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Impact of asthma on linear growth in preschool children: a cross-sectional study in Iraq

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Abstract

Background: Asthma is a common chronic respiratory condition in children, often emerging during the preschool years. Its long-term effects may extend beyond respiratory health, potentially influencing physical development, including linear growth. This study aims to determine whether a significant association exists between asthma and impaired linear growth of preschool-aged children in Iraq.

Methods: A cross-sectional study was conducted between 1st January and 30th June 2024 at Al-Batool Teaching Hospital, pediatric outpatient clinics, Diyala, Iraq. The cohort analyzed data of 90 children aged 1–5 years who has been divided into two groups: asthmatic (n=45) and non-asthmatic controls (n=45). Height-for-age z-scores (HAZ) were used to assess linear growth. Data were collected through caregiver interviews and medical record reviews, including sociodemographic characteristics and clinical information. Chi-square and logistic regression analyses were employed to identify significant associations between asthma and stunting.

Results: Among asthmatic children, 42.2% had low HAZ scores compared to 20.0% of non-asthmatic children (p=0.03). Logistic regression showed that asthma was significantly associated with linear growth impairment (OR = 2.8, 95% CI: 1.1–7.2, p=0.028), even after adjusting for confounders such as nutrition and parental education.

Conclusion: Asthma in preschool children is significantly associated with impaired linear growth. Early detection, asthma control, and integrated nutrition strategies are crucial to improving both respiratory and growth outcomes. Further longitudinal studies are needed to explore causality and long-term developmental impacts.

Keywords: Asthma, Linear Growth, Stunting, Preschool Children, Height-For-Age Z-Score, Childhood Morbidity, Iraq

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Background

Asthma is a globally prevalent chronic condition among children, with rising incidence rates in low- and middle-income countries. Characterized by airway inflammation, wheezing, and episodic shortness of breath, asthma can substantially affect a child's quality of life, activity levels, and overall health [1]. In developing countries like Iraq, the burden of childhood asthma is compounded by poor access to healthcare, environmental pollution, and socio-economic instability, all of which contribute to increased disease severity and underdiagnosis [2,3]. Growth impairment in children is multifactorial. However, the impact of chronic diseases, particularly asthma, on linear growth is increasingly gaining attention in pediatric research. Growth faltering in the early years of life is a strong predictor of long-term adverse health outcomes. It may arise from systemic inflammation, hypoxia, poor appetite, corticosteroid use, and reduced physical activity all factors potentially present in children with asthma [4]. Despite its clinical importance, few studies have explored the direct association between asthma and linear growth, particularly in low-resource settings. Iraq, with its transitional healthcare system and varying levels of pediatric care, presents an ideal context to investigate this relationship. Understanding whether asthma contributes to growth delays in Iraqi children is essential for developing holistic pediatric care approaches [5]. This study aims to assess whether asthma is associated with impaired linear growth in preschool-aged children in Iraq. Using anthropometric assessments and validated growth indicators, we investigate the prevalence of stunting and

explore contributing sociodemographic and clinical factors among asthmatic and non-asthmatic children.

Methods

Study design

This cross-sectional study was conducted between 1st January and 30th June 2024 at Al-Batool Teaching Hospital, pediatric outpatient clinics, Diyala, Iraq, serving both urban and peri-urban populations.

Sample Size and Selection

A total of 90 children aged 12 to 59 months were enrolled. Participants were divided equally into two groups: asthmatic (n=45) and non-asthmatic (n=45). Inclusion criteria for the asthma group were physician-diagnosed asthma based on clinical history and symptom criteria. Non-asthmatic controls were matched for age and sex. Exclusion criteria included congenital anomalies, chronic illnesses (e.g., congenital heart disease, endocrine disorders), or prematurity (<37 weeks).

Data Collection

Data were collected through structured caregiver interviews and review of medical records. The questionnaire included sociodemographic data (age, sex, residence, parental education, and family income), clinical history (birth weight, breastfeeding, hospitalization history), and anthropometric measurements (height in cm). Height-for-age z-scores (HAZ) were calculated using WHO growth standards. Stunting was considered when HAZ score below -2 standard deviations. While the Normal growth was considered when HAZ score ≥ -2 SD.

Statistical analysis

Data were analyzed using SPSS version 16. Categorical variables were expressed as frequencies and percentages. Chi-square tests were used to examine associations between asthma and stunting. Multivariable logistic regression was performed to identify independent predictors of growth impairment, adjusting for confounders such as nutrition, parental education, and birth weight. A p-value <0.05 was considered statistically significant.

Results

Table 1 presents a comparison of sociodemographic and clinical characteristics between children with asthma (n = 45) and a matched control group (n = 45). The mean age was similar between the groups (36.2 ± 10.8 months for asthma vs. 35.7 ± 11.2 months for control, p = 0.79), with no significant difference in sex distribution (62.2% vs. 60% male, p = 0.83). Urban residence was slightly higher in the control group (73.3%) compared to the asthma group (66.7%), but this was not statistically significant (p = 0.47). A higher proportion of mothers of asthmatic children had education below secondary level (55.6% vs. 37.8%), with borderline significance (p = 0.09). Low family income (< $400/month) was more frequent in the asthma group (68.9%) than in controls (53.3%), though this was not statistically significant (p = 0.12). Exclusive breastfeeding for 6 months or more was significantly lower in the asthma group (44.4%) compared to the control group (71.1%), with a statistically significant difference (p = 0.01). Low birth weight (< 2.5 kg) was more common among asthmatic children (26.7%) than controls (13.3%), but not statistically significant (p = 0.10).

Table 1: Sociodemographic and clinical characteristics of the study population (N=90)

Variable	Asthma (n=45) N (%)	Control (n=45) N (%)	p-value
Mean Age (months): Mean ± SD	36.2 ± 10.8	35.7 ± 11.2	0.79
Male	28 (62.2)	27 (60.0	0.83
Urban Residence	30 (66.7)	33 (73.3)	0.47
Mother's Education < Secondary	25 (55.6)	17 (37.8)	0.09
Family Income < $400/month	31 (68.9)	24 (53.3)	0.12
Exclusive Breastfeeding ≥ 6 months	20 (44.4)	32 (71.1)	**0.01**
Low Birth Weight (<2.5 kg)	12 (26.7)	6 (13.3)	0.10

Table 2 explores the association between asthma and linear growth in preschool children, using height-for-age z-scores (HAZ). Among children with asthma, 42.2% (n = 19) were stunted (HAZ < -2 SD), compared to only 20.0% (n = 9) in the control group. In contrast, normal growth (HAZ ≥ -2 SD) was observed in 57.8% of asthmatic children versus 80.0% of controls. The difference was statistically significant with a p-value of 0.03, indicating that children with asthma were significantly more likely to experience stunted growth compared to their non-asthmatic peers.

Table 2: Association Between Asthma and Linear Growth (Chi-Square Test)

Growth Status	Asthma Group (n=45)	Control Group (n=45)	Total	p-value
Stunted (HAZ < -2 SD)	19 (42.2%)	9 (20.0%)	28	0.033*
Normal (HAZ ≥ -2 SD)	26 (57.8%)	36 (80.0%)	62	

Table 3 presents the results of a multivariate logistic regression to identify independent predictors of stunting in preschool children. Asthma was significantly associated with higher odds of stunting (Adjusted OR = 2.80, 95% CI: 1.10–7.20, p = 0.028), indicating that children with asthma were nearly 3 times more likely to be stunted. Exclusive breastfeeding for less than 6 months also showed a significant association (Adjusted OR = 3.10, 95% CI: 1.20–8.20, p = 0.021), suggesting it is a strong predictor of poor linear growth. Low birth weight and mother's education below secondary level showed increased odds of stunting (OR = 2.20 and 1.90, respectively), but these associations were not statistically significant (p > 0.05).

Table 3: Logistic regression analysis of factors associated with stunting (N=90)

Variable	Adjusted OR	95% CI	p-value
Asthma (yes)	2.80	1.10 – 7.20	0.028*
Low Birth Weight	2.20	0.70 – 6.70	0.17
Mother's Education < Secondary	1.90	0.75 – 4.81	0.18
Exclusive Breastfeeding < 6 months	3.10	1.20 – 8.20	0.021*

Discussion

This study aimed to evaluate the impact of asthma on linear growth in preschool-aged children in Iraq and revealed that children with asthma are significantly more likely to experience stunting compared to their non-asthmatic peers. Our findings align with previous literature emphasizing the broader systemic implications of chronic inflammatory diseases like asthma on physical development. The prevalence of stunting in the asthma group (42.2%) was notably higher than in the control group (20%), with a statistically significant association observed (p=0.03). This aligns with findings from international studies, such as those by Sapartini et al. [6] and Nwaru et al. [7], which highlighted delayed growth in children with recurrent wheezing and asthma, particularly when disease control is poor or associated with malnutrition. The mechanisms underlying growth impairment in asthmatic children are multifaceted. Chronic systemic inflammation, increased metabolic demands, decreased appetite, and frequent corticosteroid use may all contribute. Additionally, activity limitations due to respiratory symptoms can reduce physical play, a known stimulator of growth hormone release [2,8]. Our study supports this by showing that exclusive breastfeeding and higher maternal education, both protective health factors, were associated with better growth outcomes. Exclusive breastfeeding beyond six months was significantly lower in the asthma group, and logistic regression revealed it as an independent protective factor against stunting (OR = 3.1, p = 0.021). Breastfeeding is not only crucial for nutritional adequacy but also supports immune function, potentially reducing respiratory tract infections and asthma severity. Similarly, systematic review performed by Xue et al. [9] found that children who were breastfed longer or more exclusively had a lower risk of developing asthma. Longer breastfeeding was associated with a 16.0% reduced risk (OR 0.84, 95% CI 0.75–0.93), while exclusive breastfeeding showed a 19% reduction in risk (OR 0.81, 95% CI 0.72–0.91). In contrast to some global studies, low birth weight and maternal education were not statistically significant predictors of stunting in our sample, though trends in the expected direction were observed. This may be due to the relatively small sample size or uniform socioeconomic challenges within the studied population. Santosa et al. [10] reported that maternal factors directly affected the occurrence of stunting (t=3.527, P<0.001), however, child factors (t= 5.749, P<0.001) have more significant and direct effects on stunting than maternal factors. Halli et al. [11] found that the low-birth-weight Indian children experienced a much higher chance of stunting compared to children with a normal birth weight (44.3% vs. 33.8%). Our findings underscore the need for integrated management of chronic diseases like asthma in early childhood. Pediatric asthma care should not focus solely on symptom control but also include regular growth monitoring, nutritional support, and parental education. Health interventions that combine asthma control with improved maternal-child health services can help mitigate long-term developmental consequences [12]. This study also highlights the importance of perinatal and postnatal health surveillance. In low-resource settings like Iraq, improving maternal education, promoting exclusive breastfeeding, and ensuring access to pediatric care can help address stunting at its root [13,14]. However, several limitations must be acknowledged. The cross-sectional design prevents us from establishing causality between asthma and growth impairment. Additionally, reliance on self-reported data (e.g., breastfeeding duration) may introduce recall bias. Finally, factors like asthma severity, frequency of corticosteroid use, and dietary intake were not deeply explored and may influence growth outcomes.

Conclusion

In conclusion, our study adds to the growing body of evidence linking asthma to impaired linear growth in early childhood. Interventions that support both respiratory and nutritional health are essential to ensure optimal physical and cognitive development in this vulnerable age group. Future research should adopt a longitudinal design and include biochemical markers, lung function tests, and asthma control assessments. Broader studies incorporating rural-urban comparisons and stratification by asthma severity could provide a more nuanced understanding of the interaction between chronic respiratory illness and childhood development.

Abbreviation

DENV: Dengue virus, DF: Dengue Fever: DHF: Dengue Haemorrhagic Fever; DSS: Dengue Shock Syndrome; NS1 Non-Structural 1, IgM: Immunoglobulin M; ELISA: Enzyme-linked immunosorbent assay; GI symptoms: Gastrointestinal symptoms; IPD Inpatient Department; ESR: Erythrocyte Sedimentation Rate; ALT: Alanine transaminase.

Declaration

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Availability of data and materials

Data will be available by emailing alijadees45@gmail.com

Authors' contributions

All authors have contributed equally in the conceptualization, data collection, manuscript writing, interpretation of the findings, reviewing and refining the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

We conducted the research following the declaration of Helsinki. Ethical clearance was obtained from the Ethics Committee at

College of Medicine, University of Diyala, Iraq [Ref: January 2024]. Permission to collect data was obtained from the Al Batool Teaching Hospital, Diyala, Iraq. Confidentiality of patient data was maintained throughout the study, and all analyses adhered to ethical research practices. Written informed consent was secured from parents or guardians of all participants.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interests.

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