

## Health Related Quality of Life in children with perceived and diagnosed food hypersensitivity

Carina Venter<sup>1,2</sup>, Isolde Sommer<sup>1</sup>, Harriet Moonesinghe<sup>1</sup>, Jane Grundy<sup>2</sup>, Gillian Glasbey<sup>2</sup>, Taraneh Dean<sup>1,2</sup>

<sup>1</sup>School of Health Sciences and Social Work

University of Portsmouth

James Watson West

2 King Richard 1<sup>st</sup> Road

Portsmouth

PO1 2FR

UK

<sup>2</sup>The David Hide Asthma and Allergy Research Centre

St Mary's Hospital

Newport

Isle of Wight

UK

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Corresponding Author: Carina Venter

School of Health Sciences and Social Work

University of Portsmouth

James Watson West

2 King Richard 1<sup>st</sup> Road

Portsmouth

PO1 2FR

UK

Email: [carina.venter@port.ac.uk](mailto:carina.venter@port.ac.uk)

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Venter C, Sommer I, Moonesinghe H, Grundy J, Glasbey G, Dean T

## **Health Related Quality of Life in children with perceived and diagnosed food hypersensitivity**

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### **Abstract**

#### **Background**

The few studies measuring health-related quality of life (HRQL) in food hypersensitivity (FHS) have found significantly reduced HRQL in patients and their families, particularly in the areas of family and social activities, emotional issues and family economy. One aspect that has not been studied is the effect of suspected FHS (food allergy/intolerance) vs. diagnosed FHS (based on a food challenge or a positive skin prick test (SPT) and good clinical history) on HRQL. Therefore the aim of this study was to investigate the HRQL in children with a proven diagnosis of FHS vs. those with reported FHS.

#### **Methods**

We have utilised the 10 year old follow-up cohort of the Food Allergy and Intolerance Research (FAIR) study from the Isle of Wight and assessed the child's HRQL with the Food Allergy Quality of Life Questionnaire – Parent form (FAQLQ-PF) which measures HRQL using four domains: Food Anxiety, Emotional Impact, Social and Dietary Limitation.

#### **Results**

When comparing the two groups of children (proven FHS vs. perceived FHS) no difference in HRQL was found, although food anxiety showed a p-value of (p=0.062). This was also the case when correcting for all confounding factors identified.

#### **Conclusion**

We have found that having a clear diagnosis of FHS is not an independent predictor of HRQL. Future studies are required comparing two more similar groups. We also need to focus more on the effect of continuous input from the multi-disciplinary team on HRQL and which particular factors of FHS management affect HRQL.

**Key words:** food allergy, food hypersensitivity, food intolerance, health related quality of life, perceived food hypersensitivity, proven food hypersensitivity.

## Introduction

The few studies measuring health-related quality of life HRQL<sup>(1)</sup> in food hypersensitivity (FHS) have found significantly reduced HRQL in patients and their families, particularly in the areas of family and social activities, emotional issues and family economy<sup>(2-5)</sup>. Improving HRQL of those affected by FHS is therefore an important aspect in the management of these individuals and their families.

A number of aspects in the diagnosis and management of FHS may affect HRQL. A diagnosis based on a food challenge improves HRQL, irrespective of the outcome<sup>(6)</sup>. A negative diagnosis may, however, affect HRQL more profoundly<sup>(7)</sup>. The mechanisms involved<sup>(8;9)</sup> in all presentations of FHS may also affect HRQL. For example it is difficult to compare the stress involved in dealing with a child with severe GI symptoms<sup>(10;11;12)</sup> and growth faltering<sup>(13;14)</sup> to that of having to deal with a child at risk of anaphylaxis<sup>(15)</sup>.

The only way of managing FHS at present is avoidance of the culprit food(s). Health care professionals (HCPs) dealing with FHS have moved away from “total” avoidance advice as some people may be able to tolerate small amounts of the allergenic foods<sup>(16)</sup>. For the majority, however, having a FHS means strict avoidance and vigilance at all times<sup>(17)</sup>.

We have previously shown that food allergic adults felt that they could not enjoy food to the full, found it hard to find safe foods and always had to plan ahead<sup>(18)</sup>. In the same study we have also looked at a group of adults with perceived FHS ( food allergy/intolerance). Although similar to some extent, this group was different from the group with diagnosed food allergy as their food choices were strongly influenced by emotional factors or health awareness. Knibb and Semper (2013) measured anxiety and depression in parents to assess the impact of a suspected food allergy before and after a referral to an allergy clinic (in the same group of children), finding that 32.5% of parents suffered from mild to moderate anxiety, and 17.5% of parents reported mild to moderate depression. There was no significant reduction in anxiety and depression levels post clinic suggesting that a clear diagnosis of FHS for these children did not help reduce anxiety and depression for their parents. In addition, these authors also found that prior to confirmation of FHS, the majority of parents are removing foods from the child’s diet, checking food labels and experiencing difficulties when eating away from the home; all of these factors have an impact on the lives of parents and their children suffering from FHS<sup>(19)</sup>.

It is generally accepted in the medical field that HRQL in those with perceived food allergies is just as important as those with diagnosed food allergies<sup>(20)</sup>. However, an aspect that has not been studied is the effect of suspected FHS vs. diagnosed FHS (based on a food challenge or a positive skin prick test (SPT) and good clinical history) on HRQL in two different groups. Therefore the aim of this study was to investigate the HRQL in children with a proven diagnosis of FHS vs. those with reported FHS.

## Methods

The Food Allergy and Intolerance Research (FAIR) study methodology has been described previously <sup>(21)</sup>. In short, pregnant women with an estimated delivery time between 1<sup>st</sup> September 2001 to 31<sup>st</sup> August 2002 were approached at antenatal clinics on the Isle of Wight. Information was obtained by means of a standardised questionnaire using the ISAAC questions <sup>(22)</sup>.

Children were skin prick tested at one, two, three and 10 years to a predefined panel of food allergens. Based on their given history and SPT results during the first ten years of life, the following children were invited for food challenges:

- Those with a positive SPT or specific IgE to a food that they had not knowingly eaten previously.
- Those who indicated a previous adverse reaction to foods regardless of their SPT result.

We asked parents to complete the HRQL questionnaire <sup>(23)</sup> at the 10 year follow-up if they reported the child to avoid any foods due to either a diagnosed or a perceived food allergy. This Food Allergy Quality of Life Questionnaire – Parent form (FAQLQ-PF) measures the child's HRQL, as perceived by the parent, using four domains: Food Anxiety, Emotional Impact, Social and Dietary Limitations. This questionnaire has been validated for use in the Europrevall study.

Children with *diagnosed FHS* were defined as: Any child that was diagnosed with a FHS based on the FAIR study criteria by the age of 3 years, who was still clinically allergic and who reported a problem to a food, as well as those children that were diagnosed with a FHS by the David Hide Asthma and Allergy Research Centre on the Isle of Wight prior to the 10 year follow-up.

Children with *perceived FHS* were defined as those children who were avoiding a food or foods due to perceived adverse reactions. These children did not have a previous diagnosis made by the FAIR study or the Allergy Centre on the Isle of Wight.

Ethics approval was obtained at each follow-up of the cohort by local research ethics committees (09/01 and 10/H0504/11).

### *Statistical Analyses*

Statistical analysis was carried out with IBM SPSS Statistics for Windows (version 21, Armonk, NY: IBM Corp.). Fisher's exact test was used to test for differences in sample characteristics between the perceived and diagnosed group. Mean scores of HRQL domains were compared between perceived and diagnosed children as well as binary epidemiological variables using two-sided independent t-tests. Post hoc power calculations showed the study to have 0.5 to 0.9 power to detect large effect sizes between the two groups. The twelve epidemiological variables tested were sex, education of mother (lower or further/higher), education of father (lower or further/higher), child with food allergy first born (yes or no), mother with hay fever, asthma, rash or food allergy (yes or no),

number of involved allergens – parent report (0-2 or >2), IgE or non-IgE mediated food allergy, previous systemic reactions (yes or no), having seen a dietitian (yes or no), mother with food allergies (yes or no), siblings with food allergies (yes or no), nut allergy (yes or no). We ran multiple linear regression models with all variables with a p-value <0.05 in the analyses above together to adjust for the relationship between perceived vs. diagnosed FHS which was entered as a dummy variable, and HRQL which was entered as the dependent variable. The level of significance was set at 0.05 in all analyses.

## Results

At the 10 - year follow-up, questionnaires were completed by 827 (85%) of the original cohort of 969 children. Only those who reported the child to have a diagnosed or perceived food allergy, were asked to complete the section on HRQL. Therefore, 41 families completed the FAQLQ-PF questionnaire as the child met the criteria of either diagnosed/proven (n=25) or perceived (n=16) FHS.

The majority of children (table 1) in the proven and perceived groups were girls. Maternal history of allergic disease as obtained at recruitment, was reported more often in the proven group (68% vs. 6.3%;  $p=0.000$ ) but maternal history of food allergy was the same in both groups (20%). Level of maternal or paternal education was not different between the two groups. Twenty eight percent of mothers in the proven group had a higher education (college or university), compared to 6.3% of the mothers in the perceived group ( $p=1.00$ ). Similarly for the fathers, 28% of the proven group had higher education and 18% of the perceived group ( $p=1.00$ ). The majority of children in the proven group were first borns (64%) as opposed to 31.3% in the perceived group ( $p=0.06$ ). In terms of the mechanisms involved, 64% in the proven group suffered from IgE mediated food allergy. In the perceived group 93.8% of children reported problems which could be either non-IgE mediated disease or food intolerances ( $p=0.00$ ). All but one child in the proven group have seen a dietitian whereas none of the children in the perceived group have ( $p=0.00$ ). The foods involved in the proven group were in the following order: peanut, sesame, milk, egg, tree nuts and wheat. The foods involved in the perceived reactions were mainly milk, wheat, fruit and vegetables. The number of foods causing symptoms was similarly noted by the health care professionals and the parents in the perceived group. The discrepancy in the number of foods reported by the health care professionals and the parents in the proven group (e.g. 68% of HCPs mentioned 0-2 foods vs. 44% of parents) was due to counting nuts as 1=nuts, 2=peanut and tree nuts or 9= counting peanut and each tree nut. The two groups were similar in terms of those reporting a sibling with FHS (28.6% vs. 33.3%;  $p=1.00$ ), but the proven group reported significantly more children with a nut allergy (44% vs. 0%;  $p=0.003$ ), history of systemic reactions (28% vs. 0%;  $p=0.031$ ) and carrying emergency medicine (60% vs. 0%;  $p=0.00$ ).

Looking at factors that could affect HRQL in both groups (table 2), parents where the mothers had a lower level of education reported a poorer mean overall HRQL (3.16 vs. 2.24;  $p=0.045$ ) and higher

mean levels of food anxiety than those where mothers were further or higher educated (3.31 vs. 2.17;  $p=0.014$ ). On the other hand, children where the fathers reported a lower education level only had higher mean food anxiety levels than those where fathers were further or higher educated (3.23 vs. 2.21;  $p=0.034$ ). Not surprisingly, those parents who reported the child avoided 0-2 foods reported a lower mean anxiety score than those who reported the child avoided more than 2 foods (2.07 vs. 3.34;  $p=0.005$ ). This finding is not seen when the number of foods were reported by HCPs but this may be due to the confusion of regarding the number of foods involved in nut allergies as explained. As expected, however, those parents whose child had a history of systemic reactions significantly reported on average lower HRQL in all domains of the FAQLQ-PF (Global HRQL: 3.65 vs. 2.28,  $p=0.010$ ; Emotional impact: 3.25 vs. 2.10,  $p = 0.017$ , Food anxiety: 3.82 vs. 2.27,  $p=0.006$  and Social and Dietary restrictions: 4.08 vs. 2.50,  $p=0.017$ ). If the mother also suffered from food allergies, parents reported a poorer mean overall HRQL (3.83 vs. 2.19;  $p=0.002$ ), higher mean levels of Emotional Impact (3.41 vs. 1.99;  $p=0.001$ ) and Social and Dietary Restrictions (4.60 vs. 2.30;  $p=0.000$ ) but not food anxiety, (3.38 vs. 2.30;  $p=0.056$ ). Having a child with nut allergies significantly raised mean food anxiety levels according to the parents compared to those without (3.36 vs. 2.20,  $p = 0.02$ ).

When comparing parental reported HRQL in children with proven and with perceived FHS (table 3) no difference in all HRQL domains was found, although food anxiety came close to significance ( $p=0.062$ ). The results were confirmed by multiple regression analysis showing that proven vs. perceived FHS did not significantly predict HRQL when correcting for all confounding factors previously identified (table 4).

## **Discussion**

HRQL is an important factor to take into account in the management of those with FHS. We compared the HRQL of ten-year-old children who had a previous diagnosis of FHS vs. those that were avoiding a food due to perceived symptoms but no formal diagnosis. We have found that in both these groups, those families where the mothers had a lower education (schooling up to 16 years of age), a maternal reported history of food allergy or the child had a history of systemic reactions, had a poorer mean overall HRQL. The emotional impact domain was affected by a maternal history of food allergies and a history of systemic reactions. Food anxiety was influenced by lower maternal and paternal education, a history of systemic reactions, number of foods reported and a nut allergy. The final domain, Social and Dietary Limitations, was affected by a maternal history of food allergy and a history of previous systemic reactions. In summary, the two main factors affecting HRQL in the child were maternal history of food allergy affecting 3 domains and a history of systemic reactions, affecting all four domains.

Using basic descriptive statistics, the two groups significantly differed in terms of a maternal history of allergy, IgE vs. non-IgE mediated allergy, seen a dietitian in the past, suffering from a nut allergy, previous systemic reactions or carry emergency medicine. However, proven vs. perceived FHS did not

significantly predict HRQL when correcting for confounding factors. In addition, our mean values for HRQL in the proven and perceived group was similar to those reported by van der Velde et al. (24), indicating that our group of patients are representative of an allergic population (8-12 years).

The role of having a clear diagnosis on the HRQL of those suffering with FHS have previously been reported by Zilstra et al.(6) and Van der Velde et al(7). These two studies looked at a change in HRQL before and after a food challenge in the same group of participants. Our study differs from these in that we have looked at two different groups of children: one group with a diagnosis and one group with perceived symptoms only. We are therefore the first study to our knowledge looking at HRQL in two different groups and how they compare.

We were aware that certain factors may be confounders and affect the study outcomes and we have corrected for these. There were differences in both global score and food anxiety score between parents of lower and higher maternal education level. Food anxiety scores were also higher when parents reported a lower paternal education level than those of higher level. This may reflect to some extent the parental food anxiety of not fully understanding the FHS and how to manage these. The parent's experience of heightened anxiety could lead to unhelpful responses to perceived risk such as modelling avoidance or reinforcement of the child's anxious behaviour, increasing the risk of the child developing anxiety (25).

A maternal history of allergic disease at recruitment, or a sibling with FHS did not affect the HRQL score, but a maternal history of food allergies at 10 years did. Wassenberg et al.(26) showed that children of an allergic mother, or allergic siblings had a worse quality of life than those without. It is difficult to explain these differences but it may be that a maternal history of food allergy is a more important factor in the child's HRQL than just a history of all allergic disease such as eczema, asthma and hay fever. Wassenberg et al. (26) only reports about the "atopic mother" and it is unclear how many of these mothers actually had a history of food allergies vs. other allergic manifestations.

Interestingly, HRQL scores did not differ between families where the child had seen a dietitian and those who had not. None of the children in the perceived group were seen by a dietitian previously. As the role of the dietitian is so crucial in providing information and support to families as reported by us (27), one does question if this might have had an effect on comparing the two groups. There are two ways of interpreting this data: having seen a dietitian might have improved the HRQL in those with diagnosed food allergies in order to be similar to the perceived group or that if those with perceived food allergies did see a dietitian, their HRQL might have been greater than the diagnosed group.

Families where children avoided more than two foods had a higher food anxiety score than those of children avoiding 1-2 foods. This supports a previous study by Wassenberg et al. (26). An interesting finding was that those with IgE mediated food allergies did not differ to those with non-IgE mediated

reactions. This is probably due to the fact that the current HRQL scores are focused on IgE mediated food allergies and do not provide questions covering issues such as constant itching, sleepless nights, food refusal, faltering growth, hypovolemic shock and the difficulties of avoiding foods outside of the known food allergen list <sup>(28)</sup>.

An expected finding was that the HRQL in all four domains of families where the child had a history of systemic reactions differed to those where the child never experienced a systemic reaction. Similarly it was not surprising that families of children with nut allergies had higher food anxiety levels than those of children with other food allergies. Dunngalvin et al. <sup>(29)</sup> has previously reported that the main fear parents of children with food allergy have is the death of their child and that peanut allergy particularly drives maternal fear. Although our questionnaire was completed by parents to reflect the child's quality of life, this may be true for children as well <sup>(26;30)</sup>.

In this sample there were no differences between the two groups with proven or perceived FHS. One limitation of the study is that all but one in the proven group had had continuous support from an allergy dietitian and none in the perceived group. The FAQLQ-PF is developed primarily with IgE mediated allergies in mind. However, in the absence of a validated tool to measure non-IgE mediated allergies or food intolerances specifically, it was used in this study. Future research should measure the validity of using this tool with non-IgE mediated allergies and perhaps the development of a specific tool to measure quality of life for this type of allergy as well as food intolerances.

Another limitation as reported by van der Velde et al.<sup>(24)</sup> is that parents report significantly less impact of food allergy on the child's HRQL than children themselves, although this may not always be the case <sup>(31)</sup>. This may indicate that in some cases parents tend to underestimate their child's HRQL impairment.

The strength of the study is that this is the first time that two different groups of children with perceived vs. proven FHS were compared. In future two such groups with more similarities should be compared.

In conclusion, we have found that having a clear diagnosis of FHS is not an independent predictor of HRQL, but that HRQL in families can be influenced by maternal history of food allergies, maternal education level and a history of systemic reactions. Future studies are required comparing two more similar groups with particular reference to the mechanisms (IgE vs. non-IgE mediated) triggering the adverse reactions. Validated questionnaires for non-IgE mediated food allergies and food intolerances are needed. We also need to focus more on the effect of continuous input and support from an allergy specialist dietitian and other members of the multi-disciplinary team on HRQL.



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**Table 1: Characteristics of those with proven or perceived FHS (n=41)**

	<b>Diagnosed (n=25) N(%)</b>	<b>Perceived (n=16) N(%)</b>	<b>p-value (Fisher's exact)</b>
Girls:Boys	15:10	10:6	
Maternal history of allergic disease*(recruitment)	17 (68)	1 (6.3)	<i>P= 0.00</i>
Maternal history of food allergies at 10 year follow-up	5 (20)	3/15 (20)**	<i>P=1.00</i>
Maternal education (recruitment)			<i>P=1.00</i>
- School	7 (28)	5 (31.2)	
- Further	11 (44)	9 (56.2)	
- Higher	7 (28)	1 (6.3)	
- <u>Missing</u>	0	1 (6.3)	
Paternal education (recruitment)			<i>P=1.00</i>
- School	7 (28)	5 (31.2)	
- Further	10 (40)	6 (37.5)	
-Higher	7 (28)	3 (18.8)	
- Don't Know	1 (4)	2 (12.5)	
First born	16 (64)	5 (31.3)	<i>P=0.06</i>
Ige: Non-IgE			<i>P=0.00</i>
- IgE	16 (64)	0	
- Non-IgE /intolerance	6 (24)	15 (93.8)	
- Both	3 (12)	1 (6.2)	
Seen a dietitian in past	24 (96)	0	<i>P=0.00</i>
Number of foods involved – reported by a HCP			Not applicable
1-2 foods	17 (68)	16 (100)	
3-6 foods	1 (4)	0	
7-10 foods	6 (24)	0	
>10 foods	1 (4)	0	
Number of foods involved – reported by parents (used for further analysis)			Not applicable
0-2 foods	11 (44)	15 (93.8)	
3-6 foods	1 (4)	0	
7-10 foods	12 (48)	1	
>10 foods	1 (4)	0 (6.2)	
Sibling with FHS at 10 year follow-up	6/21 (28.6)	5/15 (33.3)	<i>P=1.00</i>
Suffering from a nut allergy	11 (44)	0	<i>P=0.003</i>
Previous systemic reaction	7 (28)	0	<i>P=0.031</i>
Issued with an adrenaline auto-injector	15 (60)	0	<i>P=0.000</i>

HCP=health care professionals; FHS=food hypersensitivity

\* reported history of asthma, eczema, hay fever or food allergies at recruitment

\*\* data on maternal history of allergic disease was available for 15/16 of the mothers in this group

The denominator changed due to missing data to some of the questions.

Table 2: Factors affecting HRQL in both groups

	Category	Global Score					Emotional Impact					Food Anxiety					Social and Dietary Limitations				
		<i>N</i>	Mean (SD)	<i>t</i>	df	p-value	<i>N</i>	Mean (SD)	<i>t</i>	df	p-value	<i>N</i>	Mean (SD)	<i>t</i>	df	p-value	<i>N</i>	Mean (SD)	<i>t</i>	df	p-value
<b>All groups</b>	na	37	2.54 (1.31)	na	na	na	41	2.30 (1.18)	na	na	na	40	2.54 (1.40)	na	na	na	38	2.79 (1.61)	na	na	na
<b>Sex</b>	Female	19	2.78 (1.38)	-1.14	35	0.260	20	2.53 (1.27)	-1.25	39	0.219	19	2.82 (1.47)	-1.20	38	0.238	20	2.95 (1.73)	-0.63	36	0.532
	Male	18	2.29 (1.21)				21	2.07 (1.07)				21	2.29 (1.33)				18	2.62 (1.50)			
<b>Education mother</b>	Lower	12	3.16 (1.34)	2.08	35	0.045	13	2.76 (1.30)	1.77	39	0.085	13	3.31 (1.54)	2.57	38	0.014	12	3.54 (1.61)	2.02	36	0.051
	Further/Higher	25	2.24 (1.21)				28	2.08 (1.08)				27	2.17 (1.20)				26	2.45 (1.52)			
<b>Education father</b>	Lower	11	3.14 (1.80)	1.75	32	0.090	12	2.85 (1.61)	1.83	36	0.075	12	3.23 (1.80)	2.20	35	0.034	11	3.42 (2.17)	1.43	33	0.161
	Further/Higher	23	2.30 (1.01)				26	2.10 (0.92)				25	2.21 (1.03)				24	2.56 (1.35)			
<b>Child with food allergy first born</b>	Yes	19	2.64 (1.21)	-0.50	35	0.622	21	2.37 (1.11)	-0.38	39	0.703	20	2.73 (1.26)	-0.84	38	0.406	20	2.77 (1.62)	0.08	36	0.936
	No	18	2.43 (1.43)				20	2.22 (1.28)				20	2.35 (1.55)				18	2.81 (1.64)			
<b>Mother with hay fever, asthma, rash or food allergy</b>	Yes	25	2.69 (1.37)	1.01	35	0.319	28	2.44 (1.26)	1.14	39	0.260	27	2.66 (1.42)	0.78	38	0.444	26	2.93 (1.67)	0.85	36	0.440
	No	12	2.23 (1.17)				13	1.99 (0.97)				13	2.29 (1.39)				12	2.49 (1.49)			

	Global Score					Emotional Impact					Food Anxiety					Social and Dietary Limitations	
	Category	<i>N</i>	Mean (SD)	<i>t</i>	<i>p</i> -value	<i>N</i>	Mean (SD)	<i>t</i>	<i>p</i> -value	<i>N</i>	Mean (SD)	<i>t</i>	<i>p</i> -value	<i>N</i>	Mean (SD)	<i>t</i>	<i>p</i> -value
<b>Number of allergens (parent report)</b>	0-2	24	2.27 (1.27)	-1.75	0.089	26	2.10 (1.21)	-1.42	0.165	25	2.07 (1.17)	-3.02	0.005	25	2.60 (1.62)	-1.02	0.313
	>2	13	3.04 (1.28)			15	2.64 (1.09)			15	3.34 (1.44)			13	3.16 (1.59)		
<b>Number of allergens (HCP report)</b>	0-2	30	2.41 (1.30)	-1.28	0.208	33	2.18 (1.16)	-1.33	0.193	32	2.41 (1.44)	-1.15	0.257	31	2.67 (1.59)	-0.95	0.346
	>2	7	3.10 (1.30)			8	2.79 (1.21)			8	3.05 (1.20)			7	3.32 (1.70)		
<b>IgE or non-IgE mediated food allergy</b>	IgE	13	2.61 (1.08)	-0.50	0.589	16	2.26 (0.79)	-0.38	0.930	16	2.93 (1.36)	-0.84	0.085	13	2.67 (1.39)	0.08	0.874
	Non-IgE	21	2.37 (1.32)			21	2.23 (1.30)			21	2.17 (1.23)			21	2.76 (1.71)		
<b>Previous systemic reactions (missing values = no)</b>	Yes	7	3.65 (1.15)	2.72	0.010	7	3.25 (1.19)	2.50	0.017	7	3.82 (1.49)	2.91	0.006	7	4.08 (1.25)	2.50	0.017
	No	30	2.28 (1.22)			34	2.10 (1.10)			33	2.27 (1.25)			31	2.50 (1.55)		
<b>Having seen a dietician (missing values = no)</b>	Yes	20	2.85 (1.17)	1.61	0.116	24	2.43 (0.97)	0.83	0.410	23	2.89 (1.45)	1.88	0.067	21	3.15 (1.52)	1.57	0.126
	No	17	2.17 (1.40)			17	2.11 (1.44)			17	2.07 (1.23)			17	2.35 (1.65)		

	Category	Global Score					Emotional Impact					Food Anxiety					Social and Dietary Limitations				
		<i>N</i>	Mean (SD)	<i>t</i>	<i>p</i> -value	<i>N</i>	Mean (SD)	<i>p</i> -value	<i>N</i>	Mean (SD)	<i>p</i> -value	<i>N</i>	Mean (SD)	<i>p</i> -value	<i>N</i>	Mean (SD)	<i>p</i> -value				
<b>Mother with food allergies</b>	Yes	7	3.83 (1.62)	3.38	34	0.002	8	3.41 (1.65)	3.44	38	0.001	8	3.38 (1.60)	1.98	37	0.056	7	4.60 (1.64)	4.12	35	0.000
	No	29	2.19 (1.03)				32	1.99 (0.86)				31	2.30 (1.31)				30	2.30 (1.25)			
<b>Siblings with food allergies</b>	Yes	9	2.79 (1.36)	0.67	30	0.507	11	2.55 (1.31)	0.81	34	0.424	10	2.44 (0.97)	-0.26	33	0.794	10	2.97 (1.78)	-0.52	31	0.604
	No	23	2.43 (1.35)				25	2.19 (1.21)				25	2.58 (1.59)				23	2.65 (1.53)			
<b>Nut allergies</b>	Yes	9	3.00 (1.07)	1.24	35	0.225	11	2.49 (0.82)	0.63	39	0.533	11	3.36 (1.38)	2.43	38	0.020	9	3.19 (1.35)	0.84	36	0.409
	No	28	2.39 (1.36)				30	2.23 (1.29)				29	2.22 (1.30)				29	2.67 (1.68)			

*t*, test statistics. *df*, degrees of freedom. *na*, Not applicable, HCP=health care professionals  
The denominator changed due to missing data to some of the questions.

Table 3: Comparisons of quality of life scores between diagnosed and perceived food allergic Children: Food Allergy Quality of Life Questionnaire – Parent form

	Diagnosed		Perceived		<i>p-value</i> *
	<i>N</i>	Mean (SD)	<i>N</i>	Mean (SD)	
<b>Global Score</b>	21	2.80 (1.16)	16	2.19 (1.44)	0.162
<b>Emotional Impact</b>	25	2.39 (0.97)	16	2.15 (1.48)	0.543
<b>Food Anxiety</b>	24	2.88 (1.42)	16	2.03 (1.26)	0.062
<b>Social and Dietary Limitations</b>	22	3.09 (1.52)	16	2.39 (1.70)	0.191

\**p*-values were obtained from two-sided *t*-tests

The denominator changed due to missing data to some of the questions.

Table 4: Multiple regression for relationship between Quality of Life Scores and diagnosed – perceived food allergy

	<i>N</i>	Regression coefficient	95%CI	<i>p</i>	<b>R<sup>2</sup></b>
<b>Global Score<sup>1</sup></b>	36	-0.297	-1.011, 0.418	0.404	0.544
<b>Emotional Impact<sup>2</sup></b>	40	0.064	-0.607, 0.736	0.847	0.412
<b>Food Anxiety<sup>3</sup></b>	37	-0.130	-1.049, 0.789	0.775	0.437
<b>Social and Dietary Limitations<sup>4</sup></b>	38	-0.233	-1.345, 0.878	0.673	0.153

<sup>1</sup>adjusted for education mother, previous systemic reactions, mother with food allergies

<sup>2</sup>adjusted for previous systemic reactions, mother with food allergies

<sup>3</sup>adjusted for education mother, education father, number of allergens, previous systemic reactions

<sup>4</sup>adjusted for previous systemic reactions