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Allergic rhinitis alone or with asthma is associated with an increased risk of sickness absences

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Summary

The aim of the study is to examine the risk of sickness absence in public sector employees with allergic rhinitis or asthma or both conditions combined.

This is a prospective cohort study of 48 296 Finnish public sector employees. Data from self-reported rhinitis and asthma were obtained from survey responses given during either the 2000–2002 or 2004 periods. Follow-up data on sickness absences for the public sector employees surveyed were acquired from records kept by the employers.

During the follow-up, mean sick leave days per year for respondents were 17.6 days for rhinitis alone, 23.8 days for asthma alone and 24.2 days for both conditions combined. Respondents with neither condition were absent for a mean of 14.5 days annually. The impact of asthma and rhinitis combined on the risk of sick leave days was marginal compared to asthma alone (RR 1.1; 95% CI 1.0–1.3). In the subgroup analysis (those with current asthma or allergy medication), the risk ratio for medically certified sickness absence (>3 days) was 2.0 (95% CI 1.9–2.2) for those with asthma and rhinitis combined.

Rhinitis, asthma and both these conditions combined increased the risk of days off work.

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Introduction

Nasal symptoms and signs caused by allergen exposure and IgE-mediated inflammation are called allergic rhinitis.¹ Medications such as acetosalicylic acid, occupational exposures, foods including spices, physical and chemical

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factors in addition to prolonged viral infections may cause similar symptoms and signs.

In Finland, the prevalence of allergic rhinitis has been reported to vary between 7% and 9%^{2–4} whereas the prevalence of asthma varies between 3% and 11%.^{2–4} In a recent 8-year follow-up study both allergic rhinitis (OR 3.5; 95% CI 2.1–5.9) and non-allergic rhinitis (OR 2.7; 95% CI 1.6–4.5) increased asthma risk significantly.⁵ The prevalence of rhinitis as a comorbidity with asthma has been estimated to be 50% in patients with non-allergic asthma in USA and Europe and up to 100% in patients with allergic asthma.⁶

The use of health care systems including physician and emergency room visits, the occurrence of asthma attacks and the taking of medication have all been higher for asthma patients who also have rhinitis as a comorbidity compared with asthma patients without rhinitis.^{6,7} It has been estimated that every fourth patient with allergic rhinitis will have taken one day off work within any one year.⁸ These authors also reported that most of the productivity loss resulted from reduced at-work productivity associated with the use of sedating antihistamines and not from work absenteeism per se. In the United States, allergic rhinitis is estimated to result in 3.5 million lost work-days and 2 million lost school-days annually.⁹

In this large occupational cohort study, we examined the risk of absenteeism due to illness (sick leave) associated with allergic rhinitis with or without asthma in Finland.

Material and methods

This study is part of the Finnish Public Sector Study of local government employees in 10 towns and 21 public hospitals in Finland.^{10,11} We included full-time employees who responded to a survey conducted either in 2000–2002 ($N = 48\,598$) or in 2004 ($N = 48\,076$), a combined sample of 66 418 employees (74% of the eligible employees responded at least once, the first response only was considered for those responding twice). The baseline survey was performed in 8 towns and in 4 hospital districts in 2000 and in additional 2 towns in 2001 and in additional 2 hospital districts in 2001–2002. The follow-up survey was performed in 2004. We excluded 6358 individuals who were employed for less than six months during the follow-up, which began after the survey. Of the remaining 60 060 employees, 51 616 individuals gave their consent for a linkage to be made between employees' sick leave records maintained by the employers and the survey responses. The final sample consisted of 48 296 participants who responded to questions about asthma and rhinitis. The mean age of the individuals was 45.0 years (range from 19 to 66 years; SD 9.4) and 80% were females. The study was approved by the Ethics Committee of the Finnish Institute of Occupational Health.

Respondents were coded as positive for asthma or allergic rhinitis based on the survey responses regarding physician-diagnosed asthma or allergic rhinitis including seasonal rhinitis. Each individual was categorized as having rhinitis alone, asthma alone, both asthma and rhinitis combined or neither. In addition, we analyzed subgroups for each patient category including those participants only who, during the survey year, had purchases of asthma medication (asthma alone, asthma and rhinitis) or allergy

medication (rhinitis alone, asthma and rhinitis). Information on medication purchases according to World Health Organizations' Anatomical Therapeutic Chemical (ATC) classification code were obtained from the Drug Prescription Register of the Social Insurance Institution of Finland. Asthma medication included drugs for obstructive airway diseases (ATC code R03). Allergy medication included nasal corticosteroids (R01AD), antihistamines for systemic use (R06), and nasal anti-allergic agents excluding corticosteroids (R01AC).

Data on sickness absences from January 1 following the survey year until December 31, 2005 were analyzed for: the number of self-certified sickness absence periods (≤ 3 days), the number of medically certified sickness absence periods (> 3 days), and the total number of sickness absence days per person-year.

Information on age, sex, and socioeconomic status (SES) of the employees were also obtained from the employer-maintained records. SES was categorized according to the occupational-title classification of 'Statistics Finland' for: upper-grade non-manual workers, lower-grade non-manual workers, and manual workers such as cleaners and maintenance workers. Information regarding smoking and body mass index (BMI, kg/m^2) at the beginning of the follow-up was taken from the survey responses. Respondents reported if they had never smoked, or were ex-smokers, or were current smokers. Employees BMIs were dichotomized to indicate obesity category (> 30) or non-obesity (≤ 30).

The Chi-square test was used to analyze differences in frequency distribution of categorical baseline data in the four classified conditions (rhinitis alone, asthma alone, rhinitis and asthma combined, and neither). Age was treated as continuous variable and analysis of variance was used. Poisson regression models were used to calculate the rate of self-certified and medically certified sick leaves per person-year in addition to the corresponding rate ratios (RR) and their 95% confidence intervals (CI) for each respondent. Regression models based on negative binomial distributions were used for analyzing the number of sickness absence days.^{10,11} The rate ratios were adjusted for sex, age, socioeconomic status, smoking, and obesity. All analyses were performed using the SAS statistical software, version 9.1.3 (SAS Institute, Inc., Cary, North Carolina).

Results

The median follow-up period was 4 (interquartile range 1–5) years. A life-time diagnosis of self-reported allergic rhinitis was reported by 24.2% of the respondents, 1.8% had asthma only, 4.7% had both conditions. In contrast, 69.2% had neither of the conditions. Rhinitis and asthma were more common among women, non-manual workers, ex-smokers, and obese individuals (Table 1). Study respondents with asthma only were older than those with rhinitis only or rhinitis and asthma in combination.

During the follow-up, the respondents with rhinitis took a mean of 17.6 sickness absence days per year (RR 1.3; 95% CI 1.2–1.3); those with asthma 23.8 days (RR 1.5; 95% CI 1.4–1.7); and those with both conditions combined 24.2 days (RR 1.7; 95% CI 1.6–1.8). This compared to a mean of only 14.5 days for subjects without either diagnosis

Table 1 Baseline characteristics

	Rhinitis (N = 11 695)		Asthma (N = 883)		Asthma and rhinitis (N = 2276)		Reference (N = 33 442)	
	N	%	N	%	N	%	N	%
Age (mean, SD)	42.8	9.4	47.3	9.2	43.9	9.7	45.4	9.3
Female gender	9502	81.2	709	80.3	1918	84.3	26 535	79.3
Current smokers	1961	17.2	174	20.4	365	16.5	5987	18.4
BMI more than 30	1243	10.8	163	18.8	347	15.5	3664	11.1
Sickness absence (number/1 py)								
Self-certified spells (1–3 days)	1.61		1.59		1.84		1.27	
Medically certified spells (>3 days)	0.86		1.14		1.16		0.67	
Absence days	17.55		23.78		24.19		14.46	

SD = standard deviation; BMI = body mass index, py = person-year.

(Tables 1 and 2). Further adjustments for smoking and obesity did not alter the results. Asthma and rhinitis together increased the risk more (RR 1.7; 95% CI 1.6–1.8) than for asthma alone (Table 2).

The rate ratios for the number of self-certified sickness absence periods (≤ 3 days) after adjusting for age, sex, and SES were 1.2 (95% CI 1.2–1.2) in subjects with rhinitis

alone, 1.3 (95% CI 1.2–1.4) in those with asthma alone and 1.4 (95% CI 1.3–1.4) in those having both conditions compared to those with neither condition. Rate ratios were slightly higher for medically certified absences than for self-certified absences. Respondents with rhinitis alone had 1.3 times greater a risk of medically certified sickness absences (95% CI 1.3–1.4), whereas those with asthma

Table 2 Risk of sickness absence and number of lost work-days

Condition	Self-certified sickness absence (1–3 days)	Medically certified sickness absence (>3 days)	Number of sickness absence days
	RR (95% CI)	RR (95% CI)	RR (95% CI)
Model 1			
Reference (N = 33 442)	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Rhinitis (N = 11 695)	1.21 (1.18–1.23)	1.32 (1.29–1.35)	1.27 (1.23–1.30)
Asthma (N = 883)	1.27 (1.20–1.35)	1.63 (1.53–1.73)	1.52 (1.39–1.67)
Asthma and rhinitis (N = 2 276)	1.38 (1.33–1.43)	1.75 (1.69–1.82)	1.73 (1.64–1.84)
Model 2			
Reference	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Rhinitis	1.20 (1.18–1.22)	1.32 (1.29–1.35)	1.25 (1.22–1.29)
Asthma	1.26 (1.19–1.34)	1.60 (1.51–1.70)	1.46 (1.33–1.60)
Asthma and rhinitis	1.38 (1.33–1.42)	1.73 (1.67–1.80)	1.73 (1.63–1.83)
Cases with current medication			
Model 1			
Reference (N = 33 442)	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Rhinitis (N = 3041)	1.26 (1.22–1.30)	1.40 (1.35–1.45)	1.31 (1.25–1.38)
Asthma (N = 445)	1.29 (1.19–1.40)	1.75 (1.62–1.90)	1.63 (1.43–1.86)
Asthma and rhinitis (N = 675)	1.54 (1.45–1.63)	2.02 (1.90–2.15)	1.93 (1.74–2.15)
Model 2			
Reference	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Rhinitis	1.26 (1.22–1.30)	1.42 (1.36–1.47)	1.32 (1.25–1.39)
Asthma	1.28 (1.17–1.38)	1.73 (1.59–1.87)	1.58 (1.38–1.80)
Asthma and rhinitis	1.56 (1.47–1.65)	2.03 (1.91–2.16)	1.96 (1.76–2.18)

Model 1 was controlled for age, gender and socioeconomic status and Model 2 was additionally controlled for smoking and obesity. The subgroup analyses included those participants only who, during the survey year, had purchases of asthma medication (groups: asthma alone, asthma and rhinitis) or allergy medication (groups: rhinitis alone, asthma and rhinitis).

alone had a 1.6 times greater risk (95% CI 1.5–1.7), and those with both conditions 1.8 times greater risk (95% CI 1.7–1.8). The subgroup analyses replicated and strengthened the results (Table 2).

Risk of self-certified sickness absences was 1.1 times greater (95% CI 1.0–1.2) in the asthma and rhinitis combined group compared to those with asthma alone after adjusting for age, sex, and SES. Similarly, risk of medically certified sickness absences was 1.1 times greater (95% CI 1.0–1.2) and of increased number of lost work-days were 1.1 times greater (95% CI 1.0–1.3) in the asthma and rhinitis combined group compared to those with asthma alone ($P < 0.03$). No change in the rate ratios was observed after adjustments for smoking and obesity. In the subgroup analyses after full adjustments, RR for self-certified sickness absences was 1.2 (95% CI 1.1–1.3), for medically certified sickness absences 1.2 (95% CI 1.1–1.3), and for number of lost work-days 1.2 (95% CI 1.1–1.5).

Discussion

To our knowledge this is the first prospective longitudinal study reporting sickness absences in public sector employees with allergic rhinitis, asthma or both. This study found an increased risk of sickness absences for those employees who reported physician-diagnosed self-reported allergic rhinitis, asthma or both of these conditions combined. The results were replicated and strengthened in participants with registered use of asthma or allergy medication during the survey year. The total number of sick leave days taken was significantly higher in both the asthma alone group and the asthma and rhinitis combined group. At 6.5%, the prevalence of asthma as diagnosed by a physician in the self-reported asthma group was similar to those reported in other Finnish studies.^{2–4} However, the prevalence of self-reported life-time allergic rhinitis diagnosed by a physician in our study was 24%, which was somewhat higher than those reported in the earlier studies.^{2–4}

The strengths of this study are its large study population and the prospective follow-up of all sickness absences from employers' records. In addition, the response rate at 74% was high making the study sample representative of Finnish public sector employees.

In this study, employees with rhinitis had a mean of 3.1 sickness absence days per person-year more than the reference group without rhinitis or asthma. This is a greater excess risk than reported in a previous study, where every fourth patient with allergic rhinitis was estimated to have taken one day off work within any one year.⁸ The productivity loss associated with allergic rhinitis has been suggested to result from reduced performance due to use of sedating antihistamines rather than from work absenteeism.⁹ We found estimation of productivity loss vulnerable to many biases and did not include any analysis on at-work productivity. In Sweden, which is comparable to Finland in many geographical and socioeconomic aspects, severe nasal symptoms associated with allergic rhinitis were found to be related to lower school grade sum.¹²

In our study population, prevalence of self-reported asthma diagnosed by a physician was 6.5%. This is in agreement with a Norwegian study reporting the

prevalence of asthma complaints to be 5% in year 2003. In that study, allergic complaints decreased by 12% from year 1996 to 2003 but prevalence of sickness absences caused by allergy increased only by 5% in the same time interval.¹³ Asthma as a subjective health complaint increased by 66% but sickness absences caused by asthma decreased by 7% from year 1996 to 2003. In our study, future surveys will allow analysis of trends in sickness absences associated with rhinitis and asthma.

The actual causes for sick leaves taken were not analyzed in this study since the specific causes for the sick leaves cannot be tracked down in this database. Viral respiratory infections are known to trigger wheezing and asthma exacerbations. Such viral infections are suggested to at least partly play role in the development of allergies and asthma.^{14–16} Thus one of the most likely explanations for the increased number of sickness absences found in this study is the exacerbation of allergic rhinitis and asthma caused by viral infections.

In addition to actual cause for sick leaves, data on rhinitis and asthma symptoms in previous 12 months would give more information of the likelihood of rhinitis and asthma as the cause for absenteeism. However, in these surveys these diseases have been processed as physician-diagnosed allergic rhinitis or asthma. Furthermore, self-reported physician-diagnosed disease is widely used in epidemiological studies and considered as accurate indicator whereas symptoms of rhinitis only are often rather unspecific. Also, the subgroup analyses in those with registered use of asthma or allergy medication during the survey year strengthened the results. This is in line with the study by Alexopoulos and Burdorf, where asthmatic complaints in the past 12 months were associated with increased sickness absences during the study follow-up.¹⁷

The limitations of the study include lack of information on asthma or rhinitis symptoms, asthma or rhinitis severity and the specific causes for the sickness absences. Information on symptoms and severity of disease as well as diagnose for sickness absences would allow more accurate analysis on the causes of absences. In addition, our study population is mostly women (79–84%) and one has to be cautious when generalizing the results into men. In a recent review of studies of employees with a chronic somatic disease, work disability in asthma was weakly associated with asthma severity score and female gender and moderately associated with occupation (blue-collar work).¹⁸ Unfortunately, we had no opportunity to analyze asthma severity and sickness absences but we included both gender and socioeconomic status in adjusted multivariate models and found asthma and rhinitis to be independent risk factors for sickness absences.

These results indicate that both allergic rhinitis and asthma add to the economic burden of sick leave absenteeism affecting the employee, his or her employer and to society as a whole. The lack of treatment of allergic rhinitis, its under-treatment and also non-adherence to treatment all increase the costs associated with allergic rhinitis.¹⁹ Although this study does not demonstrate the benefits of therapy for allergic rhinitis in terms of reduced sick leave absences, our findings do emphasize the need for self-guided management and sufficient treatment by health practitioners in general.^{1,19}

Conflict of interest statement

Riina Hakola is working at the ALK Abello com and is also taking part in the research training programme of the Finnish Institute of Occupational Health. The ALK Abello com has not supported the manuscript or research work financially.

There are no other conflicts of interests for authors (Paula Kauppi, Paula Salo, Jaana Pentti, Tuula Oksanen, Mika Kivimäki, Jussi Vahtera, Tari Haahtela).

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