Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 1s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Enhancing adherence to asthma treatment control in children and adolescents

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Cite this paper as: Venu Anand Das Vaishnav, Ritesh Patel, (2025) Enhancing adherence to asthma treatment control in children and adolescents. *Journal of Neonatal Surgery*, 14 (1s), 254-261.

ABSTRACT

To evaluate therapeutic alternatives for the stepwise treatment of asthma, including the unique requirements of this population, including the potential impacts of asthma and its therapies on growth and mental health, and caregiver participation. The study searched PubMed to discover pertinent papers, then reviewed the resulting articles, asthma management recommendations for kids, and documents from personal archives. Recent worldwide and US recommendations advocate a stepwise approach to asthma treatment for kids akin to that for people. Therapy is adjusted upward or downward, momentarily or long-term, depending on the reaction. Inhaled steroids are the preferred treatment for chronic childhood asthma, and any possible slight effects on growth are deemed negligible in comparison to their advantages. Choices for controller medication for individuals under 18 are restricted, particularly for International Initiative for Asthma Stages 2-5. Tiotropium is approved for use in the United States and Europe to treat individuals aged 6 years and older. Gradually reducing therapy, although advised yet seldom implemented, might sustain symptom management and mitigate unwanted effects while significantly lowering expenses. Patient awareness and enhanced monitoring are crucial for self-management and optimal outcomes. There is a necessity to establish specific treatment objectives for kids with asthma through step-up and step-down methodologies to optimize therapeutic advantages and mitigate possible harmful effects.

Keywords: *Asthma, Children, Medical, Treatment*

1. INTRODUCTION

The incidence of asthma among children is significant. 10.2% of kids aged 6 to 11 years and 12.8% of teenagers aged 12 to 18 years in the United States were diagnosed with asthma. The frequency among young kids (0-5 years) was 3.9% [2]. Children diagnosed with asthma necessitate prolonged therapeutic intervention. Asthma treatment aims to provide adequate symptom management, sustain normal activity stages, and minimize the likelihood of exacerbations, preventing unnecessary emergency visits or admissions [1] [6]. The smallest effective dose of medication to mitigate or avert side effects should be employed to avoid fixed airflow restrictions and, especially in youngsters, to safeguard lung growth [15]. While medication is fundamental to managing asthma, non-pharmacological therapies, including pulmonary rehabilitation, breathing techniques, avoidance of allergy triggers, and counseling teenagers against smoking, might be essential [4]. Pharmacological and suitable non-pharmacological strategies must be incorporated into each patient's asthma treatment strategy [9].

Mitigating the negative consequences of drugs is a crucial objective in the management of chronic conditions like asthma, especially in children, as prolonged treatment impacts their bodily, social, and mental growth [12] [13]. Mitigating acute symptoms that disrupt routines and ongoing consequences that hinder mental, emotional, and social growth are essential therapy objectives for individuals and their guardians or caretakers [3]. Some goals are contradictory (e.g., enhanced control necessitates elevated pharmaceutical dosages, thereby augmenting the variety and frequency of unpleasant effects).

In addition to individual objectives, the attributes and preferences of the individuals (e.g., age, physical state, psychosocial factors, and inhaler method) and their caretakers (e.g., health education) must be considered to attain optimal concordant compliance with any therapeutic regime [14]. The handling of asthma is a cyclical process that includes evaluation, therapy modification, and evaluation of treatment responses; hence, sustaining long-term medication with minimal adverse effects can be difficult [10]. This study examines therapeutic alternatives for step-up and step-down therapy strategies aimed at achieving optimal asthma management for children, potential challenges associated with these therapies, and viable solutions to address these challenges [17].

2. BACKGROUND

Primary asthma, as defined by the European Respiratory Society (ERS) and the American Thoracic Society (ATS), necessitates Stage 4 or 5 therapy based on the Global Approach for Asthma (GINA) instructions. This includes high-dose Inhaled Asthma Medications (IAM) and Long-Acting Beta Antagonists (LABA) or leukotriene modifiers for the preceding year or systematic IAM for at least 50% of the year before avert it from progressing to "unregulated" or staying "uncontrolled" despite such interventions. Severe asthma involves people with recalcitrant or treatment-resistant allergies, as well as those with inadequate response to therapy attributable to comorbidity [5]. The initial strategy for a kid exhibiting serious breathing problems refractory to recommended asthma treatment should be to verify the asthma classification; it is essential to determine if the child falls into the "difficult-to-treat asthma" group. The latter phrase applies to individuals with persistent conditions that hinder effective asthma management (allergen contact, inadequate adherence), severe therapy-resistant allergies, asthma accompanied by comorbidity (gastroesophageal reflux, diabetes), or any amalgamation thereof.

Clinicians should recognize a common group of long-term upper airway complications, including ongoing rhinosinusitis and allergy-related rhinitis, which are associated with severe asthma symptoms and appear to exacerbate asthma control, complicating its evaluation and treatment [11]. It is essential to differentiate between severe asthma and uncontrollable asthma, as the latter stem from factors that can be relatively readily rectified, such as improper use of inhalers and inadequate adherence to treatment.

Adherence can be characterized as how a patient's conduct aligns with the prescribed suggestions [7]. Customers adhere to or disregard their physicians' instructions; however, noncompliance should not be a basis for attributing guilt to them. The compliance of asthmatics with long-term inhaled therapy has significantly enhanced asthma management and reduced morbidity; yet, it generally remains inadequate—suboptimal compliance results in inferior medical results and elevated healthcare expenses [8].

Inadequate adherence (<62%) to inhaled drugs must be taken into account for all patients classified as "difficult to control." Reports indicate that merely 57% of kids with medium to severe chronic asthma adhere to daily administration of their controller prescription. Suboptimal adherence rates indicate an immediate necessity to enhance compliance to alleviate the disease load. Enhancing adherence will lead to improved asthma management and decrease asthma symptoms. Treatments that enhance adherence include shared decision-making on drug and dose selection, inhaler notifications, home visits, and providing inhaled corticosteroids once a day instead of daily.

Untamed or inadequately managed asthma adversely affects development, restricts physical activity, elevates school tardiness and tardiness, hinders social interactions, and leads to psychological and psychosomatic issues [16]. These problems, along with insufficient compliance and taking risks, frequently result in a detrimental, cyclical pattern. Effective management with necessary adjustments in treatment should eliminate this adverse cycle. A multidisciplinary and customized strategy is essential for managing asthma in young patients (Figure 1).

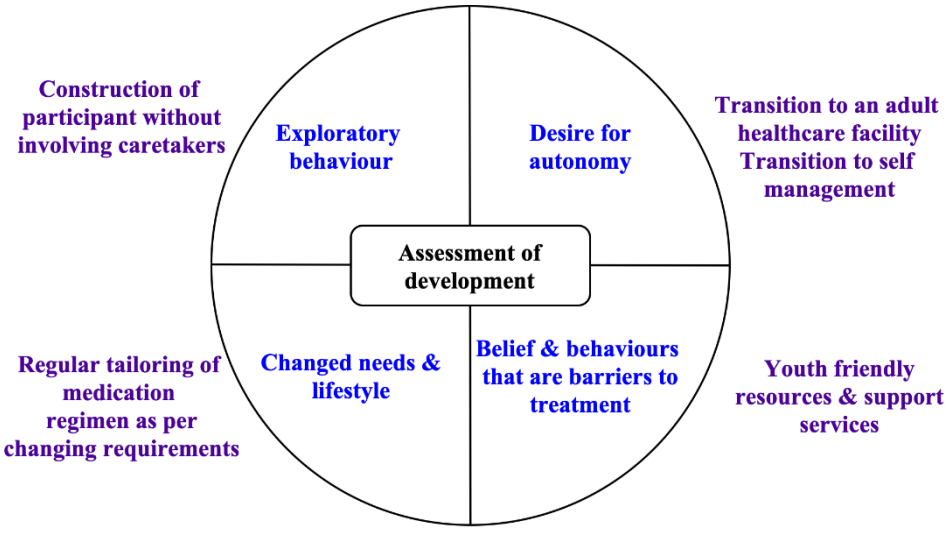

Figure 1. Methods for asthma management in kids

Despite numerous published assessments regarding the adherence of asthmatic kids to controller medications and the impact of various therapies, there is insufficient emphasis on chronic asthma. The systematic review aimed to determine the existing research on adherence rates and the effect of multiple treatments on enhancing compliance to controller inhalation medicine for kids with severe asthma.

Requirement for escalated or de-escalated therapeutic strategies in pediatric populations. Therapy for asthma for kids requires adjustments daily, for brief intervals, or continuously, depending on the patient's reaction to the controller and relief medicines over time. Before escalation, it is essential to ascertain that changeable patient factors (e.g., comorbidities, challenges in inhaler usage, inadequate inhaler method, external factors at the place of study, and non-adherence) are not impeding control. Age can affect certain patient variables: family or caregiver participation enhances adherence in kids, whereas adherence to therapy is diminished in teens due to taking risks.

The reasons for escalation are several. Adolescence commonly involves exposure to exacerbation factors, including allergies, pollutants, and respiratory illnesses. Children and teenagers are typically highly active [18]. As previously stated, taking risks during adolescence, mainly smoking, results in an absence of control over asthma. Doctors must meticulously assess if exacerbations signify a genuine deterioration in Chronic Asthma Management (CAM). If occurrences are isolated and resolved post-treatment, a modification in prescription will not be warranted. Genuine deterioration of CAM necessitates an escalation of maintained treatment.

Various causes for loss of control complicate the reduction of treatment. Kids and teens do not experience prolonged periods of stable illness without exacerbation, limiting the chance of treatment reduction. It is crucial to reduce treatment wherever feasible to mitigate unwanted effects and expenses.

The Composite Asthma Severity Indicator (CASI) is an approved instrument that measures asthma severity by evaluating damage, risk, and the quantity of medicine required for management. The highest CASI score is 20, determined by daytime sickness and usage over the past two weeks, evening symptoms and usage over the past two weeks, lung function metrics, controlling therapy, and flare-ups. The integration of respiration, controller therapy, and flare-ups renders an effective composite tool for assessing asthma seriousness, even in well-managed individuals, and it can serve as a guide for graded controlling asthma.

3. METHODS

This comprehensive review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) declaration, which seeks to provide the most precise formulation of a systematic study.

The research searched for papers across three widely utilized medical records. Phrase phrases such as "kids," "severe allergies," "difficult allergies," "inhaled therapy," and "adherence" were employed to extract articles containing these phrases in the title and description. The included parameters were the following:

1) Articles released by libraries;

2) The papers authored in English;

3) Investigations focusing on kids and/or young people;

4) Research concentrating on chronic asthma (either as the primary objective or as a subset of the study people);

5) Investigations examining the impact of treatment on compliance rates (either as the primary objective or as a subset of the study people).

3.1 Data Extraction

Two outside observers performed the data collection. The attributes gathered for each study included references, sample features, study design, time, adherence evaluation, treatment instruments, and results.

3.2 Selection of Studies

The examination of the three databases yielded 650 papers. Out of these, 290 were repetitions and were eliminated. The remainder of the 350 papers were evaluated for relevancy. Twenty-three publications were assessed for qualification, and seven articles were selected for the systemic evaluation. The flow graph (Figure 2) outlines the restrictions and the publishing retrieval operation.

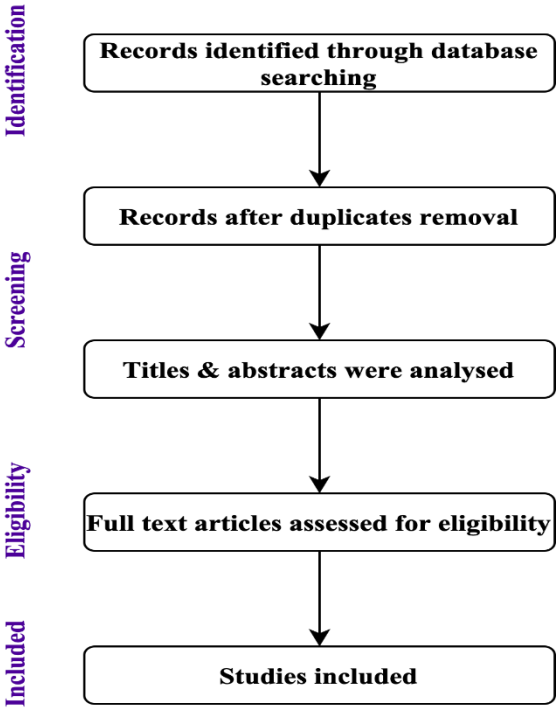

Figure 2. Workflow of the study

3.3 Study Descriptions

Seven publications were incorporated for the systemic review. Five studies occurred in the USA, one in Canada, and one in the UK. Three investigations comprised randomized controlled tests; one was a randomized practical trial, one was an ongoing observation cohort research, one was a planned longitudinal research, and one was a planned interventional research. Patient recruiting primarily occurred during outpatient appointments. The study involved individuals facilitated by neighborhood pharmacists. The recipients of treatment were kids aged between 2 and 18 years. The aggregate sample for severe asthma across the seven investigations comprised n = 500 kids and teens, with the minimum sample size being n = 9 and the maximum n = 190. Asthma severe was a subset within the group chosen across all seven investigations.

3.4 Evaluation of Compliance

Adherence to CAM therapy was assessed using objective measurements, subjective evaluations, or a mix of both. Objective compliance evaluation methods comprised the electronic tracking devices utilized in four trials and the Medication Presence Ratio (MPR).

All three aforementioned devices were created as canister attachments compatible with most inhalers. They can furnish exact details regarding medicine administration, encompassing time and dosage frequency, and all collected data can be utilized to inform asthma control.

The MPR is a verified objective metric derived from pharmacy documents, representing the proportion of days' supply obtained during a specified duration, and is considered more precise than self-reporting. Surveys are subjective instruments for evaluating adherence that are easy, somewhat inconspicuous, and based on self-reporting. The surveys in the investigations discussed in this review included:

(1) the Brief Medication Survey, an instrument for assessing patient adherence and identifying barriers to compliance. The instrument comprises a 5-item Regimen Screen inquiring about individuals' medication adherence over the past month, a 2-item Belief Screen addressing perceptions of pharmacological effects and adverse characteristics, and a 2-item Memories Screen assessing potential memory challenges.

(2) The Morisky Medicine Conformity Scale is a general self-reported measure assessing medication-taking actions through four surveys regarding past use of medicines trends;

(3) The Medicine Adherence Evaluation Scale is a self-reported instrument that evaluates views regarding medicine and actual medication-taking actions comprising 10 products;

(4) The Medication Conformity subscale assesses adhering to controller medicinal products.

3.5 Intervention Instruments

Of the seven studies, three primarily aimed to enhance adherence rates following treatment, whereas, in the remaining four research, adherence enhancement was a secondary focus of the results. The intervention designs focused exclusively on the children and incorporated an aspect of parental participation. Studies audio-recorded and analyzed conversations during children's visits to see if the practitioner incorporated feedback from the child or caretaker into the CAM regimen. Three of the investigations included tailored treatment plans in which health teams evaluated the specific requirements of clients and caregivers, disseminated information, and enhanced understanding of asthma. Research developed a customized online intervention to improve children's positive perceptions of CAM. The research employed a device that utilized peak-flow prediction with monitoring to motivate youngsters to adhere to their regular inhalation therapy. In one study, smartwatches were used as a treatment with the expectation that adherence would enhance after an observation time. The average period of treatments was 20 weeks, with an aggregate of 45 weeks and an average of 5 weeks.

3.6 Results

In the seven investigations, compliance rates for the starting point (before treatment) or control populations varied from 25% to 68%; following the treatment, there was a significant enhancement, with compliance rates rising to between 45% and 85%. Research indicated a notable favorable disparity between the treatment and control groups ($p = 0.02$) utilizing predictions with comments. Research using an interactive website demonstrated a noteworthy association between treatment and enhanced adherence. Regarding the execution of personalized care applications, research has shown significant efficacy in adherence as measured by the Scale. A highly significant relationship was observed in the results ($p < 0.01$). The team treatment in the trial significantly improved adherence rates compared to standard care (80% versus 35%). Suboptimal compliance rates following the treatment were recorded, with median compliance of 75%, while the mean compliance to control drugs, as indicated by kids, was 73.5%.

4. IMPROVING COLLABORATION WITH HEALTHCARE PROFESSIONALS

Adherence is enhanced when clinicians and patients work together to comprehend asthma and the requisite therapy thoroughly. Figure 3 illustrates a concept for efficient collaboration between clinicians and asthmatics. Transparent and direct communication between patients and physicians that fosters empathy and integrates inspirational interviewing approaches along with shared decision-making and therapy objectives is essential, especially for teenagers. This method can tackle individual patient issues, assess their beliefs, involve patients in illness care, and ensure that relatives are informed and capable of supporting the person with the illness. Comprehension is essential for identifying any alterations in symptoms and for modifying treatment or transitioning to accessible options by standards. It is necessary to schedule periodic follow-up meetings with the doctor treating, utilizing reminders and other organizational methods to enhance compliance.

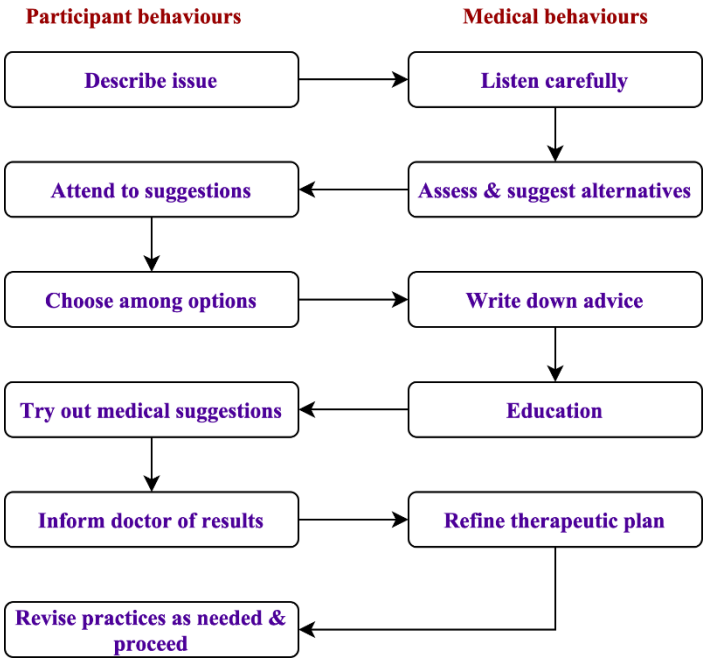

Figure 3. Efficient collaboration between clinicians and asthmatic kids

4.1 Alternative Strategies

Due to the inadequate compliance of teenagers with their asthma treatment protocols, a potential strategy to facilitate behavior modification is the systematic identification of non-compliant patients. A variety of adherence tracking approaches

exist, each possessing distinct benefits as well as drawbacks. This encompasses subjective tracking instruments, such as physician evaluations of compliance, parents or child assessments of adherence, and surveys for self-report, including the Morisky magnitude, Drugs Adherence Report Size - asthma Test of Conformity to Inhalers, and Beliefs About Drugs Survey. A study designed explicitly for adolescents with asthma, the Teenager Asthma Self-Efficacy Survey, has just been established. Objective tracking methods include examining prescription information, measuring inhaler containers and dose indicators, observing treatment, and nurse home inspections.

Simultaneously, alternative methodologies are under assessment, encompassing reminder-based methods (e.g., medical record notifications), incorporating electronic devices (e.g., sensors from Adherium, Propeller Medicine, and Timestamp), controller applications, and adherence indicators. The prevailing gold standard for evaluating adherence is electronic tracking, which assesses the frequency and timing of inhaler activation by individuals, with the capability of downloading data via smartphone applications.

While electronic recorders are considered the most precise and impartial means of documenting drug usage, they possess several limitations, such as expense and insufficient data regarding inhaler technique or the reasons for patient non-adherence. Survey findings indicate that this strategy is favored by adolescents, facilitating enhanced autonomy and accountability. Specific models, like the device, have been modified to incorporate sensors that monitor intake. Electronic tracking is crucial in shaping future administration, particularly in customizing adherence measures and facilitating decision-making over therapy modifications.

Management must concentrate on and resolve the underlying causes of inadequate adherence instead of merely intensifying the prescribed medication. Significantly, wireless monitoring can assist in identifying individuals with insufficient control of asthma with proper adherence who qualify for more costly treatments, such as biological products.

Alternative strategies teens propose to enhance adherence encompass peer support, prescription reminders (ideally through mobile apps), and accessible online support networks featuring message capabilities. Regular screening for melancholy and other emotional or mental illnesses enhances CAM and thus improves compliance.

4.2 Deliberation

This systematic analysis identified seven publications from the current literature that examined the enhancement of adherence to inhaled medications following targeted interventions in children with severe asthma. This methodical examination underscores therapies' significance in enhancing compliance in children with severe asthma.

Adherence can be evaluated using both subjective and objective metrics. The objective metrics utilized in several studies within this evaluation comprised various types of electronic surveillance equipment and the Medication Occupancy Ratio. Research utilizing surveys for the personal assessment of adherence has been included. The primary tools to gauge adherence to asthma treatment include wireless monitoring devices, canister weight, and pharmacist refill information. Electronic tracking is regarded as the "gold standard" for evaluating adherence because of its objective and comprehensive data; yet, the associated costs and technological demands (e.g., machinery, staff education) hinder its extensive routine application in clinical settings. Simultaneously, specific subjective measurement instruments include surveys, interviews, and self-reporting methods. Subjective assessments are cost-effective, convenient, and less intrusive, offering prospective insights into associated matters. While they mostly rely on self-reporting, their accuracy is contingent upon psychometric features and obscure heterogeneity in adherence among regimen elements when evaluated holistically. Due to significant variety within the asthma community concerning particular skills, requirements, and tastes, scientists have determined that more focused and customized evaluation techniques are necessary.

Chronic asthma in children is recognized to increase morbidity and elevate asthma-related expenses significantly. The precise prevalence is uncertain, while it is thought that 2-6% of asthmatic children experience severe illness. There exists a reciprocal association between serious asthma and compliance, and doctors can underestimate the severity of asthma if they fail to evaluate compliance. Inadequate adherence results in severe asthma if not rectified. The findings indicate that the initial compliance rate among kids with severe asthma varied from 25% to 68%, consistent with studies on children with chronic asthma. The compliance among kids with any form of asthma is usually 35-75%.

This comprehensive review collected papers featuring interventions designed to enhance adherence. The therapy strategies employed included home assessments, audio-taped physician consultations, personalized treatment regimens, utilization of electronic surveillance devices, a multimedia web page, and peak-flow forecasting with reporting. The review and meta-analysis examined various behavioral therapies, including methods to assist families in managing treatment regimens, educational initiatives to inform households about the state of the patient and the significance of compliance, and CAM measures like implementing self-monitoring schedules and enhancing communication between caregivers and medical professionals regarding the child's illness. Additionally, two other trials examined the effectiveness and safety of texts for dosage reminders.

The level of adherence is correlated with CAM. Research indicated that kids with inadequate adherence exhibited poor control, whereas studies demonstrated that children with asthma expertise and competence in using controller devices had

improved medication adherence. Likewise, in further research, adolescents indicate a higher likelihood of adhering to treatment when they experience hope, perceive management activities as significant, feel capable, or intend to comply with treatment suggestions. Elevated self-efficacy correlates with improved adherence. Compliance with inhaled corticosteroids was an essential independent indicator of long-term CAM, with optimal asthma control observed when adherence exceeded 82% of the recommended dosage.

The analysis indicated that an appropriate intervention can enhance adherence rates among children with severe asthma. The research articles in the evaluation demonstrated an essential rise in adherence rates, from 25-68% to 45-85%. There is a notable scarcity of research concentrating on severe asthma; however, the findings above align with the results of studies addressing various forms of asthma in kids. While most research indicates a beneficial effect, there are occasions where the use of digital asthma medicine alerts did not enhance adherence rates. A planned follow-up visit and a complete asthma treatment care package for preschoolers with asthma in the Netherlands did not improve adherence levels. An analysis revealed that trials employing adherence instruction as a treatment resulted in a 25 percentage point advantage over control, whilst electronic tracking or alerts yielded improved adherence by 15 percentage points.

Studies determined that the outcomes of treatments are contingent upon the target category, methodology, and duration of the intervention. The primary constraint of this review is the scarcity of studies concentrating on severe asthma in kids, as the majority of research examines adherence for kids within society and in adult severe asthmatics rather than in seriously asthmatic kids.

There exists variability in the characterization of severe asthma across studies, an issue previously acknowledged by other scholars. The research employed diverse adherence evaluation instruments, resulting in the varied presentation of outcomes. A limitation of all seven research studies is the ambiguity regarding the therapeutic significance of the increase in compliance. Research indicates that compliance rates must exceed 82% to sustain CAM.

5. CONCLUSION

Medical practitioners must evaluate various criteria when CAM is used in pediatric and teenage patients. The approval of novel pharmaceuticals has broadened treatment possibilities. According to established criteria, effective treatment must incorporate step-up and step-down strategies for this patient demographic. These strategies will optimize advantages and mitigate related negative impacts while striving to achieve specific patient objectives. Patient awareness and tracking of CAM in domestic and clinical environments are crucial for effective modifications in ongoing asthma treatment.

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