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Bronchial asthma in the cities of the belarusian - polish border: a study with virtual research teams

Astma oskrzelowa w miastach białorusko-polskiego przygranicza: badanie wirtualnych zespołów naukowych

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A – koncepcja i przygotowanie projektu badań, B – wykonanie analiz diagnostycznych, zbieranie danych, C – analiza statystyczna, D – interpretacja danych, E – przygotowanie manuskryptu, F – opracowanie piśmiennictwa, G – pozyskanie funduszy.

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STRESZCZENIE

Wstęp. e-Science jest innowacyjną formą działalności naukowej, która zakłada jednoczesne badania w środowisku sieciowym w ośrodkach naukowych, odległych od siebie. Współpraca, wymiana doświadczeń i informacji, wspólne projekty mogą być z powodzeniem przeprowadzone w oparciu o e-Science. Astma jest jednym z głównych problemów społecznych i na Białorusi, i w Polsce, który wymaga podjęcia odpowiednich środków wczesnego wykrywania i zapobiegania chorobie. Ta sytuacja sprawia, że konieczne jest prowadzenie międzynarodowych badan epidemiologicznych na ten temat.

Cel pracy. Określenie częstości występowania astmy oskrzelowej i głównych objawów oddechowych u młodych dorosłych w Grodnie (Białoruś), Białymstoku i Białej Podlaskiej (Polska).

Materiał i metody. Badania przeprowadzono w latach 2014-2015. Dane zebrano w ramach międzynarodowego, wieloośrodkowego badania astmy oskrzelowej dzieci i młodych dorosłych. Główną część badania zawiera odpowiedzi 1297 respondentów w wieku 17-30 lat z Grodna (Białoruś) oraz Białegostoku i Białej Podlaskiej (Polska). Wypełnione kwestionariusze zostały zebrane od 833 badanych na Białorusi i 464 w Polsce. Badanie zostało przeprowadzone przy pomocy tłumaczonych i walidowanych kwestionariuszy opracowanych na potrzeby światowych badań ECRHS II i ISAAC.

Wyniki. Odsetek respondentów o wcześniej potwierdzonej przez lekarza astmie wynosił 2,88% badanych w Grodnie oraz 4,09% w Białymstoku i Białej Podlaskiej (p>0,1). Świszczący oddech i gwizdy w czasie ostatnich 12 miesięcy odnotowano u 8,04% młodych osób dorosłych na Białorusi i 7,97% w Polsce (p>0,1) i 21,7% i 15,5% (p<0,001) za całe życie. Spastyczne lub astmatyczne zapalenie oskrzeli stwierdzono u 5,04% i 5,17% badanych (p>0,1). Wskaźnik „płeć żeńska" okazał się czynnikiem determinującym niską częstość występowania świszczącego oddechu i astmy oskrzelowej.

Wnioski. Występowanie astmy i głównych objawów oddechowych u młodych osób dorosłych w miastach przygranicznych Białorusi i Polski jest bardzo ważnym problemem regionalnym. Różnica w częstości ich występowania spowodowana jest wpływem czynników stylu życia, diety, zmian klimatu i innych. Bardzo niska częstość występowania astmy i możliwość wystąpienia nie do diagnozowania choroby w badanej populacji zasługuje na dalsze badania.

Słowa kluczowe: **wirtualny zespół badawczy, astma oskrzelowa, objawy oddechowe, młodzi dorośli, epidemiologia**

SUMMARY

Introduction. e-Science is an innovative form of scientific activity involving simultaneous research in separate scientific centers that are distant from each other but connected by a communications network. Asthma is a major social problem in Belarus and Poland. It is necessary to conduct international, standardized, randomized epidemiological studies on this disease.

The purpose of the study was to determine the prevalence of bronchial asthma and respiratory symptoms in young adults in the cities near the Belarusian–Polish border.

Material and methods. The main part of the study focused on 1297 young adults, 17–30 years of age, from Grodno (n = 833) and from Białystok and Biała Podlaska (n = 464). The choice of research areas was based on an international research questionnaire.

Results. Asthma was self-reported (asthma diagnosed by physicians) in 2.88% of subjects in Grodno and 4.09% of those in Poland (p > 0.1). Wheezing and whistling during the past 12 months was reported by 8.04% of young adults in Belarus and 7.97% in Poland (p > 0.1), and at any time in life by 21.7% and 15.5% (p < 0.001) respectively. Spastic (asthmatic) bronchitis was reported for 5.04% and 5.17% of respondents (p > 0.1). Female gender was shown to be a protective factor against wheezing and asthma.

Conclusions. The differences in the prevalence of asthma and respiratory symptoms in young adults in the cities of the Belarusian–Polish border is important regional problem. Given the low reported prevalence of asthma, the possibility of the disease being underdiagnosed in the surveyed population deserves further investigation.

Key words: **virtual research teams, bronchial asthma, respiratory symptoms, young adults, epidemiology**

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INTRODUCTION

A condition for the sustainable and stable development of border regions is the creation and implementation of rules of good practice in various areas of science. In 2014–2015, studies of the prevalence of bronchial asthma and its characteristic respiratory symptoms in young adults (age 17–30 years) were carried out at several universities on either side of the Belarusian–Polish border. The main motivation for the study was data on the official low prevalence of bronchial asthma in the population of Belarus, in comparison with neighboring countries.

The purpose of the present study was to determine the prevalence of bronchial asthma and major respiratory symptoms in young adults in Grodno (Belarus) and in Białystok and Biała Podlaska (Poland), conducting research using the e-science methodology and new communication technologies.

Materials and methods

The research was conducted in 2014–2015, and took into account the experience of the authors participating in an international research project entitled "Diagnosis and prevention of allergic diseases of the respiratory system and skin through the use of population-based epidemiological studies".

The web application LimeSurvey was used to conduct the electronic survey questionnaire (http://edukacjainauka.pl/limesurvey/index.php/669294).

The questionnaire employed questions selected from a standard questionnaire used in international research (ECRHS II: ISAAC) [1]. Each questionnaire was accompanied by an explanation of the purpose of the research. The research protocol was approved by the bioethical commissions of the partner universities in Poland and Belarus. The indicators investigated include verified medical diagnoses of bronchial asthma or of other diseases of the bronchi in the participants' medical history, as well as the presence of respiratory symptoms that are characteristic of this disease (but lacking a diagnosis). We interviewed 1,297 students (372 male, 925 female) aged 17–25 years, of which 833 (272 male, 561 female) were in Grodno and 464 (100 and 364) were in Poland. All respondents were university students. The results obtained were evaluated using the $\chi 2$ test table with four fields and one degree of freedom. A value of $p<0.05$ was defined as statistically significant.

RESULTS

Table 1 shows the results for the diagnosis of bronchial asthma and of certain diseases of the bronchi, as diagnosed by physicians, according to gender and location of respondent. Statistically significant differences are seen between the prevalence of bronchial asthma according to gender and place of residence. The diagnosis of bronchial asthma was observed more often among males than females, and this situation is typical for both groups of respondents in Belarus and Poland. 4.29 ± 1.1% of the respondents in Poland noted that they had received a diagnosis of the disease, with 2.29–5.89 being the 95% confidence interval (CI). Among those in Belarus, 2.88 ± 1.14% had been diagnosed (95% CI: 1.74–4.02; $p < 0.05$).

Table 1. Frequency of bronchial asthma and of certain diseases of the bronchi, as diagnosed by physicians, according to gender and location of respondent. (Relative Frequencies and Their 95% CI in the Brackets).

Diagnosed disease	Grodno (n = 833)			Białystok and Biała Podlaska (n = 464) % 95%CI		
	Males (n = 272) %, 95%CI	Females (n = 561) %, 95%CI	Together %, 95%CI	Males (n = 100) %, 95%CI	Females (n = 364) %, 95%CI	Together %, 95%CI
Bronchial asthma	4.78 (2.24-7.32)	1.96 * (0.81–3.11)	2.88* (1.74–4.02)	6.0 (1.35–10.65)	3.57* (1.66–5.48)	4.29 (2.29–5.89)
Chronic bronchitis	5.88 (3.08–8.68)	9.98 (7.5–12.46)	8.64 (6.73–10.55)	8.0 (2.68–13.32)	11.54 (8.26–14.82)	10.78 (7.96–13.6)
Asthmatic bronchitis	4.78 (2.24–7.32)	5.17 (3.34–7.0)	5.04 (3.55–6.53)	2.0 (0.74–4.74)	6.04 (3.59–8.49)	5.17 (3.16–7.18)

* Difference between genders ($\chi 2$ test) was statistically significant.

Table 2 shows the data on the prevalence of respiratory symptoms that characterize bronchial asthma but that can be obscured under other diagnoses. Differences were seen in the incidence of major respiratory symptoms, depending on the place of residence of the respondents and on whether they reported phenomena such as a dry cough at night (other than from colds and infections), whistling breathing or wheezing ever.

The relatively high incidence in the last 12 months of whistling breathing in the chest, and of dry cough at night (not associated with a cold or chest infection) was characteristic of bronchial asthma, as were as combinations of wheezing and whistling breathing in the chest, which may be associated with a higher prevalence of bronchial asthma than is diagnosed among the respondents.

Table 2. Incidence of respiratory symptoms in some respondents. (Relative Frequencies and Their 95%CI in the Brackets).

Respiratory symptoms apart from colds and infections	Grodno (n = 833)			Białystok and Biała Podlaska (n = 464)			P-value*
	Males (n = 272) %, 95%CI	Females (n = 561) %, 95%CI	Together %, 95%CI	Males (n = 100) %, 95%CI	Females (n = 364) %, 95%CI	Together %, 95%CI	
Dry cough at night (not associated with a cold or chest infection)	8.09 (4.85–11.33)	8.56 (6.24–10.88)	8.4 (6.52–10.28)	3.0 (-0.34–6.34)	2.2 (0.69–3.71)	2.37 (0.99–3.75)	0.01
Whistling breathing or wheezing ever	22.43 (17.47–27.39)	21.39 (18–24.78)	21.73 (18.93–24.53)	13.0* (6.41–19.59)	16.21* (12.42–20.0)	15.52 (12.23–18.81)	0.01
Dry cough at night (waking at night) over the past 12 months	3.31 (1.18–5.44)	6.24 (4.24–8.24)	5.28 (3.76–6.8)	3.0 (-0.34–6.34)	7.42 (4.73–10.11)	6.47 (4.23–8.71)	0.6
Congestion in the chest or bringing up phlegm or mucus (apart from colds and other infections)	4.4 (1.97–6.85)	6.60 (4.55+8.65)	5.88 (4.28–7.48)	5.0 (0.73–9.27)	10.44 (7.3–13.58)	9.27 (6.63–11.91)	0.01
Whistling breathing and wheezing in the chest over the last 12 months	6.62 (3.67–9.57)	8.73 (6.39–11.07)	8.04 (6.19–9.89)	9.0 (3.39–14.61)	7.69 (4.95–10.43)	7.97 (5.51–10.43)	0.9

* Differences between males and females ($\chi 2$ test) were statistically significant ($p < 0.01$).
P-value* statistical significance level of chi2 test of differences between location of respondent

Table 3 presents the results for the prevalence of respiratory symptoms among respondents with an established diagnosis of bronchial asthma, chronic bronchitis, or asthmatic bronchitis.

The most frequent symptoms were pronounced breathing problems (cases of wheezing or whistling breathing ever or in the last 12 months), which are important in the diagnosis of asthmatic bronchitis. This points to a risk of bronchial asthma in individuals diagnosed with asthmatic bronchitis; the identification of wheezing and whistling breathing can be a prognostic indicator for the diagnosis of bronchial asthma.

Our methodology involved the e-science-based web application LimeSurvey. e-Science is defined as the use of modern information technologies for scientific cooperation "without geographical borders". The term, proposed by John Taylor (1999), is used to describe research initiatives related to the implementation of computer technologies in modern scientific research. Nontraditional forms and methods of work, including in scientific activity, have arisen in conjunction with the development of society and technology, as well as with the emergence of innovative means of communication [9]. All of this allows us to go beyond the traditional forms of work and to more effectively

Table 3. Proportion of respiratory symptoms among respondents diagnosed with respiratory pathology (%).

Respiratory symptom, other than colds or infections (last 12 months)	Only					
	Bronchial asthma		Chronic bronchitis		Asthmatic bronchitis	
	Belarus	Poland	Belarus	Poland	Belarus	Poland
Dry cough at night (not associated with a cold or chest infection)	20,8	15,8	19,2	20,0	17,7	20,5
Whistling breathing and wheezing ever	20,8	31,6	20,4	32,0	32,24	37,5
Dry cough at night (waking at night) over the past 12 months	12,5	10,5	20,4	22,0	11,3	16,6
Whistling breathing and wheezing in the chest over the last 12 months	60,8	63,2	20,90	34,0	50,2	51,3

DISCUSSION

Epidemiological research in recent years along the Belarusian–Polish border indicates that between 5% and 10% of the population suffer from bronchial asthma [2]. In Western Europe, the prevalence of asthma is, on average, about 16% [3]. For example, in Poland generally, the disease is seen in 7%–9% of the adolescent population [4,5]. The results of Phase III of the ISAAC project in Eastern Europe have shown that the prevalence of bronchial asthma among residents of Ukraine, Latvia, and Estonia are respectively 5.8%, 5.6%, and 4.0% [2,6,7]. Official statistics on the prevalence of bronchial asthma are mainly based on figures received by patients in the negotiability Health Organization, and it often happens that patients are seen and treated under different diagnoses [8]. This may indicate a gap between the actual data and reports of cases of diseases (0.5–1.0% in Belarus).

carry out joint research both within the group and with other practitioners of the scientific and educational process.

Despite the fact that the Internet brings together large human communities, it continues to rely on cooperation and constant communication in small groups. Such groups are essential for the creation of new knowledge, and where it is useful for the scientific community, they should disseminate their experience to other research groups, which can thus join ongoing activities, expanding their geographic scope. Modern technology was incorporated in this process by the creation of virtual teams - that is, groups of people working together, but separated from each other geographically, creating a specific project that exists outside of the specific organization [10].

On the basis of the virtual scientific team methodology, the epidemiological picture can be interpreted as the presence of bronchial asthma hiding under diagnoses

of asthmatic bronchitis [11, 12]. The next stage in verifying such a diagnosis should be the clinical assessment of bronchial reactivity using tests (spirometry, allergic skin tests, etc.).

CONCLUSION

Conducting research using the e-science methodology and new communication technologies not only allows spatial and temporal limitations to be overcome, but also enables areas of joint research activities to be expanded and optimized. The activities of virtual scientific teams of associates can serve as a basis for developing and implementing prevention programs and evaluating their effectiveness at regional and international levels.

The level of diagnosis of asthma among young adults in Grodno is statistically significant lower than among their peers from the Polish border cities, while the characteristic frequency of respiratory symptoms is same. The low prevalence of asthma in Grodno can be attributed to underdiagnosis. If asthmatic bronchitis patients show symptoms such as asthma attacks or wheezing in the chest at night, the physician must be watchful for the signs of bronchial asthma. With the establishment of virtual scientific teams, there is a consolidation of educational and scientific centers that results in an increase in the efficiency and competitiveness of research.

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