

Blunted perception of dyspnea in asthmatic children: A potential misleading criterion

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Abstract

Dyspnea (or breathlessness) is a symptom describing a perceived experience of breathing discomfort. Children's awareness of dyspnea is variable and there is only a poor correlation between the objective respiratory distress measurements and the subjectively awareness of dyspnea. Those who do not perceive dyspnea may not be motivated to comply with their daily prophylactic

treatment. Since dyspnea is the main symptom of asthma, and disease management is based largely on the description of symptoms between clinic visits, unreliable symptom report may mislead decision-making for long-term treatment of asthma. Thus, therapeutic decisions should not be taken solely on patients' perception and description of dyspnea.

Key words: Breathlessness; Respiratory distress; Tachypnea; Asthma; Symptom

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Core tip: Children's awareness of dyspnea is variable and there is only a poor correlation between the objective respiratory distress measurements and the subjectively awareness of dyspnea. Children with asthma vary in their perception of dyspnea for the same degree of bronchoconstriction. Therapeutic decisions should not be taken solely on patients' perception and description of dyspnea.

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INTRODUCTION

Dyspnea (or breathlessness) is a symptom describing a perceived experience of breathing discomfort and is considered a warning sign to a critical threat to homeostasis. It urges to adaptive responses intended to minimize the work of breathing, such as resting or taking the necessary medicines^[1]. Since dyspnea is a subjectively perceived abnormal sensation it is quite distinct from the objective signs of respiratory

distress, such as tachypnea, retractions and use of accessory muscles. Dyspnea is a common symptom of cardiopulmonary disorders. However, its intensity is not related solely to the severity of the underlying disease but it is also affected from psychological factors^[2]. In particular, anxiety in asthmatic children is positively associated with symptom perception during times when children's asthma is mild^[3]. In addition, dyspnea may also occur in healthy individuals, *e.g.*, during intense emotional states and heavy labor or exercise^[4].

Our knowledge on the pathophysiological pathways underlying dyspnea still remains incomplete. Specific dyspnea receptors have not been found so far and, since a clear beginning of the nervous sensory transduction pathway is missing, it is not yet feasible to clarify the neurophysiology of dyspnea and depict it as a well-defined model, such as the ones that exist for vision, hearing, or pain. However, the general principle of peripheral sensory information from the respiratory system, traveling through an intact afferent pathway and triggering regions of the cerebral cortex to produce the perception of dyspnea, does seem to exist.

DYSPNEA PERCEPTION AND LUNG FUNCTION IN ASTHMATIC CHILDREN

Despite the number of methods that have been developed in order to have accurate quantitative estimates of the degree of dyspnea and reproducible follow-up of patients, the incorporation of a real life method in everyday clinical practice still remains elusive. Among the plenitude of invented dyspnea scales, the most commonly encountered in medical literature, is the Borg scale and its modifications^[5]. The majority of dyspnea scales have been extensively used and studied in adults. However, their applicability is often questionable and, simplicity is always prerequisite in order to be used in children. Such scales can be used only on the assumption that the child's ability to organize objects in order - something that it is generally achieved after the age of 7 years - has reached an operational stage^[6].

But is the perception of dyspnea so critical as to affect clinical management and outcomes of asthmatic children? Male *et al*^[7] tried to investigate the relation of poor perception of breathlessness with severe asthma attacks in children. They retrospectively studied 27 children admitted to hospital with asthma exacerbation all of whom had recordings of breathlessness scores as well as oxygen saturation, clinical score, and FEV₁, at 5, 10, 24, 48, and 72 h after admission. They found that the more severely affected (hypoxic) children had a trend towards feeling less breathless at admission. These children also experienced a smaller decrease in dyspnea score for a similar improvement in FEV₁, than children presenting without hypoxia. van Gent *et al*^[8] in a cross sectional study, measured dyspnea in two groups of "diagnosed" and "undiagnosed" asthmatic children. Subjects in

the first group were already diagnosed with asthma, whereas in the second group asthma was actually diagnosed during the recruitment phase of the study. All children underwent hypertonic saline testing for bronchial hyperresponsiveness. The authors observed that children with "undiagnosed" asthma had worse perception of dyspnea than children with "diagnosed" asthma. Nuijsink *et al*^[9] studied the perception of bronchoconstriction during methacholine bronchoprovocation challenge in children with moderately severe atopic asthma. They demonstrated that the more severe the airway hyper-reactivity, the less likely it was for patients to perceive bronchoconstriction. They also observed that children having low baseline FEV₁ values tended to use less beta-agonist bronchodilator as a "rescue medication". Panditi *et al*^[10] measured the perception of dyspnea in asthmatic children during exercise challenge testing on treadmill. There was only a weak relation of the children's reported dyspnea measurements following the exercise test with the change in FEV₁ before and after the challenge. Approximately half of the children had a repeat challenge a few weeks later in which the discrepancies from the first visit were so great that no relation could be established between the changes in dyspnea and the spirometric indices between visits. They further compared parents' independent perception of their children's dyspnea with the dyspnea perceived from the children themselves. Parents' perception of their child's dyspnea was not related to any of the lung function measurements.

What the above studies add to our knowledge regarding children's perception of dyspnea? Children's awareness of dyspnea is variable and there is only a poor correlation between the objective respiratory distress measurements and the subjectively awareness of dyspnea. Children with asthma vary in their perception of dyspnea for the same degree of bronchoconstriction. In general, children, especially those with undiagnosed asthma, may become tolerant to a certain degree of bronchoconstriction mainly because of adaptation related to frequent bronchoconstriction^[11]. Despite the absence of direct evidence proving correlation between poor perception of dyspnea with either severe persistent asthma or history of severe asthma attacks, the blunted sensation of dyspnea in many children may result in delayed diagnosis and/or under-treatment of the disease, and so puts them at risk of severe and even life threatening asthma attacks. Those who do not perceive dyspnea may not be motivated to comply with their daily prophylactic treatment. Children who underestimate their symptoms tend to seek medical help only at a late stage of their exacerbations. Moreover, poor perception contributes to the considerable number of children without proper diagnosis despite suffering from asthma. In this case, the absence of prophylactic treatment combined with poor alertness may result in the first clear presentation of their disease being a severe and possibly life threatening acute attack^[12]. Parents and caregivers appear to be even less accurate in detecting their child's

symptoms.

CONCLUSION

Since dyspnea is the main symptom of asthma, and disease management is based largely on the description of symptoms between clinic visits, unreliable symptom report may mislead decision-making for long-term treatment of asthma. Thus, therapeutic decisions should not be taken solely on patients' perception and description of dyspnea.

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