

WARSAW STUDY ON THE INFLUENCE OF TRAFFIC-RELATED AIR POLLUTANTS ON THE RISK OF OBSTRUCTION

Artur J. Badyda¹, Piotr Dabrowiecki², Wojciech Lubinski³, Piotr O. Czechowski⁴, Grzegorz Majewski⁵, Anna Gayer⁵

¹Warsaw University of Technology, Faculty of Environmental Engineering, Warsaw, Poland; ²Military Institute of Medicine, Central Clinical Hospital of the Ministry of National Defence, Warsaw, Poland; ³Gdynia Maritime University, Department of Information Systems, Gdynia, Poland; ⁴Warsaw University of Life Sciences, Faculty of Civil and Environmental Engineering, Warsaw, Poland

Within urbanized areas the direct proximity of busy main roads is characterized by higher levels of air pollutants compared to areas remote from busy roads, and particularly to rural areas. As a result inhabitants living close to the busiest traffic arteries are likely to be more exposed to the harmful influence of traffic than those living in other areas. Generally it should be taken into consideration that due to the implementation of air quality standards, significant decreases in the levels of air pollutants from fossil fuels combustion, in particular dust and sulphur dioxide, has been observed in many countries all around the world. However dynamic growth of the road traffic density has led to increased levels of other pollutants, such as ozone, particulate matter or nitrogen oxides. These pollutants, especially particulates and ozone, are currently one of the most serious problems of air quality in Europe. The pilot study on the influence of traffic-related air pollutants on the health of people living close to busy roads, which was carried out in Warsaw (Poland) in 2005-2006, due to the very promising results became the basis for further research in other areas of the city. Therefore in 2008-2011 respiratory function tests were conducted on a group of 4985 people. Among them 3997 were the inhabitants of selected 7 most busiest streets in Warsaw and 988 the residents of 2 rural areas located in eastern part of Poland, characterized by the lack of major sources of air pollutants emissions and located in a substantial distant from busy thoroughfares. Pulmonary function tests were completed using Easy One Spirometers. Examined persons were asked to accomplish a questionnaire on occurrence of the most common respiratory system diseases symptoms, allergies, cigarette smoking and passive smoking as well as basic information about living place and its conditions and practising in outdoor conditions such sports as cycling or jogging. Average values of selected spirometric parameters were calculated as well as the percentage of individuals with airways obstruction. Bronchial stricture was diagnosed, when the FEV₁/FVC factor was lower than 70%. Degrees of airways obstruction were qualified according to GOLD guidelines. The results of pulmonary function test were analysed using various statistical tests as well as multidimensional and logistic regression. In the pilot study the risk of bronchial obstruction was 4,35 times higher (95% CI: 2,57-7,35) comparing non-smoking inhabitants of the city and rural area residents. These results were confirmed in the hereby presented study which has shown that the risk of obstruction in the non-smoking urban area group was 4,82 times higher (95% CI: 2,45-9,51) in comparison to control group. Among Warsaw residents 317 cases (8,3%) of obstruction were identified, whereas in the group of rural residents there were 35 cases (3,9%). Amid smokers the difference in risk of obstruction between urban and rural areas residents was statistically insignificant. There has been found (using the Kruskal-Wallis test) statistically significant differences ($p < 0.05$) in the distribution of main spirometric parameters (FEV₁, FEV₁/FVC, MEF₅₀) and number of bronchial obstruction cases between the group of city residents and the control group. For smokers there were no statistically significant differences in FEV₁, FEV₁/FVC and obstruction cases. It has been demonstrated that there exists a statistically significant increase in obstruction appearance cases among non-smokers living in the vicinity of busy roads comparing to control groups from rural areas. The hereby results prove a significant role of air pollutants in development of diseases causing bronchial stricture (mainly COPD). In addition to the increased probability of bronchoconstriction among smokers and older people, it is also clear the increased risk of obstruction with the degree of exposure to traffic-related air pollution impact – the likelihood of bronchial obstruction is higher in urban population living in the vicinity of roads with a high traffic

volume compared with the inhabitants of rural areas.