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Title: Asthma and obesity in children: The role of physical activity and airway inflammation

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Body: Background: There is increasing evidence for an association between asthma and obesity in childhood. Characteristics of the asthma-obesity phenotype are high medication use, low asthma control and an altered inflammatory pattern. Obesity is associated with low Physical Activity (PA) levels; however, studies are inconsistent about an association between asthma and low PA levels. As obesity often antedates asthma, low PA levels might play a role in the development of the asthma-obesity phenotype. We aim to investigate the role of PA and airway inflammation in pediatric asthma and obesity. Methods: In total, 122 children (aged 6-12 years) were recruited via an online questionnaire and divided into four groups; Asthma n=29, overweight n=30, asthma-overweight n=30, and healthy control n=33. PA was defined by the average step count of seven consecutive days, measured by an accelerometer. Eosinophilic airway inflammation was measured by Fractional exhaled Nitric Oxide (FeNO). Results: Step count did not differ among the four groups ($p>0.05$). Significant predictors for a high step count included season of measurement, a younger age and the male sex ($P<0.01$). FeNO levels were not influenced by being overweight, but were increased in asthmatic children, older children and during spring season ($P<0.05$). Conclusion: Although asthma was characterised by increased FeNO levels, the paediatric asthma obesity phenotype cannot be characterized by altered FeNO levels and decreased PA levels. In future studies, other factors such as systemic inflammatory markers, dietary factors and chest wall mechanisms would be of interest to study in order to characterize the paediatric asthma-obesity phenotype.