

Risk Factors in Asthmatic Patients in Croatia

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ABSTRACT

The aim of this case-control study was to investigate whether some factors, that are associated with development of asthma, are significantly more present in the observed group of asthmatic patients, in comparison to the control group. Participants included 111 cases with asthma, and 108 controls with no asthma. Data obtained from cases and controls were compared according to the sex. The study was performed using a specially developed questionnaire and data were collected from medical documentation of cases. Results showed that a significantly high proportion of cases had lower socio-economic status, higher proportion of atopic diseases, and were more exposed to dampness in working environment, and passive smoking, both at home and at work.

Cases also exhibited poorer sustainment of physical strains and psychological stresses, and considered their life quality was greatly reduced by asthma. Among asthmatic participants, there were fewer current smokers and non-smokers, and more ex-smokers.

Introduction

Morbidity of asthma is increasing worldwide, especially, among children and adolescents¹. During the last few decades many countries have experienced an increase in the prevalence and severity of asthma, while the level of outdoor air pollution has been reduced. The tracheobronchial tree of those suffering from asthma reacts by bronchoobstruction on specific (aeroallergens, food, viruses, professional agents, aspirin) and non-specific stimuli (physical activity, cold air, smoke, gases, emotional stresses). Key el-

ements in the definition of asthma are hyperirritability and hiperreactivity of trachea and bronchi, and reversibility of bronchoobstruction. Although the role of many factors that could influence the bronchial hyperreactivity have been considered, the inflammation of the airways is today considered to be the most important factor²⁻⁵.

Asthma is a very heterogenic disease that may be caused by a variety of stimuli. Identification of factors that may trigger asthmatic symptoms and attack is the basic step in the successful therapy of

this chronic disease. Symptoms and hospital admission for asthma can be prevented when specific allergens and irritants are removed from the environment where an asthmatic patient lives. Accordingly, a reduction in the use of asthma therapy, hospital admissions, and the overall costs of asthma can be expected. Like many other diseases, asthma is a result of the interaction between genetic and environmental factors^{5–11}. Over the last 40 years the population in the developed world has retreated indoors with the majority of Americans spending more than 95% of their time inside buildings or in transport. Homes have become tighter and more energy sufficient, resulting in warm and humid houses with low ventilation rates, ideally suited to house dust mite growth throughout the year. Many people also keep pets – cats and dogs – in their houses, and low level of housing is associated with cockroach infestation throughout the world. Most asthmatics are sensitized to allergens that are actually found in closed rooms (homes and offices). Cigarette smoke is one of the most important factors that cause environmental pollution. It is possible that there exists a certain number of people that can be found with an increased sensitization to cigarette smoke which causes further progression of the lung disease and impairment^{12,13}. As smokers have usually lower socio-economic status, it is clear that those living with them would also have this status, too.

The aim of this study was to analyze whether some factors are more present in asthmatic compared with controls. We also examined by which kind of therapy what kinds of therapy cured this group of patients, how many times they were admitted to hospitals and what their daily and nighttime symptoms of asthma were. We were examining in how many patients asthma symptoms arise with physical and psychical strains, and exposure

to cold air, and how much asthma influences bearing of everyday physical activity and life quality, and how much subjects affected by asthma are absent from work because of this disease.

We also examined how subjects differ in exposure to some risk factors according to their profession.

Methods

In this study 111 cases had been treated for asthma, and 108 controls were examined. All subjects from the control group were chosen from their GP offices, and were adults of same age as cases. The age of subjects ranged from 18–73 years. Most of the asthmatic were also examined at GP's offices at primary health care centers (Novi Zagreb, Peščenica) as well as Policlinic for Lung Diseases, Policlinic for Medical Diagnostic and Clinical Hospital for Lung Diseases, Special Hospital for Chronic Diseases.

Examinations and interviews were performed from September 1998 till February 1999. Basic methods of data collection were personal interviews and the questionnaire. The questionnaire for this study was designed according to the specific needs of this kind of study. It was completed by subjects themselves, after an interview with the examiner. There were two kinds of questionnaires – one for controls, and one for cases. Controls answered the questionnaire which consisted of 19 questions, and asthmatics, except those 19 questions, answered 11 questions referring to their disease.

Questions that were proposed were: general data (sex, age), socioeconomic factors (educational achievement, occupation, incomes), family history of atopic disease and asthma, and atopic disease in subjects. Data concerning allergic atopy were checked against medical documentation of the subjects. There were questions concerning work and dwelling conditions: exposition to passive smoking

and dampness at home and at work, kind of heating used at home, smoking habit (present or ex-smokers, non-smokers), duration of smoking, and physical and psychological stresses.

Following questions were only for cases: duration of the disease, methods of asthma treatment, number of hospital admissions, absence from work, daily and nocturnal symptoms of asthma, appearance of difficult breathing caused by physical and psychological strains and exposure to cold air, and influence of asthma on bearing of everyday physical strains and life quality.

All data were analyzed using SPSS statistical software and all the tests included Student's t-test and chi-square analysis. The level of statistical significance was set at $p < 0.05$.

Results

Of the 231 eligible subjects who were identified for the case-control study, 12 individuals didn't answer the questionnaire properly and were excluded from the study.

The mean age (S.D.) of the cases was 52.6 (17.7) years of age for men, and 48.3 (16.6) years for women. The mean age for the controls was 48.2 (14.1) years for men and 43.5 (13.6) years for women.

There were no significant difference with age among participants. The gender distribution was similar among cases and controls.

According to socio-economic indicators (education, occupation, socio-economic status), asthmatics are significantly less educated compared with the control group: 27.1% of men and 30.2% of women with asthma have only primary school education, compared with 8% of men ($\chi^2 = 6.54$, $p = 0.037$) and 3.5% of women ($\chi^2 = 21.42$, $p < 0.05$) from the control group. Significantly less percent of asthmatics had a university degree, compared with the control group.

Concerning occupation, there were significantly fewer clerks among men asthmatics – 22.9%, compared with controls – 39.2% ($\chi^2 = 8.91$, $p = 0.03$), and more workers. Socio-economic status revealed a significant difference between case and control groups. 54.2% of men and 49.2% of women with asthma had low socio-economic status, compared with 17.6% of men ($\chi^2 = 15.10$, $p < 0.05$) and 15.8% of women ($\chi^2 = 15.76$, $p < 0.05$) from the control group. Satisfying socio-economic status had only 12.5% of men and 14.3% of women with asthma, compared with 31.4% of men and 31.6% of women from the control group.

The level of education is one of the factors that influence the choice of profession. A working environment may present the source of some factors that are associated with the onset of asthma. Moreover, people with a lower level of education have generally less knowledge about their disease, their compliance with therapy is worse, and therefore results of the therapy are worse in this group of patients^{14,15}. Allergies are increasingly recognized as an important component of asthma³. According to the data in our study, significantly more asthmatics have allergic atopy – 41.7% of men and 65.1% of women, compared with controls where this characteristic is present in 9.8% of men ($\chi^2 = 11.66$, $p < 0.05$) and 10.5% of women ($\chi^2 = 35.12$, $p < 0.05$).

A significantly higher proportion of cases had parents or siblings with a history of asthma or allergic atopy (29.2% of men and 30.2% of women). In the control group, 15.7% of men ($\chi^2 = 1.87$, $p = 0.170$) and 19.3% of women ($\chi^2 = 1.34$, $p = 0.056$) had family members that suffer from allergic diseases.

The number of parents and siblings that have asthma was higher in cases, but only in women was that difference significant. 25.5% of men with asthma had parents or siblings suffering from

TABLE 1
SEX AND AGE DISTRIBUTION AND EXPOSURE RISK FACTOR; GENERAL DATA (N = 219)

	Cases: 111				Controls: 108			
	N		%		N		%	
	Men	Women	Men	Women	Men	Women	Men	Women
Sex	48	43.2	63	56.8	51	47.2	57	52.8
Age	52.06		48.33		48.21		43.50	
Asthma In Family – Yes	13	25.5	17	25.8	7	13.7	6	10.5
Asthma In Family – No	35	74.5	46	74.2	44	86.3	51	89.5
SOCIOECONOMIC STATUS								
Low	9	17.6	9	15.8	26	54.2	31	49.2
Mid	16	33.3	23	36.5	26	51.0	30	52.6
High	6	12.5	9	14.3	16	31.4	18	31.6
Atopic Dijat. – Yes	20	41.7	41	65.1	5	9.8	6	10.5
Atopic Dijat. – No	28	58.3	22	34.9	46	90.2	51	89.5
Allergies In Family – Yes	14	29.2	19	30.2	8	15.7	11	19.3
Allergies In Family – No	34	70.8	44	69.8	43	84.3	46	80.7
DAMPNESS AT HOME								
Yes	11	22.9	15	23.8	7	13.7	7	12.3
No	37	77.1	48	76.2	44	86.3	50	87.7
DAMPNESS AT WORK								
Yes	28	56.5	17	25.9	14	27.5	6	10.5
No	20	43.5	46	74.1	37	72.5	51	89.5
Smokers	9	18.8	7	11.5	19	37.3	24	42.1
Non Smokers	21	43.8	44	68.9	19	37.3	25	43.9
Former Smokers	18	37.5	12	19.7	13	25.5	8	14
PASSIVE SMOKING AT HOME								
Yes	18	37.5	33	52.4	17	33.3	20	35.1
No	30	62.5	30	47.6	34	66.7	37	64.9
Passive Smoking At Work	40	82.6	43	68.4	33	64.7	21	31.6
Yes	8	17.4	21	31.6	18	35.3	36	63.2
No								
PHYSICAL ACTIVITIES								
Good	7	14.6	10	15.9	30	58.8	28	49.1
Average	17	35.4	21	33.3	17	33.3	22	38.6
Bad	24	50.0	32	50.8	4	7.8	7	12.3
Psychical activities								
Good	15	31.3	14	22.2	18	35.3	25	43.9
Average	18	37.5	22	34.9	19	37.3	28	49.1
Bad	15	31.3	27	42.9	14	27.5	4	7
Frequent Flu								
Yes	24	50.0	40	63.5	11	21.6	14	24.6
No	24	50.0	23	36.5	40	78.4	43	75.4

that disease, compared with 13.7% of men from the control group. 25.8% of women suffering from asthma, had parents or siblings with that disease in comparison to 10.5% of women ($\chi^2 = 3.64$, $p = 0.056$) from the control group.

Asthmatics were more exposed to dampness at homes, but the difference was not significant.

Cases didn't differ significantly from controls by type of home heating system. 14.6% of men and 7.9% of women with asthma had gas stoves at home, compared with 9.8% of men and 12.3% of women from the control group. But more

asthmatics used wood stoves – 20.8% of men and 11.1% of women compared with 9.8% of men and 5.3% of women from the control group.

Asthmatics sustained physical activity significantly worse than the control group. 50% of men and 50.8% of women suffering from asthma sustained physical efforts badly compared with the control group where 7.8% of men ($\chi^2 = 28.51$, $p < 0.05$) and 12.3% of women ($\chi^2 = 24.33$, $p < 0.05$) sustained physical activity badly.

31% of men and 42.9% of women asthmatics sustained psychological stresses badly, but the difference was significant only for women ($\chi^2 = 20.63$, $p < 0.05$).

Asthmatics were much more prone to colds. In this study 50% of men and 63.5% of women suffering from asthma had frequent colds, in comparison with 21.6% of men ($\chi^2 = 7.54$, $p = 0.006$) and 24.6% of women ($\chi^2 = 16.78$, $p < 0.05$) from the control group.

Smoking habits differed significantly among cases and control subjects, with a greater proportion of controls being current smokers, and cases being ex-smokers and non-smokers. There are 43.8% of men and 68.9% of women non-smoking asthmatics. In the control group there are 37.3% of men and 43.9% of women non-smokers.

Among asthmatics there were significantly less present smokers (18.8% of men and 11.5% of women) compared with the control group – 37.3% of men ($\chi^2 = 4.39$, $p = 0.062$) and 42.1% of women ($\chi^2 = 14.31$, $p < 0.05$). Among asthmatics there were significantly more ex-smokers – 37.5% of men and 19.7% of women. In the control group there were 25.5% of men and 14% of women ex-smokers. Former smokers had smoked for a mean duration of 21.9 years (SD 8.4) cases, and 10.9 years (SD 9.1) controls. Current smokers smoked for 27.1 years (SD 4.6) cases and 20.6 years (8.0) controls.

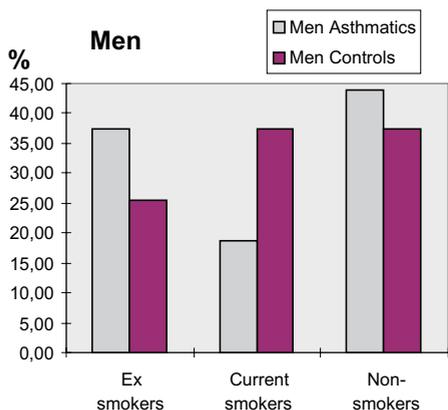


Fig. 1. Distribution of smoking habits in men

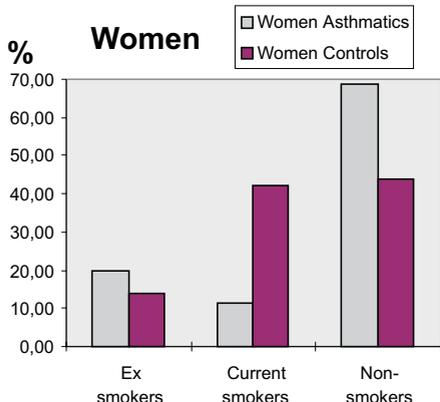


Fig. 2. Distribution of smoking habits in women

TABLE 2
 ASTHMA SYMPTOMS CAUSED BY PHYSICAL AND PSYCHICAL STRAINS

	Men		Women	
	N	%	N	%
Asthma symptoms caused by physical activity				
Yes	37	77.1	40	63.5
No	11	22.9	23	36.5
Asthma symptoms caused by psychical strains				
Yes	30	62.5	35	55.6
No	18	37.5	28	44.4
Asthma symptoms caused by exposure to cold air				
Yes	37	77.1	45	71.4
No	11	22.9	18	28.6

In our study asthmatics were more exposed to passive smoking at homes as compared with controls, but the difference was not statistically significant. 37.5% of men and 52.4% of women asthmatics were exposed to tobacco smoke at homes compared with 33.3% of men and 35.1% of women from the control group.

In both groups, women were more exposed to tobacco smoke at homes. Only women suffering from asthma, 68.4% of them, were significantly more exposed to tobacco smoke at work as compared with 36.8% of women from the control group ($\chi^2 = 10.16, p < 0.05$). Observing the same characteristic in men, 82.6% of cases and 64.7% of controls were exposed to tobacco smoke at work. Also, more women than men were exposed to passive smoking at work. We can notice that many participants have been exposed to such an important risk factor at work as it is tobacco smoke.

The average age of diagnosed asthma in this study was 39.9 years for men and 34.3 years for women.

We also examined treatment methods in this group of patients. The most common treatment was a combination of a

treatment in a GP office and hospitalization. This combined treatment cured 54.2% of men and 38.1% of women. 18.8% of men and 14.3% of women were treated in general practitioner offices only. Women were slightly more than men cured by all available methods of treatment such as medicines, hospitalization, climatic treatment and hiposensibilization. There were no statistically significant difference between men and women.

25% of men and 33.3% of women with asthma were admitted to hospital more than four times. 20.8% of men and 23.8% of women never came to hospital because of asthma.

29.2% of men and 12.7% of women had nocturnal symptoms of asthma, whereas 8% of men and 15.9% of women had no nocturnal symptoms of asthma.

68.8% of men and 60.3% of women had intermittent symptoms of asthma. Frequent symptoms had 18.8% of men and 30.2% of women and persistent symptoms had 12.5% of men and 9.5% of women.

77.1% of men and 63.5% of women had breathing difficulties associated with physical stresses. Breathing difficulties

associated with psychological stresses had 62.5% of men and 55.6% of women, and in the connection with the cold air in 77.1% of men and 71.4% of women.

Only two cases (1 man and 1 woman) considered that asthma didn't effect their ability to sustain physical efforts, and both of them are younger – 23 and 22 years of age. 12.5% of men and 22.2% of women considered that asthma influenced a little on their ability to sustain physical efforts. 47.9% of men and 30.2% of women considered that asthma influenced them moderately, and 37.5% of men and 46% of women considered that asthma greatly influenced their ability to sustain physical effort.

Men and women with asthma had similar attitudes on its influence on their quality of life. 35.4% of men and 39.7% of women considered that asthma greatly influences their quality of life. Only one woman and one man thought that asthma didn't influence their life quality. Men were less absent from work than women. Men were absent 17.3 days annually and women 25.2 days annually.

It is well known that different factors from the working environment influence the onset of asthma. In our study we were examining the exposure to passive smoking and dampness at work in workers, clerks and the retired, and we compared them to the control group. Statistically significant difference was found in women who work as clerks. These women were more exposed to passive smoking at their work place, as compared with clerks from the control group ($\chi^2 = 4.35$, $p = 0.003$). Men suffering from asthma who retired were significantly more exposed to passive smoking ($\chi^2 = 6.51$, $p = 0.01$) and dampness at work ($\chi^2 = 9.32$, $p < 0.05$) compared to the control group.

The rest of the cases – workers, clerks and retired were more exposed to those risk factors at work, but there was no statistically significant difference found.

Allergic diseases, low socio-economic status, and exposure to passive smoking have a significant role in the onset and development of asthma. Some factors at work can also have an important role in the onset of asthma (smoke, humidity, allergens and irritants).

Discussion

Education of patients on how to avoid common asthma triggers and risk factors is an important step in reducing asthma morbidity and mortality. A partnership between patients and health care providers that includes health education is a crucial component of optimal asthma management. The onset of asthma, especially in children, may be prevented when exposure to tobacco smoke and indoor allergens is reduced.

In this study we found that asthmatics have significantly lower socio-economic status, which was observed through educational achievement, occupation, and incomes. Even 27.1% of men and 30.2% of women suffering from asthma, have only primary school education. There are several possible explanations for asthma occurring in people of lower socio-economic status: worse access to high-quality care, poorer continuous control, less taking of anti-inflammatory therapy, dismal housing with high levels of dust mite, molds, and cockroaches. According to data from United States, mortality rates and number of hospitalization of asthma patients are higher for Blacks, urban and poor inhabitants^{16,17}

Results of this study clearly showed that asthmatics are more susceptible to allergic diseases. A. Custovic with his colleagues studied exposure to house-dust mites in the population of 53 adults with asthma in England and found a significant correlation between the concentration of house dust-mites in beds where the patients were sleeping and the bronchial hyperactivity¹⁸.

Epidemiological studies have showed that up to 85% of asthmatics are skin-prick sensitive to house-dust mites, as compared with 5–30% of the general population^{19,20}. If indoor allergens are risk factors for asthma, then reducing of the exposure to aeroallergens is an important step in improving asthma control. Several studies have demonstrated the effectiveness of allergen reduction in the asthma treatment^{21,22}.

Some studies have also demonstrated an association between the exposure to indoor pollutants from gas stoves and cookers, fireplaces, tobacco smoke and wood stoves and the aggravation of asthma symptoms such as nighttime asthma, moderate to severe cough and shortness of breath, restriction in activity, work absenteeism and increased hospital admissions. The cause for that is chronic respiratory tract irritation and reduction in lung functions because of exposure to nitrogen dioxide that is the product of combustion. Woodsmoke contains a variety of respiratory irritants that can trigger asthma symptoms including aldehydes, nitrogen and sulfur dioxides, acidic aerosols and particulates²³. Honicky and colleagues found more frequent symptoms of respiratory tract irritation, including coughing at night and on most days, as well as occasional wheezing without infection among children in homes heated by wood stoves compared with children who have other types of different heating systems in their homes²⁴. Those studies clearly demonstrate that those suffering from moderate to severe asthma should reduce exposure to certain air pollutants and aeroallergens to minimum from, for example, wood and gas stoves, and tobacco smoke.

Till now, the relationship between psychological factors and somatic impairments is not clearly defined, and therefore it is not clearly possible to proclaim the psychological causality of diseases. But psychological factors certainly play

an important role in all the stages of bronchial asthma, and affect the course of the disease in the sense of its improvement or exacerbation. According to our results, 31% of men and 42.9% of women suffering from asthma sustained psychological stresses badly. Many studies have demonstrated the positive effects of various psychotherapeutic interventions in asthma therapy and inform us about the importance of psychological factors in the development and course of bronchial asthma. Since the 70s, inhaled corticosteroids have brought significant improvement in the therapy of asthma, as the inflammatory disease of the airways. From that time, the interest for observing psychological and psycho-social aspects of this disease has slowly diminished. Campbell suggests that psycho-social factors should be taken more seriously in patients with severe asthma, and in those who do not stick to the therapy. There are many psychological factors that can aggravate their disease such as various family problems: family conflicts, alcoholism, drug abuse, unemployment, low incomes, moving, divorce, depression, emotional unhappiness²⁵.

According to our data, significantly higher percentage of asthmatics have frequent colds. It is well known that respiratory infections caused by viruses, especially by rhinoviruses, influenza virus and respiratory syncytial virus (RVS), are the most common cause of asthma exacerbations. Infections of airways caused by viruses increase the flow of eosinophiles into the airways and the inflammation of the mucosa of the airways in the time of the acute infection and help the development of the late answer on the inhaled allergens²⁶.

Smoking habits differ significantly among cases and control subjects in our study. Higher percentage of controls were current smokers, and cases former smokers and non-smokers. 37.5% of men with asthma and 19.7% of women were former

smokers, and 18.8% of men asthmatics and 11.5% of women were current smokers. Former smokers with asthma smoked for a mean duration of 21.9 years, and current smokers for 27.1 years. Regarding the exposure to passive smoking, 37.5% of men and 52.4% of women were exposed to tobacco smoke at homes, and 82.6% of men and 68.4% of women were exposed to tobacco smoke at work place.

Smoking increases the level of IgE antibodies, and also influences the immunological response by lowering the level of IgG and IgM antibodies. Particles of smoke, causing inflammation of airways, facilitate the absorption of antigens, which leads to the sensitization. Atopic diseases manifest earlier in families where there are smokers, and the skin prick tests to allergens will be more positive, as compared with those not exposed to tobacco smoke²⁷.

Data from Canada show that the percentage of hospitalization due to asthma increased 50% for both sexes between 1972 and 1982. The biggest increase was for patients younger than 15 years. This rate suggests that rates of mortality increased for 9% for men and 44% for women between 1972 and 1982²⁸.

According to one prospective study of the population of 14 726 adults who smoked, it was found that asthmatics who smoke are more likely to quit smoking during some period – in that study it was 6 years. In that study the prevalence of diagnosed asthma was significantly bigger in smokers, compared to non-smokers, but only in men 29.

According to studies in Canada, the prevalence of smoking in men and women

between 25 and 44 years was lowering in the mid 70s, but the average number of cigarettes smoked increased 50% in women aged 24–34 between 1969 and 1984. In that population of women, there were certainly mothers of children that were younger than 15 years, and that is the population where the Canadians have the biggest increase in hospitalization rates^{30,31}.

As a chronic condition affecting a large proportion of the population, asthma requires outcome analysis in order to assess its current management, and find ways of its possible improvements. Those analysis are important tools for health policy makers, public health practitioners, and physicians who should implement this data in their everyday practice. The management of most chronic non-communicable diseases in Croatia is lacking adequate and effective public health programs which would encourage a partnership among patients, physicians and other health professionals through modern treatment and education programs. In the case of asthma, management should be more focused on raising awareness of asthma in the public and as well in development of health promotion programs and patient education in order to improve its control, reduce morbidity and mortality and reduce health care costs. Therefore, the main point should be put in the primary and secondary prevention. Therefore, there is a need, and a possibility to reduce morbidity and mortality from asthma, as well as costs of treating this disease, by developing appropriate preventive measures of decreasing the exposure of asthmatics to certain risk factors³².

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RIZIČNI FAKTORI U ASTMATIČNIH PACIJENATA U HRVATSKOJ

SAŽETAK

Cilj ove studije bio je istražiti da li su neki faktori, koji su povezani s nastankom astme, značajno više prisutni kod promatrane skupine astmatičara, u usporedbi s kontrolnom skupinom ispitanika. U ispitivanju je sudjelovalo 111 astmatičara i 108 ispitanika koji nemaju astmu. Podaci za astmatičari i kontrolnu skupinu ispitanika uspoređeni su s obzirom na spol. Podatke od ispitanika dobili smo putem razgovora i ankete, te iz medicinskih kartona i povijesti bolesti ispitanika. Rezultati su pokazali da značajno više astmatičara ima nizak socio-ekonomski status, alergijske bolesti, te da su više izloženi vlazi na radnom mjestu, te pasivnom pušenju na radnom mjestu i kod kuće.

Astmatičari također značajno slabije podnose fizičke napore i psihičke stresove, te smatraju da je njihova kvaliteta života u velikoj mjeri smanjena radi astme. Među astmatičarima bilo je značajno manje sadašnjih pušača, te značajno više bivših pušača.

Iz ovoga proizlazi da postoji potreba i mogućnost za smanjenje pobola i umiranja od astme, kao i smanjenje troškova ove bolesti, provođenjem odgovarajućih preventivnih mjera kojima bi se smanjila izloženost astmatičara određenim faktorima rizika.