

## Epidemiology of urticaria in China: a population-based study

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### Abstract

**Background:** Urticaria is a common skin disease characterized by episodes of wheals, and it has a negative effect on patients' quality of life. Large-scale population-based epidemiological studies of urticaria are scarce in China. The aim of this survey was to determine the prevalence, clinical forms, and risk factors of urticaria in the Chinese population.

**Methods:** This survey was conducted in 35 cities from 31 provinces, autonomous regions, and municipalities of China. Two to three communities in each city were selected in this investigation. Participants completed questionnaires and received dermatological examinations. We analyzed the prevalence, clinical forms, and risk factors of urticaria.

**Results:** In total, 44,875 questionnaires were distributed and 41,041 valid questionnaires were collected (17,563 male and 23,478 female participants). The lifetime prevalence of urticaria was 7.30%, with 8.26% in female and 6.34% in male individuals ( $P < 0.05$ ). The point prevalence of urticaria was 0.75%, with 0.79% in female and 0.71% in male individuals ( $P < 0.05$ ). Concomitant angioedema was found in 6.16% of patients. Adults had a higher prevalence of urticaria than adolescents and children. Living in urban areas, exposure to pollutants, an anxious or depressed psychological status, a personal and family history of allergy, thyroid diseases, and *Helicobacter pylori* infection were associated with a higher prevalence of urticaria. Smoking was correlated with a reduced risk of urticaria.

**Conclusion:** This study demonstrated that the lifetime prevalence of urticaria was 7.30% and the point prevalence was 0.75% in the Chinese population; women had a higher prevalence of urticaria than men. Various factors were correlated with urticaria.

**Keywords:** Urticaria; Prevalence; Risk factor; China

### Introduction

Urticaria is a common skin disease characterized by episodes of wheals, with or without angioedema. Urticaria

typically resolves within 24 h, without scarring.<sup>[1]</sup> Angioedema usually presents as sudden swelling of the lower dermis and subcutis, which usually resolves in the

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mucous membranes and can last up to 72 h.<sup>[2]</sup> In patients with severe urticaria, gastrointestinal and respiratory involvement may occur. Urticaria has a considerable negative effect on the patients' quality of life. In patients with frequent episodes, the effect is more severe than that of atopic dermatitis, acne, and psoriasis and is comparable to the effect of ischemic heart disease.<sup>[3,4]</sup>

Urticaria includes acute urticaria and chronic urticaria. Acute urticaria is often associated with viral infection or an acute allergic reaction to foods, medications, or insects.<sup>[5]</sup> However, the etiology of chronic urticaria is difficult to be identify.<sup>[6]</sup> Chronic urticaria has various manifestations, including chronic spontaneous urticaria and chronic inducible urticaria, depending on whether the episodes are triggered by specific stimuli.<sup>[7]</sup> Chronic spontaneous urticaria is more common than other forms of chronic urticaria.<sup>[8]</sup> Urticaria is a main reason for consultations with an allergist, dermatologist, or general practitioner in Western countries.<sup>[9]</sup> In China, dermatologists treat much more patients with urticaria than other specialists. The prevalence of urticaria has been reported in several studies.<sup>[9-14]</sup> However, large-scale epidemiological studies in the Chinese population are scarce. We carried out a nationwide survey to determine the prevalence, risk factors, and clinical forms of urticaria in China.

**Methods**

**Ethical approval**

The study was approved by the Ethical Committee of Peking University People's Hospital (No. 2017PHB074-01). Informed consent was obtained from all study participants.

**Study population**

This survey was conducted in 35 cities covering 31 provinces, autonomous regions, and municipalities of China. The pre-estimated sample size was approximately 40,000. The sample size in each region was calculated according to the geographic distribution in the National Census 2010. Stratified multistage cluster sampling was adopted. Two to three communities in each city were randomly selected for the investigation. The target population was adults, adolescents, and children >7 years.

**Investigators and questionnaires**

The investigators were dermatologists from Peking University People's Hospital and local medical college hospitals. They were all trained for this investigation and were required to pass an examination for qualification. Participants were asked to complete questionnaires and undergo a dermatological examination. In the examination, a vertical force was applied on the forearm of participants using a cotton swab to see whether a linear wheal could be elicited. Lifetime prevalence was defined as having at least one episode of urticaria in the participant's lifetime. Point prevalence was defined as having urticaria within 1 week of

the investigation. Exposure to pollutants was defined as exposure to dust, smog, chemical fumes, and exhaust gases in the living and working environments. The age- and sex-adjusted prevalence of urticaria (overall, in male participants, and in female participants) was calculated based on the China Population Composition in 2010.

**Statistical analysis**

Epidata version 3.1 (Epidata Association, Odense, Denmark) and IBM SPSS 22.0 (IBM Corp., Armonk, NY, USA) were used for data entry and data analysis. Quantitative data are presented as mean and standard deviation whereas qualitative data are represented as number and percentage. To investigate differences in the distribution of groups with and without urticaria, we performed the Student's *t* test for quantitative data and the chi-squared test for qualitative data in these two cohorts. The odds ratio (OR) and 95% confidence interval (CI) were calculated using logistic regression to identify risk factors and protective factors of urticaria. A *P* value <0.05 was considered statistically significant.

**Results**

**Study population**

In total, 44,875 questionnaires were distributed and 41,041 valid questionnaires were collected (response rate, 91.46%). The study population included 17,563 male participants (42.79%) and 23,478 female participants (57.21%), ranging from 7.0 to 99.0 years of age (mean 33.5 ± 16.3 years).

**Prevalence of urticaria**

The lifetime prevalence of urticaria was 7.93% (7.30% after age- and sex-standardization). The lifetime prevalence was 6.61% in male individuals (6.34% after standardization) and 8.92% in female ones (8.26% after standardization) (*P* < 0.05). Concomitant angioedema was found in 6.16% of patients. The lifetime prevalence of urticaria in different regions is shown in [Table 1]. Of all eight regions of China, the eastern coastal region had the highest prevalence (10.21%) and the northwest region had the lowest prevalence (6.40%).

The point prevalence of urticaria was 0.76% (0.75% after standardization), with 0.69% in male individuals (0.71% after standardization) and 0.82% in female ones (0.79%

**Table 1: Lifetime prevalence of urticaria in eight regions of China.**

Regions	Subjects (n)	Life-time prevalence (%)
Northeast	5448	6.52
Northern Coastal	4421	9.52
Eastern Coastal	3929	10.21
Southern Coastal	5159	9.05
Middle Yellow River	7049	7.06
Middle Yangtze River	6263	8.05
Northwest	2531	6.40
Southwest	6241	7.16

**Table 2: Lifetime prevalence and point prevalence of urticaria by age group.**

Age (years)	Life-time prevalence, n (%)	Point prevalence, n (%)
7–11	59 (5.17)	4 (0.35)
12–17	154 (5.60)	12 (0.44)
≥18	3042 (8.19)	297 (0.80)
18–29	1689 (8.90)	146 (0.77)
30–39	572 (9.01)	59 (0.93)
40–49	353 (8.40)	43 (1.02)
50–59	216 (6.13)	22 (0.62)
60–69	140 (5.51)	19 (0.75)
≥70	72 (4.62)	8 (0.51)

after standardization). The point prevalence in female participants was significantly higher than in male participants ( $P < 0.05$ ).

The lifetime prevalence of urticaria in children, adolescents, and adults was 5.17%, 5.60%, and 8.19%, respectively. Adults had a higher prevalence than children and adolescents ( $P < 0.05$ ); people aged 30 to 39 years showed the highest prevalence (9.01%). The point prevalence in children, adolescents, and adults was 0.35%, 0.44%, and 0.80%, respectively. Again, adults had a higher prevalence than children and adolescents ( $P < 0.05$ ) [Table 2].

The prevalence of different forms of urticaria is shown in [Figure 1]. Acute spontaneous urticaria was the most common form (5.95%), followed by chronic spontaneous urticaria (1.29%), cold urticaria (0.40%), and dermatographism (0.37%). The prevalence of chronic urticaria was 1.80%.

### Risk factors and comorbidities of urticaria

Living in urban areas, exposure to pollutants, a psychological status of anxiety and depression, and family history of allergy were associated with a higher prevalence of urticaria; smoking was correlated with a reduced risk of urticaria [Table 3]. Compared with the population without urticaria, a trend toward an increased risk of urticaria was found in patients with eczema (23.78% *vs.* 13.55%), asthma (2.46% *vs.* 1.15%), allergic conjunctivitis (2.76% *vs.* 0.79%), allergic rhinitis (19.39% *vs.* 9.51%), food allergy (14.53% *vs.* 4.45%), and drug allergy (11.61% *vs.* 5.17%) (all  $P < 0.05$ ). Moreover, thyroid disease (3.20% *vs.* 1.42%,  $P < 0.05$ ) and *Helicobacter pylori* infection (2.58% *vs.* 1.16%,  $P < 0.05$ ) were found to be associated with increased risk of urticaria [Table 4].

We loaded 16 variables with a significant univariate relationship into a series of binary logistic regression models. The results showed that female sex (OR = 1.219, 95% CI: 1.121–1.326), living in an urban area (OR = 1.866, 95% CI: 1.552–2.243), exposure to pollutants (OR = 1.172, 95% CI: 1.082–1.270), family history of allergy (OR = 2.311, 95% CI: 2.131–2.507), and

having eczema (OR = 1.323, 95% CI: 1.206–1.451), allergic conjunctivitis (OR = 1.769, 95% CI: 1.367–2.289), allergic rhinitis (OR = 1.420, 95% CI: 1.281–1.573), food allergy (OR = 2.574, 95% CI: 2.291–2.891), drug allergy (OR = 1.625, 95% CI: 1.434–1.841), thyroid disease (OR = 1.564, 95% CI: 1.247–1.962), and *H. pylori* infection (OR = 1.604, 95% CI: 1.252–2.056) were associated with a higher prevalence of urticaria (all  $P < 0.01$ ). Age (OR = 0.999, 95% CI: 0.996–1.001,  $P = 0.248$ ), smoking history (OR = 0.939, 95% CI: 0.822–1.072,  $P = 0.352$ ), frequent anxiety/nervousness (OR = 1.107, 95% CI: 0.993–1.235,  $P = 0.068$ ), frequent depressed mood (OR = 1.078, 95% CI: 0.969–1.200,  $P = 0.165$ ), and a history of asthma (OR = 1.131, 95% CI: 0.874–1.465,  $P = 0.350$ ) had no significant association with urticaria.

### Discussion

In this study, we carried out a nationwide population-based survey to investigate the prevalence, clinical forms, and risk factors of urticaria in the Chinese population. The results showed that the lifetime prevalence of urticaria was 7.30% in China. The prevalence of urticaria varied among geographic regions and ethnic groups. One study in Germany reported that the lifetime prevalence of urticaria was 8.8%,<sup>[10]</sup> whereas another study showed that the cumulative prevalence of urticaria in Germany was 15.4%.<sup>[11]</sup> A study in Poland reported that the lifetime prevalence of urticaria was 11.2%.<sup>[12]</sup> Our results were similar to those of the German study but lower than the findings of most other studies.

We found that women had a higher prevalence of urticaria than men (8.26% *vs.* 6.34%). Several studies have also shown similar results. Lee *et al*<sup>[8]</sup> reported that the prevalence of chronic urticaria was significantly higher in female than in male individuals. Another study in Germany also showed a higher cumulative prevalence of urticaria in female than in male participants (16.2% *vs.* 14.5%).<sup>[11]</sup> The reason for this sex difference is unknown. The involvement of autoimmunity in the occurrence of urticaria might explain the difference because women are more susceptible than men to autoimmune diseases.<sup>[1]</sup>

We found that the point prevalence of urticaria was 0.75% in China. The point prevalence was obtained from patients who had urticaria within 1 week of the study. Our results were similar to the studies in Poland (0.70%)<sup>[12]</sup> and Spain (0.60%)<sup>[13]</sup> that used the same definition. Again, we found that the point prevalence of urticaria in women was higher than that in men (0.79% *vs.* 0.71%), which was similar to the study in Spain (0.93% *vs.* 0.25%).<sup>[13]</sup> However, the Polish study found no sex differences.<sup>[12]</sup> In this study, we found that the prevalence of chronic urticaria was 1.80%, which is quite similar to the results of a German study<sup>[10]</sup> and a Korean study.<sup>[14]</sup>

The prevalence of chronic spontaneous urticaria was 1.29%, which was lower than a study conducted at Central South University in China (2.70%).<sup>[15]</sup> In the abovementioned Polish study, the prevalence of chronic

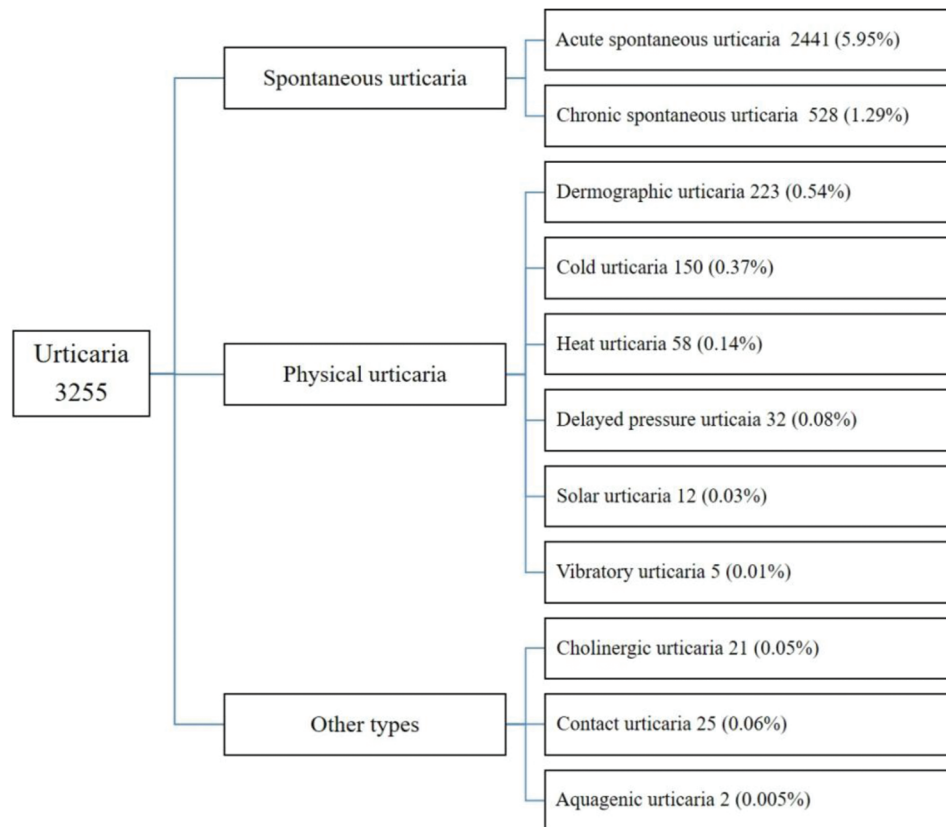


Figure 1: Lifetime prevalence of different forms of urticaria.

Table 3: Selected factors in patients with urticaria and the general population.

Variables	Urticaria patients (N= 3255)	General population (N= 37,786)	P values
BMI (kg/m <sup>2</sup> )	22.3 ± 39.2	21.8 ± 5.4	0.417
Location			<0.01
Rural	126 (3.87)	3263 (8.64)	
Urban	3129 (96.13)	34,523 (91.36)	
Exposure to pollutants*	1053 (32.35)	9956 (26.35)	<0.01
Smoking history	329 (10.11)	4940 (13.07)	<0.01
Drinking history	182 (5.59)	2446 (6.47)	0.127
Pet keeping	602 (18.49)	6982 (18.48)	0.981
Feel nervous or anxious			<0.01
Less than once a month	1158 (35.58)	16,640 (44.04)	
One to three times a month	1514 (46.51)	15,729 (41.63)	
One to three times a week	430 (13.21)	4060 (10.74)	
Almost everyday	153 (4.70)	1357 (3.59)	
Depressed mood			<0.01
Less than once a month	1269 (38.99)	17,584 (46.54)	
One to three times a month	1567 (48.14)	15,985 (42.30)	
One to three times a week	320 (9.83)	3243 (8.58)	
Almost everyday	99 (3.04)	975 (2.58)	
Family history of allergy <sup>†</sup>	1255 (38.56)	6375 (16.87)	<0.01

Data are expressed as mean ± standard deviation or n (%). BMI: Body mass index \* Defined as exposure to dust, smog, chemical fumes, exhaust gas in the living and working environments. † Defined as allergy history of first-, second-, and third-degree relatives.

spontaneous urticaria was 0.6%.<sup>[12]</sup> Another study in Europe reported that the 1-year prevalence of chronic spontaneous urticaria in pediatric patients was 0.75%.<sup>[16]</sup> A study in Italy reported that the 1-year prevalence of chronic spontaneous urticaria increased from 0.02% in

2002 to 0.38% in 2013.<sup>[17]</sup> Our result was higher than most of these previous studies.

In this study, the prevalence of cold urticaria and dermatographism was 0.40% and 0.37%, respectively,



**Table 4: Allergic and autoimmune diseases in patients with urticaria *n* (%).**

Comorbidities	Urticaria patients ( <i>N</i> = 3255)	General population ( <i>N</i> = 37,786)	<i>P</i> value
Eczema	774 (23.78)	5119 (13.55)	<0.01
Asthma	80 (2.46)	435 (1.15)	<0.01
Allergic conjunctivitis	90 (2.76)	300 (0.79)	<0.01
Allergic rhinitis	631 (19.39)	3592 (9.51)	<0.01
Food allergy	473 (14.53)	1682 (4.45)	<0.01
Drug allergy	378 (11.61)	1953 (5.17)	<0.01
<i>H. pylori</i> infection	84 (2.58)	437 (1.16)	<0.01
Thyroid disease	104 (3.20)	537 (1.42)	<0.01
Alopecia areata	15 (0.46)	164 (0.43)	0.824
Connective tissue disease*	34 (1.04)	279 (0.74)	0.054

\* Connective tissue diseases include systemic lupus erythematosus, rheumatoid arthritis, dermatomyositis, systemic scleroderma and Sjögren's syndrome, etc.

whereas the prevalence of other forms of urticaria was lower. A Korean study using an insurance database reported that the prevalence of dermatographism, cholinergic urticaria, and cold/heat urticaria was 0.12%, 0.023%, and 0.019%, respectively.<sup>[18]</sup>

We found that living in an urban area, exposure to air pollutants, anxiety, and depressed mood were associated with a higher prevalence of urticaria, which is similar to that of previous studies. Ding *et al*<sup>[19]</sup> reported that air pollution and urbanization were associated with exacerbation of allergic diseases. Patients with urticaria are susceptible to anxiety, depression, and somatoform disorders; and emotional distress can cause aggravation of urticaria.<sup>[17]</sup> Psychological disorders are not only a consequence of urticaria but also an independent risk factor for urticaria.<sup>[20-23]</sup> Interestingly, we found a protective effect of smoking, which is similar to a study by Lapi *et al*.<sup>[17]</sup> Some studies have reported that nicotine could reduce specific cytokines and thereby modulate immunological responses.<sup>[24,25]</sup>

Compared with the population that did not have urticaria, allergic diseases other than urticaria were much more common in patients with urticaria, suggesting that these conditions are risk factors of urticaria. Similarly, a German study found that over half of patients with urticaria had concomitant atopic diseases, including allergic rhinitis (41.9%), atopic dermatitis (18.9%), and allergic asthma (17.6%).<sup>[10]</sup> Another study in children also observed a strong association of urticaria with asthma, eczema, and hay fever.<sup>[11]</sup> It has been reported that acute urticaria is more common in patients with asthma and could be induced by exacerbation of seasonal asthma.<sup>[26]</sup> Raciborski *et al*<sup>[12]</sup> found that specific foods were important eliciting factors in 12.6% of patients with urticaria. Zuberbier *et al*<sup>[27]</sup> reported that immunoglobulin (Ig)E-mediated food allergy may be a cause of acute urticaria. However, Seitz *et al*<sup>[28]</sup> reported that in patients with drug hypersensitivity, potential respiratory viral infection may induce urticaria rather than drugs. It is widely accepted that IgE-mediated hypersensitivity is involved in acute urticaria whereas autoimmunity is predominant in chronic spontaneous urticaria.<sup>[29]</sup>

We found that thyroid diseases were risk factors for urticaria. It has been reported that 17.7% to 29% of patients with chronic urticaria have anti-thyroperoxidase antibodies, which is higher than that in healthy people (3%–6%). Similar results have also been found for thyroglobulin antibodies and thyroid microsomal antibodies.<sup>[30-33]</sup> These antibodies may induce inflammation in the thyroid, thereby stimulating cytokine secretion and degranulation of mast cells, which subsequently causes related diseases.<sup>[32,34]</sup> It has been suggested that thyroid antibody detection and thyroid function screening are of great importance for patients with chronic urticaria.

We found higher rates of *H. pylori* infection in patients with urticaria, similar to previous studies.<sup>[35-37]</sup> It has been reported that successful treatment of *H. pylori* infection can result in the remission of urticaria,<sup>[38]</sup> highlighting the importance of eradication therapy for *H. pylori* infection in patients with urticaria.

Female patients with chronic urticaria are more likely to develop autoimmune diseases such as rheumatoid arthritis, Sjögren's syndrome, and systemic lupus erythematosus.<sup>[29]</sup> A study in Brazil showed that childhood-onset systemic lupus erythematosus was significantly associated with chronic spontaneous urticaria.<sup>[39]</sup> However, we failed to confirm these findings. Similarly, no correlation was found between alopecia areata and urticaria. We also failed to find a correlation between urticaria and obesity. This is different from the results of many previous studies<sup>[40-43]</sup> and might be related to the fact that there are fewer obese patients in the Chinese population.

## Conclusion

In this nationwide survey, we determined the prevalence and risk factors of urticaria in China. The lifetime prevalence of urticaria was 7.30% and the point prevalence was 0.75% in the Chinese population. Women had a higher prevalence of urticaria than men. A limitation of our study is that most participants were from urban areas and children <7 years old were not included; further studies are needed.

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## Conflicts of interest

None.

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