

Does body composition affect the severity of exercise induced bronchoconstriction in asthmatic children?

BMI predicts exercise induced bronchoconstriction in asthmatic boys

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Exercise induced bronchoconstriction (EIB) describes the acute narrowing of the airways during or after exercise. EIB is a common manifestation of asthma and may impact children's physical activity behaviour and consequently children's body composition. In a recent publication, van Veen and colleagues investigated the relation between body mass index (BMI) and pre-exercise forced expiratory volume in 1s (FEV₁) on EIB occurrence and severity in asthmatic children [1].

Methods

Data from children aged 7–18 years with mild and clinically stable asthma (FEV₁ ≥ 70% predicted) were evaluated for EIB. Children performed a standardized exercise challenge test on a treadmill in a cold, dry air environment (1–10°C; humidity 1.0–6.0 mg H₂O.L⁻¹). The exercise test lasted 6 min and the target exercise intensity was 80–90% of predicted maximum (calculated by the formula 210–age). Spirometry was performed before exercise and at predefined time points until 20 minutes post exercise. EIB was defined as a decline of FEV₁ ≥ 13% from baseline.

Results

212 children aged 12.6 ± 2.4 years were included in the study, of which 19% were overweight and 5% were obese. Overall, 103 children (49%) had a positive exercise challenge test and were diagnosed with EIB. Asthmatic children with EIB had a lower pre-exercise FEV₁ (92.8 ± 13.2 versus 100.5 ± 13.8% predicted, *p* < 0.001) and a higher BMI z-score compared to 109 children without EIB (0.47 ± 1.2 versus 0.16 ± 1.0, *p* = 0.04). In multivariate logistic regression analysis (covariates were not described), pre-exercise FEV₁ was a significant predictor of EIB. Children in the highest quartile (reference group) had a six times higher risk for EIB compared to those in the lowest quartile (OR 6.1, 95% CI 2.5–14.5). Moreover, van Veen et al [1] found that the severity of EIB (i.e., maximum decline of FEV₁ post-exercise) was significantly greater in the group of overweight and obese compared to normal weight children (23.9 versus 17.9 %).

In a gender-specific sub analysis, the associations between EIB and BMI (z-score between 0 and +1 SD) were only evident for boys, not girls. Logistic regression analysis revealed

that BMI z-score and pre-exercise FEV₁ were independent predictors of EIB in boys, but not for girls.

Commentary

This study demonstrates that the severity of EIB (but not its prevalence) is greater among overweight and obese compared to normal weight asthmatic children. There has been a debate about the impact of overweight/obesity on EIB, and (sports-) pediatricians and clinicians need to consider these relationships to initiate appropriate treatment and education strategies for children and their parents/caregivers.

In asthmatic children, EIB is indicative of poor asthma control [4] and can have a detrimental impact on children's physical activity levels and may even result in avoidance of physical activities. This initiates a vicious circle and leads to further physical deconditioning and occurrence of unpleasant respiratory symptoms during physical activities and sports. However, regular physical activity is crucial to maintain a healthy bodyweight and all children with asthma [assuming appropriate education and (pharmaco-) therapy] should be able to engage in regular physical activities.

Interestingly, the study by van Veen et al. [1] found some indication for gender-specific effects on the relationship between EIB and BMI. In their study, asthmatic boys with EIB (not girls) had a higher BMI compared to boys without EIB. The authors speculated that the relation between EIB and BMI could be due to a “greater EIB induced physical inactivity and/or more truncal fat load, which is more associated with metabolic and inflammatory dysregulation”. Indeed, there is a growing body of evidence that suggests that low physical activity levels (beside other factors such as allergen exposure and hygiene) contribute to EIB prevalence and severity [6]. Unfortunately, the authors did neither measure nor adjust for children's physical activity levels as important covariate in their multivariate regression models.

The driving force for EIB is airway drying caused by a high ventilatory demand (i.e., a high minute ventilation). Thus, exercise intensity during exercise testing is a major determinant of EIB severity in children [2,3]. In the present study, heart rate was used to measure exercise intensity during treadmill exercise testing. Since overweight and obesity are associated with (severe) physical deconditioning, one could argue that a higher ventilatory demand in overweight and obese children during weight bearing treadmill exercise

[5] may have lead to the greater severity of EIB compared to normal weight children. The additional measurement of minute ventilation during exercise would have allowed to quantify the magnitude of the stimulus to airway narrowing and to control for the potential bias of a higher ventilatory work on the severity of EIB in overweight and obese children.

Future prospective studies may provide a deeper insight into the underlying causes of the observed gender differences in the relationship between EIB and BMI. Finally, and most importantly, it remains to be proven in randomized controlled trials whether changes in lifestyle [7], for example improvements in body composition and exercise capacity, have a positive effect on EIB occurrence and severity in asthmatic girls and boys.

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