Improvement of Methods for the Prevention of Cancer

ZH.T. Sayrambayeva, A.B. Otarbayeva

Abstract: *The article is dedicated to one of the widows of socially significant diseases, which not only significantly reduces the lives of many people, but also leads to death. In 2018, a malignant neoplasm in the world caused the death of 9.6 million people. According to WHO data on the number of cancer deaths, Kazakhstan occupies a leading position (15,000 people) among its closest neighbors in the CIS. About 30 thousand patients with cancer are registered annually in Kazakhstan, about 130 thousand patients are registered, these numbers change every year. Given the social and economic losses from cancer, the main goal of this article is to identify the causes that contribute to the occurrence of malignant neoplasms and to propose improved preventive measures based on studies of international organizations. To identify a problem in the fight against cancer, the authors of the article made an analysis of the current regulatory legal acts and state programs to fight cancer.*

Keywords: cancer, Kazakhstan, prevention, regulatory legal acts.

1. Introduction

Everyone wants to live a long and happy life, but unfortunately, the risk of morbidity increases over the years. Cancer is the second leading cause of death globally, and is responsible for estimated 9.6 million deaths in 2018 (Cancer. Key facts, 2018). About 17 thousand people die of cancer every year in Kazakhstan, 42% of which are people of working age. (Strategic plan, 2017). Malignant neoplasms take the second place which lead to death, second only to diseases of the cardiovascular system. The growth of patients with malignant neoplasms is 5% annually. About 30 thousand patients with cancer are registered in Kazakhstan annually, about 130 thousand patients are registered, these numbers are changing every year and unfortunately the number of patients is growing year after year. For example, oncological diseases appear in more than 80 people every day in Kazakhstan. (Summary analytical report, 2013). With a population of 18,545,829 people, this indicator of cancer is certainly alarming, to which special attention should be paid. Therefore, the study of the causes of occurrence, mass distribution and possible ways of preventing cancer is currently relevant.

Malignant neoplasm or tumor is a pathological process associated with the growth of tissue, the cells of which have acquired the ability to limitless, unregulated reproduction. Benign tumor - grows slowly, has clear boundaries and is often surrounded by a capsule. With its growth and development, a benign tumor compresses and forces out the surrounding tissue. Malignant tumor - aggressively grows and tends to penetrate not only into surrounding tissues, but also spreads through the bloodstream and lymph vessels to other organs (metastasis) (General Oncology Issues).

2. Literature Survey

When writing this article, statistical and informational data provided by the World Health Organization (WHO) and the International Agency for Research on Cancer were used. The causes of oncological diseases are detailed in the Atlas of Modern Oncology, which was written as part of the WHO (Ahmedin& Paolo, 2013). Recommendations for the prevention, diagnosis and treatment of cancer are provided in the international Recommendations European Code Against Cancer (European Code), Global action plan for the prevention and control of non-communicable diseases (Global action plan, 2013), in the Political Declaration of the High- level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases (Political Declaration, 2013), as well as the WHO Cancer Early Diagnosis Guide.

The rules for the diagnosis and treatment of malignant neoplasms at the state level of the Republic of Kazakhstan are detailed in such documents as:
1) Strategy "Kazakhstan-2050": a new political course of a successful state (Kazakhstan-2050);
2) The strategic plan of the Ministry of Health of the Republic of Kazakhstan for 2017 - 2021 (Strategic plan, 2017);
3) Complex plan of the Kazakh Scientific Research Institute of Oncology and Radiology for 2017-2021 (Complex plan, 2017);
4) The State Health Development Program of the Republic of Kazakhstan "Densaulyk" for 2016 – 2019 (Densaulyk, 2016);
5) Roadmap for the implementation of an integrated model of cancer management in the Republic of Kazakhstan for 2016 - 2020 (Roadmap, 2016);
6) Comprehensive Plan to Combat Cancer in the Republic of Kazakhstan for 2018 – 2022 (Comprehensive Plan).

Analysis of current situations in the fight against cancer is written in detail in reports such as "Summary analytical report on the project" Monitoring the effectiveness of state budget spending on the prevention and treatment of cancer ", with the support of the Soros Foundation-Kazakhstan (Summary analytical report, 2013), also in "Analytical material of an extended college of the ministry of health of the republic of Kazakhstan" (Analytical material, 2017).

Causes of cancer
How can the number of cancer patients be reduced? All world leaders are asking these questions, since huge amounts of money are spent from the budget of almost all countries on the treatment of cancer patients. A key approach to cancer reduction is prevention, not treatment. Professionals often attribute an increasing number of cancer

patients to the fact that the population does not want to engage in their health, does not undergo timely examinations, avoids screening procedures, and comes in the last stages of the disease. But this is again the consequences, and most importantly, is to identify possible factors causing the development of malignant neoplasms. The causes of cancer can be various well-known risk factors, the impact of which could have been prevented.

One of the main factors causing lung cancer is smoking, which accounts for more than 22% of global deaths (Cancer. Key facts). Smokers are 15-30 times more likely to develop lung cancer than non-smokers. In Kazakhstan, lung cancer ranks first and forms 16.9%. The next cause of malignant neoplasms is various infections, according to studies up to 25% of cancer cases in low and middle-income countries (Plummer & Martel, 2016) are caused by such cancer-causing infections (mainly cancer of the stomach, cervix and liver, respectively), such as : Helicobacter pylori, human papillomavirus, and hepatitis B and C viruses. The majority of cancers associated with Helicobacter pylori infection are caused by almost 90% of the world's gastric cancers and about 33% of all oncological diseases. Globally, the cause of 28% of oncological diseases associated with infection is the human papillomavirus (HPV). Chronic HPV infection is the cause of almost all cases of cervical cancer and a number of other malignant neoplasms: cancer of the vulva (43%), vagina (70%), anal canal (88%), penis (50%) and oropharynx (26%) in the world. There are more than 100 types of HPV, but almost 70% of all cervical cancer cases and about 90% of other cancer cases associated with HPV cause HPV types 16 and 18 (Ahmedin& Paolo, 2013).

The next reason causing the formation of malignant neoplasms is the substances that affect workplaces and enterprises. Indoor air pollution from solid fuels is responsible for approximately 2.5 million deaths per year in developing countries, or about 4.5% of deaths worldwide. The International Agency for Research on Cancer (IARC) classifies smoke emissions from coal combustion indoors as carcinogens for humans, and from the combustion of other types of solid fuels as probable carcinogens (Ahmedin& Paolo, 2013). A carcinogen is an agent that, by virtue of its properties, can cause irreversible changes or damage in those parts of the genetic apparatus that exercise homeostatic control over somatic cells (General Oncology Issues). Air pollution is particularly high in fast-growing cities in developing countries. Exhaust gases from diesel engines increase atmospheric air pollution, and according to the IARC classification, carcinogens can cause lung cancer. Carcinogens such as asbestos, mineral oils, silicon, diesel engine exhaust, tar, dioxins, environmental tobacco smoke, radon, tetrachlorethylene, arsenic and concentrated inorganic fogs, as well as occupational factors: shifts, painting, welding, etc. (Ahmedin& Paolo, 2013).

Studies show that obesity can also be the cause of a significant proportion of cancer cases. For example, obesity is a risk factor for breast cancer (in postmenopausal women), colon, uterus, kidneys, stomach, esophagus and pancreas, although the causal relationship of these diseases to nutrition, weight and fat in the body has not yet been established. There is a clear connection between alcohol consumption and cancer of the liver, gastrointestinal tract and respiratory tract, breast, colon. Alcohol increases the risk of cancer and accounts for 4% of all cancer deaths in the world. Only 5–20% of all cases of prostate cancer, breast cancer, and colorectal cancer could be prevented with improved diets, increased physical activity, or reduced alcohol consumption (Ahmedin& Paolo, 2013).

In the structure of the oncological incidence of Kazakhstan, breast cancer (12.3%) is in the top three. The study shows that this may be due to a change in hormonal factors, which led to a change in the risk models of cancer associated with them. Childbearing and breastfeeding reduce the risk of breast cancer in women, while the use of oral contraceptives and hormone replacement therapy increase this risk. With the birth of each child, the risk is reduced by 7%. The birth of the first live child after the age of 30 doubles the risk compared with the birth of the first live child under the age of 20 years. Each year, breastfeeding reduces the risk by 4.3% (Ahmedin& Paolo, 2013).

There are regional factors that cause or contribute to the formation of malignant neoplasms. For example, in South Africa and Brazil, people most often die from lung cancer, the main cause of which is smoking. In India, where tobacco is chewed, the most common oncological diseases are lip and oral cancer. The population of China most often dies of liver cancer. This type of cancer, as well as head and neck tumors are common in the Russian Federation. Experts attribute these diseases in russians to excessive alcohol consumption (Ahmedin& Paolo, 2013). In Kazakhstan, professionals talk about the dependence and relationship of the number of oncological diseases with the activities of the Semipalatinsk nuclear test site in the period 1949-1989. In this case, we cannot influence many factors, since the population has been exposed for decades to exposure and other products of the landfill through the atmosphere, soil, water. In addition, these carcinogens can affect agricultural products produced on the same contaminated soil. Carcinogens are widely distributed in industrial enterprises, in particular, in the territory of Pavlodar and East Kazakhstan regions. The highest levels of cancerare in areas such as North Kazakhstan (337.8), Pavlodar (302.3), Kostanay (299.8), East Kazakhstan (297.5). We assume that in these areas carcinogens in the workplace (Strategic plan, 2017) will provoke oncological diseases, since the period of growth of diseases coincides with the moment of opening of enterprises (Summary analytical report, 2013). However, there are no separate studies on this topic, or they are not in the public domain. This implies the assumption that the state spends colossal budget funds to combat the investigation, which, of course, is important. Given that 16.9% of deaths are lung cancer, the state needs to take specific measures to save the health and lives of people in these areas (Summary analytical report, 2013).

3. Methodology

When writing this article, we used the method of analysis of regulatory documents of the Republic of Kazakhstan and the analytical report of the Ministry of Health of the Republic of Kazakhstan. Using this method, an analysis of the current situation for the prevention and diagnosis of cancer

treatment was conducted, and the weaknesses of these measures were identified. The authors also conducted a method of interviewing respondents for knowledge of the types of prevention of diagnosis from cancer.

Analyze of legal documents against Cancer
Comprehensive anti-cancer measures include the following main components: prevention, early diagnosis and screening, treatment, palliative care and monitoring of cured patients, which should be detailed in the national plan for anti-cancer control, evaluated using a reliable monitoring system, which must include registries cancer patients, and be based on comprehensive, patient-oriented care (Guide to cancer early diagnosis, 2018). Of course, each state, depending on factors contributing to the formation of malignant neoplasms, adopts state programs and legal acts to combat cancer. One of such documents is the Strategy "Kazakhstan-2050": a new political course of a successful state providing for the development of preventive medicine, which should become the main tool in the prevention of diseases. This Strategy places great emphasis on outreach to the country's population. Primary health care will become the central link in the organization of medical care for the population with a change in its interaction with horizontal (outpatient) and vertical (psychiatric, narcological, anti-tuberculosis, oncological, etc.) specialized services (Kazakhstan-2050). The State Health Development Program of the Republic of Kazakhstan "Densaulyk" for 2016 – 2019 is also important and it aims to solve such problems as:

- The fight against cancer through highly effective early diagnosis and treatment;
- Development of a close relationship between the work of specialized services (psychiatric, narcological, anti-tuberculosis, oncological, etc.) with organizations of primary health care;
- Development of a comprehensive plan for the fight against cancer, also consideration of the establishment of a scientific cancer center;
- Regulation of the procedure for determining a private partner and concluding a public private partnership agreement for individual partnership projects, including: the development of an oncological service with medical equipment (linear accelerators, computed tomography machines, magnetic resonance imaging scanners, etc.).
- As part of the integration of specialized services with primary care, oncology, mammology rooms, and other rooms are additionally opened in clinics (Densaulyk, 2016).

United Nations General Assembly 66/2 (2011) adopted a resolution on the Political Declaration of the General Assembly of the General Assembly on the Prevention and Control of Non-communicable Diseases, which contains a roadmap for national commitments made by Heads of State and Government to combat cancer and other non-communicable diseases (Political Declaration, 2013). Kazakhstan also adopted this resolution and the Government of the Republic of Kazakhstan on March 16, 2016 launched the implementation of the Roadmap for the implementation of an integrated model of cancer management in the Republic of Kazakhstan for 2016 - 2020 (Roadmap, 2016). As part of the introduction of an integrated model of medical care (regionalization) for

cancer, roadmaps and indicators of the quality of medical care have been developed, and the Coordination Council has been approved. The analysis of the state of medical organizations, an assessment of the needs of medical organizations in equipment and medical personnel by the levels of medical care by regions. The role and responsibility of specialized medical organizations in terms of monitoring, ensuring the effectiveness and quality of medical care at all levels are strengthened. According to the results of 2016, oncological (423), mammological (304), female (1725) and male viewing (756) rooms in Primary Health Care were additionally opened, updating of screening programs was suggested taking into account the opinions of regions and international experts (the number of identified malignant tumors as a result of screenings up to 7.9) (Analytical material, 2017).

In order to improve the quality of medical care through the effective formation and implementation of state policy, the implementation of intersectional coordination and state regulation, and the provision of health services, the Strategic Plan of the Ministry of Health of the Republic of Kazakhstan for 2017-2021 was adopted. This strategy considers the implementation of new innovative diagnostic and treatment technologies, in this regard, measures are being taken to increase the potential of about 14 thousand medical personnel (studying abroad, attracting foreign specialists, conducting master classes. Further training is also aimed at studying diagnostic methods, treatment, rehabilitation and prevention in key clinical areas, including oncology (Strategic plan, 2017).

Also in 2018, the Government adopted the Decree "On the approval of the Comprehensive Plan for the fight against cancer in the Republic of Kazakhstan for 2018 - 2022". This document is aimed at:
1) Prevention and management of cancer risk factors;
2) Highly effective early diagnosis;
3) Introduction of an integrated model of cancer care;
4) Development of human resources and science.

Prevention and management of cancer risk factors include activities such as:
- Awareness of the population about risk factors for the development of cancer and the promotion of the principles of a healthy diet, physical activity, smoking cessation, alcohol consumption, and others;
- Implementation of European Code Against Cancer recommendations 12 ways to prevent cancer. (European Code) in the educational process of organizations of secondary and higher education;
- Increase in coverage by vaccination against viral hepatitis "B" at least 95% of the target group;
- Informing about voluntary vaccination of adolescents from the human papillomavirus with coverage of at least 70% of adolescents aged 10 to 13 years;
- Monitoring the implementation of measures to reduce the effects of carcinogenic factors in the workplace;
- Monitoring the reduction of the effect of carcinogenic load on environmental objects (air, water, soil, food);
- Organization of events for cooperation with non-governmental organizations in terms of joint activities for the prevention and early diagnosis of cancer;

- Expanding and ensuring coverage of target groups from 70% and higher when conducting separate screening examinations (cervical cancer, breast cancer, colorectal cancer);
- Providing medical organizations with the necessary equipment for conducting in-depth diagnostics during screening studies for early detection of breast cancer (digital mammographs-5), colorectal cancer (endovirus-resistant with colonoscopies - 6).

The implementation and monitoring of the implementation of preventive measures is carried out by the Ministry of Health and local executive bodies of the Republic of Kazakhstan.

Highly effective early diagnosis includes the following measures:
- The organization of centers of positron emission tomography studies, as well as the availability and increase of these services;
- Retrofitting the Center for Nuclear Medicine of the Kazakh Scientific Research Institute of Oncology and Radiology with an expert class system - a gamma camera, and also provide oncology organizations / centers with the latest equipment;
- Expanding the availability of clinical diagnostic services for patients with suspected cancer;
- Organization and implementation of international teleconsultation of tumor biosamples through a telepathology system, etc.

The introduction of an integrated model of cancer care is aimed at:
- Improving the regulatory framework and financing mechanisms;
- Improving the quality of cancer care;
- Improving the organization of cancer care;
- Development of palliative care;
- Digitalization of cancer care (Complex plan, 2017).

The development of human resources and science provides for the training of primary health care workers in prevention, early diagnosis, palliative care, as well as methods for calculating the need for narcotic drugs and step-by-step anesthesia, the development of international scientific cooperation in the study of cancer, etc. (Comprehensive Plan). Thus, at present, according to the indicated documents, the issue of early diagnosis and treatment of cancer is taken under control by the Government of the Republic of Kazakhstan and directly by the Ministry of Health. In addition, according to state cancer control programs, the modern healthcare system of the Republic of Kazakhstan has set a number of tasks:
- Raising awareness of the main carcinogenic factors directly through the education of children and adolescents, teachers and educators;
- joint responsibility and active participation of the population in preventive anti-cancer measures;
- the introduction of personalized diagnosis and treatment of cancer;

- provision of a multidisciplinary approach to the provision of cancer care in multidisciplinary clinics in the system of compulsory medical insurance;
- active implementation of IT-technologies (telemedicine capabilities, "artificial intelligence" etc.);
- Promotion of scientific research in oncology (Complex plan, 2017).

Analyzing national regulations, preventive measures are mainly based on screening and diagnostic measures. Since 2011, timely diagnostics has grown from 49.5% to 58.5% in 2016. As a result, a decline in the proportion of neglected cases (late diagnosis) is observed from 14.4% in 2011 to 11.1% in 2016. The proportion of patients with stage I of the first identified in 2016 increased to 21.8% from 19.9% in 2015. Positive dynamics indicates an improvement in the situation as a whole and shows sufficient effectiveness of screening programs. Positive dynamics in the context of examination and oncology rooms allowed to increase timely diagnosis of cancer. In 2016, 36,998 patients with primary malignant neoplasms were identified, while the number of cancers detected passively decreased in self-reversal to 80.1% and active detection increased according to (Analytical material, 2017), however, screening has been performed since 30/40 . In the statistics of cancer patients, the number of children with cancer is growing every year. What specific preventive measures are provided for them are not exactly indicated in the state programs of Kazakhstan. Also in the course of the study, we found only a few mentions by citizens about their receipt of information on cancer prevention. The interviewed respondents from 18-30 years old, basically knew only screening procedures, and school knowledge about the dangers of tobacco and alcohol, and they were not aware of other factors influencing the development of methods for preventing cancer. In addition, despite government programs, the incidence rate of malignant neoplasms increased by 18% (2015 - 207.7, 2017 - 253.4) (Densaulyk, 2016).

4. Recommendation and Results

So overall a substantial proportion of cancers could be prevented, including all cancers caused by tobacco use and other unhealthy behaviors. According to a recent study by American Cancer Society researchers, at least 42% of newly diagnosed cancers in the US – about 740,000 cases in 2019 – are potentially avoidable, including the 19% of all cancers that are caused by smoking and the 18% that are caused by a combination of excess body weight, physical inactivity, excess alcohol consumption, and poor nutrition. Certain cancers caused by infectious agents, such as human papillomavirus (HPV), hepatitis B virus (HBV), hepatitis C virus (HCV), and Helicobacter pylori (H. pylori), could be prevented through behavioral changes or vaccination to avoid the infection, or treatment of the infection (Cancer Facts & Figures, 2019).

However, in the fight against cancer, prevention alone is not enough. Millions of people around the world will continue to develop cancer, because not all forms of cancer are preventable, their causes are multifactorial, and existing prevention strategies do not cover all populations. Therefore, diagnosis and treatment should be available, and early

detection of cancer should be a priority. The detection of cancer in the early stages makes it possible to carry out treatment, which, in general, is more effective, less complicated and, accordingly, cheaper (Guide to cancer early diagnosis, 2018).

The reasons for the increase in the number of cancer patients, as mentioned above, may be external and internal factors. In this regard, in order to intensify national action, the World Health Assembly in 2013 adopted a comprehensive global monitoring system that includes nine voluntary global goals to achieve by 2025:

1) 25% reduction in premature mortality from cardiovascular, cancer, chronic respiratory diseases and diabetes;
2) A relative reduction of at least 10% of harmful consumption of alcohol, as the case may be and taking into account the national context;
3) A relative increase of 10% in physical activity;
4) The relative reduction of 30% of the average consumption of salt / sodium by the population;
5) A relative 30% reduction in the current prevalence rate for tobacco use;
6) A relative 25% reduction in the prevalence of high blood pressure cases or a containment of the prevalence of high blood pressure cases, in accordance with national conditions;
7) Stopping the increase in diabetes and obesity;
8) Providing at least 50% of people with appropriate indications with appropriate drug therapy and counseling (including glycemic control) for the prevention of heart attacks and strokes;
9) Achievement of 80% of the availability of basic technologies and essential medicines (including generic drugs) necessary for the treatment of major non-communicable diseases in both private and public health institutions (Prevention and control of non-communicable diseases, 2013).

These nine recommendations of the WHO are aimed at citizens of all states, which can serve as a guarantee of a long and healthy life. The International Health Organization has also adopted the Global Action Plan for the prevention and control of non-communicable diseases, which provides for the prevention of non-communicable diseases and cancer. According to this document, cancer can be detected by:

- Prevention of liver cancer through hepatitis Bimmunization;
- Prevention of cervical cancer through screening (visual inspection with acetic acid [VIA] (or Pap smear (cervical cytology), if very cost-effective), linked with timely treatment of pre-cancerous lesions;
- Vaccination against human papillomavirus, as appropriate if cost-effective and affordable, according to national programs and policies;
- Population-based cervical cancer screening linked with timely treatment;
- Population-based breast cancer and mammography screening (50–70 years) linked with timely treatment;
- Population-based colorectal cancer screening, including through a fecal occult blood test, as appropriate, at age >50, linked with timely treatment;
- Oral cancer screening in high-risk groups (e.g. tobacco users, betel-nut chewers) linked with timely treatment (Global action plan, 2013). As mentioned above, preventive measures for the determination of cervical cancer, breast cancer and colorectal cancer are carried out in the framework of the national programs of Kazakhstan. However, monitoring and control over the implementation of the prevention and diagnosis of malignant neoplasms remains controversial, since year after year in Kazakhstan the number of oncological diseases is growing, and the mortality rate is very high.

5. Conclusion

Summing up, we can confidently say that Kazakhstan has adopted a number of legal acts to combat cancer, which took into account the recommendations of WHO. It must also be said that the treatment of cancer patients is carried out at the expense of the state budget. But despite these government measures, cancer mortality is very high. The state can significantly reduce the incidence of cancer by monitoring environmental emissions and working conditions at enterprises, monitoring food quality and introducing mandatory free vaccinations against infectious diseases.

It is difficult to expect significant success in the prevention of cancer only at the state level, in the fight against such an enemy as cancer - citizens need to work together with health authorities and adhere to a healthy lifestyle and maintain proper nutrition. Citizens need to take care of their health, not to use tobacco products and alcohol, to undergo regular medical examinations, since the key to a healthy and long life is in the hands of every person.

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Author Profile

ZH.T. Sayrambayeva- Professor,Head of the Department of International Law of al-Farabi Kazakh National University, Almaty, Kazakhstan.

A.B. Otarbayeva- Master of Law, Senior Lecturer of Department of International Law of al-Farabi Kazakh National University. Almaty, Kazakhstan. ResearcherID: T-9625-2017