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A Comparison of Efficacy and Adverse Effects of Cetirizine and Desloratadine in 6-12-Year-Old Children with Allergic Rhinitis

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Abstract

Background: Antihistamines are the most common drugs used for treating allergic rhinitis. They, significantly, reduce nasal symptoms by blocking the action of a chemical cytokine called histamine. This study aimed to compare cetirizine and desloratadine's efficacy and adverse effects in children with allergic rhinitis.

Method: This randomized single-blinded clinical trial was conducted on 400 children with allergic rhinitis, aged 6-12 between February and September 2022. The patients were randomized to receive cetirizine or desloratadine for four weeks. We recorded the symptoms and adverse effects at the baseline and four weeks after starting the intervention.

Results: A total of 248 patients completed the study: 109 patients (47 female, 62 male) in the cetirizine group and 139 patients (53 female, 86 male) in the desloratadine group. The scores related to symptoms of allergic rhinitis before starting the drugs and after 4-week therapy were not significantly different between the two treatment groups (p= 0.1, p= 0.7, respectively). Cetirizine had more side effects than desloratadine in the treated patients (p = 0.02).

Conclusion: This study showed that cetirizine and desloratadine improved symptoms of children with allergic rhinitis; however, there was no significant difference in the efficacy of these two drugs. Desloratadine caused fewer side effects in patients after 4 weeks of treatment.

Key Words: Allergic rhinitis, Cetirizine, Desloratadine, Histamine antagonists.

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1- INTRODUCTION

Allergic Rhinitis (AR) is recognized to majorly impact human health worldwide. The prevalence rates of AR among Iranian children and adolescents are 18% and 25%, respectively (1). Typical signs and symptoms of AR include nasal itching, sneezing, rhinorrhea, and nasal blockage accompanied by watering and redness of the eyes. The disease is divided into seasonal, which occurs during specific seasons; perennial, occurring year-round; and mixed type. AR is an IgE-mediated disorder; seasonal AR is usually caused by sensitization to inhaled allergens such as trees, weeds, grass pollens, and some fungal allergens. Perennial AR often occurs by house dust mites and fungal allergens (1-5).

AR in children can reduce the quality of life via its symptoms and can affect contiguous organs such as the sinuses, ears, and chest; and cause sleep problems, leading to reduced school/ work performance. AR, particularly the perennial type, is a significant independent risk factor for the development of asthma (6, 7).

Treatment of AR includes allergen avoidance, pharmacotherapy, and immunotherapy. Antihistamines, intranasal steroids, leukotriene receptor antagonists, chromones, and decongestant nasal drops are the available drugs for the management of AR. The most commonly used medications in the treatment of AR are antihistamines (2).

Through at least four histamine receptors, histamine plays a crucial part in allergic inflammation. H1-antihistamines have been demonstrated to decrease histamine-mediated symptoms and signs, including sneezing, itching, rhinorrhea, and eye symptoms, although they are less successful at reducing nasal congestion. H1- antihistamines are functionally classified as a first (old) and second (new) generation. First-generation antihistamines (e.g., hydroxyzine) penetrate the human brain and have sedative effects. Second-generation antihistamines cross the blood-brain barrier minimally and cause minimal sedation (8, 9).

An H1-antihistamine of the second generation, cetirizine reduces the body's production of the natural chemical histamine. In 1987, after being granted a patent in 1981, it was first used in medicine. Sneezing, itching, watery eyes, and runny nose are just a few of the symptoms that this medication is intended to treat. Headache, dry mouth, drowsiness, and fatigue are among the frequent adverse effects of cetirizine, while more severe but rare side effects include heart failure, tachycardia, and edema (9, 10). Desloratadine is a more recent antihistaminic compound that is the main active metabolite of loratadine. Early research showed that desloratadine has a longer half-life and is 10 to 20 times more potent than loratadine at binding to the H1 receptor in vitro (11, 12).

Both cetirizine and desloratadine are rapidly absorbed after oral administration, with relief usually occurring within 1 to 2 hours. These oral H1- antihistamines also have been shown to be safe and effective in children. This study aimed to compare the efficacy and side effects of cetirizine and desloratadine on children aged 6 to 12 years with allergic rhinitis based on their symptoms in Iran.

2- MATERIALS AND METHODS

2-1. Design and population

The present randomized single-blinded clinical trial was conducted on 400 children with AR aged 6-12 years who had referred to outpatient pediatric allergy clinics affiliated to Shiraz and Mashhad University of Medical Sciences, Iran, between February and September 2022. The allergist diagnosed all patients with AR according to ARIA (Allergic Rhinitis

and its Impact on Asthma) 2016. Exclusion criteria included subjects with a history of antihistamines intolerance, systemic corticosteroid consumption; and those under treatment with appetite stimulants and intranasal corticosteroids within one month prior to enrollment. Patients having diseases such as metabolic disturbances, chronic renal failure, diabetes, heart disease, and cystic fibrosis, as well as nasal anatomic abnormalities, were also excluded. Patients younger than 6 years old and older than 12 years old at the time of the study were not included.

2-2. Sample size and sampling

The calculated sample size was 200 cases in each group, considering α= 0.05 and β1= 0.80 (d=0.15, s1=0.26, s2=0.09) by medcalc version 8. After approval of the study protocol by the Shiraz University Ethics Committee (IR.SUMS.REC.1400.796), parents of children gave written informed consent. If they did not sign the consent, the patient was excluded from the study.

2-3. Questionnaire

We designed a questionnaire to collect information about the patients' age, gender, and some related factors for allergy. The questionnaire had two parts: Part 1 included parental diseases for asthma, AR, and atopic eczema. Part 2 comprised patients' asthma and their medication, eczema, type of AR (seasonal or perennial), duration of AR, and frequency of AR symptoms in a week. The questionnaire was self-developed based on a review of related literature. Efficacy criteria (symptom and signs scores) and severity of each symptom were graded from 1 (no symptom) to 4 (severe), recorded according to **Table 1**. Symptom Score Reduce Index (SSRI) was used to assess the patient's symptoms and signs prior to and after 4 weeks of treatment with each medication.

SSRI= (total score before treatment- total score after treatment)/ (total score before treatment)

We described adverse effects as clinical signs or symptoms that appeared or worsened during treatment.

2-4. Intervention

In the current study, neither the parents nor participants knew the drug's administered name. We randomly assigned the patients into two groups using random table numbers. In the cetirizine group, children were treated with a single oral dose of 5 mg (Abidi Co., Tehran, Iran) once at night. Desloratadine (Abidi Co., Tehran, Iran) was administered to the other group. We used 2.5 mg for children once every night. The participants continued their medication for 4 weeks during the intervention period.

2-5. Assessment

The patients and their parents were visited and followed up in an allergy clinic for four weeks. They were asked for any abnormal reactions after starting the drug on the second visit.

2-6. Data analysis

Results were presented as mean± standard deviation (SD) for the quantitative variables and percentages for the categorical variables. The groups were compared using the Student's t-test or Mann Whitney U test for the continuous variables and the chi-square test (or Fisher's exact test if required) for the categorical variables. A P-value of 0.05 or less was considered statistically significant. All the statistical analyses were performed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA).

3- RESULTS

The parents of 352 of 400 eligible children with AR agreed to participate in this study. Among them, 32 were excluded because they did not meet the research

criteria, and 72 could not attend the follow-up appointments. A total of 248 patients completed the study: 109 patients (47 female, 62 male) in the first group, who were treated with cetirizine; and 139 patients (53 female, 86 male) in the second group, who received desloratadine. The demographic data of the two treatment groups are summarized in **Table 1**; there was no significant difference between the groups related to characteristic data.

Table-1: The score of disease activity in children with allergic rhinitis

Score	Sneezing	Nasal and eye itching	Nasal congestion	Rhinorrhea	Total
1	Not	Not	Not	Not	4
2	Mild	Mild	Mild	Mild	8
3	Moderate	Moderate	Moderate	Moderate	12
4	Severe	Severe	Severe	Severe	16

As presented in **Table 2,** there were no differences between the 2 groups in the score of AR symptoms, before therapy. Compared to the patients' pretreatment status, the responses to both cetirizine and desloratadine in patients with AR were notably different (p = 0.001 and p = 0.006). After the 4-week course of therapy, there was also no significant difference in reducing symptoms between the 2 treatment groups.

Table-2: Baseline demographic data of children with allergic rhinitis treated with cetirizine or desloratadine

Characteristic		Cetirizine (n=109)	Desloratadine (n= 139)	P value
Age (year) Mean ± SD		7.17± 2.58	7.04± 2.77	0.4
Sex, no. (%)	Female	47 (43.1)	53 (38.1)	0.7
	Male	62 (56.9)	86 (61.9)	
Parental allergy, no. (%)	Asthma	22 (20.2)	32 (23)	0.4
	AR*	54 (49.5)	78 (56.1)	0.2
	Eczema	6 (5.5)	6 (4.3)	0.6
Individual allergy, no. (%)	Asthma	66 (60.5)	76 (54.7)	0.1
	Asthma treated with ICS	60 (55)	77 (55.4)	0.5
	Asthma treated with montelukast	66 (60.5)	74 (53.2)	0.1
	Eczema	7 (6.4)	14 (10)	0.4
Type of AR*, no. (%)	Seasonal	39 (35.8)	40 (28.8)	0.2
	Perennial	70 (64.2)	99 (71.2)	
Duration of AR* (year) Mean ± SD		29.4± 22.9	34.6± 26.9	0.1

* AR: Allergic rhinitis

A significant difference was found between the cetirizine and the desloratadine-treated group regarding observed side effects (P value = 0.02). The most frequent adverse reaction to the protocol regimen was mild to moderate drowsiness: 8 (7.3%) in the cetirizine group. None of the patients receiving

desloratadine showed these symptoms after 4 weeks of therapy. Dry mouth was seen in only 2 patients in the desloratadine-treated group (**Table 3**).

Table-3: Comparison of the responses to treatments in children with allergic rhinitis

Response score	Cetirizine (n=109)	Desloratadine (n= 139)	P-value	95% CI of the difference
Score before treatment Mean ± SD	13.21± 3.00	14.01± 2.80	0.1	-1.25 to 0.523
Score after 4-week therapy Mean ± SD	4.57± 1.27	4.67± 1.50	0.7	-0.462 to 0.247
* SSRI Mean ± SD	0.61± 0.12	0.64± 0.14	0.4	-0.459 to 0.222

* Abbreviation: SSRI, Symptom Score Reduce Index

4- DISCUSSION

This study showed no significant difference in the efficacy of cetirizine and desloratadine, while the observed adverse effects were much fewer in the desloratadine-treated group in the management of children with AR.

The present study showed that all patients with AR treated with desloratadine improved their symptoms during 4 weeks of daily desloratadine. In the same line, Tassinari et al. conducted an open-label trial in Latin American countries on 455 children aged 6 to 12 years with AR; the symptoms of AR improved with desloratadine therapy in these patients (13). Simons et al., conducted a multicenter, randomized, placebo-controlled, double-blind study on 676 patients with symptomatic perennial allergic rhinitis who were randomly assigned to 4 weeks of treatment with desloratadine once daily or placebo. They found that desloratadine reduced the symptoms of AR, and its use is safe and rapid onset (14). Adham TM. reported that most Arab and Asian subjects in the Middle East Gulf region with AR showed significant symptom relief with desloratadine 5 mg daily for 2 weeks (15).

In line with our study, Zhouet et al. recently collected the amount of data from 22 studies on the clinical use of cetirizine in the management of patients with AR, and they found that cetirizine was often employed as the main drug in these children (16). Benazzo et al. showed that cetirizine was able to reduce symptom severity and improve quality of life in Italian children with seasonal AR (17).

Our data showed no statistically significant difference in clinical response to cetirizine and desloratadine. Purohit et al. also compared the antihistamine activity of desloratadine and cetirizine in the skin wheal-and-flare responses for 24 hours; cetirizine was associated with significantly greater suppression of skin reactivity to histamine compared with desloratadine during 24 hours after a single dose (18). Sukkul et al. found that both cetirizine and desloratadine lead to decreased skin wheal-and-flare response to allergens (19). Juliana et al. compared the efficacy of loratadine with that of cetirizine for the treatment of AR in children and found no statistically significant difference in diminishing nasal symptoms after 3 days, 7 days, and 14 days of treatment (20).

It was reported that adverse reactions to cetirizine in patients aged 2 to 11 years are mild to moderate (21). About 7% of our patients developed mild to moderate drowsiness after 4 weeks of treatment with cetirizine. Although uncommon, the other adverse effects, including fatigue,

pharyngitis, dizziness, and dry mouth were observed in our cetirizine-treated patients. After 4 weeks of treatment with desloratadine, dry mouth occured in a small number of our patients.

4-1. Limitations of the study

Differences in human genetic background can be associated with various drug responses; therefore, research in different geographic areas is needed to generalize the result of this study. While the score of disease activity in children with AR is useful, we relied solely on parent-reported and directly measured child symptoms.

5- CONCLUSION

This study demonstrated that antihistamines, cetirizine, and desloratadine once a day improved symptom scores of children with AR. However, there was not any significant difference in the efficacy of these two drugs; desloratadine provided fewer side effects in patients after 4 weeks of treatment.

6- CONFLICT OF INTEREST

None.

7- ACKNOWLEDGEMENT

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