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Prevalence of chronic bronchitis against a background of abdominal obesity in young people aged 25–44 in Novosibirsk

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ABSTRACT

Aim. To study the prevalence of chronic bronchitis (CB) against the background of abdominal obesity (AO) in young people aged 25–44 in Novosibirsk.

Materials and methods. A simultaneous population survey of 25–44 year-olds in Novosibirsk was carried out. The study included 906 people (414 men and 492 women). AO was registered with a waist circumference of more than 94 cm in men and more than 80 cm in women. CB was detected according to standardized epidemiological (questionnaire, pulmonary questionnaire) and functional (spirometry) criteria.

Results. The prevalence of AO and CB in the population was 42.9% and 8.7%, respectively; in men – 43.2% and 7.7%; in women – 42.7% and 9.6%. The prevalence of CB against the background of AO in the population was 1.95 times higher ($p = 0.003$) compared with individuals with CB without AO (OR = 2.08 [CI 1.302–3.333]). In women, the prevalence of CB against the background of AO was 2.15 times higher ($p = 0.005$) compared with women with CB without AO (OR = 2.35 [CI 1.267–4.359]). The prevalence of CB in smokers in the population was 1.65 times higher ($p = 0.015$) compared with non-smokers (OR = 1.72 [CI 1.081–2.739]). In male smokers, the prevalence of CB was 2.02 times higher ($p = 0.031$) compared with non-smoking men (OR = 2.15 [CI 1.020–4.514]). The multiple logistic regression analysis showed that in people aged 25–44, the presence of CB is associated with smoking [Exp(B) = 1.966, $p = 0.006$] and the presence of AO [Exp(B) = 2.091, $p = 0.003$].

Conclusion. Significant effects of AO and smoking on the development of CB in the population of 25–44 year-olds on the whole were revealed. At the same time, in men aged 25–44, the relative risk of developing CB is significantly affected by smoking, and in women aged 25–44, by the presence of AO.

Key words: prevalence, abdominal obesity, chronic bronchitis, population aged 25–44, smoking.

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Conformity with the principles of ethics. Informed consent was obtained from all participants for examination and processing of personal data. The study was approved by the local Ethics Committee at IIPM – Branch of IC&G SB RAS (Protocol No. 10 of 21.01.2014).

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Распространенность хронического бронхита на фоне абдоминального ожирения у молодых людей 25–44 лет г. Новосибирска

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РЕЗЮМЕ

Цель исследования – изучить распространенность хронического бронхита (ХБ) на фоне абдоминального ожирения (АО) у молодых людей 25–44 лет г. Новосибирска.

Материалы и методы. Проведено одномоментное популяционное обследование населения 25–44 лет г. Новосибирска. В исследование включены 414 мужчин и 492 женщины. АО регистрировали при окружности талии более 94 см у мужчин и более 80 см – у женщин. ХБ регистрировали согласно стандартизованным эпидемиологическим (опросник, пульмонологическая анкета) и функциональным (спирометрия) критериям.

Результаты. Распространенность АО и ХБ в популяции 42,9 и 8,7% соответственно; у мужчин – 43,2 и 7,7%; у женщин – 42,7 и 9,6%. Распространенность ХБ на фоне АО в популяции в 1,95 раза выше (p = 0,003) в сравнении с лицами с ХБ без АО (OR = 2,08 [CI 1,302–3,333]). У женщин распространенность ХБ на фоне АО в 2,15 раза выше (p = 0,005) в сравнении с женщинами с ХБ без АО (OR = 2,35 [CI 1,267–4,359]). Распространенность ХБ у курящих в популяции в 1,65 раза выше (p = 0,015) в сравнении с некурящими лицами (OR = 1,72 [CI 1,081–2,739]). У курящих мужчин распространенность ХБ в 2,02 раза выше (p = 0,031) в сравнении с некурящими мужчинами (OR = 2,15 [CI 1,020–4,514]). Проведенный многофакторный логистический регрессионный анализ показал, что у людей 25–44 лет наличие ХБ ассоциировано с курением [Exp(B) = 1,966; p = 0,006] и наличием АО [Exp(B) = 2,091; p = 0,003].

Заключение. Выявлены значимые влияния АО и курения на развитие ХБ в популяции 25–44 лет в целом. В то же время у мужчин 25–44 лет на относительный риск развития ХБ значимо влияет статус курения, а у женщин 25–44 лет – наличие АО.

Ключевые слова: распространенность, абдоминальное ожирение, хронический бронхит, популяция 25–44 лет, курение.

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INTRODUCTION

The prevalence of chronic bronchitis (CB) is high; therefore, the diagnosis and prevention of this pathology are some of the most pressing problems in pulmonology and the internal medicine. According to the official statistics of the Ministry of Health of the Russian Federation, the prevalence of "chronic and unspecified bronchitis and emphysema" is very high and in 2015 amounted to 1.5% in the adult population [1].

In the epidemiological part of the GARD study (Global Alliance Against Chronic Respiratory

Diseases), conducted in Russia, it was shown that coughing for 3 months was observed by 18.9% of respondents, coughing up mucus for at least 3 months was reported by 12.7% of patients, and the clinical picture corresponding to the diagnosis that of CB (the presence of two features at once) was present in 8.6% of participants (95% CI 7.9–9.3). It is important that 22.2% of the survey participants indicated a history of CB diagnosis (95% CI 21.2–23.2), which, according to the authors of the study, significantly exceeds the official statistics [2].

The prevalence of obesity, including abdominal obesity (AO), is also high [3, 4]. According to the ECVD-RF (Epidemiology of Cardiovascular Diseases in the regions of the Russian Federation) epidemiological study, the prevalence of AO in the Russian Federation in people aged 25–64 is 55% (61.8% among women and 44% among men), increasing with age both among men and women ($p < 0.0001$) [5].

In recent years, many studies have been conducted on the effect of AO on the development of cardiovascular and endocrine pathologies. Several studies have also been conducted on the associations between the development of CB and metabolic syndrome (MS). The clinical and functional features of the combined course of CB and AO are described, which, according to the authors, is a predictor of the development of chronic obstructive pulmonary disease (COPD) not only in smokers, but also in people who have never smoked [6]. It has been shown that for people with an increased waist circumference, the risk of developing COPD is 72% higher than for those who have a normal waist circumference [7].

The significant role of smoking in CB development is known and unconditional [8]. On the other hand, chronic inflammation plays an important role in the formation of the whole complex of pathological changes in CB. Abdominal obesity is also a pro-inflammatory condition that increases the risk of chronic diseases [9]. Adipose abdominal tissue produces a large number of cytokines and bioactive mediators, thus causing a proinflammatory state in people suffering from AO, which is also associated with an increased risk of developing bronchopulmonary pathology [10, 11].

Most studies in this area have been conducted with examination of persons older than 45 years. It seems relevant and in high demand to study the associations of abdominal obesity with CB in young people of working and child-bearing age. It is also relevant to obtain new data on the associations of abdominal obesity AO with CB in individuals living in Siberia, i.e. in extreme continental climate, where, according to international epidemiological studies, there is a high prevalence of risk factors for chronic noncommunicable diseases [12]. Therefore, the aim of the present research was to study the prevalence of CB against the background of AO in young people aged 25–44 in Novosibirsk.

MATERIALS AND METHODS

On the basis of IIPM – Branch of IC&G SB RAS, in 2013–2016, a simultaneous population screening was conducted for the population of 25–44 years old in the Oktyabrsky district of Novosibirsk (a typical district of the city) within the framework of the budgetary theme No. 0541-2014-0004 "Monitoring the health status and prevalence of risk factors for therapeutic diseases, their prognosis, and prevention in Siberia". The study was approved by the Ethics Committee of IIPM – Branch of IC&G SB RAS (Protocol No. 10 of 21.01.2014).

To select the sample, the base of the Territorial Fund of Compulsory Health Insurance in the Novosibirsk Region was used. The study included 906 people (average age of 36.5 ± 5.8 years), including 414 men (average age of 36.3 ± 5.8 years) and 492 women (average age of 36.7 ± 5.8 years). There were no age differences between the groups examined. Informed consent was obtained from all persons for examination and processing of personal data.

To identify abdominal obesity (AO), the criteria of the Russian Society of Cardiology (RSC, 2009), waist circumference (OT), were used. A waist circumference of more than 80 cm in women and more than 94 cm in men was considered positive for AO.

To detect respiratory symptoms, the WHO Respiratory Disease Questionnaire and the ECRHS (European Community Respiratory Health Survey) were used. According to the presence of cough in each year for 3 months or more (chronic cough), the respondents were divided into groups: 0 – no, 1 – yes. When studying the anamnesis, the answers to the question "Have you ever been told by a doctor that you have: 1 – chronic bronchitis, 2 – bronchial asthma, 3 – bronchiectasis, 4 – pneumosclerosis, 5 – pulmonary emphysema, 6 – COPD?" were taken into account.

The study of the external respiration function (ERF) by spirometry was carried out according to the recommendations for performing spirometry on the SpiroUSB Micro Medical Limited apparatus. Spirometry results were recorded and processed by the Spida 5 computer diagnostic program. Spirometry findings were interpreted based on the 2017 international recommendations "Spirometry for health care providers. Global Initiative for Chronic Obstructive Lung Disease (GOLD)".

Statistical processing of the results was performed using the SPSS package (v.17.0), including the creation of a database and statistical analysis. The data obtained in tables and text are presented for categorical (nominal) indicators as absolute and relative values – *n* (%). For quantitative variables, a normality test was carried out using the Kolmogorov – Smirnov test, the results are presented as the median and interquartile range – *Me* [25%; 75%], as well as *(M ± SD)*, where *M* is the arithmetic mean value, *SD* is the standard deviation. Feature associations were evaluated using linear regression analysis. The fractional difference in features was calculated using the Pearson's χ^2 test. Differences were considered statistically significant at $p < 0.05$.

RESULTS

In the population, the waist circumference was 85 [75.9; 96] cm. In men it was 1.18 times more ($p = 0.0001$) than in women (92 [84; 100] cm and 78 [71; 87] cm, respectively). The prevalence of AO in the population of 25–44 year-olds was 42.9%; it did not differ between men and women (Table 1).

Table 1

Prevalence of abdominal obesity in the studied population of people aged 25–44, *n* (%)

Index	Abdominal obesity		Total
	Absent	Present	
Men	235(56.8%)	179 (43.2 %)	414 (100%)
Women	282 (57.3%)	210 (42.7%)	492 (100%)
Population	517 (57.1%)	389 (42.9%)	906 (100%)

The obtained result is slightly different from the results of the ECVD-RF study, which describes the average data for the Russian Federation. The prevalence of AO at the age of 25–34 years in men was 23.3%, in women 27.2%. At the age of 35–44 in men, it was 41.4%, in women – 47.4%. The proportion of women with AO prevails [5]. In Novosibirsk, higher prevalence of AO in people aged 25–44 was found (42.9%), while no differences were identified between men and women, which confirms the data on higher prevalence of risk factors for cardiovascular diseases in Siberia [12].

The prevalence of CB in the population aged 25–44 was 8.7%; it did not significantly differ between men and women (Table 2).

Table 2

Prevalence of chronic bronchitis in the studied population of people aged 25–44, *n* (%)

Index	Chronic bronchitis		Total
	Absent	Present	
Men	382 (92.3%)	32 (7.7 %)	414 (100%)
Women	445 (90.4%)	47 (9.6%)	492 (100%)
Population	827 (91.3%)	79 (8.7%)	906 (100%)

The obtained result practically does not differ from the results of the epidemiological part of the GARD study, according to which 8.6% of patients (95% CI 7.9–9.3) aged from 18 to 80 years (more than 7,000 examined residents of the Russian Federation) were diagnosed with CB [2].

To study the associations between AO and CB, the ratio of signs was first analyzed (Table 3).

Table 3

Prevalence of chronic bronchitis depending on the presence of abdominal obesity in the studied population of people aged 25–44

Index	Abdominal obesity		Total
	Absent	Present	
No chronic bronchitis			
Both sexes, *n*, incl.:	485	342	827
– in the subgroup for CB, %	58.6	41.4	100
– in the subgroup for AO, %	93.8	87.9	91.3
– in the population, %	53.5	37.8	91.3
Men, *n*, incl.:	221	161	382
– in the subgroup for CB, %	57.9	42.1	100
– in the subgroup for AO, %	94.0	89.9	92.3
– in the population, %	53.4	38.9	92.3
Women, *n*, incl.:	264	181	445
– in the subgroup for CB, %	59.3	40.7	100
– in the subgroup for AO, %	93.6	86.2	90.4
– in the population, %	53.7	36.7	90.4
Have chronic bronchitis			
Both sexes, *n*, incl.:	32	47	79
– in the subgroup for CB, %	40.5	59.5	100
– in the subgroup for AO, %	6.2	12.1 *	8.7
– in the population, %	3.5	5.2	8.7
Men, *n*, incl.:	14	18	32
– in the subgroup for CB, %	43.8	56.2	100
– in the subgroup for AO, %	6.0	10.1	7.7
– in the population, %	3.4	4.3	7.7

Table 3 (continued)

Index	Abdominal obesity		Total
	Absent	Present	
Women, *n*, incl.:	18	29	47
– in the subgroup for CB, %	38.3	61.7	100
– in the subgroup for AO, %	6.4	13.8 **	9.6
– in the population, %	3.7	5.9	9.6
Entire population			
Number of persons, *n*, incl.:	517	389	906
– in the subgroup for CB, %	57.1	42.9	100
– in the subgroup for AO, %	100	100	100
– in the population, %	57.1	42.9	100

Note. CB – chronic bronchitis, AO – abdominal obesity.
* $p = 0.003$ in comparison with persons with CB without AO by 1.95 times, OR = 2.08 [CI 1.302–3.333]; ** $p = 0.005$ in comparison with women with CB without AO by 2.15 times, OR = 2.35 [CI 1.267–4.359].

It was revealed that the prevalence of CB against the background of AO in the population of people aged 25–44 was 1.95 times higher ($p = 0.003$) compared with individuals with CB without AO (OR = 2.08 [CI 1.302–3.333]). In women, the prevalence of CB against the background of AO was 2.15 times higher ($p = 0.005$) compared with women with CB but without AO (OR = 2.35 [CI 1.267–4.359]). In men, such a fact was not revealed. The data obtained indicate a significant effect of AO in young women on the risk of developing CB.

Since it is known that smoking is one of the significant risk factors for the development of CB, this study also analyzed the ratio of signs to study the association between smoking and CB in the young population (Table 4). The prevalence of CB in smokers in the population of people aged 25–44 was 1.65 times higher ($p = 0.015$) compared with non-smokers with CB (OR = 1.72 [CI 1.081–2.739]). In male smokers, the prevalence of CB was 2.02 times higher ($p = 0.031$) compared with non-smoking men (OR = 2.15 [CI 1.020–4.514]). In women, such a fact was not revealed. The findings indicate a significant effect of smoking in young men on the risk of developing CB.

In order to clarify the obtained results regarding the effect of AO on the development of CB in young people aged 25–44, a multiple logistic regression analysis was carried out, which showed that in people of both sexes, the presence of CB, regardless of other features, including age and sex, is associated with smoking [Exp(B) = 1.966, $p = 0.006$] and the presence of AO [Exp(B) = 2.091, $p = 0.003$].

Table 4

Prevalence of chronic bronchitis depending on smoking status in the studied population of people aged 25–44

Index	Smoking (S)		Total
	No	Yes	
No chronic bronchitis			
Both sexes, *n*, incl.:	547	280	827
– in the subgroup for CB, %	66.1	33.9	100
– in the subgroup for S, %	92.9	88.3	91.3
– in the population, %	60.4	30.9	91.3
Men, *n*, incl.:	215	167	382
– in the subgroup for CB, %	56.3	43.7	100
– in the subgroup for S, %	94.7	89.3	92.3
– in the population, %	51.9	40.4	92.3
Women, *n*, incl.:	332	113	445
– in the subgroup for CB, %	74.6	25.4	100
– in the subgroup for S, %	91.7	86.9	90.4
– in the population, %	67.5	23.0	90.4
Have chronic bronchitis			
Both sexes, *n*, incl.:	42	37	79
– in the subgroup for CB, %	53.2	46.8	100
– in the subgroup for S, %	**7.1**	**11.7** *	8.7
– in the population, %	4.6	4.1	8.7
Men, *n*, incl.:	12	20	32
– in the subgroup for CB, %	37.5	62.5	100
– in the subgroup for S, %	**5.3**	**10.7** **	7.7
– in the population, %	2.9	4.8	7.7
Women, *n*, incl.:	30	17	47
– in the subgroup for CB, %	63.8	36.2	100
– in the subgroup for S, %	8.3	13.1	9.6
– in the population, %	6.1	3.5	9.6
Entire population			
Number of persons, n, incl.:	589	317	906
– in the subgroup for CB, %	65.0	35.0	100
– in the subgroup for AO, %	100	100	100
– in the population, %	65.0	35.0	100

Note. CB – chronic bronchitis, AO – abdominal obesity, S – smoking.
* $p = 0.015$ in comparison with non-smokers with CB by 1.65 times, OR = 1.72 [CI 1.081–2.739]; ** $p = 0.031$ in comparison with non-smoking men with CB by 2.02 times, OR = 2.15 [CI 1.020–4.514]

DISCUSSION

When discussing the results obtained, it is important to note that, on the one hand, in the pathogenesis of chronic bronchitis, along with smoking, genetic factors, deficiency of α1-antitrypsin, surfactant, and transferrin, cold climate, frequent respiratory tract infections, and chronic inflammation play a significant role [8, 13, 14]. On the other hand, with AO, adipose abdominal tissue produces a large amount of cytokines and bioactive mediators, thus causing a proinflammatory condition in people suffering from AO, which may be associated (cause-effect pathogenetic relationship) with an increased risk of developing bronchopulmonary

pathology [10, 11]. In general, predicting the risk of developing chronic bronchitis in young people is an extremely urgent task [2, 15].

The patterns revealed in this study indicate a significant relationship between AO and smoking with the presence of chronic bronchitis in people of the young age group (25–44 years old) in Novosibirsk. At the same time, in men aged 25–44, the relative risk of developing chronic bronchitis is significantly influenced by the smoking status, and in women aged 25–44 – by the presence of abdominal obesity. Therefore, a possible cause-effect pathogenetic relationship between the increased content of inflammatory biomolecules in the body in AO, secreted by visceral adipocytes, and the chronic inflammatory process in the bronchi in CB can only be discussed in relation to women aged 25–44 in Novosibirsk.

CONCLUSION

Thus, taking into account the importance of the problem of abdominal obesity, this study obtained data indicating its significant role in the risk of developing chronic bronchitis in young women aged 25–44 years in Siberia.

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Authors contribution

Ragino Yu.I. – conception and design of the study, analysis and interpretation of the data, drafting and final approval of the manuscript for publication. Kurtukov E.A. – collection and analysis of the literature data. Denisova D.V. – design of the study and organization of data collection. Polonskaya Ya.V. – analysis of the data, drafting of the article. Shcherbakova L.V. – statistical processing of the data.

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