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The Effect of Smoking on the Formation of Bronchial Obstruction in the Open Population of Novosibirsk

Although currently smoking cigarettes recognized as the most common and important risk factor for chronic obstructive pulmonary disease, there is a view that this is not the only factor in the development of airflow obstruction (AO). Objective: to study the effect of smoking on the development of AO in the open population of the city of Novosibirsk. We used population-based cross-sectional study materials obtained in the framework of the project <HAPIEE> in 2002-2005. ("The determinants of cardiovascular disease in Eastern Europe: a cohort study"). At 73.2% (6875) from a total sample of persons aged 45-69 studied lung function: a three-fold measurement of forced expiratory volume in 1 second (FEV_1), forced vital capacity (FVC). Conducted individual calculation of indices FEV_1, FEV_1/FVC, without defining test for reversibility of AO to identify those with FEV_1/FVC < 70% and FEV_1 < 80%. Depending on the groups of smoking status: 1 - "smokers", 2 - "periodically smokers" 3 - "ex-smokers", 4 - "never smokers." With AO registered 42.5% of smokers (among men - 64.2%, among women - 14,3%); 0,8% periodically smokers (among men - 0.5%, among women - 1,2%); 15,5% ex -smokers (among men - 22.2%, among women - 6,7%); 41,2% never smokers (among men - 13.1%, among women - 77,8%). In the study of the possibility of forming AO for persons with the smoking anamnesis relative to never smokers, it was found that AO is formed 3.2 times more often in male smokers, 1.7 times more often in female smokers than non-smokers; AO is formed 2 times more often in male ex-smokers, 2.1 times more often in female ex-smokers than never smokers; chance of developing AO was not greater in periodically smokers. Analysis of indices population showed negative correlation of AO components (FEV_1, FEV_1/FVC) with the number of smoking pack years. The results showed that the presence of smoking history, intensity and duration of smoking affect the development of AO.

Key words: airflow obstruction, smoking status, smoking pack years.

Introduction. Smoking is widespread throughout the world. Russian Federation in terms of smoking prevalence among the adult population is second in the world (43.4%), second only to Greece, where the figure is 48.2%. Tobacco smoking is related to the general risk factors for chronic non-communicable diseases (including chronic respiratory diseases), which accounted for 63% of all deaths [5].

Currently, smoking cigarettes recognized as the most common and important risk factor for chronic obstructive pulmonary disease [1]. Respiratory symptoms appear earlier and impaired pulmonary function occurs more quickly in smokers [2].

However, it is believed that the factor of smoking is not only in the development of airflow obstruction (AO). There is evidence that about one third with irreversible AO had never smoked, and the majority of them women [4].

Studies on the AO, the effects of smoking on the development of AO in Novosibirsk has never been carried out.

The above makes the problem of study the effect of smoking on the development of AO in Novosibirsk.

Purpose: To study the effect of smoking on the development of AO in the open population of the city of Novosibirsk.

Materials and methods. We used population-based cross-sectional study materials obtained in the framework of the project <HAPIEE> in 2002-2005. ("The determinants of cardiovascular disease in Eastern Europe: a cohort study". Principal investigators - prof. S.K. Malyutina, Acad.

RAMS Yu.P. Nikitin). The samples were formed on the basis of the electoral lists using a table of random numbers. Sample size was determined by the protocol program. At 73.2% (6875) from a total sample of persons aged 45-69 studied lung function: a three-fold measurement of forced expiratory volume in 1 second (FEV_1), forced vital capacity (FVC).

Spirometry was performed on the device Micro Plus (MicroMedical, UK). Spirometry results were recorded and processed by a computer diagnostic program Spida 4. Carried out individual calculation of indices FEV_1, FEV_1/FVC, without defining test for reversibility of AO to identify those with FEV_1/FVC < 70% and FEV_1 < 80%. Calculation of indices (FEV_1/FEV_1 of predicted, FEV_1/FVC) was carried out using the comparative equation predicted values obtained in the course of the third national survey of U.S. (Third National Health and Nutrition Examination Survey – NHANES III) [3].

All respondents were divided into three age groups: 45-54 years, 55-64 years, 65-69 years.

Depending on smoking status were identified groups: 1 - "smokers" (regular smoking at least 1 cigarette / day), 2 - "periodically smokers" (periodically smoking at least 1 cigarette / day), 3 - "ex-smokers" (smoked in the past), 4 - "never smokers".

Number of smoking pack years (PY) was calculated using the formula: (number of cigarettes smoked per day × number of years smoked) / 20 (1 pack has 20 cigarettes). All respondents distributed to 3 groups depending on the PY: 1 - < 10 pack years (p/y), 2 - 10-24 p/y, 3 - ≥ 25 p/y.

Factual material was processed on a personal computer program SPSS 17 c using the methods of descriptive statistics (frequencies, percentages and percentage distribution). Odds ratios (OR) were calculated by cross tables. The critical level of significance when testing statistical hypotheses assumed to be 0.05.

Results and discussion. A total of 6875 respondents aged 45-69 years were examined. Of these, 3226 were men (46.9%) (mean age 57,8 ± 6,82), 3649 women (53.1%) (mean age 57,6 ± 6,96). The response in the age group 45-54 years was 38.7% (among men - 38.1%, among women - 39.3%), in the age group 55-64 years - 40.4% (among men - 41.0%, among women - 39.8%), in the age group 65-69 years - 20.9% (among men - 20.9%, among women - 20.9%).

In view of status of smoking in the total population registered: smokers - 28.6% (among men - 49.4%, among women - 10,2%, p < 0,0001), periodically smokers - 1.0% (among men - 1.0%, among women - 1,1%, p > 0,05), ex-smokers - 13.5% (among men - 24.3%, among women – 4,0%, p < 0,0001), never smokers - 56.8% (among women - 84.7% among men - 25,3%, p < 0,0001).

AO detected in the following rates: 1 - FEV_1 / FVC < 70%; 2 - FEV_1 < 80%, FEV_1/ FVC ≥ 70%.

In the total sample of AO was detected in 19.48% of the 6875 patients (in the group of 45-54 years - at 14.80%, 55-64 years - at 20.85%, 65-69 years - at 25.49%). Among men, the AO was detected in 23.47% of cases (757 of 3226 subjects), among women (582 of 3649 subjects) - in 15.95% (p < 0.001).

When AO registered 42.5% of smokers (among men - 64.2%, among women - 14,3%, p <0,001); 0,8% periodically smokers (among men - 0.5%, among women - 1 2%, p> 0,05); 15,5% ex-smokers (among men - 22.2%, among women - 6,7%, p < 0,001); 41,2% never smokers (among men – 13.1%, among women - 77,8%, p < 0,001). Smoking history was founded in men - 86.92% (of 757 men), women - in 22.16% of cases (from 582 women) among respondents with a registered AO.

We studied the prevalence of AO according to smoking status by age groups.

(Table1)

Table 1 shows that AO was detected in 30.51% of cases among regular smokers, in 12.90% - among periodically smokers, in 21.40% - among ex-smokers, in 12.12% - among never smokers the men surveyed. It is shown that the prevalence of AO higher in ex-smokers than

never smokers men in the age groups 55-64 and 65-69 years, higher in smokers than never smokers in all age groups. Frequency of AO increased with age among smokers ($p_{I-II} > 0,001$; $p_{II-III} > 0,001$; $p_{I-III} > 0,001$), of ex-smokers ($p_{I-II} > 0,001$; $p_{II-III} > 0,05$; $p_{I-III} > 0,001$), its increase was not observed among never smoking men ($p_{I-II} > 0,05$; $p_{II-III} > 0,05$; $p_{I-III} > 0,05$).

(Table 2)

Table 2 shows that AO was detected in 22.19% of cases among regular smokers, in 17.95% - among periodically smokers, in 26.71% - among ex-smokers, in 14.66% - among never smokers the women surveyed. It is shown that the prevalence of AO higher in smokers than never smokers women in all age groups, higher in smokers than the ex-smokers - in groups of 45-54 and 65-69 years. Frequency of AO increased with age among smokers ($p_{I-II} < 0,001$; $p_{II-III} > 0,05$ $p_{I-III} < 0,01$), of ex-smokers ($p_{I-II} > 0,05$; $p_{II-III} < 0,01$; $p_{I-III} < 0,001$), of female never smokers ($p_{I-II} < 0,01$; $p_{II-III} > 0,05$; $p_{I-III} < 0,001$).

In the study of the possibility of forming AO for persons with the anamnesis smoking relative to non-smokers, it was found that AO is formed 3.2 times more often (OR = 3,184; 95% CI 2,516-4,030) in male smokers, 1.7 times more often (OR = 1,660; 95% CI 1,276-2,161) in female smokers than non-smokers; AO is formed 2 times more often (OR = 1,975; 95% CI 1,507-2,589) in male ex-smokers, 2.1 times more often (OR = 2,122; 95% CI 1,451-3,102) in female ex-smokers than non-smokers; chance of developing AO was not greater in periodically smokers.

The results showed that the presence of smoking history, intensity and duration of smoking affect the development of AO.

In the analysis of total population indices revealed a negative correlation of AO components (FEV_1, FEV_1/FVC) with an number of PY: for FEV_1 $r_s = - 0,242$ ($p < 0,01$), for FEV_1/FVC $r_s = - 0,230$ ($p < 0,01$) in men; for FEV_1 $r_s = - 0,195$ ($p < 0,01$), for FEV_1/FVC $r_s = - 0,104$ ($p < 0,05$) in women.

PY (< 10 p/y) in the total sample (from 2895 respondents with the anamnesis smoking anamnesis) was detected in 19.2%, with AO (from 776 respondents with the smoking anamnesis) - in 13,3% ($p <0,001$); PY (10-24 p/y) in the total sample was detected in 27.9%, with AO - in 24,1% ($p <0,05$); PY (10-24 p/y) in the total sample was detected in 52.9 %, with AO - in 62,6% ($p <0,001$).

(Figure 1)

Distribution of respondents with AO according to the PY (Fig. 1) had gender differences: PY (< 10 p/y) was detected among men 7.5%, among women - 44.3% ($p <0.001$), PY (10-24 p/y) among men - 21.7%, among women - 36.9% ($p <0,001$), PY (≥ 25 p/y) among men - 70.8%, among women - 18.9% ($p <0.001$).

Conclusions. Thus, the effect of smoking on the formation of AO in a large industrial center of Western Siberia - Novosibirsk has been studied for the first time. The results showed that the presence of smoking history, intensity and duration of smoking affect the development of AO.

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Table 1

The prevalence of AO among men with different smoking status

Age	total	never smokers		periodically smokers		ex-smokers		smokers	
		total, n	AO, n (%)	total, n	AO, n (%)	total, n	AO, n (%)	total, n	AO, n (%)
45-54$_{I}$	1229	279	30 (10,75)	14	1 (7,14)	237	24 (10,13)	699	158 (22,60***)
55-64$_{II}$	1323	341	37 (10,85)	12	2 (16,67)	329	78 (23,71***)	641	211 (32,92***)
65-69$_{III}$	674	197	32 (16,24)	5	1 (20,00)	219	66 (30,14***)	253	117 (46,25***)
45-69	3226	817	99 (12,12)	31	4 (12,90)	785	168 (21,40***)	1593	486 (30,51***)

Note: *** - $p < 0,001$ when compared with never smokers from the respective age groups.

Table 2

The prevalence of AO among women with different smoking status

Age	total	never smokers		periodically smokers		ex-smokers		smokers	
		total, n	AO, n (%)	total, n	AO, n (%)	total, n	AO, n (%)	total, n	AO, n (%)
45-54$_{I}$	1433	1079	119 (11,03)	26	3 (11,54)	86	20 (23,26***)	242	39 (16,12*)
55-64$_{II}$	1454	1272	197 (15,49)	13	4 (30,77)	53	13 (24,53)	116	37 (31,90***)
65-69$_{III}$	762	739	137 (18,57)	0	0 (0)	7	6 (86,71***)	16	7 (43,75*)
45-69	3649	3090	453 (14,66)	39	7 (17,95)	146	39 (26,71***)	374	83 (22,19***)

Note: * – $p < 0,05$; *** - $p < 0,001$ when compared with never smokers from the respective age groups.

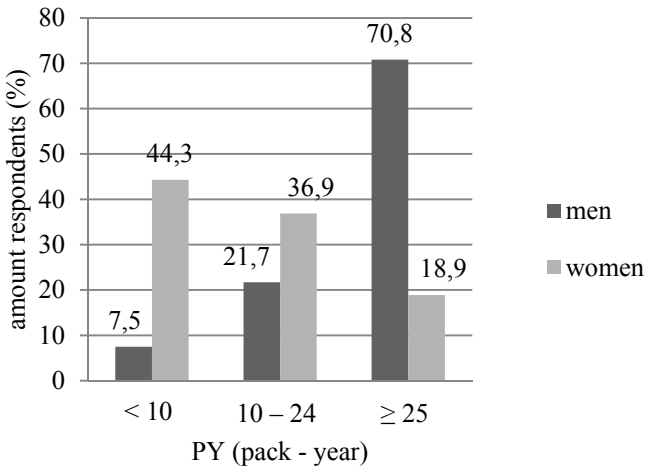

Figure.1 Distribution of respondents with AO relative the PY.

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