



## Cancer Incidence During The Covid-19 Pandemic In A Middle Anatolian City In Turkey

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### Research Article

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#### ABSTRACT

**Objective:** Cancer-related deaths in all countries of the world, including our country, are the second leading cause of deaths after cardiovascular diseases. Covid-19 is a pandemic disease affecting many organs but primarily the lung. The aim of this study is to compare the cancer incidences in the pre-Covid-19 period and during Covid-19 pandemic period in Sivas province by means of age, gender and cancer type distribution of the patients.

**Methods:** The population of the study consists of the patients who applied to health institutions in Sivas between 01.11.2018 and 30.06.2021 and were diagnosed as cancer for the first time. The main variable of the study was cancer incidence. The time variable was the 16-monthtime period comprising before Covid-19 pandemic and during the pandemic period separately. In addition, patients diagnosed with cancer in both periods were evaluated and compared according to age groups, gender and the type of cancer.

**Results:** In this study, the pre-pandemic period and the pandemic period were compared. It was determined that 1355 patients were diagnosed as cancer during the pre-pandemic period and 1720 patients during the pandemic period. The incidence, which was 212.1 per hundred thousand in the previous period, increased to 270.5 per hundred thousand during the 16-month pandemic period.

**Conclusion:** The incidence of cancer increased during the pandemic period compared to the pre-pandemic period.

**Keywords:** Incidence, cancer, Covid-19, epidemiology

## Türkiye'de Bir Orta Anadolu Şehrinde Covid-19 Pandemisinde Kanser İnsidansı

#### Süreç

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#### Öz

**Amaç:** Ülkemiz de dahil olmak üzere dünyanın tüm ülkelerinde kansere bağlı ölümler, kardiyovasküler hastalıklardan kaynaklanan ölümlerden sonra ikinci sırada gelmektedir. Covid-19, başta akciğer olmak üzere birçok organı etkileyen pandemik bir hastalıktır. Bu çalışmanın amacı, pandemi öncesi dönem ile pandemi döneminde Sivas ilinde görülen kanserlerin insidanslarının incelenmesi, kanser hastalarının yaş, cinsiyet ve kanser tipine göre dağılımlarının karşılaştırılmasıdır.

**Yöntemler:** Araştırmanın evrenini 01.11.2018-30.06.2021 tarihleri arasında Sivas ilindeki sağlık kuruluşlarına başvuran ve ilk kez kanser tanısı alan hastalar oluşturmaktadır. Araştırmanın ana değişkeni kanser insidansdır. Zaman değişkeni, Covid-19 pandemisinden önceki ve pandemi dönemini ayrı ayrı kapsayan 16 aylık zaman dilimidir. Ayrıca her iki dönemde de kanser tanısı alan hastalar değerlendirilerek yaş grupları, cinsiyet ve kanser türüne göre karşılaştırılmıştır.

**Bulgular:** Bu çalışmada pandemi öncesi dönem ile pandemi dönemi karşılaştırıldı. Pandemi öncesi dönemde 1355 hastaya, pandemi döneminde ise 1720 hastaya kanser teşhisi konduğu belirlendi. Bir önceki dönemde yüz binde 212,1 olan insidans, 16 aylık pandemi döneminde yüz binde 270,5'e yükseldi.

**Sonuç:** Pandemi döneminde, pandemi öncesi döneme göre kanser insidansında artış olduğu bulunmuştur.

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**Anahtar sözcükler:** insidans, kanser, Covid-19, epidemiyoloji

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## Introduction

SARS-CoV-2 is a pandemic virus that causes disease by transmitting from person to person and affects many organs, especially the lung <sup>1</sup>. On January 30, 2020, World Health Organization (WHO) declared the COVID-19 epidemic in Wuhan as an emergency of international concern and used the term pandemic, a major public health problem, on March 11, 2020, in order to emphasize the seriousness of the situation and called all countries to go in to action for Covid-19 pandemic<sup>2</sup>. The first Covid-19 case in Turkey was seen on March 11, 2020 <sup>3</sup>. Since this date, many applications have been put into practice by Turkish government to control Covid-19 pandemic and try to stop its spread in Turkey. Curfew were declared, schools were closed, events such as wedding, shows, meetings were banned and national and international flights were stopped. In health services, practices such a selective cases were suspended and many hospitals were redefined as pandemic hospitals<sup>4</sup>. On the other hand, cessation of screening programs in the provision of health services and reduction in the capacities of hospitals other than pandemic hospitals in many countries, the refusal of nearly 40% of adults in admission to health institutions because of Covid-19 concerns as in the USA have caused delays in the diagnosis and treatment of many diseases <sup>5</sup>. Cancer patients were one of the groups that couldn't benefit from health services and whose treatment was adversely affected during the Covid-19 pandemic.

Cancer is a disease caused by the disorganised division and uncontrolled proliferation of cells in an organ or tissue and is an important public health problem today <sup>6</sup>. Cancer-related deaths takes place in the second row after the deaths due to cardiovascular diseases, respectively; 17.9 million and 9.3 million <sup>7</sup>. In studies conducted in many European countries, it has been shown that the number of patients who received chemotherapy and also the number of patients diagnosed with new cancer decreased during the Covid-19 pandemic <sup>8</sup>. In Turkey, there is no study covering all cancer types on this respect, but some studies that were performed in short time intervals and limited to some cancer types showed an increase or decrease in the diagnosis and treatment during the pandemic period. There are publications showing this change in the direction of decrease. In a study involving 109 radiation oncology departments in the country, it was stated that new patient admissions decreased by 50% in the first two months of the pandemic <sup>9</sup>. Data from an oncology hospital showed that hospitalizations and surgeries due to head and neck cancer increased in the first three months of the pandemic compared to the same period a year ago <sup>10</sup>.

The aim of this study is to determine the incidence of cancer in the pandemic period and compare it with the pre-pandemic period in Sivas province. It is also to

compare the characteristics of the patients diagnosed in both periods.

## Method

In this descriptive study, population consisted of the patients who applied to health institutions and were newly diagnosed as cancer in Sivas, between 01.11.2018 and 30.06.2021 (n=3075). Ethical approval was obtained from non-interventional ethics committee of Sivas Cumhuriyet University, with the approval number of 2021-08/20 on 19.08.2021. Afterwards, necessary permissions were obtained from Sivas Cumhuriyet University Hospital Pathology Department, Cancer Registry Unit, Numune Hospital Pathology Laboratory and Health Directorate Cancer Registry Unit, and the data of patients diagnosed with new cancer in the specified periods were accessed. Patients diagnosed with cancer in the past were not included in the study. The 16-month period before the Covid-19 pandemic (01.11.2018-29.02.2020) was considered as pre-pandemic period and the period between 01.03.2020-30.06.2021 was considered as pandemic period. The main variable of the study is cancer incidence. The incidence was calculated by dividing the number of patients newly diagnosed with cancer in both periods by the population of Sivas province. The population of Sivas province in the pre-pandemic period (2019) was 638,956, and the population in the pandemic period (2020) was 635,889 <sup>11</sup>. The other variables are month of diagnosis, age groups (0-17, 18-44, 45-64, 65-79, 80 and above), gender and type of cancer (lung, brain, colorectum, corpus uteri, skin, lymphoma, breast, bladder, stomach, ovary, prostate, thyroid, cervix uteri, soft tissue and others).

## Data analysis

Data were analyzed with SPSS-22 (SPSS INC., Chicago, IL, USA) statistical program. Categorical data were presented with number and percentage. Incidence and characteristics of the cases were compared with the chi-square test. The rate of change in the number of cases was calculated for each cancer type (the numerical difference between the pandemic and pre-pandemic period divided by the number of pre-pandemic period and multiplied by 100).

## Results

When the pre-pandemic and the pandemic period were compared according to the number of the patients with first time diagnoses; it was seen that 1355 patients were diagnosed with cancer in the pre-pandemic period and 1720 patients during the pandemic period. The incidence, which was 212.1 per hundred thousand in the previous period, increased to 270.5 per hundred thousand during the 16-month pandemic period ( $p < 0.001$ ) (Table 1).

Table 1. Number and incidence of cancer cases by periods

Period	Number of cases	Incidence (per hundred thousand)	P
Pre-pandemic period	1355	212.1	<0.001
Pandemic period	1720	270.5	

Table 2. Age group and gender distribution of cancer cases by periods

	Pre-pandemic period(n=1355)		Pandemic period(n=1720)		P
	n	%	n	%	
Gender					0.930
Male	751	55.4	956	55.6	
Female	604	44.6	764	44.4	
Age group					0.694
0-17	3	0.2	7	0.4	
18-44	204	15.1	244	14.2	
45-64	557	41.1	698	40.6	
65-79	484	35.7	645	37.5	
80 and older	107	7.9	126	7.3	

When the distribution of cancers seen in the pre-pandemic and the pandemic period according to gender was evaluated, 55.4% of pre-pandemic cancers were seen in men and this rate increased slightly to 55.6% during the pandemic (p=0.930) (Table 2). When the distribution of cancer cases according to age groups was evaluated, it is noteworthy that cancer was most common in the age group of 45-64 years in

both periods (41.1% and 40.6% respectively). Second common group was the 65-79 age group in both periods (Table 2). During the pandemic period, the proportion of 0-17 and 65-79 years of age were increased slightly when compared to the previous period, while the proportion of other age groups decreased slightly, but the differences were not statistically significant (p=0.694).

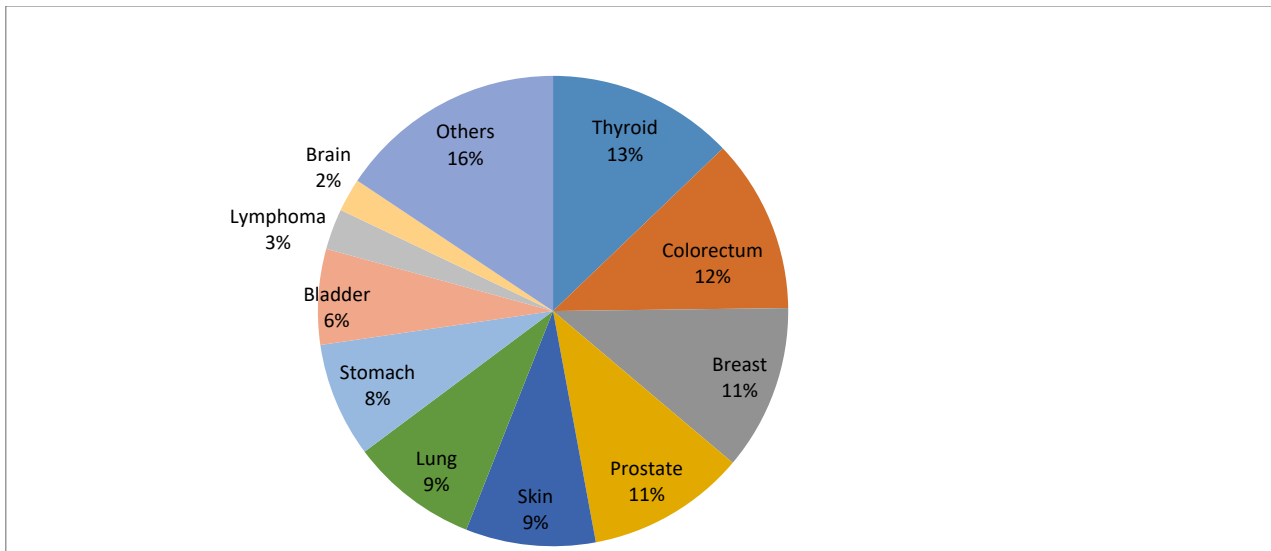


Figure 1. Most common cancers in both sexes in the pre-pandemic period

The most common cancer types in the pre-pandemic period were as follows: thyroid (13.0%), colorectum(12.0%), breast(11.4%), prostate(11.0%), skin(9.0%), lung(8.9%), stomach(8.4%), bladder (6.1%), lymphoma(3.4%) , brain (2.8%) cancers (Figure 1). On the other hand, in the pandemic period the most

common cancer types were found as follows: breast(13.4%), skin(12.4%), colorectum (10.2%), lung (10.2%), bladder (8.2%), stomach (8.0%), thyroid (7.4%), prostate (7.2%), lymphoma (5.3%), corpusuteri (2.2%) is soft tissue(2.2%) (Figure 2).

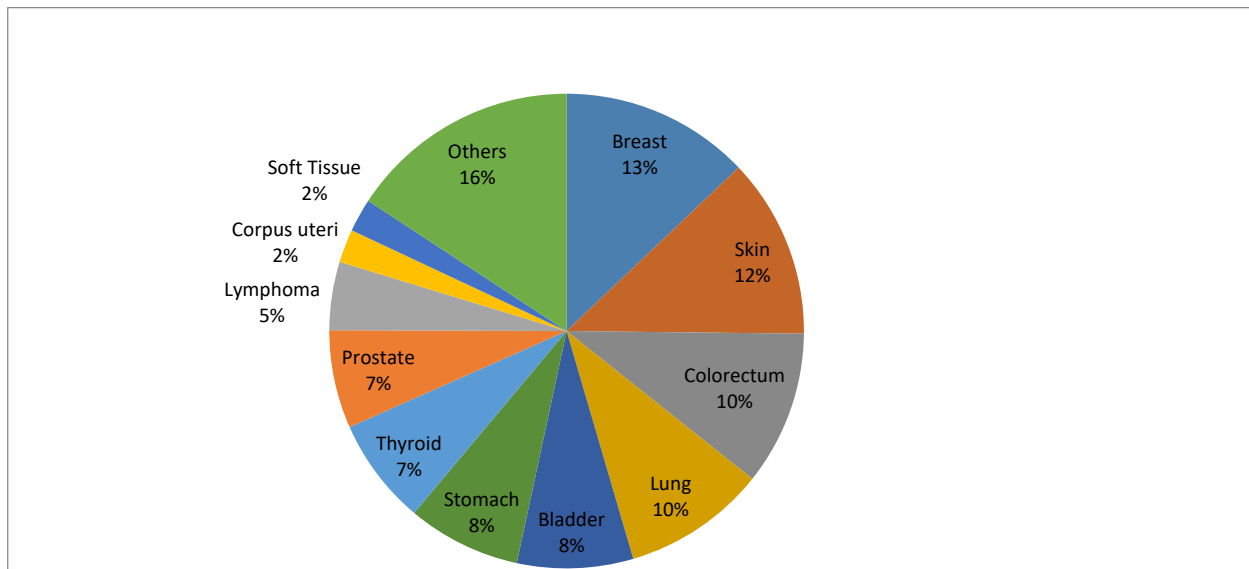


Figure 2. Most common cancers in both sexes in the pandemic period

Table 3. Number of cases by cancer types in the pre-pandemic and pandemic periods

Type	Pre-pandemic (n)	Pandemic (n)	Difference(%)
Thyroid	174	125	- 28.1
Colorectum	162	181	11.7
Breast	154	222	44.1
Prostate	148	115	- 22.2
Skin	121	211	74.3
Lung	119	168	41.1
Stomach	107	133	24.2
Bladder	89	136	52.8
Lymphoma	38	80	110.5
Brain	31	32	3.2
Corpus uteri	26	39	50.0
Soft Tissue	20	39	95.0
Others	166	239	43.9
Total	1355	1720	26.9

Compared to the pre-pandemic period, only the number of thyroid and prostate cancer cases

decreased in the pandemic period, while the number of the other tumor types were increased. (Table 3).

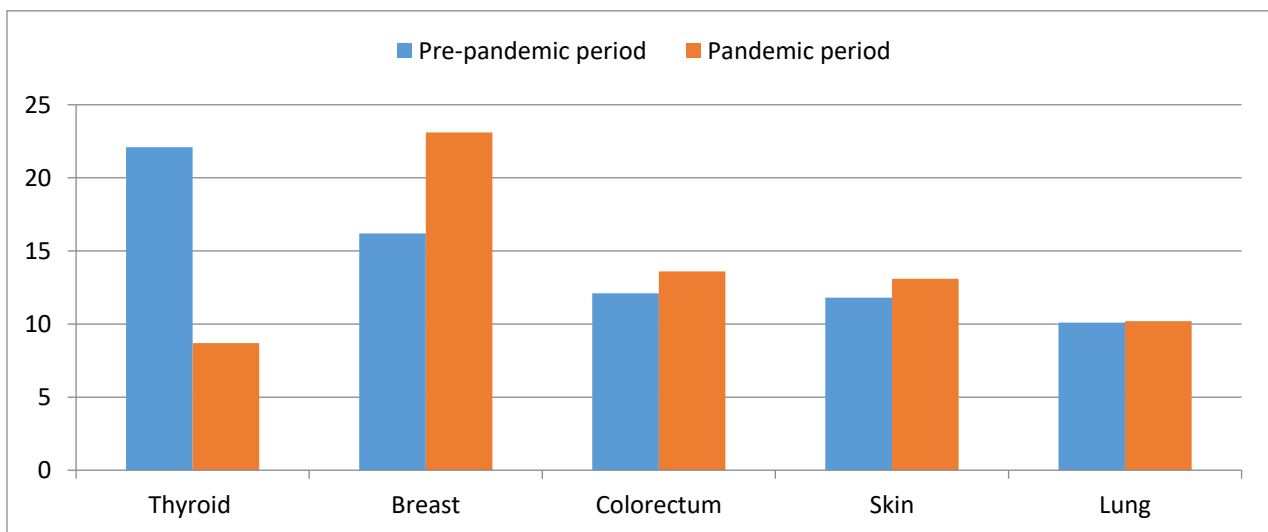


Figure 3. The most common cancers in women in the pre-pandemic and the pandemic period.

The five most common cancers in women in the pre-pandemic period were thyroid (22.1%), breast (16.2%), colorectum (12.1%), skin (11.8%), lung (10.1%) cancers. During the pandemic period, this

order has changed and the order were as follows: breast (23.2%), colorectum (13.6%), skin (13.1%), lung (10.2%), thyroid (8.7%) (Figure 3).

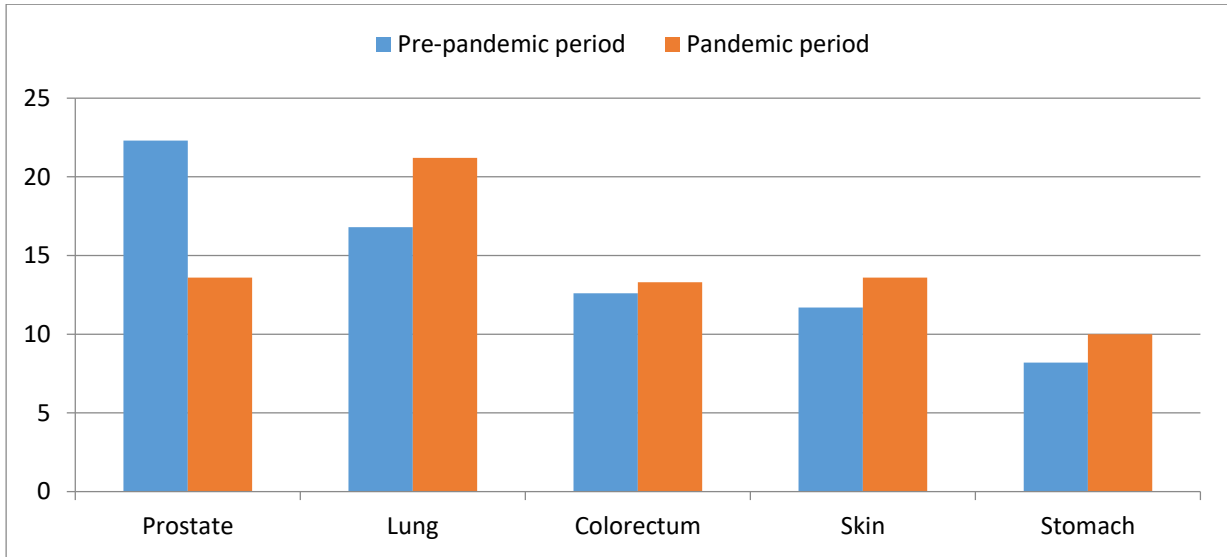


Figure 4. The most common cancers in men in the pre-pandemic and pandemic period.

In male patients, cancer types in the pre-pandemic period ordered as prostate (22.3%), lung (16.8%), colorectum (12.6%), skin (11.7%), stomach (8.2%), cancers. This order changed during the pandemic

period as lung (21.2%), prostate (13.6%), skin (13.6%), colorectum (13.3%), stomach (10.0%) cancers (Figure 4).

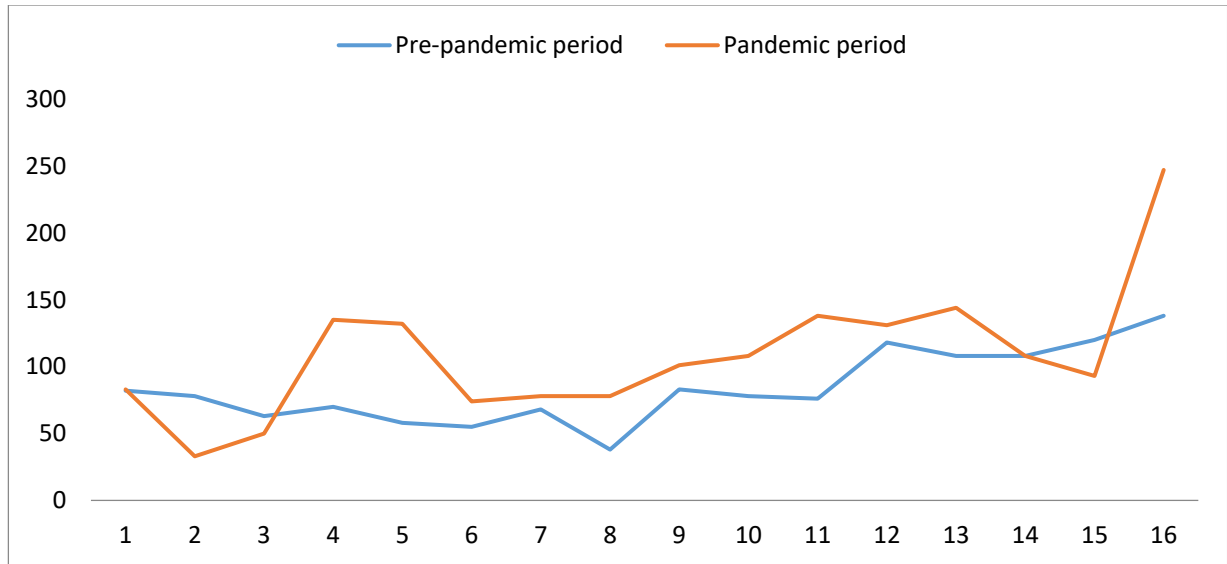


Figure 5. Number of cancer cases by months in the pre-pandemic and pandemic periods

In the pre-pandemic period there was no significant increase or decrease between October 2018 and September 2019, where as the number of newly diagnosed cases increased between October 2019 and February 2020. In the pandemic period, it

was seen that the number of newly diagnosed cases decreased in March to May 2020 then started to rise in June-July 2020 and continued with ups and downs until May 2021, and started to rise again in June 2021 (Figure 5).

## Discussion

In this study, it was found that the incidence of cancer increased in the pandemic period compared to the pre-pandemic period. However, when the 16-month period was analyzed in details, differences were observed. In 2020 there was a decrease in the number of patients diagnosed with new cancer especially during the period of social isolations, but the data obtained a year later in 2021 showed that the number of cancers diagnosed has increased when compared with 2020. Despite the increase in cancer cases as a whole during the pandemic period, the number of newly diagnosed thyroid and prostate cancer cases seemed to be decreased. There are not enough satisfactory studies about 2021 in the literature. However as some studies pointed out that there is an increase in the number of patients having new cancer diagnosis during the pandemic period rather than a decrease, it can be supposed that there will be an increase in both cancer patients and cancer-related deaths in the coming periods<sup>12-13-14</sup>.

Public health policies implemented in many parts of the world during the Covid-19 pandemic period have caused a reduction in the number of applications to hospitals. In many studies, it has been reported that there is a decrease in the number of cancers and this is due to the practices such as the cancellation of screening programs, curfews and quarantine. In a study conducted in France it has been found that especially during quarantine and curfew periods the number of applications to hospitals decreased by around 40% compared to 2019 and 2018 and the number of patients diagnosed with new cancer in 2020 decreased by 16.3% compared to 2018<sup>12</sup>. In another study performed in the Netherlands, it was pointed out that there was a 25% decrease in the number of patients diagnosed with cancer during the pandemic period. It is stated that this decrease is due to the fact that people cannot receive health services due to change in health policies<sup>13</sup>. Similarly, another study performed in Northern Ireland and the United Kingdom revealed the fact that 45-66% decrease in the number of patients receiving chemotherapy during the pandemic, and a 70-89% reduction in referrals for early cancer diagnosis<sup>14</sup>. The decrease in the initial cancer rates detected in this study was thought to be related to the isolation period.

Globocan 2018 world data stated that most common cancer types in the pre-pandemic period were found as lung, breast, prostate, colorectum and skin cancers<sup>15</sup>. On the other hand, when we look at the Globocon 2018 Turkey data, the most common cancer types were lung, breast, colorectum, prostate and thyroid cancers in Turkey<sup>16</sup>. According to the pre-pandemic data obtained in 2019, thyroid, colorectum, breast, prostate and skin cancers were the most common cancers, so our results are seemed to be compatible with literature results, except the fact that

thyroid cancer is at first rank and lung cancer is out of the top five cancer type. In our study, thyroid cancer which occupying the first rank as the most common cancer type may be considered to be an endemic condition<sup>17</sup>. According to the results obtained from our study, it is seen that lung cancers are among the five most common cancers in both men and women.

In Globocan 2020 pandemic period data, breast, lung, colorectal, prostate and stomach cancers were the most common cancer types in the world<sup>18</sup>. In the same data, the most common cancer types in Turkey were found as lung, breast, colorectal, prostate and thyroid cancers<sup>19</sup>. In our study, we found that the most common cancers during the pandemic period were ordered as breast, skin, colorectum, lung and bladder. According to Globocon data, it is stated that the ranking of the most common cancers in the world during the pandemic period has changed when compared with pre-pandemic period so that, while lung cancer was the most common in the pre-pandemic period, it has fallen to the second rank after breast cancer. Our data was found as similar to the literature.

According to Globocan 2018 world data, the most common cancers in men were found as lung, prostate, colorectum, stomach and liver cancers in the pre-pandemic period<sup>15</sup>. In Globocon 2018 Turkey data, the most common cancers in men were lined as lung, prostate, bladder, colorectum and stomach cancers<sup>16</sup>. According to the results obtained in our study, in the pre-pandemic period, the most common cancer types in men were found as prostate, lung, colorectal, skin and stomach cancers so our data was compatible with the literature, except for skin cancers. When the cancer types in women were analysed according to Globocon 2018 world data, it was seen that the most common cancer types in women were breast, colorectum, lung, thyroid and corpus uteri<sup>15</sup>. Globocon 2018 data revealed that the most common cancers in women in Turkey were breast, thyroid, colorectum, lung and corpus uteri<sup>16</sup>. In our study, the most common cancers in the pre-pandemic period were compatible with the data of the both world and Turkey (thyroid, breast, colorectum, skin and lung), except for skin cancers.

In Globocon 2020 data related with the pandemic period, the most common cancers in men in the world are found as lung, prostate, colorectum, stomach and liver cancers<sup>18</sup>. On the other hand, the most common cancers in men in Turkey were lung, prostate, colorectum, bladder and stomach cancers<sup>19</sup>. In our study, the most common cancers in men during the pandemic period were lung, prostate, skin, colorectum and stomach cancers and the rank order was found to be compatible with the data of both the world and Turkey, except for skin cancers. Globocon 2020 data showed that most common cancers in women are breast, thyroid, colorectum, lung, cervix uteri cancers<sup>18</sup>. The same Globocon 2020 data also revealed the



most common types of cancer in women as the breast, thyroid, colorectum, lung and corpus uteri cancers in Turkey<sup>19</sup>. On the other hand our study determined that the most common cancer types in women diagnosed with cancer were breast, colorectal, skin, lung, and thyroid cancer.

In the present study our results determined that the most common type of cancer during the pandemic period was breast cancer. A study conducted in England compared the first six months of 2019 with the first six months of 2020; it was found that the number of patients with suspected breast cancer in the first six months of 2020 was 28% less<sup>20</sup>. It is thought that this situation can be explained by stopping the scanning programs. In our study, it was determined that there was an increase in breast cancers during the pandemic period. However, the first two months of social isolation was the period with the lowest diagnosis.

In the present study we found are markable increase in lung cancer cases. Unlike this finding, a study conducted in Spain showed that there was a 38% decrease in diagnoses during the pandemic<sup>21</sup>. In our study, it is seen that there is an increase in lung cancer in the years 2020-2021, except during the periods of social isolation and curfews. It should be considered that the increase in lung cancers may be diagnosed incidentally because of the application of Computed Tomography (CT) used in the clinical diagnosis of Covid-19.

In our study, clinical results revealed a decrease in prostate cancer cases during the pandemic period compared to the pre-pandemic period. It is thought that the reasons for this may be a decrease in the patient capacity of urology out patient clinics or decrease in the number of (tru-cut) prostate biopsies performed for the diagnosis of prostate cancer or the postponement of the procedures<sup>22</sup>.

We found that thyroid cancer cases during the pandemic period were seemed to decrease. The reason for this decrease may result from a decrease in the number of fine needle aspirations used in the diagnosis of thyroid cancers and in out patient treatments decreased in many parts of the world during the pandemic period<sup>23</sup>. It may be related to the number of fine needle aspiration, which is a highly effective diagnostic tool in the cytological diagnosis of the thyroid cancers and use of which was decreased in Sivas during the pandemic period and this finding was found to be consistent with the literature.

The strength of this study is that it covers data of all cancer patients in a province. It also has a limitation. In the study, data were collected from the records of the hospital. Some missing data in patient records, such as level of education, socioeconomic status, place of residence, date of first cancer diagnosis was the limitation of the study.

As a result, in this study, it was determined that the incidence of cancer increased during the pandemic

period when compared to the pre-pandemic period. The compared periods were planned with having a time period as long as 16 months and included the times when strict rules such as curfew, social isolation, reduction of non-emergency health services were applied and these rules were disappeared. Consistent with the literature, it was observed that there was a decrease in new cancer diagnoses during the periods of curfew and social isolation. It is thought that uninterrupted continuation of cancer screenings and the continuation of providing health services where cancer patients can receive treatment safely will reduce both the number of cancer diseases and the number of cancer-related deaths in the period. There is a need for more multi-sectoral studies on this subject. In addition, studies are needed to understand whether Covid-19 disease has an effect on carcinogenesis.

Financing: No financial resources were used in this study.

Conflict of interest between authors: The authors declare that they have no competing financial interests or personal relationships that appear to affect the work reported in this article.

Footnotes: This study was presented as an oral presentation at the 2nd International Cancer Days and received the 3rd prize.

#### “What’s New”

Cancer and Covid-19 infection are each an important public health problem. The aim of this study is to investigate the incidence of cancer in the pre-pandemic and pandemic period. The increase in the incidence of cancer during the pandemic period has attracted attention. However, among cancer types, a decrease in the number of thyroid and prostate cancers and an increase in others were detected. There are different results in the literature. Multicentric studies are needed.

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