



Original article

The prevalence of Hymenoptera venom allergy in adults: The results of a very crowded city in Euroasia



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ABSTRACT

Background: There are scarce data about the prevalence of Hymenoptera venom allergy in the general population. The aim of this study was to determine the prevalence of Hymenoptera venom allergy in the general adult population of Istanbul.

Methods: A total of 17,064 randomly selected telephone numbers were contacted and 11,816 (69.25%) individuals who agreed to participate completed a questionnaire. Those who disclosed hypersensitivity reactions due to Hymenoptera stings in this initial survey were called again and given another questionnaire. Those who were suspected of experiencing hypersensitivity reactions to Hymenoptera stings were invited for a clinical investigation with in vivo and in vitro diagnostic tests.

Results: According to the first questionnaire, a total of 1171 (9.9%; 95% CI: 9.38–10.47%) were suspected of having a hypersensitivity to Hymenoptera stings. 51.75% (n: 606) answered the second questionnaire and 21% (n: 128) of these were still suspected of having a hypersensitivity to Hymenoptera stings (1.1%; 95% CI: 0.9–1.29%). The confirmed prevalence of hypersensitivity to Hymenoptera stings according to skin tests and in vitro sIgE levels was 0.2% (95% CI: 0.14–0.30%). Nearly all of the participants with systemic reactions were admitted to the emergency department, although only one tenth of them received adrenaline in the emergency room. 2.3% carried an adrenaline injector, whereas none of the patients received venom immunotherapy.

Conclusions: The prevalence of Hymenoptera sting reactions in our geographical region is comparable with other European studies. There is a need to increase the awareness of adrenaline in the emergency management of insect sting anaphylaxis and venom immunotherapy in the prophylaxis.

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Introduction

The prevalence of self-reported systemic Hymenoptera sting reactions among adults ranges from 0.5% to 3.3% in the US while European epidemiological studies report the prevalence of systemic reactions between 0.3% and 7.5%.^{1,2} Similarly, the prevalence of large local reactions in the general population ranges from 2.4% to 26.4% in many studies.² This wide variation may depend on the

different definitions of the large local reactions, the degree of exposure and the study population.^{3,4}

The prevalence of Hymenoptera venom allergy in adults was evaluated in a number of studies conducted in Turkey.^{5–7} In each of these studies, a selected population such as factory workers, beekeepers or hospital patients was used to determine the prevalence of insect allergies in Turkey. However, in developing countries like Turkey there is a need for large population-based studies which report both the results of a questionnaire as well as skin and serological tests that can confirm case histories and evaluate the general prevalence of Hymenoptera allergy.

The aim of this study was to determine the prevalence of Hymenoptera venom allergy in the general adult population of Istanbul, the biggest city in Turkey with approximately 14 million inhabitants.

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Methods

Study design

In the previous study of our group which evaluated the prevalence of allergies including hypersensitivity reactions to Hymenoptera stings, randomly selected telephone numbers from both the European and Asian sides of Istanbul were contacted in 2005–2006.⁸ A total of 17,064 telephone numbers were called, of which 11,816 (69.25%) individuals completed a questionnaire including hypersensitivity reactions to Hymenoptera stings as well as 8 questions relating to general allergic diseases. Those who disclosed hypersensitivity reactions due to Hymenoptera stings in this survey were called again in 2010–2011 and given another questionnaire that focused on the details of these reactions. Those who were suspected of experiencing large local and systemic hypersensitivity reactions to Hymenoptera stings were invited for a personal investigation at the clinic.

Questionnaires

The first questionnaire inquired about hypersensitivity reactions due to Hymenoptera stings in addition to other atopic diseases. The reliability of the questions, as well as the sensitivity and specificity of the questionnaire were controlled.⁸ The exact question related to Hymenoptera reactions in the first call was 'Have you ever experienced an allergic reaction due to a Hymenoptera sting?' Participants who replied 'YES' to this question were also asked the following two questions: If yes, was/were this/these reaction/s local or systemic? If yes, was the culprit insect a bee or a wasp?

The second questionnaire was conducted again with telephone contacts with participants who had answered 'YES' to the first question related to Hymenoptera stings. This questionnaire was given by allergy specialists who were capable of providing detailed information about the questions when necessary, thereby increasing the quality of the interviews (Table 1). The systemic reactions were classified according to Ring and Messmer and the definition of systemic and large local reactions were made according to the recent EAACI position paper.^{2,9} According to this detailed questionnaire, those who had experienced hypersensitivity reactions and wanted to participate were invited to the clinic.

Investigations at the clinic

During the investigations at the clinic, a detailed personal history was taken; additionally, skin prick tests were applied with standard extracts of *Apis mellifera*, *Vespula spp.*, *Polistes spp.* (100 µg/ml; Alk-Abello, Spain), positive (10 mg/ml histamine), and negative (saline) controls on the volar surface of the forearm. Tests were conducted at least 3 weeks after a sting reaction to avoid false-negative results during the refractory period. Prick tests were regarded as positive when the wheal diameter was at least 3 mm and were equal to 60% of that induced by histamine without reaction of the negative control after 15 min. Intradermal tests with the standard extracts of the same venom allergens (Alk-Abello) were applied in tenfold increasing concentrations from 0.00001 µg/ml to a maximum of 1 µg/ml of 0.02 ml of venom respectively in patients whose skin prick tests revealed negative results. An intradermal test was considered positive at a mean wheal diameter of at least 5 mm with erythema.¹⁰ Additionally, sIgE concentrations of *A. mellifera*, *Vespula spp.*, *Polistes spp.*, and tryptase levels were detected using UNICAP (Phadia, Uppsala, Sweden) in the sera of the subjects. sIgE levels below 0.35 kU/L were regarded as negative. Values in the ranges of 0.35–0.69 kU/L, 0.70–3.49 kU/L, 3.50–17.4 kU/L, 17.5–52.4 kU/L, 52.5–99.9 kU/L and >100 kU/L were considered as class I to class VI respectively. The normal tryptase level was below 11.4 ng/ml. Patients were not sting challenged.

All the stages of the study were approved by the Institutional Ethical Committee (2012/444-1002). Informed consent forms were collected from patients who were investigated in the clinic.

Statistical analyses

The sample size of the study population was calculated in our previous study.⁸ Univariate analyses of categorical variables (age, familial atopy, household pets, nasal allergy, itching dermatitis/urticaria, doctor-diagnosed asthma, smoking habits) were conducted using Pearson's χ^2 test. Multivariate logistic regression (forward LR) models were performed to examine the association between the suspicion of hypersensitivity to Hymenoptera stings and the categorical variables found significant in the univariate analyses. These included age, familial atopy, symptoms of nasal allergy and itching dermatitis/urticaria. Odds ratios (OR) were

Table 1

The second questionnaire conducted with 1171 participants who were gathered according to the first questionnaire.

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1. Have you ever experienced an allergic reaction due to a Hymenoptera sting? Yes () No ()
 2. When did the reaction occur after the sting? Early (\leq 1 hour)() Late (>1 hour)()
 3. Was the reaction a large local reaction (erythema and edema \geq 10 cm) or a systemic reaction? Local () Systemic ()
 4. What was the stage of the systemic reaction? (Filled according to the history explained)
Stage 1 () Stage 2 () Stage 3 () Stage 4 ()
 5. What was the type of the culprit insect?
Honey bee () Yellow jacket () *Polistes spp.* () Unknown ()
 6. How many times have you experienced an allergic reaction? ()
 7. If you have experienced more than one reaction, answer the above questions (number 2-5) for each reaction:.....
 8. Did you admit to an emergency department? Yes () No ()
 9. If the answer is yes to Q8, was the epinephrine administered in the emergency room?
Yes () No ()
 10. Do you carry an epinephrine auto-injector with you? Yes () No ()
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