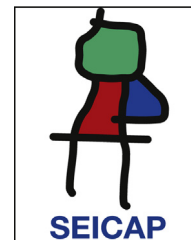




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### ORIGINAL ARTICLE

## Allergic reactions to Hymenoptera stings in Turkish school children



Z. Arıkan-Ayyıldız<sup>a,\*</sup>, S. Isık<sup>a</sup>, S. Babus<sup>a</sup>, R. Ucku<sup>b</sup>, S. Caglayan-Sozmen<sup>a</sup>,  
O. Karaman<sup>a</sup>, N. Uzuner<sup>a</sup>

<sup>a</sup> Dokuz Eylul University, Faculty of Medicine, Pediatric Allergy and Immunology, İzmir, Turkey

<sup>b</sup> Dokuz Eylul University, Faculty of Medicine, Department of Public Health, İzmir, Turkey

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#### Abstract

**Background:** Reported prevalence of the insect stings and rates of allergic reactions vary among studies. The aim of the present study was to carry out the first epidemiological study on the prevalence of Hymenoptera allergy among school children in İzmir, Turkey.

**Methods:** We planned to reach 6100 children, assuming the frequency of allergic reactions to Hymenoptera stings as 20%. Thirty-seven and eight schools were chosen from rural and urban areas, respectively. Parents were asked to complete a questionnaire which included questions about history of insect stings and the presence of atopic disease. All cases with severe systemic reactions and a representative sample from the remaining population were surveyed by telephone afterwards.

**Results:** A total of 8565 questionnaires were distributed and the response rate was 70.8%. Of the 5602 children, 61.6% were stung at least once in their lifetime. Of these, 24.3% had a LLR, 8.1% had a MSR, 0.8% had a SSR. Overall reliability of the questionnaire was calculated as 40.7% for SSR and 91.6% for other reactions after telephone survey. On logistic regression analysis, male sex and rural residence were associated with a higher risk of being stung (OR: 1.39; CI 1.25–1.56; OR: 4.37; CI 3.36–5.69, respectively). Male subjects and asthmatic children were more likely to experience a SSR (OR: 2.44; CI 1.06–5.65; OR: 3.3; CI 1.52–7.19, respectively). **Conclusion:** Hymenoptera stings are common in our population and large local reactions are the most common type of reactions. Prevalence of severe reactions is low in our population compared to previous studies.

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\* Corresponding author.

E-mail address: [zarikanayyildiz@gmail.com](mailto:zarikanayyildiz@gmail.com) (Z. Arıkan-Ayyıldız).

## Introduction

Stinging insects of the Hymenoptera order are one of the most common causes of anaphylaxis worldwide.<sup>1,2</sup> The incidence of insect sting fatalities from anaphylaxis ranges from 0.03 to 0.48 fatalities per one million inhabitants per year, which account for nearly 20% of fatal anaphylaxis from any cause.<sup>3</sup> However, it is the only successfully curable form of anaphylaxis with immunotherapy, which places Hymenoptera allergy in a unique place in the field of allergy.<sup>4</sup>

The prevalence of systemic reactions (SRs) to Hymenoptera stings has been studied in various studies revealing the prevalence of SRs between 0.5%–3.3% among adults in America and 0.3%–7.5% in Europe.<sup>5,6</sup> Prevalence of systemic reactions is lower in children, ranging from 0.15% to 0.8%.<sup>3</sup> The reported prevalence of insect sting and rates of allergic reactions differ among studies because of multiple variables including regional differences, exposure rates, differences in characteristics of the study population and also according to the different data collection methods of the different studies.

The present study was conducted in Izmir, which is the third largest city of Turkey situated in the west of the country with a population of 4 million and characterised by a warm climate all over the year. This study emerged from the observation of the low number of children receiving venom immunotherapy in three large referral allergy centres in Izmir and aimed to carry out the first epidemiological study on the prevalence of Hymenoptera allergy among school children in Izmir as well as to evaluate the factors associated with Hymenoptera venom allergy.

## Materials and methods

### Patient population

We planned to reach 6100 children based on the study of Graiff et al.<sup>7</sup> who reported the frequency of allergic reactions to Hymenoptera stings as 20% (1% precision, 95% CI). Rural and urban areas are defined as regions with a population of under and over 20,000, respectively. Thirty-seven and eight schools were chosen from rural and urban areas by simple random sampling reflecting the distribution of population in our city to reach an average 7220 children, with 20% excess of the target population. The participants were the parents of the school children aged 12–14 years attending the seventh and eighth classes of the elementary school. The parents of the children in selected schools received an explanatory letter requesting an informed consent for the study with a questionnaire. Parents willing to participate in the study were asked to complete the questionnaire which included the questions about history of insect stings, type of reaction, presence of hospital attendance and the presence of atopic disease. The questionnaires were collected 2 weeks after distribution. All cases with severe systemic reactions (SSR) and a representative sample from the remaining population which was calculated based on the error rate of SSR were surveyed with telephone afterwards.

## Questionnaire

The questionnaire was comprised six questions regarding Hymenoptera stings which were used in previous study by Graiff et al.<sup>7</sup> and three questions regarding atopic diseases based on the International Study of Asthma and Allergies in Childhood Standard core questionnaire. Questions included whether the child had ever been stung, how many times the child had been stung, whether or not they had experienced the following reactions: a large local reaction (LLR), defined as a swelling on the sting site which was larger than 5 cm and lasted for more than 2 days; a mild systemic reaction (MSR) defined as a skin reaction like rash or swelling except for the sting site within one hour of the sting; severe systemic reaction (SSR), defined as difficulty in breathing, an asthma attack, abdominal pain or loss of consciousness within one hour of the sting. The last question regarding stings was about hospital attendance after insect sting. Finally parents answered yes or no to the questions related to the presence of asthma, allergic rhinitis and eczema in their children.

Institutional ethical board approval was obtained for the study.

## Statistical analysis

Statistical analysis was done with SPSS package 15.0 (SPSS Inc., Chicago, IL, USA). A multiple logistic regression model was used to evaluate the association between the allergic reactions and the risk factors. Odds ratios were presented with 95% confidence intervals. A *p* value less than 0.05 was considered as significant.

## Results

A total of 8565 questionnaires were distributed to 45 schools, 5602 completed (regarding critical questions about being stung) and 465 incomplete questionnaires were returned with a response rate of 70.8%. Of the 5602 children, 3449 (61.6%) were stung at least once in their lifetime. The prevalence of being stung was 86.3% in rural areas while it was 59.2% in the urban areas. Male subjects and living in rural areas were found to have a high risk of being stung on logistic regression analysis (OR of 1.39 and 95% CI 1.25–1.56 for male children; OR of 4.37 and 95% CI 3.36–5.69 for children living in rural areas. Characteristics of the study population being stung are given in [Table 1](#).

In the subset of children being stung, 24.3% had a large local reaction (LLR), 8.1% had a mild systemic reaction (MSR), 0.8% had a severe systemic reaction (SSR) representing 15%, 5% and 0.5% of the whole population, respectively. Hospital attendance was 10.7% in the subjects being stung (6.6% in the whole group) while it was 17.2%, 18.6%, and 40.7% in the LLR, MSR and SSR groups.

Having a reaction after being stung was found out to be associated with three or more number of stings (OR: 1.53, 95% CI: 1.28–1.83). No significant difference was noted in the rates of LLR and MSR between subjects living in rural and urban areas. Having a reaction after being stung was more common in children having asthma, allergic rhinitis and eczema ([Table 2](#)). Local large reaction was more common

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