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Lung function and prevalence trends in asthma and COPD

THE OBSTRUCTIVE LUNG DISEASE IN NORTHERN SWEDEN
THESIS XVI

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Title
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Background Asthma and chronic obstructive pulmonary disease (COPD) are common obstructive airway diseases with a substantial burden in terms of morbidity, mortality and costs. Smoking is the single most important risk factor for COPD, and is associated with incident asthma. It is important to know if the prevalence of asthma and COPD is increasing or decreasing in the population in order to effectively allocate health care resources. The definitions of these diseases have varied over time and are still debated, which makes it difficult to measure changes in prevalence. The preferred method is to estimate the prevalence with identical procedures and definitions based on cross-sectional population samples within identical age distributions in the same geographical area at different time points. Measurements of lung function (spirometry) are required to diagnose COPD, and disease severity and progress of both asthma and COPD rely on spirometry, where observed values are compared to reference values. There are few evaluations based on Swedish population samples about how appropriate commonly used reference values for spirometry are. The aim of this thesis was to estimate trends in the prevalence of asthma and COPD in relation to smoking habits, and to evaluate and estimate reference values for spirometry. **Methods** The project was based on population-based samples of adults from the Obstructive Lung Disease in Northern Sweden (OLIN) studies. Postal questionnaires were sent to large cohorts recruited in 1992 (n=4851, 20-69 years), 1996 (n=7420, 20-74 years) and 2006 (n=6165, 20-69 years). The questionnaire included questions on respiratory symptoms and diseases, their comorbidities and several possible risk factors including smoking habits. Structured interviews and spirometry were performed in random samples of the responders to the 1992 and 2006 surveys, of which n=660 (in 1994) and n=623 (in 2009) were within identical age-spans (23-72 years). The trend in asthma prevalence was estimated by comparing the postal questionnaire surveys in 1996 and 2006 within the 20-69 year age-span, and the trend in COPD prevalence was estimated by comparing the samples participating in dynamic spirometry in 1994 and 2009, respectively. The prevalence of COPD was estimated based on several definitions of COPD. Commonly used reference values for spirometry were evaluated based on randomly sampled healthy non-smokers defined in clinical examinations of participants in the 2006 postal questionnaire (n=501). The main focus of the evaluation was the global lung function initiative (GLI) reference values, for which Z-scores and percent of predicted were analyzed. New sex-specific reference values for spirometry were estimated by linear regression with age and height as predictors. These new OLIN reference values were evaluated on a sample of healthy non-smokers identified in the population-based West Sweden Asthma Study. **Results** Although the prevalence of smoking decreased from 27.4% to 19.1%, between 1996 and 2006, the prevalence of physician diagnosed asthma increased from 9.4% to 11.6%. The prevalence of wheeze did not change significantly between the surveys or tended to decrease, while bronchitis symptoms such as cough and sputum production decreased significantly. The evaluation of the GLI reference values showed that the predicted values were lower compared to the observed values in Norrbotten, which makes the percent of predicted too high. This was especially true for FVC percent predicted, with a mean of 106%, and among women. New OLIN reference values valid for the Norrbotten sample were modelled and showed a high external validity when applied on the sample from West Sweden. Both prevalence and severity of COPD tended to decrease over the 15-year period between 1994 and 2009. **Conclusions** Parallel with a substantial decrease in smoking habits in the population, the prevalence of physician-diagnosed asthma increased while the prevalence and severity of COPD tended to decrease. The evaluation of reference values showed that the GLI reference values were lower than the observed spirometric values in the population, why the new up-to date reference values are of importance for disease evaluation.

Keywords: reference values, spirometry, risk factors, respiratory symptoms

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