Evaluation Changes in Indicators of Oncological Service in Colon Cancer in Kazakhstan

Askhat Axarin [1], Dulat Turebayev [2], Zaituna Khamidullina [3], Zhansaya Telmanova [4],

Gulnur Igissinova [5], Zarina Bilyalova [6], Zhanerke Azhetova [7], Serikbay Orozbaev [8],

Kuanish Kulayev [9], Kulsara Rustemova [10], Saken Kozhakhmetov [11], Nurbek Igissin [12]

[1] *Assistant of the Department of Surgical Diseases with courses of Cardiothoracic and maxillofacial surgery, Astana Medical University, Scientific worker at the Central Asian Institute for Medical Research, Postgraduate student of Akhunbaev Kyrgyz State Medical Academy, Bishkek, Kyrgyzstan. E-mail: aksarindoc@mail.ru*

[2] *Associate Professor of the Department of Surgical Diseases with courses in Angiosurgery and Plastic Surgery, Astana Medical University, Scientific worker at the Central Asian Institute for Medical Research, Astana, Kazakhstan. E-mail: tdk_1410@mail.ru*

[3] *Head of the Department of Obstetrics and Gynecology No.1, Astana Medical University, Astana, Kazakhstan.*
E-mail: zaituna59@gmail.com

[4] *Scientific worker at the Central Asian Institute for Medical Research, Scientific worker at the Eurasian Institute for Cancer Research, 7th year intern, Faculty of General Medical Practice, Astana Medical University, Astana, Kazakhstan. E-mail: telmanova.zhansaya@gmail.com*

[5] *Associate Professor of the Department of Oncology, Asfendiyarov Kazakh National Medical University, Senior research worker at the Central Asian Institute for Medical Research, Astana, Kazakhstan. E-mail: gulnurs@list.ru*

[6] *Chief Researcher of the Central Asian Institute for Medical Research, Astana, Kazakhstan. E-mail: z.bilyalova@gmail.com*

[7] *Associate Professor of the Department of Obstetrics and Gynecology, Astana Medical University, Scientific worker at the Central Asian Institute for Medical Research, Astana, Kazakhstan. E-mail: azhetova@mail.ru*

[8] *Associate Professor of the Department of Surgical Diseases with courses of Cardiothoracic and maxillofacial surgery, Astana Medical University, Scientific worker at the Central Asian Institute for Medical Research, Astana, Kazakhstan. E-mail: orazbaev_s.t@mail.ru*

[9] *Associate Professor of the Department of General Medical Practice No.1, Khoja Akhmet Yassawi International Kazakh-Turkish University, Scientific worker at the Central Asian Institute for Medical Research, Astana, Kazakhstan. E-mail: kulaev_k_t@mail.ru*

[10] *Professor of the Department of Surgical Diseases with courses of Cardiothoracic and maxillofacial surgery, Astana Medical University, Senior research worker at the Central Asian Institute for Medical Research, Astana, Kazakhstan. E-mail: rustemovak@mail.ru*

[11] *Head of the Department of Surgical Diseases with courses of Cardiothoracic and maxillofacial surgery, Astana Medical University, Senior research worker at the Central Asian Institute for Medical Research, Astana, Kazakhstan. E-mail: uanas_ko@mail.ru*

[12] *Head of Central Asian Institute for Medical Research, Prof. at the Department of Surgical Diseases with courses of Cardiothoracic and maxillofacial surgery, Astana Medical University, Vice President of the Eurasian Institute for Cancer Research, Bishkek, Kyrgyzstan.*
E-mail: n.igissinov@gmail.com

Abstract

According to World Health Organization (2020), about 1.148.515 new cases of colon cancer (CC) are registered annually. Colorectal cancer currently (2020) ranks fourth (9.4%) in the structure of cancer incidence in Kazakhstan. At the same time, about 4.9% of new cases of all registered cases of cancer annually account for CC.

__The purpose of the study__ was to evaluate some indicators of the oncological service of Kazakhstan on CC in 2010-2019.

__Methods.__ The material of study was the data of the Ministry of Health of the Republic of Kazakhstan – annual Form No. 7 and 35 concerning CC (ICD 10 – C18) for 2010-2019 – morbidity, mortality, early diagnosis, neglect, morphological verification. A retrospective study using descriptive and analytical methods of biomedical statistics was used as the main method.

__Results.__ In 2010-2019, 15.834 new cases of CC and 7.694 deaths from this pathology were registered in Kazakhstan. CC incidence tended to increase from $8.3\pm0.2^0/_{0000}$ (2010) to $8.8\pm0.2^0/_{0000}$ in 2019 (p=0.077). In dynamics, mortality rates from CC tended to decrease from $4.9\pm0.2^0/_{0000}$ (2010) to $3.9\pm0.1^0/_{0000}$ in 2019 (p=0.000). The study reveals a trend: the indicators of early diagnosis (the proportion of patients with stage I-II) improved from 31.4% (2010) to 57.4% in 2019, and, accordingly, the proportion of neglected patients decreased significantly with stage III (from 49.4% to 29.2%) and with stage IV (from 18.7% to 12.8%). Morphological verification indicators for CC improved by 34.2%, from 85.2% and 95.2%, respectively, in 2010 and 2019.

__Conclusions.__ Positive changes in the indicators of the oncological service were revealed: an increase in the proportion of morphological verification and early detection, a decrease in the proportion of patients with stage III-IV at the time of diagnosis and a decrease in mortality from CC. All this indicates a positive effect of the anti-cancer measures used, such as screening for CRC.

__Keywords__: colon cancer, incidence, mortality, early diagnosis, neglect, morphological verification.

Introduction

According to World Health Organization (WHO) data (2020), about 1.148.515 new cases of colon cancer (CC) are registered annually (59.5% of the CRC). The incidence in the world is 11.4 per 100.000 people, while the incidence in men is $13.1^0/_{0000}$, and in women $10.0^0/_{0000}$ [1]. The number of cancer patients is growing all over the world, while the incidence and mortality from CRC are higher in countries with a high level of development [2]. It is becoming an important and growing problem for most Asian countries, and there is an increase in morbidity and mortality throughout the region, while in some countries there has recently been a decline in indicators [1].

According to the forecast, the incidence of CC will grow and by 2040 the number of new cases will reach 1.92 million registered cases annually. In particular, in Asia, the number of new cases will increase from 569 thousand (2020) to 1.0 million new cases annually (2040) [1]. Colorectal cancer (9.4%) currently (2020) ranks fourth in the structure of oncological morbidity in Kazakhstan. At the same time, about 4.9% of new cases of all registered cases of cancer belong to colon cancer every year. In Kazakhstan, the incidence of CRC per 100.000 people has increased by 11.7% and mortality from CRC has decreased by 20.9% over the past decade (2010-2019). These improvements in incidence of and mortality from CRC are thought to be a result of cancer prevention and earlier diagnosis through screening and better treatment modalities. Nevertheless, the average annual crude incidence ($17.1\pm0.3^0/_{0000}$) and mortality was high ($8.7\pm0.2^0/_{0000}$) [3]. Also, in previous studies on the incidence and mortality from colorectal cancer, it was found that Kazakhstan belongs to regions with high rates [4,5]. Which, in turn, means insufficient screening coverage and untimely treatment.

Organized CRC screening has been recommended by the Asia Pacific Colorectal Cancer Working Group in regions with an age-standardized incidence rate above 30 per 100.000 population, targeting average-risk persons and those aged 50-75 years with quantitative fecal immunochemical test (FIT) [6]. The screening modalities of CRC include the non-invasive fecal occult blood tests targeting either heme (guaiac fecal occult blood test (gFOBT) or human hemoglobin (FIT) and the invasive endoscopy-based investigations (flexible sigmoidoscopy and total colonoscopy) for making a diagnosis.

Colorectal screening has been implemented in Kazakhstan since 2011. Screening for CRC in Kazakhstan is carried out in two stages, the first stage is a hemocultivation test, and if the results are positive, the next stage is a total colonoscopy. Patients aged 50-70 years of both sexes are subject to screening. Generally, early diagnosis and removal of cancerous or precancerous lesions can significantly cut down CRC incidence and mortality. Early colon cancer and precancerous adenomatous polyps are usually asymptomatic, which makes it difficult to detect them and serves as the basis for mass screening of adults over 50 years of age [7]. Many factors are associated with abnormal division and growth of colon epithelial cells. Abnormal growth will eventually develop into cancer. Patients are usually admitted to the hospital with symptoms of colon obstruction or bleeding [8]. Older colon cancer patients have a lower cancer survival rate than younger patients. Factors reflecting the timeliness of cancer diagnosis have the greatest impact on age differences in survival in colon cancer, probably influencing the treatment strategy [9,10]. Due to the high risk of adverse outcomes associated with the treatment of elderly patients, efforts made to improve early diagnosis in elderly patients are likely to help reduce age differences in colon cancer survival.

The purpose of this study was to evaluate some indicators of the oncological service of Kazakhstan on CC in 2010-2019.

Materials and methods

Cancer registration and patient recruitment. The research material included the data obtained from the annual forms No. 7 & 35 of the Ministry of Healthcare of the Republic of Kazakhstan on CC (ICD 10 – C18) for 2010-2019 on incidence, mortality, early detection, neglect, and morphological verification.

Population denominators. Population denominators for calculation of incidence rates were provided by the Bureau of National Statistics. At the same time, data on the number of populations of the republic, taking into account the studied regions, are used, all data are presented on the official website [11].

Statistical analysis. The main method used in the study of incidence was a retrospective study using descriptive and analytical methods of oncoepidemiology. ASRs were calculated for eighteen different age groups (0-4, 5-9, …, 80-84, and 85+) using the world standard population proposed by WHO with recommendations [12] from the National Cancer Institute (2013).

The extensive, crude (CR) and age-specific incidence rates (ASIR) are determined according to the generally accepted methodology used in sanitary statistics. The annual averages (M, P), mean error (m), Student criterion, 95% confidence interval (95% CI), and average annual upward/downward rates (T, %) were calculated. We did not justify the main calculation formulas in paper, since they are detailed in the textbooks on statistics [13,14]. Trends were determined using the least squares method, and the average annual growth rates were calculated using the geometric mean. Viewing and processing of the received materials was carried out using the Microsoft 365 software package (Excel, Word, PowerPoint), in addition, online statistical calculators were used [15], where Student criterion was calculated when comparing the average values.

Ethics approval. Because this study involved the analysis of publicly available administrative data and did not involve contacting individuals, consideration and approval by an ethics review board was not required. At the same time, the submitted data is in accordance with the Law of the Republic of Kazakhstan No. 257-IV of March 19, 2010 "About State statistics" [16], the information in the summary report is confidential and can only be used for statistical purposes in accordance with the Principles of the World Medical Association [17].

Results

In 2010-2019, 15.834 new CC cases and 7,694 deaths from this pathology were registered in the Republic of Kazakhstan. The average annual crude incidence over the study years was $8.6\pm0.1^0/_{0000}$ (95% CI=8.3-8.9). The crude CC incidence rate increased from $8.3\pm0.2^0/_{0000}$ in 2010 to $8.8\pm0.2^0/_{0000}$ in 2019, with a statistically significant difference (t=1.77, p=0.077). The CC mortality rate decreased statistically significantly (t=4.47. p=0.000), from $4.9\pm0.2^0/_{0000}$ in 2010 to $3.9\pm0.1^0/_{0000}$ in 2019. The average annual crude mortality was $4.4\pm0.1^0/_{0000}$ (95% CI=4.2-4.7). Figure 1 shows trends in equalized crude incidence and mortality from CC in Kazakhstan.

The average annual equalized CC incidence increase was equal to T=+1.0%, at the average annual mortality decrease of T=−2.5% (Figure 1).
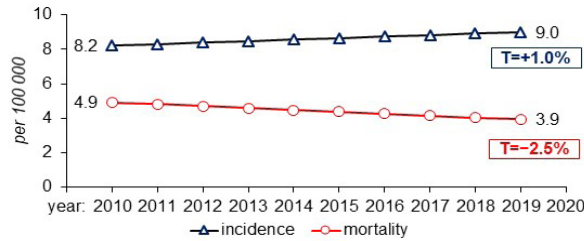

Figure 1 - Trends of incidence and mortality rates from CC in Kazakhstan, 2010-2019

The trends in equalized incidence rates by stage showed an increase in stage I-II CC incidence and a decrease in stage III and IV incidence (Figure 2).
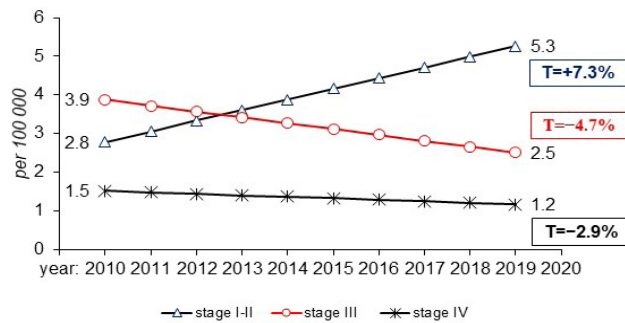

Figure 2 - Trends in equalized CC incidence rates by disease stage in Kazakhstan, 2010-2019

Over time, the share of patients with stages I-II CC increased from 31.4% in 2010 to 57.4% in 2019 (Figure 3), with an average annual increase in the equalized rate of T=+6.4%.

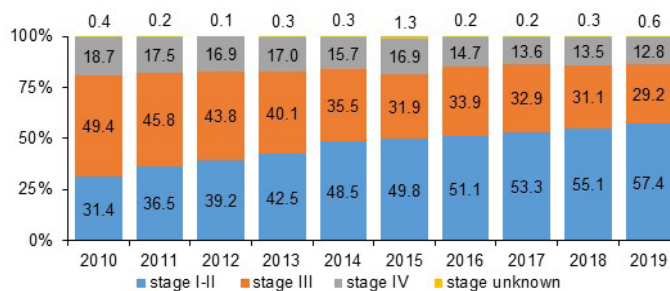The share of patients with stage III CC decreased from 49.4% in 2010 to 29.2% in 2019 (Figure 3), with an average annual decrease in the equalized rate of T=−5.8%. Over time, the share of patients with stage IV CC decreased from 18.7% in 2010 to 12.8% in 2019 (Figure 3), with an average annual decrease in the equalized rate of T=−3.9%.

Figure 3 - The dynamics of CC early detection (stage I-II) and neglect (stage III and IV) in Kazakhstan, 2010-2019

During the study period, morphological verification in CC improved, from 85.2% to 95.2% (Figure 4).

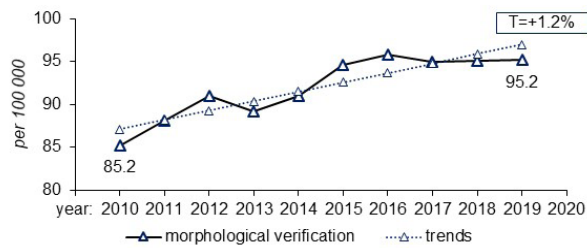The adjusted morphological verification indicators tended to increase T=+1.2% (Figure 4).

Figure 4 - The dynamics of CC morphological verification in Kazakhstan, 2010-2019

Discussion

CRC has a rapidly growing trend in Asia and survival rates from this disease mainly depend on the stage of the disease at the time of diagnosis. Survival rates range from 90% 5-year survival rate for cancer detected at a localized stage, and 70% for regional cancer, to 10% for people diagnosed with distant metastatic cancer [18]. Screening for colon cancer has become one of the great successes in cancer prevention. It is believed that the decrease in mortality from colon cancer in recent years is associated with the use and recognition of screening. Screening for colon cancer is somewhat unique because it is largely prevention and also provides early detection [19]. Screening of asymptomatic persons is recommended by national and worldwide guidelines. Colon cancer screening can include several approaches, including analysis of hidden blood in the stool using several methods, screening using one of several imaging methods, and colonoscopy. Colonoscopic polypectomy has reduced CRC mortality by reducing CRC [20], and FOBT has reduced long-term CRC mortality, primarily by detection of early-stage CRC [21]. A steady decrease in mortality from colorectal cancer supports the effect of polypectomy. These results confirm the point of view about the progression of colorectal adenomas to adenocarcinoma, as well as the existing practice of searching for and removing adenomatous polyps for the prevention of colorectal cancer.

In our study, it was found that after the introduction of screening measures, the incidence of colon cancer increases, and mortality decreases. Also in Italy, the FIT population screening program revealed lower mortality rates, while morbidity peaked during the implementation of the program, and then returned to the baseline level [22]. The screening program in California, using annual FIT and colonoscopy, allowed to achieve more than 80% of participation, which led at the beginning to an increase in the incidence of CRC, and then to a decrease in morbidity and mortality and the progressive stage of the disease [23]. In Japan, after the introduction of screening measures, there was a decrease in mortality from colorectal cancer by almost 70% in screened subjects compared with those

who did not undergo screening [24]. The initial increase in the incidence of colorectal cancer, associated with a rapid increase in screening rates, was largely due to the wider detection of cancer in the early stages.

According to the studies of Zhylkaidarova et al, with the introduction of screening, there is a steady increase in the proportion of localized cancers (stage II) due to a reduction in locally common cases (stage III) [25]. In our study, we also found an increase in detection in the early stages of the disease over the past 10 years. In previous studies (from 2004 to 2014), an increase in the specific gravity of stages I-II was revealed by more than 2 times due to a decrease in the specific gravity of stage III-IV of the disease [26]. This trend also continues during the period of our study (2010-2019). However, there was no stable dynamics of growth in the proportion of stage I-II from 2004 to 2010, while in our study the growth trend was stable from 2010 to 2019, which is most likely due to the introduction of population-based colorectal cancer screening in 2011. Nevertheless, despite the introduction of colorectal cancer screening in 2011, the increase in the incidence rate also indicates the continuing influence of adverse etiological factors.

The biggest obstacle to achieving a reduction in mortality from CRC is the low level of participation in screening. As in other parts of Asia, there is an increase in the incidence of CRC in Kazakhstan. Given that this disease is controllable through screening, efforts should be made to increase the level of participation. Apparently, the key issue of reducing the barrier to screening visits is to increase public awareness of the disease and the benefits of screening.

The obtained data shows that Kazakhstan follows the global trend of growth in CC incidence. At the same time, we can observe positive changes in the cancer service indicators: a growing share of morphological verification and early detection, reducing share patients with stage III-IV at diagnosis, and reduction in the CC mortality rate. All this evidence the positive effect of anti-cancer measures taken in the Republic, such as CRC screening.

Conclusions

1. In the Republic of Kazakhstan, over the study years, the absolute number of people with newly diagnosed CC has increased by 23.3%. CC incidence per 100.000 has increased by 5.9% over the decade. At that, the incidence of stage I CRC was growing, and the incidence of stage III-IV was decreasing.

2. In 2010-2019, the absolute number of deaths from CC in Kazakhstan decreased by 9.6%. The mortality from CC per 100.000 has decreased by 20.3% over the decade.

3. In the study period, the number of patients with stages I-II at diagnosis has added 119.6%, with stage III – lost 28.9%, with stage IV – lost 17.9%. In general, there was a positive trend in the early detection and reduction of neglect.

Conflict of interest. The authors declare no conflict of interest.

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Қазақстандағы тоқ ішек обыры кезіндегі онкологиялық қызмет көрсеткіштерінің өзгерістерін бағалау

Аксарин А. [1], Туребаев Д. [2], Хамидуллина З. [3], Тельманова Ж. [4], Игисинова Г. [5], Билялова З. [6], Ажетова Ж. [7], Орозбаев С. [8], Кулаев К. [9], Рустемова К. [10], Кожахметов С. [11], Игісін Н. [12]

[1] Кардиоторакалды және жақ-бет хирургиясы курстарымен хирургиялық аурулар кафедрасының ассистенті, Астана медицина университеті, Астана, Қазақстан; Central Asian Institute for Medical Research ғылыми қызметкері; Ахунбаев атындағы Қырғыз мемлекеттік медицина академиясының аспиранты, Бішкек, Қырғызстан. E-mail: aksarindoc@mail.ru

[2] Ангиохирургия және пластикалық хирургия курстары бар хирургиялық аурулар кафедрасының доценті, Астана медицина университеті; Central Asian Institute for Medical Research ғылыми қызметкері, Астана, Қазақстан.
E-mail: tdk_1410@mail.ru

[3] №1 Акушерлік және гинекология кафедрасының меңгерушісі, Астана медицина университеті, Астана, Қазақстан.
E-mail: zaituna59@gmail.com

[4] Жалпы дәрігерлік практика факультетінің интерні, Астана медицина университеті, Астана, Қазақстан; Eurasian Institute for Cancer Research ғылыми қызметкері, Бішкек, Қырғызстан. E-mail: telmanova.zhansaya@gmail.com

[5] Онкология кафедрасының доценті, С.Д. Асфендияров атындағы Қазақ ұлттық медицина университеті, Алматы, Қазақстан; Central Asian Institute for Medical Research аға ғылыми қызметкері, Астана, Қазақстан. E-mail: gulnurs@list.ru

[6] Central Asian Institute for Medical Research бас ғылыми зерттеушісі, Астана, Қазақстан. E-mail: z.bilyalova@gmail.com

[7] Акушерлік және гинекология кафедрасының доценті, Астана медицина университеті, Central Asian Institute for Medical Research ғылыми қызметкері, Астана, Қазақстан. E-mail: azhetova@mail.ru

[8] Кардиоторакалды және жақ-бет хирургиясы курстарымен хирургиялық аурулар кафедрасының доценті, Астана медицина университеті, Central Asian Institute for Medical Research ғылыми қызметкері, Астана, Қазақстан.
E-mail: orazbaev_s.t@mail.ru

[9] №1 жалпы дәрігерлік практика кафедрасының доценті, Халықаралық қазақ-түрік университеті; Central Asian Institute for Medical Research ғылыми қызметкері, Астана, Қазақстан. E-mail: kulaev_k_t@mail.ru

[10] Кардиоторакалды және жақ-бет хирургиясы курстарымен хирургиялық аурулар кафедрасының профессоры, Астана медицина университеті, Central Asian Institute for Medical Research аға ғылыми қызметкері, Астана, Қазақстан.
E-mail: rustemovak@mail.ru

[11] Кардиоторакалды және жақ-бет хирургиясы курстарымен хирургиялық аурулар кафедрасының меңгерушісі, Астана медицина университеті, Central Asian Institute for Medical Research аға ғылыми қызметкері, Астана, Қазақстан.
E-mail: uanas_ko@mail.ru

[12] Central Asian Institute for Medical Research басшысы, Кардиоторакалды және жақ бет хирургиясы курстарымен хирургиялық аурулар кафедрасының профессоры, Астана медицина университеті, Астана, Қазақстан; Eurasian Institute for Cancer Research вице-президенті, Бішкек, Қырғызстан. E-mail: n.igissinov@gmail.com

Түйіндеме

Дүниежүзілік денсаулық сақтау ұйымының мәліметтері бойынша (2020 ж.) жыл сайын шамамен 1 148 515 тоқ ішек қатерлі ісігінің (ТІҚІ) жаңа жағдайлары тіркеледі. Колоректальды обыр қазіргі уақытта (2020 жыл) Қазақстанда онкологиялық аурулар құрылымында төртінші орында (9,4%) тұр. Сонымен қатар, жыл сайын қатерлі ісік ауруының барлық жағдайларының шамамен 4,9%-ы ТІҚІ-не келеді.

Зерттеудің мақсаты. Қазақстанда тоқ ішек обыры кезіндегі онкологиялық қызметтің 2010-2019 жж. кейбір көрсеткіштерін бағалау.

Әдістері. Зерттеу материалы Қазақстан Республикасы Денсаулық сақтау министрлігінің 2010-2019 жылдардағы ТІҚІ (АХЖ 10 – С18) қатысты №7 және 35 жылдық нысандары – сырқаттанушылық, өлім-жітім, ерте диагностика, қараусыздық, морфологиялық верификация деректері болды. Негізгі әдіс ретінде биомедициналық статистиканың сипаттамалық және аналитикалық әдістерін қолдана отырып, ретроспективті зерттеу қолданылды.

Нәтижесі. 2010-2019 жылдары республикада ТІҚІ-нің 15 834 жаңа жағдайы және осы патологиядан 7 694 өлім тіркелді. ТІҚІ-нен сырқаттанушылық 2019 жылы 8,3±0,2⁰/₀₀₀₀ (2010 ж.) - ден 8,8±0,2⁰/₀₀₀₀-ге дейін өсті (р=0,077). Динамикада ТІҚІ-нен болатын өлім-жітім көрсеткіші 2019 жылы 4,9±0,2⁰/₀₀₀₀ (2010 ж.) - дан 3,9±0,1⁰/₀₀₀₀-ға дейін (р=0,000) төмендеу үрдісіне ие болды. Зерттеу кезінде мынадай үрдіс анықталды: ерте диагностика көрсеткіштері (I-II кезеңдегі науқастардың үлес салмағы) 2019 жылы 31,4%-дан (2010 ж.) 57,4%-ға дейін жақсарды және тиісінше асқынған III саты (49,4%-дан 29,2%-ға дейін) және IV сатыдағы (18,7%-дан 12,8%-ға дейін) науқастардың үлес салмағының көрсеткіштері айтарлықтай азайды. ТІҚІ кезінде морфологиялық верификация көрсеткіштері тиісінше 2010 жылдан 2019 жылға дейін 34,2%-ға, атап айтқанда 85,2%-дан 95,2%-ға дейін жақсарды.

Қорытынды. Онкологиялық қызмет көрсеткіштерінде оң өзгерістер анықталды: морфологиялық верификация және ерте анықтау үлесінің өсуі, диагноз қою кезінде III-IV сатысы бар пациенттер үлесінің төмендеуі және ТІҚІ-нен болатын өлімнің төмендеуі. Мұның бәрі скрининг сияқты қолданылатын қатерлі ісікке қарсы шаралардың оң әсерін көрсетеді.

Түйін сөздер: тоқ ішек қатерлі ісігі, сырқаттанушылық, өлім-жітім, ерте диагностика, қараусыздық, морфологиялық верификация.

Оценка изменений показателей онкологической службы при раке толстой кишки в Казахстане

Аксарин А. [1], Туребаев Д. [2], Хамидуллина З. [3], Тельманова Ж. [4], Игисинова Г. [5], Билялова З. [6], Ажетова Ж. [7], Орозбаев С. [8], Кулаев К. [9], Рустемова К. [10], Кожахметов С. [11], Игісін Н. [12]

[1] *Ассистент кафедры хирургических болезней с курсами кардиоторакальной хирургии и челюстно-лицевой хирургии, Медицинский университет Астана; Научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан; Аспирант Кыргызской государственной медицинской академии имени Ахунбаева, Бишкек, Кыргызстан. E-mail: aksarindoc@mail.ru*

[2] *Доцент кафедры хирургических болезней с курсами ангиохирургии и пластической хирургии, Медицинский университет Астана; Научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан. E-mail: tdk_1410@mail.ru*

[3] *Заведующая кафедрой акушерства и гинекологии №1, Медицинский университет Астана, Астана, Казахстан. E-mail: zaituna59@gmail.com*

[4] *Научный сотрудник Central Asian Institute for Medical Research, Интерн факультета общей врачебной практики, Медицинский университет Астана, Астана, Казахстан; Научный сотрудник Eurasian Institute for Cancer Research, Бишкек, Кыргызстан. E-mail: telmanova.zhansaya@gmail.com*

[5] *Доцент кафедры онкологии, Казахский Национальный медицинский университет имени С.Д. Асфендиярова, Алматы, Казахстан; Старший научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан. E-mail: gulnurs@list.ru*

[6] *Главный исследователь Central Asian Institute for Medical Research, Астана, Казахстан. E-mail: z.bilyalova@gmail.com*

[7] *Доцент кафедры акушерства и гинекологии, Медицинский университет Астана; Научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан. E-mail: azhetova@mail.ru*

[8] *Доцент кафедры хирургических болезней с курсами кардиоторакальной хирургии и челюстно-лицевой хирургии, Медицинский университет Астана; Научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан. E-mail: orazbaev_s.t@mail.ru*

[9] *Доцент кафедры общей врачебной практики №1, Международный Казахско-Турецкий университет имени Ходжи Ахмета Ясави, Туркестан, Казахстан; Научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан. E-mail: kulaev_k_t@mail.ru*

[10] *Профессор кафедры хирургических болезней с курсами кардиоторакальной хирургии и челюстно-лицевой хирургии, Медицинский университет Астана; Старший научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан. E-mail: rustemovak@mail.ru*

[11] *Заведующий кафедрой хирургических болезней с курсами кардиоторакальной хирургии и челюстно-лицевой хирургии, Медицинский университет Астана; Старший научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан. E-mail: uanas_ko@mail.ru*

[12] *Руководитель Central Asian Institute for Medical Research; Профессор кафедры хирургических болезней с курсами кардиоторакальной хирургии и челюстно-лицевой хирургии, Медицинский университет Астана, Астана, Казахстан; Вице президент Eurasian Institute for Cancer Research, Бишкек, Кыргызстан. E-mail: n.igissinov@gmail.com*

Резюме

По данным Всемирной организации здравоохранения (2020 год) в мире ежегодно регистрируется около 1 148 515 новых случаев рака ободочной кишки (РОК). Колоректальный рак в настоящее время (2020 год) занимает четвертое место (9,4%) в структуре онкологической заболеваемости в Казахстане. В то же время около 4,9% новых случаев из всех зарегистрированных случаев рака ежегодно приходится на РОК.

Цель исследования: оценить некоторые показатели онкологической службы при раке ободочной кишки в Казахстане за 2010–2019 гг.

Методы. Материалом исследования послужили данные Министерства здравоохранения Республики Казахстан – годовая форма № 7 и 35, касающиеся РОК (МКБ 10 – С18) за 2010–2019 гг. – заболеваемость, смертность, ранняя диагностика, запущенность, морфологическая верификация. В качестве основного метода использовалось ретроспективное исследование с применением дескриптивных и аналитических методов медико-биологической статистики.

Результаты. За 2010–2019 гг. в республике было впервые зарегистрировано 15 834 новых случаев РОК и 7 694 смертей от данной патологии. Заболеваемость РОК имела тенденцию к росту с $8,3\pm0,2^0/_{0000}$ (2010 г.) до $8,8\pm0,2^0/_{0000}$ в 2019 году (p=0,077). В динамике показатели смертности от РОК имели тенденцию к снижению с $4,9\pm0,2^0/_{0000}$ (2010 г.) до $3,9\pm0,1^0/_{0000}$ в 2019 году (p=0,000). При исследовании изучаемого периода выявляется тенденция: показатели ранней диагностики (удельный вес больных с I-II стадией) улучшились с 31,4% (2010 г.) до 57,4% в 2019 году, и соответственно показатели удельного веса запущенных больных значительно уменьшились с III стадией (с 49,4% до 29,2%) и с IV стадией (с 18,7% до 12,8%). Показатели морфологической верификации при РОК улучшились на 34,2%, с 85,2% и 95,2% соответственно в 2010 и 2019 годах.

Выводы. Были выявлены положительные изменения в показателях онкологической службы: рост доли морфологической верификации и раннего выявления, снижение доли пациентов с III–IV стадией на момент постановки диагноза и снижение смертности от РОК. Все это свидетельствует о положительном эффекте применяемых противораковых мер, таких как скрининг на КРР.

Ключевые слова: рак ободочной кишки, заболеваемость, смертность, ранняя диагностика, запущенность, морфологическая верификация.