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THE IMPACT OF COVID-19 ON THE INCIDENCE OF RECTAL CANCER IN KAZAKHSTAN: RESULTS OF COMPONENT ANALYSIS

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ABSTRACT

Relevance: *Every year, 732,210 new cases of RC are registered globally, with an incidence of 7.6 per 100,000. The COVID-19 pandemic has affected the screening, case detection, and referral of patients with an asymptomatic cancer diagnosis.*

The aim was to *assess the trends in rectal cancer incidence in the entire population of Kazakhstan before and during the COVID pandemics.*

Methods: *The data obtained from the Ministry of Healthcare of the Republic of Kazakhstan concerning RC (Form no. 7) was retrospectively studied by descriptive and analytical epidemiology methods. The component method was used to analyze RC incidence dynamics based on the number of cases from 2010 to 2020.*

Results: *From 2010 to 2020, the risk of getting RC went down. An increase in incidence in 2010-2020 (+24.8%) was lower than in the preCOVID period of 2010-2019 (+37.2%). We found a sharp decrease in RC incidence from 2019 to 2020. The overall decrease was 0.89‰ due to changes in the age structure of the population ($\sum\Delta_A$=+0.13‰), the risk of getting RC ($\sum\Delta_R$=−1.02‰), and the combined impact of age structure and the risk of getting RC ($\sum\Delta_{AR}$=−0.002‰). According to the component analysis, 1,662 patients with RC were expected in 2020; instead, only 1,471 cases were registered. Such a decline in cases was mainly due to a reduced risk of getting RC.*

Conclusions: *The analysis of RC incidence trends in Kazakhstan shows a negative impact of COVID-19 on cancer care indicators and effectiveness. All oncological examinations were strengthened with the resumption of work after COVID restrictions. However, the number of screening visits remains lower than in previous years. Untimely diagnosis can increase the number of cases of late-stage CRC and an overall loss of years of life due to the lack of proper treatment. However, these forecasts can be mitigated by proper follow-up.*

Keywords: *rectal cancer (RC), incidence, trends, COVID-19, Kazakhstan.*

Introduction: According to the latest WHO data (2020), colorectal cancer (CRC) is the 3rd most common globally, with an incidence of 19.5 per 100,000. The number of patients with rectal cancer (RC) was 732,210 cases, with an incidence of 7.6 per 100,000 [1]. RC differs from colon cancer due to the narrow anatomical boundaries of the pelvis, the proximity of the genitourinary organs and nerves, and the mechanism of the anal sphincter. The 5-year survival rate in general for RC (all stages) is about 53%, and unfortunately, it remains low, despite progress in diagnostic and therapeutic measures [2].

Population screening plays an essential role in detecting pathology and increasing morbidity rates. The COVID-19 pandemic has affected the screening, case detection, and referral of patients with symptomatic cancer [3]. National professional societies have issued recommendations (the American Society of Clinical Oncology, the American Society of Breast Surgeons, the American College of Radiology, and the American Society of Colposcopy and Cervical Pathology) to postpone regular cancer screening until medical institutions resume preventive visits [4-6]. Patients with well-recognized alarming symptoms, such as rectal bleeding, will continue to seek primary care. However, when COVID-19 is at the forefront, patients may not pay due attention to the vague primary symptoms of cancer, such as fatigue, changes in bowel function, and weight loss [7]. Years before the pandemic, the rates of population screening for CRC among adults with an average age-appropriate risk increased [8]. During the pandemic, an analysis of national cancer screening schemes revealed a sharp 86% drop in the rates for CRC screening [9].

In a recent study on CRC incidence in Kazakhstan, it was found that the incidence is 16.9 per 100,000 population and tends to increase [10]. Therefore, there is an interest in studying each section of the large intestine separately.

The study aimed to assess the trends in rectal cancer incidence in the entire population of Kazakhstan before and during the COVID-19 pandemics (2020).

Material and Methods: The material of the study was the data of the Ministry of Health (MoH) of the Republic of Kazakhstan concerning RC (Form no. 7). The retrospective study employed descriptive and analytical methods of epidemiology. The component method in this study was used to decompose the increase in the number of cases in the same population in different periods. There are seven components of the increase in the number of cases; the first three are associated with changes in the population,

its age structure, and a combined impact of these factors. The 4th component is an actual increase in the number of patients with oncological pathology due to a change in the morbidity risk index only. The other three components are associated with the risk of getting a malignant neoplasm, population growth, changes in its age structure, and the impact of all these three factors. Thus, the last four components are associated with an increase in the risk of developing the disease. The "risk of getting sick" covers the whole range of reasons that can increase, decrease, or stabilize morbidity rates [11]. The component method was used to analyze the dynamics of RC incidence based on the number of cases registered in 2010-2019, 2010-2020, and 2019-2020. Extensive and intensive indicators were calculated using the generally accepted methods of biomedical statistics [12, 13]. The annual averages (M), mean error (m), 95% confidence interval (95% CI), and average annual upward/downward rates (T%) were calculated.

The following symbols and abbreviations were used in this article: AN – absolute number; ASP (Δ_A) – the age structure of the population; PN (Δ_P) – population number; RAI (Δ_R) – risk of getting RC; R^2 – the value of the approximation confidence; I – the incidence; ‰ – percent mille.

Results: During the study period (2010-2020), 15,552 new cases of RC were registered in the country. RC's annual average incidence in Kazakhstan amounted to 8.1±0.2‰ (95% CI=7.8-8.3) per 100,000 population. Over time, the index increased from 7.2±0.2‰ (95% CI=6.8-7.6) in 2010 to 7.8±0.2‰ (95% CI=7.4-8.2) in 2020, with a statistically significant difference (t=2.12; p=0.034) (Figure 1).

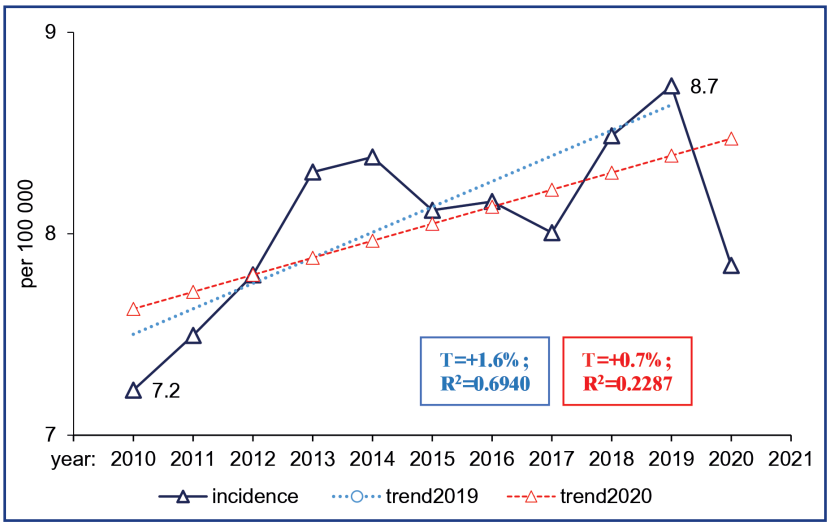

Figure 1 – Trends of RC incidence in Kazakhstan, 2010-2020

To identify the components that influenced the incidence of RC during this period, we will analyze the pre-COVID-19 period (2010 to 2019), the COVID-19 period (2019 and 2020), and the entire period in general (2010 to 2020) (see Table 1).

Table 1 – Influencing components on the number of cases of RC, 2010-2020

Components of growth in the number of cases due to:	2010 to 2019			2010 to 2020			2019 to 2020		
	AN	%, growth		AN	%, growth		AN	%, growth	
		to (n_2-n_1)	to n_1		to (n_2-n_1)	to n_1		to (n_2-n_1)	to n_1
1. Growth PN. $\Delta_P = \frac{N_1 - N_2}{N_1} n_1$	+158	+36.2	+13.4	+176	+60.2	+14.9	+21	+14.5	+1.3
2. Changes ASP. $\Delta_A = \frac{N_1}{N_2}(E(n_2) - n_2 - \Delta_H$	+126	+28.8	+10.7	+141	+48.2	+11.9	+23	+16.0	+1.4
3. Combined effect of changes in PN+ASP. $\Delta_{PA} = \frac{N_2 - N_1}{N_1} \Delta_A$	+17	+3.9	+1.4	+21	+7.2	+1.8	+0.3	+0.2	0.0
	Σ_{1-3} = +68.9	Σ_{1-3} = +25.6		Σ_{1-3} = +115.6	Σ_{1-3} = +28.6		Σ_{1-3} = +30.7	Σ_{1-3} = +2.8	
4. Change of RAI. $\Delta_R = N_1(P_2^c - P_1^c) \times 10^{-5}$	+85	+19.4	+7.2	-51	-17.5	-4.3	-188	-128.8	-11.6
5. Combined effect of changes of RAI+PN. $\Delta_{RP} = \frac{N_2 - N_1}{N_1} \Delta_R$	+11	+2.6	+1.0	-8	-2.6	-0.6	–2	-1.7	-0.2
6. Combined effect of changes of RAI+ASP. $\Delta_{RA} = \frac{N_2 - N_1}{N_1} \Delta_R$	+35	+8.0	+3.0	+11.3	+3.9	+1.0	–0.3	-0.2	0.0
7. Combined effect of the changes RAI+PN+ASP. $\Delta_{RAP} = \frac{N_1}{N_2}(n_2 - n_1 - \Sigma_{x=1}^{5})$	+5	+1.1	+0.4	+1.7	+0.6	+0.1	0.0	0.0	0.0
	Σ_{4-7} = +31.1	Σ_{4-7} = +11.6		Σ_{4-7} = -15.6	Σ_{4-7} = -3.9		Σ_{4-7} = +130.7	Σ_{4-7} = -11.8	
Total Σ_{1-7}	+438	100.0	+37.2	+292	100.0	+24.8	-146	100.0	-9.0

The total increase in the pre-COVID-19 period was +1.51‰ and depended on the changes in the age structure of the population ($\Sigma\Delta_A$=+0.77‰), the risk of getting RC ($\Sigma\Delta_R$=+0.52‰), and the combined impact of the age structure and the risk of getting RC ($\Sigma\Delta_{AR}$=+0.22‰). At the same time, the average annual growth rate of the aligned indicator was T=+1.6%, and the approximation confidence value was close to 1 (R^2=0.694).

According to the calculations of the component analysis (2010-2019), considering all the above factors, 1,481 patients were expected in 2019. Still, the actual number of patients amounted to 1,617. The number of patients with RC in Kazakhstan grew from 2010 to 2019. After the component analysis, we attributed the growth in the number of patients mainly to the population growth, changes in the age structure, and changes in the risk of getting RC (see Table 1).

If we analyze the period from 2010 to 2020 (Table 1), we can see an increase in the number of patients but an apparent decrease in the risk of getting RC. An increase of cases by 24.8% was lower compared to an increase of 37.2% in 2010-2019.

Further comparing 2019 and 2020, we found that the incidence of RC has decreased dramatically. The total decrease was -0.89‰ and depended on changes in the age structure of the population ($\Sigma\Delta_A$=+0.13‰), the risk of getting RC ($\Sigma\Delta_R$=-1.02‰) and the combined impact of the age structure and the risk of getting RC ($\Sigma\Delta_{AR}$=-0.002‰). As you can see, the decrease was mainly affected by a lower risk of getting RC.

According to the calculations of the component analysis, 1,662 patients were expected in 2020. Instead, the number of patients decreased and amounted to 1,471. Thus, the RC incidence has decreased due to a lower risk of getting this disease (-11.6% of the total decrease by -9.0%) (see Table 1).

Discussion: Non-urgent laboratory and imaging tests and scheduled procedures were suspended worldwide to help medical institutions cope with the COVID-19 outbreak, avoid overloading the healthcare system, save resources, and reduce the risk of transmission [14]. Fear of infection could promote many deaths due to delays in diagnosing life-threatening diseases. These restrictions have also been introduced in our republic. As a result, as it turned out in our study, the number of detected cases of RC decreased in 2020. There is data on a significant decrease in the number of patients undergoing cancer screening tests; respectively, the number of subsequent diagnoses of cancerous and precancerous lesions during the COVID-19 pandemic was reduced [15-18].

Conclusion: Thus, the analysis of trends in rectal cancer incidence in Kazakhstan shows the negative impact of COVID-19 on the indicators and effectiveness of the cancer care service since the number of newly identified cases has decreased and the incidence declined. Ultimately, a decrease in the number of people undergoing screening might lead to delayed detection of precancerous lesions and CRC, thus increasing CRC incidence or the proportion of later stages at detection. With the resumption of work after the restrictions associated with COVID-19, all cancer screenings were intensified. However, the number of cancer screening visits remains significantly lower than in the previous years. The long-term consequences of a delay in diagnostics can lead to a devastating increase in the number of cases of late-stage CRC and an overall loss of years of life due to the lack of appropriate treatment for these patients. However, these forecasts can be mitigated if proper catch-up surveys are carried out.

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COVID-19-дың ДЫҢ ҚАЗАҚСТАНДАҒЫ ТІК ІШЕК ОБЫРЫНА ӘСЕРІ: КОМПОНЕНТТІК ТАЛДАУ НӘТИЖЕЛЕРІ

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ТҰЖЫРЫМ

Өзектілігі: *Жыл сайын тік ішек обырымен ауыратын 732 210 жағдай тіркеледі, сырқаттанушылық 100 000 адамға 7,6 құрайды. COVID-19 пандемиясы скринингке, жағдайларды анықтауға және асимптоматикалық қатерлі ісік диагнозы бар науқастарды бағыттауға әсер етті.*

Зерттеудің мақсаты *– COVID-пандемиясы басталғанға дейін және оның кезеңінде Қазақстан тұрғындары арасында тік ішек обырының сырқаттанушылық динамикасын бағалау.*

Әдістері: *Зерттеу материалы Қазақстан Республикасы Денсаулық сақтау министрлігінің тік ішек обырына қатысты деректері (7-нысан) болды. Ретроспективті зерттеуде эпидемиологияның сипаттамалық және аналитикалық әдістері қолданылды. Компоненттік әдіс 2010 жылдан 2020 жылға дейін болған жағдайлардың санына негізделген тік ішек қатерлі ісігінің динамикасын талдау үшін қолданылды.*

Нәтижелер: *2010-2020 жылдардағы деректерді талдай отырып, біз тік ішек обырымен ауру қауіпінің айқын төмендеуін анықтадық. 2010 жылдан бастап 2020 жылға дейін байқалған сырқаттанушылықтың өсуі (+24,8%) ковид алды 2010-2019 жылдарға (+37,2%) қарағанда төмен болды. Әрі қарай, біз 2019 жылдан 2020 жылға дейін тік ішек обырымен сырқаттанушылықтың күрт төмендегенін байқадық. Жалпы төмендеу −0,89‰₀₀₀ болды және халықтың жас құрылымының өзгеруіне (∑ΔA = +0,13‰₀₀₀), ауру қаупі (∑ΔR = -1,02‰₀₀₀) және жас құрылымы мен ауру қаупінің жиынтық әсері (∑ΔAR = -0,002‰₀₀₀) байланысты болды. Компоненттік талдау есептеулеріне сәйкес, 2020 жылы 1662 тік ішек обыры бар науқас күтілген, бірақ оның орнына пациенттер саны 1471 болды. Аталған жағдайлар санының төмендеуі тік ішек обырымен ауру қаупінің төмендеуімен байланысты болды.*

Тұжырымдар: *Осылайша, Қазақстанда тік ішек обырымен сырқаттанушылық динамикасын талдау COVID-19-дың онкологиялық қызметтің көрсеткіштері мен тиімділігіне теріс әсерін көрсетеді. COVID-19-ға байланысты шектеулерден кейін жұмысты қайта бастаған кезде барлық онкологиялық тексерулер күшейтілді. Алайда, қатерлі ісік скринингіне бару саны алдыңғы жылдарға қарағанда едәуір төмен болып қала береді. Диагноздың кешігуі тоқ ішек қатерлі ісігінің соңғы кезеңдерінің ұлғаюына және осы науқастарда тиісті емнің болмауына байланысты өмір сүру ұзақтығының жалпы төмендеуіне әкелуі мүмкін. Дегенмен, егер тиісті бақылау жүргізілсе, бұл болжамдарды жақсартуға болады.*

Түйінді сөздер: *тік ішек қатерлі ісігі, сырқаттанушылық, тренд, Covid-19, Қазақстан.*

ВЛИЯНИЕ COVID-19 НА ЗАБОЛЕВАЕМОСТЬ РАКОМ ПРЯМОЙ КИШКИ В КАЗАХСТАНЕ: РЕЗУЛЬТАТЫ КОМПОНЕНТНОГО АНАЛИЗА

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АННОТАЦИЯ

Актуальность: *Ежегодно в мире регистрируется 732 210 новых случаев рака прямой кишки (РПК), заболеваемость составляет 7,6 на 100 000. Пандемия COVID-19 повлияла на скрининг, выявление случаев заболевания и направление пациентов с бессимптомным диагнозом рака.*

Цель исследования *– оценить динамику заболеваемости населения Казахстана раком прямой кишки до и во время пандемии COVID-19.*

Методы: *В ретроспективном исследовании данных Министерства здравоохранения Республики Казахстан о новых случаях РПК, полученных из формы №7, использовались описательные и аналитические методы эпидемиологии. Для анализа динамики заболеваемости на основе количества случаев заболевания с 2010 по 2020 год был использован компонентный метод.*

Результаты: *Анализируя данные за 2010-2020 гг., мы обнаружили явное снижение риска заболевания РПК. Рост заболеваемости, наблюдавшийся с 2010 по 2020 гг. (+24,8%), был ниже, чем в доковидном периоде 2010-2019 гг. (+37,2%). Далее, мы обнаружили резкое снижение заболеваемости РПК с 2019 по 2020 гг. Общее снижение составило −0,89‰₀₀₀ и зависело от изменений в возрастной струк-*

туре населения (∑ΔA=+0,13‰), риска заболевания (∑ΔR=−1,02‰) и совокупного влияния возрастной структуры и риска заболевания (∑ΔAR=−0,002‰). Согласно расчетам компонентного анализа, в 2020 году ожидалось 1662 пациента с РПК, но вместо этого число пациентов составило 1471. Указанное снижение числа случаев произошло в основном из-за влияния риска заболевания РПК.

Заключение: *Таким образом, анализ динамики заболеваемости раком прямой кишки в Казахстане свидетельствует о негативном влиянии пандемии на показатели и эффективность работы онкологической службы. С возобновлением работы после ограничений, связанных с COVID-19, все онкологические обследования были усилены. Тем не менее, количество посещений для скрининга рака остается значительно ниже, чем в предыдущие годы. Несвоевременная диагностика может привести к увеличению числа случаев поздних стадий КРР и общей потере лет жизни из-за отсутствия надлежащего лечения этих пациентов. Однако эти прогнозы можно смягчить, если проводить надлежащее последующее наблюдение.*

Ключевые слова: *рак прямой кишки (РПК), заболеваемость, тренды, COVID-19, Казахстан.*

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