Cancer Incidence and Mortality Data in Aktobe, West Kazakhstan, 2000-2010

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Abstract

The article provides an assessment of the dynamics of cancer incidence and mortality in the territory of Aktobe city for the period 2000-2010. The most common cancers were found in the lungs, stomach, esophagus and breast throughout the period, with slight increase in colon cancer and decrease in esophageal cancer being apparent. In an attempt to cast light on effects of environmental pollution, the authors also compared data on total emissions of chemicals into the air. While preliminary, the findings provide a basic picture of cancer burden in this industrialised city in Kazakhstan which should be followed up by more comprehensive monitoring.

Keywords: Cancer statistics - incidence - mortality - Aktobe, Kazakhstan - environment - pollution

Materials and Methods

Epidemiological analysis of cancer incidence and mortality from cancer per 100 thousand capita was conducted from 2000 to 2010 based on the statistical data received from the Statistics Department and extracted from the account forms f # 7, f 030-u, f 025-u, f 090-u, and f # 35. The disease list was prepared based on the “Handbook of International Statistical Classification of Diseases, Injuries and Causes of Death Tenth Revision”.

Figures on the total emission of chemicals into the air were taken from “2-TP-Air” forms of the Environmental Department. The conditional index of chemical pollution of atmospheric air (P) was calculated by formula:

\[ P = \sqrt{\sum_{i=1}^{n} \Sigma_{j=1}^{k} x_{ij}} \]

Where: P-the conditional index of chemical pollution of atmospheric air; \( \Sigma x^2 \)-the sum of the rates of excess of the maximum permissible concentrations of substances of different hazard categories normalized to the hazard category III.

The pollution of atmospheric air was measured by the integrated air pollution index (API) calculated for five substances with the highest standardized MPC values taking into account the hazard category of those substances.

Results

Table 1 provides the results of cancer incidence study in Aktobe. In the studied periods, the highest incidence of pathology was noted in bronchopulmonary system and metallurgical enterprises that extract and process chromium ore, for example.
In all the studied periods, the structure of cancer mortality was headed by diseases of trachea, bronchus, lung, stomach, esophagus, breast cancer, and leukemia, as well as rectum, liver, and gall bladder (Table 2). The highest mortality was in 2000, 2001, and 2005, with a decrease from 2007 to 2010 (Figure 2). Despite the spread of incidence and mortality in certain years, generalized incidence of cancer and mortality rates remained stable.

Generalized data on the total emissions of chemicals into the air (see Table 3) showed no reduction in technogenic emissions in the analyzed period (2005-2012). Figures of pollutant emissions from stationary and mobile sources reflected the growth of gross pollutant emissions from 2003 to 2012 (Figure 3).

The mentioned trend was valid for both stationary and non-stationary sources of emissions.

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and mobile sources. In Aktobe, API ranged from 6.4 to 10.1 (Table 4). According to the hygienic standards, API should not exceed 5.0. Major air pollutants in the city were sulfur dioxide, carbon monoxide, nitric oxide and dust containing trivalent, and hexavalent chromium, as well as magnesium compounds, manganese, and iron. According to the provided evidence the north-eastern edge of Aktobe hosts all the major stationary sources of air pollution (industrial area). Due to their close proximity to each other, these plants represent a single powerful core of multi-component air pollution of residential areas of the city. The urban air contains a considerable variety of chemical pollutants including a number of inorganic compounds such as heavy metals. These circumstances necessitate a detailed study of the health status of adults and children living in the city, including indicators of newly diagnosed cancer incidence, and mortality from cancer.

Discussion

It was established that in the territory of Aktobe city the incidence of cancer was relatively high, and primarily on the part of bronchopulmonary system, breast cancer,
stomach, and esophagus. High levels of oncological pathology were identified on the part of female genital organs, lymphatic and hematopoietic tissue. The authors identified features of the dynamics and spread of cancer incidence in the studied period. The mortality from cancer largely depends on the structure of cancer incidence. At the same time, we observed an emerging trend of reduced mortality from cancer.

As is well known, primary cancer registration is the basis for the development of programs to combat cancer (WHO, UICC). Though Globocan provides worldwide data (Globocan, 2012), in many cases these figures indicate just the general picture without details. Therefore, the study of “rough” and standardized rates of cancer incidence and mortality from cancer seems relevant especially when these indicators are linked to a complex of factors of the environment and socio-economic living conditions of the population, geographic and ethnic characteristics of the study groups. Many researchers highlight the negative impact of air pollution on the emergence and development of malignant tumors (Chimitdorzhiyeva and Kremenetsky, 2008; Crouse et al., 2010; Cambra et al., 2011).

Specific environmental polluters in Aktobe included such highly toxic chemicals as chromium compounds (Cr$^{3+}$, Cr) known to have strong long-term effects including mutagenic and carcinogenic action (Blockin and Zubov, 1974; Bigaliyev, 1977; Tushnyakova and Likhacheva, 1979; Tushnyakova et al., 1979; Sarto et al., 1982; Elias et al., 1983; Snow and Xu, 1989; Kutikhin et al., 2012). At that, the intensity of the pollution in the city was different varied with the city district and its proximity to the industrial area.

Monitoring of quality of air, water, and soil allows to quantitatively and qualitatively assess the impact of the environment on public health and to calculate the environmental risks. The assessment made in Aktobe has identified the highest danger from the inhalation of chromium, formaldehyde, sulfur dioxide, and hydrogen sulfide; as well as from the oral (alimentary) admission of chromium, boron, fluoride and nitrates (Ibrayev et al., 2010). Rates of disability, their dynamics, structure, and causes, provided important information not only about the effectiveness of therapeutic and preventive measures and the level of working capacity examination, but also about the state of the environment. It was found that the 1st category of disability in Aktobe was three times more often assigned to working-age population than to the pensioners; the 2nd category of disability was assigned to that population group 10 times more often than to the pensioners; and the 3rd category of disability-18 times more often (Mamyrbayev et al., 2010).

In the structure of medical entities causing disability, the 1st rank was hold by diseases of the circulatory system, the 2nd - by cardiovascular diseases, the 3rd - by injury and poisoning, the 4th - by tumors, the 5th - by diseases of the musculoskeletal system, the 6th - diseases of the eye and its appendages, and the 7th - by TB.

The results of our own studies and the literary data show that the regional specific features influence the degree of expression of many risk factors related to the possibility of cancer. The adverse ecological background contributes to poor health of the urban population, the growth of cancer and mortality rates. General morbidity, its incidence and disability rates are also positively related to the environmental degradation. All the above requires urgent adoption of a set of measures for prevention, screening, early detection, and timely treatment of oncological diseases.

References


