0021-7557/11/87-06/541
Jornal de Pediatria

Perception of dyspnea in childhood asthma crisis by the patients and those in charge of them

Ana Alice Amaral Ibiapina Parente,[1] Maria de Fátima Pombo March,[2] Lucia de Araujo Evangelista,[3] Antonio Ledo Cunha[4]

Abstract

Objective: To evaluate the correlation between perception of dyspnea during a mild to moderate asthma attack using the Modified Borg Scale (MBS) and peak expiratory flow rate (PEFR).

Methods: This was a cross-sectional study conducted with children and adolescents who sought a pediatric emergency service due to an asthma attack. Data were collected from July 2005 to June 2006. Demographic data were recorded. Patients and those in charge of them were requested to grade, individually, the patient's dyspnea using the MBS; afterwards, the PEFR was measured.

Results: 181 asthmatic patients were evaluated, with a mean age of 7.2 (± 2.4) years (range, 4-12). The mother sought medical aid in 83.4% of the cases (151/181). Patient symptoms included coughing in 68.5% (124/181), dyspnea in 47.0% (85/181), and wheezing in 12.7% (23/181). Thirty-six percent (65/181) had a mild attack, and 64.1% (116/181) a moderate one. A significant negative correlation was found between the patients' and accompanying adults' perceptions of patient's dyspnea and the PEFR (% predicted; r_s = -0.240 and r_s = -0.385, respectively).

Conclusion: Both the patients and those looking after them had a poor perception of the severity of the patient's dyspnea. This emphasizes the need to monitor objective measures such as the PEFR and to develop better ways of evaluating dyspnea.

J Pediatr (Rio J). 2011;87(6):541-6: Perception, asthma and dyspnea.

Introduction

Perception can be defined as a conscious sensation of a physiological problem felt by the patient. It is the end result of a series of processes: activation of afferent terminals by physiopathological stimuli, transmission and processing of information by neuronal channels, interpretation in the cerebral cortex and acknowledgement by the patient. The term dyspnea is usually employed to describe unpleasant or uncomfortable respiratory sensations experienced by individuals.[1,2]

Dyspnea is one of the main symptoms reported by the asthmatic patient, as is coughing, wheezing and the sensation of chest tightness. When diagnosing asthma, the presence of recurring episodes of airway obstruction and the exclusion of alternative diagnoses are of paramount

1. Professora adjunta, Pediatria, Faculdade de Medicina, Universidade Federal do Estado do Rio de Janeiro (UNIRIO), Rio de Janeiro, RJ, Brazil. Pneumologista pediátrica, Serviço de Pneumologia, Instituto de Puericultura e Pediatria Martagão Gesteira (IPPMG), Universidade Federal do Rio de Janeiro (UFRJ), Rio de Janeiro, RJ, Brazil.
2. Professora adjunta, Departamento de Pediatria, Faculdade de Medicina, UFRJ, Rio de Janeiro, RJ. Chefe do Serviço de Pneumologia, IPPMG, UFRJ, Rio de Janeiro, RJ, Brazil.
3. Médica assistente, IPPMG, UFRJ, Rio de Janeiro, RJ, Brazil.
4. Professor titular, Departamento de Pediatria, Faculdade de Medicina, UFRJ, Rio de Janeiro, RJ, Brazil.

No conflicts of interest declared concerning the publication of this article.

Suggested citation: Parente AA, March MF, Evangelista LA, Cunha AL. Perception of dyspnea in childhood asthma crisis by the patients and those in charge of them. J Pediatr (Rio J). 2011;87(6):541-6.

Manuscript submitted Dec 31 2010, accepted for publication Aug 24 2011.

http://dx.doi.org/10.2223/JPED.2144

importance. Thus, clinical data and laboratory examinations, in addition to the evaluation of lung function, via spirometry or the peak expiratory flow rate (PEFR) measure, are combined to confirm or exclude the disease and to evaluate severity classification.[3,4]

In asthmatic individuals, there is strong evidence that the perception of dyspnea is associated with an increased respiratory effort generated by increased airway resistance. Thus, dyspnea quantification seems to be a good approach to determining the degree of airway obstruction.[5] In addition to mechanical factors, Rosi et al.[6] also emphasize the existence of a relationship between inflammation and the perception of dyspnea during bronchoconstriction.

Asthma attacks are classified according to their severity, and treatment should be started immediately. Asphyxia is identified as the main cause of death. Excessive treatment as the cause of death, although possible, is rare. A poor perception of the degree of airway obstruction has been identified, among other aspects, as a risk factor for the occurrence of very severe or fatal attacks.[7]

Choi et al.,[8] studying asthmatic patients, showed that treatment with beta-2 agonist and corticosteroid improved the perception of dyspnea, even in elderly patients. Those authors emphasized the impact of an allergic component in the perception difficulty observed in some patients.

In spite of having more severe asthma attacks, some patients undervalue them and neglect their treatment. Conversely, other patients, with an exaggerated perception of their dyspnea, consume an excessive amount of drugs and medical resources.[3,7,9]

There are both qualitative and quantitative methods available to determine the severity of dyspnea. The Modified Borg Scale (MBS) is one of those most used. The patient grades his or her degree of respiratory discomfort using a scale from zero to 10, with 10 being the maximum.[10] Among other data, age, socioeconomic and cultural level and anxiety have been identified as factors involved in the perceptive variations reported. Because the treatment plan is determined by the symptoms described, monitoring objective measures, such as the PEFR, in poor perceivers acquires great importance in the patient's life.[1,11]

Little is yet known about the accuracy of perception of respiratory difficulty in pediatric asthma.[9,11] Fritz et al.[12] have published a study on subjective and objective methods employed to evaluate respiratory perception, emphasizing its relevance in medical handling. Guyatt et al.,[13] studying pediatric patients, observed that the perception of asthma by patients over 10 years old was more accurate than that referred by the people in charge of them.

Two studies have evaluated the perception of dyspnea in children with asthma and detected a high percentage of inadequate perception.[14,15] Cabral et al.[16] showed that a large number of pediatric patients could not accurately perceive bronchial obstruction; those authors did not detect any association with age, sex, clinical severity or use of prophylactic medication. Fritz et al.,[17] evaluating the correlation between PEFR measure and perception of external overload applied to the patient, have stressed the importance of *in vivo* studies and their greater possibility of practical application in identifying children at risk for greater asthma-related morbidity. Two recent studies have emphasized that the perception of bronchospasm severity can contribute to a delay in appropriate treatment.[18,19]

The objective of this study was to evaluate the correlation between perception of dyspnea during a mild to moderate asthma attack using the MBS and PEFR.

Methodology

All the patients who sought the Institute of Puericulture and Pediatrics Martagão Gesteira (Instituto de Puericultura e Pediatria Martagão Gesteira, IPPMG), of the Universidade Federal do Rio de Janeiro (UFRJ), with a mild to moderate asthma attack, in the period between July 20, 2005 and June 30, 2006, in the working days of the researcher, were invited to take part in the study.

Inclusion criteria: Patients with the diagnosis of mild to moderate acute asthma, according to the Global Initiative for Asthma (GINA)[4]; an affirmative answer to the question "did the child present wheezing in the last 12 months?"[20]; age between 4 and 12 years old.

Exclusion criteria: Patients with other conditions associated with the presence of dyspnea, such as cardiopathy, neuromuscular disease or other lung diseases; lack of cooperation or inability to execute the maneuvers requested; asthma classified as acute severe by the same criteria.[4]

In order to collect the data, a standardized sheet was filled in by the project author. The following items were recorded: the patient's age, sex and education level; symptom(s) which led to medical attendance; relationship of the person in charge with the child or adolescent and if he or she cared for the child when she/he was not at school; education level and socioeconomic classification of the person in charge according to criteria of the Brazilian Institute of Public Opinion and Statistics (Instituto Brasileiro de Opinião Pública e Estatística, IBOPE).[21]

The child's height and weight were recorded. Before starting the treatment, the patients were asked to score, without any intervention of the examiner, how dyspneic they felt, using the MBS, with scores available from zero to 10, being 10 the maximum value. The person in charge, without being aware of the patient's answer, proceeded likewise.

Afterwards, the patient was asked to blow three times, in discardable flow tubes, the device for measuring the PEFR (Mini-Wright Peak Flow Meter, Clement-Clarke International,

Harlow, UK), and the best result was recorded.[3,4] The protocol of the study was approved by the local Research Ethics Committee and all those in charge signed the free informed term of consent (FITC).

Statistical analysis

Means and SDs of patients ages were recorded. The gender and education level of the patient and person in charge, relationship, if he or she looks after the child most of the time, classification of the IBOPE[21] and of the acute asthm,[3,4] and complaint(s) which led to the medical attendance were described in absolute numbers and frequency. According to data distribution, Spearman's rank correlation coefficient (r_s) was used to measure the degree of association between the perception (of the child and the person in charge) and the PEFR measure (PEFR % of predicted, related to the patient's height). Significance was set at 5%. The statistical analysis was processed by the software SAS 6.04 (SAS Institute, Inc., Cary, U.S.A.).

Results

Among the 181 patients, the mean age was 7.2 (±2.4) years, varying from 4 to 12 years old; 52.5% (95/181) were male. They all went to school.

The mother was responsible for seeking medical attendance in 83.4% (151/181) of the cases. There was an affirmative answer concerning looking after the patient in 93.4% (169/181). According to the criteria of the IBOPE of socioeconomic level, nobody in charge was in classes A1, A2 or E; 1.1% (2/181) belonged to class B1, and 4.4% (8/181) belonged to class B2. The classes C and D, together, accounted for 94.4% (171/181) of the population studied.

By the classification of the asthma crisis as per the GINA, 35.9% (65/181) had a mild attack, and 64.1% (116/181) a moderate attack. Coughing was reported in 68.5% (124/181), dyspnea in 47.0% (85/181), and wheezing in 12.7% (23/181). All the patients had one or more signs or symptoms characteristic of an asthma attack[3,4] (Table 1).

Table 1 - Description of the general characteristics of the sample – frequency (n) and percentage (%)

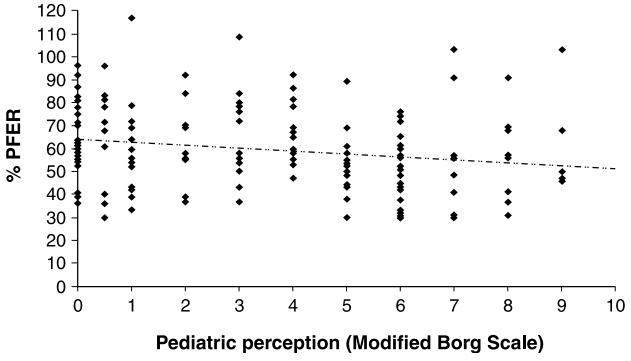
Characteristic/category	N	%
Gender		
Male	95	52.5
Female	86	47.5
Patient's education level (elementary school incomplete)	181	100.0
Person in charge		
Mother	151	83.4
Father	22	12.2
Grandparents	4	2.2
Neighbors	2	1.1
Others	2	1.1
Looking after the child outside the school?		
Yes	169	93.4
No	12	6.6
Education level of the person in charge		
None	4	2.2
Elementary School incomplete	85	47.0
High school incomplete	60	33.1
High school complete	32	17.7
IBOPE		
B1	2	1.1
B2	8	4.4
C	96	53.0
D	75	41.4
Asthma crisis classification		
Mild	65	35.9
Moderate	116	64.1
Complaint which led to the attendance		
Coughing	124	68.5
Dyspnea	85	47.0
Wheezing	23	12.7
Chest tightness	6	3.3

IBOPE = Brazilian Institute of Public Opinion and Statistics (Instituto Brasileiro de Opinião Pública e Estatística).

The mean score of dyspnea, by the MBS, of the patients and the accompanying adults was 3.5 and 4.1, with a standard deviation of 2.8 and 2.4, respectively. There was a significant inverse correlation between the patient's perception and the PEFR (% of predicted) (r_s = -0.240; p = 0.001; n = 181), as can be seen in Figure 1. There was also a significant inverse correlation between the perception of the accompanying adult and the PEFR (% of predicted) (r_s = -0.385; p = 0.0001; n = 181), as can be seen in Figure 2.

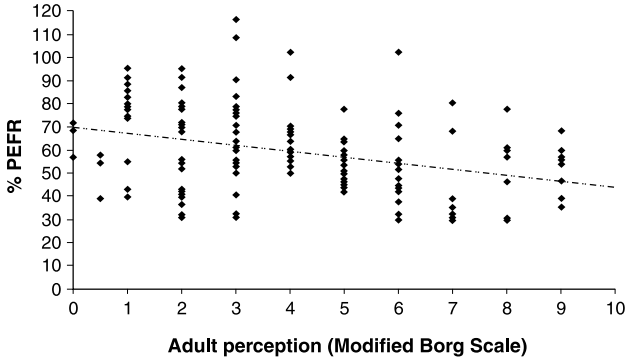
In the two scatter charts, the straight line drawn illustrates the trend of the relationship between the perception of dyspnea and the PEFR (% of predicted).

Subsamples were analyzed, in order to detect significant variations between the patient's perception and that of the person in charge, related to the age and gender of the child and adolescent; education level of the person in charge; classification of the asthma crisis. The patients were divided into two age ranges: 4-9 and 10-12 years old; and two asthma crisis groups: mild or moderate. Regarding education level, the people in charge were divided into two groups, up to or more than eight years of study (Table 2).



PEFR = peak expiratory flow rate.

Figure 1 - Correlation of pediatric perception assessed using the Modified Borg Scale and PEFR (% of predicted) in the patients studied



PEFR = peak expiratory flow rate.

Figure 2 - Correlation of adult perception assessed using the Modified Borg Scale and PEFR (% of predicted) in the patients sudied

Discussion

This study showed a significant correlation between the perception of dyspnea of children and adolescents and those in charge of them and the PEFR measure (% of predicted). However, this correlation can be considered to be weak, as Spearman's rank correlation coefficient varies from -1 to 1, and the nearer it is to zero, the weaker is the relationship between the two variables. Those in charge showed better perception of the dyspnea than the patients studied.

The importance of a study performed in natural conditions should be pointed out, as it evaluates the perception of the dyspnea *in vivo*, in a situation very close to reality, in spite of the difficulties concerning an emergency room with spontaneous demand.[13,16]

Cabral et al.,[16] analyzing three different age ranges (6-9, 10-11 and 12-16 years old), concluded that the perception was not related to the age range. On the other hand, Guyatt et al.[13] noted that the patients aged between 11 and 17 years old showed a better correlation of the capacity to evaluate asthma than those in charge of them. The authors emphasized that using the daily PEFR measure could bring additional benefit regarding the evaluation of the airway caliber. To analyze the age, the patients' results were subdivided into two age ranges: 4-9 and 10-12 years old. A significant inverse correlation was detected in the range from 4 to 9 years old (r_s = -0.321; p = 0.0001; n = 147); however, in the subgroup of 10 to 12 years old, no significant correlation was found between the patient's perception and the PEFR measure (% of predicted) (r_s = 0.102; p = 0.56; n = 34). This fact can be explained by the reduced number of patients in this age range or by their lower willingness to collaborate. Although widely used and recommended, using the PEFR measure does have limitations, as it is not familiar to all the patients, has an effort-dependent characteristic and may not reflect the involvement of the small airways accurately.[12,17] In spite of Yoos & McMullen[22] reporting that adolescents have greater accuracy in the perception, Boulet et al.[23] had described poorer perception over time (10 years or more of disease) in asthmatic adults, and Chen et al.[24] point out that even children with more severe asthma can become accustomed to the symptoms and, as a result, be slower to perceive changes during exacerbations of asthma. Most of the studies in adults did not find any differences in gender perception. These findings were confirmed by studies in the pediatric population[16] and are compatible with the results presented here.

Table 2 - Correlation of the patient's perception and that of the person in charge with the PFER (% of predicted) in the samples and subsamples analyzed

Sample	Perception of patient	Perception of person in charge
General		
r_s	-0.240	-0.385
p	0.001	0.0001
n	181	181
Male		
r_s	-0.302	-0.533
P	0.003	0.0001
N	95	95
Female		
r_s	-0.161	-0.146
P	0.14	0.18
N	86	86
Patients from 4 to 9 years		
r_s	-0.321	-0.384
p	0.0001	0.0001
n	147	147
Patients from 10 to 12 years		
r_s	0.102	-0.417
p	0.56	0.014
n	34	34
Education level of person in charge: up to elementary school incomplete		
r_s	-0.273	-0.442
p	0.010	0.0001
n	89	89
Education level of person in charge: high school incomplete and complete		
r_s	-0.212	-0.326
p	0.042	0.001
n	92	92
Mild asthma crisis		
r_s	-0.194	-0.487
p	0.12	0.0001
n	65	65
Moderate asthma crisis		
r_s	-0.163	-0.333
p	0.080	0.0003
n	116	116

The accompanying adults showed a significant inverse correlation between their perception of the patient's dyspnea and the PFER (% of predicted) ($p < 0.01$) ($r_s = -0.326$ and $r_s = -0.442$), although studies with adults have shown a greater difficulty in individuals with a low socioeconomic and educational level in the perception of dyspnea.[25] As anxiety seems to play an important role in the perceptive capacity, such variables may not be the only ones responsible for individual differences in perception.[22,26]

No variation was shown in the perception between patients with a mild or moderate attack. Baker et al.[15] described that the difficulty in perceiving changes in the degree of bronchial obstruction, induced by methacolin, was not significantly correlated with the hyperreactivity of the airway. We consider that the non-inclusion of patients with a severe asthma attack is a limitation of the study, but we should respect the patient's physical conditions and the ethical commitment of clinical research.

Issues concerning the improvement of the perception of symptoms of asthma with training and the best evaluation method remain inconclusive[17,27,28]; nevertheless, all the patients studied went to school, so we suggest studies, in our setting, which evaluate the accuracy of the teachers in identifying students having an asthma attack, as well as their response to capacitation programs. A recent study showed that children whose caregivers did not have suitable knowledge of diagnosing asthma had a worse perception of dyspnea than those diagnosed by a doctor as being asthmatic.[29] Thus, clinical parameters added to the evaluation of the quality of life, lung function and inflammatory markers can be complementary in the management of the patient with asthma.[30]

We concluded that the perception of dyspnea by the children and those in charge of them had a significant, but weak, correlation with the PFER measure (% of predicted). Further studies about more appropriate methods to evaluate perception of dyspnea and factors involved in poor perception are required, as well as how those factors can be modified in order to provide greater accuracy in perception.

References

1. Banzett RB, Dempsey JA, O`Donnell DE, Wamboldt MZ. Symptom perception and respiratory sensation in asthma. Am J Respir Crit Care Med. 2000;162:1178-82.
2. Dyspnea. Mechanisms, assessment and management: a consensus statement. American Thoracic Society. Am J Respir Crit Care Med. 1999;159:321-40.
3. National Asthma Education and Prevention Program (NAEPP). Guidelines for the diagnosis and management of asthma (Expert panel report 3). Bethesda: National Heart, Lung, and Blood Institute; 2007. http://www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf. Access: 26/08/2010.
4. Global Initiative for Asthma (GINA) [Internet]. Global strategy for asthma management. http://www.ginasthma.org. Access: 26/08/10.
5. Roisman GL, Peiffer C, Lacronique JG, Le Cae A, Dusser DJ. Perception of bronchial obstruction in asthmatic patients. Relationship with bronchial eosinophilic inflammation and epithelial damage and effect of corticosteroid treatment. J Clin Invest. 1995;96:12-21.
6. Rosi E, Stendardi L, Binazzi B, Scano G. Perception of airway obstruction and airway inflammation in asthma: a review. Lung. 2006;184:251-8.
7. Lougheed MD. Variability in asthma: symptom perception, care, and outcomes. Can J Physiol Pharmacol. 2007;85:149-54.
8. Choi IS, Chung SW, Han ER, Lim JH, Cho JS, Lee YC, Cho S, Jang AS. Effects of anti-asthma therapy on dyspnea perception in acute asthma patients. Respir Med. 2006;100:855-61.
9. Martínez-Moragón E, Perpiñá M, Belloch A, de Diego A, Martínez-Francés ME. Percepción de la disnea durante la broncoconstricción aguda en los pacientes con asma. Arch Bronconeumol. 2003;39:67-73.
10. Borg GA. Psychophysical bases of perceived exertion. Med Sci Sports Exerc. 1982;14:377-81.
11. Martínez-Moragón E, Perpiñá M, Belloch A, de Diego A, Martínez-Francés ME. [Agreement in asthmatics' perception of dyspnea during acute and chronic obstruction]. Arch Bronconeumol. 2005;41;371-5.
12. Fritz GK, Yeung A, Wamboldt MZ, Spirito A, McQuaid EL, Klein R, Seifer R. Conceptual and methodologic issues in quantifying perceptual accuracy in childhood asthma. J Pediatr Psychol. 1996;21:153-73.
13. Guyatt GH, Juniper EF, Griffith LE, Feeny DH, Ferrie PJ. Children and adult perceptions of childhood asthma. Pediatrics. 1997;99:165-8.
14. Male I, Richter H, Seddon P. Children's perception of breathlessness in acute asthma. Arch Dis Child. 2000;83:325-9.
15. Baker RR, Mishoe SC, Zaitoun FH, Arant CB, Lucas J, Rupp NT. Poor perception of airway obstruction in children with asthma. J Asthma. 2000;37:317-24.
16. Cabral AL, Conceição GM, Saldiva PH, Martins MA. Effect of asthma severity on symptom perception in childhood asthma. Braz J Med Biol Res. 2002;35:319-27.
17. Fritz GK, Adams SK, McQuaid EL, Klein R, Kopel S, Nassau J, Mansell A. Symptom perception in pediatric asthma: resistive loading and in vivo assessment compared. Chest. 2007;132:884-9.
18. Motomura C, Odjima H, Tezuka J, Harada J, Okada K, Nishima S. Perception of dyspnea during acetylcholine-induced bronchoconstriction in asthmatic children. Ann Allergy Asthma Immunol. 2008;102:121-4.
19. Malakauskas K, Ragaisiene S, Sakalauskas R. Perception of acute airway function changes by patients with mild asthma. Allergy Asthma Proc. 2009;30:277-83.
20. Worldwide variations in the prevalence of asthma symptoms: the International Study of Asthma and Allergies in Childhood (ISAAC). Eur Respir J. 1998;12:315-35.
21. Instituto Brasileiro de Opinião Pública e Estatística (IBOPE) [Internet]. http://www.ibope.com.br. Access: 26/08/10.
22. Yoos HL, McMullen A. Symptom perception and evaluation in childhood asthma. Nurs Res. 1999;48:2-8.
23. Boulet LP, Milot J, Turcotte H. Relationship between changes in diurnal variation of expiratory flows, lung volumes and respiratory symptoms after acute asthma. Respir Med. 1991;85:487-93.
24. Chen E, Hermann C, Rodgers D, Oliver-Welker T, Strunk RC. Symptom perception in childhood asthma: the role of anxiety and asthma severity. Health Psychol. 2006;25:389-95.
25. Martínez-Moragón E, Perpiñá M, Belloch A. Does experience influence perception of dyspnea?. Arch Bronconeumol 2006;42(4);171-4.
26. Martínez-Moragón E, Perpiña M, Belloch A, Serra B, Lloris A, Macián V. Evolution over time in over perceivers of dyspnea in asthma. Arch Bronconeumol. 2006;42;120-4.
27. Chen E, Oliver-Welker T, Rodgers D, Strunk RC. Developing measures of symptom perception for children with asthma. J Allergy Clin Immunol. 2007;119:248-50.
28. Coli C, Picariello M, Stendardi L, Grazzini M, Binazzi B, Duranti R, Scano G. Is there a link between the qualitative descriptors and the quantitative perception of dyspnea in asthma? Chest. 2006;130:436-41.
29. van Gent R, van Essen-Zandvliet, Rovers M M, Kimpen JL, de Meer G, van der Ent CK. Poor perception of dyspnoea in children with undiagnosed asthma. Eur Respir J. 2007;30:887-91.
30. Andrade CR, Chatkin JM, Camargos PA. Assessing clinical and spirometric control and the intensity of the inflammatory process in asthma. J Pediatr (Rio J). 2010;86:93-100.

Correspondence:
Ana Alice Parente
Av. das Américas 8888, Bl.2, Ap. 902
Barra da Tijuca
CEP 22793-081- Rio de Janeiro, RJ - Brazil
Tel: +55 (21) 24316865
Fax: +55 (21) 34574066
Email: aaliceparente@terra.com.br