

# Asthma Management in Pediatric Patients: Strengths and Weaknesses in Medical Students' Knowledge

## Manejo da Asma em Pacientes Pediátricos: fortalezas e fragilidades no conhecimento dos estudantes de Medicina

## Manejo del asma en pacientes pediátricos: fortalezas y debilidades en el conocimiento de los estudiantes de medicina

Letícia Edwiges Machado Abrahão<sup>1</sup>, Laura de Souza Corrêa Netto<sup>2</sup>, Raphaela Naara Sizinia da Silva Monteiro<sup>3</sup>, Monica Couto Guedes Sejanas da Rocha<sup>4</sup>

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**REVISA**

1.Faculdade de Ciências Médicas e da Saúde de Juiz de Fora-MG.  
<http://orcid.org/0009-0008-4824-6954>

2.Faculdade de Ciências Médicas e da Saúde de Juiz de Fora-MG  
<http://orcid.org/0009-0009-2937-2178>

3.Faculdade de Ciências Médicas e da Saúde de Juiz de Fora-MG  
<http://orcid.org/0009-0000-8610-2603>

4.Faculdade de Ciências Médicas e da Saúde de Juiz de Fora-MG  
<http://orcid.org/0009-0003-2882-4626>

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### RESUMO

**Objetivo:** Avaliar o conhecimento dos estudantes de medicina sobre manejo e condutas na asma em pacientes pediátricos. Foram analisados ensaios clínicos controlados e randomizados e meta-análises em humanos publicados em inglês nos últimos 5 anos, na base de dados MedLine. Foram usados critérios de inclusão e exclusão neste estudo. A pesquisa se deu por meio de um questionário acerca do tratamento da asma; repercussões clínicas associadas; uso adequado da medicação; técnicas de utilização do nebulímetro. O questionário foi aplicado aos estudantes de medicina do primeiro ao oitavo período pelos próprios pesquisadores após a aprovação do Comitê de Ética e Pesquisa. O estudo identificou que embora os estudantes sejam aptos a reconhecer sinais e sintomas da doença, existem fragilidades no conhecimento das diretrizes atuais de manejo da asma bem como no uso do nebulímetro.

**Palavras-chave:** Terapêutica, Asma, Pediatria, Broncodilatador, Inalação.

### ABSTRACT

**Objective:** To assess medical students' knowledge of asthma management and management in pediatric patients. Randomized controlled clinical trials and meta-analyses in humans published in English over the past five years were analyzed in the MedLine database. Inclusion and exclusion criteria were used in this study. The survey consisted of a questionnaire addressing asthma treatment; associated clinical repercussions; appropriate medication use; and nebulizer use techniques. The questionnaire was administered to medical students from the first to eighth semesters by the researchers themselves after approval by the Research Ethics Committee. The study identified that although students are able to recognize signs and symptoms of the disease, there are weaknesses in their knowledge of current asthma management guidelines and nebulizer use.

**Keywords:** Therapeutics, Asthma, Pediatrics, Bronchodilator, Inhalation.

### RESUMEN

**Objetivo:** Para evaluar el conocimiento de los estudiantes de medicina sobre el manejo del asma y el manejo del asma en pacientes pediátricos, se analizaron ensayos clínicos controlados aleatorizados y metaanálisis en humanos publicados en inglés durante los últimos cinco años en la base de datos MedLine. Se utilizaron criterios de inclusión y exclusión en este estudio. La encuesta consistió en un cuestionario que abordó el tratamiento del asma; las repercusiones clínicas asociadas; el uso apropiado de la medicación; y las técnicas de uso del nebulizador. El cuestionario fue administrado a estudiantes de medicina de primero a octavo semestre por los propios investigadores, tras la aprobación del Comité de Ética de la Investigación. El estudio identificó que, si bien los estudiantes son capaces de reconocer los signos y síntomas de la enfermedad, presentan deficiencias en su conocimiento de las guías actuales para el manejo del asma y el uso del nebulizador.

**Descriptores:** Terapéutica, Asma, Pediatría, Broncodilatador, Inhalación

## Introduction

Asthma is the most common chronic disease of childhood, affecting nearly 22 million children worldwide.<sup>1</sup> Acute asthma exacerbations are a leading cause of pediatric emergency room visits and hospitalizations, and are the leading cause of mortality and morbidity in children with asthma.<sup>1,2</sup> Factors such as allergic sensitization, changes in immunity, antiviral response, bacterial infections, and allergen exposure increase susceptibility or risk of exacerbations and are directly related to the success of asthma maintenance therapy<sup>1,3</sup>. Treatment is classically guideline-based and focuses on the intensity and severity of symptoms and the choice of the most appropriate therapy to control and reduce the risk of exacerbations.<sup>4</sup> Although systemic corticosteroids, inhaled  $\beta_2$  agonists, and anticholinergics are recommended for the treatment of severe exacerbations, some children are resistant to this therapy, in part due to genetic polymorphisms.<sup>5</sup> Furthermore, despite the availability of effective maintenance therapies, including inhaled corticosteroids (ICS), patients continue to experience periodic asthma exacerbations, and the incidence of exacerbations in both pediatric and adult patients remains high. Therefore, asthma is a complex condition characterized by marked variation in pathophysiology and response to treatment<sup>6,7</sup>.

Emergency treatment for asthma exacerbation is the administration of aerosolized short-acting beta-2 agonists (SABA) associated, if indicated, with oral corticosteroids. According to international guidelines, maintenance treatment with inhaled corticosteroids (ICSs), when recommended, should be initiated as soon as possible after diagnosis and monitored for gradual reduction in well-controlled patients<sup>8</sup>. Recent GINA updates (2025) suggest considering the use of intravenous magnesium sulfate in patients with severe asthma who do not respond to first-line treatment<sup>9,10</sup>. Administration of IV magnesium therapy among children with acute refractory asthma was associated with hospitalization, independent of asthma severity and other patient characteristics.<sup>10,11</sup>.

## Objective

To assess the knowledge of medical students at an institution in Juiz de Fora, Minas Gerais, regarding the management of asthma in pediatric patients and identify existing weaknesses in order to contribute to excellence in outpatient care and better control of the disease in the community.

## Method

The study involved 425 medical students aged between 18 and 31, from the first to the eighth semester of a private college in the city of Juiz de Fora.

It was carried out through a physical questionnaire about asthma treatment; associated clinical repercussions; proper use of medication; nebulimeter usage techniques.

The questionnaire was applied by the researchers themselves after approval by the Research Ethics Committee (CEP) in December 2024 and data collection took place between March and May 2025.

The research questionnaire was prepared using controlled and randomized clinical trials and meta-analyses in humans published in English over the last 5 years, using the MedLine database as a reference.

The search for descriptors was carried out by consulting MeSH: pediatrics, inhalation, asthma, therapeutics, bronchodilator.

Studies with pediatric patients of different ethnicities, both sexes, aged between 2 and 18 years, which addressed therapy as well as the correct handling of the nebulimeter and which related asthma to lifestyle were included. Studies published in abstract form; with unclear methods and results; about other diseases of the respiratory tract; without a focus on pediatric patients and which only addressed drug interactions and only an intensive care approach and not an outpatient approach were excluded.

The number referring to the Ethics Committee approval is CAAE: 85327424.9.0000.5103.

## Results

The average number of correct answers between the periods was: first period 38.46; second period 46.2; third period 42; fourth period 37.06; fifth period 39.46; sixth period 37.2; seventh period 20.6; eighth period 37.13.

The limitations of this study can be considered as possible consultations by students with teaching materials or other students; low student participation in responding to the survey; questionnaires with erasures, allowing double interpretation and consequent discarding for analysis.

It was possible to observe that the question with the highest success rate was question number 1, with 407 correct answers, which addressed the topic of the pathophysiological mechanism of asthma. The question with the lowest correct answer rate was number 5, with only 119 correct answers. This question addressed the main structural change in the airways in asthma.

**Table I** - Number of correct answers per period.

Questions	Correct Answers per Period							
	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth
1)Pathophysiology	58	67	59	56	50	50	24	43
2)Symptoms	29	27	25	22	48	38	17	33
3)Anatomy	19	31	26	33	33	32	23	40

4)Treatment	48	66	57	46	48	49	22	41
5)Exacerbation	13	23	15	15	10	12	9	22
6)Control	50	54	55	52	53	48	26	43
7)Diagnosis	21	37	26	24	28	19	15	18
8)Therapeutic	29	44	29	35	38	22	21	43
9)Monitoring	15	23	21	16	33	28	17	34
10)Genetic	58	60	63	49	48	47	25	45
11)Technique	33	32	35	25	15	24	12	29
12)Surveillance	56	60	60	45	52	47	26	44
13)Evaluation	58	64	63	50	51	49	26	43
14)Medication	58	59	60	51	47	49	25	44
15)Espacer	32	46	36	37	38	44	21	35

**Source:** Elaborated by Authors.

**Table II - Statistical Values for each period**

Measurement	Period							
	1°	2°	3°	4°	5°	6°	7°	8°
Average	38,466	46,2	42	37,066	39,466	37,2	20,6	37,133
Median	33	46	36	37	47	44	22	41
Mode	58	23 e 60	26	-	48	49	26	43
Standard Deviation	17,303	16,28	17,80	13,94	13,48	13,14	5,422	8,492

**Source:** Elaborated by authors.

## Discussion

The present study evaluated the knowledge of medical students about the management of asthma in children, covering treatment, clinical repercussions and use of inhalation devices. Analysis of a questionnaire administered after a literature review showed that although knowledge increases

with academic progression, weaknesses persist that can compromise asthma care in pediatric patients.

The overall average number of correct answers shows that the topic is not fully consolidated in undergraduate courses, which is worrying, since asthma is the most common chronic disease in childhood and an important cause of pediatric hospitalization<sup>1</sup>. Thus, it is expected that future doctors will be able to recognize and correctly manage the disease.

The uneven performance between semesters suggests that learning is not linear. Students in the middle of the course had better results than those at the beginning and end, possibly due to their greater proximity to Pediatrics and the lack of review of procedures in advanced stages. This demonstrates that fragmented teaching hinders content retention and reinforces the need for active methodologies and early integration into clinical practice. Studies have already identified asthma as a cause of high morbidity and recurrent hospitalizations<sup>1</sup>.

Another finding was the difficulty in correctly handling the nebulimeter. Errors in inhalation technique compromise asthma control, even with appropriate prescription<sup>4</sup>, which highlights the importance of greater practical training to guide patients and families.

In pharmacological treatment, the low accuracy rate regarding inhaled corticosteroids and bronchodilators reveals weaknesses in the understanding of current recommendations. International guidelines consider corticosteroids the basis for maintenance therapy, combined with long-acting  $\beta$ 2-agonists in moderate or severe cases<sup>1,11</sup>. Lack of knowledge of these points compromises adherence and therapeutic efficacy. Regarding magnesium, whether inhaled or intravenous, uncertainty was observed regarding its indication, although the literature recommends its use only in severe cases<sup>10,3</sup>.

The highest rates of correct answers were in questions about symptoms and acute crises, a relevant fact, as early identification reduces complications and hospitalizations. Rapid intervention with short-acting bronchodilators and oral corticosteroids is associated with lower childhood morbidity<sup>2,8</sup>.

Thus, the results reinforce the need for curricular improvement, greater integration between theory and practice, periodic reviews and the adoption of active methodologies. Given the high prevalence of asthma and its impact on children's health, it is essential to strengthen teaching strategies with supervised practice and continuous updating of international guidelines. These measures can train physicians better prepared to deal with a prevalent and highly impactful condition in pediatrics.

## Final Considerations

The study enabled medical students from the analyzed periods to expand their knowledge about asthma symptoms, treatment, clinical repercussions and nebulimeter use techniques. It also contributed to sparking greater interest in the topic and expanding access to technical information to correct inadequate practices in managing the disease. Furthermore, it was observed that, as the periods progressed, students demonstrated greater mastery of the subject.

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**Correspondent author**

Leticia Edwiges Machado Abrahão  
Rua José Esteves de Oliveira, 16, apto 201, Bairro Bom  
Pastor, CEP: 36021-710.  
Juiz de Fora, Minas Gerais, Brasil.  
itsmachado00@gmail.com