

Disease Burden, Psychological Well-Being and Attitudes regarding the Set of Emergency Medication in Adults with Insect Venom Allergy

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Keywords

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Abstract

Background: Insect venom allergy is common and greatly impairs patients' quality of life. Additionally, low compliance with carrying emergency medication is reported. The aim of our study was to analyze the disease burden, levels of anxiety and depression, and to evaluate attitudes towards the set of emergency medication in affected patients. **Methods:** Between April 2016 and January 2017, patients ≥18 years visiting our department because of an insect venom allergy were asked to complete a paper-based questionnaire. The questionnaire assessed willingness to pay (WTP), the Hospital Anxiety and Depression Scale (HADS), subjective anxiety levels, willingness to carry the set of emergency medication, self-assurance in using it, compliance with carrying it, and reasons for not always carrying it. **Results:** 55 patients (81.8% wasp allergy) were included. On average, WTP for a complete cure was EUR 1,727 (median: 500). Using the HADS, 14.5% showed definite anxiety disorders while 5.5% had significant depression disorders. Most patients stated to carry the emergency medication "always" (25.5%) or "almost al-

ways" (47.3%). "Forgetfulness" (36.4%) was reported as the main reason for not always carrying the medication, followed by "too big" (18.2%). **Conclusions:** In our patient cohort, insect venom allergy was associated with a moderate disease burden and a good compliance with carrying the emergency medication. However, several of our participants demonstrated borderline or significant anxiety and/or depression disorders. In this regard, this study highlights the necessity to regularly ask the patient about the psychological well-being to identify patients needing psychological support.

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Introduction

Systemic allergic reactions to insect stings are common, with a prevalence of 3% in adults [1]. Symptoms occur within minutes of a sting and range from cutaneous manifestations to a potentially fatal anaphylactic shock [2, 3]. Although patients have no ongoing symptoms when not exposed to stings, a continuous anxiety and vigilance required to prevent stings as well as the

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uncertainty about the reaction in case of a sting greatly impair quality of life of affected patients [4]. Thus, limitations in daily activities are common, and patients report to reduce spending time in open areas and feel limited in doing certain types of work [5]. An exploratory survey on the psychological consequences of the systemic reaction event on patients who attended an allergy outpatient clinic for venom immunotherapy (VIT) demonstrated that the impact of an anaphylactic reaction can be very broad with a long-lasting impairment in the quality of life [5]. VIT is the only effective preventive treatment able to reduce the severity of sting reactions and, by doing so, it can have a significant positive impact on health-related quality of life (HRQoL) [3, 6]. Several studies suggest that VIT is able to prevent anaphylactic sting reactions in up to 90% [1]. Unfortunately, no clinical parameter can predict who will profit from the treatment or not [1]. Therefore, adrenaline autoinjectors as well as oral antihistamines and corticosteroids are routinely prescribed to all patients with a history of systemic reaction due to a hymenoptera sting, and they are advised to carry this “emergency medication” at all times. However, low compliance with carrying adrenaline autoinjectors and a poor ability to correctly use it have frequently been reported [7].

Clinical parameters alone do not necessarily correlate with the subjective psychological distress of the patient. Thus, the individual burden of illness and the assessment of the psychological well-being should be part of the medical assessment [4]. There are several methods to measure disease burden, but studies focusing on venom allergy are scarce [4]. The only validated questionnaire on HRQoL especially in patients with wasp allergy is the Vespidae Allergy Quality of Life Questionnaire (VQLQ) [8], which was translated and validated in diverse languages [9–11]. Willingness to pay (WTP) is a generic opportunity to measure the disease burden by directly asking the patient what amount she/he would be willing to pay to get rid of her/his specific disease. No published literature on WTP in patients with venom allergy has been found. WTP had been measured in various dermatological disorders, e.g., psoriasis vulgaris [12, 13], atopic dermatitis [12, 14], rosacea [15], port wine stains [16], and vitiligo [15, 17], which, in contrast to insect venom allergy, have all ongoing clinical symptoms.

The objective of this study was to analyze the disease burden based on the WTP, levels of anxiety and depression, and to evaluate attitudes towards the set of emergency medication in adults with insect venom allergy.

Materials and Methods

Outpatients treated at the Department of Dermatology, Venerology, and Allergology at the University Medical Center Mannheim, Germany, because of an insect venom allergy between April 2016 and January 2017 were asked to participate. Inclusion criteria were age ≥ 18 years and a history of an anaphylactic sting reaction in combination with a positive diagnostic test for venom-specific immunoglobulin E (IgE), including skin and in vitro tests [1].

Participants were asked to complete a paper-based questionnaire while attending our clinic.

Thereby, WTP was determined by the following questions: (1) absolute sum participants were willing to pay once for a complete cure (open question), (2) absolute sum per month participants were willing to pay for a complete cure while the treatment is conducted (open question), and (3) percentage of the monthly income patients were willing to spend for a complete cure while the treatment is conducted (predetermined categories: 0–5, 6–10, 10–20, 20–30, 30–40, 40–50, $>50\%$).

Furthermore, the survey included the Hospital Anxiety and Depression Scale (HADS), which was developed by Zigmond and Snaith [18] in 1983. It is a questionnaire that performs well in screening for the separate dimensions of anxiety and depression [19]. It consists of an anxiety subscale and a depression subscale, each containing 7 items, thereby each item is scored from 0 to 3 [18]. Zigmond and Snaith [18] recommended the following interpretation of values for each subscale: 0–7, no cases of anxiety or depression; 8–10, cases of borderline disorders; and >10 , cases of significant disorders. Additionally, the patient’s subjective anxiety level due to the venom allergy was elicited on a visual analogue scale ranging from 0 (not at all anxious) to 10 (extremely anxious).

Regarding the emergency medication, participants were asked to state their compliance with carrying this medication with them all the time using the predefined categories “always,” “almost always,” “often,” “infrequently,” “never” or “just when I plan to do outdoor activities.” Furthermore, reasons for not always carrying the emergency medication were asked. In addition to the predefined answers “too big,” “too heavy,” “forgetfulness,” “fear of overheating the medication,” “I do not need it,” and “storage in the car is sufficient,” patients were able to choose the option “other reason” and insert a free text. Participants could give multiple answers. In addition, they were asked to state their willingness to carry the emergency medication always on a visual analogue scale ranging from 0 (not at all willing) to 10 (extremely high willingness) and to rate their self-assurance in using the emergency medication on an analogue scale ranging from 0 (very unsure) to 10 (very sure). Additionally, questions on demographics and medical history were part of the survey. The venom involved (i.e. wasp, honeybee, or both), the duration of VIT, and the severity of reaction according to the Mueller 4-grade classification (ranging from grade 1 [slight general reaction] to grade 4 [shock reaction]) [2] were documented by the attending physician.

Associations of demographic characteristics and medical history with WTP, HADS, and willingness to carry the emergency medication always were analyzed using nonparametric tests (Kruskal-Wallis tests and Spearman ρ for correlations). When analyzing subgroups by continuous variables, the median was used as cutoff. Significance was assumed at $p \leq 0.05$.

Table 1. Characteristics of the study cohort (*n* = 55)

Females, <i>n</i> (%)	30 (54.5)
Age, years	
Min–max	23–77
Mean ± SD	53.7±12.1
Disease duration, years	
Min–max	1–30
Mean ± SD	5.1±6.1
Venom involved	
Honeybee, <i>n</i> (%)	7 (12.7)
Wasp, <i>n</i> (%)	45 (81.8)
Both, <i>n</i> (%)	3 (5.5)
Severity of reaction	
Mueller grade I, <i>n</i> (%)	6 (10.9)
Mueller grade II, <i>n</i> (%)	25 (45.5)
Mueller grade III, <i>n</i> (%)	20 (36.4)
Mueller grade IV, <i>n</i> (%)	4 (7.3)
Venom immunotherapy	
Currently ongoing, <i>n</i> (%)	45 (81.8)
Completed, <i>n</i> (%)	2 (3.6)
Intended, <i>n</i> (%)	3 (5.5)
Not intended, <i>n</i> (%)	5 (9.1)
Duration, months	
Min–max	1–120
Mean ± SD	26.4±25.9

In the descriptive analyses, data were presented as absolute and percentage frequencies for categorical variables and mean and standard deviations for continuous ones. Medians were additionally indicated for WTP to enable optimal comparison across diseases. Statistical analyses were conducted using IBM SPSS Statistics 23 for Windows.

The study was performed according to the principles of the Declaration of Helsinki and approved by the Ethics Committee of the Medical Faculty of Mannheim.

Results

Participants

In total, 57 patients answered the questionnaire. Two participants had to be excluded: 1 did not complete other questions than the demographic ones and 1 did not have a positive diagnostic test for allergen-specific IgE. Thus, 55 patients (54.5% female) were included in the analyses. Their mean age was 53.7 years (range: 23–77 years), and their mean disease duration was 5.1 years (range: 1–30 years). The allergen reported most was wasp venom (81.8%) followed by bee venom (12.7%), and 3 participants (5.5%) were allergic to both insects.

When reaction severity was classified according to the 4-grade classification of Mueller, most participants had

Table 2. Willingness to pay (WTP) and levels of anxiety and depression in adults with insect venom allergy

<i>Absolute WTP/month (n = 37), EUR</i>	
Min–max	0–300
Median	30
Mean ± SD	53±63
<i>WTP (n = 41)</i>	
0–5% of the monthly income, <i>n</i> (%)	26 (63.4)
6–10% of the monthly income, <i>n</i> (%)	9 (22.0)
10–20% of the monthly income, <i>n</i> (%)	4 (9.8)
20–30% of the monthly income, <i>n</i> (%)	2 (4.9)
<i>Absolute one-time WTP (n = 33), EUR</i>	
Min–max	0–20,000
Median	500
Mean ± SD	1,727±3,775
<i>HADS (n = 55)</i>	
<i>Anxiety subscale</i>	
0–7 points, <i>n</i> (%)	40 (72.7)
8–10 points, <i>n</i> (%)	7 (12.7)
11–21 points, <i>n</i> (%)	8 (14.5)
<i>Depression subscale</i>	
0–7 points, <i>n</i> (%)	47 (85.5)
8–10 points, <i>n</i> (%)	5 (9.1)
11–21 points, <i>n</i> (%)	3 (5.5)
<i>Subjective anxiety level because of the venom allergy (analogue scale from 0 [not at all] to 10 [extremely anxious]) (n = 53)</i>	
Min–max	0–10
Mean ± SD	6.0±2.8

reaction grades II (45.5%) or III (36.4%), while grades I (10.9%) and IV (7.3%) were infrequently reported. Of the participants, 81.8% were currently on VIT, with a mean duration of 26.4 months (range 1–120 months). Additionally, 3.6% of the patients had already completed a VIT. All characteristics of the study population are listed in Table 1.

Willingness to Pay

On average, participants were willing to pay EUR 1,727 (range: 0–20,000, median: 500; Table 2) as one-time payment for a complete cure of the insect venom allergy. When participants were asked to state the absolute sum per month they were willing to pay for a complete cure while treatment is conducted, participants were willing to pay EUR 53 on average (range: 0–300, median: 30).

Asked about the percentage of their monthly income participants were willing to invest for a complete cure while the treatment is conducted, most participants were willing to spend 0–5% (63.4%) or 6–10% (22.0%); 9.8%

were willing to pay 10–20%, and 4.9% chose the category 20–30% of their monthly income. None of the participants were willing to invest >30% of their monthly income.

Notably, only $n = 33$ (60.0%) answered the question about the absolute one-time WTP, $n = 37$ (67.3%) answered the absolute WTP per month and $n = 41$ (74.5%) the task on WTP as percentage of their monthly income.

Levels of Anxiety and Depression

Using the recommended two cutoff scores 7/8 for possible and 10/11 for probable disorders for each HADS subscale, most participants showed unremarkable values (72.7% for anxiety and 85.5% for depression; Table 2). According to the anxiety subscale, 12.7% had doubtful and 14.5% definite disorders, and regarding the depression subscale, 9.1% had borderline disorders while 5.5% had significant disturbances.

On average, a level of 6.0 (range: 0–10) was reported when participants were asked to state their subjective anxiety level because of the venom allergy.

Attitudes regarding the Set of Emergency Medication

Most patients stated to carry the emergency medication “always” (25.5%), “almost always” (47.3%), or “often” (14.5%), while “infrequently” (5.5%) and “just when I plan to do outdoor activities” (7.3%) were rarely indicated. None of the participants chose the category “never” (Table 3).

Asked to name reasons for not always carrying the emergency medication, more than one third stated “forgetfulness” (36.4%) as main reason, followed by “too big” (18.2%), “too heavy” (10.9%), “fear of overheating the medication” (10.9%), “I do not need it” (10.9%), “storage in the car is sufficient” (9.1%), and “other reason” (9.1%): “unhandiness” ($n = 2$), “no handbag to store it today” ($n = 2$), and “I do not need it for short trips” ($n = 1$).

A mean level of 7.7 (range: 0 [not at all willing] to 10 [extremely high willingness]) was reported when participants were asked to state their willingness to carry the emergency medication always, and a mean of 6.7 (range: 0 [very unsure] to 10 [very sure]) was stated when participants were asked to indicate their self-assurance in using the emergency medication.

Associations of Patient Characteristics with WTP, HADS, and Willingness to Carry the Emergency Medication Always

No influence of age (cutoff: 54 years), severity of the anaphylactic reaction, disease duration (cutoff: 3

Table 3. Attitudes regarding the emergency medication

Compliance with carrying the emergency medication ($n = 55$)	
Always, n (%)	14 (25.5)
Almost always, n (%)	26 (47.3)
Often, n (%)	8 (14.5)
Infrequently, n (%)	3 (5.5)
Never, n (%)	0 (0)
Just when I plan to do outdoor activities, n (%)	4 (7.3)
Willingness to carry the emergency medication always (scale from 0 to 10) ($n = 55$)	
Min–max	0–10
Mean $\pm$ SD	7.7 $\pm$ 2.8
Subjective self-assurance in using the emergency medication (scale from 0 to 10) ($n = 55$)	
Min–max	0–10
Mean $\pm$ SD	6.7 $\pm$ 2.3
Reasons for not always carrying the emergency medication ($n = 55$)	
Too big, n (%)	10 (18.2)
Too heavy, n (%)	6 (10.9)
Forgetfulness, n (%)	20 (36.4)
Fear of overheating the medication, n (%)	6 (10.9)
I do not need it, n (%)	6 (10.9)
Storage in the car is sufficient, n (%)	5 (9.1)
Other reasons, n (%)	5 (9.1)

Other reasons are “unhandiness” ($n = 2$), “no handbag to store it today” ($n = 2$), and “I do not need it for short trips” ($n = 1$).

years), status of VIT, duration of VIT, and the venom involved on absolute WTP per month, absolute one-time WTP, anxiety score, depression score, and willingness to carry the emergency medication always was found.

Women were more willing to carry the set of emergency medication always than men (mean willingness 8.6 vs. 6.6, $p = 0.006$). However, no influence of gender on absolute WTP per month, absolute one-time WTP, or anxiety and depression scores was noted in our cohort. Furthermore, a higher subjective anxiety level because of the venom allergy was significantly associated with a higher anxiety score on the HADS (Spearman $\rho = 0.387$, $p = 0.004$) as well as with a higher willingness to carry the emergency medication always (Spearman $\rho = 0.550$, $p \leq 0.001$). Associations of subjective anxiety levels with absolute WTP per month, absolute one-time WTP, and depression score were not demonstrated.

Discussion

In this study, we aimed at gathering information about the individual burden of illness, the psychological well-being, and the attitudes regarding the emergency medication of patients with insect venom allergy.

Using the WTP method, we could show that with a WTP of EUR 1,727 (median: 500) as one-time payment for a complete cure of the allergy, the disease burden of patients with insect venom allergy was comparable with the burden of patients with rosacea (mean WTP: EUR 2,880, median: 500) [15], while patients suffering from vitiligo (mean: EUR 7,360, median: 3,000) [17] and atopic dermatitis (mean: EUR 11,884, median 1,000) [14] are willing to pay higher amounts for a complete healing. To reduce the potential bias of income levels on WTP [14], patients were additionally asked about the percentage of their monthly income they were willing to invest for a complete cure while the payment is conducted. Here, only 14.6% of the participants were willing to spend more than 10% of their monthly income, compared to 58.6% of patients with atopic dermatitis [14] and 37.7% of patients with rosacea [15]. Therefore, the results indicate that insect venom allergy is associated with a moderate disease burden.

We next aimed to measure levels of anxiety and depression in affected patients. Of our participants with insect venom allergy, 27.3% demonstrated borderline or significant anxiety disorders, and, as expected, the subjective anxiety levels correlated with the HADS score. Furthermore, the depression subscale of the HADS showed borderline disorders (9.1%) and significant disturbances (5.5%) in our cohort. Hinz and Brähler [20] tested a representative sample of the German general population ($n = 4,410$) to present normative values for the HADS. Here, the percentages for elevated scores (≥ 8) were 21.0% for anxiety and 23.7% for depression [20].

Nowak et al. [21] also used the HADS in 61 insect-allergic adults from Poland during the insect season. Our results are mostly in line with their findings; however, none of their participants demonstrated significant disturbances on the depression scale [21]. They revealed that the intensity of anxiety decreased with the duration of VIT [21], while no influence of the status of VIT on anxiety levels was found in our cohort. We also found no associations of the severity of anaphylactic reactions on anxiety scores. However, the severity of anaphylactic reactions was found to be an independent determinant of the anxiety level in VIT-treated patients by Cichocka-Jarosz et al. [22]. The levels of anxiety and depression are

notable, as it was demonstrated that higher general anxiety levels in patients with hymenoptera allergy were associated with a higher impairment in HRQoL [23] and the VQLQ showed that patients with yellow-jacket allergy experience impairment in quality of life especially because of emotional distress [8]. Confino-Cohen et al. [5] surveyed 97 patients who regularly attended their clinic for VIT. According to their results, one third of the participants held self-imposed debilitating beliefs, was preoccupied with the anaphylactic shock event, perceived impairment in their quality of life, and showed symptoms of emotional distress. These psychological responses were not attenuated with a longer duration of VIT [5]. In conclusion, it is necessary to screen patients for anxiety or depression and to provide psychological support if needed.

In this study, we also analyzed patient attitudes towards the set of emergency medication. All our participants routinely received a set of emergency medication as well as oral and paper-based instructions for its use. In summary, there was a high self-reported willingness to follow our recommendations and a high self-reported compliance in our cohort. In contrast, Goldberg et al. [7] demonstrated that a minority of their 96 participants with venom allergy carry the epinephrine pen all the time. Furthermore, they showed that compliance was independent of the education level and not more common among high-risk patients or patients with professional exposure to insect stings. However, patients who had not started VIT were more compliant. In our cohort, those with a higher subjective anxiety level because of the venom allergy and women were significantly more willing to carry the emergency medication always than others. It is logical that a higher anxiety results in a higher importance on safety provisions. Accordingly, a positive correlation between anxiety and a higher care to avoid a sting was demonstrated in a Polish multicenter cross-sectional study [22]. Studies on HRQoL indicate that women with insect venom allergy are more impaired than men [23, 24]. It can be hypothesized that this impairment contributes to a higher willingness to follow safety recommendations.

Even though our patients were willing to carry the medication, forgetfulness was the most common reason for failing this intention, followed by unhandiness ("too big" or "too heavy"). In a prospective study in 120 patients with a history of anaphylaxis in Colombia, "forgetfulness" was also the main reason (34%) for not carrying the epinephrine pen, followed by "could not get it," "did not remember how to use it," and "fear to use" [25]. Oude Elberink et al. [26] investigated the positive and negative

factors of the EpiPen in comparison with VIT as perceived by patients. Here, only 48% of those carrying the EpiPen were positive about the treatment. On the one hand, participants indicated to feel safe and that it is reassuring to carry the pen. However, carrying a pen was perceived inconvenient and troublesome by most patients. In a study on pitfalls in the use of epinephrine for anaphylaxis, the lack of epinephrine autoinjector availability was the most common problem [27]. Furthermore, inadequate education of patients or providers and uncertainty about the administration were reported complications [27]. Thus, not only incompliance in carrying the medication but also a lack of knowledge on how to use the medication should be considered. Asking our participants about their self-assurance in using the emergency medication on an analogue scale ranging from 0 to 10 (very unsure to very sure), a moderate mean level (6.7) was stated.

Uncertainty and fear contribute to underuse or misuse of the medication in an emergency situation, which increases the risk of negative outcomes [28].

Clearly, the study has limitations. Generalizability of the results is limited because of the restricted cohort size, the fact that nearly all participants obtained a VIT, and the single-center setting. Thus, for example, our data may not be transferrable to patients with insect allergy that do not seek medical attention and to other health care systems. It should also be considered that due to the limited cohort size, differences between subgroups might have been missed. Furthermore, WTP is a generic instrument and is, therefore, not able to measure disease-specific problems. However, it allows comparing the burden across medical conditions.

Clearly, the time point of the measurement also influences the results. For example, one might hypothesize that the individual burden of illness, the psychological well-being, and the compliance may change during the insect season, and repeated sting experiences may also affect these factors.

In conclusion, we could show that in our patient cohort an insect venom allergy is associated with a moderate disease burden, although up to a quarter of our participants demonstrated borderline or significant anxiety and/or depression disorders. In this regard, this study highlights the necessity to regularly ask the patient about his/her psychological well-being to identify patients with a high psychological distress in need of psychological support.

The regular visits during VIT are a unique opportunity to establish a trusting physician-patient relationship to provide support in all the investigated aspects if desired.

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References

- ▶ 1 Golden DB: Anaphylaxis to insect stings. *Immunol Allergy Clin North Am* 2015;35:287–302.
- ▶ 2 Mueller HL: Diagnosis and treatment of insect sensitivity. *J Asthma Res* 1966;3:331–333.
- ▶ 3 Dhami S, Zaman H, Varga EM, Sturm GJ, Muraro A, Akdis CA, Antolin-Amerigo D, Bilo MB, Bokanovic D, Calderon MA, Cichocka-Jaros E, Oude Elberink JN, Gawlik R, Jakob T, Kosnik M, Lange J, Mingomataj E, Mitsias DI, Mosbech H, Ollert M, Pfaar O, Pitsios C, Pravettoni V, Roberts G, Rueff F, Sin BA, Asaria M, Netuveli G, Sheikh A: Allergen immunotherapy for insect venom allergy: a systematic review and meta-analysis. *Allergy* 2017;72:342–365.
- ▶ 4 Oude Elberink JN: Significance and rationale of studies of health-related quality of life in anaphylactic disorders. *Curr Opin Allergy Clin Immunol* 2006;6:298–302.
- ▶ 5 Confino-Cohen R, Melamed S, Goldberg A: Debilitating beliefs, emotional distress and quality of life in patients given immunotherapy for insect sting allergy. *Clin Exp Allergy* 1999;29:1626–1631.
- ▶ 6 Oude Elberink JN, De Monchy JG, Van Der Heide S, Guyatt GH, Dubois AE: Venom immunotherapy improves health-related quality of life in patients allergic to yellow jacket venom. *J Allergy Clin Immunol* 2002;110:174–182.
- ▶ 7 Goldberg A, Confino-Cohen R: Insect sting-inflicted systemic reactions: attitudes of patients with insect venom allergy regarding after-sting behavior and proper administration of epinephrine. *J Allergy Clin Immunol* 2000;106:1184–1189.
- ▶ 8 Oude Elberink JN, de Monchy JG, Golden DB, Brouwer JL, Guyatt GH, Dubois AE: Development and validation of a health-related quality-of-life questionnaire in patients with yellow jacket allergy. *J Allergy Clin Immunol* 2002;109:162–170.
- ▶ 9 Fischer J, Feidt A, Giel KE, Martens U, Zipfel S, Biedermann T, Teufel M: Quality-of-life in wasp venom allergy – validation of the German version of the “Vespid Allergy Quality of Life Questionnaire” (VQLQ-d). *J Dtsch Dermatol Ges* 2011;9:379–385.

- ▶10 Armisen M, Guspi R, Alfaya T, Cruz S, Fernandez S, Dominguez-Noche C, Alonso A, Dalmau G, Marques L, Vega A: Cross-sectional validation of a quality of life questionnaire in Spanish for patients allergic to hymenoptera venom. *J Investig Allergol Clin Immunol* 2015;25:176–182.
- ▶11 Silva D, Pereira AM, Santos N, Amaral L, Delgado L, Oude Elberink JN, Coimbra A: The Vespidae Allergy Quality of Life Questionnaire – cultural adaptation and translation to Portuguese. *Eur Ann Allergy Clin Immunol* 2017;49:114–121.
- ▶12 Lundberg L, Johannesson M, Silverdahl M, Hermansson C, Lindberg M: Quality of life, health-state utilities and willingness to pay in patients with psoriasis and atopic eczema. *Br J Dermatol* 1999;141:1067–1075.
- ▶13 Schiffner R, Schiffner-Rohe J, Gerstenhauer M, Hofstadter F, Landthaler M, Stolz W: Willingness to pay and time trade-off: sensitive to changes of quality of life in psoriasis patients? *Br J Dermatol* 2003;148:1153–1160.
- ▶14 Beikert FC, Langenbruch AK, Radtke MA, Kornek T, Purwins S, Augustin M: Willingness to pay and quality of life in patients with atopic dermatitis. *Arch Dermatol Res* 2014;306:279–286.
- ▶15 Beikert FC, Langenbruch AK, Radtke MA, Augustin M: Willingness to pay and quality of life in patients with rosacea. *J Eur Acad Dermatol Venereol* 2013;27:734–738.
- ▶16 Schiffner R, Brunnberg S, Hohenleutner U, Stolz W, Landthaler M: Willingness to pay and time trade-off: useful utility indicators for the assessment of quality of life and patient satisfaction in patients with port wine stains. *Br J Dermatol* 2002;146:440–447.
- ▶17 Radtke MA, Schafer I, Gajur A, Langenbruch A, Augustin M: Willingness-to-pay and quality of life in patients with vitiligo. *Br J Dermatol* 2009;161:134–139.
- ▶18 Zigmond AS, Snaith RP: The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;67:361–370.
- ▶19 Bjelland I, Dahl AA, Haug TT, Neckelmann D: The validity of the Hospital Anxiety and Depression Scale. An updated literature review. *J Psychosom Res* 2002;52:69–77.
- ▶20 Hinz A, Brähler E: Normative values for the Hospital Anxiety and Depression Scale (HADS) in the general German population. *J Psychosom Res* 2011;71:74–78.
- ▶21 Nowak N, Bazan-Socha S, Pulka G, Pelka K, Latra P: Evaluation of the quality of life in subjects with a history of severe anaphylactic reaction to the Hymenoptera venom. *Pneumonol Alergol Pol* 2015;83:352–358.
- ▶22 Cichocka-Jaros E, Brzyski P, Swiebocka E, Lange J, Tobiasz-Adamczyk B, Lis G, Jedynak-Wasowicz U, Kulus M, Kaczmarski M, Malaczynska T, Klajna-Kraluk B, Breborowicz A, Kycler Z, Pietrzyk JJ: Health-related quality of life in Polish adolescents with Hymenoptera venom allergy treated with venom immunotherapy. *Arch Med Sci* 2012;8:1076–1082.
- ▶23 Oude Elberink JN, Dubois AE: Quality of life in insect venom allergic patients. *Curr Opin Allergy Clin Immunol* 2003;3:287–293.
- ▶24 Alfaya T, Vega A, Dominguez-Noche C, Ruiz B, Marques L, Sanchez-Morillas L: Longitudinal validation of the Spanish version of the Health-Related Quality of Life Questionnaire for Hymenoptera Venom Allergy (HRQLHA). *J Investig Allergol Clin Immunol* 2015;25:426–430.
- ▶25 Sanchez J: Anaphylaxis. How often patients carry epinephrine in real life? *Rev Alerg Mex* 2013;60:168–171.
- ▶26 Oude Elberink JN, van der Heide S, Guyatt GH, Dubois AE: Analysis of the burden of treatment in patients receiving an EpiPen for yellow jacket anaphylaxis. *J Allergy Clin Immunol* 2006;118:699–704.
- ▶27 Cohen MB, Saunders SS, Wise SK, Nassif S, Platt MP: Pitfalls in the use of epinephrine for anaphylaxis: patient and provider opportunities for improvement. *Int Forum Allergy Rhinol* 2017;7:276–286.
- ▶28 Pumphrey RS: Lessons for management of anaphylaxis from a study of fatal reactions. *Clin Exp Allergy* 2000;30:1144–1150.

Compliance with carrying the emergency medication

(*n* = 55)

Always, <i>n</i> (%)	14 (25.5)
Almost always, <i>n</i> (%)	26 (47.3)
Often, <i>n</i> (%)	8 (14.5)
Infrequently, <i>n</i> (%)	3 (5.5)
Never, <i>n</i> (%)	0 (0)
Just when I plan to do outdoor activities, <i>n</i> (%)	4 (7.3)

Willingness to carry the emergency medication always

(scale from 0 to 10) (*n* = 55)

Min-max	0-10
Mean $\pm$ SD	7.7 $\pm$ 2.8

Subjective self-assurance in using the emergency medication

(scale from 0 to 10) (*n* = 55)

Min-max	0-10
Mean $\pm$ SD	6.7 $\pm$ 2.3

Reasons for not always carrying the emergency medication

(*n* = 55)

Too big, <i>n</i> (%)	10 (18.2)
Too heavy, <i>n</i> (%)	6 (10.9)
Forgetfulness, <i>n</i> (%)	20 (36.4)
Fear of overheating the medication, <i>n</i> (%)	6 (10.9)
I do not need it, <i>n</i> (%)	6 (10.9)
Storage in the car is sufficient, <i>n</i> (%)	5 (9.1)
Other reasons, <i>n</i> (%)	5 (9.1)

Other reasons are “unhandiness” (*n* = 2), “no handbag to store it today” (*n* = 2), and “I do not need it for short trips” (*n* = 1).

<i>Absolute WTP/month (n = 37), EUR</i>	
Min-max	0-300
Median	30
Mean ± SD	53±63
<i>WTP (n = 41)</i>	
0-5% of the monthly income, n (%)	26 (63.4)
6-10% of the monthly income, n (%)	9 (22.0)
10-20% of the monthly income, n (%)	4 (9.8)
20-30% of the monthly income, n (%)	2 (4.9)
<i>Absolute one-time WTP (n = 33), EUR</i>	
Min-max	0-20,000
Median	500
Mean ± SD	1,727±3,775
<i>HADS (n = 55)</i>	
Anxiety subscale	
0-7 points, n (%)	40 (72.7)
8-10 points, n (%)	7 (12.7)
11-21 points, n (%)	8 (14.5)
Depression subscale	
0-7 points, n (%)	47 (85.5)
8-10 points, n (%)	5 (9.1)
11-21 points, n (%)	3 (5.5)
<i>Subjective anxiety level because of the venom allergy (analogue scale from 0 [not at all] to 10 [extremely anxious]) (n = 53)</i>	
Min-max	0-10
Mean ± SD	6.0±2.8

Females, <i>n</i> (%)	30 (54.5)
Age, years	
Min-max	23-77
Mean $\pm$ SD	53.7 $\pm$ 12.1
Disease duration, years	
Min-max	1-30
Mean $\pm$ SD	5.1 $\pm$ 6.1
Venom involved	
Honeybee, <i>n</i> (%)	7 (12.7)
Wasp, <i>n</i> (%)	45 (81.8)
Both, <i>n</i> (%)	3 (5.5)
Severity of reaction	
Mueller grade I, <i>n</i> (%)	6 (10.9)
Mueller grade II, <i>n</i> (%)	25 (45.5)
Mueller grade III, <i>n</i> (%)	20 (36.4)
Mueller grade IV, <i>n</i> (%)	4 (7.3)
Venom immunotherapy	
Currently ongoing, <i>n</i> (%)	45 (81.8)
Completed, <i>n</i> (%)	2 (3.6)
Intended, <i>n</i> (%)	3 (5.5)
Not intended, <i>n</i> (%)	5 (9.1)
Duration, months	
Min-max	1-120
Mean $\pm$ SD	26.4 $\pm$ 25.9