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CLINICAL RESEARCH

Features of Chronic Bronchitis in Different Age Groups

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Abstract

Background: Lung diseases are assuming greater relevance and importance today. Chronic bronchitis is a self-nosology, which may precede the development of COPD, the importance of which can hardly be overestimated. The main problem in this disease is caused by late diagnosis and treatment due to the delay by patients in seeking medical help. ***The aim*** of the work was to study the distribution and exposure to tobacco smoke, especially chronic bronchitis, depending on various factors, including age.

Methods: We examined 1779 persons, including 855 men and 924 women. The mean age of the population was 35.83±8.3 years. We conducted surveys and spirometry. The outcome was assessed after a bronchodilation test was performed with salbutamol 400 μg. We performed all statistical analysis using software package Statistica 10.

Results: We identified chronic bronchitis in 9.2% of the cases in the group of younger individuals and in 14.9% of the cases in the group of older individuals, during the active detection of chronic bronchitis using questionnaires. The prevalence of cigarette smoking was slightly higher among the younger (39.5%) than the older persons (33.6%); the frequency of smoking in a group of chronic bronchitis was reliably higher. Also, in this group, the performance spirometry reliably decreased.

Conclusions: Outpatient survey is an effective method of identifying chronic bronchitis. Smoking is a major risk factor in the group of young respondents and the prevalence of smoking is inversely related to the education level of the respondents, regardless of age. As the decline in the Forced Expiratory Volume (FEV1 and FEV1/FVC) is the main criterion diagnosis of COPD, it revealed significant declines in the FEV1 of the younger smoking individuals, which may help to predict the development of COPD in the older age group.

Keywords*: smoking; chronic bronchitis; education; spirometry.*

Introduction

Lung diseases associated with environmental problems are “diseases of progress” which are gaining relevance and social significance. One of the major diseases of this group includes COPD, the significance of which is difficult to overestimate. WHO estimates that by 2020, the COPD prevalence and corresponding damage will rise from the 12th to 5th place in ranking, whereas the cause of mortality will move from the 6th to 3nd position [1]. The Global Initiative for Chronic Obstructive Lung Disease (GOLD, 2013) guidelines state that chronic bronchitis is a completely independent disease, but one which may precede the development of airflow limitation or accompany it, as well as cause or aggravate the persistent airflow limitation [2,3]. A primary etiologic factor for the majority of patients with chronic bronchitis is smoking, which is a huge problem for both Russian and global health [4]. The main problem with this disease is the late diagnosis caused by unexpressed clinical symptoms and delay in patients seeking treatment as medical aid. According to the literature, to date, no objective studies are available on the effect of tobacco smoke, flow characteristics and distribution of chronic bronchitis, depending on various factors, including age.

Methods

We performed an integrated cross-sectional clinical study using the functional basis of Chelyabinsk City Center Pulmonology (GBUZ Regional Clinical Hospital #4). Our population of interest included adults with obstructive lung

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disease randomly selected for the survey at the pulmonology center during the year 2013 (January-December). All the participants revealed the required volume survey. This study consisted of 1,779 participants, including 855 men and 924 women (11.8% of the total population served by the health facility). The mean age of the population was 35.83±8.3 years.

Inclusion criteria:

1. Lack of exacerbations of lung disease known at the time of enrollment;
2. Respondents' consent to participate in the study.

The complex included a mandatory screening questionnaire, which contained all the personal data and demographic information such as gender and age, as well as height and weight parameters and known somatic diseases. The questionnaire contained information regarding risk factors including family and medical history, especially colds and allergic predisposition effects of the aeropollutants in the workplace. The smoking history was assessed by two major parameters - the degree of nicotine dependence - Fagerstrom test (TF) and the index of "pack-years". Considering that the current diagnosis standards of chronic bronchitis stated that a diagnosis is made in the case of cough for at least three months per year during at least two years (WHO, 1998). All the subjects were asked the following questions: "Do you have a cough?" and "Have you been coughing more than three months per year for at least two years"?

Evaluation of Respiratory Function (ERF) was performed using spirograph MicroLab III (England). The study was conducted under conditions of relative rest in the sitting position; the result was evaluated after conducting the bronchodilation test using salbutamol 400 mcg. We analyzed the Forced Expiratory Volume in 1 second (FEV1), the ratio of FEV1/FVC.

Results were statistically processed using the software package Statistica 10 for Windows. Analysis of the distribution of values obtained was performed using the Kolmogorov-Smirnov test. For data with normal distribution, inter-group comparisons were performed using Student's t-test. The mean (M) and standard error of the mean (SEM) were calculated. Group comparisons with respect to categorical variables are performed using chi-square tests or, alternatively, Fisher's exact test when expected cell counts were less than 5. A value of $P \leq 0.05$ was considered statistically significant.

Results

For research purposes all the respondents were divided into two groups based on the *WHO* classification: the Group 1 included the young individuals - 18-44 years (n=1,417), while Group 2 was composed of those persons 45 years and older (n=362). Mean age was 30.06±6.3 years and 56.4±8.2 years, respectively. We analyzed the smoking history in the groups investigated. The results are presented in Table 1. The prevalence of smoking was comparable in both groups. The smoking initiation age, however, was statistically significant. It was 5 years less in the group of young individuals which, therefore, increases the risk of tobacco addiction diseases at an earlier age.

Table 1

Analysis of the smoking history in the groups investigated

	Smokers		Ex-smokers		Smoking initiation (years)	Index "pack-years"	TF, points
	n	%	%	duration (years)			
Group 1	562	39.5	7.4	9.6	19.33±5.4	9.46±9.1	4.48±1.94
Group 2	120	33.6	14	20.5	24.37±9.1*	30.35±19.3*	5.33±2.1*

*Note: * - $p \leq 0.05$ vs Group 1*

The analysis of the prevalence of smoking was based on the age and education level the persons surveyed. Among the young men, 148 persons were found to have higher education, which accounted for 22% of the total number of men and 37.5% of the respondents with higher education; and among the women which included 246 persons the percentages were 32.5% and 62.5%, respectively. Significant differences in the frequency of smoking based on the education level of the young people surveyed were reliably identified (Fig.1): among those having higher education, smokers of both sexes amounted to 29.9%, whereas among those with only secondary level of education, the smoking respondents totaled to 44.9% (*P>0.05*). Similar results were revealed on questioning persons in the older age group: the number of smokers with the higher level of education was significantly lower than the non-smokers (19.4% vs 80.6%), and among those with secondary education, the incidence of smoking was 41.9% versus 58.1% among the non-smokers. In addition, on comparing the number of younger smokers the prevalence of smoking among persons with higher education was found to be less than among the persons with secondary education; this dependence, however, has not been revealed in Group 2 respondents.

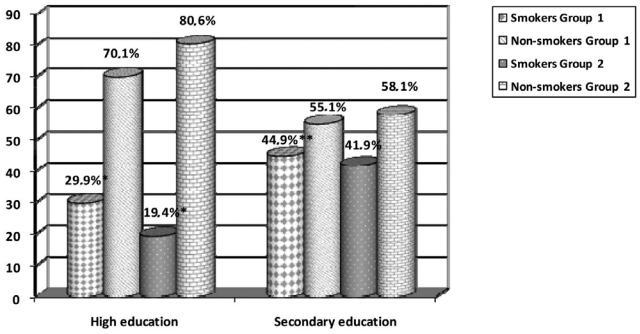

Figure 1. *Frequency of smoking depending on the age and education level*

**- $p \leq 0.05$ between smokers and non-smokers within the group*

***- $p \leq 0.05$ between high and secondary education within the group*

All respondents were questioned regarding their existing bronchopulmonary diseases. Our results revealed 51 persons with the diagnosis of chronic bronchitis (2.8% of the population studied). Significant prevalence of bronchitis patients in the older age group was also noted, at 6.1% versus 2.1%, respectively. Also, with the higher frequency of chronic bronchitis diagnosis in men in both groups: 58.8% were men and 41.2% - women. The predominance of the diagnosis

"chronic bronchitis" in men is more likely to be associated with the higher prevalence of smoking among males. All persons surveyed were requested to answer questions that revealed the presence of chronic bronchitis. Results of respiratory complaints are presented in Figure 2. Apparently, from the results presented, about half of those surveyed in both the groups (54.2% in Group 1 and 47.9% in Group 2) did not complain about any respiratory symptom like cough. Periodical cough was noted in 36.6% and 37.2%, respectively. The criterion of the presence of chronic bronchitis was noted in 9.2% in the younger age group and 14.9% in the older age group *(P<0.05)*. All the patients who complained of a persistent cough were examined by a pulmonologist to exclude the other causes of the condition, and the diagnosis of chronic bronchitis was confirmed. Thus, the active detection method of questioning shows high efficiency in the diagnosis of the disease: the true prevalence of the disease exceeded the official data by more than 8 times in the group of younger respondents, and in the older age group – by more than two times.

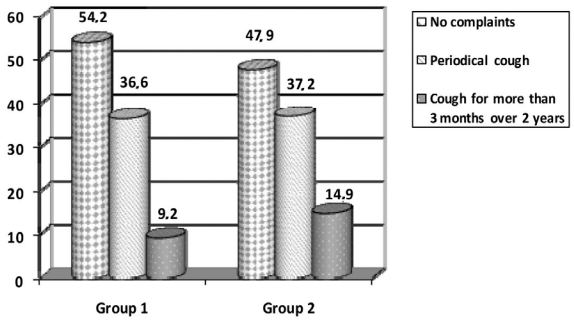

Figure 2. *Frequency of respiratory complaints depending on the age of the respondents*

The analysis of the frequency of smoking among the patients with chronic bronchitis revealed that the number of smokers and non-smokers in Group 2 was approximately comparable - 48.3% of smokers and 51.7% of persons with no history of tobacco use. By contrast, in the young age group of respondents with chronic bronchitis, the number of smokers was significantly higher than the non-smoker population (69.6% and 30.4%, respectively), which proves the pivotal role that smoking plays among young people in the development of chronic bronchitis; meanwhile, in the older age group in the genesis of the disease, possibly there are other factors as well which also play a similar role. On performing spirometry (Table 2) it was revealed that among the young people with symptoms of chronic bronchitis, the level of FEV1 in the smoker respondent category was significantly lower than in those with no smoking history (79.3±18.1% and 85.6±15.4% respectively). Among the older age category this regularity was not found to be correlated with the above data, which reveals the ambiguity of smoking as a risk factor in these patients. The FEV1 level in Group 2 was significantly reduced, regardless of the smoking status in comparison with the young group which corresponds with the modern concept of the annual drop in the FEV1 [6].

Table 2

Spirometry in patients with chronic bronchitis, depending on the age and smoking status

Parameters	Group 1		Group 2	
	Smokers (a)	**Non-smokers (b)**	**Smokers (a)**	Non-smokers (b)
FEV1 %	79.3±18.1 $P_{1a\text{-}1b} \leq 0.05$	85.6±15.4	67.7±12.3 $P_{1a\text{-}2a} \leq 0.05$	65.9±13.2 $P_{1b\text{-}2b} \leq 0.05$
FEV1/FVC, %	78.2±11.7	83.1±13.7	78.7±18.9	83.3±16.6

Discussion

The appearance of the concept of risk factors for chronic non-communicable diseases has determined that in the civilized countries at least half of these factors have a behavioral nature, i.e. induced by lifestyle, while one of the premises essentially defining a lifestyle is the overall and medical cultures of a population [7]. Some data are available on the negative correlation between the risk factors such as smoking, overweight and education level of the population [8]. We showed, in our study, that the prevalence of smoking among persons with higher education, regardless of age, was significantly lower than among those persons with secondary education. Besides, a trend is now seen of early onset of smoking [9], which concurs with the results of our study, showing that the age of onset of smoking in Group 1 is 5 years younger than in the older group.

The problem of bronchitis has not been too actively discussed in recent years, although the prevalence of these types of pathologies is significantly higher than asthma, COPD and pneumonia considered together [10]. We identified with the healthy active poll respondents that the true prevalence of chronic bronchitis among the younger people is more than eight times higher than the officially fixed rate of the disease. Thus the main risk factor for the disease is smoking. Also, the true prevalence of chronic bronchitis in the older group is more than two times higher than the officially fixed rate of the disease, which proves the effectiveness of the active detection of chronic bronchitis at any age. We have established that the presence of chronic bronchitis in young smokers increases the probability of developing COPD [3]. In our study, a significant decrease in the FEV1 was observed in the young smokers' relatively non-smoking population. Thus, the early detection of chronic bronchitis among the young people and motivating smoking cessation are important and essential medical and social tasks.

Conclusion

Outpatient survey is an effective method of identifying chronic bronchitis. Smoking is a major risk factor in the group of young respondents and the prevalence of smoking is inversely related to the education level of the respondents, regardless of age. As the decline in the Forced Expiratory Volume (FEV1 and FEV1/FVC) is the main criterion diagnosis

of COPD, it revealed significant declines in the FEV1 of the younger smoking individuals, which may help to predict the development of COPD in the older age group.

Competing interests

The authors declare that they have no competing interests.

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