

Incidence of Asthma-Like Symptoms in Adolescents of Khabarovsk and the Khabarovsk Rural Area, Russian Federation

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Abstract

Background: In recent decades, there has been an increase in the prevalence of bronchial asthma, in the difference in the prevalence of asthma-like symptoms detected by a continuous survey, and of bronchial asthma detected by the incidence rate. The aim of this study was to determine the frequency of occurrence of asthma-like symptoms in schoolchildren of Khabarovsk and Khabarovsk rural area.

Materials and Methods: The cross-sectional study was conducted between April 2018 and June 2019, and involved 696 school students at the age of 13 to 14 years old from Khabarovsk and Khabarovsk rural area, Russia. For the first time, the prevalence of asthma-like symptoms in adolescents in the Khabarovsk territory was determined by the standard continuous survey of ISAAC.

Results: Of the students surveyed, 345 were boys and 351 were girls. The prevalence of asthma-like symptoms among adolescents in the whole region according to ISAAC (17.9%) is 7.5 times higher than that revealed by the incidence rate (2.4%). The prevalence and severity of asthma-like symptoms in the Khabarovsk rural area is much higher (18.6%) than in Khabarovsk (17.6%), specifically, nocturnal dyspnea occurs 1.5 times more often (34.6% vs. 23.7%), shortness of breath causing difficulties in speech occurs 1.9 times more often (30.8% vs. 16.5%), distant wheezing during physical activity occurs 2.6 times more often (98,0% vs. 37,3%).

Conclusion: The level of asthma-like symptoms among adolescents in the Khabarovsk territory was the highest among the regions of Russia and significantly exceeds the level of nearby regions. It can be suggested that the atopic process in the bronchi, socio-economic factors and the availability of medical care have a greater impact on the frequency of asthma-like symptoms.

Key Words: Adolescents, Bronchial asthma, ISAAC, Russian Federation.

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1- INTRODUCTION

Bronchial asthma (BA), a well-known disease in medicine, became a serious health problem in almost all countries of the world at the end of the twentieth century. Its prevalence has been steadily increasing during the current century, and to date, the detection of bronchial asthma has reached 15% among the children of the world's population (1). In recent years, there also has been a steady increase in the prevalence of bronchial asthma among children and adolescents in the Khabarovsk territory; thus, within 13 years (2005-2018), there has been an increase from 1.2% to 2.0% among children under 14 years of age, and from 1.2% to 2.6% among adolescents (2).

However, in the Khabarovsk territory and in Russia as a whole the absolute indicators of the prevalence of asthma-like symptoms are significantly lower compared to other industrialized countries (about 2% in Russia and 7-15% in industrialized countries) (1, 3-9); but this is only the result of different study methods. In most countries of the world, asthma-like symptoms are taken into account using a continuous population survey (10). In this regard, a standardized questionnaire for research on the prevalence of bronchial asthma symptoms in the population (The International Study of Asthma and Allergies in Childhood [ISAAC]) has been developed.

Thus, according to a survey conducted using the ISAAC methodology in the Amazon region of Brazil the prevalence of asthma-like symptoms in the age group of 6 to 7 was 25.2%, and 15.9% in the age group of 13 to 14 (11). In Kurdistan Province, the West of Iran, the prevalence of asthma-like symptoms was detected in 24.2% of cases in the age group of 6 to 7 and 25.1% - in 13 to 14 year olds, while the prevalence of bronchial asthma in this region is 3.9% (12). In Russia, no national research was conducted using this method,

and the prevalence of the disease is revealed by the incidence rate. Similarly, for the Khabarovsk territory, statistics on the prevalence of asthma are currently available only by the incidence rate. There have been no standardized studies evaluating the prevalence of asthma-like symptoms in the population. In a number of other Russian regions, such studies were conducted within the framework of the 3rd stage of ISAAC (Novosibirsk, Moscow), or after its completion, but using a standardized method (Blagoveshchensk, Vladivostok, Saha-Yakutia, Naro-Fominsk, Cheboksary, Nalchik, Ulan-Ude, Irkutsk, Novokuznetsk, Tomsk, etc. – a total of 17 regions).

In all cases, the prevalence revealed by surveys is at least twice as high as that revealed by the incidence rate; and it reaches the values typical for industrially developed countries (Moscow – 2.3% by the incidence rate and 5.0% according to ISAAC, Blagoveshchensk–2.4% and 5.3%, Novosibirsk – 3.5% and 10.7%, Irkutsk – 3.1% and 12.1%, Yakutia – 5.2% and 13.4%, Tomsk – 2% and 14% respectively, Saint-Petersburg – 1.5% and 7.4%) (13-15). The prevalence indicators obtained using the same methodology differ by two or more times in various regions of Russia, which emphasizes the need for such studies in each region.

The study of bronchial asthma by the incidence rate not only gives inaccurate quantitative information, but also distorts the observed structure of the severity of bronchial asthma. In accordance with the incidence rate method, the occurrence of moderate asthma is most frequent, which is up to 70.0% (16). The study using the ISAAC method shows that 80.0% of children and adolescents with identified asthma-like symptoms have mild bronchial asthma (13-15). This correlates with the data, according to which, on average, more than two years pass from the appearance of the first symptoms of bronchial asthma to

its diagnosis (14), thus the pathological process has time to fully develop, while light forms often remain undiagnosed. In this regard, determining the frequency of occurrence of asthma-like symptoms in children and adolescents in various regions of Russia using a standard method is relevant. It not only allows us to assess the true prevalence of symptoms of such a common disease as bronchial asthma, but also to conduct an early diagnosis of this nosology, which in turn will allow implementing more rational strategies for its secondary prevention and therapy. The aim of this study was to determine the frequency of occurrence of asthma-like symptoms in schoolchildren of Khabarovsk and Khabarovsk rural area by means of a standardized survey using the ISAAC method.

2- MATERIALS AND METHODS

The cross-sectional study was conducted between April 2018 and June 2019, after obtaining the permission from the Department of Education of Khabarovsk and Khabarovsk rural area, Russia. The survey was conducted in the schools of these municipalities under the direct supervision of the study participants, thus, all the school students who received the questionnaire answered the questions.

2-1. Subjects

The survey involved 696 school students at the age of 13 to 14 years old from Khabarovsk and Khabarovsk rural area. 556 school students were from Khabarovsk, 140 - from Khabarovsk rural area, which roughly corresponds to correlation of the population in these municipalities. Two large schools in Khabarovsk and 5 schools in Khabarovsk rural area were randomly selected, then a continuous survey was conducted among all the school students of these schools aged 13 to 14, which allowed us to randomize the study group. Of the students

surveyed, 345 were boys and 351 were girls.

2-2. Instrument

The study was conducted using the standardized ISAAC methodology for the 13 to 14 year old age group. The methodology consists of 3 phases: phase I, which was used as the basis of this study, includes simple methods for measuring the prevalence of asthma in children and adolescents. The survey is suitable for making global comparisons in different geographical areas with different languages, moreover, there is a standardized adaptation of the ISAAC questionnaire for Russian (17). Members of the study groups fill out a questionnaire consisting of three blocks, the first of which, that was used in this study, contains 8 questions reflecting the presence and intensity of asthma-like symptoms (10).

2-3. Ethical consideration

All data was collected with the personal consent of the school students and their legal representatives. All the interviewees are presented under serial numbers in all tables of statistical processing, except for the primary one. The Excel spreadsheet was password-protected and accessible only for the study participants. The study design was approved by the institution's Ethics Committee.

2-4. Statistical analysis

The data collected by ISAAC was entered into the Excel-2013 electronic database and analyzed using the Statistics-13.3 software. Descriptive statistics was used for the entire group of respondents and for comparison of urban and rural residents. Pearson's criterion (Chi-square) was used in assessing the reliability of differences between the studied groups. The prevalence of asthma in the groups was calculated by dividing the number of positive responses to each question by the number of completed questionnaires. P-

value less than 0.05 was statistically significant.

3- RESULTS

Of the students surveyed, 345 were boys and 351 were girls. The study involved 5.3% of teenagers of taken age, living in the city of Khabarovsk, and 7.3% living in the Khabarovsk rural area. It was found that the prevalence of asthma-like symptoms among adolescents in

Khabarovsk and the Khabarovsk rural area is 17.9%. When analyzing the structure of asthma-like symptoms, we used indicators of the frequency of any asthma-like manifestations, the frequency of nocturnal episodes of obstruction that characterize a more severe course of the process, the impact of asthma-like symptoms on the quality of life – endurability of physical activity, speech disorder (**Figure. 1**).

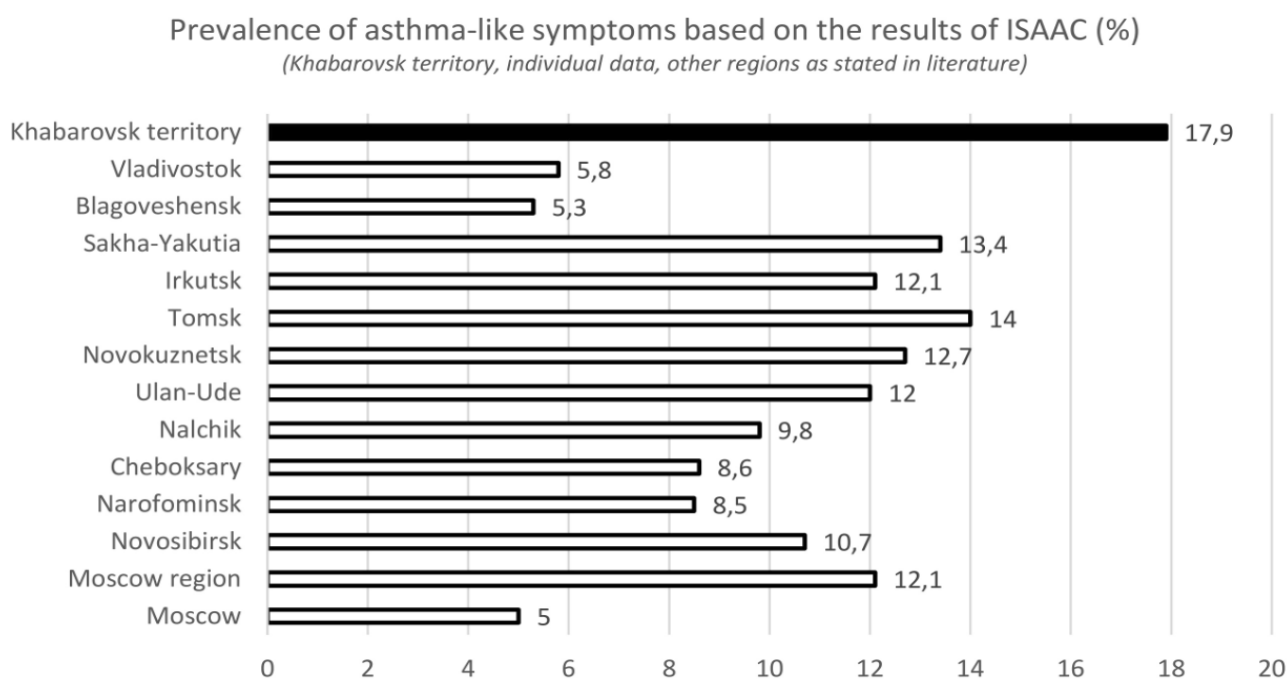


Fig.1: Prevalence and severity of specific asthma-like symptoms among adolescents in the Khabarovsk territory.

An integral assessment of these indicators revealed that 73% of cases in children, who had asthma-like symptoms, correspond to a medium severity of BA, about 20% – to moderate and about 8% – to severe, which coincides with the global indicators according to the results of a standardized survey. However, they differ greatly from the morbidity pattern in terms of the incidence rate (according to our

clinic: 41.5% for mild bronchial asthma, 46.5% - moderate, and 12% - a severe course of a disease) (12). While comparing the prevalence, severity, and structure of asthma-like symptoms of urban and rural adolescents, the following data were obtained (**Figure. 2**). It means asthma-like symptoms are more severe and more common in rural residents, and have a greater impact on their daily lives.

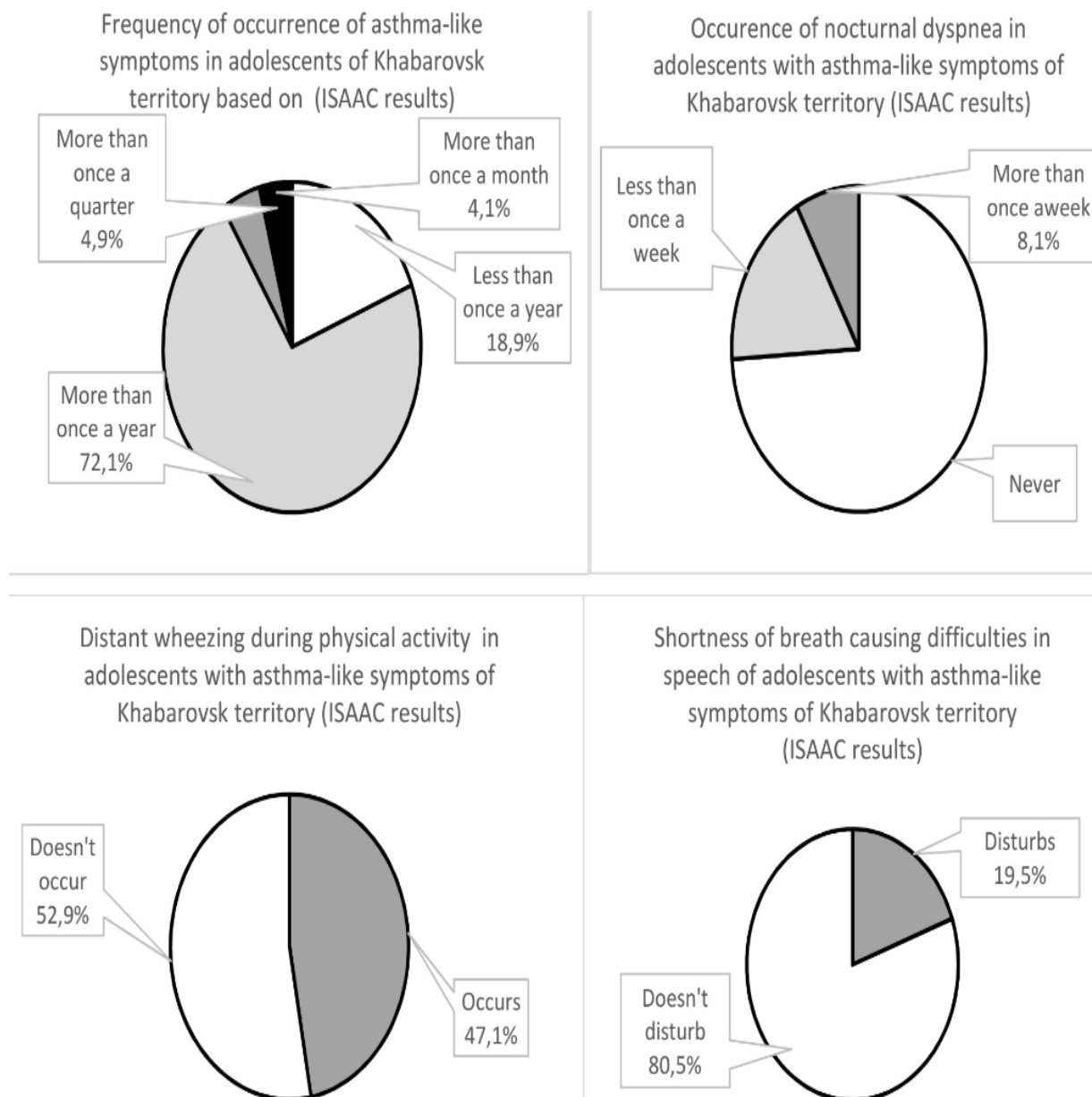


Fig.2: ISAAC results of adolescents in Khabarovsk and Khabarovsk rural area (%).

Results showed that the incidence of asthma-like symptoms in the Khabarovsk territory was the highest of the Russian regions where the study was conducted

using this method (17.9%), and it exceeds the incidence rate of BA (2.4%) in adolescents in the Khabarovsk territory by 7.5 times (**Figure. 3**).

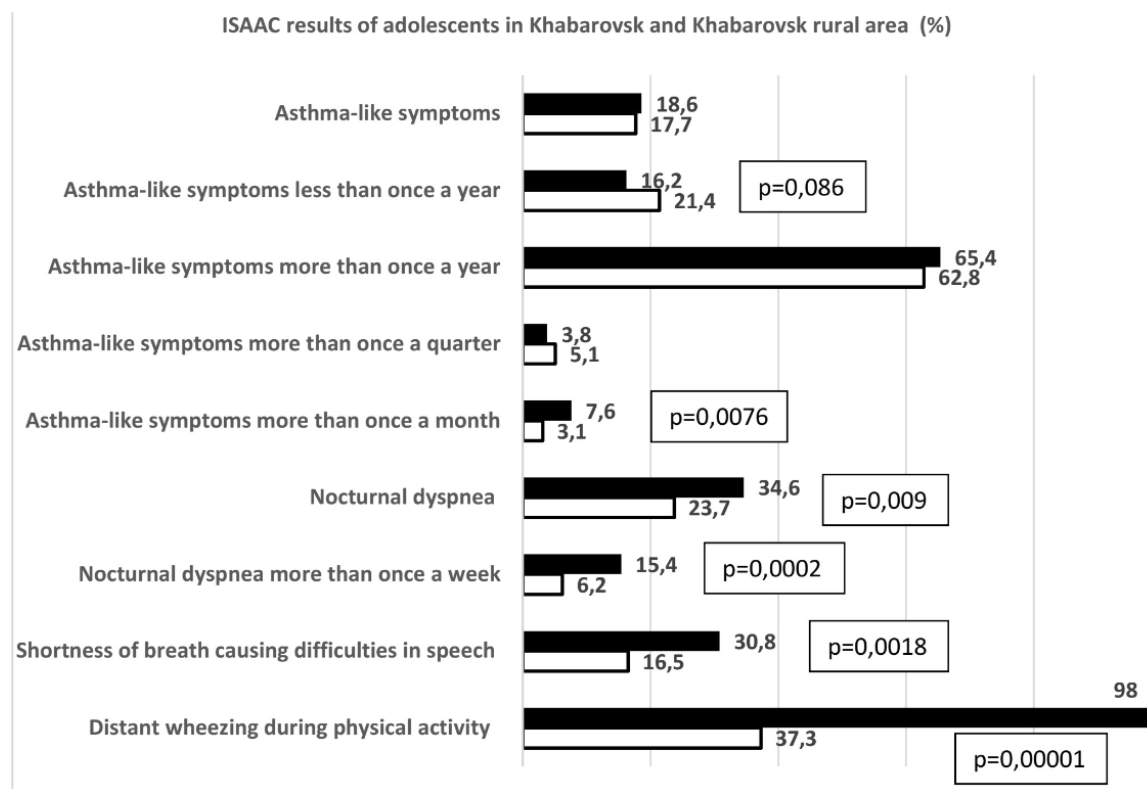


Fig.3: Prevalence of asthma-like symptoms based on the results of ISAAC in Russian regions (%). (Khabarovsk territory, individual data, other regions as stated in literature).

4- DISCUSSION

This study aimed to determine the frequency of occurrence of asthma-like symptoms in schoolchildren of Khabarovsk and Khabarovsk rural area, Russia. When analyzing the results obtained from a survey of schoolchildren, it was found that the incidence of asthma-like symptoms in the Khabarovsk territory was the highest of the Russian regions where the study was conducted using this method (17.9%), and it exceeds the incidence rate of BA (2.4%) in adolescents in the Khabarovsk territory by 7.5 times (Figure.3). Similar indicators in terms of incidence and survey, and similar difference between them are observed in Tomsk, Irkutsk, and Yakutia. In the nearest regions (Vladivostok, Blagoveshchensk), the occurrence of asthma-like symptoms is significantly lower (14, 15). Such significant differences in geographically close regions

present the need of a more in-depth study of the biogeochemical, socio-economic, and population-genetic factors that affect the occurrence of asthma-like symptoms in different places of residence in the course of further research. The detected structure of severity of asthma-like symptoms (73% of cases in children, who had asthma-like symptoms, correspond to a medium severity of BA, about 20% – to moderate and about 8% – to severe) coincides with the global indicators according to the results of a standardized survey. However, they differ greatly from the morbidity pattern in terms of the incidence rate (according to our clinic: 41.5% mild bronchial asthma, 46.5% - moderate, and 12% - a severe course of a disease) (16). Based on the significant differences in the survey results depending on the place of residence, the difference in the occurrence of asthma-like symptoms in urban and rural areas is of great interest. Figure 1

shows that in most cases in Russia, the survey was conducted in cities, with the exception of the Moscow region and the Republic of Sakha-Yakutia. Only for the Moscow region is there a geographically close city - Moscow, which provides information for comparison. It is worthy to note that in this region asthma-like symptoms are two times more common in relation to the neighbouring city. When comparing the frequency of asthma-like symptoms in Khabarovsk and Khabarovsk rural area (Figure. 2), their occurrence is significantly more frequent in the latter, but the difference is much smaller than between Moscow and the Moscow region. Attention is drawn to the fact that frequency of asthma-like symptoms is higher among children from Khabarovsk rural area. For example, a significant difference (2.5 times higher) was detected among children who suffered from asthma-like symptoms more than once a month. The percentage of rural residents with less frequent (less than once a year) asthma-like symptoms had a tendency to reduce by almost a quarter.

A more severe form of the disease is characteristic of the rural area: nocturnal dyspnea is one-third more common, night weekly shortness of breath is almost three times more often, which is a symptom of severe disease. Residents of rural areas are twice as likely to have shortness of breath that makes it difficult to speak, and three times more likely to have distant wheezing during exercise. The data obtained by us, as well as the data for Moscow and the Moscow region, contradict the "hygienic" theory of atopic inflammation and the widespread opinion about the significance of xenobiotic and anthropogenic pollutants (whose concentration in the city is obviously higher) in the development of bronchial asthma. Without denying their significance in the development of the atopic process in the bronchi, we can assume that socio-economic factors and

the availability of medical care (specialized care in particular, which is utterly different in the city and village) have a greater impact on the frequency of asthma-like symptoms.

5- CONCLUSION

Based on the results, the prevalence of asthma-like symptoms among adolescents in Khabarovsk and the Khabarovsk territory when studied by the standard continuous survey ISAAC is 7 times higher than that detected by the incidence rate. The level of asthma-like symptoms in the Khabarovsk territory is the highest among the regions of Russia where they were determined using a standardized method, and significantly exceeds the level of nearby regions. The frequency and structure of asthma-like symptoms identified in the survey is typical for industrially developed countries. It should be noted that the prevalence and severity of asthma-like symptoms in the Khabarovsk rural area is significantly higher than in the city of Khabarovsk. The above-mentioned newly diagnosed regional features, as well as differences between urban and rural areas, require the study of factors that determine the uniqueness of the studied population in comparison with other regions of Russia. The data obtained will allow the quality of diagnosis of bronchial asthma in Khabarovsk and the Khabarovsk territory to be improved, reduce the time from detection of the first symptoms to diagnosis and allow timely treatment.

6- CONFLICT OF INTEREST: None.

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