

**EFFECT OF CONCENTRATION OF SO₂ ON AVERAGE NUMBER OF
MEDICAL VISITS ASTHMATIC CHILDREN
(2006. – 2010.)**

Smajil Durmisevic
Cantonal Public Health Institute Zenica
Fra Ivana Jukica 2, Zenica
Bosnia and Herzegovina

Jasminka Durmisevic-Serdarevic
Health Centre Zenica
Fra Ivana Jukica 2, Zenica
Bosnia and Herzegovina

Suad Sivic
Cantonal Public Health Institute Zenica
Fra Ivana Jukica 2, Zenica
Bosnia and Herzegovina

Jasmin Durmisevic
student of medicine
Medical Faculty of Sarajevo

ABSTRACT

Introduction: *The ambience of the city of Zenica, with high concentrations of pollutants in the air, as a consequence of the technological process of production of ferrous metals, causing a high risk of illness and exacerbation of respiratory diseases among residents of Zenica, especially in risk population groups, such as children with asthma.*

The goal: *The main objective of this work was to determine the correlation of monthly and quarterly average concentration of SO₂ with the number of medical visits in asthmatic children, five-year period since 2006. by 2010. **Methods:** We analyze trends in average monthly and quarterly sulfur dioxide concentrations in the city of Zenica, the number of medical visits asthmatic children and asked for statistical correlation between these two health-statistics appear in the five-year period of 2006. - 2010. **The results:** Statistical analysis shows that increased an average concentration of SO₂ increased the average number of medical visits asthmatic children. Pearson correlation coefficient between the average concentration of SO₂ in µg/m³ of air and the average number of visits by asthmatic children yearly quarters is 0.571, which means that there is a significant positive correlation between the average concentrations of SO₂ and the average number of visits asthmatic children, but this correlation was not significant, probably due small series of patients ($p > 0.05$).*

Conclusion: *Increased the average concentration of SO₂ in ambient air increased the average number of medical visits asthmatic children.*

Keywords: air quality, the city of Zenica, health visiting, children, asthmatics

1. INTRODUCTION

Iron and steel industry has always been strongly associated with the environment, not only because of the technological process, but also because of general use products of black metallurgy.[1,2,3,4,5] Milestone in the development of Zenica, and its transformation in the industrial city, there was at the end of the XIX century, when Europe splashed wave of industrialization. The production was constantly growing, in order to achieve its maximum in 1988. year, with production of 1.374 million tons of coke, 1.669 million tons of iron, 1.879 million tons of steel, etc. [6,7,8] Zenica valley is about 12 km long. The valley is 2 km wide. Elevation the valley is about 350 m. The valley is bounded surrounding hills heights around 1000 m, while the chimneys height of 100 m, maximally 150 m, which means that in Zenica dominated by weak air currents, weak terms of dispersion of harmful substances, or are many elements contributing to high air pollution.[9,10]

Sulfur and sulfuric acid generated from sulfur oxides in the presence of water steam, irritates mucosa at the concentrations as low as 0.02 mg/l, and at 0.1 mg/l it leads to grave impairments of pulmonary parenchyma [11,12,13]. During the research of the impact of the air pollution on the health of Zenica's children, Čerkez and associates (1985) found a high correlation between the air pollution and respiratory diseases, be it in increased incidence of those diseases or the medical visits related to such diseases. This particularly refers to preschool children populations. The greater frequency was found of respiratory symptoms in relation to comparative environment.[14] Polish authors got similar results.[15]

More recent studies show correlation between short-term exposure to increased concentration to suspended particles and sulphurdioxide in the air and deteriorated respiratory functions, deteriorated respiratory organs irritation symptoms, increased consumption of drugs for treating breathing organs diseases and increased number of admission to health care facilities. Health workers can contribute to reduced air pollution by waste material communicating to general public information on harmful impacts of pollutants on children and adults health. [16,17,18]

2. THE GOAL:

The main objective of this work was to determine the correlation of monthly and quarterly average concentration of SO₂ with the number of medical visits in asthmatic children, five-year period since 2006. by 2010.

3. METHODS

We analyze trends in average monthly and quarterly sulfur dioxide concentrations in the city of Zenica, the number of medical visits asthmatic children and asked for statistical correlation between these two health-statistics appear in the five-year period of 2006. - 2010.

4.RESULTS

The observed five-year period 2006th - 2010. years, we found that the five-year average concentration of sulfur dioxide were recorded in the town of Zenica: 201 μ g/m³ air in winter, 67 μ g/m³ of air in the spring time, 50 μ g/m³ air in summer, and 92 μ g / m³ of air in the autumn period. The average number of medical visits in asthmatic children during this period ranged: 22 visits in the winter period, 19 visits in the spring, 14 visits in the summer, and 24 visits in the autumn period.

Statistical analysis shows that increased an average concentration of SO₂ increased the average number of medical visits asthmatic children. Pearson correlation coefficient between the average concentration of SO₂ in μg/m³ of air and the average number of visits by asthmatic children yearly quarters is 0.571, which means that there is a significant positive correlation between the average concentrations of SO₂ and the average number of visits asthmatic children, but this correlation was not significant, probably due small series of patients (p> 0.05).

4.1. Trends in monthly and quarterly concentrations of SO₂ and the number of medical visits in asthmatic children period of 2006. - 2010. years

Table 1. The influence of monthly and quarterly concentration of SO₂ in the number of medical visits in asthmatic children period of 2006. - 2010. years

The observed quarters	The observed months	Average monthly concentrations of SO ₂ in µg/m ³ of air	Monthly average number of medical visits asthmatic children	Quarterly averages	
				Quarterly average concentration of SO ₂ in µg/m ³ of air	Quarterly average number of medical visits asthmatic children
WINTER	December	200	23	201	22
	January	241	19		
	February	162	25		
SPRING	March	101	14	67	19
	April	55	21		
	May	45	23		
SUMMER	June	46	14	50	14
	July	52	14		
	August	52	11		
AUTUMN	September	47	16	92	24
	October	77	33		
	November	153	24		

5. DISCUSSION

In Zenica valley dominated by poor air circulation, poor conditions of the dispersion of harmful substances, and present the many elements that are conducive to high air pollution. [9,10]

Sulfur and sulfuric acid generated from sulfur oxides in the presence of water steam, irritates mucosa at the concentrations as low as 0.02 mg/l, and at 0.1 mg/l it leads to grave impairments of pulmonary parenchyma [11,12,13]. Čerkez and associates (1985) found a high correlation between the air pollution and respiratory diseases, be it in increased incidence of those diseases or the medical visits related to such diseases. The greater frequency was found of respiratory symptoms in relation to comparative environment.[14] Polish authors got similar results.[15] Our statistical analysis shows that increased an average concentration of SO₂ increased the average number of medical visits asthmatic children. There is a significant positive correlation between the average concentrations of SO₂ and the average number of visits asthmatic children, but this correlation was not significant, probably due small series of patients (p> 0.05).

6. CONCLUSIONS

Increased the average concentration of SO₂ in ambient air increased the average number of medical visits asthmatic children.

Results of the researches are shedding light on a very actual epidemiological problem. Only explanation from high incidence of respiratory diseases, in retrospective and prospective part of the study, in population of Zenica, is that this occurrence can be related to high concentrations of SO₂, as an irritant which affects the breathing pathways also as a mean of influencing development of irritant processes and processes of over sensitiveness.

7. REFERENCES

- [1] Duran, F., et al.: Stanje zagađenosti zraka u Zenici, prvi Jugoslavenski kongres o očuvanju čistoće vazduha, Zbornik radova, 84/962, Zenica, 1989.
- [2] Duran, F.: Specifičnosti zagađenosti zraka u gradu Zenici za period 1986. – 1996., Metalurški institut «Kemal Kapetanović», Zenica.
- [3] Đorđević, D., et al.: Pregled stanja zagađenosti vazduha sa SO₂ i dimom u većim industrijskim mjestima, sa posebnim osvrtom na epizode visoke koncentracije u cijeloj SFRJ, prvi jugoslavenski kongres o očuvanju čistoće vazduha, Zbornik radova, 20/231, Zenica, 1989.
- [4] Durmišević, S.: Uticaj zagađenja zraka na zdravlje stanovnika Zenice, Seminarski rad, Medicinski fakultet Sarajevo, Institut za higijenu i zaštitu životne okoline, Sarajevo 1997.
- [5] Durmišević, S.: Ispitivanje aerozagađenja na zdravlje stanovništva Zenice, Specijalistički rad, Medicinski fakultet Sarajevo, Institut za higijenu i zaštitu životne okoline, Sarajevo, 1999. 1998: 184 – 188.

- [6] Duran, F., et al.: Air pollution in Zenica, first Yugoslav congress on air pollution prevention, Compendium, 84/962, Zenica, 1989.
- [7] Duran, F., et al.: Specificities of air pollution in Zenica between 1986 and 1996, Metallurgical Institute "Kemal Kapetanovic", Zenica
- [8] Duran, F., et al.: Overview of SO₂ and smoke-caused air pollution in larger industrial centers, with a particular emphasis on episodes of high concentration in the whole of SFRJ, first Yugoslav congress on air pollution prevention, Compendium, 20/231, Zenica, 1989.
- [9] Durmišević, S.: Impact of air pollution on Zenica's public health, Semestral study, Medical College in Sarajevo, Institute of Hygiene and Environment Protection, Sarajevo, 1997.
- [10] Durmišević, S.: Research on impacts of air pollution on Zenica's public health, Specialist Study, Medical College in Sarajevo, Institute of Hygiene and Environment Protection, Sarajevo, 1999
- [11] Kristiforovic-Ilic, M., et al.: Impact of air pollution on human health, U: Communal hygiene, Prometej, Novi Sad, 1998: 184 – 188.
- [12] Etikna, EI., Etikna, IA.: Chemical mixtures expositure and children's health, Chemosphere, 31(1):2463-74, 1995 Jul.
- [13] Huttemann, U.: Pneumological aspects of environmental medicine. Medical relevance of environmental pollution of outdoor air, Zeitschrift Fur Arztliche Fortbildung Und Qualitatssicherung, 91(1): 27-30, 1997 Feb.
- [14] Cerkez, F., et al.: Examination of health effect of air pollution in Zenica and presentation of prospective contemporary models, First Yugoslav Congress on air pollution prevention, Compendium, 59/671, Zenica, 1989.
- [15] Jedrychowski W., Flak, E., Mroz E.: Variability of respiratory system reactions to aiur pollution, Epidemiologic study of children in Cracow,
- [16] Berktaş BM., Bircan A.: Effects of atmospheric sulphur diocide and particulate matter concentracions on emergency room admissions due asthma in Ankara. Tuberk Toraks 2003;51:231-238.
- [17] Schwartz J., Slater D., Larson TV., Pierson WE., Koenig JQ.: Particulate air pollution and hospital emergency room visits for asthma in Seattle. Am Rev Respir Dis 1993;147:826-831.
- [18] Jazbec A., Simic D., Hrsac J., Peros-Golubcic T., Kujundzic D., Sega K., et al.: Short-term effects of ambient nitrogen oxides on number of emergency asthma cases in Zagreb, Croatia. Arh Hig Rada Toksikol 1999; 50:171-182.