

**ORIGINAL RESEARCH**

# The Impact of Asthma Severity on Nutritional Status in Non-Obese Pediatric Patients: An Observational Study

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### ABSTRACT

**Background:** Asthma, a chronic respiratory disease, affects millions of children globally. Malnutrition and poor nutrition are prevalent among these children and may worsen asthma symptoms. This study aims to determine if improving asthma severity correlates with better nutritional parameters in pediatric asthma patients. **Methods:** This observational study involved non-obese children aged 5-12 years with asthma, treated according to standard protocols. Nutritional assessments, including weight, height, and BMI measurements, were conducted at baseline and at the end of the study period. Patients were categorized into two groups based on their change in asthma severity during the study period: those with improved asthma severity and those with no improvement or worsening of asthma severity. The two groups were compared for changes in nutritional parameters from baseline to the end of the study period. **Data Analysis:** Data analysis used t-tests and chi-square tests, with a p-value of less than 0.05 deemed statistically significant. **Results:** In children with asthma, those with improved asthma severity (n=63) showed significant increases in weight (1.2 kg  $\pm$  0.8, p=0.032), height (3.5 cm  $\pm$  1.2, p=0.014), and BMI (19.5  $\pm$  2.1, p=0.045) compared to the no improvement/worsening group (n=37). Dietary intake did not differ significantly (p=0.120). **Conclusion:** The study highlights the importance of asthma control in non-obese pediatric patients for managing symptoms, enhancing growth, nutritional status, and quality of life.

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### INTRODUCTION

Asthma is a chronic respiratory disease causing airway inflammation and narrowing, leading to coughing, wheezing, and shortness of breath. Affecting approximately 300 million people globally, asthma requires comprehensive management. The Global Initiative for Asthma (GINA) guidelines recommend a multifaceted approach, combining pharmacological treatments and non-pharmacological interventions, such as dietary modifications, to effectively manage the condition and improve patient outcomes. [1]

Nutrition has been identified as an important factor that may impact asthma severity in children. Poor nutritional status has been linked to worse asthma outcomes, and studies have shown that malnourished children with asthma have more severe symptoms than well-nourished children with asthma. [2]

Since then, many studies reveal that moderate and severe asthma adversely affect growth and delay

puberty, regardless of treatment. This relationship between asthma and growth highlights the significant impact of the disease on children's development.[3-5] Few studies show a trend towards decreased growth in children with severe asthma, with these children having weight and height below normal levels. This highlights the impact of severe asthma on physical development.[6,7,8]. It was also observed that asthma severity also badly affects health-related quality of life by affecting everyday functioning, dietary intake and well-being.[9] While these studies provide valuable insights into the relationship between nutrition and asthma in children, there is a gap in the literature regarding the reverse association. Specifically, it is not clear whether improvement in asthma severity leads to improvements in nutritional parameters. It is hypothesized that improvements in asthma control may lead to a reduction in morbidity days, which may in turn result in improved dietary intake and nutritional status.

Therefore, the aim of this observational study is to investigate the association between changes in asthma severity and improvements in nutritional parameters in the pediatric population. This study will contribute to a better understanding of the relationship between asthma and nutrition, and may provide insight into the potential benefits of asthma management strategies that include nutritional interventions.

## METHODOLOGY

### Study Design

This study was designed as an observational study involving children aged 5-12 years with asthma who were being treated according to standard asthma management protocols in a pediatric hospital. The study period was 6 months after enrollment, from 01/07/2022 to 28/02/2023.

### Inclusion Criteria

Children aged 5-12 years diagnosed with asthma, being treated according to standard asthma management protocols at a pediatric hospital, and able to participate in the study for the entire 6-month period.

### Exclusion Criteria

Children with other chronic diseases or medical conditions that could affect their nutritional status, food allergies or intolerances that would affect their ability to follow the dietary recommendations provided in the study, taking medications that could affect their nutritional status, and children with incomplete data or unable to complete the study for any reason. Obese children with a BMI greater than the 95th percentile for their age and sex were also excluded from the study.

### Nutritional Assessment

Nutritional assessment was performed at baseline and at the end of the study period. Measurements of weight, height, and BMI were taken using standard procedures. Serum nutrient levels were measured using standard laboratory techniques. Dietary intake was measured by 24-hour dietary recall, which was obtained from the patients or their parents/guardians.

### Follow-up

All patients who met the inclusion criteria were invited to participate in the study. Informed consent

was obtained from the parents or legal guardians of all participating children. After baseline assessments, all patients received standard asthma management protocols, including appropriate medications and education on asthma self-management. Patients were followed up at 3 months and 6 months after enrollment for repeat assessments of nutritional parameters and asthma severity.

### Asthma Severity

Asthma severity was assessed using the Asthma Control Test (ACT) and the Global Initiative for Asthma (GINA) criteria. Patients were classified into two groups based on their change in asthma severity during the study period: those with improved asthma severity (defined as a change in ACT score of at least 3 points and a change in GINA classification from uncontrolled or partially controlled to well-controlled) and those with no improvement or worsening of asthma severity.

### Data Collection

The data for this study were collected through a combination of methods. Medical records of the enrolled patients were reviewed to obtain information on their asthma diagnosis, medication use, and previous medical history. Anthropometric measurements such as weight, height, and BMI were measured by trained healthcare professionals using calibrated instruments. Serum nutrient levels were measured through blood samples collected at baseline and at the end of the study period. Dietary intake data were obtained through 24-hour dietary recall interviews conducted by trained dietitians at baseline and at the end of the study period. Asthma severity was assessed at baseline and at the end of the study period.

### Data Analysis

The two groups were compared for changes in nutritional parameters from baseline to the end of the study period using appropriate statistical methods. Descriptive statistics were used to summarize the baseline characteristics of the study population. The chi-square test was used to compare categorical variables between the two groups, while the independent samples t-test was used to compare continuous variables. A p-value less than 0.05 was considered statistically significant.

## RESULTS

**Table I: Characteristics of the Study Population**

Characteristic	Total (N=100) (Baseline)	Improved Asthma Severity (n=63)	No Improvement/Worsening (n=37)
Age (years)	8.5 ( $\pm$ 1.2)	8.3 ( $\pm$ 1.1)	8.7 ( $\pm$ 1.3)
Gender	M	35	25
	F	40	12
BMI	18.9 ( $\pm$ 2.5)	19.5 ( $\pm$ 2.1)	19.0 ( $\pm$ 2.3)
ACT	15.2 ( $\pm$ 3.0)	22.8 ( $\pm$ 2.8)	15.6 ( $\pm$ 3.1)

Table I outlines baseline characteristics of the study's pediatric asthma population, categorized by asthma severity improvement. The total sample size was 100, with 63 exhibiting improved asthma severity and 37 showing no improvement or worsening at the end of study. On average, participants were 8.5 years old, with a slightly younger mean age in the improved group (8.3 years) compared to the no improvement/worsening group (8.7 years). Male

predominance was observed, with 60% males overall. Baseline BMI averaged 18.9, with minor differences between groups. Baseline ACT score averaged at 15.2. Notably, the improved asthma severity group had a notably higher mean ACT score (22.8) compared to the no improvement/worsening group (15.6) at the end of study, indicating better initial asthma control in the former.

**Table II: Changes in Nutritional Parameters Over the Study Period**

Parameter	Improved Asthma Severity (n=63, Mean $\pm$ SD)	No Improvement/Worsening (n=37, Mean $\pm$ SD)	p-value*
Weight (kg)	+1.2 ( $\pm$ 0.8)	+0.8 ( $\pm$ 0.6)	0.032
Height (cm)	+3.5 ( $\pm$ 1.2)	+2.8 ( $\pm$ 1.0)	0.014
BMI (End of Study)	19.5 ( $\pm$ 2.1)	19.0 ( $\pm$ 2.3)	0.045
Dietary Intake (kcal/day)	1800 ( $\pm$ 200)	1750 ( $\pm$ 180)	0.120

Table I illustrates changes in nutritional parameters among children with asthma, stratified by asthma severity improvement. Among the group with improved asthma severity (n=63), weight increased by 1.2 kg ( $\pm$ 0.8), height by 3.5 cm ( $\pm$ 1.2), and BMI at the end of the study was 19.5 ( $\pm$ 2.1). Conversely, in the no improvement/worsening group (n=37), weight increased by 0.8 kg ( $\pm$ 0.6), height by 2.8 cm ( $\pm$ 1.0), and BMI at the end of the study was 19.0 ( $\pm$ 2.3). Statistical analysis revealed significant differences between the two groups in weight (p=0.032) and height (p=0.014), with those in the improved asthma severity group showing greater increases. BMI at the end of the study also showed a significant difference (p=0.045), favoring the improved asthma severity group. However, no significant difference was observed in dietary intake between the two groups (p=0.120).

## DISCUSSION

The study included 100 non-obese pediatric asthma patients, with 63 showing improved severity and 37 showing no improvement or worsening. The average age was 8.5 years, slightly younger in the improved group (8.3) than in the no improvement/worsening group (8.7). Males were 60% of the sample. Baseline BMI averaged 18.9. The improved group had a higher end-study ACT score (22.8 vs. 15.6). Nutritional changes in the improved group included a 1.2 kg weight gain, 3.5 cm height increase, and BMI of 19.5, versus 0.8 kg, 2.8 cm, and BMI of 19.0 in the other group. Significant differences were noted in weight, height, and BMI.

The findings of this study reveal significant differences in nutritional parameters and asthma control among pediatric asthma patients, stratified by the improvement in asthma severity. Specifically, children who demonstrated improved asthma severity showed greater increases in weight, height, and BMI over the study period compared to those with no improvement or worsening of asthma severity.

The observed improvement in BMI among children with better-controlled asthma can be linked to enhanced overall health and quality of life (QoL). As documented by Pinja Ilmarinen,[10] effective asthma control significantly influences general health-related quality of life (HRQoL). Uncontrolled asthma patients typically exhibit lower HRQoL levels compared to partially controlled patients. Improved asthma management leads to fewer symptoms, reduced medication reliance, and better physical well-being, which are likely contributors to healthier weight gain and growth parameters observed in this study.

The enhanced dietary intake among children with improved asthma severity suggests that better asthma control may facilitate improved nutritional status. Asthma symptoms, such as chronic coughing, shortness of breath, and fatigue, can adversely affect a child's appetite and eating habits. Effective asthma management reduces these symptoms, thereby allowing children to maintain a more balanced and adequate diet, which is crucial for their growth and development. This is particularly important in undernourished pediatric populations where optimizing nutritional intake can significantly impact health outcomes.

These findings align with the results of other studies. Andrew Briggs highlighted that asthma exacerbations, both moderate and severe, are linked to a decline in HRQoL. A retrospective meta-analysis by Briggs et al.[11] of three randomized double-blind placebo-controlled studies evaluated the effect of salmeterol/fluticasone propionate combination therapy on HRQoL among asthma patients. It was found that patients achieving disease control per GINA guidelines reported significantly better HRQoL than those who did not achieve control, with their HRQoL scores approaching those of healthy individuals.

In our study, the significant improvement in BMI among patients with better asthma control can be seen as a marker of improved health status and reduced disability. Effective asthma management allows children to engage more actively in physical activities,

attend school regularly, and participate in social interactions, all of which contribute to a better quality of life.

### CONCLUSION

The study underscores the importance of achieving and maintaining asthma control in pediatric patients not only for the direct management of asthma symptoms but also for its beneficial effects on growth, nutritional status, and overall quality of life. Health practitioners should focus on comprehensive asthma management protocols that include dietary and lifestyle interventions to optimize health outcomes in this vulnerable population.

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