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Evaluation of Some Growth Parameters among Patients with Chronic Asthma Attending Salahaldeen General Hospital

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ABSTRACT

Bckgrownd : Asthma can impair airway development and reduce maximally attained lung function, and these deficits in lung function can persist or extend into adulthood without further progressive loss. Asthmatic patients are more vulnerable to infections and noncommunicable chronic co-morbidities, which are linked to poorer asthma outcomes.

Aim: The current study aimed to assess the impact of asthma and its treatment on children's growth parameters.

Pateint and Method: A convenient sample of 200 children in primary school aged (6-12 years) was enrolled including a case group consisting of 100 patients who were presented with asthma; This group was subdivided into two subgroups (50 children using steroids as a treatment and 50 children with asthma using non-steroidal therapy) and 100 healthy children in the control group.

Results: The results of the current study showed that male constitutes the largest percentage of the sample (56%). There was a difference between the study groups regarding age, gender, and residency. The parent's asthma, exposure to smoking, lower respiratory tract infection, and allergy were confirmed as risk factors for asthma in children. The means of anthropometric parameters, except height, were higher among asthmatic patients with regular steroids than those with intermittent steroid use and healthy child in the control group. The height mean was lower in asthmatic patients with regular steroid use than those with intermittent steroid use and healthy children in the control group.

Conclusion : There were associations between childhood asthma and its treatment and impairment of growth parameters.

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Introduction:

Asthma is the most common chronic lower respiratory disease in children worldwide. It is a chronic inflammatory disorder characterised by variable airflow obstruction and bronchial hyperresponsiveness[1, 2]. Chronic inflammation is often characterised by allergic inflammation and eosinophilia, while airway remodelling is a mutual feature of asthma, even in young children[3].

Asthma is characterised by recurrent episodes of shortness of breath, wheezing, chest tightness, and coughing[1]. These manifestations are frequently controllable by avoiding or decreasing the triggers of asthma (irritants and allergens) and adhering to medical care recommendations that include the use of asthma-controlling treatments[4].

The accuracy of the diagnostic algorithm in school-aged children who are suspected of having asthma is uncertain, which can lead to either under-treatment or over-treatment [4].

Children with sever form of asthma are restricted from participating in daily activities including school activities, sports, and playing with friends, which disturb their quality of life. Furthermore, children with asthma may be troubled by asthma symptoms and fear of asthma attacks or exacerbations[1]. In addition, the exacerbations of asthma result in medical encounters and reduced productivity and cause significant costs to families and society[4].

Aim of the study

To assess the impact of asthma and its treatment on children's growth parameters.

Patients and Method

A case-control study was conducted in Iraq/ Salahadeen Governorate/ Salahadeen General Hospital / Pediatric Department during the period from January to May 2022.

Ethical Approval:

The study has been proposed and subsequently approved by the scientific committee of the College of Medicine/ Tikrit University.

Fully informed consent was obtained from the parents of the patients verbally after explaining the aim of the study thoroughly and clearly. All the information and questions were communicated to the patients with honesty and transparency objectively to avoid bias as much as possible. All the parents of participants were assured of anonymity and confidentiality of information.

A sample of 200 children of primary school age (6-12 years) who were presented to the Pediatric Department. The sample included two groups:

Case group: It consisted of 100 patients who were presented with asthma. This group was subdivided into two subgroups include:

Subgroup I: It included 50 children with chronic controlled asthma depending mainly on regular steroids (including inhaled and/or systemic steroids) as a treatment at least for two years .

Subgroup II: It included 50 children with chronic asthma who used non-steroidal therapy or intermittent steroid for two years at least.

Control group: It consisted of 100 patients who were presented with other diseases to be matched with the case group regarding age and gender.

Exclusion Criteria

1. Children with a chronic endocrinological disease that could affect the growth
2. Children with neurological diseases
3. Children with other diseases that were treated with steroid

Data collection

The data were obtained through direct interviews by using a questionnaire formulated after

reviewing similar articles, then revised by the supervisor and panel of experts at the Pediatric department in the College of Medicine/Tikrit University. Their modification and advice regarding the proposed questionnaire were taken into consideration. The questionnaire was filled through two steps including:

Step one: Included sociodemographic and medical history of the child and was obtained from the parents and included:

Step two: Examination**,** which included general and respiratory examination to obtain the following:

- Assessment of FEV1 which was categorized into <60, 60-80, and >80. This examination was done by using digital peak flow and FEV1 meter .

Digital peak flow and FEV1 meter

Evaluation of the anthropometric measurements including weight (kg) by using a body weight scale (Figure 3.2), height (m) by using a tape measure, and triceps skinfold thickness was measured by using Harpenden calliper on the non-dominant arm . According to the weight and height, the body mass index (BMI) was calculated according to the formula:

BMI= weight (Kg) / **(**height (m)**)**$^{2(5)}$

Assessment of the severity of asthma was done depending on

history, examination and FEV1. The severity was categorized into intermittent, mild persistent, moderate persistent, and severe persistent.

The data was entered and analyzed by Microsoft Excel 2016 and software package of social science (SPSS) version 22. Categorical data were presented as proportions and the chi-square was used to test the statistical difference between the two proportions. Continuous variables were presented as mean (±Standard Deviation (SD)) and were compared using the t-test and ANOVA test. A P-value of less than 0.05 was considered statistically significant.

Results

A total of 200 participants were enrolled in the current study. Male constitutes more than half of the sample (56%). In addition, more than half of the patients were aged 10-12 years and were living in rural areas, as shown in table 4.1.

Table 4.1: Distribution of the gender, age, and residency according to the study groups

Characteristic		Groups				Total		P-value
		case		Control				
		N	%	N	%	N	%	
Gender	Male	57	57.0	55	55.0	112	56.0	0.776
	Female	43	43.0	45	45.0	88	44.0	
Age (years)	6-9	40	40.0	44	44.0	84	42.0	0.567
	10-12	60	60.0	56	56.0	116	58.0	
Residency	Urban	55	55.0	53	53.0	108	54.0	0.777
	Rural	45	45.0	47	47.0	92	46.0	

Chi-square test

The parent's asthma, exposure to smoking, lower respiratory tract infection, and allergy were confirmed as risk factors for asthma in children, as shown in table 4.2.

Table 4.2: Risk factors of asthma in children

Risk factors		Groups				Odds ratio
		Case		Control		
		N	%	N	%	
Low birth weight	Yes	13	13.0	10	10.0	1.34
	No	87	87.0	90	90.0	
Parent asthma	Yes	19	19.0	7	7.0	3.116
	No	81	81.0	93	93.0	
Exposure to smoking	Yes	26	26.0	12	12.0	2.577
	No	74	74.0	88	88.0	
Lower respiratory tract infection	Yes	17	17.0	5	5.0	3.892
	No	83	83.0	95	95.0	
Allergy	Yes	19	19.0	6	6.0	3.675
	No	81	81.0	94	64.0	
Reduced lung function at birth	Yes	9	9.0	9	9.0	1
	No	91	91.0	91	91.0	

The mean weight, BMI, weight for height, and skinfold thickness were higher in the case group than in the control group (Table 4.3)

Table 4.3: Distribution of anthropometric parameters according to the study groups

Anthropometric parameters	Groups		
	Case	Control	P-value
	Mean (±SD)	Mean (±SD)	
Weight (kg)	37.33 (±5.9)	33.99 (±5.46	**<0.001**
Height (cm)	132.43 (±7.7)	134.77 (±8.3)	**0.041**
BMI (k/m^2)	28.06 (±3.2)	25.09 (±2.8)	**<0.001**
Weight (kg)/height (cm)	28.06 (±3.2)	25.09 (±2.8)	**<0.001**
Skinfold thickness (mm)	23.92 (±2.6)	21.14 (±2.6)	**<0.001**

t-test. BMI (Body mass index)

In the case group, 20% of patients had severe persistent asthma, while 13% of them had intermittent asthma (Figure 4.1)

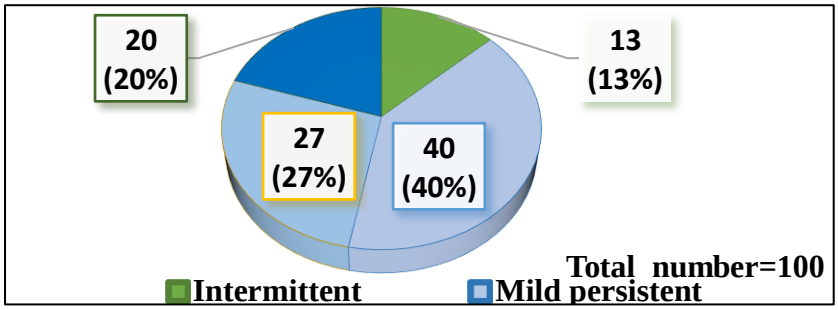

Figure 4.1: Severity of asthma among the patients

There was a difference between the case groups (including 50 patients with regular steroid use and 50 patients with intermittent steroid use) regarding the severity and duration of asthma, as shown in table 4.4 and figure 4.2.

Table 4.4: Distribution of the severity according to the steroid use

Severity	Case groups				Total N (%)		P-value
	Regular steroid use		Intermittent steroid use				
	N	%	N	%	N	%	
Intermittent	0	0.0	13	26.0	13	13.0	**<0.001**
Mild persistent	15	30.0	25	50.0	40	40.0	
Moderate persistent	20	40.0	7	14.0	27	27.0	
Severe persistent	15	30.0	5	10.0	20	20.0	

Chi-Square test

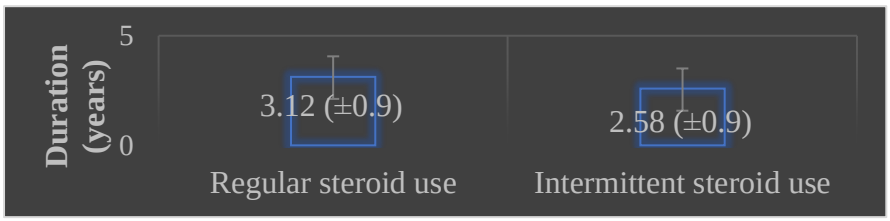

Figure 4.2: Duration of asthma in the case groups

The mean weight, BMI, weight for height, and skinfold thickness were higher in asthmatic children with regular steroid use than in those with intermittent steroid use, as shown in table 4.5.

Table 4.5: Distribution of anthropometric parameters according to steroid use

Anthropometric Parameters	Subgroups		P-value
	Regular steroid use (N=50)	Intermittent steroid use (N=50)	
	Mean (±SD)	Mean (±SD)	
Weight (kg)	38.60 (±5.6)	36.06 (±5.9)	**0.013**
Height (cm)	131.44 (±6.9)	133.42 (±8.4)	0.205
BMI (k/m^2)	29.24 (±3.0)	26.88 (±3.0)	**<0.001**
Weight (kg)/height (cm)	29.25 (±3.0)	26.88 (±3.0)	**<0.001**
Skinfold thickness (mm)	24.66 (±2.6)	23.18 (±23.1)	**0.005**

t-test

The means of anthropometric parameters, except height, were higher among asthmatic patients with regular steroids than those with intermittent steroid use and healthy child in the control group, as shown in figures 4.3, figure 4.4, figure 4.5, and figure 4.6.

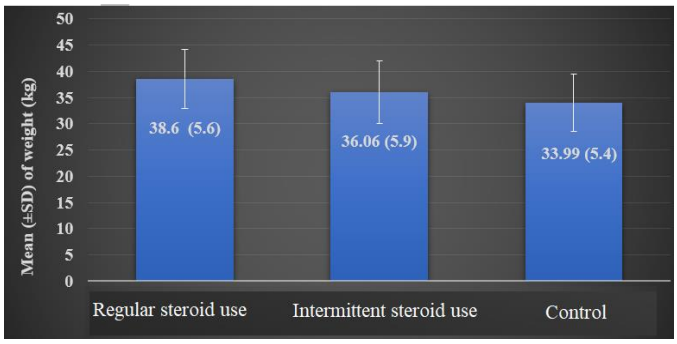

Figure 4.3: Distribution of the weight according to the study groups. ANOVA test. P-value<0.001

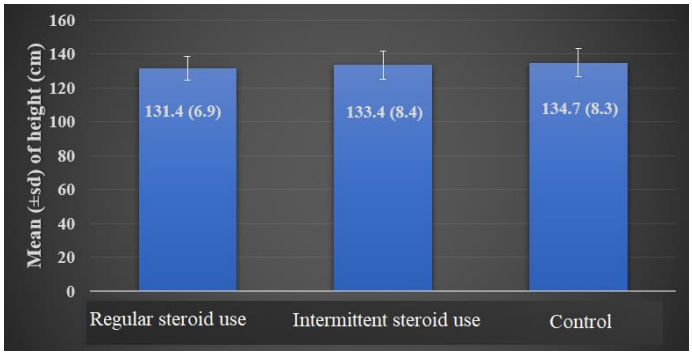

Figure 4.4: Distribution of the height according to the study groups. ANOVA test. P-value=0.059

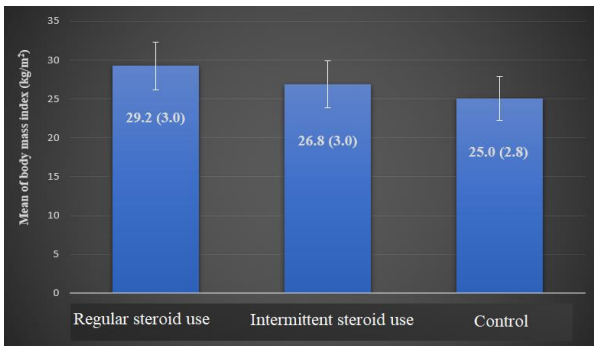

Figure 4.5: Distribution of the BMI according to the study groups. ANOVA test. P-value<0.001

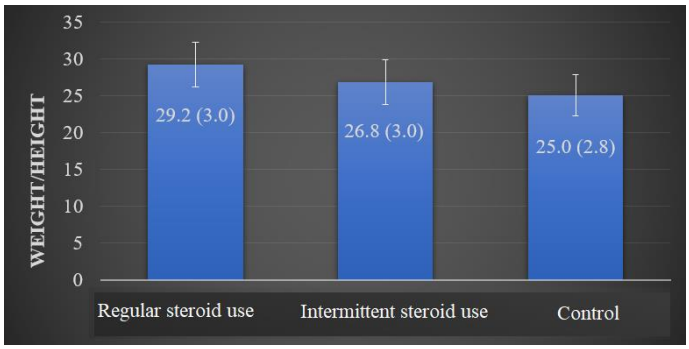

Figure 4.6: Distribution of the (weight/height) according to the study groups. ANOVA test. P-value<0.001

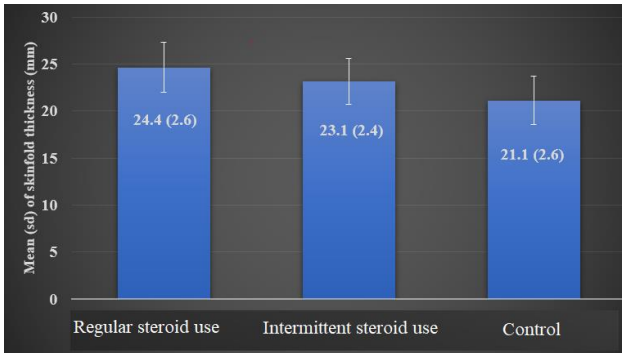

Figure 4.7: Distribution of the skinfold thickness according to the study groups. ANOVA test. P-value<0.001.

Discussion

The first finding of the current study was that the parent's asthma, exposure to smoking, lower respiratory tract infection, and allergy were risk factors for childhood asthma. In comparison. Theresa et al. agreed with the results of the current study in that significant risk factors for childhood asthma include lower respiratory tract infections, atopic dermatitis, and parental asthma histories[5]. Another study was conducted in Chile by Jose in 2016 revealed that parental asthma, exposure to tobacco smoke, and prematurity (particularly very

preterm birth) are well-established risk factors for childhood asthma[6].

According to the results of the current study, low birth weight was not associated with the development of asthma. Another study suggested that low birth weight (<2,500 g) is linked to an increased risk of developing asthma, and it may act as a bridge between prenatal factors and later disease risk.[7]. In contrast, Teumzghi et al. suggested that Low birth weight (2.5 kg) is a risk factor for wheezing disorders in childhood and adolescence[8]. This discrepancy might be related to the accuracy and recall bias among parents about the birth weight of their children.

In the current study, there was no significant association between reduced lung at birth and the development of asthma. In contrast, Theresa et al. revealed that reduced lung function at birth is a significant risk factor for asthma in children[5]. Reduced lung function at birth and the increased risk of asthma was approved by another study that was done by Håland et al[9].

The anthropometric parameters, including height, weight, BMI, weight/height, and skinfold thickness were different among asthmatic children compared to normal children. The same results were obtained by another study that was done in Iraq by Hussam who concluded that asthma affects the growth of asthmatic patients except height[10]. In agreement with these results, another study done in Egypt by Khaled et al. concluded that there was an association between the impaired growth metrics in the children under study and childhood asthma. This could be caused by the illness itself, its associated treatments, or a combination of both[11]. Another study that was done in Iraq by Jinan et al. concluded that the height, weight and skin fold thickness were retarded in asthmatic compared to normal children[12].

In contrast to the current study, another study was done in Iran by Nasrin et al. and concluded that the weight, height, and BMI were not different between children with asthma and those without asthma[13].

Among the asthmatic participants, the current study revealed an association between the

growth of children and the severity of asthma and the type of treatment as the anthropometric parameters including weight, BMI, weight/height, and skinfold thickness (except the height) were different among severe asthmatic children with regular steroid use compared to normal children[14].

The same results were obtained by another study that was done in Iraq by Hussam et al.[12]. The same results were obtained in another study that was done in Egypt by Khaled et al. who found that the more severe illness, the slower the growth rates of asthmatic children. Children who inhaled corticosteroids showed the lowest mean values for the weight/age percent and height/age percent with the highest percentage of delayed bone age compared to other asthmatic cases and controls, according to research on the impact of treatment[13]. Jinan et al. concluded that asthma affected all aspects of growth (including severity, duration, and treatment), so the growth parameters can be used to assess the effectiveness of treatment in asthmatic children[14]. Another study was done in Brazil concluded that regular use of inhaled corticosteroids may cause a small reduction in linear growth in children with asthma[15].

Conclusion

There was a significant association between childhood asthma and impaired growth parameters. This may be due to the disease itself or its related treatment.

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