Accuracy of Parental and Child's Report of Changes in Symptoms of Childhood Asthma

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This cohort study was conducted to evaluate the accuracy of parental and child's reports of changes in asthma symptoms. Fifty-three asthmatic children and their parents were interviewed at enrollment and after 4 and 8 weeks. The outcomes were parental and child's reports of changes in asthma symptoms, changes in mean daily symptom scores and changes in pulmonary function. Among patients 6 to 10 years old, parental reports correlated more strongly than child's reports with changes in mean daily symptom scores (r: 0.54 vs 0.23). In patients aged 11 years or older, parental and child's reports correlated comparably with changes in mean daily symptom scores (r: 0.63 vs 0.57). In both age groups, neither parental nor child's reports correlated significantly with changes in pulmonary function. The relatively low coefficient of correlation between parental/ child report with symptom score suggests that these may not be very accurate reflections of change in asthma status. Nevertheless, for the age group 6-10 year, parental reports are more reliable than child reports, while both are comparable in the age group 11-18 years.

Keywords: *Childhood asthma; Cohort study; Symptom diary; Peak expiratory flow.*

ASTHMA is the most common chronic respiratory disease in childhood. Most asthmatic children need regular assessment and long term follow-up. There are a number of clinical and functional parameters for assessment of these patients, such as asthma symptom diary, quality of life questionnaire, spirometric test and peak expiratory flow rate (PEFR)(1-3). In general pediatric practice, parental and child's reports of changes in asthma symptoms over a period of observation are the most available source of data used by pediatricians for assessment of patient's status and therapeutic response. This practice may be more common in developing countries where consulting time and laboratory resource are usually scarce. Generally, pediatricians are inclined to rely on the parental reports than child's reports for their clinical judgment. However, limited evidence is available on the accuracy of parental and child's reports of changes in asthma symptoms. One study from Canada shows that clinicians can rely on children as young as 7 years old to accurately report changes in asthma symptoms for periods as long as 1 month(4). In children under 11 years old, parents can provide important complementary information, but in children over 11, parental reports of changes in asthma symptoms have very limited value. However, it remains unknown whether these findings could be applicable to other populations with different socioeconomic and cultural background.

We conducted this prospective cohort study to assess the accuracy of parental and child's reports of changes in asthma symptoms

among a sample of Brazilian children with asthma.

Subjects and Methods

Study subjects

All asthmatic children (6 to 18 years) attending the pediatric pulmonary clinic of the Federal University of Rio Grande-Brazil, between March 1998 and October 1999, were eligible for the study. The diagnosis and classification of asthma were based on the international consensus report on diagnosis and treatment of asthma(1). Children who had concomitant chronic diseases or were unable to perform reliable peak flow measurement were excluded from the study. For each patient, we recruited one parent who lived with child and accompanied child to the clinic. The study protocol was approved by the Ethics Committee of the University and the written informed consent was obtained from the child's parent.

Study design

This was a prospective cohort study. Patients and their parents attended the clinic at enrollment and after 4 and 8 weeks. At each visit, clinical evaluation and spirometric test were performed. At the 8-week visit, patients and parents were asked whether there had been any change in asthma symptoms since the last visit. Daily peak expiratory flow rate and symptoms diary were recorded by patients and parents at home during the whole study period. Routine medical care was offered to all patients and drug therapy was based on the international consensus report on diagnosis and treatment of asthma(1).

Outcome variables and measurements

Reports of changes in asthma symptoms (RCAS)

At the 8-week visit, patients and parents were asked separately whether there had been any change in asthma symptoms since the last visit. Responses were scored using a 15-ponit scale from +7 (a very great deal better) to 0 (no change) and to –7 (a very great deal worse(4-5). This scale system was validated for the population in this study(6).

Symptom diary

The following variables were recorded using a validated symptom diary(6): daytime and nocturnal cough, daytime and nocturnal wheezing, sleep disturbance, school absenteeism, activity limitation, use of medications (bronchodilator, oral steroids), emergency room visit and hospitalization. The symptom diary was completed at bedtime by children under supervision of their parents. Children and parents were trained to complete symptom diary at the first visit. Daily symptoms were scored according to the following criteria: one point was scored for presence of each of the following variables: daytime cough, nocturnal cough, daytime wheezing, nocturnal wheezing, sleep disturbance, school absenteeism, activity limitation and use of bronchodilator; two points were scored for emergency room visit or use of oral steroids; three points were scored for hospitalization. The daily symptom score varied from minimum (0) to maximum (15) where 0 indicates asymptomatic and 15 indicates a moderate to severe acute asthma exacerbation. The mean daily symptom score (total symptom scores/days of observation) since the last visit was calculated.

Spirometric test

Spirometry was performed using Flowscreen spirometer (Jaeger, Erich Jaeger GmbH, Hoechberg, German) according to American Thoracic Society standards. Values of forced expiratory volume in one second (FEV_1) were expressed as a percent of predicted for patient's height.

Peak expiratory flow rate

Patients were instructed to make PEFR measures at home, using a TruZone peak flow meter (Invacare Co., Elyria, Ohio, USA). PEFR was measured twice daily, in the morning and at night, 10 minutes after inhaling a beta2-agonist if this medication was needed. Three consecutive PEFR measures were performed each time in the upright position and the best value was recorded by children under supervision of their parents. The mean daily PEFR value (total PEFR values/days of observation) since the last visit was calculated.

Data analysis

Two reference measures were used to evaluate the accuracy of parent and child's reports of changes in asthma symptoms: (1) clinical parameter: mean daily symptom scores which measure clinical control of asthma; (2) pulmonary functional parameters: mean daily PEFR values and percent of predicted FEV_1 which measure pulmonary function impairment. The mean daily symptom scores and mean daily PEFR values during the first 4-week-period were used as the baseline data. The differences of mean daily symptom scores, mean dairy PEFR values and percent of predicted FEV_1 between the first 4-week-period and the second 4-week-period were calculated and defined as the changes of these variables. Correlations between reported changes in asthma symptoms and changes in each of the following measures were evaluated with Pearson's correlation test: mean daily symptom scores, mean daily PEFR values and percent of predicted FEV_1. The strength of the correlation was used to assess the accuracy of parental and child's reports of changes in asthma symptoms. To investigate the influence of patient's age on the accuracy of parental and child's reports of changes in asthma symptoms, analyses were performed separately in patients 6 to 10 years old and those 11 to 18 years old. The choice of two age groups was based on the previous study(5). These age categories were also consistent with two age groups in childhood: school aged-children and adolescents.

Comparison within groups were performed with paired *t*-tests. All statistical analyses were performed using Statistics for Windows 4.3 (Statsoft, Inc. 1993).

Results

Fifty-eight patients and their parents were recruited for the study. All parents were mother. Five patients were withdrawn from the study, 3 were unable to perform reliable peak flow meter because of technical difficulty and 2 refused to continue the study. Of 53 patients who completed the study, 33 aged 6 to 10 years old and 20 aged 11 to 18 year. The demographic and clinical characteristics of 53 patients at enrollment are shown in *Table 1*. Thirty patients (56.6%) had persistent asthma and most of these children (83.3%) were receiving daily anti-inflammatory medications. The broncho-dilatiors were given as needed for symptom relief in all patients.

Table II shows absolute values of mean daily symptom score, mean daily PEFR score and FEV_1 values of the 53 patients during the first and second 4-week period. Compared with the first 4-week, the second 4-week had a lower mean daily symptom score and a higher mean daily PEFR score. The value of FEV_1 measured at the second 4-week visit was higher than that measured at the first 4-week visit, but the difference did not reach the level of statistical significance. These data indicate that, as a whole group of 53 patients, asthma symptom and pulmonary function have changed towards improvement during the studied period.

TABLE I–*Demographic and Clinical Characteristics of 53 Asthmatic Children at Enrollment*

Characteristics	Patients 6 to 1 0 yr (n=33)	Patients 11 to 18 yr (n = 20)
Age (years)	7.8 ± 1.3	12.4 ± 1.6
Male sex	17 (51.5)	10 (50.0)
Asthma severity		
Intermittent	15 (45.5)	8 (40.0)
Persistent	18 (54.5)	12 (60.0)
Medication use		
Bronchodilators as needed	33 (100.0)	20 (100.0)
Anti-inflammatory medication	16 (48.5)	9 (45.0)

* Values expressed as mean ± standard deviation or n (%)

TABLE II–*Values of Mean Daily Symptom Score, Mean PEFR Score and FEV_1 of the 53 Patients During the 1st and 2nd 4-Week Period**

Parameters	1st 4-week	2nd 4-week	Difference	t**	P value
Mean daily symptom score	1.52 ±13	1.13 ± 0.98	-0.39	2.59	0.03
Mean daily PFER score	253.9 ± 112.9	269.4 ± 107.8	+15.5	2.48	0.02
FEV1	85.1 ± 20.4	91.3 ± 20.2	+6.2	1.16	0.25

* Values expressed as mean ± standard deviation; ** Paired t tests

TabIes III and *IV* and show coefficients of correlations between parental and child's reports of changes in asthma symptoms and changes in other measures.

Discussion

Due to lack of a validated instrument in Portuguese to measure patient's quality of life in pediatric population, child's experience with asthma was not assessed in this study. This limitation impedes direct comparison of the results between this study and the Canadian study(4). However, in both studies, clinical control of asthma was used as the principal reference measure to assess the accuracy of parental and child's reports of change in asthma symptoms. In spite of different instruments used to measure asthma control, the two studies showed consistent findings. Among patients younger than 11 years parental reports of changes in asthma symptoms were correlated more strongly than child's reports with clinical control of asthma, although the child had more accurate insight into their experience with asthma as measured by quality of life. In patients aged 11 years or older, children themselves provided reliable information regarding asthma control. These findings have relevant clinical implications. When attending young school-aged (6-10 year) asthmatic children, pediatricians should rely more on parental, rather than child's reports of changes in asthma symptoms for judgment of asthma control. In adolescents (≥11 years) however, pediatrician can address questions about changes in asthma symptoms

TABLE III–*Correlation Between Parental and Child's Reports of Changes in Asthma Symptoms and Changes in Other Measures Among Patients*

	Changes in mean daily symptom scores	Changes in mean daily PEFR values	Changes in FEV_1 values
Pareental reports of changes in asthma symptoms	0.54 (0.001)	0.03 (0.85)	0.31 (0.15)
Child's reports of changes in asthma symptoms	0.23 (0.19)	0.27 (0.14)	0.04 (0.85)

* Values expressed as correlation coefficients' value.

TABLE IV–*Correlation Between Parental and Child's Reports of Changes in Asthma Symptoms and Changes in Other Measures Among Patients 11 to 18 years*

	Changes in mean daily symptom scores	Changes in mean daily PEFR values	Changes in FEV1 values
Parental reports of changes in asthma symptoms	0.63 (0.01)	0.19 (0.47)	0.32 (0.24)
Child's reports of changes in asthma symptoms	0.57 (0.01)	0.26 (0.30)	0.32 (0.22)

* Values expressed as correlation coefficients (p value)

to the child for obtaining information related to asthma control. Among patients aged 11 year or older, this study showed that parental reports of changes in asthma symptoms were also reliable for assessment of asthma control. This differs from the Canadian study in which parental reporting of symptomatology correlated weekly with asthma control and this may be due to cultural factors reflecting the independence of pre-teen and teenage Canadian children as compared with those of Brazil. However, in older patients, no matter what the validity of parental reporting is, asking the child but not the parent about changes in asthma symptoms has advantages. In this case, child may be encouraged to participate in their asthma management(2).

This study showed that, in both age groups, parental and child's reports of changes in asthma symptoms correlated weekly with changes in pulmonary functional parameters, such as mean daily PEFR value (r: 0.03 to 0.27) and FEV_1 (r: 0.04 to 0.32). The similar findings were also reported by the Canadian study(4). It may be more easy to explain the discordance between FEV_1 and parental and child's reports of asthma symptom as FEV_1 represented the pulmonary functional status at the moment of the visiting while parental and child's reports reflects changes of asthma symptom over the studied period. The inconsistent correlation between parental and child's reports and daily PFER score found in this study casts doubts on the validity of routine use of peak flow meter for monitoring asthma severity in children. Recently, there has been increasing evidence showing that PFER monitoring is less sensitive than symptom reporting to detect meaningful clinical changes(7-9). These data may provide a plausible explanation for the findings of this study. The poor compliance of patients is the another important limitation which may

Key Messages

- Parental reports of changes in asthma symptoms are more reliable than child's reports in patients under 11 years; in patients aged 11 years or older, child's reports are so valid as their parent reports.
- Neither parent's nor child's reports of changes in asthma symptoms correlate accurately with changes in patient's pulmonary function.

prejudice the validity of daily PFER monitoring(10). However, in some selected children who underperceive or overperceive symptoms, the peak flow meter can be useful for adequate assessment of asthma control and for optimal asthma management(11).

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