




RESEARCH ARTICLE

-  **Mebrure Beyza Gokcek¹**
 **Humeyra Aslaner²**
 **Adil Cetin¹**
 **Irfan Gokcek³**
 **Ali Ramazan Benli⁴**

¹ Family Phsician Specialist,
Kayseri Provincial Health
Directorate, Kayseri, Turkey

² Department of Family
Medicine, Kayseri City
Education and Research
Hospital, Kayseri, Turkey

³ Emergency Medicine
Specialist, Kayseri City
Education and Research
Hospital, Kayseri, Turkey

⁴Department of Family
Medicine, Karabuk University,
Karabuk, Turkey

Corresponding Author:

Irfan Gokcek

*Emergency Medicine Specialist,
Kayseri City Education and
Research Hospital, Kayseri,
Turkey*

mail: irfangokcek@yahoo.com

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konuralptipdergi@duzce.edu.tr

konuralptipdergisi@gmail.com

www.konuralptipdergi.duzce.edu.tr

Comparison of the Number and Reasons of Death in the First Five Months of 2020 in Kayseri with the Previous Year

ABSTRACT

Objective: The spread of a new contagious disease across the world is called a pandemic. COVID-19 was declared as a pandemic by WHO on 11th March 2020. Although treatment modalities and vaccines are being developed against COVID-19 disease, COVID-19 related deaths continue and the rate of infectious diseases among all causes of death increases. In this study, we aimed to determine the effect of COVID-19 infection on mortality statistics by comparing mortality statistics in the first five months of 2020 with mortality statistics in the same period of 2019.

Methods: This study was conducted by evaluating the death notification system data records using the ICD 10 diagnostic coding system for the first five months of 2019-2020 of the Kayseri Provincial Health Directorate, between 1 June 2020 and 1 July 2020. It is a retrospective study. In the study, data on dates (months) of deaths, ages, genders, marital statuses, causes of death and manners of death (infectious disease, forensic, natural death) in Kayseri were evaluated. Data were evaluated in SPSS (version 21.0) statistical package program.

Results: There were 3349 deaths in the first 5 months of 2019, and 3491 deaths in the first five months of 2020. Of these, 54.6% were male and 45.4% were female. The monthly average numbers of death in 2019 and 2020 were similar. The rates of disease diagnoses differed in 2019 and 2020. In 2020, all-cause death numbers, including COVID-19, were higher among men. The total mortality rate of infectious diseases was 20.2% in 2019, and the mortality rate due to infectious diseases including COVID-19 was 20.1% in 2020.

Conclusions: During the COVID-19 outbreak, there were significant changes in the rates of some specific causes of death. However, there was no significant change in the total number of deaths during the first five months in Kayseri province.

Keywords: COVID-19, Pandemic, Cause of Death.

Kayseri’de 2020 Yılı İlk Beş Ayının Ölüm Sayı Ve Nedenlerinin Bir Önceki Yıl İle Karşılaştırılması

ÖZET

Amaç: Yeni ve bulaşıcı bir hastalığın tüm dünyaya yayılmasına pandemi denir. Dünya Sağlık Örgütü (DSÖ) tarafından 11 Mart 2020 tarihinde COVID-19 pandemisi ilan edilmiştir. COVID-19 hastalığına karşı tedavi modaliteleri ve aşı geliştirilmeye çalışılsa da COVID-19’a bağlı ölümler devam etmektedir ve tüm ölüm nedenleri arasında enfeksiyon hastalıklarının oranı artmaktadır. Biz de bu çalışmamızda COVID-19 enfeksiyonunun ölüm istatistiklerine etkisini 2020 yılının ilk beş ayındaki ölüm istatistiklerini 2019 yılının aynı dönemindeki ölüm istatistikleri ile karşılaştırarak ortaya koymayı amaçladık.

Gereç ve Yöntem: Bu çalışma, 1 Haziran 2020-1 Temmuz 2020 tarihleri arasında KAYSERİ İl Sağlık Müdürlüğü’nün 2019- 2020 yılı ilk beş ayına ait ICD 10 tanı kodlama sistemi kullanan ölüm bildirim sistemi verileri kayıtları değerlendirilerek yapılmıştır. Retrospektif bir çalışmadır. Çalışmada Kayseri’de meydana gelen ölümlerin tarihleri (ay), ölenlerin yaşı, cinsiyeti, medeni hali, ölüm nedenleri ve ölüm şekilleri (bulaşıcı hastalık, adli, doğal ölüm) ile ilgili veriler değerlendirilmiştir. Veriler, SPSS (versiyon 21.0) istatistik Paket Programında değerlendirilmiştir.

Bulgular: 2019 yılı ilk beş ayında 3349, 2020 yılı ilk beş ayında ise 3491 ölüm gerçekleşmiştir. Bunların %54,6’sı erkek, %45,4’ü kadındı. 2019 ve 2020 yıllarında aylık ölen kişi sayısı ortalamaları benzerdi. 2019 ve 2020 yıllarında hastalık tanılarının oranları farklılık gösterdi. 2020 yılında COVID-19 da dâhil olmak üzere tüm nedenlere bağlı ölüm oranları erkeklerde daha fazla görülmekteydi. 2019 yılında enfeksiyon hastalıklarının toplam ölüm oranı %20,2, 2020 yılında COVID-19 dahil enfeksiyon hastalıkları nedeniyle ölüm oranı toplam %20,1 idi.

Sonuç: COVID-19 salgını sırasında bazı spesifik ölüm nedenlerinin oranlarında anlamlı değişimler olmuş ancak Kayseri ili özelinde ilk beş aylık toplam ölüm sayısında anlamlı bir değişiklik gerçekleşmemiştir.

Anahtar Kelimeler: COVID-19, Pandemi, Ölüm Nedeni.

INTRODUCTION

Death is the irreversible loss of basic bodily functions; in other words, it is the arrest of the vital functions of a person. According to 2019 data from Turkish Statistical Institute (TURKSTAT), analysed within the context of death causes, the first three diseases to cause death are circulatory system diseases, malignancies and respiratory system diseases, followed by infective and contagious diseases such as pneumonia, diarrhea and tuberculosis (1). Cardiovascular diseases come first, as well, among the death causes across the world. However, infectious diseases such as diarrhea, pneumonia and tuberculosis are more common causes of deaths worldwide than in our country (2). As it can be seen from these data on death causes, infective and contagious diseases are among significant death causes.

Spread of a new and contagious disease across the world is called a pandemic (3). Pandemics are circumstances in which infective diseases are seen in masses and cause deaths of millions of people.

According to the definition of World Health Organization (WHO), for a disease to be recognized as a pandemic, it must be originated by an agent that is encountered for the first time (4). Many pandemics have occurred till this day and millions of people have died in these pandemics. The most well-known and the deadliest of them was the "Spanish Flu (H1N1)" outbreak in 1918. It is estimated that nearly 500 million people was infected by Spanish Flu and 40-100 million people died for this reason (5). In addition, two other pandemics were also occurred; Asian Flu (H2N2) in 1957-1958 and Hong Kong Flu (H3N2) in 1968, and around one million people died in each (6).

The first pandemic of the 21st century was the Swine Flu (H1N1) pandemic, which was first seen in North America in 2009, and around 100-400 thousand people died (7).

In 20th and 21st centuries, regional epidemics that affected millions of people have also occurred, such as Ebola, yellow fever, cholera, SARS, MERS and Zika virus. Nevertheless, the most important pandemic in these days is the COVID-19 pandemic, which was declared as one on 11th March 2020 by WHO. This new isolated virus was called as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) and the disease was named by WHO as COVID-19 (8).

COVID-19 pandemic was first began as cases of pneumonia of unknown etiology, in Wuhan city of Hubei province in China (8-10). According to July 2020 data of WHO, there were nearly 15 million confirmed cases and more than 600 thousand confirmed deaths caused by COVID-19, in 215 countries and regions across the world (11). Although treatment modalities and vaccines are being tried to develop against COVID-19 disease, deaths linked to COVID-19 still continue to happen

and the proportion of infectious diseases is rising among all causes of death.

Since it is a new epidemic, we aimed to investigate the effect of the COVID-19 pandemic on the number and causes of deaths in our province by comparing the death data of 2020, when the pandemic started, and the first five months of the previous year

MATERIAL AND METHODS

Workgroup Planning: This study was carried out between 1 June 2020 and 1 July 2020 by evaluating the death notification system data of the first five months of 2019-2020 of the Kayseri Provincial Health Directorate. The death notification system is a data system in which the responsible physician uses the International Classification of Diseases (ICD) 10 diagnostic coding system while specifying the causes of death. The completed form is checked and approved by a responsible physician. The study was conducted as a retrospective file review. The total population of Kayseri province, which is located in the Central Anatolian Region, has a metropolitan status and is a semi-rural settlement, is 1,407,409 in 2019, and its population in 2020 is 1,421,455. A total of 6840 people, who were 3349 in the first five months of 2019 and 3491 in the first five months of 2020, were included in our study.

Data Scanning Process: In the study, various data on deaths in Kayseri was evaluated, such as dates (months, seasons), ages, genders and marital statuses of dead persons, death causes and manners of death (contagious disease, forensic, natural death).

ICD which was defined by WHO, is a coding system, used for writing down disease diagnoses, as well as indicating death causes, with certain international rules and reminders on disease and mortality coding it introduced (12). In our study, ICD diagnosis system was used for classification of death causes. Our study was planned in accordance to Helsinki Declaration decisions and by-law on patient rights; and obtained ethics committee approval dated 14.05.2020 and numbered 70, from Clinical Research Ethics Committee of Kayseri City Training and Research Hospital.

Statistical Analysis: Data was evaluated with SPSS (version 21.0) statistical package software. Descriptive statistics; mean, standard deviation, minimum and maximum values were calculated for continuous variables, and categorical variables were expressed as numbers and percentages. One-sample Kolmogorov Smirnov test was used for determining whether numerical values of variables were concordant with normal distribution. Chi-square test was used for determining the relationship between groups and categorical variables. P-value was assumed as $p < 0.05$ for statistical significance.

RESULTS

There were 3349 deaths in the first five months of 2019 and 3491 deaths in the first five months of 2020, with a total of 6840 deaths. In the first five months of the years of 2019 and 2020, a total of 6.840 deaths have occurred. 54.6% of these were males and 45.4% were females. Age median

of the dead persons was 73 (0-103) in 2019 and it was 73 (0-102) in 2020. The top three most common causes of death in 2019 are cardiovascular diseases, infectious diseases and malignant diseases. In 2020, the ranking is as malignant diseases, infectious diseases and cardiovascular diseases (Table 1).

Table 1. Distribution of Diseases Causing Death by Gender

	2019			2020		
	Male n (%)	Female n (%)	Total n (%)	Male n (%)	Female n (%)	Total n (%)
Cardiovascular Diseases - Hypertension	393 (55.1)	320 (44.9)	713 (100)	356 (57)	269 (43)	625 (100)
Malignancy	397 (66.2)	203 (33.8)	600 (100)	382 (57.8)	279 (42.2)	661 (100)
Infection	344 (50.9)	332 (49.1)	676 (100)	350 (54.1)	297 (45.9)	647 (100)
Respiratory System	141 (51.8)	131 (48.2)	272 (100)	176 (55.7)	140 (44.3)	316 (100)
Neurology	160 (45.3)	193 (54.7)	353 (100)	233 (52.8)	208 (47.2)	441 (100)
Infant Mortality	80 (46.8)	91 (53.2)	171 (100)	83 (55.3)	67 (44.7)	150 (100)
Nephrology	51 (44)	65 (56)	116 (100)	72 (52.6)	65 (47.4)	137 (100)
Gastrointestinal System - Endocrine	72 (40.9)	104 (59.1)	176 (100)	72 (50)	72 (50)	144 (100)
Trauma-Intoxication-Suicide	85 (65.9)	44 (34.1)	129 (100)	55 (61.1)	35 (38.9)	90 (100)
Other	74 (51.7)	69 (48.3)	143 (100)	125 (56.1)	98 (43.9)	223 (100)
COVID-19	0	0	0	37 (64.9)	20 (35.1)	57 (100)
Total	1797 (53.7)	1552 (46.3)	3349 (100)	1941 (55.6)	1550 (44.4)	3491 (100)

52.3% of the dead persons in 2019 were married, 36.1% were widowed/divorced and 11.6% were single. 51.4% of the dead persons in 2020 were married, 37.1% were widowed/divorced and 11.5% were single. Marital statuses of the dead persons were similar in both years (p : 0.064). 13.9% percent of the dead persons in 2019 were graduated from primary school and 13.3% were

illiterate. 11.6% of the dead persons in 2020 were graduated from primary school and 11.1% was illiterate.

While the mean of death numbers in the first five months of 2019 was 669.8 ± 128.22 , the mean of death numbers in the first five months of 2020 was 698.2 ± 126.63 . Monthly death numbers in 2019 and 2020 was similar (p : 0.734), (Table 2).

Table 2. Comparison of Monthly Death Numbers in 2019-2020

Monthly Death Number in 2019	Monthly Death Number in 2020	p
Mean±Std	Mean±Std	
669.8±128.2291	698.2±126.6381	0.734

*Student t test was used, p -value was assumed as $p < 0.05$.

In terms of age groups of dead persons, there was no significant difference between 2019 and 2020 (p : 0.68). There was difference between age groups of dead persons in terms of genders in 2019 ($p < 0.001$); death numbers of male patients aged 18-

65 was higher than its female counterpart. Age groups of dead persons were similar in terms of genders in 2020 (p : 0.784), but death numbers of male patients over 65 was higher than females (Table 3).

Table 3. Evaluation of Death Numbers By Age Groups

		2019		2020	
		Male	Female	Male	Female
0-1	(n)	228	123	251	105
	(%)	6.80%	7.90%	7.20%	6.80%
Age 1-18	(n)	53	22	56	27
	(%)	1.60%	1.40%	1.60%	1.70%
Age 18-65	(n)	824	284	893	395
	(%)	24.60%	18.30%	25.60%	25.50%
Age 65 and over	(n)	2244	1123	2291	1023
	(%)	67.00%	72.40%	65.60%	66.00%

In terms of death causes by genders in 2019, cardiovascular diseases, malignancies and deaths caused by trauma, suicide and intoxication were more common in males, while neurological, nephrological, gastrointestinal system-endocrine

associated deaths were more common in females ($p < 0.001$). In 2020, all-cause death numbers, including COVID-19, were higher among males (p : 0.514), (Table 1). 21.3% of deaths in the first five months of 2019 were associated with

cardiovascular diseases and hypertension; this rate was 17.9% in 2020. Deaths caused by malignancies were 17.9% of total in 2019, and it was 18.9% in 2020. Deaths associated with infectious diseases occurred in rates of 20.2% in 2019 and 18.5% in 2020. In 2020, 163,000 cases were seen in Turkey

in the first five months, while 944 people had COVID-19 infections in Kayseri in the same period. Again, 1.6% of deaths in the same period were due to COVID-19 infection. 1.6% of deaths in 2020 were caused by COVID-19 infection (Table 4).

Table 4. Yearly Comparison of Diagnoses of Death

	2019		2020		p value
	Number	Percentage	Number	Percentage	
Cardiovascular Diseases - Hypertension	713	21.3	625	17.9	<0.001
Malign Diseases	600	17.9	661	18.9	0.146
Infection	676	20.2	647	18.5	0.092
Respiratory System	272	8.1	316	9.1	0.092
Neurological Diseases	353	10.5	441	12.6	0.004
Infant Mortality	171	5.1	150	4.3	0.064
Nephrology	116	3.5	137	3.9	0.172
Gastrointestinal System - Endocrine	176	5.3	144	4.1	0.016
Trauma - Intoxication -Suicide	129	3.9	90	2.6	0.002
COVID-19	0	0	57	1.6	<0.001
Other	143	4.3	223	6.4	<0.001

* Chi-Square test was done, p-value was assumed as $P < 0.05$.

Total mortality rate caused by infectious diseases in 2019 were 20.2%, while in 2020 total mortality rate from infectious diseases, including COVID-19, was 20.1%.

DISCUSSION

Many studies that analyse death causes were conducted in Turkey and worldwide. Utilizing the results of these studies, preventable death causes, such as tuberculosis, maternal and infant mortalities and infectious diseases, were reduced (13, 14). However, from time to time, newly occurred infections also spread across the world, caused pandemics and resulted in deaths of millions of people (15). Significance of infectious diseases among death causes was understood during these pandemics.

For these reasons, in our study, where we evaluated how the COVID-19 pandemic affected the number of deaths in our province, the death data of the first five months of 2019-2020 were examined. It was observed that there was no significant difference in monthly death numbers. Death numbers in 2019 and 2020 were similar, while there were changes in diagnoses of death causes.

In a study conducted in Adnan Menderes University, it was seen that 45.8% of people that died in 2008 were female and 54.2% of them were male, while in 2009 it was 46.2% female and 53.8% male (16). In another study that analysed mortality statistics in Turkey between 2009 and 2016, it was seen that male and female mortality percentages did not differ from year to year (17). In our study, gender-based death number distribution was also observed to be similar to the literature. Evaluating the marital statuses of the dead persons in both years, no significant difference was found in our

study and obtained data was seen to be comparable with the literature (18).

In many studies that analyse death causes worldwide and by country, mortality rates of males of adult age groups were observed to be higher than females in same age group (19, 20). Deaths associated with cardiovascular system diseases being more common in males of this age group is indicated to be the reason for this situation (14). In our study, similar to the literature, death numbers of males in adult age group in the first five months of 2019 was found to be significantly higher than females of same age group. Distribution of age-linked death numbers in other age groups was also similar to the literature and it was the highest for males and females over 65 (13, 17, 20). In the first five months of 2020, death numbers of males of adult age group were similar to females of same age group. We consider that the decrease of male death numbers in adult age group in 2020 could be linked to decisions taken in order to fight COVID-19 disease, such as lockdowns and quarantine measures, culminating a decrease in deaths caused by trauma like traffic accidents and murders, which is an important cause of death for males in this age group.

An important analysis conducted between 1990 and 2013 found that trauma-related deaths were significantly higher in males in all age groups, except for those aged 80 and over, where the gender gap disappeared (21). In "Final Report on Disease Burden", which was published in December 2004 within the scope of National Project on Disease Burden and Cost Effectiveness conducted in our country, it was emphasized that deaths caused by trauma in males aged 15-25 were much higher than females of same age group, while age-based distribution of deaths caused by trauma was similar

in both genders (13). Significant decrease in crime rates and traffic accidents as a result of decisions and measures taken in order to fight COVID-19 disease, supports our opinion about the decrease of male mortality rates in adult age group (22).

In our study, non-contagious diseases, like cardiovascular system, hypertension, malignancies, gastrointestinal-endocrine system, nephrology and respiratory system diseases such as chronic obstructive pulmonary disease (COPD), were more common than contagious diseases in the first five months of 2019 and 2020, similar to the literature. In many studies that analyse yearly changes in death causes and mortality rates in Turkey and in the world, death causes and mortality rates were analysed under main titles of deaths caused by traumas, non-contagious diseases and contagious diseases, such as pneumonia, enteritis, tuberculosis and malaria; and it was observed that mortality rates linked with non-contagious diseases were much higher than of contagious diseases (13, 18, 20, 23).

In our study, as well, total rate of deaths linked to non-contagious diseases was higher than the rate of deaths linked to infectious diseases, including contagious diseases like pneumonia, enteritis and tuberculosis. Also the rate of deaths caused by traumas, intoxication and suicide among all-cause deaths turned out to be similar with the studies in the literature (17, 24).

In our study, respiratory tract diseases increased proportionally compared to the previous year. However, there is no statistically significant difference and this increase did not affect death numbers.

There are differences between death causes of the first five months of 2019 and 2020. While cardiovascular diseases and hypertension were the most fatal diseases with a rate of 21.3% in the first five months of 2019, this rate has decreased to 17.3% and cardiovascular diseases and hypertension have fallen to third rank among fatal diseases in 2020.

Diseases of cardiovascular system and hypertension are the most common causes of death across the world and in Turkey; their risk factors are quite well-defined (25, 26). Male gender, advanced age, obesity and dietary habits, diabetes, sedentary life, emotional stress and some other factors constitute the risk factors of cardiovascular diseases. Home isolation and quarantine practices were implemented for a long time by the government for individuals over 65, due to them being at high risk regarding to COVID-19. Although sedentary lifestyle is a risk factor for cardiovascular system diseases, and individuals over 65 constitute the riskiest age group for cardiovascular diseases; we consider that stays of these persons at their homes within the context of isolation and quarantine measures, may have resulted in cautiously applying to hospitals earlier

by themselves or other family members living in the same house, for the slightest changes in their medical conditions, thereby reaching early diagnosis and treatment opportunities, and consequently leading to a decrease in mortalities. Moreover, we also consider that, having been in administrative leave for a long period during COVID-19 pandemic, persons with chronic diseases, such as cardiovascular system diseases and hypertension, were kept away from emotional stress, which is a serious risk factor regarding cardiovascular system diseases and hypertension; resulting them to be protected from fatal and unwanted acute incidents of these diseases like sudden cardiac death (27).

We also observe that, another change in the rates of fatal diseases, directly or indirectly linked to COVID-19 pandemic and measures taken during the pandemic, has happened in deaths linked to neurological diseases. It is seen that the death numbers linked to neurological diseases in 2019 increased significantly in the first five months of 2020.

Diseases of nervous system and sense organs, which were the fourth most common cause of death in Turkey regarding to 2018 data of the Turkish Statistical Institute, have also been seen as the fourth most common cause in our study (1). In some other studies conducted in our country, stroke was the third most common death cause (14, 28).

The title of neurological diseases is a wide spectrum of diseases. This complicates the evaluation of the effects of COVID-19 pandemic and pandemic-related measures, like isolation and quarantine, on the course of diseases under the title of neurological diseases.

In line with all these information, we consider that already extended hospital application periods of neurological patients, who had developed disabilities caused by previous neurological incidents and have comorbidities, were even more prolonged as a result of the knowledge of COVID-19 disease to progress more fatal in persons over 65 and the fear of the risk of getting this disease in hospitals; resulting newly-emerged neurological incidents to show a more fatal course.

Another case, in which change of death numbers can be seen clearly as a result of COVID-19 pandemic and the implementation of pandemic-related measures and prohibitions, is the significant decrease of deaths caused by traumas such as traffic accidents, intoxication and suicides in the first five months of 2020, in comparison with the same period of 2019. We consider this situation to be linked with the decline of trauma rates in especially males of adult age group, as a result of isolation measures, such as lockdowns and quarantines, which were implemented in 2020 in the context of fight against COVID-19 pandemic since the detection of first case in Turkey.

Coercive factors occurring during pandemics have led to an increase in suicide cases (29,30). However, the reason for the decrease in suicide cases in our study may be that family support, which is a preventive factor for suicide (31), was felt more during isolation, quarantine and lockdown measures.

In addition, the loyalty support services, which provide the needs of people in quarantine during the pandemic and can be easily reached with a fixed number, have made a significant contribution to reducing the negative psychological impact.

Since December of 2019, when COVID-19 disease was understood to be a new pandemic, studies have begun on diagnosis, treatment and vaccines against this disease. Many studies also have been launched in order to find a cure for COVID-19 disease, definitive treatment yet to be found. Several modalities were tried in treatment, such as mesenchymal stem cell treatment and many agent and plasma treatments, including the one used for the treatment of SARS, because of the resemblance with the agent of SARS outbreak; however the definitive treatment of COVID-19 disease could not be discovered yet (32, 33, 34).

Because a definitive treatment has not yet been discovered and the vaccination endeavours do not seem to be completed in short term, isolation still appears to be the most effective way to control COVID-19 pandemic. Indeed, isolation measures had worked in the fight against the 1918 “Spanish Flu” pandemic, when not any antiviral and antibacterial treatments had been discovered yet. For example, during the 1918 “Spanish Flu” pandemic, no cases was detected in American Samoa, where isolation rules could be

implemented; while in Western Samoa, which is just a few kilometres away but could not implement isolation from the world, 22-23% of the population have died from the flu (5).

We too, in our study, have observed the effects on causes of death, directly, and by secondary factors indirectly, resulted from decisions such as lockdowns and quarantines, as a part of measures taken by the government in the context of isolative-preventive health services.

Limitations

Our study was conducted in a specific province and in a limited region. In addition, cases were first seen in March in our country, and this study includes only the first two months of cases. Because it includes the first period of the pandemic and the population is narrow, the number of cases and deaths may not reflect the overall. These situations constitute the limitations of our study. Future studies that would be conducted within a longer period may pose sufficient data.

CONCLUSION

Pandemics are important occasions, which can cause serious results on sociodemographical data of related countries during their span, with effects enduring for years. In these days, COVID-19 pandemic is globally the most important health problem. Without a doubt, COVID-19 pandemic has already caused serious changes in every domain of life. More clear effects of the pandemic on yearly death causes and rates will be seen in the upcoming years, with more studies in this area. Our study showed that there was no significant change in the number of deaths in our province in the early days of the pandemic, but the causes of death changed. For this reason, we think that it will be a source for new studies to be done in the future.

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