
Exacerbations Are Associated with Lung Function Decline in a Broad Asthma Population in England, Scotland, and Wales 1950-2019

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Abstract

INTRODUCTION: Progressive lung function decline in patients with asthma may result in poorer control and worsening quality of life. Asthma exacerbations are thought to contribute to this decline. However, evidence is mixed and limited to a few mainly small, post-hoc studies. This longitudinal study aimed to assess the association between exacerbation burden and long-term lung function decline in a broad asthma patient population.

METHODS: This was a historical cohort study of a broad asthma patient population covering the United Kingdom in the Optimum Patient Care Research Database. Patients were followed up from the first eligible post-18th birthday peak expiratory flow rate (PEF) record (primary analysis), or record of forced expiratory flow in 1 second (sensitivity analysis) until the last record of the same type. Linear growth models that adjusted for age, sex, follow-up length, height, and time-varying smoking status were used to test the impact of mean annual exacerbation rate (AER - averaged over follow-up) on lung function trajectory both overall and stratified by age (18-24, 25-39 and 40+ years) and by mean dosage of inhaled corticosteroids (ICS), categorised into terciles (lowest, middle and highest).

RESULTS: We studied 109,182 patients with follow-up between 5 and 60 years. For each additional exacerbation per year an estimated additional 0.21% predicted PEF/year was lost (95% CI 0.18, 0.25). The effect was greatest in younger adults where those with AERs of 2+ and aged 18-24 years at baseline lost an additional 1.27% predicted PEF/year (95% CI 0.73, 1.81) compared to those with AER 0. These differences in the rate of LF decline between AER groups became progressively smaller as age at baseline increased. Apart from patients in the lowest ICS dosage tercile where there was no significant impact, there was a significant acceleration in lung function decline in patients with higher AERs compared to AER 0 for those in the middle and highest ICS terciles. The results using FEV₁ were consistent with the above.

CONCLUSION: To our knowledge, this is the largest, population-based assessment of asthma exacerbation burden and lung function decline and addresses key evidence gaps. We show that exacerbations are associated with faster lung function decline, which is most accelerated in patients aged under 40 years and not entirely prevented by ICS. Earlier intervention with appropriate management in younger asthma patients could be of value to prevent excessive lung function decline.

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