

# Facilitators and Barriers to Asthma Treatment Adherence in Adolescents: An Integrative Literature Review

João Borges<sup>1</sup>, Luís Canas<sup>2</sup>

<sup>1</sup>Nursing School of Coimbra, Department of Pediatrics, Local Health Unit of Baixo Mondego, Coimbra, Portugal

<sup>2</sup>Nursing School of Coimbra, Department of Pre-Hospital Emergency and Operating Room, Local Health Unit of Baixo Mondego, Coimbra, Portugal

Email: borges.forma@gmail.com

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## Abstract

**Objective:** This integrative literature review aims to identify the main factors that facilitate or hinder asthma treatment adherence among adolescents, with emphasis on the role of caregivers and healthcare professionals. **Method:** A comprehensive search of multiple electronic databases was performed, and 16 studies were included for in-depth analysis. **Results:** Nine key factors influencing asthma treatment adherence in adolescents were identified: behavior, beliefs, self-management, health literacy, healthcare professional role, adherence assessment, caregiver role, peer influence, and national guidelines. Adherence is related to a complex interaction of personal, social, and systemic factors. **Discussion:** The transition from childhood to adolescence presents unique challenges for asthma management. Health literacy, self-management strategies, and a balanced doctor-patient relationship are critical for improving adherence. **Conclusion:** Promoting educational strategies, strengthening bonds between adolescents and healthcare professionals, and developing adequate tools for adherence assessment are essential to improve health outcomes.

## Keywords

Asthma, Adolescents, Treatment Adherence, Self-Management, Health Literacy, Caregivers, Healthcare Professionals

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## 1. Introduction

Asthma is one of the most prevalent chronic respiratory diseases worldwide, affecting millions of adolescents and significantly impacting their quality of life.

It is characterized by inflammation and narrowing of the airways, leading to symptoms such as wheezing, shortness of breath, chest tightness, and coughing. Asthma is a lifelong condition that requires ongoing management, and adherence to prescribed treatment regimens is crucial for controlling the disease and preventing acute exacerbations. Inadequate adherence to asthma treatment can lead to frequent hospitalizations, increased healthcare costs, and a reduced quality of life for patients.

Adolescence is a critical period in the management of chronic diseases like asthma. During this stage, individuals undergo significant physical, emotional, and cognitive changes that can influence their health behaviors and decision-making processes. The transition from childhood to adolescence is marked by a desire for independence, social identity formation, and increased peer influence. These factors can complicate adherence to treatment regimens, as adolescents may prioritize social activities, academic pressures, and peer acceptance over consistent disease management. Moreover, adolescents may have limited understanding of the chronic nature of their condition, which can result in a tendency to underestimate the severity of asthma and the importance of regular medication use.

Studies have shown that asthma treatment adherence among adolescents is often suboptimal. Various factors contribute to this non-adherence, including behavioral challenges, psychological barriers, environmental factors, and inadequate communication with healthcare providers. Adolescents may perceive asthma as a less serious condition, especially during symptom-free periods, leading them to skip medications or neglect regular check-ups. In addition, the fear of stigma associated with using inhalers in public or the difficulty of managing asthma in social settings can further hinder adherence.

The role of caregivers and healthcare professionals is paramount in supporting adolescent asthma patients. Caregivers, particularly parents, are responsible for ensuring that adolescents follow their treatment plans and adhere to medication regimens. However, as adolescents seek independence, caregiver involvement often diminishes, and the balance between supervision and autonomy becomes a critical factor in maintaining adherence. Healthcare professionals must also adapt their approach to engage adolescents effectively, fostering trust, addressing misconceptions, and providing education that aligns with their developmental needs.

This review aims to explore the facilitators and barriers to asthma treatment adherence in adolescents, focusing on the personal, social, and systemic factors that influence their ability to follow treatment protocols. By identifying these key factors, the review will provide insights into how healthcare providers and caregivers can improve asthma management in this age group. Additionally, this review will examine the role of digital health tools and innovative interventions, such as electronic reminders and peer education, in enhancing adherence. Ultimately, this paper advocates for a multifaceted, youth-centered approach to asthma care, emphasizing the need for tailored interventions that address the unique challenges faced by adolescents with asthma.

## 2. Methodology

This integrative literature review was conducted following the framework proposed by [Whittemore and Knafl \(2005\)](#), which emphasizes a systematic and transparent approach for reviewing and synthesizing qualitative, quantitative, and mixed-methods studies. This methodological approach was chosen to ensure a comprehensive understanding of the factors that influence asthma treatment adherence in adolescents. The review adhered to the principles of methodological rigor, ensuring that studies included in the review met specific inclusion criteria, and only the most relevant evidence was synthesized to draw meaningful conclusions.

### 2.1. Research Question

The main research question guiding this review was:

**What are the key facilitators and barriers to asthma treatment adherence in adolescents?**

This question focused on identifying the personal, social, and systemic factors that influence adolescents' adherence to asthma treatment regimens, with an emphasis on the role of caregivers and healthcare professionals.

### 2.2. Search Strategy

A comprehensive search of multiple electronic databases was performed to identify studies relevant to the research question. The following databases were systematically searched: 1) **PubMed**, 2) **PsycINFO**, 3) **MEDLINE**, 4) **CINAHL**.

The search was conducted using a combination of MeSH (Medical Subject Headings) terms and keywords, including: “asthma” “adherence” “adolescents” “self-management” “health literacy” “caregiver” “peer influence” “healthcare professional” “treatment barriers” “digital health tools”.

The search was conducted in September 2021, and it was limited to studies published between the years of 2000 and 2021. Studies were considered only if they were available in full text and published in English, Portuguese, or Spanish. Additionally, reference lists of identified studies were reviewed to find any additional relevant articles.

### 2.3. Inclusion and Exclusion Criteria

To ensure that the studies were relevant to the research question, the following inclusion criteria were applied:

- **Study Population:** Adolescents (ages 10 - 19 years) diagnosed with asthma.
- **Study Type:** Quantitative, qualitative, or mixed-methods studies that explored factors influencing asthma treatment adherence.
- **Study Focus:** Articles must have examined treatment adherence, self-management, or factors affecting asthma control and treatment outcomes in adolescents.
- **Language:** Only studies published in English, Portuguese, or Spanish were

included.

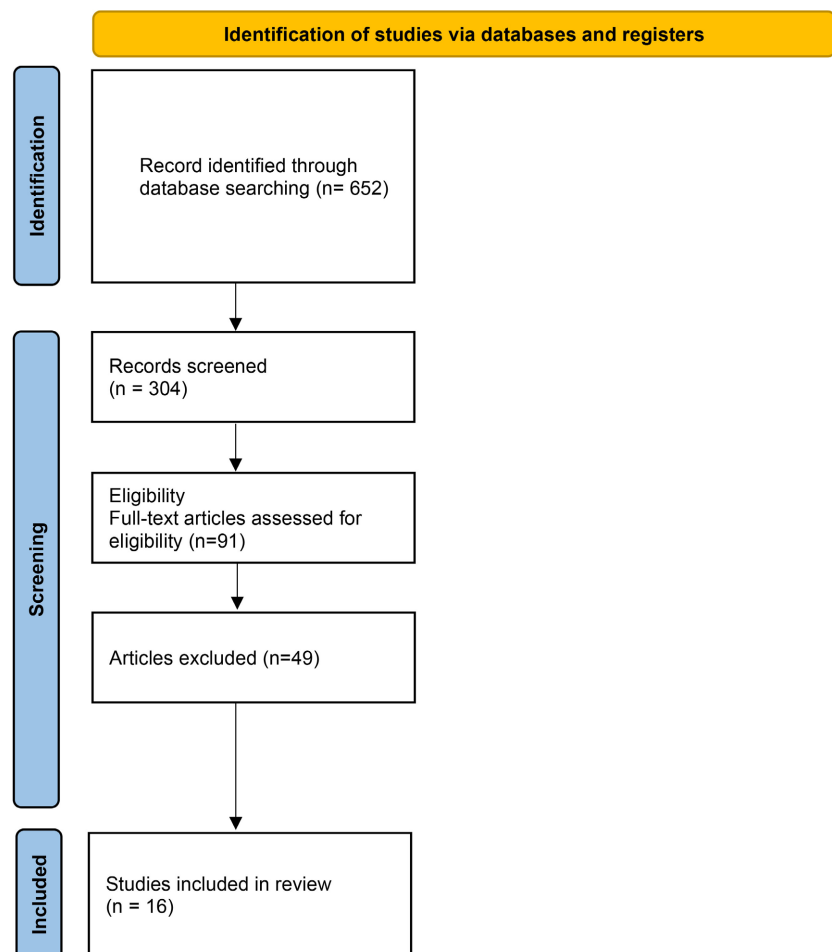
- **Publication Date:** Studies published between 2000 and 2021.

Studies were excluded based on the following criteria:

- Studies that focused exclusively on children or adults outside the adolescent age range.
- Articles that were not available in full text.
- Systematic reviews and meta-analyses that did not provide empirical data.
- Studies with poor methodological quality, as assessed through the quality appraisal step.

## 2.4. Selection Process

The initial search yielded a total of **652 studies**. After the removal of duplicates using EndNote reference management software, 304 studies remained. The titles and abstracts of these 304 studies were screened for relevance to the research question. A total of **91 studies** were selected for full-text review, during which a further selection was made based on the eligibility criteria. Ultimately, **16 studies** were included in the final analysis.



**Figure 1.** Identification of studies via database and registers (PRISMA model).

The full-text review involved reading each study in detail to assess its relevance, methodological quality, and alignment with the inclusion criteria. Studies were categorized by their focus on different themes related to adherence, such as behavioral factors, health literacy, caregiver involvement, and healthcare provider influence (Figure 1).

## 2.5. Quality Appraisal

A quality appraisal step was performed to assess the methodological rigor of the included studies. This was done using the **Critical Appraisal Skills Programme (CASP)** tool, which evaluates studies based on their design, methodological quality, and relevance to the research question. The studies were rated on the following aspects: 1) Study design and methodology 2) Sample size and representativeness 3) Data collection and analysis methods 4) Relevance of findings to the adolescent asthma treatment adherence context.

Based on this evaluation, studies were categorized as having **high**, **medium**, or **low** methodological quality. The findings were summarized in a table (Table 1), which allowed for an assessment of the strength and reliability of the evidence reviewed.

**Table 1.** Studies included in the review for critical analysis.

Year	Authors	Title	MeSH
2016	Ahmad, A., Sørensen, K.	Enabling and Hindering Factors Influencing Adherence to Asthma Treatment Among Adolescents	“asthma”, “adherence”, “adolescents”, “health literacy”
2018	Desager, K., Vermeulen, F., Bodart, E.	Adherence to Asthma Treatment in Childhood and Adolescence: A Narrative Literature Review	“asthma”, “treatment adherence”, “childhood”, “adolescents”
2020	Kaplan, A., Price, D.	Treatment Adherence in Adolescents with Asthma	“asthma”, “adherence”, “adolescents”, “behavior”
2016	Chan, A. H. Y., Stewart, A. W., Foster, J. M.	Factors Associated with Medication Adherence in School-Aged Children with Asthma	“asthma”, “adherence”, “children”, “school”
2017	Holley, S. L. et al.	Asthma Self-Management Goals, Beliefs and Behaviors of Adolescents	“asthma”, “self-management”, “adolescents”, “behavior”
2020	Mosnaim, G. S. et al.	Effectiveness of Digital Tools for Asthma Management in Adolescents	“asthma”, “digital health”, “adolescents”, “technology”
2022	Ciprandi, G. et al.	Asthma Control in Adolescents: The Importance of Assessing Adherence	“asthma”, “adherence”, “adolescents”, “control”
2018	Gray, W. N. et al.	Medication Adherence in Pediatric Asthma: A Systematic Review	“asthma”, “adherence”, “pediatric”, “systematic review”
2019	Rhee, H. et al.	Barriers to Asthma Medication Adherence in Adolescents	“asthma”, “medication adherence”, “adolescents”, “barriers”
2014	Armstrong, M. L. et al.	Association of Caregiver Health Beliefs and Parenting Stress with Medication Adherence	“asthma”, “caregiver”, “health beliefs”, “parenting stress”
2021	George, M. R. et al.	Role of Caregivers in Asthma Treatment Adherence in Adolescents	“asthma”, “caregivers”, “adolescents”, “adherence”
2012	Bruzzese, J. et al.	Peer Influence on Asthma Management in Adolescents	“asthma”, “peer influence”, “adolescents”, “management”

**Continued**

2015	Gibson-Scipio, W. et al.	Asthma Self-Management in African American Adolescents	“asthma”, “self-management”, “adolescents”, “African American”
2012	McQuaid, E. L. et al.	Health Literacy and Asthma Management in Adolescents	“asthma”, “health literacy”, “adolescents”, “management”
2019	Zolnierek, C., Dimatteo, M.	Doctor-Patient Communication and Asthma Treatment Adherence	“asthma”, “doctor-patient communication”, “adherence”
2021	Mosnaim, G. et al.	Digital Health Interventions for Asthma: A Systematic Review	“asthma”, “digital health”, “adolescents”, “intervention”

## 2.6. Data Extraction and Synthesis

Data from the included studies were systematically extracted using a standardized data extraction form. The following information was collected for each study: **1) Study citation (author(s), year), 2) Study design, 3) Sample characteristics (sample size, age range, gender distribution), 4) Key findings related to asthma treatment adherence, 5) Facilitators and barriers to adherence identified by the study.**

The extracted data were then synthesized thematically, allowing for the identification of common themes and patterns across the studies. The synthesis focused on personal, social, and systemic factors that influence adherence to asthma treatment, as well as interventions that have shown promise in improving adherence.

## 2.7. Limitations of the Review

This review has several limitations. The inclusion of studies published only in English, Portuguese, and Spanish may have excluded relevant articles published in other languages, limiting the diversity of perspectives included. Additionally, the exclusion of grey literature (e.g., conference abstracts, dissertations) may have led to the omission of valuable evidence. The potential for publication bias also exists, as only studies published in peer-reviewed journals were included in the analysis.

## 2.8. Ethical Considerations

As this review utilized secondary data from published studies, ethical approval was not required. However, all included studies adhered to ethical standards in research, ensuring that participants’ rights and privacy were protected in the original studies.

## 3. Results

The analysis of the 17 studies identified nine main categories of factors influencing asthma treatment adherence in adolescents:

### 3.1. Adolescent Behavior

Adolescent behavior is heavily influenced by the biopsychosocial transformations

characteristic of this developmental phase. During adolescence, there is a heightened desire for autonomy, experimentation, and identity seeking, often accompanied by impulsive behaviors, decision-making based on immediate gratification, and increased peer group influence (Steinberg, 2007). These characteristics can directly affect treatment adherence.

Impulsivity and a propensity for risk-taking make adolescents more likely to neglect medical advice, especially when it conflicts with their immediate interests or social image (Kaplan & Price, 2020). For example, many adolescents avoid using inhalers in public due to embarrassment, fear of judgment, or stigma from peers (Ahmad & Sørensen, 2016). This behavior not only compromises disease control but may also lead to avoidable exacerbations.

Additionally, the desire for independence can result in resistance to supervision by parents and caregivers, including in adherence to prescribed treatments. Some adolescents may omit or alter medication doses as a way of asserting their autonomy (Desager, Vermeulen, & Bodart, 2018). This pursuit of self-determination may be exacerbated by the misconception that asthma is not a serious condition or that symptoms can be controlled without continuous medication use.

Another relevant aspect is the tendency of adolescents to prioritize social, school, or sports activities over health care. Medication use, medical appointments, and monitoring routines are often perceived as obstacles to their daily activities, which leads to lapses in adherence (Chan et al., 2016). This neglect, even when unintentional, compromises treatment effectiveness and can have medium- and long-term consequences.

Thus, understanding typical adolescent behavior is essential for developing approaches that promote treatment adherence. Personalized interventions that address the psychological and social needs of this age group are crucial. Actively involving adolescents in therapeutic decisions, combined with adapted educational and motivational methods, can significantly contribute to building more responsible and adherent behavior regarding asthma.

### **3.2. Beliefs and Attitudes**

The beliefs and attitudes that adolescents develop regarding asthma and its treatment play a crucial role in determining their adherence behaviors. These beliefs, often shaped by personal experiences, information from family, healthcare professionals, or the media, directly influence how adolescents perceive the severity of the disease and the need to follow therapeutic recommendations.

Negative beliefs about medication are one of the main barriers to adherence. Many adolescents fear side effects of inhaled corticosteroids, such as weight gain, hormonal changes, or dependence, even though these associations are not supported by robust clinical evidence (Desager et al., 2018). Additionally, the perception that medications are ineffective or unnecessary, especially during symptom-free periods, may lead to treatment discontinuation. This attitude is particularly common in adolescents with mild or intermittent symptoms who believe they do not need

maintenance medication.

On the other hand, positive beliefs—such as understanding the usefulness of treatment in preventing crises, improving quality of life, and maintaining physical and social capacity, are associated with greater adherence to the therapeutic regimen (Chan et al., 2016). Valuing one's own health and believing in the treatment's effectiveness are factors that facilitate continuity and engagement in asthma care.

Another important aspect is how adolescents interpret the disease itself. Minimizing asthma severity or believing that symptoms can be controlled without medical help are frequently observed attitudes that may be reinforced by family members or peers (Ahmad & Sørensen, 2016). These distorted interpretations contribute to neglecting proper medication use, resulting in higher morbidity and emergency service usage.

Therefore, it is essential for healthcare professionals to identify and discuss adolescents' beliefs during consultations, providing a safe space for clearing doubts and correcting misconceptions. Strategies such as patient-centered health education, motivational counseling, and the use of accessible and non-paternalistic language are recommended to promote attitude change and strengthen positive beliefs about treatment (Kaplan & Price, 2020).

### 3.3. Self-Management

Asthma self-management refers to an adolescent's ability to monitor their condition, recognize signs of worsening, use prescribed medications correctly, and adopt preventive strategies to avoid crises. It is an essential component for effective disease control, especially during a phase of life marked by the pursuit of autonomy and independence (Holley et al., 2017).

However, while many adolescents wish to take control of their health, not all are adequately prepared to do so. Self-management requires cognitive, emotional, and practical skills that are not always fully developed during adolescence. Studies indicate that adolescents often underestimate the severity of their symptoms and have difficulty recognizing patterns that indicate worsening asthma (Rhee et al., 2019). This can lead to delays in administering relief medications or failure to seek timely medical help.

Another challenge related to self-management is inconsistent decision-making. Even when correctly instructed, adolescents may neglect the asthma action plan during stress, social, or school activities, prioritizing aspects of their routine they deem more important at the time. The lack of continuous supervision by caregivers can also contribute to low adherence to self-management practices (Zhang et al., 2023).

Nevertheless, several strategies have proven effective in strengthening self-management. One of them is the development of individualized action plans, created together with the adolescent and their caregivers. These plans clearly and accessibly describe the steps to be followed in case of symptoms, as well as the

correct use of preventive and rescue medications (GINA, 2023).

Support technologies, such as asthma monitoring apps, electronic medication reminders, and symptom tracking tools, have also been used to promote self-management among adolescents. Furthermore, health education programs specifically aimed at this age group—especially those conducted by peers or trained professionals—have shown positive results in promoting self-care (Mosnaim et al., 2020).

In summary, asthma self-management in adolescence is a developing skill that depends on the continuous support of healthcare professionals and caregivers. Investing in educational interventions, technological resources, and personalized strategies is key to ensuring adolescents can safely and effectively self-manage their respiratory condition.

### 3.4. Health Literacy

Health literacy is defined as the ability to obtain, understand, evaluate, and apply health information to make appropriate decisions. In the context of asthma, it involves understanding the chronic nature of the disease, crisis triggers, the role of preventive and rescue medications, and the correct use of inhalation devices (Nutbeam, 2000).

During adolescence, this competence is not always fully developed. Many adolescents do not fully understand the risks of non-adherence or misinterpret the absence of symptoms as a cure, leading to treatment discontinuation (McQuaid et al., 2012). Moreover, incorrect information obtained from unreliable sources, such as social media or peers, can reinforce inappropriate behaviors.

Caregivers also play a key role in this aspect. When parents or caregivers have low health literacy, this can compromise the necessary supervision and support for the adolescent. Therefore, literacy should be addressed with both adolescents and their families through interactive educational programs, accessible language, and visual resources that facilitate understanding.

### 3.5. Role of Healthcare Professionals

The relationship between the adolescent and healthcare professionals is central to promoting adherence. Clear, empathetic, and respectful communication creates a trusting environment where the adolescent feels comfortable expressing doubts, fears, and difficulties related to treatment (Zolnierek & Dimatteo, 2009).

Studies indicate that a patient-centered approach—one that considers the adolescent's preferences, values, and life context—is more effective than an imposed approach. The healthcare professional should act as a partner in care, encouraging adolescent autonomy while maintaining continuous guidance and monitoring (Holley et al., 2017).

Moreover, it is essential that healthcare professionals are trained to address the specificities of this age group, considering the behavioral, cognitive, and emotional changes typical of adolescent development. Strategies such as periodic consultations,

reviewing the action plan, simplifying therapeutic regimens, and using digital resources can strengthen the bond and promote adherence.

### 3.6. Adherence Assessment

Assessing asthma treatment adherence is a challenge in both clinical settings and research. Many adolescents do not accurately report their behavior regarding medication use, either due to forgetfulness, embarrassment, or a desire to meet healthcare professional expectations (Zhang et al., 2023).

Traditional assessment tools, such as self-reported questionnaires, may overestimate adherence. More objective methods include dose counting on inhalation devices, electronic medication use records, and laboratory tests (such as measuring drug levels in the blood), but these are less accessible in clinical practice.

Combining multiple assessment methods, along with a non-punitive, active listening approach, is recommended. The goal should be to understand the reasons for non-adherence and adapt interventions in a personalized manner, respecting the context and challenges faced by the adolescent.

### 3.7. Role of Caregivers

Caregivers — parents, guardians, or other adult references — play a crucial role in supporting asthma treatment adherence. They are responsible for supervising medication use, ensuring attendance at medical appointments, and promoting a home environment free of disease triggers, such as cigarette smoke or allergens (Rhee et al., 2019).

However, during adolescence, caregiver involvement tends to decrease as adolescents seek greater independence. This transition can be delicate, as many adolescents are not fully prepared to independently manage their condition. A balance between supervision and autonomy is essential to avoid care gaps.

Additionally, the emotional support provided by caregivers is fundamental. A welcoming family environment, with open dialogue and positive encouragement, contributes to building responsibility and trust in the adolescent's asthma management.

### 3.8. Peer Influence

Adolescence is a phase marked by intense valuing of peer relationships. The need for social acceptance can directly influence treatment behavior. Many adolescents avoid using inhalers in public due to embarrassment or fear of being seen as “different”, which can lead to non-adherence, especially in school or social situations (Bruzzese et al., 2012).

On the other hand, peers can also exert positive influence. Peer education programs—where adolescents with asthma share their experiences and management strategies with other young people—have proven effective in promoting self-management and reducing stigma (Mosnaim et al., 2021).

Therefore, understanding the social dynamics of adolescents and developing interventions that account for peer influence is crucial for promoting sustainable adherence behaviors.

### **3.9. Health Guidelines and Policies**

Clinical guidelines and public health policies have a direct impact on asthma treatment adherence, especially regarding access to medications, professional training, and the implementation of health education programs.

Guidelines such as those from the Global Initiative for Asthma (GINA, 2023) guide clinical management based on evidence, promoting the rational use of medications, patient education, and the development of personalized action plans. However, their effectiveness depends on the training of professionals and their practical application in real-world healthcare settings.

Moreover, policies that ensure the free or subsidized supply of medications, access to appropriate inhalation devices, and multidisciplinary care are essential for reducing structural barriers that hinder adherence, especially among adolescents in socially vulnerable situations.

## **4. Discussion**

This integrative literature review highlighted the multifaceted nature of asthma treatment adherence in adolescents, emphasizing personal, social, and systemic factors that influence whether adolescents follow prescribed asthma management protocols. Adolescence represents a unique phase in the lifecycle, with numerous developmental challenges that can significantly impact health behaviors, including adherence to chronic disease management. The findings from this review align with existing literature, reinforcing the notion that treatment adherence is not solely determined by individual factors such as motivation or cognitive understanding, but is also heavily influenced by social dynamics and systemic barriers.

### **4.1. Personal Factors and Behavior**

Adolescence is marked by significant psychological and emotional changes, including an increased desire for independence and a heightened sensitivity to peer influence. These factors can both facilitate and hinder adherence to asthma treatment. Adolescents often struggle with balancing self-management with their desire for autonomy, leading to behaviors that can undermine their health. As demonstrated by the studies reviewed, many adolescents underestimate the severity of asthma and view it as less serious during symptom-free periods. This misperception contributes to medication non-adherence, especially when adolescents do not feel immediate consequences of neglecting their treatment. Behavioral barriers to adherence, such as impulsivity and the prioritization of social activities over health management, were found to be significant challenges.

Moreover, the reluctance to use inhalers in public settings due to fear of stigma or social exclusion is a critical behavioral barrier. This finding was consistent with

previous research that underscores the negative impact of stigma on chronic disease management, particularly in adolescents. In this age group, the pressure to conform to social norms and peer behaviors can lead to non-compliance, even when the adolescent understands the importance of medication. Thus, interventions targeting this age group need to focus not only on education but also on strategies to build resilience and self-empowerment, helping adolescents navigate these pressures without compromising their health.

#### **4.2. Beliefs and Perceptions of Asthma**

Adolescents' beliefs about asthma and its treatment also play a crucial role in adherence. Negative perceptions of medication, especially concerns about side effects such as weight gain or hormonal imbalances, were prominent in the studies reviewed. These concerns were often unfounded, with the fear of side effects not supported by substantial evidence. This highlights the need for healthcare providers to engage in discussions that address misconceptions and provide clear, factual information about the benefits of asthma medication.

Additionally, the perceived severity of asthma significantly affects treatment adherence. Some adolescents may believe that their asthma is not serious enough to require consistent medication, particularly during periods of symptom remission. This perception of asthma as a manageable or transient condition often leads to sporadic medication use. Health literacy interventions, particularly those tailored to the developmental stage of adolescence, are crucial for changing these beliefs and improving adherence. These interventions should focus on helping adolescents understand the chronic nature of asthma and the long-term benefits of consistent treatment.

#### **4.3. Role of Caregivers and Healthcare Professionals**

The review also highlighted the pivotal role of caregivers and healthcare professionals in supporting adherence to asthma treatment. Caregivers, particularly parents, are integral in ensuring that adolescents follow treatment regimens, attend appointments, and provide emotional support. However, as adolescents transition into adulthood, the involvement of caregivers often diminishes. This shift can create gaps in the management of the disease, as adolescents may lack the necessary maturity to manage their condition independently. Studies indicate that caregivers can be instrumental in enhancing adherence by monitoring medication use and ensuring a supportive home environment that minimizes asthma triggers.

Similarly, healthcare professionals must adopt an empathetic and collaborative approach to adolescent care. Studies revealed that adolescents are more likely to adhere to treatment when they perceive their healthcare providers as partners in their care, rather than authoritative figures imposing rules. Building trust through effective communication and providing age-appropriate education about asthma management are essential components of successful interventions. Furthermore, healthcare professionals should be trained to recognize the developmental needs

of adolescents and incorporate motivational interviewing techniques that empower them to take ownership of their health.

#### **4.4. Peer Influence and Social Factors**

Peer influence emerged as a significant factor in the adherence to asthma treatment. Adolescents are at a stage where peer relationships are crucial, and the desire for social acceptance can directly affect health behaviors. Studies found that many adolescents avoid using inhalers in public, especially in school or social settings, due to concerns about being labeled as “different.” This peer pressure can result in non-adherence, even when the adolescent understands the importance of their medication.

However, peer influence can also be a positive force. Peer education programs, where adolescents with asthma share their experiences and self-management strategies with other peers, have proven to be effective in improving adherence. Peer support can reduce stigma, provide emotional reinforcement, and encourage healthy behaviors. These findings suggest that incorporating peer influence into adherence interventions could have a significant impact on improving asthma management in this age group.

#### **4.5. Digital Health Tools and Technological Interventions**

Digital health tools, such as mobile apps for asthma management and medication reminders, were shown to be effective in improving adherence. Recent randomized controlled trials (RCTs) and systematic reviews have highlighted the potential of digital tools in promoting self-management behaviors and supporting adolescents in their treatment adherence. One study found that using a mobile app with integrated reminders led to a significant improvement in medication adherence and a reduction in asthma exacerbations. These digital tools provide real-time reminders, track medication use, and offer educational resources that are easily accessible to adolescents.

The use of digital health tools also has the potential to overcome some of the barriers identified in this review, such as forgetting to take medications or avoiding treatments in public. By providing adolescents with more control over their health management, these tools can help bridge the gap between healthcare visits and daily treatment adherence. Furthermore, integrating digital health solutions with healthcare providers’ workflows can facilitate better communication and monitoring of adolescents’ asthma management.

#### **4.6. Policy and Systemic Factors**

National guidelines and healthcare policies play a significant role in shaping the environment for treatment adherence. The review highlighted the importance of accessible healthcare services and the availability of medications in promoting adherence. Policies that ensure free or subsidized access to medications, particularly for adolescents from disadvantaged backgrounds, are crucial for improving

asthma management. Additionally, healthcare systems must invest in training healthcare professionals to adopt best practices for adolescent care and adherence support.

However, the exclusion of grey literature from this review limits the scope of findings on healthcare system-related barriers. Further research could investigate how national policies and systemic factors, such as healthcare access and socioeconomic disparities, influence treatment adherence.

#### 4.7. Limitations of the Review

This review has several limitations. The inclusion of studies published only in English, Portuguese, and Spanish may have excluded relevant articles published in other languages, limiting the diversity of perspectives included. Additionally, the exclusion of grey literature (e.g., conference abstracts, dissertations) may have led to the omission of valuable evidence. The potential for publication bias also exists, as only studies published in peer-reviewed journals were included in the analysis. Future reviews could consider including grey literature to provide a more comprehensive understanding of the factors influencing adherence.

### 5. Conclusion

This integrative review underscores the complex and multifaceted nature of asthma treatment adherence in adolescents. The findings suggest that a variety of personal, social, and systemic factors influence adherence, and these factors are often interconnected. Adolescents' behaviors, beliefs, and developmental needs must be considered when designing interventions aimed at improving adherence. The review also highlights the importance of caregiver involvement, healthcare professional support, and the potential of digital health tools in enhancing adherence.

Moving forward, it is essential to develop and implement multifaceted, youth-centered interventions that address the specific challenges faced by adolescents with asthma. These interventions should include education, peer support, digital health solutions, and collaborative care models that empower adolescents to take an active role in managing their condition. Moreover, further research is needed to explore the impact of healthcare system factors and policies on adherence and to evaluate the effectiveness of different intervention strategies in improving long-term asthma management outcomes for adolescents.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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