

IMPACT OF OBESITY ON ASTHMA CONTROL AND PULMONARY FUNCTION IN ASTHMATIC CHILDREN: A CROSS-SECTIONAL STUDY

IMPACTO DA OBESIDADE NO CONTROLE DA ASMA E NA FUNÇÃO PULMONAR DE CRIANÇAS ASMÁTICAS: UM ESTUDO TRANSVERSAL

IMPACTO DE LA OBESIDAD EN EL CONTROL DEL ASMA Y LA FUNCIÓN PULMONAR EN NIÑOS ASMÁTICOS: UN ESTUDIO TRANSVERSAL



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ABSTRACT

Background: Asthma and childhood obesity are globally growing public health challenges. Obesity is recognized for exacerbating asthma control in children, with pathophysiological mechanisms contributing to pulmonary dysfunction. Understanding this complex interaction is crucial for effective clinical management and the development of appropriate health strategies.

Aims: The main objective was to analyze the impact of obesity on asthma control and pulmonary function in asthmatic children.

Methods: A cross-sectional study was conducted with 165 asthmatic children and adolescents followed in specialized outpatient clinics. Medical record data were used to evaluate Body Mass Index (BMI) using Z-scores to classify overweight/obesity, asthma control (GINA criteria and Asthma Control Test - ACT), and pulmonary function (spirometry). Statistical significance was set at $p < 0.05$.

Results: The sample had a mean age of 11.00 ± 3.21 years, with 61.21% male participants and 34.50% presenting overweight/obesity. A significant association was observed between overweight/obesity and worse asthma control (GINA: $p=0.047$; ACT: $p=0.041$). However, no significant differences were observed in most conventional spirometric parameters between the groups.

Conclusions: Obesity in asthmatic children was significantly associated with worse disease control, even in the absence of significant changes in traditional pulmonary function tests. This reinforces the need for integrated approaches, including nutritional monitoring and promotion of physical activity, in the management of pediatric asthma.

Keywords: Asthma. Obesity. Child. Asthma Control. Pulmonary Function.

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RESUMO

Introdução: A asma e a obesidade infantil são desafios de saúde pública globalmente crescentes. A obesidade é reconhecida por dificultar o controle da asma em crianças, com mecanismos fisiopatológicos que contribuem para a disfunção pulmonar. Compreender essa interação complexa é crucial para um manejo clínico eficaz e desenvolvimento de estratégias de saúde adequadas.

Objetivos: O objetivo principal foi analisar o impacto da obesidade no controle da asma e na função pulmonar de crianças asmáticas.

Métodos: Foi realizado um estudo transversal com 165 crianças e adolescentes asmáticos acompanhados em ambulatórios especializados. Dados de prontuários foram utilizados para avaliar o Índice de Massa Corporal (IMC) usando escores Z para classificar sobrepeso/obesidade, o controle da asma (critérios GINA e Asthma Control Test - ACT) e a função pulmonar (espirometria). A significância estatística foi estabelecida em $p < 0,05$.

Resultados: A amostra teve idade média de $11,00 \pm 3,21$ anos, com 61,21% de participantes masculinos e 34,50% apresentando sobrepeso/obesidade. Observou-se uma associação significativa entre sobrepeso/obesidade e pior controle da asma (GINA: $p=0,047$; ACT: $p=0,041$). Contudo, não foram observadas diferenças significativas na maioria dos parâmetros espirométricos convencionais entre os grupos.

Conclusões: A obesidade em crianças asmáticas foi significativamente associada a um pior controle da doença, mesmo na ausência de alterações marcantes nos testes de função pulmonar tradicionais. Isso reforça a necessidade de abordagens integradas, incluindo monitoramento nutricional e promoção de atividade física, no manejo da asma pediátrica.

Palavras-chave: Asma. Obesidade. Criança. Controle da Asma. Função Pulmonar.

RESUMEN

Introducción: El asma y la obesidad infantil son desafíos crecientes para la salud pública mundial. Se reconoce que la obesidad dificulta el control del asma en niños, con mecanismos fisiopatológicos que contribuyen a la disfunción pulmonar. Comprender esta compleja interacción es crucial para un manejo clínico efectivo y el desarrollo de estrategias de salud apropiadas.

Objetivos: El objetivo principal fue analizar el impacto de la obesidad en el control del asma y la función pulmonar en niños asmáticos.

Métodos: Se realizó un estudio transversal con 165 niños y adolescentes asmáticos seguidos en clínicas ambulatorias especializadas. Los datos de las historias clínicas se utilizaron para evaluar el índice de masa corporal (IMC) mediante puntuaciones Z para clasificar el sobrepeso/obesidad, el control del asma (criterios GINA y Prueba de Control del Asma - ACT) y la función pulmonar (espirometría). La significación estadística se estableció en $p < 0,05$.

Resultados: La muestra tenía una edad media de $11,00 \pm 3,21$ años, con un 61,21% de participantes varones y un 34,50% con sobrepeso/obesidad. Se observó una asociación significativa entre el sobrepeso/obesidad y un peor control del asma (GINA: $p=0,047$; ACT: $p=0,041$). Sin embargo, no se observaron diferencias significativas en la mayoría de los parámetros espirométricos convencionales entre los grupos.



Conclusiones: La obesidad en niños asmáticos se asoció significativamente con un peor control de la enfermedad, incluso en ausencia de alteraciones marcadas en las pruebas de función pulmonar tradicionales. Esto refuerza la necesidad de enfoques integrados, que incluyan la monitorización nutricional y la promoción de la actividad física, en el manejo del asma pediátrico.

Palabras clave: Asma. Obesidad. Niños. Control del Asma. Función Pulmonar.

1 INTRODUCTION

1.1 EPIDEMIOLOGY

According to the Global Initiative for Asthma (GINA) 2025, asthma affects approximately 350 million people worldwide, being responsible for the worsening of the quality of life of children and their families, remaining one of the most common chronic diseases worldwide (GLOBAL INITIATIVE FOR ASTHMA, 2025). In addition, in Brazil, the Ministry of Health warns about the estimate that about 23% of the Brazilian population lives with the disease, with variable incidence depending on the region (BRASIL, 2022).

Childhood obesity, a risk factor for multiple morbidities, also represents a health problem in the pediatric population and has grown exponentially in recent decades, with relevance in the global context. Worldwide, data show that in four decades the number of obese children and adolescents jumped from 11 million to 124 million (MINISTRY OF HEALTH, 2022). In Brazil, the National Study of Child Food and Nutrition (ENANI, 2019), the latest study released by the Ministry of Health, reveals that 10.1% of Brazilian children under the age of five are overweight, while 3% of them suffer from obesity.

In the United States, the prevalence of obesity among children and adolescents has grown significantly over the past decades, from 3.6% in 1980 to 19.3% in 2018. Similarly, childhood asthma has also shown a significant increase, with the proportion of children affected rising from 3.4% in 1980 to about 7% in 2019, totaling more than five million cases. (REYES-ANGEL et al., 2022).

1.2 ASTHMA

Asthma represents one of the main public health problems of the twenty-first century, affecting millions of children around the world. It is a heterogeneous disease, characterized by variable airway obstruction, associated with bronchial hyperresponsiveness (JAYASOORIYA et al., 2025). In childhood, it is noteworthy that the risk factors involved in the development of asthma are low birth weight, prematurity, viral infections, passive exposure to smoking, and obesity (JAYASOORIYA et al., 2025). Its clinical presentation varies according to age group, with the presence or absence of eczema, food allergies, cough, wheezing, higher incidence of obesity, sensitization to aeroallergens, and dyspnea (KHALAF et al. 2024).

For an accurate diagnosis of asthma, according to the Global Initiative for Asthma (GINA, 2025), a clinical history compatible with recurrent respiratory symptoms (wheezing, cough, dyspnea, and chest tightness) is required, as well as objective evidence of variable airflow obstruction (spirometry or PEF) or type 2 inflammatory biomarkers (eosinophils or

FeNO).

Despite the common symptoms, individuals with asthma may present with different phenotypes (symptoms and observable clinical characteristics) and endotypes (distinct biomarker profiles and pathophysiology) (AVERILL et al. 2024). Once the diagnosis of asthma is made, it is important to assess the patient's risk factors for exacerbations, even if symptom control is adequate. In addition, the role of pulmonary function tests in helping in the diagnosis and assessment of future risk is highlighted (GINA, 2025).

1.3 OBESITY

Obesity is a pathology that involves the excessive accumulation of body fat, resulting from the individual's genetic predisposition, associated with the way fat is distributed in the body and the influence of environmental factors (NORIEGA et al. 2023).

Obesity in children from the age of 2 is defined according to specific growth parameters. The criteria used by the Centers for Disease Control and Prevention (CDC) that obesity is considered when the Body Mass Index (BMI) reaches or exceeds the 95th percentile for age and sex; or by the World Health Organization (WHO), which uses the Z score: values above +2 indicate obesity in children aged 5 to 19 years, while in children under 5 years the cutoff point is $Z > +3$. The severity of obesity can be classified into Grades 1, 2, and 3, according to standardized growth tables prepared by the CDC or the WHO. For children under 2 years of age, the CDC recommends using the WHO weight-for-length growth standards, which are age- and sex-specific, rather than BMI.

The global increase in obesity, which significantly increases susceptibility to several diseases, including asthma, has become a worldwide epidemic. According to the World Obesity Federation, obesity is considered a chronic, recurrent, and progressive disease that alters respiratory functions due to the compression caused by adipose mass and inflammation of adipose tissue, contributing to respiratory dysfunctions, regardless of the presence of asthma (KRIVOŠOVÁ et al., 2025).

1.4 THE OVERLAP: ASTHMA AND OBESITY

Obesity exerts a substantial influence on asthma control in the pediatric population. The interaction between these two conditions manifests early, with a higher prevalence of persistent symptoms, worse response to treatment, and a higher frequency of exacerbations among overweight children and adolescents. (KRIVOŠOVÁ et al., 2025).

The overlapping of these two comorbidities reveals a complex condition in which obesity not only predisposes to the development of asthma, but also has a direct impact on

the pulmonary control and function of asthmatic children (DIXON; POYNTER. 2016).

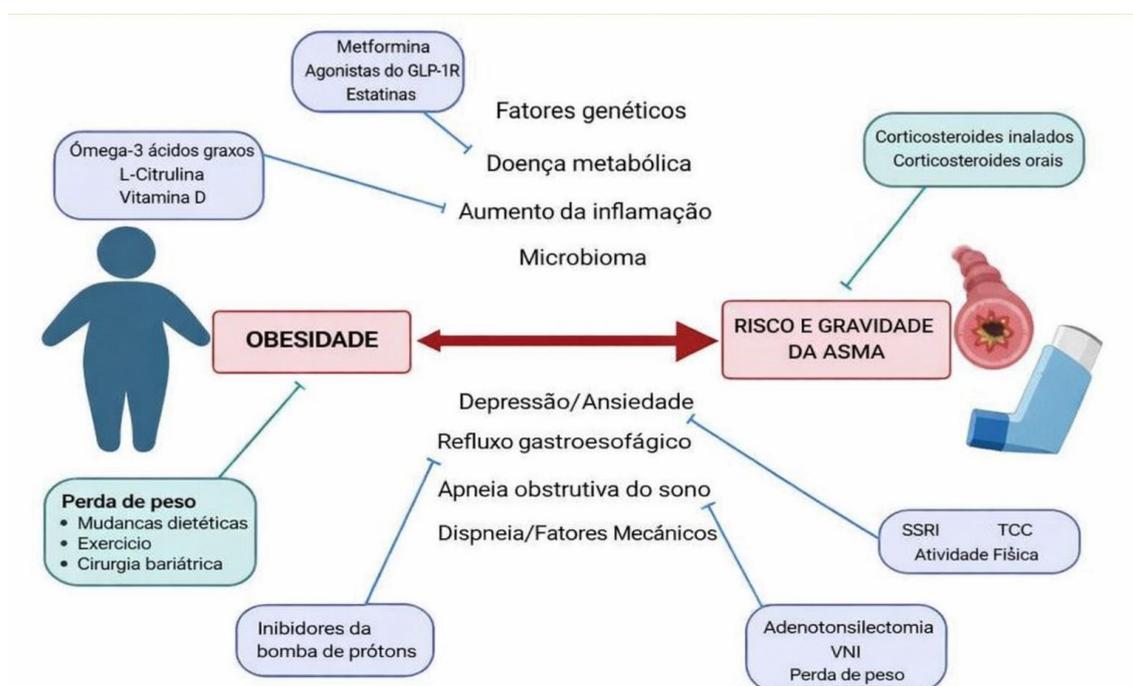
Epidemiological studies have shown that asthma is more frequent in obese individuals compared to thin people. In these patients, the disease tends to persist longer, requires more intensive treatments, greater use of reliever medications, and often longer periods in the emergency room. (KRIVOŠOVÁ et al., 2025).

The association between obesity and asthma is so significant that it gave rise to the concept of obesity-associated asthma, a specific phenotype characterized by greater severity and poorer control of the disease. This phenotype can be subdivided into early-onset atopic asthma (OAE), in which disease control shows little improvement after weight loss, and late-onset non-atopic asthma (LONA), in which the disease tends to regress with reduced body weight (KRIVOŠOVÁ et al., 2025).

The understanding of this impact has been widely studied, evidencing pathophysiological mechanisms reserved for the pediatric population, not observed in adults and lean individuals (ABU ZAHRA; PESSIN.; RASTOGI. 2024).

Figure 1

Pathophysiological pathways involved in obesity-related asthma and potential interventions for the management of asthma patients in the context of obesity. CBT/CBT: Cognitive-behavioral therapy. GLP-1R: Glucagon-like peptide-1 receptor. NIPP/NIV: Non-invasive positive pressure ventilation. SSRI/SSRI: Selective serotonin reuptake inhibitor



Source: Averill; Oven, 2024.

1.5 PATHOPHYSIOLOGY

The relationship between obesity and asthma is multifactorial, including genetic factors, dietary and gut microbiome changes, systemic inflammation, metabolic changes, and changes in lung anatomy and function. (KRIVOŠOVÁ et al., 2025)

In addition, behaviors associated with obesity, such as inadequate intake of macro and micronutrients and a sedentary lifestyle, contribute to the worsening of both diseases. In addition, genetic and epigenetic variations in molecules involved in metabolic regulation and associated inflammation have been identified as factors that contribute to the development of obesity-related asthma. (MAZZOTTA et al., 2025)

These multiple mechanisms combined help explain the greater severity and more difficult control of asthma in overweight children.

1.5.1 Structural changes

From a mechanical point of view, excess adipose tissue imposes additional load on the rib cage, reducing the volume of the cavity and limiting the mobility of the wall, which decreases lung compliance and ventilation efficiency. (KRIVOŠOVÁ et al., 2025).

The pulmonary function of children and adolescents with obesity declines proportionally to the increase in adiposity. According to Krivošová et al. (2025), mechanical compression on the diaphragm due to abdominal obesity also reduces lung expansion, causing a decrease in parameters such as vital capacity and dynamic lung volumes. This is explained by the increase in intra-abdominal pressure that restricts diaphragmatic movement.

1.5.2 Changes in ventilatory mechanics

In non-obese asthmatic children, typical airflow limitation is evidenced by a reduction in FEV_1/FVC (forced expiratory volume in one second/forced vital capacity) and $FEF_{25-75}\%$ (forced expiratory flow between 25% and 75% of FVC), with partially reversible obstruction after bronchodilator use (YING et al., 2022). In the concomitant presence of obesity, studies have shown a further reduction in FEV_1/FVC and $FEF_{25-75}\%$, suggesting that obesity aggravates airflow limitation in these patients (YING et al., 2022).

Respiratory mechanics undergo important changes due to multiple factors. It is observed that, even with FEV_1 and FVC values within normal or even increased ranges, the FEV_1/FVC ratio tends to be lower, a finding that has been associated with the phenomenon of dysanapsia—a mismatch between the growth of the lung parenchyma and the caliber of the airways. This condition favors expiratory flow limitation, since the small airways become

narrower and the available airflow is significantly reduced. (REYES-ANGEL et al., 2022).

This reduction in respiratory volumes, particularly in functional residual capacity (FRC), has been described as inversely proportional to body mass index, and is attributed to lower chest wall compliance in obese individuals.

In situations of reduced lung volume, the elastic retraction force of the lung on the airways also decreases, which reduces the strain on the smooth muscle of the airways (LLVA). With less mechanical load, this muscle can contract more easily in the face of bronchoconstrictive stimuli or neuromuscular activation, increasing susceptibility to narrowing of the airways. In addition, a reduced tidal volume contributes to further reducing the strain applied to the LLM, favoring bronchial hyperresponsiveness. (MAZZOTTA et al., 2025)

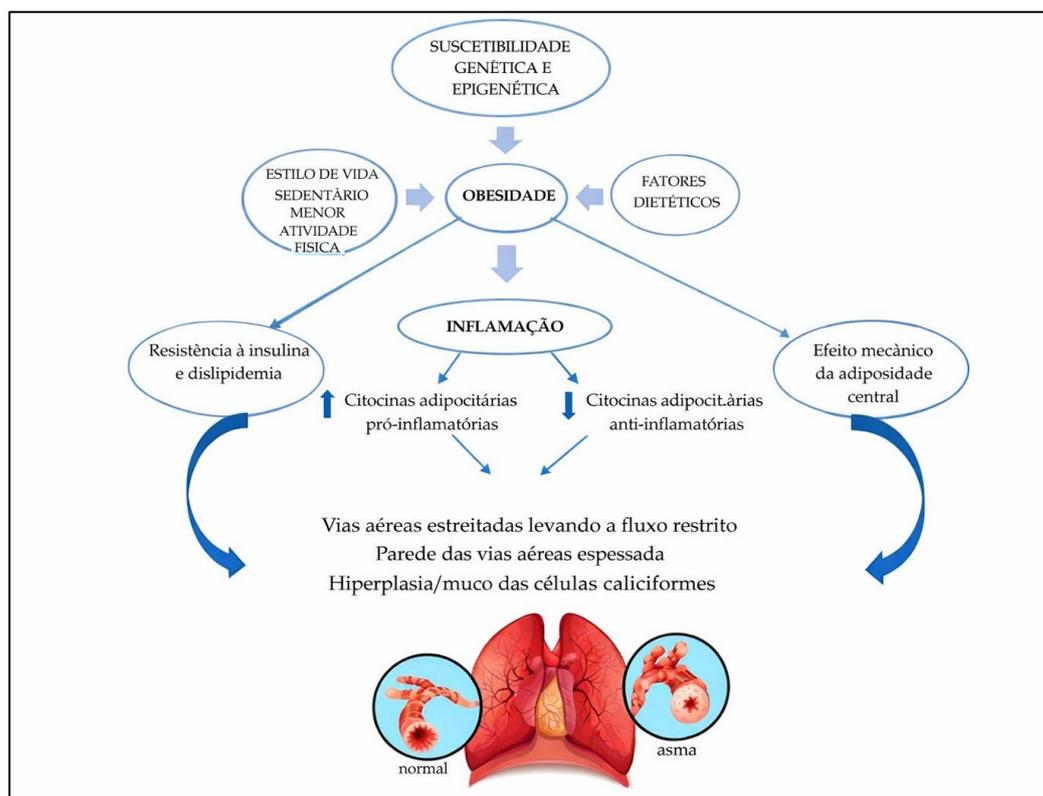
Obesity, therefore, acts as a modulator of this process, intensifying changes that are already present in asthma. The biomechanical limitation favors the worsening of symptoms and the impairment of ventilatory capacity. Thus, obesity is a significant impact factor that can be explained due to changes in airway anatomy caused by excess weight (REYES-ANGEL et al., 2022)

1.5.3 Visceral adipose tissue

Among the different adipose compartments, visceral adipose tissue (VST) stands out as the main determinant of asthma risk and severity in the pediatric setting. As pointed out by Krivošová et al. (2025), HST is characterized by high metabolic activity and greater macrophage infiltration, resulting in the production of pro-inflammatory mediators, which intensify systemic inflammation and airway hyperresponsiveness.

Metabolically active, adipose tissue secretes molecules called adipokines, which have pleiotropic effects. In lean individuals, there is production of low concentrations of pro-inflammatory adipokines, such as leptin and resistin, as well as cytokines such as interleukin (IL)-6, IL-8, and tumor necrosis factor (TNF) α , while adiponectin, an adipokine with an anti-inflammatory effect, is produced in high quantities. (MAZZOTTA et al., 2025)

On the other hand, in the state of obesity, adipose tissue becomes hypertrophied and infiltrated by pro-inflammatory activated macrophages, resulting in increased inflammatory cytokines and reduced adiponectin. The proportion of macrophages in adipose tissue is normally low (about 4%), but can reach up to 12% in obese individuals. (MAZZOTTA et al., 2025)

Figure 2*Factors related to asthma associated with obesity*

Source: Mazzotta; Barkai, 2025.

1.5.4 Systemic inflammation

Obesity can also influence the severity and evolution of asthma through changes that occur directly in systemic inflammation.

In terms of inflammation, asthma is classically characterized by T helper 2 (Th2) type inflammation, involving cytokines such as IL-4, IL-5, and IL-13, with consequent eosinophilia, increased IgE, and bronchial hyperresponsiveness (NYAMBUYA et al., 2020).

The phenotype known as allergic asthma (eosinophilic) is associated with this inflammatory profile and is the most common in childhood (CARVALHO-PINTO et al., 2021).

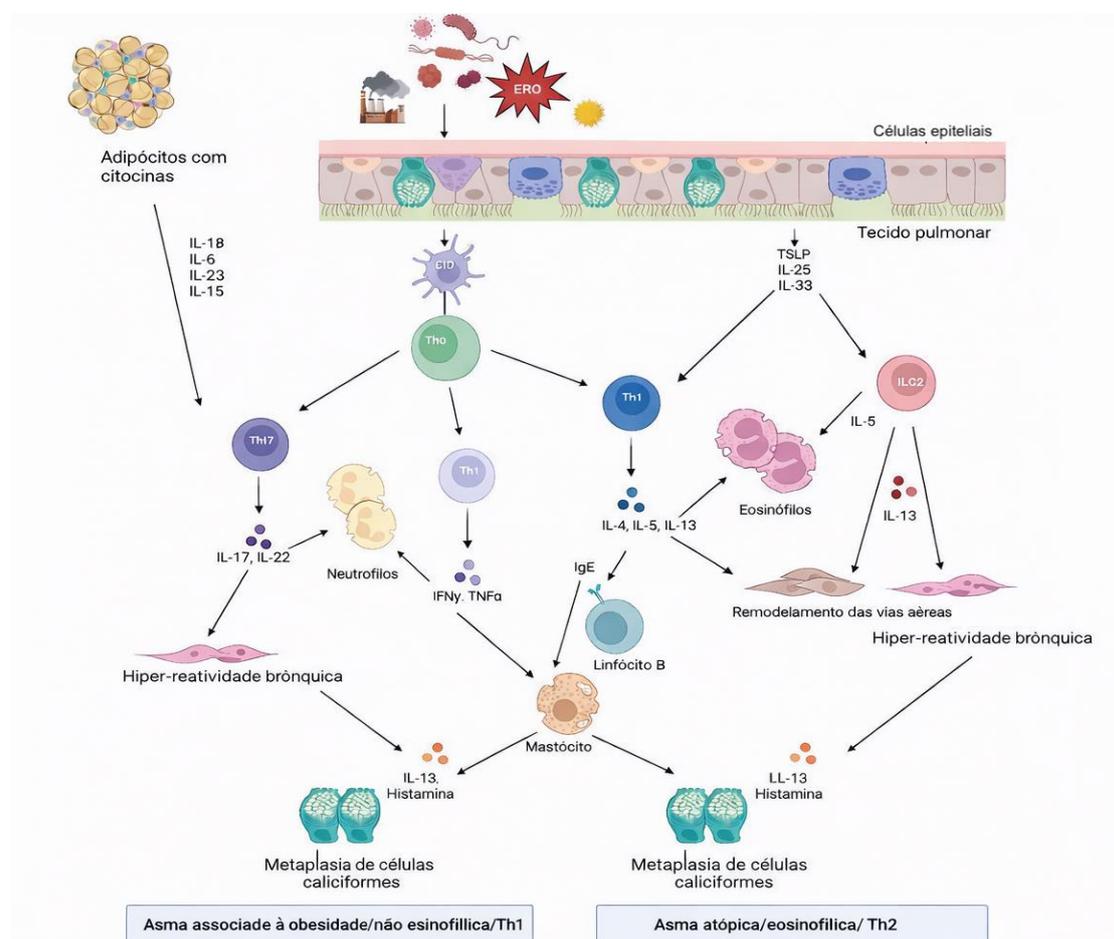
On the other hand, the overlap between obesity and asthma reveals a difference in the inflammatory pattern: the immune response tends to correspond to the T helper 1 (Th1) profile. In these cases, there is an increase in mediating cytokines such as TNF- α , IFN- γ , IL-6, and IL-8, with a reduction in the Th2 response (VEZIER et al., 2021). Such immune modulation is due to high levels of inflammatory adipokines, which promote the activation of Th1 cytokines (SCHMIDT et al., 2022).

Furthermore, it is necessary to emphasize that this Th1 profile is more associated with neutrophilic or non-eosinophilic inflammation. In these cases, the lower association with eosinophilic alterations may mean lower response to corticosteroids and greater disease

severity (DI CICCIO et al., 2023) (REYES-ANGEL et al., 2022).

Figure 3

Schematic of the role of Th17, Th1, and Th2 cells in asthma. When in contact with respiratory allergens, pollutants, and viruses, airway epithelial cells produce a wide range of inflammatory cytokines. In addition, excess adipose tissue present in the body triggers "low-grade inflammation," with inflammatory cytokines contributing to airway inflammation. According to the subtype of asthma, several immune cells are activated and produce cytokines and inflammatory molecules, causing the typical symptoms of asthma. IFN γ : interferon gamma, IgE: immunoglobulin E, IL: interleukin, ROS: reactive oxygen species, TNF α : tumor necrosis factor-alpha, TSLP: thymic stromal lymphopoietin



Source: KRIVOŠOVÁ et al, 2025

1.5.5 Therapeutic interventions, repercussions on prognosis and control

Studies have concluded that obese children tend to have greater difficulty in achieving and maintaining adequate control of the disease, since excessive adiposity contributes to the intensification of systemic inflammation, to the reduction of thoracic compliance, and to the alteration of ventilatory mechanics, with a direct impact on the clinical stability of asthma. (KRIVOŠOVÁ et al., 2025).

The literature shows that nutritional interventions and multidisciplinary programs aimed at reducing adiposity can simultaneously improve metabolic parameters and pulmonary function in the pediatric asthmatic population.

As reported by Krivošová et al. (2025), the decrease in visceral and subcutaneous fat, accompanied by an improvement in body composition, is associated with increased lung function and a reduction in respiratory symptoms in obese children and adolescents. These findings highlight the importance of an integrated approach, which includes nutritional intervention, encouragement of physical activity, and appropriate clinical management.

1.6 JUSTIFICATION

Asthma and childhood obesity pose growing public health challenges, affecting millions of children globally and significantly impacting their quality of life. The overlap of these conditions is alarming, as obesity has been shown to increase the risk of asthma exacerbation, leading to poorer disease control, more persistent symptoms, and a higher frequency of exacerbations in the pediatric population. Pathophysiological mechanisms, such as mechanical compression of adipose tissue and systemic inflammation, contribute to pulmonary dysfunction. Therefore, this cross-sectional study is justified by the urgent need to investigate and quantify the impact of obesity on asthma control and lung function in asthmatic children, in order to support more effective clinical strategies and health policies.

2 OBJECTIVES

2.1 MAIN OBJECTIVE

The objective of this study was to analyze the impact of obesity on asthma control and lung function in asthmatic children.

2.2 SPECIFIC OBJECTIVES

- To assess the association between obesity and the level of asthma control;
- To evaluate the association between obesity and pulmonary function in asthmatic children;

3 METHODOLOGY

3.1 STUDY DESIGN

A descriptive, cross-sectional study was conducted involving 165 children and adolescents at the Children's Asthma Outpatient Clinic and at the Pediatric Pulmonology Outpatient Clinic of the Federal University of Goiás Hospital das Clínicas.

The diagnosis of asthma was based on clinical and functional symptoms. Obesity and overweight was based on BMI Z scores.

3.2 INCLUSION CRITERIA

Data were collected from the medical records of patients treated from July 2024 to September 2025. The study included children and adolescents diagnosed with asthma and who were able to undergo spirometry.

3.3 EXCLUSION CRITERIA

Patients with neurological diseases, immunodeficiencies, and prematurity, or with other chronic lung diseases, such as bronchiolitis obliterans, bronchopulmonary dysplasia, and cystic fibrosis, were excluded. Patients who had incomplete data in the medical records were also excluded.

3.4 PROCEDURES

3.4.1 Anthropometric assessment

Weight and height were obtained from the data recorded in the consultation. From then on, BMI was calculated, with weight in kilograms divided by the square of height, in meters. The values found were placed in graphs, with Z-score distribution according to sex and age. The classification of nutritional status followed the criteria of the World Health Organization (WHO), in which Z scores between -2 and +1 were considered normal weight, overweight Z score greater than or equal to +1 and less than +2 and obesity Z score greater than or equal to +2 and less than +3 and severe obesity Z score greater than +3. (Tosca et al., 2021)

3.4.2 Pulmonary function test

Spirometry was performed at the Pulmonary Function Laboratory of the Hospital das Clínicas of the Federal University of Goiás (HC-UFG). Pulmonary function tests were performed using the KoKo Spirometer (Koko® Spirometer, PDS Instrumentation, Louisville, CO, USA) and analyzed according to the recommendations of the ATS (SCHMIDT et al., 2022) The Global Lung Function Initiative (GLI) set of reference equations for interpreting pulmonary function tests was used for both percentage and z score (Quanjer et al; 2012).

All patients were instructed not to use short-acting bronchodilators in the last four hours and long-acting bronchodilators in the last 12 hours before the examination. None of them were exacerbated at the time of the test. Before each examination, height and weight

measurements were taken. (SCHMIDT et al., 2022)

The examination was performed by trained technicians experienced in pulmonary function assessments or by the researchers themselves. The test was considered acceptable after performing three maneuvers with a difference of less than 500 milliliters between their peak expiratory flow (PEF); and reproducible when the difference between FVC and forced expiratory volume in one second (FEV1) was less than 150 milliliters in at least two maneuvers. The highest values of FEV1 and FVC were chosen for each curve. (SCHMIDT et al., 2022)

For all of the respiratory function parameters analyzed, we considered normal values equal to or greater than 80% of the expected value, and for bronchodilator response, we considered a variation greater than or equal to 200 ml or 12%. (ENANI, 2019)

3.4.3 Assessment of Asthma Control and Severity

According to the updated guidelines of the Global Initiative for Asthma (GINA 2024/2025), asthma severity should be determined retrospectively, considering the level of treatment required to maintain adequate symptom control. Therefore, mild asthma corresponds to cases in which control is achieved with therapies in Steps 1 or 2, such as the use of low-dose daily inhaled corticosteroids or the use of inhaled corticosteroids in combination with formoterol as needed, in addition to the possibility of association with antileukotrienes. Moderate asthma is asthma in which control is achieved at Step 3, usually by means of a low-dose inhaled corticosteroid associated with a long-acting bronchodilator or, alternatively, by a medium-dose inhaled corticosteroid. Severe asthma, on the other hand, is defined as control only achieved with Steps 4 or 5 therapies, which involve the use of inhaled corticosteroids in a medium or high dose associated with a long-acting bronchodilator, and, when necessary, additional therapies, such as antileukotrienes, tiotropium, or biologic drugs, including anti-IgE, anti-IL5, anti-IL4R α , and anti-TSLP. Severe asthma also encompasses patients who remain uncontrolled even after therapeutic optimization in the recommended step, and oral corticosteroids may be required in specific situations, always with caution due to adverse effects.

Based on this current definition, the severity of asthma in the present study was retrospectively assessed, according to the therapeutic step in which the patient was or in which he had achieved clinical control. Symptom control was determined according to the GINA 2025 criteria, considering the manifestations presented in the last four weeks. Evaluation included the presence of daytime symptoms more than twice a week, asthma-related nighttime symptoms or awakenings, the need for reliever medication more than twice

a week, and any limitation in usual activities resulting from the disease. According to these criteria, the patient was classified as well-controlled when none of the items were present, partially controlled when one or two criteria were identified, and uncontrolled when three or four were present.

In the study, both the level of control and the severity of asthma were determined on the basis of the information recorded in the medical records, including clinical and therapeutic data corresponding to the time of spirometry. This approach allowed the assessment of the disease status in a standardized way, strictly following the most current GINA recommendations.

In addition, the Asthma Control Test (ACT) was also used to assess asthma control. It is considered a valuable tool for assessing asthma control and refers to the assessment of the limitation of daily activities at home, school, or work; the frequency of dyspnea; the frequency of awakenings at night or earlier than the usual time due to asthma; the frequency of use of short-acting bronchodilators and the patient's perception of the control of their disease (how they think their asthma is) in the last four weeks. The questionnaire score is calculated from the sum of the values of the answers to each question, which score from 1 to 5 points and the final score ranges from 5 to 25 points. Answers that indicate greater control receive higher scores. If the sum results in 20 points or more, asthma is considered controlled (Schatz et al; 2006).

3.5 STATISTICAL ASPECTS

3.5.1 Sample Size Calculation

This was a non-probabilistic sample, and all eligible patients who underwent spirometry within the established time limit of the patients with asthma followed up at our service were analyzed.

3.5.2 Statistical Analysis

All analyses were performed using the Statistical Package for the Social Sciences, version 22.0 for Windows (SPSS Inc., Chicago, IL, USA). Statistical analyses included simple frequencies and descriptive statistics of the variable of interest. The results obtained were presented as cases (proportion), mean \pm SD, or median (interquartile range). The Chi-square test and Student's t-test or the Mann-Whitney U test were, respectively, used to test differences between categorical variables and between continuous variables.

Nominal statistical significance was set at $p < 0.05$ for all analyses. The odds ratio (OR) from this analysis is the OR for obesity.

3.5.3 Ethical aspects

The study was approved by the Research Ethics Committee of the Federal University of Goiás (UFG). The study protocol and the Informed Consent Form (ICF), as well as the Informed Consent Form (TALE) were approved by the UFG Research Ethics Committee (COEP) in the project entitled "Clinical, functional, and inflammatory evaluation of asthmatic children and adolescents at the asthma outpatient clinic of the Hospital das Clínicas of the Federal University of Goiás", CEP/HC/UFG protocol, opinion no.: 3.716.365 (APPENDIX 1). All parents and guardians of the children and adolescents in the study, as well as the participants, signed the informed consent form and TALE, respectively (APPENDICES 2 AND 3).

4 RESULTS

A total of 165 children and adolescents with asthma were included, with a mean age of 11.00 ± 3.21 years, and 61.21% were male. There were no losses or exclusions.

According to the level of asthma control, 49.09% (81) were classified as having controlled asthma according to the GINA questionnaire and 69.7% (115) were classified as having asthma controlled by the GINA questionnaire and 69.7% (115) by the ACT. Regarding the BMI classification, 65.50% (108) were underweight or normal weight, whereas 34.50% (57) were overweight or obese. The sociodemographic characteristics of the children and adolescents included in the study are shown in Table 1.

Table 1

Clinical and sociodemographic characteristics of the children and adolescents included in the study

VARIABLES	VALUES
Age*	11.00 \pm 3.21
Gender**	
Male	101 (61,21)
Women	64 (38,79)
BMI**	
Low weight/eutrophic	108 (65,50)
Overweight/obesity	57 (34,50)
GINA**	
Controlled	81 (49,1)
Partially controlled	49 (29,7)
Uncontrolled	35 (21,2)
ACT**	
Controlled	115 (69,7)
Uncontrolled	50 (30,3)
Physical activity**	
Yes	80 (48,48)
No	85 (51,52)
Step treatment**	
1	21 (12,73)

2	40 (24,25)
3	61 (36,97)
4	32 (19,39)
5	11 (6,66)
Spirometry report**	
Normal	98 (59,39)
Lightweight DVO without BD	22 (13,34)
Lightweight DVO with BD	34 (20,60)
Moderate DVO with BD	3 (1,82)
Nonspecific	8 (4,85)

Continuous variables presented as mean \pm standard deviation* and categorical variables presented as n (%)**; BMI: Body mass index; GINA: Global Initiative for Asthma. ACT: Asthma Control Test; OLD: Obstructive lung disease; BD: Bronchodilator..

Source: Authors.

A statistically significant association was found between the presence of overweight/obesity and the level of asthma control according to the GINA ($p=0.047$) and ACT ($p=0.041$) classifications (Table 2). No significant associations were observed between BMI classification and gender, level of physical activity, and spirometry report.

Table 2

Association between the presence of overweight/obesity and the level of asthma control in children and adolescents

Asthma control	Low weight/eutrophic	Overweight/obesity	P
GINA			
Controlled	60 (55,6)	21 (36,8)	0,047
Partially controlled	30 (27,8)	19 (33,3)	
Uncontrolled	18 (16,7)	17 (29,8)	
ACT			
Controlled	81 (75,0)	34 (59,6)	0,041
Uncontrolled	27 (25,0)	23 (40,4)	

GINA: Global Initiative for Asthma. ACT: Asthma Control Test. Statistical test: Chi-square test. Percentage relative to the spine.

Source: Authors.

When comparing pre-BD spirometry values in liters, percentage of predicted and FVC z-score, FEV1, FEV1/FVC, FEF25-75%, no significant differences were observed between the underweight/eutrophic and overweight/obese groups ($p>0.005$). There were also no differences between BMI and qualitative classification of FEV1 and FEF25-75% (Table 3).

Table 3

Association between the presence of overweight/obesity and the qualitative classification of FEV1 and FEF25-75%

Spirometric Values	Low weight/eutrophic**	Overweight/obesity**	P
FEV1			
≥ 80	86 (80,4)	46 (80,7)	0,960*
< 80	21 (19,6)	11 (19,3)	
FEF25-75%			
≥ 70	74 (70,5)	43 (75,4)	0,041*
< 70	31 (29,5)	14 (24,6)	

* Chi-square test. ** Percentage relative to column. FEV1: Forced expiratory volume in one second. FEF25-75%: Forced expiratory flow between 25 and 75% of forced vital capacity. Statistical test: Source: Authors.

5 DISCUSSION

This cross-sectional study on the impact of obesity on asthma control and lung function in asthmatic children did not show a significant association between obesity and impaired lung function as assessed by spirometric parameters, but it did demonstrate an association between high BMI and poorer asthma control in this population. Similar findings have been described in the literature, indicating that, despite the worsening of clinical control and the increase in symptom perception, conventional spirometry parameters, such as FEV1 and FVC, can remain preserved in obese asthmatic children (MAZZOTTA et al., 2025). Corroborating these data, a study involving children aged 5 to 14 years conducted in Anápolis, Goiás, did not identify significant differences in the predictive values of spirometry between eutrophic and obese groups after adjusting for maturity and other factors, although trends in pulmonary changes were observed (MELLO et al., 2025). This non-association between obesity and worse lung function, but also an association with the level of disease control is possibly due to the duration of the disease. Children tend to have better lung function than adults, often even presenting with normal spirometry in asthmatic children, which is not common in adults.

In adults, obesity is also associated with poorer asthma control and poorer quality of life. A study conducted at the Federal University of Bahia involving 925 patients with asthma, 299 of whom were characterized as obese according to their BMI. BMI was associated with several pulmonary function parameters ($p < 0.05$). There were associations between BMI and asthma symptoms, asthma-related quality of life, asthma exacerbations, and difficult-to-treat asthma ($p < 0.05$). The group with a high BMI required higher doses of inhaled

corticosteroids and showed a reduction in some pulmonary function parameters, such as FVC. (JESUS et al., 2017). Unlike the relationship observed in our study, which did not show significant differences between the underweight/eutrophic and overweight/obese groups ($p>0.005$). This is mainly due to poorer lung function in adults than in children, regardless of whether they are obese or not.

The absence of significant differences in spirometric parameters, as observed by us, suggests that the impact of excess weight on the clinical expression of asthma might be related to mechanisms that were not fully captured by traditional spirometry, such as systemic inflammation, respiratory mechanical alterations, and greater perception of dyspnea. Therefore, the assessment of asthma control should be comprehensive, incorporating clinical instruments, objective parameters, and the analysis of nutritional and behavioral factors.

The guidelines of the Global Initiative for Asthma recognize obesity as a specific phenotype of asthma, associating it with poorer disease control and a higher frequency of exacerbations (GINA, 2025). In this sense, understanding the interaction between overweight and asthma is essential for appropriate clinical management and for the development of more individualized therapeutic strategies. The results of our study reinforce this perspective by demonstrating a significant association between high BMI and poorer asthma control in children and adolescents.

The results presented by us are in line with recent evidence in the literature. JIANG et al. (2025), in a study with a pediatric population, observed that asthmatic children who are overweight or obese have greater clinical severity, worse disease control, and higher levels of systemic proinflammatory cytokines, suggesting that excess adipose tissue, through inflammatory mechanisms, contributes to a greater symptomatic burden and difficulty in asthma control, even in the absence of significant functional changes.

Despite the clinical relevance of this association, there are still relatively few studies investigating the relationship between increased BMI, asthma severity, and spirometric impairment, especially in the pediatric population and in the national context. In Brazil, the first studies on the subject date back to the early 2000s, which highlights the need for more up-to-date scientific production. Among the pioneering national studies, the study conducted in Santa Maria, Southern Brazil, which evaluated 4,010 adolescents aged 13 to 14 years and demonstrated a positive association between high BMI and a higher prevalence of sporadic and exercise-induced wheezing, stands out, constituting one of the first national evidences of the relationship between overweight, obesity, and a higher frequency of asthmatic symptoms (CASSOL et al., 2005).

On the international scene, similar findings have also been described. A study conducted in Italy with 462 children and adolescents with asthma identified higher prevalences of overweight (18.6%) and obesity (13.9%) than those observed in the general pediatric population, suggesting a higher frequency of overweight among individuals with asthma (TOSCA et al., 2021). In line with these data, the present study also showed a significant association between obesity and poorer asthma control, corroborating the characterization of this phenotype as clinically more difficult to manage. Recent studies indicate that obese individuals with asthma have a higher symptomatic burden, a higher frequency of exacerbations, and a less favorable response to conventional treatment. Similarly, MAZZOTTA et al. (2025) highlight that, especially in the pediatric population, the coexistence between obesity and asthma is related to worse clinical control and greater impact of respiratory symptoms, even in the absence of significant functional changes.

In our study, we also found no significant associations between BMI and variables such as gender, level of physical activity, or qualitative spirometry report. Even so, the literature points out that factors related to a sedentary lifestyle and inadequate eating patterns can act synergistically in obesity and asthma control, reinforcing the importance of multidisciplinary approaches (TOSCA et al., 2021; GINA, 2025). A previous study also highlights that 88% of asthmatic children performed less than two hours of physical activity per week, and a sedentary lifestyle was an important contributor to obesity and to the decline in quality of life in chronic disease. (PAZINI et al., 2021)

From a clinical point of view, the results presented here corroborate the need for integrated strategies in the management of pediatric asthma, including monitoring nutritional status, promoting healthy eating habits, and encouraging regular physical activity. Given the high global prevalence of childhood obesity and its negative impact on chronic diseases, prevention and early intervention actions are essential to reduce respiratory morbidity and improve the quality of life of these patients.

Among the limitations of the study, the cross-sectional design stands out, which prevents causal inferences. In addition, the use of BMI as the only measure of adiposity does not allow the assessment of the distribution of body fat, which can exert different effects on respiratory function. Longitudinal studies, with detailed assessment of body composition and inclusion of inflammatory biomarkers, may contribute to a better understanding of the complex interaction between obesity and asthma in children and adolescents.

6 CONCLUSIONS

The present study demonstrated that, although obesity is not associated with a significant reduction in spirometric parameters in the pediatric population evaluated, excess weight is related to poorer clinical control of asthma in children and adolescents. This finding reinforces the characterization of obesity as a specific phenotype of the disease, associated with a higher symptomatic burden and greater difficulty in management, even in the presence of preserved pulmonary function.

Considering the global increase in childhood obesity and the clinical impact of this condition on chronic diseases, such as asthma, it is essential to implement preventive strategies that promote healthy lifestyles from childhood. Educational measures, intersectoral actions, and encouragement of physical activity represent fundamental tools to reduce the risk associated with excess weight and improve the respiratory prognosis of this population.

Finally, the need to deepen scientific production on the interaction between obesity and asthma in children and adolescents is highlighted, especially in the Brazilian scenario. Longitudinal studies, with larger samples and detailed evaluation of body composition and inflammatory biomarkers, will be fundamental to elucidate the mechanisms involved and guide more individualized therapeutic strategies.

DEDICATION

We dedicate this work to God and our family members, as they are our source of support and inspiration.

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We thank God first for granting health, strength and discernment for the conclusion of this challenging and transformative stage of our formation.

To our families, our foundation, for unconditional love, constant support and understanding in moments of absence, fatigue and renunciation. Without you, none of this would be possible.

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ANNEXES

ANNEX 1 - INFORMED CONSENT FORM

FEDERAL UNIVERSITY OF GOIÁS
FACULTY OF MEDICINE
DEPARTMENT OF PEDIATRICS
PAEDIATRIC PULMONOLOGY

INFORMED CONSENT FORM

Your child is being invited to participate, as a volunteer, in a research called "Clinical, functional and inflammatory evaluation of asthmatic children and adolescents at the asthma outpatient clinic of the Hospital das Clínicas of the Federal University of Goiás". conducted by doctors Lusmaia Damaceno Camargo Costa and Raquel Vidica Fernandes. After carefully reading this document and being clarified about the following information, if you accept that your son (daughter) is part of the study, sign on all sheets and at the end of this document, which is in two copies and will also be signed by the researcher on all pages, one of them is yours and the other is the researcher's in charge. This research was approved by the Research Ethics Committee (CEP) of the Hospital das Clínicas of the Federal University of Goiás and is therefore following the ethical guidelines that govern Brazil in relation to research. If you have any questions about the research, you can contact the researchers in charge, Dr. Lusmaia Damaceno Camargo Costa and Dr. Raquel Vidica Fernandes, at (62) 99433-9936.

. If you have any questions about your participation as a participant in this research, you can contact the Research Ethics Committee of the Hospital das Clínicas of the Federal University of Goiás, at the following telephone numbers: 3269-8338 or at the address: 1ª Avenida S/Nº Setor Leste Universitário, Unidade de Pesquisa Clínica, 2º andar. Opening hours: Monday to Friday from 7:00 am to 5:00 pm.

IMPORTANT INFORMATION ABOUT THE RESEARCH:

Objective of the study: In this study, we aimed to evaluate the factors that may lead to greater asthma severity in children and adolescents. If you accept that your child participates in this study, we will collect some information in your son's medical record (medical record) about

the disease, previous consultations and tests already performed. In addition, we will do some other procedures to help us better understand the disease.

Details of the interventions:

1. Questionnaires: an assessment of daily physical activities will be carried out through the application of two questionnaires: Physical Activity Questionnaire for Children (PAQ-C) or Physical Activity Questionnaire for Adolescents (PAQ-A) and International Physical Activity Questionnaire (IPAQ), with an average of 10 questions each, which must be answered in approximately 5 minutes each.

The evaluation of disease control will be through two questionnaires: Asthma Control Test (ACT) and Comprehensive Asthma Control Scoring System (ACSS), with an average of 5 questions each, which should be answered in approximately 2 minutes each.

And quality of life by means of a questionnaire: Questionnaire on Quality of Life in Pediatric Asthma (PAQLQ), with 23 questions, which should be answered in approximately 10 minutes.

2. Pulmonary function assessment: tests will be carried out to assess how much asthma affects the functioning of your child's lungs. In the tests, the child or adolescent will be asked to breathe in a mouthpiece attached to a device, to collect all the necessary values. In some tests only normal breathing will be necessary, and in others some commands will be requested such as pulling in normal air and releasing with all the force, releasing normal air and pulling with as much force as possible.

In the evaluation of cardiorespiratory function, a test called the 6-minute walk test will be performed. The child or teenager will be asked to walk on a track, as fast as possible, without running for 6 minutes. Before, during and after the exercise, some data such as heart rate, respiratory rate, systemic blood pressure, and sensation of shortness of breath and discomfort in the legs will be analyzed.

3. Evaluation of the inflammatory process (induced sputum, nitric oxide dosage and blood tests, allergy test): blood and secretion samples will be collected through the association of physiotherapy, inhalation and cough techniques. In addition to the use of a device that will evaluate the gases of breathing. In the samples, substances that indicate the presence or absence of inflammation and its severity will be analyzed. In the allergy test, some substances that can cause allergy in some people will be applied to the child's forearm to check if the child is allergic.

Form of follow-up:

All the exams mentioned above will be performed on the same day as the routine medical appointment.

Benefits of participating in the survey:

By participating in this study, you will be contributing to obtaining more information on this subject, enabling a better approach to the treatment of him or her and other children with asthma.

Specification of the risks, damages, discomfort, injuries that can be caused by the research:

The possible risks related to this research are minimal, and most tests are routinely done during consultations. In the case of the bronchial provocation test, there may be the discomfort of triggering an asthma attack, and if this occurs, he/she will be assisted by the team of pediatric pulmonologists involved in the study. When performing the Immediate Hypersensitivity Skin Test, your child may develop an immediate allergic reaction if he is allergic to the test substances. In this case, he will be assisted by the team of pediatric pulmonologists involved in the study. If the reaction is mild, he may receive an oral anti-allergy. If the reaction is stronger, he may need medication injected into a vein. In the case of the Induced Sputum Test, we will do an inaction with a substance called hypertonic saline solution (which is a more "salty" serum) and, in this case, there may be some discomfort due to feeling a salty taste in the mouth, which can be solved by rinsing the mouth after collecting the material. Some degree of asthma attack may also occur and, in this case, he or she will be assisted. In the case of blood test collection, there may be pain during the collection or hematoma formation at the puncture site. To minimize these possible risks, the collection of tests will be carried out by experienced professionals and all tests will be performed only after your child's evaluation and if he is symptom-free at the time of the tests.

If there is any adverse reaction to any of the procedures performed, your child will be monitored and medicated (if it is the case that he needs any medication) by the researchers until his complete recovery.

You are entitled to compensation, according to the laws in force in the country in case of damages resulting from your child's participation in the research, and according to Resolution 466/2012 of the National Health Council/Ministry of Health. Participation in this research is voluntary, so there is no payment or financial gratification for participation. You will not have any expenses for your child to participate in the research, since the approaches will be performed on the day of scheduling your child's routine appointment at the pediatric asthma

outpatient clinic at the Hospital das Clínicas of the Federal University of Goiás.

Your son's (daughter) participation in this research will occur in a single period, being the same day as the previously scheduled medical appointment. Your child will have free access to the researchers 24 hours a day and seven days a week while they are part of it.

You are assured that your identity and that of your child will be kept confidential and no information will be given to others who are not part of the research team. In the release of the results of this study, your name or that of your child will not be mentioned. You have the total freedom to accept or not your son's (daughter) participation in this research, as well as you can withdraw the authorization, being able to withdraw this consent at any time, without any prejudice to the continuity of his/her follow-up/treatment. The data collected will be used only for this research and will not be stored for future studies.

Name and signature of the researcher

CONSENT TO THE PERSON'S PARTICIPATION AS A RESEARCH SUBJECT

I, _____, the undersigned, agree that my son participate in the study "Clinical, functional and inflammatory evaluation of asthmatic children and adolescents at the asthma outpatient clinic of the Hospital das Clínicas of the Federal University of Goiás", under the responsibility of Dr. Lusmaia Damaceno Camargo Costa and Dr. Raquel Vidica Fernandes. The information collected will have the guarantee of confidentiality that ensures the privacy and anonymity of my son regarding the confidential data involved in the research. I was duly informed and clarified by the researcher _____ about the research, the procedures involved in it, as well as the possible risks and benefits arising from my child's participation. I am convinced that if my child has any medical problems resulting from the study, it will be quickly circumvented by the research team. I have been assured that I may not agree to my child participating in the research, or that I may withdraw my consent at any time, without



this leading to any penalty or interruption of his/her treatment at this Hospital.

Place _____ and
date: _____

Name _____ of _____ the _____ child's
guardian: _____

Signature _____ of _____ the _____ child's
guardian: _____

Name _____ and _____ signature _____ of _____ the _____ principal
investigator: _____

FEDERAL UNIVERSITY OF GOIÁS
FREE AND INFORMED ASSENT TERM (TALE)
FOR CHILDREN (5 TO 11 YEARS OLD)

You are being invited to participate, as a volunteer, in the research "Clinical, functional and inflammatory evaluation of asthmatic children and adolescents at the asthma outpatient clinic of the Hospital das Clínicas of the Federal University of Goiás". My name is Dr. Lusmaia Damaceno Camargo Costa and Dr. Raquel Vidica Fernandes, we are the researchers responsible for this research. Below I will give you some clarifications about the research.

- a) The objective of this study is: To evaluate factors and alterations that can lead to a worsening of asthma in children and adolescents.
- b) To carry out this research, we need you to let us collect some information from your medical record about the disease, previous consultations and tests already performed. In addition, we will do some other procedures, such as applying questionnaires to learn more about your asthma, how much it bothers you on a daily basis, and about your daily activities such as running and playing. We will also do tests to evaluate your lung and heart, and you will need to blow into a device following some commands such as pulling the normal air and releasing with all the force, releasing the normal air and pulling with the greatest possible

force to collect the necessary information, and walking on a track, as fast as possible, Without running for 6 minutes to assess how many times your heart beats in a minute, if you experience shortness of breath and leg pain while walking. We will need to collect some of your blood and phlegm with the help of a salty inhalation and physiotherapy maneuvers to evaluate some items related to inflammation and allergy, and drip a few drops on your arm of some substances that can identify the allergy, if you are allergic to it. Remembering that all the exams mentioned above will be performed on the same day as the routine medical appointment, so you won't need to come here another day for that. Also, you will have free access to the researchers 24 hours a day and seven days a week while you are part of it. If there is any adverse reaction to any of the tests, you will be monitored and medicated (if you need any medication). To minimize these possible risks, the collection of tests will be carried out by experienced professionals and all tests will be performed only after your child's evaluation and if he is symptom-free at the time of the tests.

c) If you are not enjoying participating in the exams, if you are finding it boring, if you get tired or if you get irritable  , you can withdraw from participating in the survey at any time.

d) If you want to participate  , as it can help in the knowledge and treatment of other colleagues with asthma. You may feel a little shortness of breath, pain in your chest or legs in the blowing or walking test, itchy arm with the allergy test and a little pain when drawing blood, but during all these tests, the entire medical team will be here to treat you, help you and if you need it, take you to the emergency room. So don't worry, because we are prepared for anything that happens, okay?

e) You will not receive any money to participate in this survey.



f) If you want to participate in the research, but have any questions, you can call the researcher Dr Lusmaia Damaceno Camargo Costa and Dr. Raquel Vidica Fernandes to

collect  at (62) 99433-9936.

g) If you have any questions about your rights, you can call  the Research Ethics Committee of the Hospital das Clínicas of the Federal University of Goiás, at (62)3269-8338.

h) In this search, no one will hear your voice  , no one will know your name and no one will see your photo or image.

i) If you think that the research was not legal, that someone did not respect your right, you can ask for compensation  and this is guaranteed by law.

1.2 Consent to Participation in the Research:

I,  Agree ()  Do not agree ()

I understood everything that will happen in the research, the good and bad things that will happen if I participate.  Yes ()  No ()

I understood that I can give up participating in the research at any time and that I will not suffer any punishment for it.  Yes ()  No ()

I therefore declare that I agree  () with my participation in the research project described above.

Goiânia,

Participant's signature in full



Signature _____ of _____ the _____ principal investigator: _____

FEDERAL UNIVERSITY OF GOIÁS

INFORMED CONSENT FORM (TALE) - 12 TO 18 YEARS OF AGE

You are being invited to participate, as a volunteer, in the research "Clinical, functional and inflammatory evaluation of asthmatic children and adolescents at the asthma outpatient clinic of the Hospital das Clínicas of the Federal University of Goiás". My name is Dr. Lusmaia Damaceno Camargo Costa and Dr. Raquel Vidica Fernandes, we are the researchers responsible for this research. Below I will give you some clarifications about the research.

a) The objective of this study is: To evaluate factors and alterations that can lead to a worsening of asthma in children and adolescents.

b) To carry out this research, we need you to let us collect some information from your medical record about the disease, previous consultations and tests already performed. In addition, we will do some other procedures, such as applying questionnaires to learn more about your asthma, how much it bothers you on a daily basis, and about your daily activities such as running and playing. We will also do tests to evaluate your lung and heart, and you will need to blow into a device following some commands such as pulling the normal air and releasing with all the force, releasing the normal air and pulling with the greatest possible force to collect the necessary information, and walking on a track, as fast as possible, Without running for 6 minutes to assess how many times your heart beats in a minute, if you experience shortness of breath and leg pain while walking. We will need to collect some of your blood and phlegm with the help of a salty inhalation and physiotherapy maneuvers to evaluate some items related to inflammation and allergy, and drip a few drops on your arm of some substances that can identify the allergy, if you are allergic to it. Remembering that all the exams mentioned above will be performed on the same day as the routine medical appointment, so you won't need to come here another day for that. Also, you will have free access to the researchers 24 hours a day and seven days a week while you are part of it. If there is any adverse reaction to any of the tests, you will be monitored and medicated (if you need any medication). To minimize these possible risks, the collection of tests will be carried out by experienced professionals and all tests will be performed only after your child's evaluation and if he is symptom-free at the time of the tests.

c) If you are not enjoying participating in the exams, if you are finding it boring, if you get tired

or if you get irritable, you can withdraw from participating in the survey at any time.

d) If you want to participate, you can help in the knowledge and treatment of other colleagues with asthma. You may feel a little shortness of breath, pain in your chest or legs in the blowing or walking test, itchy arm with the allergy test and a little pain when drawing blood, but during all these tests, the entire medical team will be here to treat you, help you and if you need it, take you to the emergency room. So don't worry, because we are prepared for anything that happens, okay?

e) You will not receive any money to participate in this survey.

f) If you want to participate in the research, but have any questions, you can call the researcher Dr Lusmaia Damaceno Camargo Costa and Dr. Raquel Vidica Fernandes to collect at (62) 99433-9936.

g) If you have questions about your rights, you can call the Research Ethics Committee of the Hospital das Clínicas of the Federal University of Goiás, at (62) 3269-8338.

h) In this search, no one will hear your voice, no one will know your name and no one will see your photo or image.

i) If you think that the research was not legal, that someone did not respect your right, you can ask for compensation and this is guaranteed by law.

Assent to Participation in the Survey:

Me, Agree () Do not agree ()

I understood everything that will happen in the research, the good and bad things that will happen if I participate. Yes () No () I understood that I can withdraw from participating in the research at any time and that I will not suffer any punishment for it. Yes () No () I declare, therefore, that I agree () with my participation in the research project described above.

Goiânia,

Participant's signature in full:

Signature of the principal investigator: _____

ANNEX 2 - COEP APPROVAL

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Avaliação clínica, funcional e inflamatória de crianças e adolescentes asmáticos do ambulatório de asma do Hospital das Clínicas da Universidade Federal de Goiás.

Pesquisador: Lusmaia Damaceno Camargo Costa

Área Temática:

Versão: 4

CAAE: 08037918.4.0000.5078

Instituição Proponente: Hospital das Clínicas Universidade Federal de Goiás - GO

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 3.716.365

Apresentação do Projeto:

A asma é uma doença crônica de alta prevalência, com grandes impactos de saúde pública. É clinicamente caracterizada pela presença de tosse, sibilância, dispneia, dor torácica além de limitação variável ao fluxo aéreo. Assim, caracterizar a doença em cada paciente, de forma mais individualizada possível, através da avaliação do controle, bem como do padrão inflamatório, funcional e nutricional pode otimizar o manejo da asma e alcançar o seu controle de forma mais eficaz. Trata-se de estudo prospectivo englobando todas as crianças e adolescentes com idade entre cinco e 18 anos com asma em acompanhamento nos ambulatórios de pneumologia pediátrica do hospital das clínicas da UFG. Todos os pacientes irão ser submetidos a avaliação clínica e a exames que visam auxiliar na elucidação diagnóstica, e analisar o padrão inflamatório, funcional e nutricional. Para isso, serão realizados exame clínico, aplicações de questionário para avaliação do nível de controle da asma (GINA, ACT, ACQ e ACSS), espirometria com prova broncodilatadora, teste de broncoprovocação pelo exercício, teste de caminhada de 6 minutos, AVD-glittre, escarro induzido, medida da fração exalada de óxido nítrico, oscilometria de impulso, prick test (teste alérgico cutâneo de leitura imediata), avaliação nutricional, dosagem de imunoglobulinas e de interleucinas. Além disso, os pacientes também responderão à questionários para avaliação do nível de atividade física (International Physical

Activity Questionnaire - IPAQ) e da qualidade de vida (Paediatric Asthma Quality of Live Questionnaire PAQLQ). Os dados obtidos serão armazenados e analisados no programa de computador SPSS para Windows, versão 22.0 (SPSS Inc., Chicago, IL; EUA). Em todos os métodos estatísticos será adotado o nível de significância de 5% ($p < 0,05$). São descritos os seguintes critérios: Inclusão: Crianças e adolescentes entre cinco e 18 anos de idade com diagnóstico de asma acompanhadas por pelo menos seis meses nos ambulatórios de pneumologia pediátrica do HC/UFG. E de exclusão: Serão excluídas crianças com fibrose cística, imunodeficiências congênitas ou adquiridas, cardiopatias, deficiência de 1-antitripsina, doenças neurológicas, prematuridade e bronquiolite obliterante pós-transplante.

Objetivo da Pesquisa:

Objetivo Primário: Avaliar as características clínicas, funcionais e inflamatórias de crianças e adolescentes asmáticos acompanhados no serviço de pneumologia pediátrica do HC/UFG. Objetivo Secundário: - Avaliar as características clínicas e sociodemográficas; - Avaliar a associação entre do nutricional e dosagem de vitamina D com os níveis de controle da asma; - Caracterizar o padrão fenotípico das crianças e adolescentes com asma;

- Avaliar os marcadores inflamatórios clínicos;- Avaliar a correlação entre os testes de avaliação do controle da asma: GINA, ACT, ACQ, ACQ e ACSS; - Caracterizar o padrão de função respiratória nos diferentes níveis de controle da asma, mediante realização da espirometria; -Avaliar a prevalência de broncoespasmo induzido por exercício mediante a utilização de teste de esforço (TC6 e AVDglitre); - Avaliar a resposta aos testes de broncoprovocação (por exercício e por metacolina) em pacientes com sintomas atípicos - Avaliar opadrão inflamatório mediante a avaliação da celularidade e dosagem de interleucinas no escarro induzido e dosagem da fração exalada do óxido nítrico (FENO)

-Avaliar o perfil alérgico mediante a realização do teste cutâneo de hipersensibilidade imediata e dosagem de IgE sérica.

Avaliação dos Riscos e Benefícios:

Segundo relata AINDA a pesquisadora, a aplicação dos questionários Teste de Controle da Asma (ACT), o Asthma Control Questionnaire (ACQ), o Asthma Control Scoring System (ACSS), Questionário Internacional de Atividade Física (IPAQ) e Questionário sobre Qualidade de Vida na Asma Pediátrica (PAQLQ) não apresentam nenhum risco previsto para as crianças e adolescentes do estudo.A realização dos testes de função pulmonar como espirometria, oscilometria de impulso não apresentam nenhum risco previsto para as crianças e adolescentes do estudo. Porém, caso seja identificado alguma alteração hemodinâmica como

presença de broncoespasmo grave, sinais de desconforto respiratório importante, rebaixamento de consciência nas crianças e adolescentes com asma durante a realização dos testes, a mesma será encaminhada para o Serviço de Referência em Urgência Pediátrica (SERUPE) localizado no Hospital das Clínicas da UFG (HC/UFG), mesmo Hospital onde serão realizados todos estes testes, localizado na Primeira Avenida, s/ n., Setor Universitário, Goiânia-GO. Durante a realização do teste de caminhada de 6 minutos e o AVD-glittre, há risco mínimo previsto para a criança ou adolescente, porém se a mesma apresentar dor no peito, dispnéia importante, dor em membros inferiores, taquicardia, queda de saturação abaixo de 88% ou 90% da frequência cardíaca máxima ou qualquer outro sintoma/sinal de desconforto, o teste será interrompido imediatamente e realizado o acompanhamento pelo SERUPE do HC/UFG. Na coleta dos mediadores inflamatórios, a fração exalada de óxido nítrico não apresenta nenhum risco previsto. Durante a indução do escarro, se verificado presença de sibilos expiratórios, queda do VEF1 superior ou igual a 20%, comparado com a medida pós-BD ou presença de sinais de desconforto respiratório, a indução será interrompida e a criança ou adolescente será encaminhada para o SERUPE do HC/UFG. E na coleta do sangue para análise dos mediadores sanguíneos, a criança ou adolescente pode apresentar dor no local da inserção da agulha com possível mudança de coloração (roxo, verde ou petéquias avermelhadas), com reabsorção em alguns dias. As crianças e adolescentes serão acompanhados durante a realização de todos os testes de uma fisioterapeuta e uma médica pneumologista pediátrica. As informações coletadas terão a garantia do sigilo que assegura a privacidade e o anonimato dos sujeitos quanto aos dados confidenciais envolvidos na pesquisa. E os dados obtidos ao final da pesquisa serão arquivados e somente serão tomados públicos através de publicações em periódicos científicos e/ou em encontros científicos, quer sejam favoráveis ou não. Como benefícios: A identificação do padrão clínico, inflamatório e funcional dos pacientes com asma irá ajudar na melhor abordagem terapêutica de cada um destes pacientes. E também, poderá levar a estudos futuros de novas medicações para o controle desta doença, agindo diretamente no tipo de inflamação do paciente.

Comentários e Considerações sobre a Pesquisa:

Vide item conclusões ou pendências e lista de inadequações.

Considerações sobre os Termos de apresentação obrigatória:

Todos os termos de apresentação obrigatória foram submetidos

Conclusões ou Pendências e Lista de Inadequações:

Após atendidas as pendências referendadas, não são observados óbices éticos que impeçam sua realização.

Considerações Finais a critério do CEP:

Diante do exposto, a Comissão de Ética em Pesquisa do Hospital das Clínicas da Universidade Federal de Goiás, de acordo com as atribuições definidas na Resolução CNS 466/2012 e na Norma Operacional CNS 001/2013, manifesta-se pela **APROVAÇÃO** do PROTOCOLO DE PESQUISA proposto.

Lembramos que o pesquisador responsável deverá encaminhar ao CEP/HC/UFG, através de Notificação via Plataforma Brasil, os relatórios trimestrais/semestrais do andamento da pesquisa, encerramento, conclusões e publicações.

O CEP/HC/UFG pode, a qualquer momento, fazer escolha aleatória de estudo em desenvolvimento para avaliação e verificação do cumprimento das normas da Resolução 466/12 e suas complementares.

SITUAÇÃO: APROVADO

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BASICAS_DO_PROJETO_1159624.pdf	10/09/2019 06:56:21		Aceito
Outros	PEND3.pdf	04/09/2019 16:41:41	Raquel Vidica Fernandes	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLEvers4.pdf	04/09/2019 16:32:51	Raquel Vidica Fernandes	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TALECRIANCASvers4.pdf	04/09/2019 16:32:02	Raquel Vidica Fernandes	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TALEADOLESCENTESvers4.pdf	04/09/2019 16:31:28	Raquel Vidica Fernandes	Aceito
Declaração de Instituição e Infraestrutura	aprovacao_HC.pdf	11/02/2019 13:41:54	Lusmaia Damaceno Camargo Costa	Aceito

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Folha de Rosto continuação do Parecer: 3.716.365	Folha_rosto.pdf	22/01/2019 21:24:31	Lusmaia Damaceno Camargo Costa	Aceito
Projeto Detalhado / Brochura Investigador	Projeto.pdf	22/08/2018 14:26:51	Raquel Vidica Fernandes	Aceito

Situação do Parecer:

Aprovado

Necessita Apreciação da CONEP:

Não

GOIANIA, 21 de Novembro de 2019

Assinado por:
JOSE MARIO COELHO MORAES
(Coordenador(a))

Endereço: 1ª Avenida s/nº - Hospital das Clínicas/UFG - 1º Andar - Unidade de Pesquisa Clínica
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