Impact of Peanut Allergy on Quality of Life, Stress and Anxiety in the Family

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Short title: Impact of peanut allergy on a family's quality of life

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ABSTRACT

Background: Peanut allergy (PA) is known to impact on quality of life (QoL) of the sufferer, but little research has focused on all family members. We therefore sought to establish the impact of PA on QoL and reported anxiety of children with clinically confirmed PA, their parents and older siblings.

Methods: 46 families, who had a child with PA, completed QoL, (PedsQL^{TM} or WHOQOL-BREF), anxiety (SCAS or STAI) and perceived stress (PSS) scales. PA children completed a PA specific QoL questionnaire (Avery, 2003). Parents and sibling also completed QoL proxy questionnaires for the PA child (PedsQL^{TM}, Avery 2003).

Results: Mothers rated their own psychological ($p<0.01$) and physical ($p<0.05$) QoL significantly worse than fathers rated theirs, and had higher scores than fathers for anxiety ($p<0.05$) and stress ($p<0.001$). Children with PA had significantly poorer physical health related QoL ($p<0.05$), QoL within school ($p<0.01$) and general QoL ($p<0.05$) than their siblings did and greater separation anxiety ($p<0.05$). The majority of differences were between girls with PA and female siblings. Mothers felt that there was a greater impact on QoL for their PA child, compared with that reported by siblings, fathers or the PA children themselves ($p<0.01$).

Conclusions: Mothers report that they have significantly poorer QoL and suffer more anxiety and stress than fathers do; this inter-parental difference may be an important feature of family stress caused by PA. Siblings have a similar view of how QoL affects the PA child as the PA child does, while mothers may possibly overestimate this impact.

Key words: family, gender, peanut allergy, quality of life.

Introduction

Food allergy affects around 6% of school children (1,2) and can have severe consequences, including fatal anaphylactic reactions (3). Current treatment focuses on prevention of anaphylaxis by avoidance of trigger foods. When accidental ingestion does occur the symptoms may be acute and severe and require emergency treatment. Food allergy can therefore have a significant impact on psychosocial aspects of quality of life (QoL) (4), extending beyond the immediate clinical effects of the patient's allergic condition. For example dietary restrictions may compromise social activities such as dining out or attending social functions and necessitate careful reading of food labels (5) and the daily activities of families caring for a child with food allergy can be affected (6).

Sicherer et al (7) found that food allergy in children had a significant impact on parental perception of general health, emotional impact on the parent and subsequent limitation of family activities, using a children's health questionnaire to look at health related QoL. However, other areas of QoL such as environment or social welfare were not investigated and 93% of the parents completing the questionnaire were mothers of the allergic child and so father's perspectives were not fully considered. Primeau et al (8) showed that families of children with peanut allergy experienced significantly more disruption in familial and social interactions than families of a child with chronic rheumatological disease. They suggested this may be due to the constant fear of sudden death from anaphylactic reaction in the peanut allergic group, leading to parental restriction of activities. Again only adults were asked to complete the questionnaires and it is questionable whether rheumatological disease is a suitable comparison group for peanut allergy in both its symptomatology and management.

The only study that has investigated QoL from a food allergic child's perspective asked children with peanut allergy and children with insulin dependent diabetes mellitus (IDDM) to report their own QoL using a questionnaire specifically developed for the study. In this study children with peanut allergy reported poorer QoL than children with IDDM, and they described more fear and anxiety about managing their allergy than the IDDM group did about managing their diabetes (9).

The primary aim of the present study was to investigate the impact on QoL and anxiety reported by a child with peanut allergy and by their immediate family members. There is evidence in the literature that proxy ratings of parents and teachers of variables such as depression, anxiety, well-being and emotional and social health-related quality of life are different to the ratings of the children themselves (10,11,12,13) although no studies have examined differences in sibling ratings. This study therefore also sought to measure the differences in the perception of QoL between both parents and older sibling of the child with peanut allergy compared to the child with peanut allergy's own perceptions, using validated QoL scales.

Methods

Design

This was a cross-sectional questionnaire study, measuring quality of life, anxiety and stress. The study gained ethical approval from Southampton and South West Hampshire Local Research Ethics Committee (LREC number 04/Q1701/53).

Participants

Each family included in the study had to have a child with clinically confirmed peanut allergy (PA) age 8-12, at least one older sibling (15 years and under), living in the family home with no personal history of food allergy or intolerance, and both biological parents living at home, with no personal history of food allergy or intolerance. All family members included in the study had to be living in the family home in order for there to be parity in completion of proxy quality of life measures. No allergy or intolerance in other family members ensured that this would not affect scores on measured variables.

The diagnosis of PA was made by a pediatric allergy consultant using similar criteria to Fleischer et al (14). All PA children had to have a history of exposure to peanut resulting in typical acute allergic symptoms (participants who had never knowingly reacted to peanut were excluded) and positive skin prick test (SPT) or specific Immunoglobulin E (SpIgE). The most common peanut-induced symptoms were angioedema (reported by 43% of children), followed by difficulty breathing (39%), urticaria (37%) and nausea or vomiting (24%).

All children (apart from one who had SpIgE measured only) had SPT results ranging from 6mm to17mm wheals (average 8mm). In 20 cases blood was also taken for

SpIgE, resulting in ranges from 0.38 to >100UA/L; four children also had positive

food challenges. Given these results there is a very high likelihood of reactivity in

these children (15,16).

All children with PA were avoiding peanut at the time of the study and had been

prescribed oral antihistamine for mild to moderate allergic reactions and self-

administered intramuscular epinephrine for anaphylaxis. All families had instruction

on recognition and management of allergic reactions and the use of self-administered

epinephrine from one experienced allergy nurse (RMK).

Materials

State-Trait Anxiety Inventory (STAI) (17) is a 40-item self-report measure split into

two sections of 20 questions scored 1-4, which measure state (how you feel generally)

and trait (how you feel right now) anxiety. The higher the score on the STAI the

higher the level of anxiety (minimum score 20; maximum 80 for each section). Mean

normative scores for a healthy adult U.S. population are shown in Table 1. There is

excellent internal consistency for the state and trait anxiety sections of the scale

(Cronbach's α > .90, > .89 respectively) (17).

Perceived Stress Scale - 14 (PSS-14) (18) is a 14-item self-report measure which asks

about thoughts and feelings in the last month and includes items such as 'In the last

month, how often have you dealt with irritating life hassles?' Items are measured on a

Likert scale scoring 0 (never) to 4 (always) with a higher score indicating greater

perceived stress. Cohen and Williamson (19) have suggested that in an adult healthy

U.S. population scores range between 0 and 45, with a mean of 19.62 (Table 1). This

measure has good internal consistency (Cronbach's α = .84) (19).

The World Health Organisation QoL Scale (Brief version) (WHOQOL-BREF) (20) is a 26 item QoL scale, using a 1 to 5 Likert scale, which measures four major domains: physical, psychological, social relationships and environment.   Raw scores are computed into transformed scores with a range of 4 to 20. There are also two one-item questions, which look at overall quality of life and satisfaction with health and have a score range of 1 to 5 on each. A higher score on this scale relates to better quality of life. The scale has good reliability for physical health, environmental and psychological domains (alphas range from 0.80 to 0.82) but only marginally good for the social relationships domain (0.68). Norm data for a U.K. adult healthy population adjusted for age and sex (20) are reported in Table 1.

Pediatric QoL Inventory 4.0 (PedsQL[TM]) (21) is a 23-item self-report generic quality of life scale with developmentally appropriate self-report forms for children (age 8 to 12) and adolescents (age 13 to 18), and proxy-report forms for parents. It is designed for use in the community, school and clinical paediatric populations and with healthy children or those with acute or chronic disorders. The PedsQL[TM] 4.0 measures physical, emotional, social and school functioning and provides a total scale score, a physical health summary score and a psychosocial health summary score, with children rating on a five-point Likert scale (never, almost never, sometimes, often, almost always) how often they experience things. Each sub-scale and composite scale is marked out of 100 and higher scores represent a better quality of life. All scales have good reliability for the total scale score, with alphas over 0.85 for the self and proxy versions and the scale has been validated against children with asthma (22) and diabetes (23). Norm data for 699 healthy U.S. children aged 5-16 years (24) are reported in Table 2.

The QoL questionnaire for children with PA (9) is an unvalidated 25 item self-report measure, developed for children aged 8 and over. Children are asked to rate how often things happen to them using a Likert scale, ranging from never (scored 1) to always (scored 4); scores range from 25 to 100 with a higher score indicating a poorer QoL. It includes items such as 'people treat me differently because of my peanut allergy' and 'I worry about going to school because of my peanut allergy'. For this sample the scale demonstrated good internal consistency with alpha of 0.78 for the self-administered version and 0.75-0.79 for the proxy versions.

Spence Child Anxiety Scale (SCAS) (25) is a self-report scale which has been developed specifically for children aged 8 upwards and consists of 38 anxiety items. It provides an overall measure of anxiety together with six sub-scale scores measuring panic attack and agoraphobia, separation anxiety, physical injury fears, social phobia, obsessive compulsive, generalised anxiety disorder/overanxious disorder; higher scores represent greater anxiety. Children rate on a four-point Likert scale – never, sometimes, often or always – how often something happens to them. The scale has high internal reliability with an alpha of 0.92 and a Guttman split-half reliability of 0.90. Test-retest reliability was 0.51 on children tested after 6 months. Norm data based on a sample of 2,052 healthy Australian children age 8-12 (26) are reported in Table 2.

Procedure

Families were recruited from the paediatric allergy clinic at Southampton University Hospital, UK. Informed written consent was obtained from each family member participating in the study. The questionnaires with instructions on how to complete

them were sent home via the attending child and parent, with a stamped addressed

envelope for their return. The PA child was asked to complete the peanut food allergy

quality of life questionnaire (9), the PedsQL^{TM} and the SCAS. The sibling was asked

to complete the PedsQL^{TM} and the SCAS for themselves and the Avery scale and

PedsQL^{TM} as a proxy measure for the PA child. Parents were asked to complete the

STAI, the PSS and the WHOQOL-BREF for themselves and the Avery scale and

PedsQL^{TM} as a proxy measure for the PA child. Parents were specifically directed not

to help children complete the questionnaires but to let them fill in the questionnaires

on their own and not influence the answers from the children. Data was collected

between August 2004 and July 2006.

Data analysis

Statistical analyses were conducted using SPSS for Windows, (version 14, SPSS,

Illinois, USA). Differences between parents, siblings and the children with PA were

analysed using paired samples or independents samples t-tests and MANOVA where

appropriate. Repeated measures ANOVA was conducted on measures that were

directly comparable (the generic quality of life scale and the food allergy specific

quality of life scale) in order to analyse differences between scores within each family

unit. All tests carried out were 2-tailed and significance level was set at $p<0.05$. Post

hoc power calculations showed the study to have 0.7 power to detect medium to large

effect sizes between two groups and 0.8 power to detect medium to large effect sizes

between four groups.

Results

Fifty-six families were approached to take part and 46 families completed all
questionnaires (a response rate of 82%). Of those who took part 35% of PA children
were girls (n = 16, mean age 10 years, s.d. = 1.6) and 65% were boys (n = 30, mean
age 9.6 years, s.d. = 1.3). For the siblings 63% were girls (n = 29, mean age 12.8
years, s.d. 1.5) and 37% were boys (n =17, mean age 13 years, s.d. 1.2).   Fathers'
mean age was 45.33 years (s.d. = 4.42) and mothers' was 42.59 years (s.d. = 4.46);
57% of both mothers and fathers had been educated to tertiary level, 41% had been
educated to secondary level.

66.7% (n=30) of PA children reported other food allergies including tree nut allergy
(n=24); egg (n=9); fruits (n=6); legumes (n=3) and wheat or soy (n=2). 80% (n=36)
of PA children had other atopic conditions (69.5% asthma; 54.3% eczema; 47.8% hay
fever). 15.6% (n=7) reported having to use their Epi-Pen in an emergency and 40%
(n=18) had been admitted to an accident and emergency department due to a food-
induced reaction.

Parental Ratings

Mothers scored significantly higher than fathers on state anxiety ($t(89)=-2.13$,
$p=0.04$), trait anxiety ($t(88)=-3.33$, $p=0.001$) and perceived stress ($t(89)=-4.23$,
$p<0.001$). Mothers' trait anxiety ($t(45)=3.52$, $p<0.001$) and stress ($t(45)=5.60$,
$p<0.001$) were also significantly higher than norm means, while fathers' state anxiety
was significantly lower ($t(44)=-2.26$, $p<0.05$). Mothers rated their psychological QoL
($t(90)=3.16$, $p=0.002$) and physical QoL ($t(90)=2.08$, $p=0.04$) as significantly worse
than fathers (see Table 1). However, mothers and fathers reported significantly better
quality of life than the norm means for all quality of life sub-scales (apart from

psychological quality of life in mothers, where there was no significant difference) (Table 1).

Comparisons between all children with PA and their siblings

Children's anxiety scores were significantly lower than published norms on all subscales apart from separation anxiety and physical injury for children with PA, where there was no significant difference. However, children with PA did rate separation anxiety as significantly higher than their siblings (t(85)=2.39, p=0.02) (Table 2).

Children with PA had poorer emotional QoL (t(44)=-2.11, p<0.05) and psychosocial health (t(44)=-2.05, p<0.05) than the norm means. They also rated physical health related QoL (t(87)=-2.31, p=0.02), QoL within school (t(87)=-2.64, p=0.01) and total QoL (t(87)=-2.02, p=0.05) as significantly poorer than their siblings (Table 2). Siblings however reported better physical health related QoL (t(43)=5.59, p<0.001), QoL within school (t(43)=2.09, p<0.05) and overall QoL (t(43)=2.03, p<0.05) than the norm means (Table 2).

Comparisons between girls and boys with PA

Girls with PA had significantly higher scores for anxiety over physical injury than boys with PA (t(43)=-3.76, p=0.001) (Table 3). There were no other significant differences for anxiety or quality of life.

Comparisons between girls with PA and female siblings

Girls with PA had significantly higher scores for separation anxiety (t(39)=2.35, p=0.02) and anxiety over physical injury, than female siblings (t(39)=2.10, p<0.05).

They also rated QoL in school (t(40), -1.96, p=0.05), physical health related QoL (t(40), -2.36, p=0.02) and total quality of life as significantly worse than female siblings (t(45), -2.09, p<0.05), (Table 3).

Comparisons between boys with PA and male siblings

There were no significant differences in anxiety ratings between boys with PA and male siblings, but boys with PA did rate QoL in school as significantly worse than male siblings (t(45), -2.05, p<0.05) (Table 3).

Comparisons on allergy-related parameters

There were no significant differences in anxiety or QoL ratings for PA children who had multiple food allergies compared to those who only had peanut allergy; nor were there any significant differences for those who had been admitted to an accident and emergency department or not. PA children who reported having to use their Epi-Pen in an emergency did have significantly poorer health-related quality of life (mean=75.90, s.d.=16.10) compared to those had not used their Epi-pen (mean=88.23, s.d.=13.20), t(43)=-2.20, p<0.05 and poorer emotional quality of life (mean=65.00, s.d.=17.32) than those who had not used their Epi-Pen (mean=78.16, s.d.=14.68), t(43)=-2.12, p<0.05. PA children who had other atopic conditions did not have significantly different anxiety ratings to those who had no other atopic conditions, but they did report poorer QoL on all of the PedsQL^{TM} sub-scales apart from school-related QoL (F(1,43)=6.807, p<0.01) (Table 4).

Siblings of PA children with multiple food allergies reported greater general anxiety (mean=5.11, s.d.=3.47) than siblings of PA children with only peanut allergy (mean=2.64, s.d.=2.41), t(40)=2.38, p<0.05. There were no differences in anxiety,

stress or QoL ratings of parents of children with multiple food allergies or other atopic conditions compared to parents of children with peanut allergy only, or those with no other atopic conditions. Nor were there any differences in ratings of parents of children who had used their Epi-pen in an emergency or not. However, mothers of children who had been admitted to an accident or emergency department reported significantly higher state anxiety (mean=38.83, s.d.=11.29) than those who had not been admitted (mean=31.92, s.d.=8.57), t(44)=2.35, p<0.05.

Self and proxy-ratings differences

A MANOVA was conducted to compare self and proxy quality of life scores for the peanut allergic child on the scale developed by Avery et al. (9) and the PedsQL^{TM} sub-scales, however, no significant differences were found (F=1.49, p=0.076 using Pillai's Trace statistic). MANOVA only compares across groups (i.e. PA child, sibling, mother and father), therefore repeated measures ANOVAs were conducted to compare scores within family units for the directly comparable quality of life measures. For the peanut allergy specific quality of life scale, mothers rated their child with PA's QoL significantly worse (mean=54.54, s.d.=7.44) than the child's own ratings (51.07, s.d.=7.48) and the proxy ratings of the sibling (mean=50.73, s.d.=7.17) and father (mean=51.27, s.d.=7.43), (F(3,120)=4.07, p=0.009).

There was one significant difference between the self and proxy scores for the generic QoL scale; children with PA and their siblings rated the child with PA's emotional QoL as significantly better (child with PA mean =75.71; sibling mean = 77.77) than the mother (mean =68.57) or father (mean =71.43), (F(3.123)=4.07, p=0.006).

Discussion

We assessed quality of life, anxiety and stress in families with a peanut allergic child, and examined whether family members had a similar view of the impact of peanut allergy on the quality of life of the peanut allergic child. Mothers reported greater anxiety and stress than fathers did and their trait anxiety and perceived stress levels were significantly higher than reported norm mean values for these scales, while fathers' scores were more in line with or lower than norm scores (17,19). The mother traditionally has a greater role in buying and preparing food and so greater stress and anxiety may be caused by mothers taking more responsibility for reading food labels and making the decisions regarding what food is safe for her child to eat, which is often difficult due to inadequate labelling of allergenic foods (27).

Mothers reported significantly poorer psychological and physical quality of life than fathers, however in general both parents reported better quality of life than the norm scores of a healthy U.K. population (20). It may be that peanut allergy does not have a large impact on generic (as opposed to peanut-allergy specific) quality of life in parents. Families with a child with food allergy have been found to have greater family cohesion (7,28) and have reported receiving significant support from spouses and the extended family (29), which may also partially account for the better QoL scores.

The parental differences in stress, anxiety and quality of life reported in the present study support the findings of previous research of parents of children with other chronic illnesses such as asthma and diabetes. Poorer well-being, general health, quality of life and higher levels of depression and post-traumatic stress disorder have all been found in mothers compared to fathers (30,31,32).   Thus our findings add to the growing literature supporting a gender difference in the parental impact of child chronic illness. The difference between the perceived impact from mothers and fathers may lead to greater family tension and eventually poorer health outcomes for all family members and should be taken into account by health care professionals. Divorce rates are higher in parents of children with a chronic illness or disability, compared to those with healthy children (33). Therefore marital distress arising from differences in perceptions concerning food allergy must be addressed, possibly with the aid of an integrated family therapy approach which has been suggested to be helpful for parents with chronically ill children (34).

Peanut allergic children's generic quality of life scores were generally poorer than healthy children's norms for this scale, whereas siblings generally reported better quality of life than the norm scores (24). PA children with other atopic conditions also reported poorer QoL than PA children with no other atopic conditions. The impact of peanut allergy on general health-related quality of life has been reported elsewhere; however in previous studies the parents have been asked to assess the impact on quality of life experienced by their allergic child (7,8,28). The present study has demonstrated a similar impact when asking the allergic children directly. For anxiety both the peanut allergic child and the siblings rated their anxiety levels as significantly lower than most of the norm means for healthy children for this scale (26). Thus, peanut allergy may not be significantly adversely affecting general

anxiety levels in these children. However, the norm data are over ten years old and unfortunately not based on U.K. children and it is unclear how far they can be generalised to children in this study.

Encouragingly, few significant differences between peanut allergic children and siblings were found in this study. Children with peanut allergy did report greater separation anxiety than their siblings, possibly arising from a fear of having to manage their food allergy by themselves with no family help. It is important that children with peanut allergy develop self-care behaviours and take more responsibility for their own allergy risk assessments as they grow up (35), especially in adolescence, a time when children are most at risk of having anaphylactic reactions after accidental exposure to food allergens (3,36,37,38). Fostering these behaviours in younger children while counselling mothers regarding ways in which they could do this may help reduce anxiety levels. Children with food allergy also reported greater impact on school related quality of life than their siblings. Again, managing their food allergy away from the care of the family home may be a contributory factor. Having to carry medication and the possible isolation from not being able to eat school dinners may also be making children feel different from their peers, an issue that has been previously reported in the literature (36,39).

Research on siblings of chronically ill children has rarely focused on comparisons of siblings with their chronically ill brother or sister (40). When compared to comparison groups or normative data a meta-analysis of the psychosocial impact on siblings of children with a chronic illness showed a small but negative effect size (41); a finding at variance with the results from this study. However, none of the studies included in the meta-analysis analysis had examined children with allergy. The

gender differences in anxiety and quality of life found in this study have rarely been examined in the literature. Indeed sex and gender in food allergy has been under-researched in general (42). The little research that has reported comparisons of gender in children with chronic illness and healthy siblings found no significant differences (43), yet the findings in the present study indicate that there might be a greater impact on girls with peanut allergy compared to female siblings, rather than boys with peanut allergy. There is therefore a need to further explore the impact food allergy has on the different genders in siblings in relation to the allergic child and to control comparison groups.

Analysis of differences in self and proxy ratings showed that mothers estimated the impact of food allergy on their peanut allergic child as more severe than the allergic child themselves. These differences call into question the findings of studies that have relied solely on proxy measures of the impact of peanut allergy on quality of life of children. It may be that this impact has been overestimated, particularly if mothers have predominantly completed the questionnaires. Proxy ratings have been shown in studies of other childhood chronic illness to exaggerate the impact of psychological distress (10,11,12,13). Nevertheless the reverse is entirely plausible; mothers may have a more realistic view of the true impact of peanut allergy on their allergic child than other family members. Interviews with mothers of food allergic teenagers revealed that they considered the impact of food allergy on day-to-day life to be much greater than their affected children did (44). One possible reason for this was mothers could vividly recall anaphylactic reactions that had occurred when their child was very young, whereas the teenagers themselves had no recollection of a severe reaction. Although PA children in the present study are younger, this may partly explain differences in perceptions. It may also explain why mothers, in the present

study, of children admitted to accident and emergency departments due to food-induced reactions had higher anxiety levels. Before these alternative explanations can be deciphered it is essential that future research focuses on the child's own perceptions as well as that of parents in order to ensure reliable and valid measures of the impact on quality of life are obtained.

There are a number of limitations in this study, which must be considered. Firstly, the study relies on self-report measures, which are subject to social desirability; for example fathers may not have wanted to report high levels of anxiety and stress and adjusted their responses accordingly. The extent to which this occurred in this study is unknown; however, the scores from fathers did span a wide range with some father's scoring very highly on these measures, signified by the large standard deviations on this scale. Social desirability bias may therefore be limited to only a small number of fathers in this study.

A further limitation is the lack of availability of a validated peanut allergy specific quality of life scale at the time of data collection. Differences in proxy ratings found using the un-validated scale therefore need to be treated with caution. The generic scales used had the benefit of allowing comparisons to be made across siblings and between self and proxy ratings. However, they may not be sensitive enough to assess the impact of peanut allergy specifically. Validated food allergy specific QoL scales are therefore needed in order to ascertain the validity of the findings in this study. Two scales in particular (which were unavailable when this study began) would be extremely useful to use in a replication of this study: the Food Allergy Quality of Life – Parental Burden Questionnaire (FAQOL-PB) (45) and the Food Allergy Parent Questionnaire (FAPQ) (29). Finally, the clinic- based nature of this patient group

King 20

means that only a relatively small number of families were recruited and the findings may not be generalisable to the non clinic-based population of allergic families.

In conclusion, clinicians need to be aware of the differing affects of peanut allergy on the whole family. The causes of the differences in impact on parents and on different genders in children require further investigation, alongside ways in which they can be redressed in order to ease the family burden of peanut allergy.

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Table 1. Anxiety (STAI), stress (PSS) and quality of life (WHOQOL-BREF) mean

scores (and standard deviations) for parents, with norm data for healthy adults

Domain	Mothers	Fathers	Norm Data
	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)
State anxiety	34.63^{a} (10.19)	30.42^{ac} (8.54)	33.3^{c} (9.5)
Trait anxiety	39.04^{ab} (12.04)	31.77^{a} (8.24)	32.8^{b} (8.3)
Perceived stress	25.13^{ab} (6.67)	19.62^{a} (5.71)	19.62^{b} (7.49)
WHOQOL-BREF			
Overall QoL	4.30 (0.63)	4.15 (0.63)	Not available
Satisfaction with health	3.85 (0.92)	4.02 (0.71)	Not available
Physical	16.65^{ab} (2.02)	17.46^{ac} (1.67)	15.8^{bc} (3.8)
Psychological	14.61^{a} (2.08)	15.85^{ac} (1.66)	14.7^{c} (3.4)
Social	15.63^{b} (2.33)	15.46^{c} (2.83)	14.2^{bc} (3.5)
Environmental	15.85^{b} (2.08)	16.07^{c} (2.10)	14.1^{bc} (2.3)

[a] = p<0.05 for comparisons between mothers and fathers; [b] = p<0.05 for comparisons

between mothers and norms; [c] = p<0.05 for comparisons between fathers and norms

Table 2. Anxiety (SCAS) and quality of life (PedsQL^TM) mean scores (and standard deviations) for allergic children and siblings, with norm data for healthy children

Domain	Allergic children	Siblings	Norm data
	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)
SCAS			
Panic	2.69^b (2.65)	2.12^c (3.13)	4.42^{bc} (4.85)
Separation anxiety	3.96^a (3.23)	2.33^{ac} (3.01)	4.90^c (3.75)
Physical injury	3.20 (2.68)	2.81^c (2.32)	3.66^c (2.97)
Social phobia	4.09^b (3.04)	4.45^c (3.62)	6.65^{bc} (4.07)
OCD^	3.40^b (3.22)	3.07^c (2.69)	6.09^{bc} (3.95)
General anxiety	4.49^b (2.62)	4.29^c (3.34)	6.35^{bc} (3.76)
Total anxiety	21.80^b (13.46)	19.07^c (14.94)	32.08^{bc} (18.66)
PedsQL^TM			
Physical health	86.31^a (14.22)	92.19^{ac} (9.28)	84.37^c (17.33)
Emotions	76.11^b (15.66)	76.59 (18.92)	81.04^b (19.54)
Social relationships	83.44 (16.61)	89.32 (13.45)	86.82 (17.52)
School	74.22^a (16.02)	82.95^{ac} (15.15)	78.19^c (20.70)
Psychosocial health	77.99^b (13.51)	83.08 (13.46)	82.11^b (15.72)
Overall QoL	81.05^a (12.89)	86.25^{ac} (11.32)	82.79^c (15.00)

^Obsessive Compulsive Disorder ^{a} = p<0.05 for comparisons between children with PA and siblings; ^{b} = p<0.05 for comparisons between children with PA and norms; ^{c} = p<0.05 for comparisons between siblings and norms

Table 3. Anxiety (SCAS) and quality of life (PedsQL^{TM}) mean scores (and standard deviations) for girls and boys with PA and male and female siblings

Domain	Girls with PA	Female siblings	Boys with PA	Male siblings
	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)
SCAS				
Panic	2.87 (3.20)	2.65 (3.52)	2.60 (2.39)	1.25 (2.18)
Separation anxiety	5.13[a] (3.74)	2.77[a] (2.69)	3.37 (2.83)	1.63 (3.63)
Physical injury	5.07[a b] (2.91)	3.50[a] (1.88)	2.27[b] (2.03)	1.69 (2.57)
Social phobia	3.53 (2.13)	4.65 (3.63)	4.37 (3.40)	4.13 (3.70)
OCD^	3.53 (3.29)	3.08 (2.59)	3.33 (3.25)	3.06 (2.93)
General anxiety	4.80 (2.83)	5.15 (3.28)	4.33 (2.54)	2.88 (3.01)
Total anxiety	24.93 (13.92)	21.81 (14.31)	20.23 (13.18)	14.63 (15.33)
PedsQL^{TM}				
Physical health	81.64[a] (16.16)	91.55[a] (10.96)	88.65 (12.81)	93.20 (5.87)
Emotions	72.00 (10.14)	74.63 (19.06)	78.17 (17.60)	18.83 (4.57)
Social relationships	81.67 (18.39)	90.56 (13.82)	84.33 (81.67)	87.5 (13.00)
School	72.00[a] (13.60)	81.30[a] (15.29)	75.33[c] (17.22)	85.59[c] (14.99)
Psychosocial health	75.43 (10.73)	82.12 (14.39)	79.27 (14.71)	84.61 (12.11)
Overall QoL	77.37 (10.50)	85.41 (12.67)	82.90 (13.73)	87.60 (8.94)

^Obsessive Compulsive Disorder   [a] = p<0.05 for comparisons between girls with PA and female siblings; [b] = p<0.01 for comparisons between girls with PA and boys with PA; [c] = p<0.05 for comparisons between boys with PA and male siblings

Table 4. Quality of life (PedsQL^{TM}) mean scores (and standard deviations) for allergic children with and without other atopic conditions

Domain	Allergic children with atopy	Allergic children without atopy	t-value
	Mean (S.D.)	Mean (S.D.)	
PedsQL^{TM}			
Physical health	84.28 (14.73)	94.45 (8.38)	-2.73**
Emotions	73.75 (15.83)	85.56 (11.30)	-2.10*
Social relationships	80.28 (17.11)	96.11 (3.33)	-5.17***
School	72.50 (16.10)	81.11 (14.52)	-1.46
Psychosocial health	75.59 (13.57)	87.59 (8.29)	-2.52**
Overall QoL	78.59 (12.81)	90.92 (7.67)	-2.75**

*p<0.05   **p<0.01   ***p<0.001