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Health-Related Quality of Life of Children with Asthma: Self and Parental Perceptions

Efrosini Kalyva[1] · **Christine Eiser**[2] · **Aikaterini Papathanasiou**[1]

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Abstract
Purpose This study aimed to explore whether age, gender, asthma severity, asthma duration, and exposure to parental smoking were associated with levels of asthma-specific health-related quality of life (HRQoL) among Greek children with asthma and to identify any differences between self- and proxy ratings of asthma-specific HRQoL.
Method One hundred and seventy-three (173) children with asthma (8–12 years old) and their parents completed the Pediatric Quality of Life Asthma Module self- and proxy measures.
Results Asthma severity, age, and asthma duration explained almost half of the variance in asthma-specific HRQoL scores according to self- and proxy reports. Older male children with more severe asthma who were diagnosed for a longer period of time and had at least one smoking parent reported lower asthma-specific HRQoL according to self- and proxy reports. Although children and their parents seemed to agree in their views of asthma-specific HRQoL, there were significant differences in ratings of specific parameters of asthma-specific HRQoL.
Conclusion This study identifies the factors that account for a significant variance in asthma-specific HRQoL scores according to self- and proxy reports and is among the first to record the effect of parental smoking on children's and parents' perceptions of asthma-specific HRQoL.

✉ Efrosini Kalyva
kalyva@city.academic.gr

[1] City College, Department of Psychology, The International Faculty of the University of Sheffield, 24 Proxenou Koromila Street, 546 22 Thessaloniki, Greece

[2] Department of Psychology, University of Sheffield, Sheffield, UK

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Introduction

Asthma is the 14th most important disorder in the world in terms of the extent and duration of disability, with 14 % of children worldwide experiencing asthma symptoms [1]. Both children and their families are at risk of impaired psychological functioning, well-being, and quality of life (QoL) [2, 3]. Therefore, it is essential to conceptualize healthcare beyond just medical treatment, especially for patients with chronic conditions, such as asthma, who need to learn to manage their own symptoms [4]. So, measuring health-related quality of life (HRQoL) in children with asthma constitutes more than a mere assessment of their actual situation and their healthcare needs, since it contributes to the evaluation of the effectiveness of clinical interventions [5].

HRQoL is "affected in a complex way by the persons' physical health, psychological state, level of independence, social relationships, personal beliefs, and their relationships to salient features of the environment" [6, p. 286]. The HRQoL of children with asthma is adversely affected by disease-specific parameters, such as asthma severity [7–9] and poor asthma control [2]. One of the factors that can aggravate asthma severity and control is exposure to irritants, such as environmental tobacco smoke [10]. O'Connell and Logan [11] found that most parents of children with asthma reported that cigarette smoke aggravated the asthma, and elimination of smoking generally led to improvement. Increased environmental tobacco smoke can lead to school absenteeism [12], which is also considered to be a measure of QoL in children [13].

Demographic characteristics are also related to the HRQoL of children with asthma. In terms of gender, girls [14, 15] and women [16] seem to experience higher levels of HRQoL—as is the case with many chronic health conditions [15–18]. Reports on age, however, are less clear. Some studies showed that older children reported lower HRQoL [14, 15, 19], maybe because in time children with asthma develop comorbid conditions that could impair their HRQoL [14]. On the other hand, there is evidence that HRQoL improves as children with asthma enter adulthood—possibly because of enhanced self-confidence and independence [20]. These contradictory findings in relation to the age effect may result from different sources of information, since HRQoL is assessed primarily through self-reports and some studies that used both children and their parents as respondents reported levels of agreement that varied from very low to very high [21]. Children's age, gender, as well as several social, cultural, and educational factors may be responsible for these different outcomes [22–26] and so a critical decision that needs to be taken is how to interpret divergent reports between parents and children. It is assumed that parental reports are more reliable, but children's reports tend to be more valid given the subjective nature of HRQoL [22, 27, 28].

The mixed findings in relation to age differences in the reported HRQoL of children with asthma may also be attributed to the different ways in which HRQoL is both defined and measured. For example, many studies have used generic measures of HRQoL [6, 29], whereas disease-specific measures have a different conceptualization of HRQoL. It is assumed that disease-specific symptoms are causal indicators of generic HRQoL and thus more sensitive to detect differences [4]. Therefore, the main aim of the present study is to identify whether asthma severity together with age, gender, asthma duration, and exposure to environmental tobacco smoke are associated with asthma-specific HRQoL according to self- and proxy reports. It is expected that female older children with less severe asthma who have non-smoking parents will report higher levels of asthma-specific HRQoL, as will their parents.

Method

Participants

A total of 173 children with asthma (94 boys and 79 girls) aged 8–12 years (mean age = 10 years and 7 months, SD = 2.68) and one parent of each child (124 mothers and 49 fathers aged 24–57 years old) participated in the study. Only one parent was allowed to accompany the child to the visits and so he/she was approached to participate and this resulted to a sample consisting of many more mothers than fathers. Age at diagnosis ranged from 1 to 12 years (mean age of diagnosis = 3 years and 4 months, SD = 2.16) and they had been diagnosed between 1 to 11 years previously (mean age of asthma duration = 5 years and 5 months, SD = 2.84). Participants ($N = 95$) were recruited from the Pediatric Asthma Unit of the General University Hospital AXEPA in Thessaloniki and the rest from ten private practices in Northern Greece ($N = 78$). Regardless of the severity of their asthma, all children were enrolled in a plan of scheduled follow-up meetings with their physicians. The time period between appointments varied from 3 to 6 months.

Measures

We used the Pediatric Quality of Life Asthma Module (PedsQL^{TM} 3.0) [30], a condition-specific questionnaire that includes parallel forms for children and parents, instructions, five-point Likert type reply scales, and scoring method similar to the extensively validated PedsQL^{TM} 4.0 Generic Core Scales [31]. We used the version for children aged 8–12 years and the parallel version for parents. It includes four scales: (1) Asthma Symptoms (11 items), (2) Treatment Problems (11 items), (3) Worry (3 items), and (4) Communication (3 items) [35]. The questionnaire provides five scores, one for each subscale and a total score obtained by summing scores for the four subscales [31] (higher scores mean higher HRQoL). Both child self-report and parent proxy-report versions of the PedsQL Asthma Module have adequate internal consistency reliability and convergent and discriminative validity [4, 31]. Parents were interviewed to obtain demographic information. This included their child's age and gender and other information related to the child's medical history and asthma history (e.g., asthma severity, age of onset, asthma duration, pharmaceutical treatment, parent smoker, exposure to passive smoking). Parents were also asked if they or their partners were currently smokers. After consultation with physicians, children were classified as having mild, moderate, or severe asthma [32]. Children with severe asthma exhibited weekly wheezing episodes, woke up during the night frequently every week with cough or wheeze and woke up in the morning with wheeze a number of times every week. Those with mild asthma experienced wheezing episodes less than monthly and woke up during the night due to wheezing or coughing also less than weekly, and children in the moderate category were those in an intermediate status between the two other groups [8]. The level of asthma severity was judged by the physician before the start of the treatment and was communicated to the researchers at the time of completion of the questionnaire.

Procedure

Ethical approval was obtained for this study by the appropriate Ethics Committee. A total of 200 children and their parents were approached during their routine clinic visits in the

pulmonology wing of the hospital or their physician's private practice. The treating doctor introduced parents to the researchers and briefed them about the aim of the study. A total of 173 parents and their children agreed to participate in the study. The participants filled in paper-and-pencil questionnaires in a private room while they were waiting to be examined. Parents and children completed the questionnaires simultaneously and separately, so that they would not discuss between them about what to write. Those who did not take part typically cited lack of time as the reason. All parents and their children gave signed informed consent, while all data were treated with confidentiality. The briefing, the consent, and the completion of the questionnaires lasted approximately 25–35 min.

Statistical Analyses

We scored measures according to information in previous reports and computed Cronbach's alphas to determine reliability of all scales. We conducted independent-samples *t* tests to determine differences between those who took part and refusers and between those recruited from the hospital and private practice. We used loglinear multiple regression analyses to explore whether age, gender, asthma duration, and asthma severity were associated with self-reported generic and proxy-reported asthma-specific HRQoL. Intraclass correlations were used to assess the level of agreement between self- and proxy reports of asthma-specific HRQoL and paired-samples *t* tests were run to measure differences in asthma-specific HRQoL according to self- and proxy reports. Mann-Whitney tests were conducted to measure the differences in self-and proxy reports of asthma-specific HRQoL according to current parental smoking status due to violations of the assumptions necessary to run parametric analyses.

Results

Cronbach reliability for the PedsQL™ 3.0 Asthma Module in this study is very satisfactory both for the child ($\alpha = .92$) and the parent ($\alpha = .87$) versions. More specifically for the self-reports, the alpha reliability for the Asthma symptoms subscale was .87, for the Treatment problems subscale .87, for the Worry subscale .94, and for the Communication subscale .90. As far as parents' proxy reports are concerned, the alpha reliability for the Asthma symptoms subscale was .88, for the Treatment problems subscale .74, for the Worry subscale .94, and for the Communication subscale .94.

Preliminary analyses revealed that there were no statistically significant differences between the two recruitment contexts (clinics vs private practices) in terms of asthma severity or demographic characteristics. Responders and non-responders did not differ on any specific characteristic according to the medical records or demographic data. Thirty-four percent of the children had mild asthma, 35.4 % moderate, and 30.6 % severe according to their physicians' classifications. Most children with asthma (74.6 %) had one or both parents who were currently smoking, while in 25.4 % of the cases both parents were non-smokers. Out of the 173 parents, 129 (74.6 %) were smokers and only 44 (25.4 %) were non-smokers. Older children had been diagnosed for a longer period of time ($r_{(173)} = .59$, $p < .001$).

Age, gender, asthma duration, asthma severity, and self-report asthma-specific HRQoL

To test the hypothesis that self-reported asthma-specific HRQoL is a function of four variables—age, gender, asthma duration, and asthma severity—a loglinear multiple regression analysis was performed. Age, gender, asthma duration, and asthma severity accounted for 41.8 % of the variance in asthma symptoms ($R^2 = .418$, $F_{(1,172)} = 54.88$, $p < .001$), 24.2 % of the variance in treatment problems ($R^2 = .242$, $F_{(1,172)} = 24.75$, $p < .001$), 33 % of the variance in worry ($R^2 = .330$, $F_{(2, 171)} = 37.88$, $p < .001$), and 12.8 % of the variance in communication ($R^2 = .128$, $F_{(2,171)} = 8.33$, $p < .001$). Asthma severity was significantly associated with asthma symptoms ($\beta = -.64$, $p < .001$), treatment problems ($\beta = -.48$, $p < .001$), worry ($\beta = -.27$, $p < .001$), and communication ($\beta = -.24$, $p = .002$). Child's age was significantly associated with worry ($\beta = -.48$, $p < .001$), while asthma duration was significantly associated with communication ($\beta = .35$, $p < .001$). Intercorrelations between the variables are presented in Table 1.

Since the loglinear regression revealed that asthma severity was a significant negative predictor of children's perception of asthma-specific HRQoL, MANOVA was conducted to explore if the differences between the three groups were statistically significant. A main effect of asthma severity was found on asthma symptoms ($F_{(2, 168)} = 60.55$, $p < .001$, $\eta^2 = .42$), treatment problems ($F_{(2, 168)} = 28.48$, $p < .001$, $\eta^2 = .25$), worry ($F_{(2, 168)} = 13.26$, $p < .001$, $\eta^2 = .14$), and communication ($F_{(2, 168)} = 5.65$, $p < .001$, $\eta^2 = .07$). Further analyses with Bonferroni adjusted alpha levels of .01 per test revealed that the average number of HRQoL scores was significantly lower for the severe group, followed by the moderate group and the mild group for asthma symptoms and treatment problems. For the worry subscale, there was no statistically significant difference between the moderate and severe groups, while in the communication subscale there was no statistically significant difference between the moderate and severe groups and the mild and moderate groups. Mean and standard deviations are presented in Table 2.

Table 1 Means, standard deviations, and intercorrelations among the study variables

Variables	*M*	SD	1	2	3	4	5	6	7	8
1. Age	10.71	2.68	1.00							
2. Gender	1.46	0.50	.03	1.00						
3. Asthma duration	5.51	2.84	.59*	.05	1.00					
4. Asthma severity	1.97	0.81	.08	−.01	−.08	1.00				
5. Asthma symptoms[a]	56.88	19.06	−.03	−.00	.14	−.65*	1.00			
6. Treatment problems[a]	78.62	17.31	−.02	.03	.08	−.51*	.47*	1.00		
7. Worry[a]	74.86	31.38	.60*	.01	−.25*	.35*	−.30*	−.31*	1.00	
8. Communication[a]	74.52	24.59	.01	.07	.27*	−.27*	.30*	.37*	.21*	1.00

*$p < .05$

[a] With the highest score being more positive

Age, gender, asthma duration, asthma severity, and proxy-report asthma-specific HRQoL

To test the hypothesis that proxy-reported asthma-specific HRQoL is a function of four variables—age, gender, asthma duration, and asthma severity—a loglinear multiple regression analysis was performed. The above analyses were repeated for proxy-report asthma-specific HRQoL. Age, gender, asthma duration, and asthma severity accounted for 48.6 % of the variance in asthma symptoms ($R^2 = .486$, $F_{(1,172)} = 72.03$, $p < .001$), 21.9 % of the variance in treatment problems ($R^2 = .219$, $F_{(1,172)} = 20.55$, $p < .001$), 20.4 % of the variance in worry ($R^2 = .204$, $F_{(3,170)} = 10.58$, $p < .001$), and 10.3 % of the variance in communication ($R^2 = .103$, $F_{(2,171)} = 9.61$, $p < .001$). Asthma severity was significantly associated with asthma symptoms ($\beta = -.66$, $p < .001$), treatment problems ($\beta = -.50$, $p < .001$), worry ($\beta = -.28$, $p < .001$), and communication ($\beta = -.29$, $p < .001$). Child's age was significantly associated with worry ($\beta = -.54$, $p < .001$) and communication ($\beta = -.16$, $p = .026$). Asthma duration was significantly associated with communication ($\beta = .31$, $p < .001$), while gender was significantly associated with communication ($\beta = -.23$, $p = .025$). Intercorrelations between the variables are presented in Table 3.

Since the loglinear regression revealed that asthma severity was a significant negative predictor of children's perception of asthma-specific HRQoL, MANOVA was conducted to explore if the differences between the three groups were statistically significant. A main effect of asthma severity was found on asthma symptoms ($F_{(2, 168)} = 76.30$, $p < .001$, $\eta^2 = .48$), treatment problems ($F_{(2, 168)} = 22.23$, $p < .001$, $\eta^2 = .21$), worry ($F_{(2, 168)} = 10.57$, $p < .001$, $\eta^2 = .11$), and communication ($F_{(2, 168)} = 8.28$, $p < .001$, $\eta^2 = .09$). Further analyses with Bonferroni adjusted alpha levels of .01 per test revealed that the average number of HRQoL scores was significantly lower for the severe group, followed by the moderate group and the mild group for asthma symptoms and treatment problems. For the worry subscale, there was no statistically significant difference between the moderate and mild groups, while in the communication subscale there was no statistically significant difference between the moderate and severe groups and the mild and moderate groups. Mean and standard deviations are presented in Table 4.

Asthma-specific HRQoL according to self- and proxy reports

An investigation of the level of agreement between self- and proxy reports using intraclass correlation showed that it was significant for asthma symptoms (ICC = .76, $p < .001$), treatment problems (ICC = .60, $p < .001$), worry (ICC = .67, $p < .001$), and communication (ICC = .69, $p < .001$). Paired-samples *t* test revealed that there was a statistically significant difference between the asthma symptoms and the worry scores of children as reported by themselves and their parents ($t_{(172)} = 2.47$, $p < .05$ and $t_{(172)} = 2.94$, $p < .05$, respectively).

Table 2 Means and standard deviations of the children's self-reports of asthma-specific HRQoL according to physician determined asthma severity

Scales[a]	Mild asthma ($N = 58$) *M* (SD)	Moderate asthma ($N = 61$) *M* (SD)	Severe asthma ($N = 52$) *M* (SD)
Asthma symptoms	70.89 (13.32)	58.07 (12.21)	40.25 (18.16)
Treatment problems	88.48 (10.61)	78.95 (16.96)	66.84 (16.68)
Worry	90.81 (22.17)	70.35 (29.17)	63.30 (36.01)
Communication	83.62 (23.68)	73.08 (25.11)	66.99 (30.38)

[a] With the highest score being more positive

Table 3 Means, standard deviations, and intercorrelations among the study variables

Variables	*M*	SD	1	2	3	4	5	6	7	8
1. Age	10.71	2.68	1.00							
2. Gender	1.46	0.50	.03	1.00						
3. Asthma duration	5.51	2.84	.59*	.05	1.00					
4. Asthma severity	1.97	0.81	.08	−.01	−.08	1.00				
5. Asthma symptoms[a]	54.59	18.58	−.13	−.04	.03	−.68*	1.00			
6. Treatment problems[a]	78.32	21.31	−.05	.01	.03	−.46*	.48*	1.00		
7. Worry[a]	69.02	32.34	−.46*	.05	−.13	.33*	.31*	.28*	1.00	
8. Communication[a]	79.06	25.01	−.03	−.15	.21*	−.30*	.31*	.42*	.14	1.00

*$p < .05$

[a] With the highest score being more positive

No statistically significant differences were detected for the treatment problems and communication subscales.

Self- and proxy-report asthma-specific HRQoL according to current parental smoking status

Mann-Whitney *U* tests were conducted to evaluate the hypothesis that children with asthma whose parents smoke currently would score lower in asthma-specific HRQoL, on the average, than children with asthma whose parents do not smoke. The results of the tests were in the expected direction and significant for all areas apart from the communication subscales. Average rank scores are presented in Table 5.

Mann-Whitney *U* tests were conducted to evaluate the hypothesis that parents of children with asthma who smoke currently would report lower levels of asthma-specific HRQoL for their children, on the average, than parents of children with asthma who do not smoke. The results of the tests were in the expected direction and significant for all areas apart from the communication subscales. Average rank scores are presented in Table 6.

Discussion

Analysis revealed that asthma severity together with age, gender, asthma duration, and exposure to environmental tobacco smoke were associated with asthma-specific HRQoL according to self- and proxy reports. As expected, asthma severity was related to all dimensions of asthma-specific HRQoL according to both self- and proxy reports. It is important to note here that classification of asthma severity was not made only according to parental reports, but in consultation with the attending physicians and this is a major strength of this study. Children in the mild group reported less asthma symptoms, less treatment problems, less worries, and less problems with communication. Asthma severity was positively associated with treatment problems for both children and their parents, with more severe symptoms leading to more treatment problems. This might happen because children as young as 8 years (which formed this sample) were responsible for their own medication [33], while symptom monitoring requires the measurement and recording of lung function twice daily. Worsening symptoms could lead to hospitalization or change of the medication, which could explain also why asthma severity was associated with more worry for the children. Therefore, our findings are in agreement with much previous work showing that asthma severity is consistently negatively related to the QoL of children with asthma [7–9]. However, these studies measured asthma severity mainly on the basis of service use and not symptom severity and they used a generic QoL measure instead of an asthma-specific measure like our study.

The age of the children with asthma was not associated with their reported perception of either asthma symptoms or treatments problems according to both self- and proxy reports. However, both older children with asthma and their parents reported higher levels of worry than younger children and

Table 4 Means and standard deviations of the proxy reports of asthma-specific HRQoL according to children's physician determined asthma severity

Scales[a]	Mild asthma ($N = 58$) *M* (SD)	Moderate asthma ($N = 61$) *M* (SD)	Severe asthma ($N = 52$) *M* (SD)
Asthma symptoms	68.22 (11.82)	56.74 (13.61)	36.75 (15.25)
Treatment problems	90.42 (19.01)	76.86 (20.05)	66.51 (17.95)
Worry	81.47 (24.33)	69.44 (32.39)	54.71 (34.99)
Communication	85.17 (18.51)	75.42 (23.54)	66.67 (29.55)

[a] With the highest score being more positive

Table 5 Average ranks of asthma-specific HRQoL reported by children with asthma according to current parental smoking

Scales	Non-smoking parents ($N = 44$)	Smoking parents ($N = 129$)	U
Asthma symptoms	104.61	80.27	3613*
Treatment problems	99.55	82.15	3334*
Worry	100.69	82.33	3440*
Communication	96.35	83.81	3249

Higher scores indicate better HRQoL

*$p < .05$

their parents. Although the participants were from a relatively narrow age range (8–12 years), older children and their parents were more worried about the side effects of medication and whether it was effective, as well as their asthma-related problems. This may be linked to the unsettling realization that asthma is a chronic condition that has to do with symptom control rather than cure [2, 4]. Finally, parents of older children with asthma reported that their children were more able to communicate about asthma both with staff and with others. This finding agrees with that of another study arguing that age may impact parental perceptions of their child's asthma-related QoL [34], especially for children over 11 years. It also means that researchers should not rely mainly on parents to collect HRQoL data for longitudinal purposes as argued by le Coq et al. [35], especially when dealing with older children who seem to be able to articulate their opinions according to their parents.

Another parameter that is associated with age is asthma duration, since older children tend to have experienced asthma symptoms for a longer period of time. However, the correlation between the two variables in our study was moderate and so they were not treated as one. We found that children who had asthma for a longer period of time perceived themselves as being better able to communicate about it than children with less years of asthma. This may happen because they develop a different coping style towards asthma that helps them improve their communication skills [2].

Table 6 Average ranks of asthma-specific HRQoL reported by parents of children with asthma according to current parental smoking

Scales	Non-smoking parents ($N = 44$)	Smoking parents ($N = 129$)	U
Asthma symptoms	105.24	80.24	3640*
Treatment problems	101.66	81.29	3483*
Worry	100.18	82.56	3418*
Communication	87.64	86.88	2866

Higher scores indicate better HRQoL

*$p < .05$

As far as gender is concerned, parents reported that girls were better at communicating about their asthma than boys, possibly because girls tend to verbalize in general their thoughts and feelings [36]. It is also likely that boys are more reluctant to appear different from others than girls and are thus less willing to talk about their asthma (especially in the pre-adolescent or adolescent years) [37]. This parental perception of the different communication skills between boys and girls may also be a by-product of cultural differences [38], since in Greece males are less encouraged to disclose their emotions and negative experiences than girls who are expected to do so.

Finally, exposure to environmental tobacco smoke and more specifically parental smoking was associated with increased asthma symptoms, treatments problems, and worry, whereas there was no association with communication. This is consistent with the finding that exposure to indoor environmental tobacco smoke predicted children's higher level of worry about asthma and their parents' increased reporting of asthma symptoms, since it affects asthma management according to current guidelines [10]. However, a worrying finding was that 75 % of the parents of children with asthma in this study who were concerned about their children's asthma and treatment were smokers themselves. This percentage is higher than in other studies, where the maximum percentage is 68 % [10, 12]. So, the issue is even more pressing for these children with asthma, given that exposure to environmental tobacco smoke leads to exacerbated asthma symptoms [25]. Therefore, helping smoking parents of children with asthma to quit smoking should be a priority for clinicians, since it could lead to a decrease in their children's level of functional impairment. However, this would prove to be a great challenge, given that families with one (42 %) or two smoking parents (78 %) did not attend an asthma education program for child patients and tended to deny that their children had asthma [39]. It is evident that a lot of emphasis must be placed on this target, since we cannot change a child's age, gender, or even its level of asthma severity, but by addressing exposure to environmental tobacco smoke through parental smoking we can improve their asthma-related symptoms and this is all part of the symptom control process that is the target of most interventions [2, 4]

As far as the agreement between self- and proxy reports is concerned, findings differed according to the analysis that was employed. When looking at the levels of agreement between self- and proxy reports, they were high (ranging from .60 to .77) for all the dimensions of asthma-specific HRQoL and they are considered satisfactory. However, when looking at differences in means, children reported statistically significant less asthma symptoms and less worries than their parents. The latter findings confirm the observation that children and parents do not necessarily share similar views about HRQoL [40] and partly contradict the claim that parents and children tend to agree upon more observable dimensions of HRQoL, such

as physical activity, functioning, and symptoms, while there is poor agreement in more subjective areas, such as social or emotional domains [28]. It is remarkable that although asthma symptoms are quite visible and obvious, parents overestimated them as do parents of children with diabetes [41] or cancer [38, 42].

The disagreements between child–parent reported may be due to differences in reasoning or response styles [43]. Sometimes, parents and children differ in how they perceive QoL, which could partly reflect the low agreement between their scores and necessitates data collection from both respondents. Current approaches to measuring children's HRQoL should explore the perspectives of both parents and children [6] to ensure that they have a more complete idea.

This study has the following limitations: (a) the gender of the smoking parent as well as the extent of exposure to passive smoking was not measured, although the effects on a child's asthma seem to be greater when the mother smokes [44] and heavy smokers may be more unaware than those who smoke less of the effects of environmental tobacco smoke exposure on children [45]; and (b) these findings refer to a specific age group (8–12 years old) and they might be slightly different for younger or older children, since age seems to affect asthma-related HRQoL [34].

Conclusively, this study showed that asthma severity is acknowledged by both children with asthma and their parents as the leading factor associated with all dimensions of asthma-specific HRQoL, while age, gender, and asthma duration are linked to individual subscales. Expose to environmental tobacco smoke through parental smoking was associated with more asthma symptoms, more treatment problems, and more worries according to both children with asthma and their parents. However, the number of smoking parents in this sample is very high (75 %) and should be targeted in future interventions. Finally, both children with asthma and their parents should be used as informants about asthma-specific HRQoL information, since their opinions are overall similar but not identical (in all areas apart from communication skills).

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Compliance with Ethical Standards Efrosini Kalyva, Christine Eiser, and Aikaterini Papathanasiou have conformed to the Helsinki Declaration concerning human rights and informed consent, and they followed correct procedures concerning treatment of humans in research.

Conflict of interest Efrosini Kalyva, Christine Eiser, and Aikaterini Papathanasiou declare that they have no conflict of interest.

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