were enrolled in the study. Informed consent was acquired from parents or guardians, and agreement was secured from children when applicable.

Grouping and Intervention

Participants were randomly divided into two groups: MDOT Group (n = 30): Patients or caregivers were instructed to record daily videos of inhaler use using a mobile application. These videos were reviewed by healthcare professionals, and feedback on technique was provided regularly.

Control Group (n = 30): Patients received standard care, including verbal instructions and physical demonstration of correct inhaler technique during clinic visits.

All patients were prescribed standard inhaled therapy as per asthma management guidelines.

Outcome Measures

Enhancement of inhaler technique (as measured by a standardized checklist) and adherence to medication were the main objectives. Asthma control, as defined by ACT scores, and the frequency of asthma exacerbations during the research period were included as secondary outcomes.

Inclusion Criteria

- Children aged between 6 and 14 years
- Newly diagnosed cases of asthma
- Prescribed inhalation therapy (metered-dose inhaler with or without spacer)
- Access to a smartphone with video recording capability (for MDOT group)
- Willingness of parents/guardians to participate and provide consent

Exclusion Criteria

- Children with severe or life-threatening asthma requiring hospitalization
- Presence of other chronic respiratory diseases
- Significant comorbid conditions affecting study participation
- Prior use of inhaler therapy for more than 2 weeks
- Lack of access to mobile devices (for MDOT group)

Statistical Analysis: Metrics for continuous variables were presented as mean ± standard deviation (SD), whereas percentages were used for categorical variables. An unpaired Student's t-test was used for continuous data and a chi-square test for categorical variables to compare groups. We utilized paired t-tests to examine comparisons within each group. For statistical purposes, a p-value below 0.05 was deemed significant. We used SPSS (version 25.0), a popular statistical program, to do the statistical analysis.

RESULTS

The trial included 60 pediatric kids who had just been diagnosed with asthma and managed to finish it. There were 30 people in the control group and 30 in the MDOT group. The outcomes can be seen down below:

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants

Parameter	MDOT Group (n=30)	Control Group (n=30)	p-value
Age (years)	9.8 ± 2.4	10.1 ± 2.6	>0.05
Gender (M/F)	18/12	17/13	
Baseline ACT Score	14.2 ± 2.5	14.5 ± 2.3	
Inhaler Technique Score	5.8 ± 1.2	6.0 ± 1.3	

In terms of age, gender distribution, ACT scores, and inhaler technique scores, there were no statistically significant differences between the MDOT and control groups at baseline ($p > 0.05$), as shown in Table 1. This suggests that there was little difference between the two groups when the research began.

Table 2: Comparison of Inhaler Technique Scores Before and After Intervention

Group	Baseline Score	8 Weeks Score	p-value
MDOT Group	5.8 ± 1.2	9.2 ± 0.6	<0.001
Control Group	6.0 ± 1.3	7.4 ± 1.1	<0.05

After 8 weeks, both groups showed a significant improvement in inhaler technique scores (Table 2). Nevertheless, the MDOT group showed significantly more improvement than the control group, suggesting that mobile-based feedback and monitoring worked.

Table 3: Medication Adherence Rates in Both Groups

Group	Adherence (%)	p-value	Group
MDOT Group	92.5 ± 5.3	<0.01	MDOT Group
Control Group	75.3 ± 8.7		Control Group

Medication adherence was much higher in the MDOT group than in the control group, as seen in Table 3. A statistically significant change was observed ($p < 0.01$), demonstrating that MDOT plays a crucial role in enhancing adherence to therapy.

Table 4: Change in Asthma Control Test (ACT) Scores

Group	Baseline ACT Score	8 Weeks ACT Score	p-value
MDOT Group	14.2 ± 2.5	21.6 ± 1.8	<0.001
Control Group	14.5 ± 2.3	18.2 ± 2.1	<0.01

According to Table 4, both groups experienced a notable improvement in asthma control during the course of the trial. Digital intervention may have improved clinical outcomes since the MDOT group's ACT scores increased more than the control group's.

Table 5: Frequency of Asthma Exacerbations During Study Period

Group	Number of Exacerbations (Mean ± SD)	p-value
MDOT Group	0.6 ± 0.5	<0.01
Control Group	1.4 ± 0.7	

There was a statistically significant difference between the control group and the MDOT group in the number of asthma exacerbations (Table 5). This decline lends credence to MDOT's claims that it can enhance disease management and forestall acute episodes.

DISCUSSION

Clinical outcomes, medication adherence, and inhaler technique were assessed in this pilot trial of children newly diagnosed with asthma using Mobile Directly Observed Therapy (MDOT). The results show that compared to conventional treatment, MDOT is a much better digital intervention for managing asthma in terms of both behavior and clinical outcomes.[12,13]

To confirm that the intervention was responsible for the observed changes in outcomes, the demographic and clinical characteristics of the control group and the MDOT group were similar at baseline. After 8 weeks of observation, the MDOT group demonstrated significantly better inhaler technique scores than the control group. Conventional education-based techniques generally fail to provide constant supervision and feedback, which is emphasized by this conclusion. It is highly probable that the correct method was reinforced and mistakes were diminished over time with regular observation through MDOT, as inhaler misuse is a well-documented problem in pediatric asthma.[14-16]

Digital monitoring has the potential to positively impact patient behavior, as evidenced by the much higher medication adherence in the MDOT group. There may have been an increase in compliance due to the fact that patients and caregivers were held accountable for documenting and submitting their daily inhaler use. Consistent with other research in other chronic diseases, this supports the idea that regularly engaged and overseen and monitored therapy improves adherence.[17-19]

The fact that the MDOT group showed an improvement in ACT scores provides more evidence that this intervention is clinically relevant. An improvement in symptom control and optimal drug administration can be achieved by better inhaler technique and adherence. On the other hand, the control group did not do as well, suggesting that conventional wisdom about teaching techniques is inadequate for long-term illness prevention.[20-22]

It is worth mentioning that the MDOT group saw a significant decrease in asthma exacerbations. greater disease management is reflected in fewer exacerbations, which in turn leads to lower healthcare

utilization, greater quality of life, and better overall health. The efficacy of MDOT as a treatment for asthma in children is demonstrated by these results.[23,24]

At a time when digital health is rapidly gaining popularity, this study's utilization of mobile technology provides a workable and expandable answer. Now that smartphones are so common, healthcare clinicians can simply include MDOT into their everyday clinical practice. This will enable them to extend care beyond hospital settings. Crucial in the management of chronic diseases, it also permits quick intervention and individualized feedback.[25,26]

There are, however, some caveats to this study. The results may not apply to bigger populations because this is a pilot study with a small sample and a short time frame. Potentially limiting its usefulness in contexts with limited resources is the reliance on smartphone access. Additionally, reporting bias may have been introduced into the study because it depended on data that was partly recorded and reported by patients.[27,28]

CONCLUSION

This pilot study shows that MDOT is a practical and effective way to help kids with newly diagnosed asthma with their inhaler technique, medication adherence, and overall control of their asthma. Better clinical results and a substantial decrease in asthma exacerbations were observed when MDOT offered continuous monitoring and prompt feedback in comparison to usual therapy. There is a practical way to overcome typical difficulties, like poor compliance and inappropriate inhaler use, by integrating mobile health technology into normal asthma therapy. With MDOT, healthcare providers may give remote, individualized support to patients while simultaneously increasing patient involvement. The long-term efficacy and scalability of this method need to be confirmed by bigger multicenter trials with longer follow-up periods, notwithstanding the optimistic results. However, MDOT has great promise as an advantageous supplement to pediatric asthma treatment, which might lead to better disease control and overall well-being.

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