значительная доля вегетативной дисфункции, заболеваний инфекционно-воспалительного характера и сочетанных дисфункций тазовых органов, для которых свойственны моторные висцеральная гиперчувствительность и нарушения моторики, низкая толерантность к боли, отсутствие признаков активности воспалительного процесса. Следовательно, выявление и коррекция сопутствующих заболеваний и функциональных расстройств тазовых органов позволит улучшить результаты лечения больных хроническим циститом.

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ДИНАМИЧЕСКИЕ ИЗМЕНЕНИЯ В КОНЦЕНТРАЦИИ АЗОТНОГО ДИОКСИДА В АТМОСФЕРНОМ ВОЗДУХЕ В СТАРОЗАГОРСКОМ РАЙОНЕ

Аннотация

Учитывая основные источники загрязнения воздуха (промышленные и автомобильные) в Старозагорском районе, в течении пяти лет просле-живается один из основных загрязнителей воздуха азотного диоксида .

В настоящей работе обобщены и проанализированы динамические изменения в концентрации загрязнителей ежемесячно и ежегодно в периоде 2009-2013 года.

Ключевые слова: загрязнители воздуха, азотный диоксид, среднемесяч-ная концентрация, среднегодовая концентрация

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DYNAMIC CHANGES OF THE CONCENTRATION OF NITROGEN DIOXIDE IN THE ATMOSPHERE IN THE MINICIPALITY OF STARA ZAGORA

Abstract

When considering the main sources of air pollution in the Municipality of Stara Zagora (industrial plants and automobiles), one of the major pollutants-nitrogen dioxide-has been traced over a period of five years.

The following report summarizes and analyzes the dynamic changes in the concentration of the pollutant on a monthly, quarterly and yearly basis for the time period 2009-2013.

Keywords: air pollutants, nitrogen dioxide, mean monthly concentration, mean yearly concentration

Nitrous oxides affect the weather patterns in the area by absorbing solar radiation of the ultraviolet and visible parts of the spectrum and by reducing atmospheric transparency [1]. In turn weather patterns affected by nitrous oxides cause a variety of health problems [12].

Of the nitrous oxides present in the atmosphere, of biological importance is nitrogen dioxide which has direct and indirect implications. Indirectly it is related to the formation of acid rain which in turn damages ecosystems, plays a role in the formation of the ozone layer in the troposphere and causes soil acidification [2]. The Stara Zagora municipality is one region where pollution from acid rain can be observed (3). Directly nitrogen dioxide affects human health. High concentrations of nitrogen dioxide in the air can increase the risk for respiratory infections. This is due to the pollutant's negative effects on the immune system [5]. People with a history of respiratory disease such as asthma and COPD are even more sensitive to air polluted with nitrogen dioxide [4]. Registered levels of $NO_2$and soot (which are a result of traffic pollution) led to an increased number of cases of conjunctivitis, mucus secretion, wheezing and increased levels of total serum immunoglobulin E [11]. Nitrous oxides also affect the heart and circulatory system. Research in Massachusetts has shown that cases of patients with heart arrhythmias who need defibrillation are closely related higher levels of nitrogen dioxide in the air [10]. Air pollution can also increase the risk for a stroke. Research in Georgia has shown that higher levels of nitrogen dioxide correlate to the number of patients diagnosed with PVD (thrombosis, vasculitis, stroke, etc.) who seek medical help [8]. High oncentrations of NO_2 are also related to a higher stroke fatality rate in Shanghai, China and Sheffield, Great Britain [6,7]. A study in Italy shows that the number of adults seeking medical attention for head pain correlates with high levels of carbon monoxide and nitrogen dioxide [9]. Higher-than-normal concentrations of NO_2 lead to psychiatric problems and more psychiatric hospital admissions. This was established back in 1979 in a psychiatric hospital in St. Louis, Missouri [12].

As a result of the actions of industrial plants and motor vehicles, nitrogen dioxide acts as one of the main atmospheric pollutants in the Municipality of Stara Zagora.

The goal of this report is to observe the dynamic changes in concentration of nitrogen dioxide monthly and yearly for the time period 2009-2013.

Materials and methods

On the territory of municipality Stara Zagora there are three NO_2 sampling stations. One is the Automatic Measuring Station (AMS)-Zelen Klin. Another is Differential Optical Absorption Spectroscopy (DOAS) - Ostra Mogila in the village Ostra Mogila. The third is Differential Optical Absorption Spectroscopy (DOAS) –Mogila EKO1 in village Mogila.

Records of the Bulgarian United National System for Observtion and Control are used to calculate the mean concentration levels monthly and yearly for the time period 2009-2013.The medically statistical processing are made using data grouping, alternative and graphical analysis as well as analysis of dynamic changes.

Results and discussion

Bulgarian legislation establishes norms for sulfur dioxide, nitrogen dioxide, small dust particles, lead, benzene, carbon monoxide and ozone in the atmosphere.

The mean concentration of nitrogen dioxide is summarized for every month in the time period 2009-2013. The results are presented in Table 1 and illustrated in Figure 1.

Table 1. Mean monthly concentrations of $NO_2(\mu g/m^3)$ for the time period 2009-2013

Month/Station	AMS -Zelen Klin	DOAS-Ostra Mogila	DOAS-Mogila EKO1
January	27,31	7,49	15,30
February	22,27	7,21	15,94
March	19,47	6,72	13,73
April	17,80	6,30	12,77
May	15,53	5,05	15,96
June	13,95	4,39	24,17
July	13,66	5,51	17,97
August	15,42	6,18	13,32
September	18,78	6,21	14,31
October	24,92	5,49	22,40
November	45,88	6,08	16,39
December	47,22	6,37	17,11

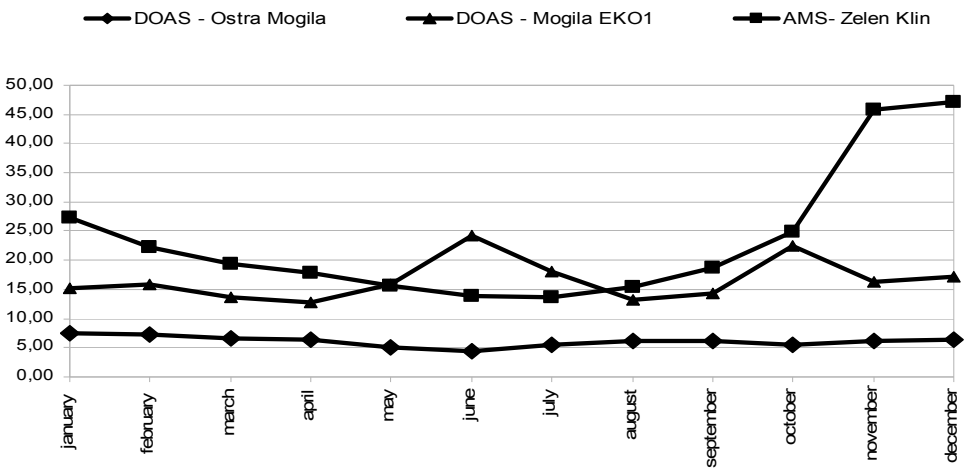

Fig. 1. Mean monthly concentrations of NO_2 ($\mu g/m^3$) for the time

period 2009-2013 by stations

Considerably higher average values (two or three times higher) are observed at AMS-Zelen Klin. It can be noted that highest mean values are observed during November and December (Figure 2). This is due to the two or three times higher values of NO_2 during November and December of 2009 (87,04 μg/m^3 и 118,55 μg/m^3 respectively) and November, 2012- 65,32 μg/m^3. Bulgarian legislature for the norms of sulfur dioxide, nitrogen dioxide, small dust particles, lead, benzene, carbon monoxide and ozone in the atmosphere states that the mean hourly norm for NO_2 of 200 μg/m^3 cannot increase more than eighteen fold during a period of one calendar year. Most likely the recorded concentration values are due to the gassing recorded in 2009 and 2012.

From the summarized data it can be seen that lowest values are recorded in DOAS - Ostra Mogila (4,39μg/m^3) during the month of June (Table 1).

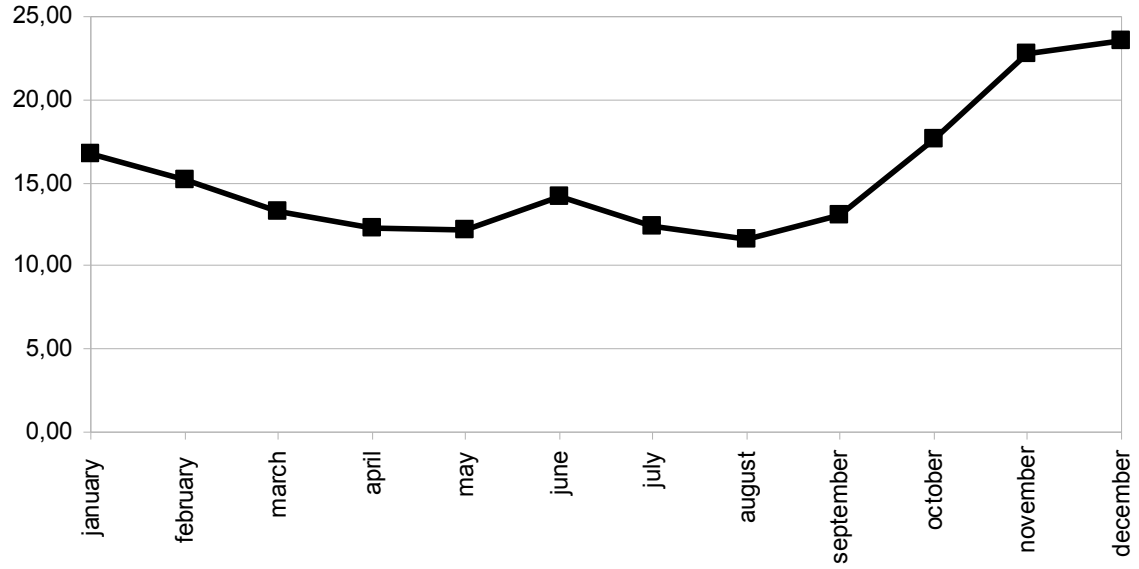

Fig. 2.Mean monthly concentrations of NO_2 (μg/m^3) during the time period 2009-2013

In addition to the gassing, high values can also be attributed to household heating and motor vehicle traffic. AMS - Zelen Klin is in close proximity to several technical schools which give off emissions when heated. The station is also close to a busy road with heavy traffic.

When the mean yearly concentration values of NO_2 are calculated, it can be noted that all values are less than threshold - 40 μg/m^3. The data are presented in Table 2 and Figure 3.

Table 2. Mean yearly concentrations of NO_2 (μg/m^3) for the time period 2009

Year /Station	AMS -Zelen Klin	DOAS-Ostra Mogila	DOAS-Mogila EKO1
2009	30,62	7,52	11,90
2010	21,78	5,48	12,67
2011	21,54	6,95	13,40
2012	27,38	6,93	17,90
2013	16,26	3,53	24,32

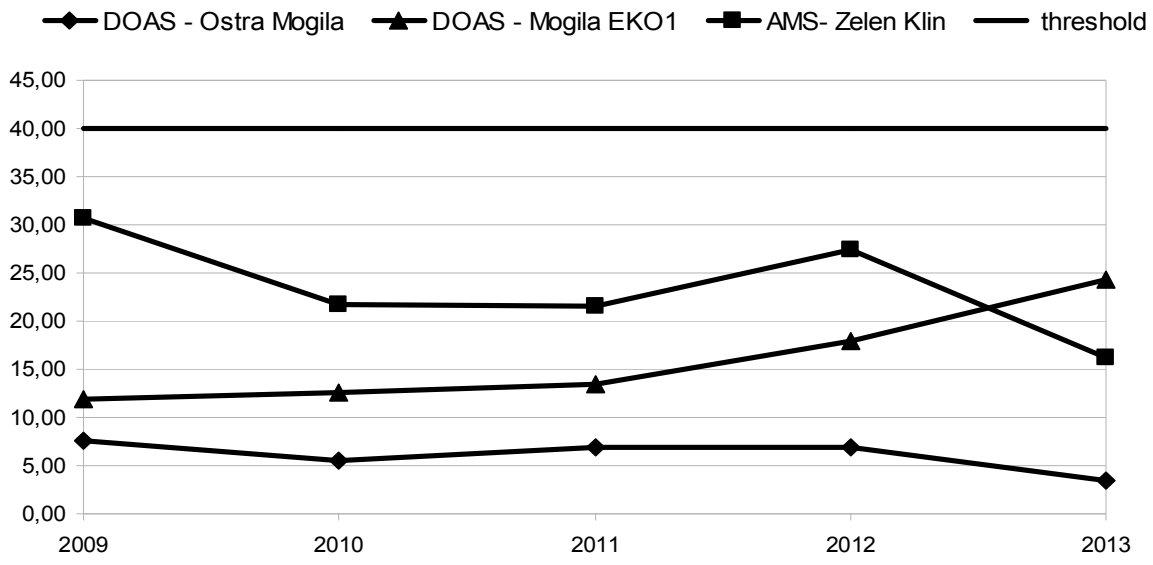

Fig. 3. Mean yearly concentrations of NO_2 (μg/m^3) in the Municipality Stara Zagora

Figure 3 shows that at AMS - Zelen Klin in 2013 the average yearly levels of NO_2 are much lower. This can be attributed to lower recorded pollution concentrations from July, 2013 to September, 2013.

Table 3.Mean yearly concentrations and standard deviation for NO_2($\mu g/m^3$) in the Stara Zagora Municipality for the time period 2009-2013.

Year	**2009**		**2010**		**2011**		**2012**		**2013**	
Station	$\bar{x}$	$S\bar{x}$	$\bar{x}$	$S\bar{x}$	$\bar{x}$	$S\bar{x}$	$\bar{x}$	$S\bar{x}$	$\bar{x}$	$S\bar{x}$
DOAS-Ostra Mogila	7,52	0,66	5,48	0,37	6,95	0,25	6,93	0,392	3,53	0,64
DOAS -Mogila EKO1	11,90	1,32	12,67	0,75	13,40	1,06	17,90	1,35	26,53	5,57
AMS - Zelen Klin	30,62	10,14	21,78	1,12	21,54	1,36	27,38	3,94	16,26	2,24

Table 3 shows a decrease in variation of the pollutant NO_2 from 2009 to 2013. The highest average value is for 2009- ($\bar{x} \pm S\bar{x}$) - 7,52 ± 0,68 at DOAS - Ostra Mogila. The lowest average value is at the same station in 2013-3,53 ± 0,64.

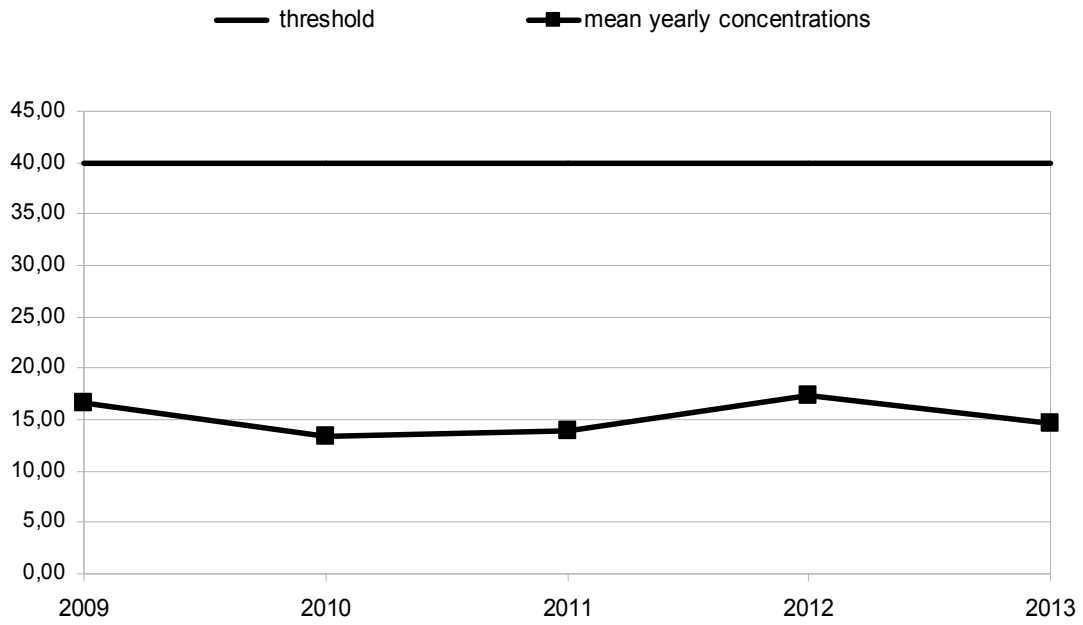

Fig. 4. Mean yearly concentrations of NO_2($\mu g/m^3$)) in the Stara Zagora Municipality for the time period 2009-2013.

A summary of the data for dynamic changes in mean yearly concentration levels for the period 2009-2013 are presented in Figure 4.A decreasing pattern is observed for the concentration levels of the pollutant.

Conclusion

1. Industrial plants, motor vehicles and decentralized heating are the major sources of pollution of the atmosphere over the Stara Zagora Municipality.

2. Higher levels of mean monthly concentrations values are observed during the cold months, but those levels are below the established threshold.

3. Mean yearly concentration levels are decreasing in the time period 2009-2013.

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АНАЛИЗ РЕЗУЛЬТАТОВ ПЕРИОДИЧЕСКОГО МЕДИЦИНСКОГО ОСМОТРА РАБОТАЮЩИХ В ПРЕДПРИЯТИИ ВОДОСНАБЖЕНИЯ И КАНАЛЛИЗАЦИИ В БОЛГАРИИ

Аннотация

Разумное использование водных ресурсов и их безопасность от загрязнения является не только экологической проблем, но и существенным фактором устойчивого экономического роста. В Болгарии не существует единной системы мониторинга для состояния здоровья рабочих. ***Цель*** *этого исследования – анализировать состояние здоровья работающих в одном из крупнейших предприятий Болгарии по доставке и обработке питьевой воды и отходных вод.* ***Постановка и методы:*** *В 2012 году был проведен анализ моментной заболеваемости среди 193 работающих в предприятии „Водоснабжение и Канализация“ (81 в секторе „Канализация” и 112 работающих в секторе „Водоснабжение”). Первичная информация по здоровью собрана из карт для периодического медосмотра. Работающие разделены по критериям: пол, возраст, должность в фирме, направление.* ***Результаты:*** *Общее число зарегистрированных заболеваний - 503 при 193 работающих. Относительная доля зарегистрированных рабочих с отклонениями в состоянии здоровья в секторе „Водоснабжение” - 83.04%, в секторе „Канализация” - 85.19%. С наибольшей относительной долей в обоих секторах - Артериальная гипертония, Глухота, Нарушения рефракции и аккомодации, Ожирение.* ***Заключение: 1.*** *Наблюдается тенденция увеличения относительной доли патологического поражения с увеличением возраста выше 25 лет ($p<0.001$).* ***2.*** *Анализ моментной заболеваемости всего лишь за 1 год не показывает убедительной связи между експозицией факторов рабочей среды и зарегистрированными болезнями. Под влиянием факторов в трудовой среде изменения по здоровью наступают за различный период времени (от нескольких месяцев до 5-ти лет). Поэтому считаем, что необходимо проводить анализ моментной заболеваемости за минимальный период 5 лет. Установлена высокая относительная доля работающих с потерей слуха в причинный комплекс которого вероятнее всего включается и высокий уровень шума в рабочей среде.* ***3.*** *В Болгарии не существует единой статистической системы, которая следит моментную заболеваемость рабочих в целом и по отраслям, независимо от того, что этой деятелностью занимаются службы трудовой медицины.*

Ключевые слова: водоснабжение, канализация, моментная заболеваемость, работающие.

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ANALYSIS OF THE RESULTS OF THE PERIODIC MEDICAL EXAM OF THE EMPLOYEES IN THE WATER SUPPLY AND SEWERAGE COMPANY IN BULGARIA

Abstract

The sensible use of water resources and their protection from pollution is not only an environmental issue, but also an important factor for sustainable economic growth. In Bulgarian there is no unified system for monitoring the health status of the workers. ***The aim*** *of this study is to analyse the momentary morbidity rate of the employees in one of the biggest companies for drinking water supply and waste water treatment in Bulgaria.* ***Material and methods:*** *Through 2012. is an analysis of the current prevalence among 193 working in Enterprise "water and sanitation" (81 persons in the wastewater treatment plant for wastewater (sewerage worker, operators, etc.) and 112 operating in the section "the extraction of drinking water". Primary health information collected from health cards for periodic medical examinations. Workers are separated by criteria: sex, age, position in the company direction.* ***Results****: the total number of registered diseases - 503 in 193 employees. The proportion of the registered working with abnormal health status in the sector "water supply" is at 83.04% of workers in the sector "Sewage" was 85.19%. With the large relative share in both groups are Arterial hypertension, Conductive and sensorineural hearing loss, Disorders of refraction and accommodation, Obesity.* ***Conclusion****:* **1.** *A tendency of pathological affection relative share increase with age increase over 25 years is observed ($p<0.001$).* ***2.*** *Momentary morbidity rate analysis for one year only failed to demonstrate a convincing relation between the exposure to occupational environment factors and the registered diseases. Health-related changes occur after various periods of time (from several months to 5 years) as a result of occupational environment factor impact. Therefore, in our opinion a momentary morbidity rate analysis for a minimum period of 5 years is necessary. A high relative share of the employees experiencing hearing loss is established, the causal complex of which most probably included the high level of noise in the occupational environment.* ***3.*** *There is no integrated statistical system in Bulgaria to follow-up employee morbidity rate as a whole and by sectors, irrespective of the fact that occupational medicine services are being engaged with this activity.*

Keywords: momentary prevalence working, sanitation, water supply.

The territory of the Republic of Bulgaria is divided in four Basin Directorates for Water Management. The second largest one is the East White Sea Region, located in a part of the Central South Bulgaria in 10 administrative counties, 92 municipalities, 1772 settlements and 20 Water Supply and Sewerage companies with 24 urban waste water treatment plants. Employee health status monitoring is being exercised by means of periodic medical exams, during which the abilities of the employees to fulfil their obligations in the specific industrial environment conditions having in mind their established health status are being assessed.

Disease occurrence is influenced not only by health culture, age, sex, individual lifestyle peculiarities, etc., but also by factors, such as length of service duration, work process characteristics and occupational environment conditions. The length of service at a particular workplace may be a ‘terrain’ on which any latently existing pathological deviations related to particular risk factors of occupation and environment may appear, or new ones may form. **The purpose** of this research is to analyse the momentary morbidity rate of the employees in one of the biggest companies for drinking water supply and waste water treatment in Bulgaria.

Materials and methods: The primary information on instantaneous disease rate was collected from the periodic medical exam records, which was regulated by the Bulgarian legislation [1]. The analysis was conducted pursuant to the following indicators: employees’ sex, relative share, age groups: up to 25 years old, from 26 to 35 years old, from 36 to 45 years old, from 46 to 55 years old, over 55 years old and a relative share of the groups, position and trend in which employee works. Data is processed by means of the descriptive statistic and relative share comparison methods.