



Measurement of health-related quality of life in adult patients with birch pollen-associated food allergy

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Summary

Background: The “Food Allergy Quality of Life Questionnaire – Adult Form” (FAQLQ-AF) is the first freely available questionnaire for the assessment of health-related quality of life (HRQL) in adults with food allergy (FA). We present validation data for the German version as well as data on HRQL in patients with birch pollen-associated FA.

Patients and Methods: The Dutch FAQLQ-AF (scale from 1–7, no impairment – maximum impairment) was translated into German. Subsequently, 73 consecutive patients with a history of birch pollen-associated FA (52 women, median age 43 years) were surveyed using questions regarding triggers and symptoms of their FA as well as questions contained in the FAQLQ-AF. Construct validity, internal consistency, and discriminative ability were analyzed.

Results: The foods most frequently reported to elicit allergic reactions included apple (78 %), hazelnut (75 %), soy drinks (55 %), and carrot (52 %). Thirty percent of patients exclusively reported symptoms consistent with oral allergy syndrome (OAS). Sixty-four percent reported OAS combined with systemic symptoms, and only 6 % were exclusively affected by non-OAS symptoms. The German FAQLQ-AF showed good construct validity (correlation with the food allergy-independent measure: $r = 0.81$; $p < 0.001$) and excellent internal consistency (Cronbachs $\alpha = 0.98$). The mean overall FAQLQ-AF score was 3.7. Women, elderly individuals, and those with multiple relevant food allergies showed a greater impairment of HRQL.

Conclusions: The German FAQLQ-AF questionnaire is a reliable and valid tool for measuring HRQL in patients with birch pollen-associated food allergy.

Background

In Europe, birch pollen-associated food allergy (FA) is the most common form of FA in adults [1–5]. Clinically, FA usually presents as oral allergy syndrome (OAS) with or without concomitant systemic reactions [1, 6]. The latter may lead to considerable stress [7], anxiety [4], and impaired health-related quality of life (HRQL) [8].

A health-related quality of life questionnaire for adults with FA – the “Food Allergy Quality of Life Questionnaire

– Adult Form” (FAQLQ-AF) – was initially developed in the context of the EuroPrevall project. Showing excellent internal consistency and good construct validity, the questionnaire has been translated and validated for many European countries [9–13]. Previous studies on HRQL have almost exclusively been conducted in children [14–16] and patient cohorts with combined pollen- and non-pollen-associated FA [10, 17].

The objective of our study was to validate the German version of the FAQLQ-AF and to determine HRQL in adults with birch pollen-associated FA.

Patients and Methods

Patients

From 2008–2009, adult patients (age: ≥ 18 years) with a type 1 sensitization to birch pollen (positive prick test for birch and/or specific IgE Bet v 1 > CAP 1) and a positive history of birch pollen-associated FA symptoms were recruited from the Allergy Clinic at the Department of Dermatology, Venerology and Allergology of the University of Leipzig (Ethics Committee of the University of Leipzig, 279-08). Previous history of atopic disorders was documented.

Questionnaires

Using a standardized questionnaire, consumption of and tolerance to 36 specified foods (including seven soy products) were determined. Subsequently, OAS symptoms (tingling sensation and swelling in mouth and throat) were distinguished from non-OAS symptoms (pruritus, flush, urticaria, angioedema, dyspnea, nausea, vomiting, abdominal cramps, diarrhea, cardiovascular problems). In addition, patients completed the German Food Allergy Quality of Life Questionnaire – Adult Form (FAQLQ-AF).

The FAQLQ-AF consists of 29 questions on a 7-point ordinal scale from 1 (no impairment) to 7 (maximum impairment). Each of the 29 questions may be assigned to one of four subscales; (a) Allergen Avoidance and Dietary Restrictions [AADR], 11 questions), (b) Emotional Impact [EI], 7 questions), (c) Risk of Accidental Exposure [RAI], 8 questions), (d) Food Allergy-Related Health [FAH], 3 questions). Another six questions constituted an independent measuring instrument (Food Allergy-Independent Measure [FAIM]) for determining the construct validity. These questions provided information on patients' individual expectations and his or her subjective food allergy-related health assessment [18].

Using the methodology set by the World Health Organization, the FAQLQ-AF and FAIM were translated into German [19]. The questionnaire was first translated into German by a native German speaker (forward translation). Then, a native speaker translated the German version back into the original language (back translation). This version and the original version were then checked for inconsistencies by an review committee in cooperation with the authors.

Construct validity and internal consistency

The construct validity of the German FAQLQ-AF version was determined by calculating Spearman's rank correlation coefficient between the FAQLQ-AF and FAIM scores (individual FAQLQ-AF scores with overall FAIM score and overall FAQLQ-AF score with overall FAIM score). The internal

consistency of the FAQLQ-AF was analyzed by calculating Cronbach's alpha, with $\alpha \geq 0.70$ rated as good internal consistency [20].

Statistics

According to Flokstra-de Blok et al. [10], the overall FAQLQ-AF score, the overall FAIM score as well as mean scores (with standard deviation (SD)) for all four subscales were determined for each patient. The data were separately analyzed according to gender, age (18–43 years and 44–72 years), number of foods not tolerated (1–7 and ≥ 8), and type of symptoms (OAS and/or non-OAS symptoms). Using the median split method, patients were grouped according to age and number of foods not tolerated; the comparison of observed differences between patient subgroups was carried out using the Mann-Whitney U test. Categorical data were compared by means of Fisher's exact test.

Results

Study population and food allergies

Seventy-three patients (52 women; 18–72 years, median age 43 years) were included. Men and women equally frequently (90 % respectively) reported allergic rhinoconjunctivitis symptoms. While men more often had a history of atopic dermatitis (24 % vs. 13 %; not significant), women were more frequently affected by bronchial asthma (25 % vs. 9 %; not significant). The mean number of foods not tolerated was nine (SD: 5.9, range: 4–13). The various foods mentioned as triggers of immediate-type reactions are shown in Figure 1. The most common triggers among patients with non-OAS symptoms included hazelnut (75 %; 39/51), carrot (57 %; 29/51), peach (51 %; 26/51) and soy drinks (65 %; 17/26).

Overall, 95 % (69/73) of patients experienced OAS symptoms; 52 % (38/73) skin reactions (pruritus, flush, urticaria, angioedema); 30 % (22/73) dyspnea; 21 % (15/73) gastrointestinal symptoms; and 12 % (9/73) cardiovascular reactions. Only 30 % (22/73) of patients were exclusively affected by OAS symptoms and 6 % (4/73) exclusively by non-OAS symptoms (respiratory, gastrointestinal, cardiovascular). The majority of patients (64 %; 47/73) showed a combination of OAS and non-OAS symptoms.

HRQL and selectivity

The mean overall FAQLQ-AF score was 3.7 (± 1.6), thus indicating mild to moderate impairment of HRQL (Table 1). The most severe impairment overall was seen in the FAH subscale (Food Allergy-Related Health), with a mean value of 4.7 (± 1.8). Analysis of the FAQLQ-AF by gender and age

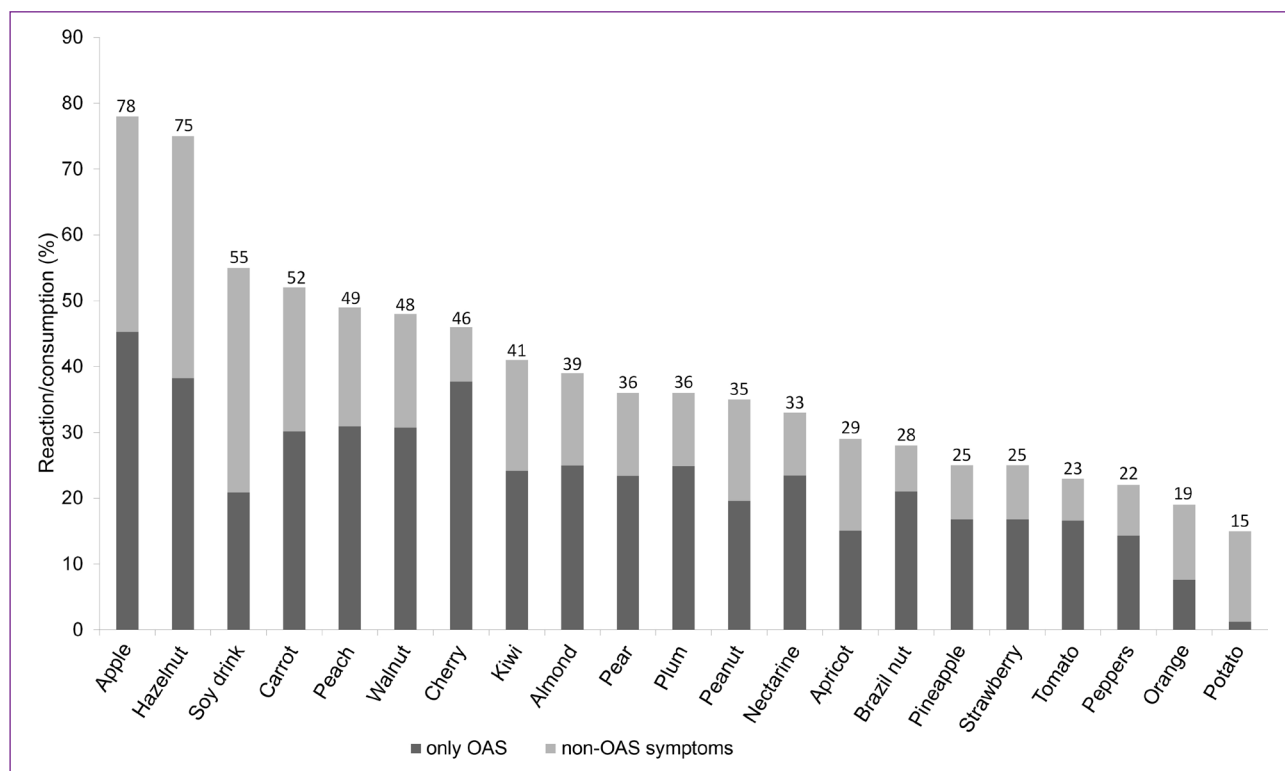


Figure 1 Triggers of immediate-type reactions (percentage of symptomatic patients in relation to the overall consumption of various foods; separate figures are presented for exclusive OAS and non-OAS-symptoms).

Table 1 Detailed analysis of the FAQLQ-AF for various subpopulations (on a scale from 1–7, no impairment – maximum impairment).

	n	Total		AADR		EI		RAE		FAH		FAIM	
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Total	73	3.7	1.6	3.4	1.6	3.8	1.6	3.6	1.7	4.7	1.8	3.2	1.1
Women	52	4.1**	1.4	3.8**	1.6	4.2**	1.4	4.1**	1.6	5.2**	1.5	3.5**	1.0
Men	21	2.6**	1.5	2.3**	1.4	2.6**	1.6	2.6**	1.7	3.4**	1.7	2.4**	1.0
18 – 43 years	38	3.4	1.5	3.2	1.6	3.5	1.6	3.2*	1.7	4.5	1.9	3.0	1.0
44–72 years	35	4.0	1.6	3.5	1.7	4.1	1.6	4.1*	1.7	4.9	1.7	3.4	1.1
1 – 7 foods	34	3.4	1.5	3.0*	1.5	3.5	1.6	3.4	1.6	4.6	1.8	2.9	1.1
≥ 8 foods	39	3.9	1.6	3.7*	1.7	4.0	1.6	3.8	1.8	4.7	1.8	3.4	1.1
Only OAS	22	3.1	1.5	2.9	1.5	3.2	1.7	3.1	1.6	4.2	1.8	2.9	1.2
Non-OAS symptoms	51	3.9	1.6	3.6	1.7	4.0	1.6	3.9	1.7	4.9	1.8	3.3	1.1

Abbr.: AADR, allergen avoidance and dietary restrictions; EI, emotional impact; RAE, risk of accidental exposure; FAH, food allergy-related health; FAIM, food allergy-independent measure.

** $p \leq 0.0001$, * $p \leq 0.05$

yielded – for all subscales – a significantly poorer HRQL assessment in women (overall FAQLQ-AF score 4.1 vs. 2.6, $p = 0.0001$) and elderly individuals. Here, individuals > 43 years of age (median split; $n = 35$, 77 % women, 23 % men) rated the risk of accidental allergen exposure as higher than younger patients (RAE: 4.1 vs. 3.2, $p = 0.03$). Especially older women (> 43 years) showed a significantly greater impairment of HRQL in the EI and RAE subscales than younger women. In addition, patients with multiple FAs, especially women, showed a significantly poorer HRQL in the AADR subscale than younger women (3.7 vs. 3.0, $p = 0.05$). Interestingly, patients with exclusive OAS symptoms ($n = 22$) and patients with generalized reactions ($n = 51$) did not significantly differ in the assessment of their quality of life. Neither did patients with life-threatening cardiovascular reactions ($n = 9$) rate their quality of life as poorer than patients without

such symptoms (4.5 vs. 3.6; $p = 0.129$). There was, however, a statistical trend towards poorer HRQL in patients with non-OAS symptoms, for example with regard to the overall FAQLQ-AF score (3.9 vs. 3.1; $p = 0.057$), AADR (3.6 vs. 2.9; $p = 0.093$), EI (4.0 vs. 3.2; $p = 0.064$), RAE (3.9 vs. 3.1; $p = 0.066$), and overall FAIM score (3.3 vs. 2.9; $p = 0.093$).

Construct validity and internal consistency

Construct validity is the result of correlating FAQLQ-AF and FAIM scores. All individual questions contained in the German FAQLQ-AF version correlated significantly with the overall FAIM score, with scores between 0.5 and 0.86 (Table 2). The overall FAQLQ-AF score also correlated significantly with the overall FAIM score ($r = 0.81$; $p < 0.0001$), indicating excellent internal consistency (Cronbach's $\alpha = 0.98$) of the FAQLQ-AF.

Table 2 Spearman's correlation rank coefficients between individual FAQLQ-AF questions and total FAIM scores.

		Correlation coefficient	Mean FAQLQ-AF scores
Given your food allergy, how bothersome is it for you to...			
1	always have to pay attention to what you eat?	0.62	3.8
2	to be able to eat fewer things?	0.61	3.8
3	be restricted in the kind of products you can buy?	0.67	3.6
4	have to read labels?	0.61	3.6
5	have the feeling of less control over what you eat when eating out?	0.72	3.6
6	have to refuse many things during social activities?	0.59	3.2
7	sometimes have to disappoint people trying their best to accommodate your food allergy?	0.50	3.3
8	be less able to spontaneously accept an invitation for lunch or dinner?	0.57	2.9
9	not be able to taste or try as many different dishes when eating out?	0.67	3.3
10	not be able to eat out as much?	0.61	2.9
11	personally have to check whether you can eat something when eating out?	0.69	3.3
12	hesitate eating certain products you deem problematic?	0.72	3.7
Given your food allergy, how bothersome is it for you...			
13	when ingredients of a product change?	0.68	3.8
14	when labels are incomplete?	0.63	3.9
15	when the font size on labels is too small?	0.57	3.4
16	when the label states: "...may contain (traces of)..."?	0.70	3.7
17	that ingredients in certain products are different in other countries (for example, during vacation)?	0.53	3.5
18	that people underestimate the problems you experience due to your food allergy?	0.71	3.7
19	that it is unclear to which food you are allergic?	0.67	3.7

Table 2 Continued.

		Correlation coefficient	Mean FAQLQ-AF scores
20	that you have to explain to those around you that you have a food allergy?	0.50	3.1
21	with respect to your host or hostess, if you have an allergic reaction?	0.58	3.8
Given your food allergy, how worried are you...			
22	about your health?	0.75	4.4
23	that your allergic reactions to foods will become increasingly severe?	0.66	5.0
Given your food allergy, how afraid are you...			
24	of an allergic reaction?	0.68	4.3
25	of accidentally eating the wrong food?	0.70	4.0
26	of an allergic reaction when eating out, although your dietary restrictions have been discussed beforehand?	0.71	3.8
27	When eating out, to what degree do you feel you are a nuisance because of your food allergy?	0.67	2.8
28	How dejected do you feel once an allergic reaction occurs?	0.71	4.1
29	How apprehensive are you about eating something you have never eaten before?	0.69	3.7
How great do you think the likelihood is that you...			
A	will accidentally eat something to which you are allergic?	0.74	3.7
B	will have a severe reaction, if you accidentally eat something to which you are allergic?	0.86	3.8
C	will die, if you accidentally eat something to which you are allergic?	0.7	2.1
D	cannot adequately deal with an allergic reaction, if you accidentally eat something to which you are allergic?	0.72	3.2
E	How many foods do you have to avoid because of your food allergy?	0.78	3.5
F	How great is the impact of your food allergy on your social life?	0.77	2.6
Overall FAQLQ-AF score		0.81	3.7
Allergen avoidance and dietary restrictions (AADR)		0.73	3.4
Emotional impact (EI)		0.82	3.8
Risk of accidental exposure (RAE)		0.75	3.6
Food allergy-related health (FAH)		0.77	4.7
Overall FAIM score		—	3.2

Discussion

In order to ascertain the extent of everyday impairment in patients with FA, the assessment of HRQL has proven to be a suitable measuring instrument [21]. Our study shows that the German FAQLQ-AF version is characterized by very good construct validity and excellent internal consistency, thus representing a reliable and valuable tool for measuring HRQL in German-speaking adults with FA. Our patient cohort most frequently showed allergic symptoms following the

consumption of apples and hazelnuts [22]. In addition, there was a large number of patients who reacted to soy products. This might, among other things, be due to a study on birch pollen-associated soy allergy concurrently conducted at the Department of Dermatology, University Hospital Leipzig [22, 23]. Although OAS was by far the most frequently reported clinical symptom, the majority of patients also stated to have experienced non-OAS symptoms.

Analyzing the answers of the FAQLQ-AF, we noticed a large difference in the subjective assessment of HRQL

between men and women. The latter – displaying the same clinical reactions as men – seemed to feel much more impaired in everyday life and with respect to social activities because of their pollen-associated FA. Other authors have also confirmed that women, in case of atopic as well as non-atopic disorders, rate their quality of life as poorer than men [24–27], and that health problems in general present a greater burden for women than for men [28, 29].

Furthermore, we noticed partly considerable differences in the assessment of HRQL between older and younger patients. Women in the older half of our cohort (> 43 years) rated the risk of accidental allergen exposure as higher than younger women. In addition, they were more afraid of the occurrence of an allergic reaction, felt more frequently dejected because of their FA, and were more apprehensive about eating out. Among other reasons, they felt they had no control over their food and that they were a burden to their hosts. Among men, there were no such age differences, which, however, may also be explained by the small number of cases. In a cross-sectional study of the Swedish population, Burström et al. were also able to illustrate the highest health-related quality of life in younger men and the poorest in older women [29].

It has been reported that there is a correlation between the number of foods patients are allergic to and poorer quality of life [10, 17]. In our study, too, women with multiple FAs also showed significantly poorer HRQL in the AADR and RAE subscales than patients with fewer FAs. One might speculate that this also has to do with impairments in the area of social activities (including restaurant visits, family gatherings). Interestingly, some studies of adults with non-pollen-associated FA (without OAS) have been able to show a significant impairment in HRQL in patients with anaphylaxis [10, 17]. In our patient cohort, on the other hand, there was only a slight tendency for a stronger impairment of HRQL in patients with non-OAS symptoms compared to those with exclusive OAS symptoms. Neither was there a significant difference in HRQL between patients with (n = 9) and without (n = 64) cardiovascular reactions. Although one would expect that patients with severe immediate-type reactions take their food allergy more seriously, are more careful in handling food, and are more anxious – given their past experience – than patients with milder symptoms, we were unable to ascertain a significant correlation between the severity of clinical reactions and the extent of HRQL impairment in our cohort. Other studies in adults [30] as well as children and adolescents with and without anaphylaxis have yielded similar results [31, 32]. This may suggest that the patients' personality structure plays a larger role in pollen-associated FA than type and severity of symptoms, and that, therefore, patients with milder symptoms may also indeed experience impairment of their quality of life.

Interpretation of our data is limited by the fact that the diagnosis of FA in our patients was exclusively based on their personal accounts and not on food challenges tests. This, however, is also true for many other studies on FA-related quality of life [10, 17]. Moreover, given its monocentric design, the present study cannot be regarded as representative of all German-speaking adults. Further studies with larger patient groups are therefore recommended.

In conclusion, this is the first study to apply and validate the German FAQLQ-AF version in adults with exclusive pollen-associated FA. We were able to show that OAS as well as non-OAS symptoms may equally impair the quality of life, and that women, elderly individuals, and those with multiple food allergies are particularly affected by such impairment.

Clinical Relevance

For the first time, the FAQLQ-AF was validated in a German cohort with pollen-associated FA. The questionnaire is available for download at www.faqlq.com.

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References

- 1 Sicherer S. Epidemiology of food allergy. *J Allergy Clin Immunol* 2011; 127: 594–602.
- 2 Geroldinger-Simic M, Zelniker T, Aberer W et al. Birch pollen-related food allergy: clinical aspects and the role of allergen-specific IgE and IgG4 antibodies. *J Allergy Clin Immunol* 2011; 127: 616–22.e1.
- 3 Treudler R, Simon JC. Overview of Component Resolved Diagnostics. *Curr Allergy Asthma Rep* 2013; 13: 110–7.
- 4 Kalogeromitros D, Makris M, Chliva C et al. An internet survey on self-reported food allergy in Greece: clinical aspects and lack of appropriate medical consultation. *J Eur Acad Dermatol Venereol* 2013; 27: 558–64.
- 5 Werfel T. Food allergy. *J Dtsch Dermatol Ges* 2008; 6: 573–83.
- 6 Werfel T, Erdmann S, Fuchs T et al. Approach to suspected food allergy in atopic dermatitis. Guideline of the Task Force

- on Food Allergy of the German Society of Allergology and Clinical Immunology (DGAKI) and the Medical Association of German Allergologists (ADA) and the German Society of Pediatric Allergology (GPA). *J Dtsch Dermatol Ges* 2009; 7: 265–71.
- 7 Augustin M, Franzke N, Beikert F et al. Allergies in Germany – prevalence and perception by the public. *J Dtsch Dermatol Ges* 2013; 11: 514–20.
- 8 Lange L. Lebensqualität bei Anaphylaxie und Nahrungsmittel-allergie. *Allergo J Int* 2014; 23: 24–32.
- 9 Flokstra-de Blok B, Vlieg-Boerstra B, Oude Elberink J et al. A framework for measuring the social impact of food allergy across Europe: a EuroPrevall state of the art paper. *Allergy* 2007; 62: 733–7.
- 10 Flokstra-de Blok BMJ, Van der Meulen GN, DunnGalvin A et al. Development and validation of the Food Allergy Quality of Life Questionnaire-Adult Form. *Allergy* 2009; 64: 1209–17.
- 11 Flokstra-de Blok B, Dubois A. Quality of life measures for food allergy. *Clin Exp Allergy* 2012; 42: 1014–20.
- 12 Flokstra-de Blok B, Dubois A, Vlieg-Boerstra B et al. Health-related quality of life of food allergic patients: comparison with the general population and other diseases. *Allergy* 2010; 65: 238–44.
- 13 Van der Velde J, Flokstra-de Blok B, deGroot H et al. Food allergy-related quality of life after double-blind, placebo-controlled food challenges in adults, adolescents, and children. *J Allergy Clin Immunol* 2012; 130: 1136–43.e2.
- 14 Van der Velde J, Flokstra-de Blok B, Hamp A et al. Adolescent-parent disagreement on health-related quality of life of food-allergic adolescents: who makes the difference? *Allergy* 2011; 66: 1580–9.
- 15 Uwe N, Eva Ö, Ann-Charlotte E et al. Validation of a disease-specific questionnaire for measuring parent-reported health-related quality of life in children with allergies. *Scand J Caring Sci* 2012; 26: 679–87.
- 16 Ravid N, Annunziato R, Ambrose M et al. Mental health and quality-of-life concerns related to the burden of food allergy. *Immunol Allergy Clin North Am* 2012; 32: 83–95.
- 17 Goossens N, Flokstra-de Blok B, Vlieg-Boerstra B et al. Online version of the food allergy quality of life questionnaire-adult form: validity, feasibility and cross-cultural comparison. *Clin Exp Allergy* 2011; 41: 574–81.
- 18 Van der Velde J, Flokstra-de Blok B, Vlieg-Boerstra B et al. Development, validity and reliability of the food allergy independent measure (FAIM). *Allergy* 2010; 65: 630–5.
- 19 World Health Organization Process of translation and adaption of instruments. Available at: http://www.who.int/substance_abuse/research_tools/translation/en/. (Accessed 17 May 2013).
- 20 Bullinger M, Anderson R, Cella D, Aaronson N. Developing and evaluating cross-cultural instruments from minimum requirements to optimal models. *Qual Life Res* 1993; 2: 451–9.
- 21 Liebermann J, Sicherer S. Quality of life in food allergy. *Curr Opin Allergy Clin Immunol* 2011; 11: 236–42.
- 22 Treudler R, Werner M, Thiery J et al. High risk of immediate-type reactions to soy drinks in 50 patients with birch pollinosis. *J Investig Allergol Clin Immunol* 2008; 18: 483–4.
- 23 Treudler R, Simon JC. Severe soy allergy in adults. Is there a role for specific immunotherapy? *Hautarzt* 2012; 63: 307–12.
- 24 Larsson U, Taft C, Karlsson J, Sullivan M. Gender and age differences in the relative burden of rhinitis and asthma on health-related quality of life- A Swedish population study. *Respir Med* 2007; 101: 1291–98.
- 25 Larsson U, Karlsson J, Sullivan M. Impact of overweight and abesity on health-related quality of life – a Swedish population study. *Int J Obesity* 2002; 26: 417–24.
- 26 Tovt-Korshynska M, Dew M, Chohey I et al. Gender differences in psychological distress in adults with asthma. *J Psychosom Res* 2001; 51: 629–37.
- 27 Krause K, Kessler B, Weller K et al. German Version of ItchyQoL: Validation and Initial Clinical Findings. *Acta Derm Venerol* 2013; 93.
- 28 DunnGalvin A, Hourihane J, Frewer L et al. Incorporating a gender dimension in food allergy research: a review. *Allergy* 2006; 61: 1336–43.
- 29 Burström K, Johannesson M, Diderichsen F. Health-related quality of life by disease and socio-economic group in the general population in Sweden. *Health Policy* 2001; 55: 51–69.
- 30 Jansson SA, Heibert-Arnlin M, Middelvel R et al. Health-related quality of life, assessed with disease-specific questionnaire, in Swedish adults suffering from well-diagnosed food allergy to staple foods. *Clin Trans Allergy* 2013; 3: 21.
- 31 Flokstra-de Blok B, DunnGalvin A, Vlieg-Boerstra B et al. Development and validation of a self-administered Food Allergy Quality of Life Questionnaire for children. *Clin Exp Allergy* 2009; 39: 127–37.
- 32 Flokstra-de Blok B, DunnGalvin A, Vlieg-Boerstra B et al. Development and validation of the self-administered Food Allergy Quality of Life Questionnaire for adolescents. *J Allergy Clin Immunol* 2008; 122: 139–44.