Asthma control level in Finland among asthmatics with smoking history: a cross-sectional study

Timo Helin (timo.helin@hus.fi)

Research article

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Abstract

Surprisingly little is known about asthma control level of smoking asthmatics. The aim of this study was to investigate asthma control level, according to GINA guidelines, among asthmatics with smoking history.

One hundred and ninety asthmatics from primary care were investigated. The patients were current or ex-smokers with history of 10 or more pack-years. They completed a questionnaire, with questions set according to the GINA guidelines, so that their asthma control level (well controlled, partly controlled, uncontrolled) according to GINA could be determined.

According to GINA guidelines, 66 (34.7%) patients had their asthma well controlled, 81 (42.6%) had their asthma partly controlled, and 43 (22.6%) were uncontrolled. Current smokers had more often uncontrolled asthma than ex-smokers OR 2.54 (95%CI 1.25-5.14, p=0.01). Patients with asthma exacerbation during the previous year had uncontrolled asthma more often than the patients without exacerbation OR 2.17 (95%CI 1.06-4.47, p=0.04), and patients with FEV1 < 80% of predicted had their asthma more often uncontrolled than patients with FEV1 > 80% of predicted OR 2.04 (95%CI 1.02-4.08, p=0.04).

Primary care asthmatic patients who are either current or ex-smokers, are often not well controlled. The asthma control level was associated with current smoking status. Therefore, every attempt should be made to get smoking asthmatics to quit smoking.

Background

Asthmatic patients smoke roughly as much as population in general. Around 20% of asthmatics are smokers.[1,2,3] Among asthmatic patients smoking is associated with increased morbidity and mortality, higher frequency of asthma exacerbations, accelerated decline of lung function, reduced response to inhaled corticosteroids, and increased asthma severity, when compared to asthmatics who do not smoke.[4,5]

It has been shown that especially current, but also previous, smoking is associated with poorer asthma control level, when compared to non-smoking asthmatics.[6,7,8,9] However, surprisingly little is known about asthma control level among smoking asthmatics.

The aim of this study was to investigate asthma control level according to GINA guidelines[10] among primary care asthmatic patients who are either current or ex-smokers and to find the patient characteristics that may associate with asthma control level.

Methods

This was a cross-sectional study. The study was approved by the Ethics Committee of Pirkanmaa Health Care District, and every patient gave written informed consent before any study-related procedures were performed.

We have earlier investigated the prevalence of asthma-COPD overlap syndrome among primary care asthmatic patients who were either current or ex-smokers.[14] In addition to pulmonary function tests (Medikro, Kuopio, Finland) and demographic questionnaires, the patients completed also a questionnaire, with questions set according to the GINA guidelines, so that their asthma control level (well controlled, partly controlled, uncontrolled) according to GINA could be determined.[10]

The inclusion criteria were as follows: age 18–70 years, current or ex-smoker with 10 or more pack-years and doctor-diagnosed asthma. The exclusion criteria were as follows: any severe illness, any known pulmonary disease other than asthma, use of inhaled anticholinergic or indacaterol or oral roflumilast.

Patients were considered to have had an exacerbation during the previous year if they had been hospitalized, or had used a course of oral corticosteroids, for their asthma during the previous year.

Statistical analysis

The primary variable was asthma control level according to GINA guidelines (well controlled, partly controlled or uncontrolled). Baseline characteristics of patients with well controlled, partly controlled and uncontrolled asthma were compared using the Kruskal-Wallis test for continuous variables and Chi-squared test for categorical variables. Jonckheere-Terpstra test for trend was applied if Kruskal-Wallis test yielded a significant association, and Mantel-Haenzel test for trend was applied if Chi-squared test yielded a significant association. Univariate logistic regression analyses were performed to assess the association of asthma control with patient characteristics. Before analysis, the 3 asthma control categories were dichotomized in separate analyses as: well controlled versus partly controlled and uncontrolled; uncontrolled versus well and partly controlled. In other words, the opposite categories, well controlled asthma and uncontrolled asthma were set as separate dependent variables. Independent variables that were significant or almost significant ($p < 0.10$) factors in univariate models were introduced into the multivariate models. Multivariate logistic regression analyses were then performed using the forward and backward stepping covariate selection procedures. At each step, the criterion for entry was $p < 0.05$ and for remove $p > 0.05$. First-order interactions between the covariates were tested. The results are given as odds ratios (OR) with 95% confidence intervals (95% CI).

P-values less than 0.05 were considered statistically significant. The analyses were performed using IBM SPSS Statistics for Windows (version 25.0, Armonk, NY, USA, IBM Corp.).

Results

One hundred and ninety patients were investigated (Table 1). Their median age (range) was 58 (23–70) years, they had smoked for 20 (10–60) pack-years, and their BMI was 27.5 (16.1–50.3) kg/m^2. Inhaled corticosteroids (ICS) were used by 179 (94.2%) and leukotriene antagonist by 34 (17.9%) of the patients. One hundred twenty-two (64.2%) of the patients were using both ICS and inhaled long-acting B2-adrenergic (LABA). Eighty-three (44.1%) of the patients were current smokers and 78 (41.1%) were male.

Table 1
Characteristics of 190 asthmatics with smoking history according to asthma control (GINA)

	Well controlled (n = 66)	Partially controlled (n = 81)	Uncontrolled (n = 43)	Total (n = 190)	P-value*
Age (years)	59.5 (52.0–65.0)	57.0 (49.0–65.0)	58.0 (49.0–64.0)	58.0 (50.0–65.0)	0.79
BMI (kg/m^2)	26.3 (24.2–30.1)	27.5 (24.3–31.2)	27.9 (23.9–33.3)	27.5 (24.2–31.1)	0.47
Pack-years	20.0 (15.0–30.0)	20.0 (15.0–27.0)	26.0 (15.0–35.0)	20.0 (15.0–30.0)	0.25
FEV1 (% of predicted)	84.0 (71.0–94.0)	83.0 (72.0–95.0)	78.0 (67.0–83.0)	80.5 (71.0–93.0)	0.03 (0.03)**
FEV1/FVC	0.73 (0.68–0.77)	0.75 (0.70–0.81)	0.72 (0.68–0.80)	0.74 (0.68–0.79)	0.24
Females	36 (54.5)	46 (56.8)	30 (69.8)	112 (58.9)	0.25
Current smokers	23 (35.4)	34 (42.0)	26 (61.9)	83 (44.1)	0.02 (0.01)***
Exacerbation during previous year	7 (10.6)	27 (33.3)	17 (39.5)	51 (26.8)	0.001 (< 0.001)***
Significant reversibility	5 (7.6)	5 (6.2)	7 (16.3)	17 (8.9)	0.15
Postbronchodilator FEV1/FVC < 0.70	17 (25.8)	22 (27.2)	13 (30.2)	52 (27.4)	0.88
Inhaled corticosteroid	63 (95.5)	77 (95.1)	39 (90.7)	179 (94.2)	0.53
Inhaled corticosteroid + inhaled long-acting b_2-agonist (ICS + LABA)	42 (63.6)	56 (69.1)	24 (55.8)	122 (64.2)	0.34

All patients were current or ex-smokers.

Results are given as median (interquartile range) or number of patients (%).

* Kruskal-Wallis test was used for continuous variables and Chi-squared test for categorical variables.

** Jonckheere-Terpstra trend test in parenthesis

***Mantel-Haenzel trend test in parenthesis

Sixty-six (34.7%) patients had their asthma well controlled, 81 (42.6%) had their asthma partly controlled, and 43 (22.6%) were uncontrolled, according to GINA guidelines.

Proportions of current smokers (p = 0.02) and patients with exacerbation during previous year (p = 0.001) were different between asthma control categories. There was also a difference between the groups when FEV1 (percent of predicted) was analyzed (Table 1). The proportion of current smokers and patients who had had asthma exacerbation during previous year

decreased when the level of asthma control improved (trend test $p = 0.01$ and $p < 0.001$, respectively). Similarly, FEV1 improved as asthma control improved (trend test $p = 0.03$).

Unadjusted analysis of asthma control level according to the patient characteristics is shown in Table 2. Current smokers had more often uncontrolled asthma than ex-smokers (31% vs. 15%), OR 2.54 (95%CI 1.25–5.14, $p = 0.01$). Patients who had had asthma exacerbation during the previous year had more often uncontrolled asthma than patients without exacerbation (33% vs. 19%), OR 2.17(95%CI 1.06–4.47, $p = 0.04$). Patients with significant reversibility in spirometry tended to have more often uncontrolled asthma than patients without significant reversibility (41% vs. 21%), OR 2.66 (95%CI 0.95–7.49, $p = 0.06$), and patients with FEV1 less than 80% of predicted had more often uncontrolled asthma than patients with FEV1 more than 80% of predicted (29% vs. 17%), OR 2.04 (95% CI 1.02–4.08, $p = 0.04$). At least 30 pack-years was related to uncontrolled asthma, OR 1.99 (95%CI 0.98–4.05, $p = 0.06$). The final multivariate logistic regression model included current smoking (OR 2.38, 95%CI 1.14–4.99, $p = 0.02$), at least 30 pack-years (OR 2.62, 95%CI 1.21–5.64, $p = 0.01$), exacerbation during the last year (2.73, 95%CI 1.24–6.04, $p = 0.01$) and significant reversibility (OR 3.91, 95%CI 1.27–12.09, $p = 0.02$) as significant independent variables. None of the tested interaction terms were significant.

Table 2

Asthma control level according to some patient characteristics. Univariate logistic regression analyses was used to analyze the associations to asthma control levels 'Well controlled' and 'Uncontrolled'.

		Asthma control level			Univariate logistic regression analyses					
		Well controlled N (%)	Partly controlled N (%)	Uncontrolled N (%)	Dependent variable is Well controlled asthma OR 95% CI P			Dependent variable is Uncontrolled asthma OR 95% CI P		
Smoking	Ex-smoker (N = 105)	42 (40.0)	47 (44.8)	16 (15.2)						
	Current smoker (N = 83)	23 (27.7)	34 (41.0)	26 (31.3)	0.58	0.31–1.07	0.08	2.54	1.25–5.14	0.01
Pack-years	< 30 (N = 133)	47 (35.3)	61 (45.9)	25 (18.8)						
	≥30 (N = 57)	19 (33.3)	20 (35.1)	18 (31.6)	0.91	0.47–1.76	0.79	1.99	0.98–4.05	0.06
ICS	No (N = 11)	3 (27.3)	4 (36.4)	4 (36.4)						
	Yes (N = 179)	63 (35.2)	77 (43.0)	39 (21.8)	1.45	0.37–5.65	0.59	0.49	0.14–1.75	0.49
ICS + LABA	No (N = 68)	24 (35.3)	25 (36.8)	19 (27.9)						
	Yes (N = 122)	42 (34.4)	56 (45.9)	24 (19.7)	0.96	0.52–1.79	0.90	0.63	0.32–1.26	0.19
FEV1/FVC < 0.70*	No(N = 138)	49 (35.5)	59 (42.8)	30 (21.7)						
	Yes (N = 52)	17 (32.7)	22 (42.3)	13 (25.0)	0.88	0.45–1.73	0.72	1.20	0.57–2.53	0.63
Sex	Female (N = 112)	36 (32.1)	46 (41.1)	30 (26.8)						
	Male (N = 78)	30 (38.5)	35 (44.9)	13 (16.7)	1.32	0.72–2.41	0.37	0.55	0.26–1.13	0.10
Exacerbation**	No (N = 139)	59 (42.4)	54 (38.8)	26 (18.7)						
	Yes (N = 51)	7 (13.7)	27 (52.9)	17 (33.3)	0.22	0.09–0.51	0.001	2.17	1.06–4.47	0.04
Significant reversibility#	No (N = 173)	61 (35.3)	76 (43.9)	36 (20.8)						

*Postbronchodilator, **hospitalization or oral corticosteroidsfor asthma during the previous year, # More than 12% and 200 ml

			Asthma control level		Univariate logistic regression analyses					
	Yes (N = 17)	5 (29.4)	5 (29.4)	7 (41.2)	0.77	0.26–2.27	0.63	2.66	0.95–7.49	0.06
FEV_1, % of predicted	≥ 80%	40 (39.6)	44 (43.6)	17 (16.8)						
	< 80%	26 (29.2)	37 (41.6)	26 (29.2)	0.63	0.34–1.15	0.13	2.04	1.02–4.08	0.04
*Postbronchodilator, **hospitalization or oral corticosteroidsfor asthma during the previous year, # More than 12% and 200 ml										

Fewer associations were found between patient characteristics and controlled asthma. Exacerbation during the previous year associated significantly (p = 0.001) and current smoking nearly significantly (p = 0.08) with well controlled asthma (Table 2).

Discussion

One third of asthmatics with smoking history had their asthma well controlled. The number is relatively low and suggests that good asthma control among current or ex-smokers in primary care is not often achieved, even in a country like Finland where asthmatics in general do quite well.[1]

In a recent survey of 8000 European asthmatics, with only 22.8% of the patients being current smokers, Price at al.[2] found that only 20.1% of asthmatics had their asthma well controlled according to GINA guidelines. Compared to that, our finding that 34.7% of current or ex-smoking asthmatics had their asthma well controlled was surprisingly high. Most probably this is due to fact that in our study practically all patients were using inhaled corticosteroids regularly, which was not the case in the study by Price et al.[2] In the study by Braido et al.[9] 43,5% of the patients had controlled asthma. In that study 35% of patients were either current or ex-smokers. However, they did not use GINA criteria to define asthma control level, and therefore their result cannot be directly compared with our result.

From the GOAL-study we have learned that it is possible to achieve good asthma control in at least 70% of the cases by stepping up with asthma medication.[11] More than 94% percent of our patients were using inhaled corticosteroids (ICS) regularly, and 64.2% of the patients used ICS in combination with long-acting B2-adrenergic (LABA). Still, only one third of our patients had their asthma well controlled. This is most probably due to fact that our patients had smoked more than 10 pack-years, and 44,1% of our patients were current smokers which is known to reduce response to ICS.[12,13] However, also in the current study using ICS + LABA increased the likelihood of asthma being well controlled among the subgroup of current smokers OR 3.39 (95%CI 1.03–11.20), p = 0.04; when compared to those without ICS + LABA. Although 94.2% of our patients used inhaled corticosteroids, 64.2% in combination with LABA, and 17.9% of the patients used leukotriene antagonists, we cannot state that our patients were optimally treated. Namely, as we investigated asthmatics who had smoked at least 10 pack-years, with 27.4% of patients having a post-bronchodilator FEV1/FVC < 0.70, suggesting possibility of asthma-COPD overlap syndrome,[14] it is probable that more patients would have had their asthma better controlled if they had used also LAMA.

We found that uncontrolled patients were current smokers more often than well/partly controlled patients (61.9% vs 39.0%; p = 0.009). The finding that current smoking is associated with worse asthma control is also found by the others,[6,8] and may reflect the fact that cigarette smoke is known to reduce the response of ICS in asthmatic patients.[12,13] Furthermore, there is good evidence that asthma outcome improves in several ways after smoking cessation,[3,5] which also is in line with our observation that ex-smokers had their asthma better controlled than current smokers.

Conclusions

Primary care asthmatic patients who are either current or ex-smokers, are often not well controlled. The asthma control level was associated with current smoking status, so that current smokers' asthma was more often uncontrolled. Therefore, every attempt should be made to get smoking asthmatics to quit smoking.

Declarations

Ethics

The study was approved by the Ethics Committee of Pirkanmaa Health Care District, and every patient gave written informed consent before any study-related procedures were performed.

All the authors have given a consent of publication

Due to local legislation on data protection we are not allowed to provide original data on individual level, but on a reasonable request, aggregated data is available from the authors.

Competing Interests

Dr. Kiljander: No competing interests

Ms. Poussa: No competing interests

Dr. Helin: No competing interests

Dr. Jaakkola is a former employee of Boehringer-Ingelheim, Finland

Dr. Venho: personal fees and travel expenses from Boehringer Ingelheim and GSK

Dr. Lehtimäki: No competing interests

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Contributions

TK and TP were responsible for writing the manuscript, and TK is the guarantor. All the authors were involved in planning of the study and writing the manuscript.

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