

# The impact of Hymenoptera venom allergy on occupational activities

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The objective of this study was to investigate the impact of allergy to hymenoptera venom on the occupational activities of patients undergoing immunologic treatment for insect sting anaphylaxis. The design was a cross-sectional study conducted in a sample of 500 out of 1,500 patients undergoing venom immunotherapy for insect sting reaction in 13 allergy clinics in Israel. A self-administered questionnaire was used to collect data about demographic characteristics of patients, severity of the allergic reaction, and adverse effects on occupational activities. Of the 204 respondents who were part of the labour force, 48.5% reported adverse effects on routine occupational activities. The factors with a significant influence on the probability of adverse occupational effects were: (1) patient's type of work (blue collar vs. white collar: OR = 3.22,  $p < 0.001$ ; army vs. white collar: OR = 5.28,  $p = 0.001$ ); (2) severity of the allergic reaction (severe reaction vs. mild/moderate reaction: OR = 2.34,  $p = 0.007$ ). Our findings suggest that severe insect sting allergy has an adverse impact on patients' occupational activities. This factor requires special attention by the medical community. Social workers and occupational physicians should collaborate in the assessment and management of these patients.

*Key words:* Allergy; anaphylaxis; Hymenoptera.

Occup. Med. Vol. 47, 273–278, 1997

Received 15 July 1996; accepted in final form 24 February 1997.

## INTRODUCTION

Systemic anaphylaxis following Hymenoptera insect sting has been widely studied. Prevalence rates in the general population vary from region to region,<sup>1</sup> generally ranging from 0.15% to 4%.<sup>2–9</sup> In the largest study of an unselected group of 2,067 adults aged 20–60 years, 1.2% of the subjects had a history of systemic anaphylaxis.<sup>10</sup>

Health status has long been recognized as an important factor in occupational function.<sup>11</sup> Specifically, allergic sting reactions have been investigated in selected occupational groups. Terr<sup>12</sup> reports that atopic bee-

keepers are at high risk of sting anaphylaxis owing to their sensitization by inhalation of dried bee venom allergen during the course of occupational exposure to a large number of insect stings. The same author found that almost 50% of all beekeepers and their families had a history of generalized reactions to bee sting. In another study, 3.3% of the beekeepers examined had systemic reactions to bee venom.<sup>9</sup>

Systemic anaphylactic reaction is an acute, potentially life-threatening episode which in addition to its physical effect may precipitate apprehension and anxiety. Upon recovery, the traumatic event and the fear of a subsequent life-threatening episode may affect social and occupational behaviour of the affected individuals. In this group<sup>13</sup> we have demonstrated like others before that exposure to contact with the stinging insect determines the risk for an anaphylactic reaction. Therefore, reason and fear dictate avoiding situations that increase exposure to insects such as outdoor

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activities.

Employment is included in the list of the World Health Organization's<sup>14</sup> 'Health for the Year 2000' plans; recent legislation has also been targeted at improving the occupational status of people with various disabilities.<sup>15</sup> However, insect venom allergy *per se*, in relation to employment, has not received direct attention.

This cross-sectional study was conducted to evaluate the impact of a prior reaction to insect sting of the Hymenoptera order on the occupational activities of patients undergoing insect venom immunotherapy.

## METHODS

A random sample of 500 out of 1,500 patients who were undergoing venom immunotherapy for insect sting reaction in 13 allergy clinics in Israel was chosen. Individuals were requested to complete a self-administered questionnaire on demographic and socio-economic characteristics, index sting conditions, clinical sting reactions and the impact of the anaphylactic reaction to stinging on occupational activities. The questionnaire was distributed at the clinics by a research assistant who explained the purpose of the study and provided individual instruction. Patients were asked to fill out the questionnaire in the waiting room.

The severity of the insect sting reaction was categorized as mild — diffuse cutaneous symptoms only; moderate — presence also of respiratory or gastrointestinal symptoms; or severe — drop in blood pressure or loss of consciousness. Patients were divided by occupation into white collar workers — liberal arts, education, scientific and health services, and sales and administration — and blue collar workers — drivers, agriculture and industry.

### Data analysis

The relationship between patient characteristics and prevalence of adverse occupational effect were evaluated by  $\chi^2$  test.

To identify the major factors that could affect the probability in a patient of the disease having an adverse effect on occupational activities, we used a logistic regression model, expressed as:

$$\log \frac{[\text{prob}(\text{event})]}{[\text{prob}(\text{not-event})]} = b_0 + b_1 x_1 + \dots + b_p x_p.$$

The logistic coefficients may be interpreted as the change in the log odds associated with a one-unit change in the independent variable. The parameters of the model were estimated using the maximum likelihood method. Backward elimination was used for model selection, the 0.05 probability of score statistic, for entering a variable in the model; and the Wald statistic at  $p = 0.1$  was used to remove a variable from the model. To assess the goodness-of-fit of the model, the goodness-of-fit statistic and the model chi-square

test were used. The following variables were defined: (1) Dependent variable: adverse effects on occupational activities: yes (event) = 1; no (not event) = 0; (2) Independent variables: sex: male = 1; female = 0; age: 18–21 yrs = 1; 22–40 yrs = 2; 41+ yrs (reference category) = 3; type of reaction: severe reaction = 1; mild or moderate reaction = 0; type of work: blue collar = 1; army = 2; white collar (reference category) = 3.

All computations were done with the SPSS<sup>16</sup> software package.

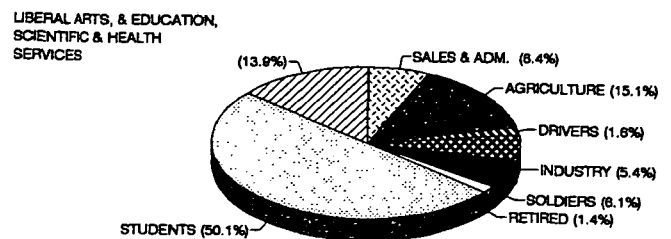
## RESULTS

Out of 500 questionnaires distributed, two were excluded from the analysis because of missing data.

Sixty-eight per cent of the subjects were male. The mean age of the cohort was 23.3 years (SE = 15.6); 53% had started immunotherapy at age 22 or younger. Fifty per cent had always lived in rural areas, compared to only 10% of the general Israeli population (an additional 28% had moved from a rural settlement to an urban one, or *vice versa*).

The distribution of patients by type of work is shown in Figure 1. Fifty per cent of the subjects were students, 20% were white collar workers and 15.1% were agricultural workers. Israel Central Bureau of Statistics<sup>17</sup> excludes students, soldiers and pensioners from its labour force statistics; we did likewise. Among the remainder, 35.6% were agricultural workers, compared to only 3.5% in the general labour force in Israel.

Figure 1. Distribution by occupations in study group ( $n = 425$ ).



Following the index sting, 48% of the patients received medical care by a physician or nurse at the same geographic location in which the sting occurred. Thirty-four per cent of the patients needed emergency-room care, and 6% were treated by Magen David Adom (the Israeli equivalent to the Red Cross). Twelve per cent treated themselves.

Forty-four per cent of the patients reported adverse effect on occupational activities due to Hymenoptera venom allergy. Table 1 shows the distribution of subjects (without students;  $n = 204$ ) by sex, age, severity of allergic reaction and type of work, in relation to their report of an adverse effect on occupational activities. The analysis of the data by a logistic model

**Table 1.** Relationship between patient characteristics and prevalence of adverse occupational effect of Hymenoptera sting venom allergy

Patient characteristics	Adverse occupational effect				$p^*$	
	Total	Absent		Present		
		No.	%	No.		%
Sex						
Male	136	62	45.6	74	54.4	0.026
Female	68	43	63.2	25	36.8	
Age (yrs)						
18–21	31	12	38.7	19	61.3	
22–40	124	66	53.2	58	46.8	NS
44+	49	27	55.1	22	44.9	
Severity of allergic reaction						
Mild–moderate	127	75	59.1	52	40.9	0.010
Severe	76	30	39.5	46	60.5	
Type of work						
White collar	86	59	68.6	27	31.4	
Blue collar	94	39	41.5	55	58.5	< 0.001
Soldier	24	7	29.2	17	70.8	

\*Significance of  $\chi^2$  test.

**Table 2.** Logistic regression analysis

Variables in the equation	B	SE	Exp (B)	$p^*$
Type of work				
Blue collar	1.1682	0.3219	3.2161	< 0.001
Soldiers	1.6636	0.5153	5.2783	0.001
Severity of allergic reaction				
Severe	0.8513	0.3133	2.3426	0.007
Constant	-1.1283	0.2741	—	< 0.001

Dependent variable: adverse effect on occupational activities; Yes (event) = 1; No (non-event) = 0.

\* Significance of Wald statistic.

Model chi square = 26.28; df = 3;  $p < 0.001$ .

Goodness of fit = 203.49; df = 199;  $p = 0.4$

(see Methods) is shown in Table 2. The factors identified as having a significant ( $p < 0.05$ ) effect on the probability of a negative impact on occupational activities were: (1) patient's type of work and (2) severity of the allergic reaction. Soldiers were at higher risk of having occupational problems than white collar workers (OR = 5.28,  $p = 0.001$ ). Blue collar workers were in higher risk of suffering from occupation problems than white collar workers (OR = 3.21,  $p < 0.001$ ). More patients with a severe allergic reaction reported an adverse effect on occupational activities than those with a mild or moderate allergic reaction (OR = 2.34,  $p = 0.007$ ). Sex and age had no significant effect.

## DISCUSSION

Our results suggest that the presence of Hymenoptera systemic allergy, especially when severe, can lead to occupational problems. This effect persists even after

controlling for patient age and sex. We believe these findings merit special attention owing to their medical, social and familial implications, and because it is the role of modern medicine to promote autonomy in all areas of life.<sup>18</sup> Our findings are related not only to the participation of the affected patients in the labour market, but also to the costs entailed by the patient and his/her family and to the state, in social security and welfare by the consequent changes in lifestyle enforced by the disorder.<sup>19</sup> From the medical point of view, problems in the patients' social/occupational life may affect compliance with and effectiveness of treatment. Intervention in the form of counselling and vocational assessment, retraining and allocation of medical services may be necessary.<sup>20</sup>

In our study, the patients' type of work was significantly correlated with their reports on occupational activity problems (soldiers or blue collar workers had a higher probability of adverse effects on occupation). It is important to note that severe systemic Hymenoptera allergy is sufficient cause for special consideration during task assignment in the military or even deferment.<sup>21</sup>

With regard to blue collar workers, it had been reported<sup>18</sup> that when employing people with disabilities, the employer may be unaware of a gap between an individual's abilities and the requirements of the particular job. The accepted medical approach is, as part of patient management, to teach patients to adapt to their new status created by the disease. It is recommended that, with the patient's co-operation, the physician should include an evaluation of their social and occupational problems, as they may relate to their disease,<sup>18</sup> and enhance their self-confidence by making them aware of what they can now realistically achieve.<sup>22</sup>

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