Post N Med 2017; XXX(07): 344-350

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A retrospective analysis of dispatches of emergency medical units to diagnosed bronchial asthma cases in the population of the Voivodeship Rescue Service in Katowice area in the years 2015-2016

Analiza retrospektywna wyjazdów zespołów ratownictwa medycznego do rozpoznanej astmy oskrzelowej w populacji objętej działalnością Wojewódzkiego Pogotowia Ratunkowego w Katowicach w latach 2015-2016

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Keywords

bronchial asthma, dyspnoea, emergency medical unit

Słowa kluczowe

astma oskrzelowa, duszność, zespół ratownictwa medycznego

S u m m a r y

Introduction. Bronchial asthma is a civilization disease. There are 300 million people in the world who suffer from this disease and 250 thousand fatal cases a year caused by asthma.

Aim. The aim is to assess the frequency of bronchial asthma incidence in the population under research in the years 2015-2016. There is a special focus on the characteristic features of the group, the physical symptoms of the patients, and the actions taken by the emergency medical units in question.

Material and methods. The retrospective analysis has covered medical documentation, i.e. dispatch order forms and emergency medical procedure forms of the Voivodeship Rescue Service in Katowice. The number of forms being subject to research has been limited only to cases with a diagnosed bronchial asthma. There have been 2879 dispatch cases included in the research.

Results. Bronchial asthma is more frequent in women. The average age of patients under research was 56.21. The attack rate was 53.3/100 000. The most frequent dispatch destination was the patient's home (72.94%, $p < 0.05$). The members of patients' families most often called emergency service (57.62%, $p < 0.05$). Most of the interventions were reported in the first quarter of the year. Special medical emergency units (55.43 vs 44.56%, $p < 0.05$) were dispatched more often than basic units. There were some statistical dif-

ferences reported that related with the emergency priority code ($p < 0.05$). In most of the cases, there were no issues with the patients' skin. There were centralization of circulation symptoms in 81 cases. In most of the cases, the patient's breath was efficient (81.26%). The most common type of reported breath sound was wheezing (2230 cases, 77.45%).

Conclusions. The asthma cases ratio compared with the overall number of visits is quite low. In most of the interventions, patients are in a stable condition and do not require any advanced emergency medical procedures.

S t r e s z c z e n i e

Wstęp. Astma oskrzelowa jest chorobą cywilizacyjną, dotyka około 300 milionów ludzi na całym świecie i jest przyczyną 250 tysięcy zgonów rocznie.

Cel pracy. Ocena częstości występowania astmy oskrzelowej w badanej populacji w latach 2015-2016 ze zwróceniem szczególnej uwagi na charakterystykę grupy, objawy fizykalne pacjenta oraz postępowanie zespołów ratownictwa medycznego.

Materiał i metoda. Analizie retrospektywnej poddano dokumentację medyczną tj. karta zlecenia wyjazdu i karta medycznych czynności ratunkowych zespołów ratownictwa medycznego należących do Wojewódzkiego Pogotowia Ratunkowe w Katowicach, które kończyły się rozpoznaniem astmy oskrzelowej. Do badania włączone 2879 zrealizowanych wizyt.

Wyniki. Częściej astma oskrzelowa występuje u kobiet. Średnia wieku badanych wyniosła 56,21 lat. Współczynnik zapadalności wyniósł 53,3/100000. Najczęstszym miejscem wezwania był dom osoby poszkodowanej (72,94%, $p<0,05$). Członek rodzinny najczęściej wzywał pogotowie ratunkowe (57,62%, $p<0,05$). Najwięcej interwencji odnotowano w pierwszym kwartale. Częściej dysponowany na miejsce zdarzenia był zespół specjalistyczny (55,43% vs 44,56%, $p<0,05$). Wykazano różnice statystyczne w odniesieniu do kodu pilności wezwania ($p<0,05$). Skóra pacjenta najczęściej była prawidłowa. Cechy centralizacji krążenia odnotowano w 81 przypadkach. W większości przypadków oddech u pacjenta był wydolny (81,26 %). Najczęstszym szmerem oddechowym były świsty (2230 przypadki, 77,45 %).

Wnioski. Odsetek wizyt do astmy w stosunku do wszystkich realizowanych wizyt jest stosunkowo niski. W większości interwencji stan pacjenta jest stabilny i nie wymaga zaawansowanych procedur ratowniczych.

Conflict of interest
Konflikt interesów

None
Brak konfliktu interesów

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INTRODUCTION

The Global Initiative for Asthma, GINA, was created in the USA in the early 1990s. It was an initiative of the National Heart Lung and Blood Institute alongside the World Health Organization (WHO) (1). It was already in 1995 that the first guidance of bronchial asthma procedures was published. The guidance had been changing, and the last guidance instructions were published on 6 May 2014, which is called the World Asthma Day (2). The main point of the GINA mission is reducing the incidence and mortality due to bronchial asthma. The 1998 report launched inhalatory glycocorticosteroids, which was a milestone in the history of asthma treatment (3). The newest GINA 2014 guidance was presented in 8 chapters. There is also a chapter about children in this guidance.

Globally, there are 235-300 million people suffering from asthma. Moreover, asthma is the cause of 250 000 fatal cases a year (4).

The characteristics of asthma includes temporary symptoms of bronchial hypersensitivity and reversible obstruction, the latter being caused by smooth muscle contraction and mucosal inflammation. One can differentiate two types of asthma, i.e.:

- extrinsic asthma – depending on immunological factors, usually having its origins in the patient's childhood,
- intrinsic asthma – where there is no causal factor and the disease progresses with age (5).

Chronic inflammation of respiratory tracts is typical of asthma. What is more, asthma is characterized by wheezing, dyspnoea, chest pressure and cough. These symptoms may vary in intensity and frequency as the obstruction of the air flow in the respiratory tracts may vary as well (6, 7).

A sudden exacerbation of asthma is a life-threatening event. At the same time, it is one of the justified causes of calling the emergency medical units. Bronchial asthma exacerbation may depend on many factors. Some of them are allergens and higher incidence of other respiratory diseases, including infections. This led us to conduct this research that focuses on the demographic factors and the seasonality of interventions to patients with sudden asthma exacerbation. We would also like to point out to physical symptoms in patients with sudden asthma exacerbation. According to the available sources, in case of a life-threatening event, the organism is expected to gradually centralize blood circulation, which usually makes skin pale and sweaty (8-12).

AIM

The assessment of the frequency of bronchial asthma incidence in the population under research in the years 2015-2016. There is a special focus on the characteristic features of the group, the physical symptoms

of the patients, and the actions taken by the emergency medical units in question.

MATERIAL AND METHODS

The retrospective analysis has covered dispatch order forms and emergency medical procedure forms of the Voivodeship Rescue Service in Katowice in the years 2015-2016 (n = 479 872). The number of forms being subject to research has been limited only to cases with a diagnosed bronchial asthma (J45 and J46 in ICD-10). Taken into account the above mentioned criteria, there have been 2879 dispatch order forms included in the research (tab. 1).

Tab. 1. Criteria of inclusion

Number of dispatch cases in the years 2015-2016 n = 479 782	
Number of other cases managed by the units n = 476 903	Diagnosed bronchial asthma n = 2879

All calculations have been prepared in the IBM SPSS 24.0. software. Contingency tables and chi-squared tests have been performed to estimate the relationships between the specific qualitative variables. In the case of comparing and contrasting the groups with regard to quantitative variables, the conformity of distributions to the normal distribution has been assessed by means of the Kolmogorov-Smirnov test. Non-parametric methods have been applied because of discrepancies between the distributions and the normal distribution. In order to evaluate the significance of discrepancies, the Mann-Whitney test has been applied. A graph has been prepared in the cases of significant results. $P < 0.05$ values have been assumed statistically significant.

The Voivodeship Rescue Service in Katowice is the largest public emergency medical dispatch center in Poland. It provides services to 2.7 million people and manages 85 emergency medical units of the system of Emergency Medical Services (EMS).

The research could be conducted upon receiving a written consent of the CEO of the Voivodeship Rescue Service in Katowice. There has been a detailed analysis of the demographic data of cases with diagnosed bronchial asthma, i.e. sex, age, place and type of event as well as the region of the area. The conversations between emergency medical dispatchers and witnesses have been analysed with a special focus on the main reason and the emergency priority code of the call. The cases have been divided into two groups: the group with a specialized emergency medical unit, and the group with a basic emergency medical unit dealing with the case. Actions taken by the members of the specific units have been reviewed on the basis of the emergency medical procedure forms to check the type of the applied emergency medical procedures.

RESULTS

In the years 2015-2016, there were app. 1.3 million calls reported in the area of Katowice, Jastrzębie-Zdrój and Gliwice (three integrated dispatch centers of the Voivodeship Rescue Service in Katowice – VRS). At the same time, there were 479 782 dispatched units in this area. 2879 of them were related to diagnosed bronchial asthma (0.6%). To be more specific, most of the cases were reported in Katowice (1314 cases – 45.7%), fewer were noted in Gliwice (1082 cases – 37.5%), and the least were registered in Jastrzębie-Zdrój (483 cases – 16.8%). The group includes 1150 (39.8%) male patients and 1729 (60.2%) female patients (fig. 1). There were no statistically significant differences between the specific distributions of sex in the particular dispatch centers ($p = 0.218$). The bronchial asthma attack rate in the population under research resulted in 53.3/100 000 and was higher in women (32.05/100 000) than in men (21.25/100 000).

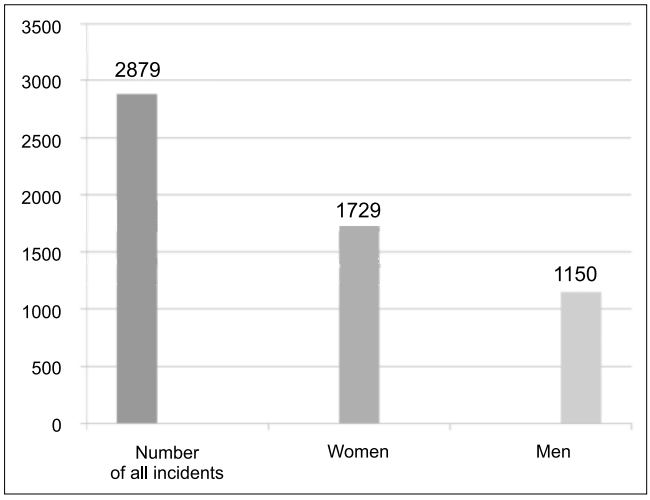

Fig. 1. The division of incidents regarding sex

The attack rate increases along with age. The age median of the patients involved in the research was 56.21 years. There were no statistically significant differences between the dispatch centers as far as age is concerned ($p = 0.089$).

Most of the cases with diagnosed bronchial asthma were in the largest districts of the area manager by the VRS in Katowice. A majority of such incidents was reported in the district of Katowice (387 cases – 13.44%). The least cases were registered in the district of Mysłowice (54 cases – 1.87%) (fig. 2).

Bronchial asthma incidents most frequently occurred in the patients' homes (2213 cases – 79.34%). The second place of occurrence take public places (474 cases – 16.46%). The lowest number of cases was noted in road traffic (2 cases – 0.06%). There have been no statistically significant differences between the specific distributions of sex in the context of the place of incident ($p = 0.126$). Statistically significant differences in the context of the place of incident have been found as far as age is concerned ($p < 0.0005$) (tab. 2).

It was the members of patients' families who called emergency service most often (1659 cases – 57.62%).

However, there have been statistically significant differences noticed in relation to the particular month of

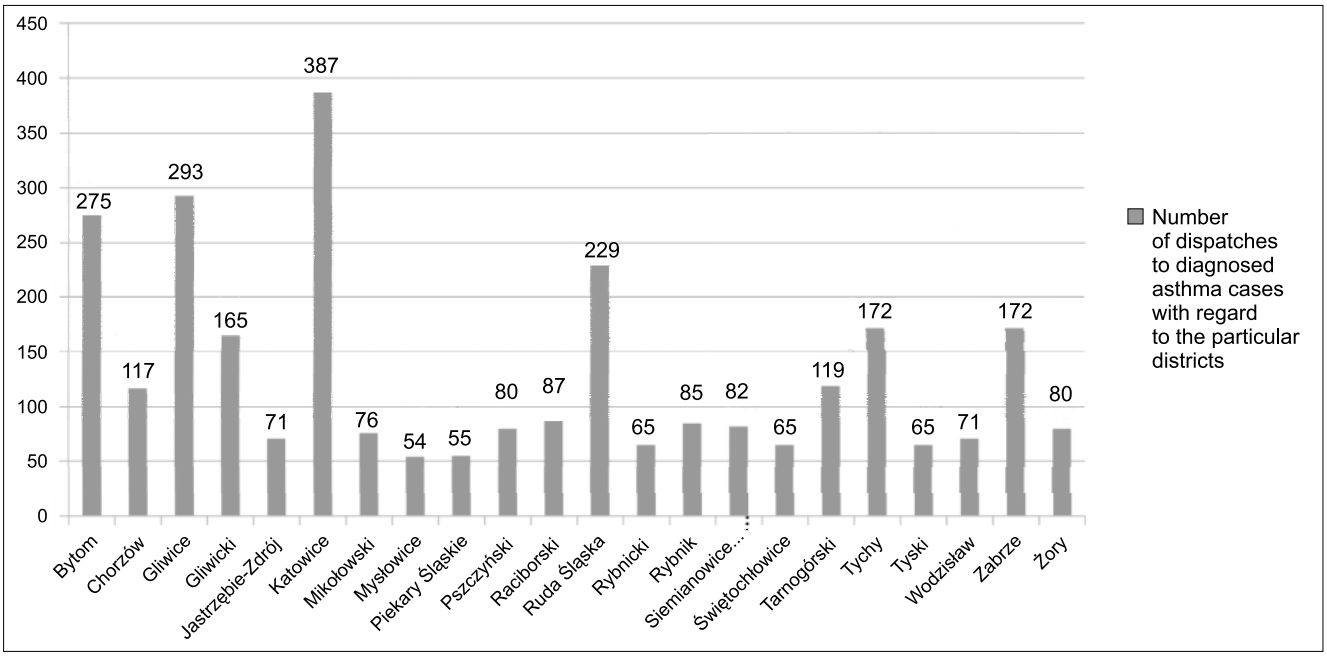

Fig. 2. The number of interventions with a division into cities and districts

Tab. 2. The statistical analysis of age in the context of various places of incident

Place of incident	Average	Median	Standard deviation	Minimum	Maximum	N
At home	59.22	63.00	20.610	1	102	2213
At work	48.83	50.00	17.697	23	81	50
At school	18.64	15.00	14.975	11	70	32
In other public place (including road traffic)	43.88	46.00	24.913	1	93	474
Other	47.02	53.00	22.420	2	88	110
Total	56.21	62.00	21.393	1	102	2789

the year. The highest number of cases was reported in March (326 cases – 11.04%), whereas the lowest number of cases was registered in August (179 cases – 6.21%) (tab. 3). What is more, an observation has been made that the frequency of emergency calls to bronchial asthma was decreasing over the subsequent quarters. The highest rate was reported in the first quarter (909 cases – 31.57%), and the lowest rate in the third quarter (634 cases – 22.02%) (fig. 3).

Tab. 3. The number of incidents in the particular dispatch centres with regard to month

Month	Dispatch center Jastrzębie-Zdrój	Dispatch center Gliwice	Dispatch center Katowice	Total
January	49	92	124	265
February	53	120	145	318
March	40	146	140	326
April	38	94	109	241
May	37	89	109	235
June	34	60	106	200
July	45	75	114	234
August	35	67	77	179
September	48	74	99	221
October	30	101	113	244
November	34	77	85	196
December	41	86	92	219

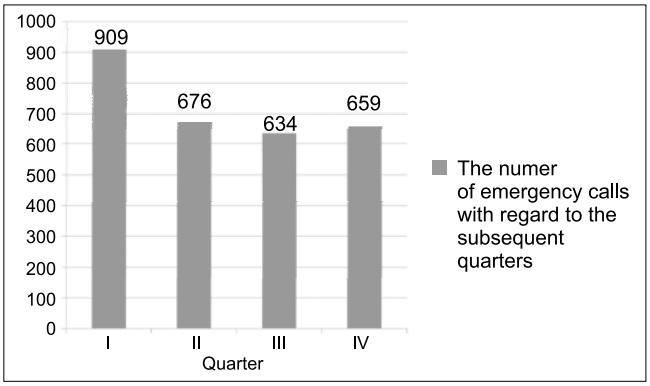

Fig. 3. The number of reported bronchial asthma cases in the subsequent quarters

In most of the bronchial asthma cases, there were witnesses of the incident (1817 cases – 63.11%). The emergency medical units dispatched to incidents with diagnosed bronchial asthma were usually specialized units (with a doctor; 1596 cases – 55.43%), other cases were managed by basic teams (1283 cases – 44.56%) (fig. 4).

The only quality indicator in the Emergency Medicals Services is the median of time that takes an emergency medical unit to reach the destination. Depending on the priority of the incident (as in the incident coding), the average median in the highest emergency priority code (code-1) was 6 minutes 29 seconds taking into

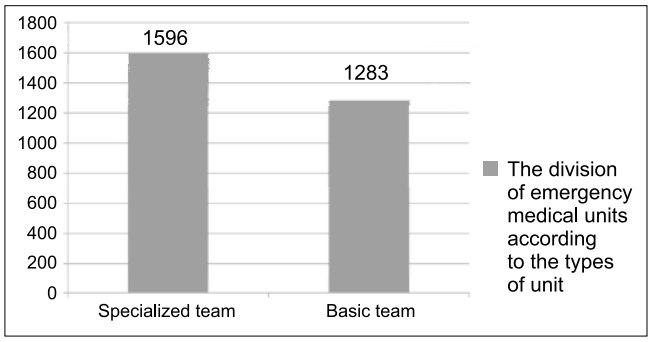

Fig. 4. The division of emergency medical units according to the types of unit

account the time from dispatch to reaching destination. Depending on the code, there were statistically significant differences with regard to the age of patients (p = 0.028). Code-1 dispatches usually involved young patients.

Statistically significant differences have been observed between the particular groups (p = 0.021). Code-2 dispatches were most often related to incidents that had occurred at home, whereas cases with other destinations were labelled with code-1 (tab. 4).

It is worth noticing that the change of the emergency priority code (code-2) leads to a significant increase in the time needed to reach a destination (tab. 5).

The most frequent final step in managing bronchial asthma incident has been taking patients to hospital (1435 cases – 49.84%). The least frequent situation has been lack of patient's consent to taking them to hospital (122 cases – 4.23%). The analysis of medical emergency procedures performed by emergency medical units indicates that most of the patients were cardiovascularly and respiratorily stable and did not require any advanced emergency medical procedures. It is only in the physical examination that the characteristic symptoms of bronchial asthma could be observed (fig. 5). The basic part of examination of a patient who is in a sudden risk of health is checking the following parameters: airway, breathing and circulation (ABC). In most of the cases involved in such an examination patients were respiratorily stable (2350 cases – 81.26%). Inefficient respiration was noticed in 429 cases (18.74%). Regular pulse (with a clear pulse of the peripheral artery) was reported in 1945 cases (45.64%). Irregular pulse was reported in other patients (934 cases – 32.44%). As far as skin is concerned, there were no issues reported in most of patients (2501 cases – 86.87%). However, in 297 patients their skin was pale and sweaty (10.31%). Finally, blue skin with some centralisation of blood circulation was reported in 81 cases (2.81%). In the physical examination of a patient, it is very important to listen to the patient's chest, especially when dyspnoea is the main symptom reported by the patient. The most frequent respiratory sounds included wheezing (2230 cases – 77.45%) and whirring (852 cases – 29.59%). There were no respiratory sounds reported in 13 cases – 0.45%) (fig. 6). Statistically significant differences between the groups could be observed in the research (p < 0.005).

DISCUSSION

Bronchial asthma attack rate was 53.3/100 000, and was higher in women (32.05/100 000) than in

Tab. 4. The statistical analysis of the relationship between emergency priority codes and places of incident

			Emergency Priority Code		Total
			K-1	K-2	
Place of incident	at home	% of the emergency priority code	1281 74.47%	932 80.41%	2213 79.34%
	at work	% of the emergency priority code	39 2.26%	11 0.94%	50 1.79%
	at school	% of the emergency priority code	26 1.51%	6 0.0005%	32 1.15%
	in other public places (including road traffic)	% of the emergency priority code	311 18.08%	163 14.06%	474 16.46%
	other	% of the emergency priority code	63 3.66%	47 4.05%	110 3.82%
Total		% of the emergency priority code	1720 100.0%	1159 100.0%	2789 100.0%

Tab. 5. The number of incidents per emergency priority code and the average median of travel time

Number of incidents labelled with the code						
code-1	1720					
code-2	1159					
Median						
	TRAVEL TIME from when an incident had occurred to when a destination was reached [s]	min.	sec.	TRAVEL TIME from dispatch to when a destination was reached [s]	min.	sec.
code-1	442	7	22	389	6	29
code-2	647	10	47	572	9	32

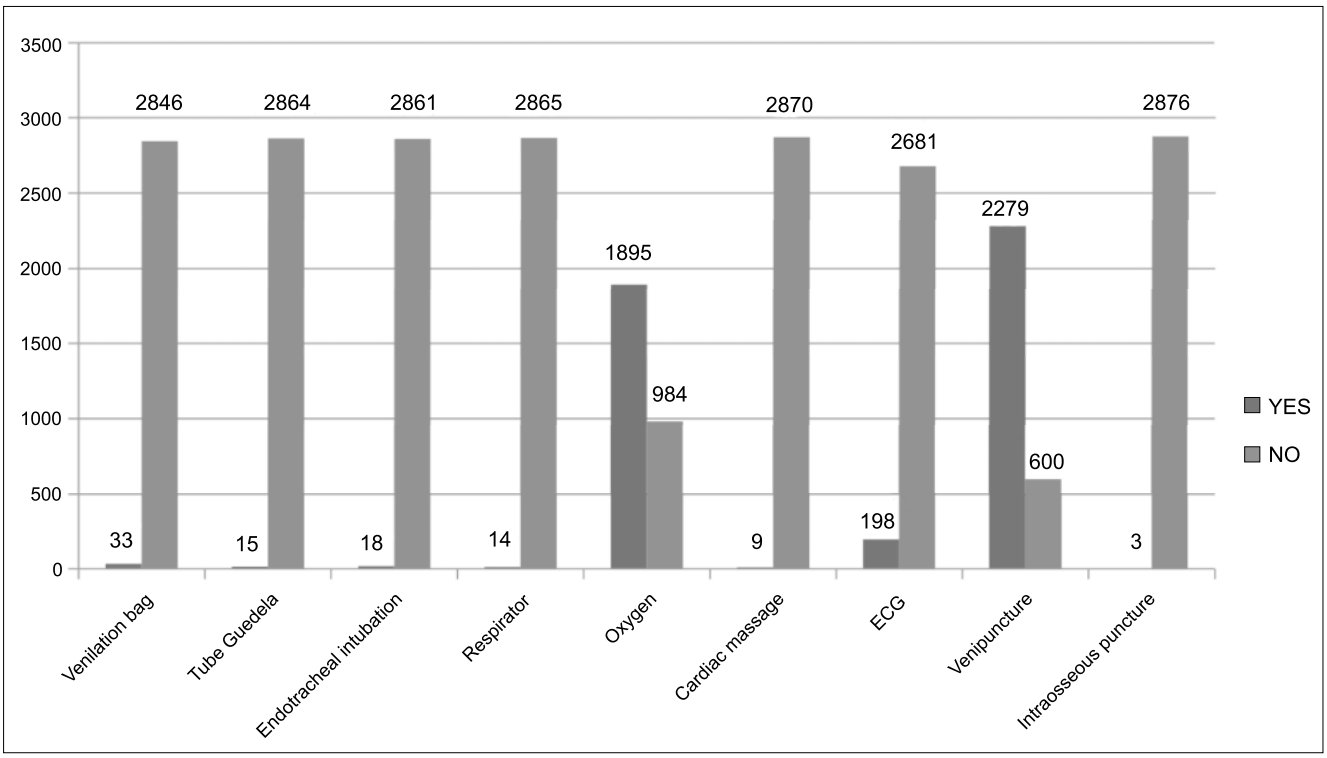

Fig. 5. The number of advanced emergency medical procedures performed by an emergency medical unit

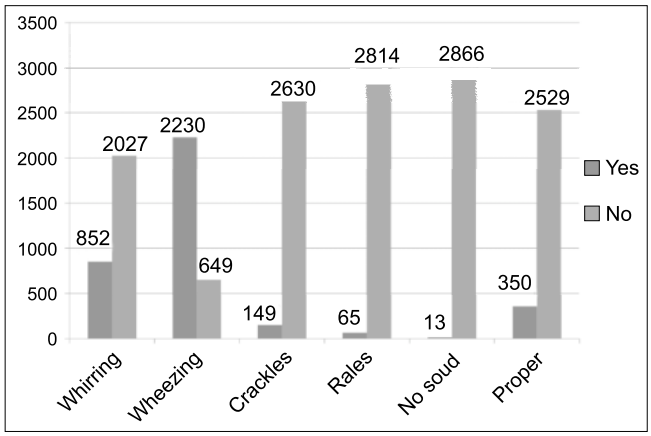

Fig. 6. Respiratory sounds reported by an emergency medical team

men (21.25/100 000). Global figures concerning adults indicate that the incidence of bronchial asthma is higher in women than in men. Moreover, it is more often in young people that the disease occurs (13, 14). The analysis of documentation indicates a relatively low rate of EMS units dispatched to bronchial asthma cases (app. 1%). However, one cannot say that bronchial asthma is an isolated case. Emergency medical units are usually called to exacerbated asthma cases and the person responsible for the emergency call is a witness, usually by the closest person, not the patient. The fact it is usually a member of the family who reports the case suggest that increased dyspnoea and bronchial asthma deterioration occur at night while the patient is resting. Bronchial asthma is more frequent in women than in men and the symptoms are more and more visible with age. Most of the cases were reported in the first and fourth quarters of the year, which is caused by weather conditions and allergens (15). According to the research, there are more asthma cases in large cities, which is probably caused by an increased air pollution (sulphur oxide, nitrogen oxide, dust, ozone and particles of gases). The exposure to the above mentioned irritating substances causes inflammatory responses and makes the respiratory tract more vulnerable to infections. This has been confirmed by research data all over the world, e.g. the Kuschnir et al. research (16) in Brasil or some Polish authors like Semik-Orzech et al. (6). During the standard ABC examination scheme, the patients described their skin as normal (2501 cases – 86.87%), pale and sweaty (297 – 10.31%), and blue with some centralization of blood circulation (81 cases – 2.81%). Blue skin is characteristic to life-threatening conditions and to chronic respiratory failure, which is confirmed by research data (17, 18).

CONCLUSIONS

1. The asthma cases ratio compared with the overall number of visits is relatively low.
2. Most of bronchial asthma cases are related to big cities.
3. Bronchial asthma is more frequent in women. The age median has been 56.21 years.
4. The attack rate was 53.3/100 000.
5. In most of the interventions, patients are in a stable condition and do not require any advanced emergency medical procedures.
6. Emergency calls regarding asthma are most frequent in the first quarter of the year.

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received/otrzymano: 02.06.2017
accepted/zaakceptowano: 29.06.2017