The effect of air pollution by nitrogen dioxide and meteorological parameters on a number of patients admitted to the Sestre milosrdnice University Hospital Centre Emergency Department

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Recent reviews indicate that ambient air pollution has important short and long-term effects on human health. Exposure to air pollutants (PM₁₀, PM₂₅, NO₂, SO₂, CO, O₂) is in direct relation with higher morbidity and mortality of cardiovascular patients and with higher number of patients examined in the Emergency Department (ED). The aim of this study was to investigate correlation of certain meteorological parameters, concentrations of nitrogen dioxide (NO₂) in the air and the number of patients admitted to the "Sestre milosrdnice" University Hospital Centre Emergency Department (ED), as well as the number of patients with cardiovascular referral diagnosis, according to the International Classification of Diseases (ICD-10), during the period of two years. Data on meteorological conditions and the concentrations of air pollutants were obtained from the State measuring stations Zagreb. There were 44,245 patients and 12,946 cardiovascular patients during the two years' period. The results showed that the total number of patients admitted to ED was higher during the summer, while the number of cardiac patients was higher in the winter. The highest concentrations of NO₂ were measured during the winter and autumn, probably due to an increased use of motor vehicles. Results

confirmed the hypothesis that high levels of NO₂ lead to an increase in the number of cardiovascular patients admitted to the ED. Despite the fact that the highest concentrations of NO₂ were recorded in the colder part of the year the influence of the concentration of NO₂ in the air on the number of admitted cardiovascular patients was statistically significant in the warmer part of the year when the slightest increase in the concentration of NO₂ in the air lead a significant increases, the number of cardiac patients in the ED. These results indicate the need for further research of photochemical processes and their impact on cardiovascular patients.

KEYWORDS: air pollution, nitrogen dioxide concentration, meteorological conditions.

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Table 1. Number of patients examined in Emergency Department in the period of June 30th 2008 to July 1st 2010 according to seasons (№ of patients examined in summer was corrected by 20%).

	Total № of patients	№ of cardiac patients
Total	44 245 (100.0%)	12 946 (100.0%)
Spring	11 561 (26.1%)	3 320 (25.7%)
Summer	11 689 (26.4%)	3 055 (23.6%)
Autumn	10 503 (23.8%)	3 226 (24.9%)
Winter	10 492 (23.7%)	3 345 (25.8%)

Table 2. Average values of meteorological characteristics according to seasons.

	No of days	Temperature Median (range)	Rel. Moisture Median (range)	Pressure Median (range)
Total	730	13.4 (-7.9 – 28.5)	68.9 (37.7 – 95.3)	996 (966 – 1020)
Spring	184	13.8 (-1.2 – 26.5)	60.7 (37.7 – 91.4)	997 (966 – 1009)
Summer	184	22.5 (13.3 – 28.5)	61.5 (41.0 – 89.5)	996 (984 – 1004)
Autumn	182	13.4 (1.0 – 25.4)	73.5 (44.4 – 95.3)	998 (979 – 1013)
Winter	180	2.6 (-7.9 – 14.5)	78.9 (43.6 – 94.0)	994 (971 – 1020)
Kruskal-Wallis ANOVA		p=0.0000	p=0.0000	p=0.0000

Figure 1. Number of patients with cardiac symptoms in Emergency Department according to seasons.

Figure 2. Average nitrogen dioxide concentrations according to seasons.

Figure 3. Correlation between number of patients with cardiac symptoms in Emergency Department and nitrogen dioxide in summer; Spearman's rang correlation $R=0.3763$; $p=0.0000$.

Literature

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