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The prevalence of chronic airflow obstruction in three cities in the Nordic-Baltic region



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ARTICLE INFO	A B S T R A C T			
A R T I C L E I N F O Keywords: Chronic airflow obstruction COPD Asthma Smoking Gender difference	<i>Back ground:</i> Chronic airflow obstruction (CAO) is the primary characteristic of Chronic obstructive pulmonary disease (COPD) but is also seen in chronic asthma. <i>Objective:</i> To compare the prevalence of CAO and possible risk factors between Tartu in Estonia, Reykjavik in Iceland and Uppsala in Sweden. <i>Methods:</i> All participants underwent spirometry testing of forced expiratory volume in 1 s (FEV ₁) and forced vital capacity (FVC) before and after bronchodilation. CAO was defined as post-bronchodilator FEV ₁ /FVC below lower limit of normal. Information on respiratory diseases and smoking status, was obtained through questionnaires administered by trained interviewers. <i>Results:</i> 1037 men and 956 women participated in the study. The prevalence of CAO was lower in women in Tartu compared to the other centres (4.9% vs. 13.4 and 8.7% in Reykjavik and Uppsala, respectively, p = 0.002) while no difference was found for men. A similar picture was seen for the proportion of participants that had smoked 10 pack years or more which was much lower in Tartu for women than in Reykjavik and Uppsala, respectively (13.2% vs. 33.7 and 29.2%, p < 0.001). (Fig. 1). Of the participants with CAO the majority (57–67%) did not have a previous diagnosis of asthma or COPD. <i>Conclusion:</i> The prevalence of CAO was lower in Estonian women than in women from Iceland and Sweden. The reason for this was probably that the Estonian women had smoked less than the female participants from Iceland and Sweden. The majority of those with CAO do not have a diagnosed lung disease.			

1. Introduction

Chronic airflow obstruction (CAO) is the primary characteristic of chronic obstructive pulmonary disease (COPD). COPD is a disease characterized by a progressive airflow limitation and an accelerated decline in lung function [1]. It is an important cause of morbidity and mortality worldwide and it is suggested that the rates of the disease are generally underestimated [2]. The ageing population of the world and the continuous smoking is a big part of the growing burden of COPD [2,3], but previous studies shows that it is not the only explanation [4]. An accurate estimation of the prevalence of CAO and its risk factors would be of great value to prevent a further increase. CAO is also seen in chronic asthma with remodeling of the airway [5].

The prevalence of CAO and COPD in Europe ranges widely from 2.1 to 26.1% [6]. The reason behind this large difference is not fully known. The Burden of Lung Disease Initiative (BOLD) is an international study on the prevalence of CAO and COPD [7,8]. Previous studies on prevalence of asthma, respiratory allergies [9] and bronchial hyper responsiveness [10] has shown a lower prevalence in eastern Europe compared to western Europe but it is less clear if this is also the case when it comes to CAO.

The aim of this analysis was to see whether there is a difference in the prevalence of CAO and the possible risk factors between Tartu in Estonia, Reykjavik in Iceland and Uppsala in Sweden.

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2. Methods

2.1. Study design and participants

The report is based on data from BOLD, which is an international study on the prevalence of COPD and its rationale and design are described elsewhere [11]. The participants were adults aged 40 or older recruited through random sampling from the general population of Reykjavik, Iceland 2004–2005, Uppsala, Sweden 2006–2007 and Tartu, Estonia 2009.

Information was obtained about demographics, respiratory symptoms and diagnoses, pharmacological treatment, smoking status, occupational exposure and education level, through questionnaires administered by trained interviewers.

All participants underwent spirometry testing of forced expiratory volume in 1 s (FEV₁) and forced vital capacity (FVC) before and after bronchodilation (200 μ g salbutamol). The spirometry was conducted with the participant sitting in an upright position wearing a disposable mouth piece and a nose clip. FEV₁ and FVC values were obtained by spirometry using the NDD Easy One, ndd Medizintechnik, Zurich, Switzerland. Height and weight were measured and body mass index (BMI) was calculated as weight in kilograms divided by the square of height expressed in meters.

Serum concentrations of interleukin 6 (IL-6) and C-reactive protein (CRP) were measured at the University Hospital in Reykjavik. Blood was drawn from the antecubital vein of the seated subjects. Specimens were collected in SSTs from Greiner (Kremsmunster, Austria). Serum IL-6 concentrations were measured with enzyme-linked immunosorbent assays, using reagents obtained from IBL (Hamburg, Germany). The lower detection limit of the IL-6 assay was 0.074 ng/L. CRP concentrations were measured on a Kone 30 analyser using a commercially available latex-enhanced immunoturbidimetric assay from Roche Diagnostic Systems (Mannheim, Germany). The lower detection limit of the assay was 0.1 mg/L.

2.2. Definition of CAO

CAO was defined as post-bronchodilator FEV₁/FVC below lower limit of normal (LLN) using the reference values from the third United States National Health and Nutrition Examination Survey (NHANES III) for adult Caucasian men and women [12].

2.3. Smoking

The participants were divided into never, ex- and current smokers. Pack years were also calculated and the participants were categorized into those that had smoked 10 pack years or less or more than 10 pack years. Passive smoking was defined as answering 'yes' to the question: Has anyone living in your home (besides yourself) smoked a cigarette, pipe or cigar in your home during the past two weeks?

2.4. Diagnosed airway disease

Ever asthma was defined as answering yes to the questions: "Has a doctor or other health care provider ever told you that you have asthma, asthmatic bronchitis or allergic bronchitis?" Current asthma was defined as answering yes to the question above and also answering yes to the question: "Do you still have asthma, asthmatic bronchitis or allergic bronchitis?"

Diagnosed COPD was defined as reporting that a doctor or other health care provider had ever told the participant that he or she had chronic bronchitis, chronic obstructive pulmonary disease or emphysema.

Table 1	
Characteristics of the participants (% and mean \pm SD).	

	Tartu (n = 614)	Reykjavik (n = 757)	Uppsala (n = 547)	p-value		
Women Age (years) Body Mass Index kg/m2	49.3 61.0 ± 11.9 28.7 ± 7.8	$\begin{array}{r} 46.8 \\ 56.4 \ \pm \ 11.9 \\ 27.9 \ \pm \ 4.9 \end{array}$	$\begin{array}{l} 48.0 \\ 58.8 \ \pm \ 11.2 \\ 27.0 \ \pm \ 4.3 \end{array}$	0.65 < 0.001 < 0.001		
Smoking history				< 0.001		
Never smoked	52.5	39.1	44.0			
Ex smoker	29.8	42.6	42.0			
Current smoker	17.8	18.3	14.0			
Smoked 10 pack	25.3	39.5	32.9	< 0.001		
years or more						
Passive smoking	14.4	16.8	6.5	< 0.001		
Education				< 0.001		
Elementary school	12.5	25.1	24.7			
Highschool	51.7	46.6	47.0			
University	35.8	28.2	28.3			
Occupational exposure						
Dusty job	35.8	31.9	31.6	0.20		
for > 1 year						
Respiratory disease						
Ever diagnosed asthma	6.2	16.7	13.9	< 0.001		
Current asthma	3.7	8.0	9.2	< 0.001		
Ever diagnosed COPD**	6.2	8.2	5.6	0.14		
Asthma/COPD medication	3.1	13.2	12.7	< 0.001		
Chronic Airflow Obstructio- n**	6.1	11.3	9.0	0.04		

*Also including subjects with diagnosed chronic bronchitis and emphysema. **Defined as post bronchodilator FEV1/FVC below lower limit of normal.

2.5. Statistical analysis

The statistics were calculated using STATA software, version intercooled STATA 14.2 for Windows (Stata Corporation, Collage Station, Texas). The prevalence estimates for CAO were weighted to reflect the sampling site of each centre [7]. All other analyses used unweighted data. Chi² test and ANOVA in bivariable between-centre analyses and logistic regression were used when analysing the independent association between different variables towards CAO. The inflammatory variables were log transformed in the analyses and expressed as geometric mean with a 95% confidence interval in the table. A p < 0.05 denoted a statistically significant difference.

3. Results

In total 1037 men and 956 women from the different centres participated in the study. The characteristics of the studied population is presented in Table 1. Of the participants 177 (9.2%) had CAO. The prevalence of CAO was lowest in Tartu and highest in Reykjavik. Tartu also had the lowest prevalence of diagnosed asthma and use of medication against asthma or COPD, while no difference was found concerning diagnosed COPD.

3.1. Smoking and CAO in men and women

The prevalence of CAO was lower in women in Tartu compared to the other centres (4.9% vs. 13.4 and 8.7% in Reykjavik and Uppsala, respectively, p = 0.002), while no difference was found for men

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