



Asthma trigger perceptions are associated with work disability

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ABSTRACT

Objective: To study the association between perceptions of various triggers of asthma and employment status. **Methods:** A questionnaire was administered to all those adults living in the city of Tampere, Finland, who were entitled to special reimbursement for asthma medication by the Social Insurance Institution (n = 2613). The response rate was 79%. The study population (n = 1657) consisted of individuals who worked full-time (n = 967), were unemployed (n = 197), had all-cause work disability (n = 334), or were retired due to old age (n = 159). Given a list of potential asthma triggers, the respondents were asked how often (never/sometimes/often) the trigger caused or worsened their asthma symptoms during leisure time.

Results: After adjusting for background variables (age, sex, smoking, and professional status), frequency of asthma symptoms, and the use of asthma medication during the last year, any individual trigger identified as asthma-relevant was associated with having work disability (vs. working full-time). The highest odds ratio (OR) was found for vehicle exhaust (OR 5.0, CI 2.2–11.4). We found similar but less consistent associations between asthma trigger perceptions and unemployment. No elevated ORs were found regarding asthma trigger perceptions for old-age retirement.

Conclusions: Perceptions of asthma triggers are associated with all-cause work disability. Our findings suggest that asthmatics have excess trigger perceptions that are not explained by asthma alone. Asthmatics need to be informed that inaccurate trigger perceptions may develop, and how they are induced, because unnecessary trigger avoidance may interfere with work life.

1. Introduction

Asthma is a common chronic disease with potential occupational consequences. It has been shown to increase the risk of job change [1], sickness absences [2], all-cause long-term work disability [3,4], and sick leave or disability benefits [5]. Poorer symptom control of the disease associates with work disability outcomes [6]. Patients with worse asthma control are also more likely to be unemployed, as shown by a large population-based study in Europe [7].

Asthma is characterized by variable symptoms of wheeze, shortness of breath, chest tightness and/or cough, and by variable airway limitation [8]. Typically, these variations are triggered by a variety of factors, such as allergens, exercise, viral infections, emotional factors, cold air, irritants, or strong odors, and may lead to an acute onset or worsening of asthma symptoms [8,9]. Exposure to these triggers seems to play a part in poor control of asthma symptoms [10,11]. However, trigger perceptions are not systematically related to asthma control, as

some individuals have persistent symptoms without trigger sensitivity while others may have only infrequent symptoms but a striking sensitivity to environmental triggers. In addition, the mechanism of symptoms in asthmatic individuals is not always bronchoconstriction, but comorbidities like laryngeal obstruction may be clinically recognized [12].

In addition to pharmacological treatment, the identification of asthma triggers is often a key element in asthma management aiming at good control of symptoms, normal activity levels, and minimizing the risk of exacerbations. Therefore, patients are educated to recognize and avoid factors that trigger symptoms [13,14]. Individuals who reported that asthma had impacted their daily life also reported making considerable behavioral changes in order to manage exposure to known asthma triggers [11]. However, evidence of whether allergen and trigger education and avoidance improve asthma control is either limited or inconsistent [9].

Multiple factors contribute to the identification of asthma triggers,

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and psychological mechanisms are also involved [15]. Individuals vary in their perception of asthma triggers, and both underidentification and overidentification may occur. Asthma triggers that have a phenomenal appearance, such as cats and dogs, are easy to perceive, but the presence of many other potential triggers is inferred from cues such as the smell of diesel exhaust or mold [15,16]. Prior knowledge and beliefs about potential asthma triggers may help to identify triggers that are hard to perceive, but may also lead to inaccurate trigger beliefs and unnecessary avoidance of triggers [15,17]. Concerning allergens, symptom trigger reports only moderately match the results of skin prick tests [18]. Women report more asthma triggers than men [19,20], and some studies have shown higher education levels to be associated with reporting of fewer asthma triggers [18]. Further, smokers report fewer triggers than non-smokers [18,19].

Although asthma induced or triggered by workplace exposures, i.e. occupational asthma and work-exacerbated asthma, and their socioeconomic consequences have been studied previously [21], asthma triggers outside work have received little scientific attention from occupational researchers. However, as patients' perceptions of asthma triggers are important determinants of asthma outcomes, which in turn may increase the risk of adverse occupational outcomes, asthma triggers both at and outside work are of interest. If perceptions of asthma triggers outside work are related to employment status, this would suggest that trigger perceptions should be assessed in asthma management not only to improve daily asthma control but also to support working careers of asthmatic individuals.

The aim of the study was to assess the association between various perceived triggers of asthma and employment status. We studied whether the reporting of leisure time asthma triggers of individuals outside work life (those with work disability, unemployed or retired) differed to that of full-time workers, and also whether or not the detected differences remained after controlling for more symptomatic asthma and the use of asthma medication.

2. Materials and methods

2.1. Study population

The study was a cross-sectional questionnaire survey among adults with verified asthma. The questionnaire was sent to all adults (aged 20–65 years) with asthma living in the city of Tampere, Finland, entitled to special reimbursement for asthma medication by the Social Insurance Institution (SII) ($n = 2613$). The cases were identified from the Medication Reimbursement Register of the SII, which covers all permanent residents of the country. To be eligible for the reimbursement for asthma medication, the diagnosis of asthma must fulfill certain criteria that must be documented by the patient's physician and approved by the SII. At the time of the study, the criteria for receiving special reimbursement for asthma medication were: 1) a typical history, clinical features and course of asthma; 2) variable airway limitation shown by at least one of the following: a) a positive bronchodilator reversibility test (an increase in FEV_1 of $\geq 15\%$ and > 200 ml from baseline after β_2 -agonist); b) a repeated diurnal variability of $\geq 20\%$ in twice-daily PEF over two weeks; c) a significant increase in lung function (in FEV_1 by $\geq 15\%$ or PEF by $\geq 20\%$) after four weeks of anti-inflammatory treatment; d) a positive exercise challenge test (a decrease of $\geq 15\%$ in FEV_1 from baseline); and 3) continuing regular use of asthma medication that had lasted for at least six months at the time of the SII decision. All three criteria must be fulfilled. Thus, the study population consisted of individuals with clinically verified asthma, including objectively measured bronchial constriction. Individuals with occupational asthma were not included in the study, as they get compensation for asthma medication through another insurance system (statutory accident insurance).

The questionnaire with an information letter and an invitation to participate was sent in October 2000 (outside pollen season) and the

response rate was 79%. The formation of the study groups is described in more detail in previous reports of the survey [22,23]. In the present study, the study population ($n = 1657$) consisted of the following four groups, which were formed according to their employment status: (1) working full-time ($n = 967$), (2) unemployed ($n = 197$), (3) outside work life due to work disability (including all-cause sickness absence, disability pension, and disability pension applied for but not yet granted) ($n = 334$), and (4) retired due to old age ($n = 159$). We excluded those outside work life for other reasons (housewives, students, part-time workers, maternity leave, etc.) from this study because of their small number and the heterogeneity of the groups.

2.2. Background data, symptoms, and medication

The questionnaire included questions on age, sex, smoking, and professional status. We asked those who were on disability pension if asthma was the partial or main cause for this. The frequency of asthma symptoms was elicited by the question: 'How often on the average did you have asthma symptoms during the last year?'. To estimate the long-term use of asthma medication needed to control asthma, we asked the respondents: 'Have you used medication for your asthma during the last year (12 months)?' The response options for these questions can be seen in Table 1.

2.3. Asthma trigger perceptions

The respondents were given a list of potential factors that trigger asthma, which were chosen according to an unsystematic literature search and prior clinical experience. We asked if the factor in question causes or worsens their asthma symptoms during leisure time. The options were never, sometimes, or often. The triggers included environmental allergens (pollens and animals), irritants/odorants (house dust, tobacco smoke, odors or smells, vehicle exhaust, cleaners or detergents), cold air, physical activity, emotional stress, and foodstuffs (Table 2).

2.4. Statistical analysis

We studied whether the asthma trigger reports of full-time workers differed from those of the three other groups (unemployed, work disability, and retired). Our data set consisted of both continuous and categorical variables. When comparing the differences between the groups, we applied ANOVA with Dunnett's post-test (variances between the groups were not equal) for a continued variable (age) and Chi-squared tests for categorical variables. After these preliminary studies, we built logistic regression models using unemployed vs. full-time work, work disability vs. full-time work, or retired vs. full-time work as an outcome variable. Whether the inquired asthma trigger worsened or triggered asthma symptoms during leisure time ('sometimes' vs. 'never' and 'often' vs. 'never') was used as an independent variable one at a time. Our strategy for building the model was as follows. First, we estimated crude models (Model 1) and then adjusted models for background variables (age, sex, smoking, and professional status) (Model 2), adjusted models for background variables and frequency of asthma symptoms during the last year (data not shown in the tables, because the results did not differ considerably from those of the Model 3), and finally, we adjusted the models with the aforementioned factors and the use of asthma medication during last year (Model 3). The odds ratios (OR) with their 95% confidence intervals (95% CI) are presented in the tables. We considered a p-value of $< .05$ statistically significant, and conducted all analyses using SPSS (version 24) software (IBM Corporation, New York).

3. Results

We have reported on the four employment groups' background data,

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