THE FREQUENCY OF RESPIRATORY DISEASES IN CHILDREN OF SARAJEVO CANTON IN RELATION TO ENVIRONMENTAL QUALITY

UČESTALOST RESPIRATORNIH OBOLJENJA KOD DJECE SARAJEVSKOG KANTONA U ODNOSU NA KVALITET ŽIVOTNE SREDINE

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ABSTRACT

During this research, it has been established that in Sarajevo area, there is a high prevalence of children suffering from bronchitis and asthma. The number of diseased children has tripled in the period of ten years. Though there is no clear evidence, it is indicative that there is a correlation between air quality and the number of diseased.

Key words: Obstructive pulmonary diseases, asthma, bronchitis, air pollution
SAŽETAK

Tokom ovog istraživanja ustanovljeno je da u području Sarajeva postoji veliki broj djece oboljele od bronhitisa i astme. Broj oboljele djece se utrostručio u razdoblju od deset godina. Iako ne postoji jasan dokaz, indikativno je da postoji povezanost između kvaliteta zraka i broja oboljelih.

**Ključne riječi:** opstruktivne plućne bolesti, astma, bronhitis, zagаdenje zraka

INTRODUCTION

For a long time, diseases of respiratory system are considered to be the leading in general framework of diseases among world population, affecting children of different parts of the world. The proportion of this disease relates to the quality of environment, the state, trends and examples of industrial and energetic growth. Many studies have inquired into this issue, based on the samples of population living in urban area, where a factor of emission (including immision) of various polluters is identified. The high-risk group of patients, affected by different respiratory diseases are those who live and work in ecologically unsafe work area, as well as in the area of polluted air caused by active and passive smoking, pollution by inflammation of SO2 and NO2, smoke and other parameters which emphasize the high sensitivity of respiratory systems (Breen et al., 2002; Calverley et al., 2003; Celli, 1995; Compton et al., 2001; Halbert et al., 2003; Mannino, 2002; Mendell et al., 2007). Studies on Epidemiology have shown that a significant growth in prevalence of obstructive diseases among children population happened in the last 300 years. According to data of White Book on Allergies in Europe (1997), in the last two decades the percentage of children and teenagers suffering from asthma has doubled or even tripped. Similar case was registered in other industrial countries of the world (USA, Australia, Japan) In the majority of countries with high economic standard, prevalence rate of children with asthma is between 5 and 15%.

Causes of such a high and sudden growth of incidence of children with asthma are not yet clear. Considering the short time line of these changes, we can not state that a genetic factors bare a dominant role, eventhough there are many reports on polygenic basis for asthma (Ivković-Jureković, 2006). Lately, more attention has been given to risk factors that are present in surrounding areas and the so called „western life style“ . These factors are
numerous and it is difficult to indentify their individual role, because their impacts are constantly mixed and summed up. However, among the most important are the allergens, other polluters, respiratory and virus infections. (Viegi, Scognamiglio, Baldacci et al., 2001).

**MATERIALS AND METHODS**

For the preparation of this work, data from Pediatric Clinic at the University Clinical Center in Sarajevo have been used. The data have been collected out from the protocol books where all patients who seeked medical help have been registered. There is a clear information about the date, place, permanent adress and sex of each patient in the protocol. This research includes only patients born and residing in Sarajevo. The age bracket of patients include patients from 3 days to 15 years of age.

Data on air quality has been taken from the Federal Hidrometeorological Institute of FBiH, where, since 1974, the actions of measuring the level of sulphur dioxide concentration and the level of dust in the air are being measured, and since 2003 these measurings include the concentration of CO2, O3, NO2 and NOx. The method which was used in collecting the data on chronical pulmonary diseases is a retrospective analysis for a twelve-year period (1997-2008). The following forms of Chronic Diseases were discussed: (i) Bronhitis chronica simplex (ii) Bronhitis chronica obstructiva (iii) Bronhitis chronica mukopurulenta and (iv) Asthma bronhalae.

Collected data were used on the basis of statistical methods.

The aim of this research is to prove the incidence of asthma and bronchitis prevalence in young children, and to try to relate this issue to the increase of air pollution.

**RESULTS AND DISCUSSION**

Table 1 shows the overall results of research of the number of diseased in terms of asthma bronchale and bronchitis, following the age bracket and sex. This research covers the period of twelve years; however, due to insufficient data, only information covering the eight-year period has been found, that sums up to 23,054 patients. The number of people suffering from bronchitis is 17,503, average number per year is 21,879, while the number of patients suffering from asthma bronchale is 5,551 or approximately per year 693,9 people.
It has been confirmed that, in childhood, boys are more affected by pulmonary diseases than girls. In the sample taken out from 17,503 children affected by bronchitis, 10,937 of them are boys, and 6,566 are girls, which is 62% to 38%. Similar case is in terms of asthma: the total of 5,551 diseased, includes 3,673 (66%) of male and 1,878 (34%) of female sex.

Table 1. Incidence of bronchitis and asthma in children according to age and sex structure

<table>
<thead>
<tr>
<th>Age</th>
<th>Bronchitis</th>
<th>Bronchial asthma</th>
<th>Bronchitis</th>
<th>Bronchial asthma</th>
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<td>M</td>
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<tr>
<td>1997</td>
<td>1196</td>
<td>568</td>
<td>750</td>
<td>446</td>
</tr>
<tr>
<td>2000</td>
<td>1282</td>
<td>821</td>
<td>788</td>
<td>494</td>
</tr>
<tr>
<td>2001</td>
<td>1460</td>
<td>551</td>
<td>936</td>
<td>524</td>
</tr>
<tr>
<td>2002</td>
<td>2515</td>
<td>408</td>
<td>1616</td>
<td>899</td>
</tr>
<tr>
<td>2005</td>
<td>1288</td>
<td>290</td>
<td>787</td>
<td>501</td>
</tr>
<tr>
<td>2006</td>
<td>3118</td>
<td>1235</td>
<td>2004</td>
<td>1114</td>
</tr>
<tr>
<td>2007</td>
<td>2848</td>
<td>1270</td>
<td>1741</td>
<td>1107</td>
</tr>
<tr>
<td>2008</td>
<td>3796</td>
<td>408</td>
<td>2315</td>
<td>1481</td>
</tr>
<tr>
<td>total</td>
<td>17503</td>
<td>5551</td>
<td>10937</td>
<td>6566</td>
</tr>
<tr>
<td>average</td>
<td>2187.9</td>
<td>693.9</td>
<td>1367.1</td>
<td>820.8</td>
</tr>
</tbody>
</table>

This data shows that the most exposed population of children suffering from bronchitis are those between the age of 1 to 10. In each age group, which have been the subject of this research, the dominant age group is that between the age of 1 to 10.

In terms of bronchitis and asthma, a statistically significant difference in the number of diseased, without including the age and sex structure, has been established. It is indicative that there are differences and various trends in terms of other factors that might point to the presence of statistically significant differences in conditions where major air changes of air quality happen, including changes of other ecological parameters within the area of living.

It can be concluded, on the basis of this research, that the greatest number of people suffering from obstructive pulmonary diseases happens in Spring and Winter time. In Spring period, starting in March to June there are many people suffering from this disease, and the reason is the high concentration of pollen in the air which causes problems among people
with allergies. From June till October the number of diseased rises, and the cause is the rising concentration of air pollution, fog and smog, which is characteristic for Sarajevo during Winter period.

![Figure 1. Average annual concentration of sulphur-dioxide and smoke](image)

**Figure 1.** Average annual concentration of sulphur-dioxide and smoke

Air polluters are connected with asthma symptoms and the state of asthma being worsened, but it seems that a chronic exposure to polluted air creates a predisposition for a respiratory system diseases in a more complex way than a simple sensitivity. Polluters can cause a bronchospasm, temporary risen the BHR and the allergy outcome, producing asthma egzacerbation. Even though asthma is more present in industrialized countries, there is little or no evidence of air pollution being directly responsible for the growth in prevalence of asthma in these countries (Renzetti, 2009; Houssaini et al., 2007; Wilhelm, Qian, Ritz, 2009). Sometimes it is considered that there is no real connection between the air pollution and respiratory diseases such as emphysema and chronic bronchitis. However, the symptoms of these diseases are similar to those responsible for inhaling the air polluters which suggests that these diseases can, at least, worsen by the effect of air pollution. Furthermore, the incidence of respiratory diseases is the greatest in cities with the highest level of air pollution. But the direct line that connects the high level of specific air polluter with certain respiratory disease is not ordinary. It is very difficult to prove the presence of this connection, because the urban and industrial atmosphere contains gasses and substances whose relevant concentration
fluctuates continuously, and whose interactions are very complex. The age, the level of physical vitality and general state of health, along with the quantity and frequency of exposure, affect a person’s reaction to polluted air (Ko et al., 2006; Pauwels, Buist, Calverley et al., 2001; O’Connor et al., 2008; Moshammer H., 2006; Man et al., 2003).

A number of diseased children increases from year to year, which is especially visible in bronchitis. The real cause of such a trend is hard to mark, but one of the main causes is, certainly, the ever growing concentration of polluters in the atmosphere-biosphere of Sarajevo, mainly the gasses coming out of old and over-used cars with no appropriate cleansing systems. The geographical position of the city, surrounded by high mountains adds to that, which again causes slow air circulation. Apart from this, the erecting of high and large buildings, without previous analysis of factors preventing air circulation, will lead to even worse situation. This is especially visible in winter months when the fog is highly present and when air pollution is intensified by the smoke coming out from boiler rooms and independent heating systems, which results in increased number of diseased—more emphasized in this period of the year. Considering the fact that air polluters spread cummulatively, depending on an individual’s genetic predisposition and many other factors, it is very difficult to decide on one specific polluter as being responsible for the obstructive pulmonary diseases. This is the reason why there is no clear evidence on this issue.
References


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