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# Low health-related quality of life is associated with declining home introduction of suspected food allergens

To the Editor,

Food allergy should be adequately diagnosed or excluded to avoid anxiety and unnecessary elimination of foods.<sup>1,2</sup> Mothers who suspect their child to be food allergic appeared to be more anxious and eliminated (multiple) foods unnecessarily.<sup>3</sup> Furthermore, peanut-allergic children avoided tree nuts even when this food was proven to be safe or had been eaten before without symptoms.<sup>4</sup>

We recommend to gradually introduce the food at home following a standardized schedule for children who are referred due to suspected food allergy but deemed tolerant (i.e. very low probability of food allergy based on medical and dietary history) for a specific food. However, this advice is declined for numerous reasons by many parents. Next to this, parents, who accepted the advice at first, did not introduce the food as recommended. To avoid unnecessary elimination and improve personalized medicine, it is therefore worthwhile to address potential hesitation during the visit and preferably in a standardized way. Health-related quality of life (HRQL) questionnaires might be valuable during this diagnostic process in order to screen for possible factors that influence the willingness to introduce the food at home.

To the best of our knowledge, the association between HRQL and the parental decision to decline, accept and perform the advice to introduce the suspected food at home has not been studied. Therefore, we aimed to investigate this association and hypothesized that declining the advice is associated with a low HRQL due to anxiety, adverse experiences and expected food reactions.

This prospective study took place between June 2018 and September 2020 at the paediatric allergy centre of a large teaching hospital. All children from 0–12 years of age were eligible for inclusion if introduction at home for peanut or tree nut using standardized schedules was recommended based on predefined criteria (online supplement; part A; see <https://doi.org/10.5281/zenodo.5681272>). Shortly, these are related to possible atopic comorbidities, sensitization and previously food consumption. If parents were reluctant and indicated, they preferred a clinically oral food challenge (OFC), their choice was honoured regardless of the reason. During a brief telephone interview 3 months after the advice had been given, data on the actual performance, as well as major reasons for not performing the introduction at home, were collected.

Briefly, HRQL was investigated using the validated Food Allergy Quality of Life Questionnaire (FAQLQ) and Food Allergy Independent Measure (FAIM) in Dutch.<sup>5–7</sup> All questionnaires were filled in prior to the visit to our outpatient clinic either electronically or on paper (online supplement; part B). For this study, analysis was limited to the total scores and specific domain scores. The total scores were used because we aimed to investigate the general HRQL association. Next to this, both food anxiety and emotional impact scores were used. We expected anxiety to be the most important aspect related to our outcome measures based on previous research.<sup>8</sup> Finally, FAIM scores were used, which provide additional independent information on parents' perception of food allergy risks.

All statistical analyses were performed using IBM SPSS Statistics version 20 and 24 (IBM). Binary logistic regression analysis was performed to investigate the association between the HRQL scores and the parental decision. The diagnostic value of the significantly associated HRQL scores was investigated by determining the area under the receiver operating characteristic curve (AUC). Multilevel binary logistic regression analysis was performed to investigate the possible association between HRQL scores and performance of the introduction at home. A  $p$ -value  $< .05$  was considered statistically significant.

Patient characteristics are summarized in Table C1 (online supplement). A total of 89 patients were included (median age 3 years; 55.1% male). Eczema was the most common atopic comorbidity. At the time the advice had been given, 5 patients (5.7%) were sensitized for the specific food.

Details on introductions at home are presented in Tables C2 and C3 (online supplement) and Figure 1. The majority of the participants were recommended to introduce one or two food allergens subsequently at home, predominantly for almond, cashew and walnut. A total of 52 patients (58.4%) were advised to perform at least one OFC for another food at the same time introductions at home were recommended (Table C2). The parents of 15 patients (16.9%) indicated they preferred an OFC due to anxiety for the specific food despite the recommendation to introduce the food at home. For the children whose parents accepted the advice, a total of 171 introductions at home were recommended (Figure 1). Symptoms occurred in 12 of 102 (11.8%) performed introductions

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at home. The parents reported the occurrence of the following specific allergic symptoms most frequently: erythema (local), stomach ache (mild), rhinitis and conjunctivitis, itchy mouth (Table C3). One of the parents contacted their general practitioner because of local erythema around the mouth and in the neck (no intervention needed). Another parent administered antihistamine because their child suffered from mild stomach ache and local hives around the mouth.

A total of 89 and 19 questionnaires were filled in by parents and children respectively (online supplement; Table C4). An overview of all HRQL scores is presented in Table 1. FAIM-PF scores were significantly lower in those who accepted the advice versus those who did not (median score accepted 2.80; median score declined 3.20;  $p = .014$ ).

Results of the analysis on HRQL scores and parental decision are presented in Table C5 (online supplement). Low HRQL was related to declining the advice to introduce the potential food allergen at home given OR greater than one, except for FAQLQ-PF (0–3 years). The FAIM-PF score was significantly associated with declining the advice (OR 1.940;  $p = .029$ ). This means that if the FAIM-PF score increases with one point, the odds for declining the advice increases with a factor 1.9. The number of food allergens advised to introduce at home, was not found to be a confounder of the association between HRQL and parental decision.

The diagnostic value of FAIM-PF for declining the advice (AUC-value) was 0.708 (0.577–0.840;  $p = .014$ ). We aimed to minimize the number of parents that accepted our advice at first, but did not perform the introduction on second thought. Therefore, we determined the lowest cut-off value for the FAIM-PF score as possible that was associated with declining the advice to introduce a specific food at home (i.e. high sensitivity). The best suitable cut-off value for FAIM-PF was 2.3 (sensitivity 100%; specificity 34.2%). FAIM-PF was filled in completely by 14 out of 15 participants who declined our advice, all of them reported a total score of 2.3 or more.

The multilevel analysis showed no significant associations between HRQL scores and whether the recommended introductions at home were performed or not (online supplement; Table C6).

### Key Messages

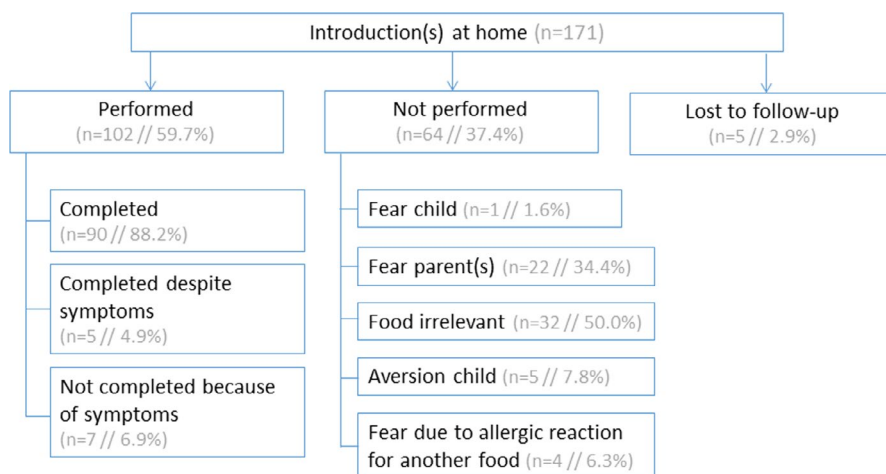
- One-third of parents did not follow advice to introduce food allergens to their child at home
- Low quality of life scores were associated with not following advice to introduce food allergens
- Multivariate analysis did not confirm this; other factors such as food relevance may be important

This study demonstrates that parents and children reported higher HRQL scores as measured by the FAQLQ and FAIM questionnaires, indicating lower quality of life, if the advice was declined. This finding might be helpful to health care professionals in the shared decision-making process how to introduce foods if the child is deemed tolerant.

As certain questions focus on the subject of perceived risk and severity after accidental ingestion of a food allergen, naturally FAIM-PF total score was significantly different.<sup>8</sup> Furthermore, based on the AUC value of 0.708, FAIM-PF could be used as modest predictor for the parental decision to introduce a specific food at home. However, we found no other significant association between HRQL and parental decision so further research is needed before these questionnaires can be implemented in daily health care. Until then, it is recommended to discuss with parents whether they are anxious and explain how safety can be taken into account to potentially improve introductions and avoid unnecessary restrictions.

Approximately one-third of the introductions at home were not performed, mostly because the food appeared to be irrelevant to the parents and/or children. Therefore, healthcare professional should pay more attention to the contribution of specific foods in daily life of the children and their families. Additionally, cultural diversity and family dietary preferences should be taken into account.

Our study had several limitations. First, the questionnaires were related to food allergy in general and not specifically to the food allergen that was advised to be introduced at home. Therefore, the results could have been influenced by known food allergies or



**FIGURE 1** Outcome introductions at home. Results are presented as frequencies and percentages for the parents that accepted the advice to introduce a specific food at home

TABLE 1 HRQL scores

	A	B	p-value
FAQLQ-PF (0–3 years)			
Total score	1.46 (1.06–2.69)	1.46 (1.11–2.13)	.799
FA score	1.00 (1.00–2.00)	1.00 (1.00–1.33)	.212
FAQLQ-PF (4–6 years)			
Total score	1.80 (1.46–2.32)	3.54 (1.57–4.59)	.215
FA score	2.14 (1.89–2.64)	3.71 (2.29–4.71)	.136
FAQLQ-PF (7–12 years)			
Total score	1.92 (1.27–2.45)	2.75 (2.19–4.17)	.062
FA score	2.07 (1.38–2.78)	3.00 (2.44–4.31)	.057
FAIM-PF (0–12 years)			
Total score	2.80 (2.20–3.35)	3.20 (2.90–4.15)	<b>.014</b>
FAQLQ-CF (8–12 years)			
Total score	2.70 (1.79–3.96)	3.98 (3.10–4.26)	.161
EI score	3.00 (1.50–4.33)	3.67 (2.71–4.88)	.367
FAIM-CF (8–12 years)			
Total score	2.33 (1.83–3.17)	2.42 (2.33–3.25)	.580

Note: Data stratified for parental decision. Results presented as median (IQR). Other parameters are presented as frequencies and percentages. Differences between the groups were tested with Mann-Whitney U test. An  $\alpha < .05$  was defined as statistically significant and is presented with a bold *p*-value.

Abbreviations: A, the advice to introduce a specific food at home was accepted; B, the advice to introduce a specific food at home was declined; EI score, emotional impact score; FAIM, Food Allergy Independent Measure, FA score, food anxiety score; FAQLQ-CF, Food Allergy Quality of Life Questionnaire – Child Form; FAQLQ-PF, Food Allergy Quality of Life Questionnaire – Parent Form; HRQL, health-related quality of life.

experiences with other foods. However, we aimed to resemble daily practice as much as possible. Second, each questionnaire was filled in once, so no comparison regarding potential HRQL differences at a later time could be made (e.g. after introduction at home was performed). Third, we decided to use only domain scores about anxiety which might provide limited information. However, recent research emphasized the importance of anxiety within food allergy.<sup>9</sup> Fourth, our predictive HRQL cut-offs were based on one population and should be replicated in an independent study.

Summarizing, low HRQL is related to declining the advice to introduce a food at home. FAIM-PF may be used as predictor of the actual performance. Further research is needed to determine whether HRQL measurements could contribute to a higher success rate of the introduction of potential food allergens at home.

## KEYWORDS

children, diagnostic, food allergy, introduction, quality of life

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## CONFLICT OF INTEREST

The authors report no proprietary or commercial interest in any product mentioned, concept discussed or personal relationships

with other people or organizations that could influence their work and conclusions in this article.

## AUTHOR CONTRIBUTIONS

WW, MK, CH, GM, LL, GK, AS and AK contributed to conceptualization; WW and MK contributed to data acquisition; WW and MK contributed to formal analysis; WW contributed to writing – original draft preparation; WW, MK, CM, GM, LL, GK, AS, AK contributed to writing – review and editing; AK contributed to supervision.

## ETHICAL APPROVAL

This study protocol was reviewed and approved by the Medical Ethical Committee (MEC) of Martini Hospital, Groningen, the Netherlands (approval number: MEC 2018-054A). Written informed consent was obtained from parents and children from the age of 12 years old.

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## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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#### SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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