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Original Contribution

Predictive factors of the duration of a first-attack acute urticaria in children

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Abstract

Purposes: This study's aim was to determine the predictive factors of the duration of first-attack acute urticaria in children.

Basic Procedures: The sample included 1075 children admitted to the emergency department with first-attack acute urticaria. Variables comprising the clinical features and past histories of children with duration of disease of 3 days or less, 4 to 7 days, 8 to 14 days, and 15 days or more were compared to determine the predictors of duration of acute urticaria.

Main Findings: Age, various etiologies, clinical presentations, coexistent pyrexia or angioedema, and personal histories of allergic diseases were significant factors (all $P < .05$). Among allergic diseases, atopic dermatitis was the most significant predictor of duration of acute urticaria, and those with multiple allergic diseases had longer durations of urticaria (both $P < .05$). Oral plus injection forms of antihistamine or steroid were related to shorter duration of disease ($P < .05$).

Principal Conclusions: Etiologies and personal allergy history may be the most important predictors of the duration of a first attack of acute urticaria.

1. Introduction

Urticaria is a common disease in the pediatric emergency department (ED) and is estimated to affect 15% to 25% of people at some point in their life [1]. Many parents seek emergency medical treatment for their children when they experience a first attack of acute urticaria, especially when

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their children develop severe clinical presentations, including intensive pruritus, recurrent generalized wheals, edema of the lips or eyelids, respiratory distress, and gastrointestinal symptoms [2]. Acute urticaria is defined as spontaneous wheals presenting for less than 6 weeks [3,4]. A detailed understanding of the factors that may predict the duration of urticaria will help primary physicians perform appropriate clinical assessments. Many studies have discussed the demographics and etiologies of acute urticaria in children [1,5-9], but the factors that may influence the duration of acute urticaria have not been well addressed, especially in children who present with a first attack. In this study, we aimed to analyze the factors that may predict the duration of a first attack of acute urticaria in children.

2. Materials and methods

2.1. Patient population

During the study period January 2002 to January 2008, acute urticaria was diagnosed in 9523 children aged 18 years or younger at the Changhua Christian Hospital, a 2500-bed medical center in central Taiwan. Among these patients, 2051 children underwent medical treatments in the pediatric ED; a total of 1348 children were identified as having had a first attack of acute urticaria. A first attack of acute urticaria was defined as urticarial symptoms presenting for less than 6 weeks in patients without a previous history of urticaria. All of the 1348 children were well educated to follow up in the ED or dermatology/pediatric outpatient department (OPD) after ED or hospital treatment courses because acute urticaria usually presents with recurrent itching and skin lesions for several days to weeks. In total, 1075 (79.7%) children followed up their symptoms in the ED or dermatology/pediatric OPD, and information on the durations of urticaria were obtained according to the descriptions of the physicians in the follow-up OPD or ED and which were made by direct observation or family's statements. In addition, 273 (20.3%) children were excluded from the study because they had been lost to follow-up and the information of urticaria duration was unavailable. Therefore, the final study population was composed of 1075 patients.

2.2. Methods

The demographic information of the children was obtained from hospital chart records and statements from family members and included the date of disease onset, age at onset, sex, etiologies, clinical manifestations, coexistence with pyrexia, coexistence with angioedema, personal allergy histories, treatments, and total duration of urticaria. Children were divided into 4 age groups: infant (age range, <1 years), preschool age (age range, >1-6 years), school age (age range, >6-12 years), and adolescent (age range, >12-18 years). The etiologies of acute urticaria were divided into 7 major categories: (1) medications, (2) foods, (3) various infections, (4) inhalants, (5) insect bites, (6) contact materials, and (7) idiopathic causes. The relationships between these etiologies and first-attack acute urticaria were determined by peer review of the patients' medical history and clinical assessments. The etiologies of acute urticaria were determined based on statements made by the patients or their family members about special life events or exposure to certain environmental stressors. For example, patients who presented with urticaria after a recent bacterial or viral infection were surveyed for the source of the infection. Either viral or bacterial infection was suspected to be the etiology when patients or family members denied any other special life events or exposure to environmental stressors, such as changes in diet, recent medication use, or contact with animals, plants, or special materials. Food or medications were suspected to be the etiology when patients or family members stated that they had rashes after eating a particular food or taking a particular medication. Idiopathic causes were suspected when patients or family members denied any special life event or exposure to environmental stressors and when clinical assessments revealed nonspecific findings.

Personal history of allergic disease, including (1) asthma, (2) allergic rhinitis, and (3) atopic dermatitis, were obtained from hospital chart records and statements from patients or family members. The clinical presentations of children with a first attack of acute urticaria in this study included 6 groups of major symptoms: (1) skin lesion only, (2) respiratory tract symptoms (cough, nasal obstruction, rhinorrhea, sore throat, dyspnea, shortness of breath, stridor, and wheezing), (3) urinary tract symptoms (frequency, dysuria, and pyuria), (4) neurological symptoms (dizziness, vertigo, convulsion, headache, and consciousness change), (5) gastrointestinal symptoms (nausea, vomiting, diarrhea, constipation, and abdominal pain), and (6) others. The types of medical treatment that improved symptoms were recorded. Antihistamine and steroid were used to treat urticaria in most patients. Adrenalin was used only in children who presented with angioedema or respiratory distress [8,10,11]. Dosages of medications had been adequately calculated based on the body weight of children in all cases. The methods of administering the medications were also evaluated.

The total duration of urticaria was defined as the period from the time of the onset of symptoms to the time of subsidence of symptoms. The correlation between related factors, including age, sex, etiologies, clinical presentations, coexistence with pyrexia or angioedema, personal allergy histories, and treatments and the duration of a first attack of acute urticaria, was also analyzed. The durations of urticaria were divided into 4 major periods, namely, 3 days or less, 4 to 7 days, 8 to 14 days, and 15 days or more, to demonstrate the extreme distributions of the duration of urticaria. Furthermore, variables comprising the clinical features between these 4 periods of urticaria were further analyzed to determine the predictors of duration of a first attack of acute urticaria in children.

2.3. Statistical analysis

Data were analyzed by one-way ANOVA analysis of variance and the χ^2 test. The results of descriptive analyses of independent variables (age, sex, etiologies, clinical presentations, and personal allergy histories) are reported as percentages and means ± SD. Factors that may be associated with the duration of first-attack acute urticaria were analyzed by the χ^2 test. The relationship between the number of allergic events and the duration of urticaria were analyzed by one-way ANOVA analysis of variance. A P value < .05 was regarded as significant.

3. Results

3.1. Demographics, etiologies, and treatments

This study included a total of 1075 children 18 years or younger (mean ± SD age, 5.7 ± 4.4 years) with a first attack of acute urticaria. All children were followed in the ED or OPD for 6 years. There were 626 (58.2%) boys and 449 (41.8%) girls. Most children were in the preschool age group (53%), followed by the school age group (22.8%), the infant group (16.2%), and the adolescent group (8%). Allergic rhinitis was the predominant allergic disease (23.8%), followed by asthma (9.1%) and atopic dermatitis (4.4%). The most common etiology of first-attack acute urticaria in children was infection from various sources (45.2%), followed by foods (24%), idiopathic causes (15.3%), medications (11.8%), inhalants (2%), insect bites (1.5%), and contact materials (0.2%). Clinical presentations included skin lesions only (46.5%), respiratory tract symptoms (38.3%), gastrointestinal symptoms (12.2%), urinary tract symptoms (0.9%), and neurological symptoms (0.6%). Pyrexia was noted in 308 children (28.7%). Urticaria coexistent with angioedema was noted in 109 children (10.1%) (Table 1).

The most commonly used medical treatments were oral antihistamines (65.1%), followed by intravenous steroids (25.1%), oral plus intravenous antihistamines (24.7%), and oral steroids (17.7%); only 1.2% of children received subcutaneous adrenalin injections. The total mean ± SD duration of symptoms was 6.7 ± 4.8 days (Table 1).

Table 1 Demographics, etiologies, and clinical presentations of first-attack acute urticaria in children

	First-attack acute urticaria of children (n = 1075)	
	No.	%
Sex		
Male	626	58.2
Female	449	41.8
Age, mean ± SD, y	5.7 ± 4.4	
Infant	174	16.2
Preschool age	570	53
School age	245	22.8
Adolescent	86	8
Personal allergic diseases		
Asthma history	98	9.1
Allergic rhinitis history	256	23.8
Atopic dermatitis history	47	4.4
Etiology of urticaria		
Medications	127	11.8
Foods	258	24
Various infections	486	45.2
Inhalants	22	2
Insects bite	16	1.5
Contact materials	2	0.2
Idiopathic causes	164	15.3
Clinical presentations		
Only skin lesions	500	46.5
Respiratory tract symptoms [a]	412	38.3
Urinary tract symptoms	10	0.9
Neurological symptoms	6	0.6
Gastrointestinal symptoms	131	12.2
Others	16	1.5
Coexistent with pyrexia	308	28.7
Coexistent with angioedema	109	10.1
Treatments		
Antihistamines (oral form/injection form [b]/both)	700/15/265	65.1/1.4/24.7
Steroids (oral from/injection form [b]/both)	190/270/54	17.7/25.1/5
Adrenalin (SC)	13	1.2
Total duration of symptoms, mean ± SD, d	6.7 ± 4.8	

SC indicates subcutaneous.

[a] Cough, nasal obstruction, rhinorrhea, sore throat, dyspnea, shortness of breath, stridor and wheezing.

[b] Injection form included intravenous form or intramuscular form.

3.2. Related factors in predicting the duration of first-attack acute urticaria

The durations of acute urticaria in this study were divided into 4 time periods. The duration of urticaria for most patients was from 4 to 7 days (54.6%), followed by 8 to 14 days (25.9%), 3 days or less (14.2%), and 15 days or more (5.3%). The factors that may have influenced the total duration of symptoms were analyzed among these 4 time periods.

3.2.1. Age associated with the total duration of acute urticaria

Infants and adolescents had shorter durations of symptoms than did the preschool age and the school age children. (The percentages of patients with a duration of acute urticaria of ≤3 days were 23.6% among infants and 25.3% among adolescents vs 10.4% among preschool age and 12.7% among school age children; $P < .05$; Table 2.) Sex was not a statistically significant factor associated with the duration of urticaria ($P = .101$).

Table 2 Predictors of the duration of first-attack acute urticaria in children

	First-attack acute urticaria in children (n = 1075)								
	Total duration of symptoms								
	≤3 d (n = 153)		4-7 d (n = 587)		8-14 d (n = 278)		≥15 d (n = 57)		*P*
	No.	%	No.	%	No.	%	No.	%	
Age									
Infant [a]	41	23.6	83	47.9	40	22.9	10	5.6	<.05
Preschool age	59	10.4	319	55.8	161	28.3	31	5.5	
School age	31	12.7	139	56.7	62	25.3	13	5.3	
Adolescent [a]	22	25.3	46	53.3	15	17.3	3	4	
With personal allergic diseases	48	11.9	229	56.5	96	23.6	32	7.9	<.05
Without personal allergic diseases	105	15.4	358	53.7	182	27.2	25	3.7	
Clinical presentations									
Only skin lesions [a]	105	21	256	51.1	106	21.2	33	6.7	<.05
Respiratory tract symptoms [b]	32	7.8	243	59	117	28.4	20	4.8	
Urinary tract symptoms	0	0	3	30	6	60	1	10	
Neurological symptoms	0	0	6	100	0	0	0	0	
Gastrointestinal symptoms	14	11	68	51.7	46	34.7	3	2.5	
Others	2	9.5	11	71.5	3	19	0	0	
Coexistent with pyrexia	15	4.9	194	62.8	92	29.9	7	2.4	<.05
Urticaria without pyrexia [a]	138	17.8	393	51.5	186	24.1	50	6.6	
Coexistent with angioedema [a]	29	27.3	60	54.5	19	17.2	1	1	<.05
Urticaria without angioedema	124	12.7	527	54.8	259	26.6	56	5.8	
Treatment with steroid									
Nil	92	16.5	311	55.5	130	23.1	28	4.9	<.05
Oral form	13	6.8	95	50	56	29.3	26	14	
Injection form	37	14	145	53.5	86	31.8	2	0.7	
Both [a]	11	21.5	36	66.2	6	10.8	1	1.5	
Treatment with antihistamine									
Nil	21	22.7	51	53.3	17	17.3	6	6.7	<.05
Oral form	58	8.5	368	52.5	226	32.2	48	6.8	
Injection form	2	11.8	6	41.2	7	47.1	0	0	
Both [a]	72	30	162	61	28	10.3	3	1.8	
Treatment with adrenalin									
Nil	150	14.1	579	54.5	278	26.2	55	5.2	<.05
Injection [a]	3	21.4	8	64.3	0	0	2	14.3	

[a] Predictors of a shorter duration of first-attack acute urticaria.
[b] Cough, nasal obstruction, rhinorrhea, sore throat, dyspnea, shortness of breath, stridor and wheezing.

3.2.2. Etiologies associated with the total duration of acute urticaria

In this study, 7 major etiologic categories were identified. These etiologies were then analyzed to see whether they could predict the duration of urticaria. We found that the mean durations of urticaria differed significantly between etiologies ($P < .05$). The longest mean duration of urticaria was associated with inhalants (8.7 ± 4.6 days) followed by idiopathic causes (8.1 ± 5.7 days), various infections (7.0 ± 2.9 days), insect bites (6.6 ± 5.4 days), foods (6.2 ± 4.4 days), medications (5.5 ± 3.6 days), and contact materials (3.7 ± 0.9 days). Furthermore, the etiologies of inhalants (21.1%) and idiopathic causes (13.8%) had a higher percentage of patients with a duration of acute urticaria of 15 days or more than did foods, medications, and various infections (all $P < .05$) (Fig. 1). In addition, various infections was the etiology that accounted for the lowest percentage (only 6.2%) of children having acute urticaria for 3 days or less (Fig. 1).

3.2.3. Personal allergic histories associated with the total duration of acute urticaria

Personal history of atopy included asthma (9.1%), allergic rhinitis (23.8%), and atopic dermatitis (4.4%). In total, 405 (37.7%) children had personal histories of atopy, and we found that the duration of urticaria was significantly shorter in children without a personal allergy history than in children with a personal history of atopy (percentage of patients with duration of acute urticaria of ≤3 days: 15.4% in those without history vs 11.9% in those with history) ($P < .05$) (Table 2). Of the 405 children with personal allergy histories, 10 children had a history of all 3 allergic diseases, 88 children had a history of 2 of the 3 allergic diseases, and 307

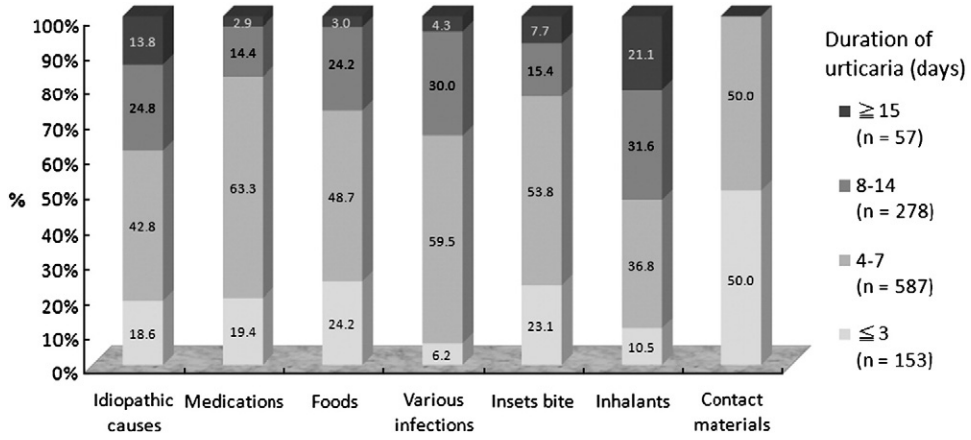

Fig. 1 The durations of first-attack acute urticaria differ significantly among the 7 major etiologies ($P < .05$).

children had a history of only 1 of the 3 allergic diseases. The number of associated allergic diseases was related to the total duration of urticaria. Children with personal allergy histories comprising more than 1 allergic disease had a longer duration of urticaria. (The mean ± SD duration of urticaria in those with none of the 3 allergy histories was 6.64 ± 3.75 days; 1 of the 3 allergy histories, 7.46 ± 4.54 days; 2 of the 3 allergy histories, 9.06 ± 4.62 days; and all of the 3 allergy histories, 9.43 ± 4.50 days; $P < .05$; Fig. 2). Furthermore, we compared these 3 personal allergic diseases with the duration of urticaria symptoms and found that atopic dermatitis was associated with the longest duration of urticaria ($P < .05$) (Fig. 3).

3.2.4. Clinical presentations associated with the total duration of acute urticaria

In this study, 6 major clinical presentations of urticaria were identified. We found that children with only skin lesions had the shortest duration of urticaria and that children with gastrointestinal symptoms had the longest duration ($P < .05$) (Table 2). Urticaria without the coexistence of pyrexia was significantly associated with shorter duration of urticaria ($P < .05$). (The percentages of patients with a duration of acute urticaria of ≤3 days were 17.8% in those without pyrexia vs 4.9% in those with pyrexia.) In addition, urticaria coexisting with angioedema was associated with a shorter duration of urticaria symptoms than did urticaria alone ($P < .05$). (The percentages of patients with a duration of acute urticaria of ≤3 days were 12.1% in those without angioedema vs 27.3% in those with angioedema; Table 2).

3.2.5. Types of treatments associated with the total duration of acute urticaria

Antihistamine, steroid, and adrenalin were the 3 major medications used for treating urticaria. We found that the method of administering medications influenced the duration of urticaria. The duration of urticaria was significantly shorter in children who were administered combination therapy via oral plus injection form of antihistamine or steroid than in children who received antihistamine or steroid only ($P < .05$) (Table 2). (The percentages of patients with a duration of acute urticaria of ≤3 days were, for antihistamine, 30% in those who received oral plus injection vs

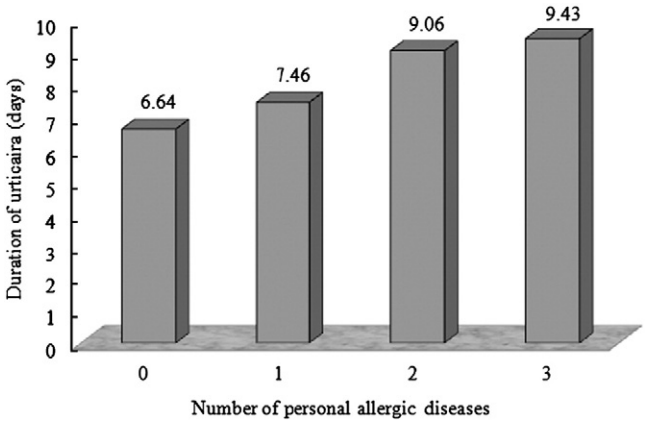

Fig. 2 The number of allergic diseases significantly associated with duration of urticaria ($P < .05$).

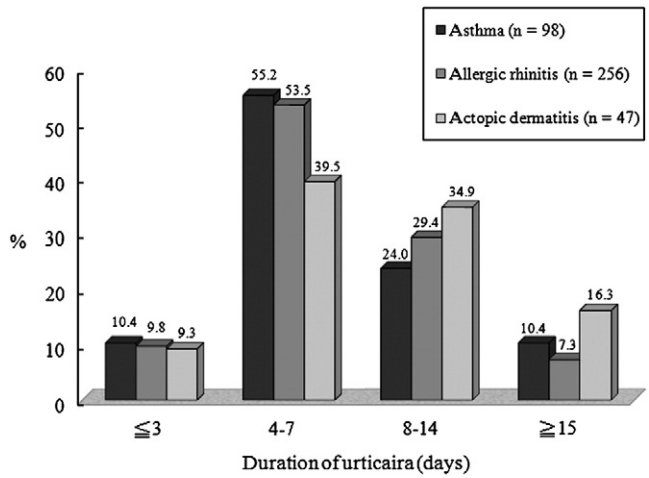

Fig. 3 Atopic dermatitis was the predominant history associated with longer duration of urticaria ($P < .05$).

11.8% in those who received injection vs 8.5% in those who received oral antihistamine; and, for steroid, 21.5% in those who received oral plus injection vs 14% in those who received injection vs 6.8% in those who received oral).

4. Discussion

Acute urticaria has been defined as spontaneous wheals presenting for less than 6 weeks [3,4]. However, the durations of acute urticaria in children vary from individual to individual and depend on the clinical presentations of the disease. Therefore, a detailed understanding of the related factors that may influence the duration of acute urticaria will help primary physicians perform more appropriate clinical assessments. In this study, we have presented the demographics and determined the factors that can be used to predict the duration of a first attack of acute urticaria in children.

The first predictor was age. It has been reported that the etiologies of urticaria may differ between age groups [5]. However, the relationship between age and duration of urticaria had not been well addressed. In this study, we noted that infants and adolescents had the shortest durations of urticaria. Furthermore, there were higher percentage of children who had less than 3 days' duration of urticaria in the 2 age groups of infant and adolescent than the other 2 age groups.

Personal allergy history was also a predictor of the duration of urticaria. Atopy history (personal or family history) has been reported to be associated with the incidence or prevalence of urticaria in children [1,5,6]. In this study, we found not only that children without personal allergic histories had shorter durations of acute urticaria but also that atopic dermatitis was associated with a longer duration of acute urticaria than did asthma or allergic rhinitis, which were the 2 most common atopic histories of the children in this study. Moreover, longer durations of acute urticaria were associated with greater numbers of atopic events. Therefore, we recommend that detailed personal allergic history taking be included in the assessment of patients with a first attack of acute urticaria. The etiologies of acute urticaria in children were the most important predictors of disease duration. Several previous studies have reported that infection was the most common etiology of acute urticaria in children [1,5-8]. However, the relationships between etiologies and duration of acute urticaria have not been well studied. We found that in the group of patients who suffered urticaria symptoms for <3 days, children with urticaria due to various infections represented the smallest percentage of patients. Based on this finding, we propose that acute urticaria caused by infections may indicate a long and difficult recovery from urticaria symptoms. We also noted that inhalants and idiopathic causes were associated with the longest duration of acute urticaria.

The clinical presentations were also related to the duration of acute urticaria in children, especially when the etiologies or family histories could not be determined immediately in the ED. We found that children who presented only with skin lesions had the shortest duration of acute urticaria. Plumb et al [6] studied 52 children with urticaria and reported that gastrointestinal symptoms were significantly associated with acute urticaria in children. Other studies have reported that gastrointestinal symptoms are associated with the severity of urticaria [12,13]. In the present study, we found that children who presented with gastrointestinal symptoms had the longest duration of disease. In addition, urticaria coexistent with pyrexia was associated with a longer disease duration than did urticaria without pyrexia. A higher body temperature in children may not only be associated with severe allergic reactions but also be related with underlying infections. Therefore, pyrexia may be a factor that influences the duration of urticaria.

In this study, 109 children (10.1%) had acute urticaria together with angioedema. Typical sites of angioedema involvement are the eyelids, lips, genitalia, and distal extremities. Some previous studies reported that urticaria and angioedema were both caused by reversible vasodilatation and increased vascular permeability, different only in the tissue depth of the reaction [10,11]. Ordinary angioedema has the same pathogenic mechanism and is often associated with urticaria [3,8]. However, we found that children who had acute urticaria coexistent with angioedema had a shorter duration of urticaria than did those without coexistence of angioedema. This result might be related to the differences in methods used to treat urticaria and urticaria combined with angioedema.

Treatments of urticaria or urticaria coexistent with angioedema varied based on the clinical conditions of children. Antihistamine, steroid, and adrenalin were the 3 major medications used in this study. The oral form antihistamine was the most commonly used medication; however, only 8.5% of the patients who had urticaria for 3 days or less received only the oral form of antihistamine. According to this finding, different methods of administering medication may be associated with the duration of acute urticaria in children. But this study is limited to detecting the association, and there is not enough information to attribute causality. Some studies have shown the benefits of treating acute urticaria with a higher dose of antihistamine followed by a short-term burst of steroid therapy [14-17]. However, different methods of administering antihistamine or steroid have not been well discussed in children with acute urticaria. Therefore, we suggest that the total dose of combination treatments (oral plus injection form of antihistamine or steroid) be adjusted according to the individual conditions of children and the current guidelines of management of urticaria [14]. Moreover, when children have acute urticaria and do not require hospitalization, a single injection of antihistamine or steroid in the ED followed by a self-administered oral form of antihistamine

or steroid at home may be associated with a shorter duration of the disease.

4.1. Limitation

There were some limitations to this study. The retrospective nature of this study was a limitation; after peer review of the hospital chart records, 19 children who had been followed up in the pediatric ED were also excluded from this study because the duration of their urticaria was difficult to confirm.

5. Conclusion

Factors of predicting the duration of a first attack of acute urticaria in children were identified in this study. Etiologies and personal allergic histories were the 2 most important predictors. However, clinical presentations of a first attack of acute urticaria may be useful when etiologies and histories could not be determined immediately. Oral plus injection form of antihistamine or steroid was associated with a shorter duration of urticaria, but this study is limited to detecting the association, and there is not enough information to attribute causality.

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