



Research Article

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Impact of COVID-19 pandemic on the diagnosis of gastrointestinal cancer

Tuğba ŞENEL*^{ORCID}, Talat AYYILDIZ^{ORCID}

Department of Gastroenterology, Faculty of Medicine, Ondokuz Mayıs University, Samsun, Türkiye

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Abstract

Coronavirus disease 2019 (COVID-19) pandemic has had a major impact every aspect of life all over the world with severe consequences. This study aimed to evaluate the impact of COVID-19 pandemic on the number of gastrointestinal endoscopy procedures and resulting cancer detection rate at our center. This was a retrospective and single-center study. The 6-month period from March 11 to September 11, 2020 (lockdown period) was compared with the same months of 2018 and 2019 (pre-pandemic period) in terms of the number of endoscopic procedures performed at our gastroenterology unit, malignancy detection rate and clinicopathological characteristics of patients. The data were analyzed using the SPSS Statistics 22.0 software package. A 33% reduction was observed in the number of endoscopic procedures during the pandemic compared to pre-pandemic years and the difference was significant ($p<0.001$). Despite the decrease in endoscopic activity, cancer detection increased during the pandemic ($p=0.057$). Male sex and age 65 years or older were non-significantly more common among patients diagnosed with cancer on endoscopic biopsy during the pandemic compared to the pre-pandemic era but the difference was non-significant ($p=0.983$, $p=0.241$). Patients diagnosed with cancer during the pandemic were more likely to present at an advanced stage. The most common cancers were those originating from the colon and rectum and adenocarcinoma was the most prevalent pathological diagnosis. The distributions of tumor location and pathological diagnosis of the patients were not significantly different among the years ($p=0,494$, $p=0,849$). In conclusion, a reduction was found in the overall number of endoscopic procedures during the lockdown. However, despite the decrease in the number of procedures, cancer detection rate and the rate of admission at advanced stages were increased at a non-significant level.

Keywords: COVID-19, gastrointestinal endoscopy, gastrointestinal cancer, tumor stages, tumor locations

1. Introduction

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) spread rapidly from China to almost all parts of the world and was declared a pandemic by the WHO (World Health Organization) on March 2020. This infection typically presents with fever, cough, muscle pain and fatigue. Patients having gastrointestinal disturbances such as diarrhea and nausea as the initial symptoms have also been reported (1). While transmission of SARS CoV-2 occurs mainly through respiratory droplets, SARS-CoV-2 RNA has also been demonstrated in the stools of infected patients (2). Gastrointestinal endoscopy is an invasive procedure that carries a risk for the spread of SARS-CoV-2 via respiratory droplets, aerosol inhalation, conjunctival contact and potentially fecal-oral route (3).

COVID-19 pandemic has affected healthcare systems globally irrespective of differences in political structure and economic status among countries. Both emergency room and intensive care unit beds have been heavily used in the fight against COVID-19, leading to inevitable disruptions to routine

and non-emergency health services. Thus, as with other countries, endoscopic procedures have been performed for the diagnosis and treatment of prioritized patients and those requiring emergency care only during the pandemic. Consistently, in our hospital, endoscopic procedures were limited to carefully selected patients who were deemed clinically to be at greatest need. The current study aimed to determine and discuss the impact of COVID-19 on the number of endoscopic procedures performed in our hospital, the rate of cancer detection on endoscopic biopsy and clinicopathological characteristics of the patients.

2. Materials and Methods

In this study, the number of patients (18 years of age or older) who underwent esophagogastroduodenoscopy, colonoscopy and rectosigmoidoscopy in the 6-month period between March 11, 2020 (the date of first COVID-19 case identified) and September 11, 2020, cancer detection rate, pathologic subtypes of tumors in patients diagnosed with a malignancy, tumor locations and stages, and age (≥ 65 and <65 years) and sex distribution of these patients were compared to the patients

*Correspondence: tugbasenel-89@hotmail.com

who had the same procedures during the same time intervals in 2018 and 2019. Patient information was retrieved from the Nucleus v9.35.1 medical information system (MONAD, Turkey) database. This was a single-center study with a retrospective design. The study was approved with the decision of the Ethics Committee of our hospital, dated 13.10.2021 and numbered 2021/479.

2.1. Statistical analysis

The study data were analyzed using the IBM Statistical Package for Social Sciences (SPSS) Version 22 (IBM Corp., Armonk, NY). Descriptive statistics were presented as numbers and percentages for categorical variables. Pearson’s chi-square test was applied to compare categorical variables using contingency tables, and likelihood ratio test and Bonferroni correction were used for significant results. In addition, frequency distributions were presented and interpreted using clustered bar charts by categorical variables. Statistical significance levels were set at $p < 0.05$, $p < 0.01$ and $p < 0.001$.

3. Results

It was identified that a total of 6828 esophagogastroduodenoscopy, 1116 flexible rectosigmoidoscopies and 3266 colonoscopies were performed in our center at the specified time intervals in 2018, 2019 and 2020. Fig. 1 shows the distribution of these procedures by time intervals. The total number of endoscopic procedures was 3616 in 2018, 4773 in 2019 and 2821 in 2020. A significant 33% reduction was observed in the total number of endoscopic procedures performed in 2020 compared to 2018 and 2019 ($p < 0.001$).

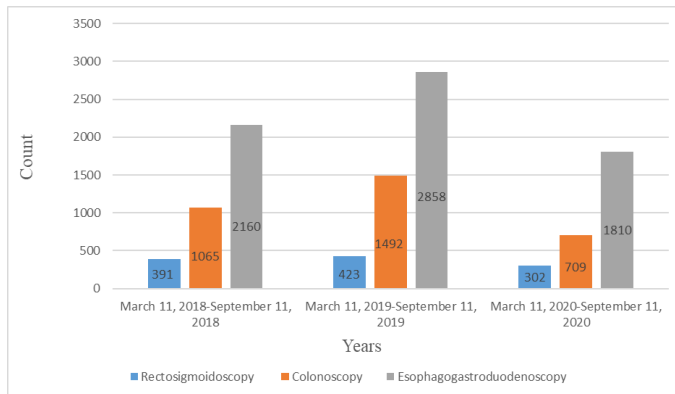


Fig. 1. Number of endoscopic procedures by years

A total of 309 patients were identified as having received a diagnosis of gastrointestinal cancer following endoscopic procedures during this time period. The monthly distribution of the cancer patients is shown in Fig. 2. Among these patients, 27.2% (n=84) were diagnosed in 2018, 37.2% (n=115) in 2019 and 35.6% (n=110) in 2020. The rate of cancer detection per procedure was 0.023% in 2018, 0.024 in 2019 and 0.038 in 2020. It was observed that despite the reduction in the total

number of endoscopic procedures in 2020, the increase in the cancer detection rate was non-significant at 95% confidence interval (CI) but significant at 90% CI ($p = 0.057$).

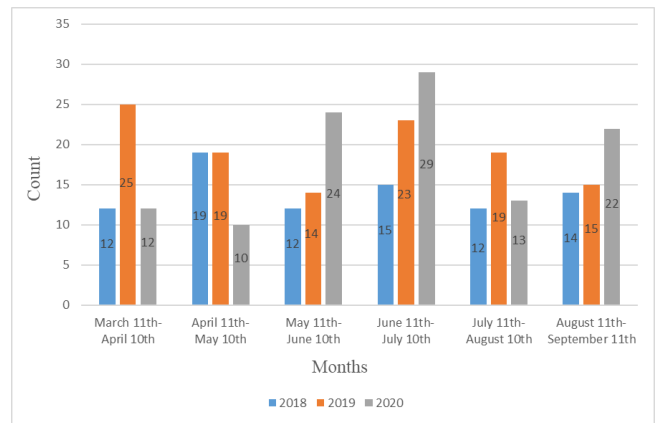


Fig. 2. Frequency of monthly gastrointestinal cancer detection by years

Table I shows the distribution of demographic variables by years. Although the annual cancer detection rates were higher in male patients than in female patients, there was no significant difference between sexes over the study years ($p = 0.983$). When the age groups were examined by years, there was a greater number of patients aged 65 years or older in 2020 than patients under 65 years of age but the difference was not significant ($p = 0.241$). The age cut-off of 65 years was specifically chosen for the study because a curfew was imposed for persons aged 65 years or older during the pandemic in Turkey. No significant differences were found in terms of sex and age group among years in patients diagnosed with cancer ($p_{2018} = 0.095$, $p_{2019} = 0.946$, $p_{2020} = 0.791$).

Table 1. Distributions of demographic variables by years

		Years			p value
		2018	2019	2020	
		n (%)	n (%)	n (%)	
Sex	Female	29 (34.5)	40 (34.8)	37 (33.6)	0.983
	Male	55 (65.5)	75 (65.2)	73 (66.4)	
Age (years)	<65	49 (58.3)	57 (49.6)	51 (46.4)	0.241
	≥65	35 (41.7)	58 (50.4)	59 (53.6)	

A review of the pathology results of 309 patients diagnosed with cancer showed that 81.9% (n=253) of the patients had adenocarcinoma, 8.7% (n=27) had a neuroendocrine tumor, 4.9% (n=15) had squamous cell carcinoma and 4.5% (n=14) had other tumors (lymphoma, gastrointestinal stromal tumor, malignant melanoma). In patients with cancer, the distribution of tumors was as follows: colorectal cancer (46.6%, n=144), gastric cancer (37.9%, n=117), small intestine cancer (8.4%, n=26) and esophageal cancer (7.1%, n=22).

The distribution of tumor locations by years is presented in Table II. Colorectal cancer was the most common malignancy in all years. There was no significant difference in the tumor location distribution among the years ($p = 0.494$).

Table 2. Distribution of tumor locations by years

		Years			p value
		2018	2019	2020	
		n (%)	n (%)	n (%)	
Location	Esophagus	7 (8.3)	8 (7.0)	7 (6.4)	0.494
	Stomach	35 (41.7)	41 (35.7)	41 (37.3)	
	Small intestine	5 (6.0)	7 (6.1)	14 (12.7)	
	Colon and rectum	37 (44.0)	59 (51.3)	48 (43.6)	

The distribution of pathologies by years is summarized in Table III. No significant difference was found among tumor locations ($p=0.849$).

Table 3. Distribution of pathologies by years

		Years			p value
		2018	2019	2020	
		N (%)	N (%)	N (%)	
Pathology	Adenocarcinoma	67 (79.8)	99 (86.1)	87 (79.1)	0.849
	Squamous cell carcinoma	4 (4.8)	4 (3.5)	7 (6.4)	
	Neuroendocrine tumor	9 (10.7)	8 (7.0)	10 (9.1)	
	Others	4 (4.8)	4 (3.5)	6 (5.5)	

Among 309 patients included in the study, the tumor stage was 0, 1 or 2 in 45.3% ($n=140$) and 3 or 4 in 54.7% ($n=169$). Table IV shows the distribution of tumor stages by years. It was seen that stage 3 tumors were more common in all years and also, the number of patients with stage 3 or 4 tumors increased in 2019 and 2020 compared to 2018. However, there was no significant difference in tumor stage among the years ($p=0.374$).

Table 4. Distribution of tumor stages by years

		Years			p value
		2018	2019	2020	
		n (%)	n (%)	n (%)	
Stages	0-2	40 (47.6)	56 (48.7)	44 (40.0)	0.374
	3, 4	44 (52.4)	59 (51.3)	66 (60.0)	

4. Discussion

Endoscopy plays an important role in the diagnosis and treatment of gastrointestinal diseases. Endoscopic screening enables early detection and treatment of gastrointestinal tumors. However, considering the invasive nature of endoscopy and associated high risk for transmission of viral infection as well as prioritization of fight against COVID-19 in healthcare services, elective endoscopic procedures were postponed in most clinics across Turkey after the reporting of first case on March 11, 2020. Naturally, this has led to concerns that cancerous lesions would be diagnosed at a late and advanced stage. The current study was conducted on the consideration that from a scientific standpoint, it is of vital importance to present quantitative data on cancer outcomes

from the pandemic period and compare them with literature data.

In a study involving 252 endoscopy units in 55 countries around the world, over 80% reduction was reported in endoscopic procedures during the COVID-19 pandemic (4). Similarly, in a study by D'Ovidio et al., it was shown that while the number of colonoscopies performed was substantially reduced, the detection rate of colorectal cancers and high-risk adenomas was significantly high during the COVID-19 lockdown (5). Turkington et al. reported that the number of patients diagnosed with esophagogastric cancer and Barrett's esophagus decreased significantly during the pandemic compared to previous years (6). In a single-center study from Australia, a significant reduction was observed in the overall number of endoscopic procedures during the pandemic versus pre-pandemic period, there was no significant difference in the number of cancerous and precancerous lesions (7). A study from the United Kingdom reported an 88% decrease in the number of endoscopic procedures during the pandemic. Additionally, weekly cancer detection rate dropped by 58%. However, cancer detection rate per procedure was significantly increased from 1.91% in the pre-pandemic period to 6.61% during the COVID-19 period (8). Likewise, in two separate studies from China, although a considerable reduction in the endoscopic activity was found during the pandemic, there was a significantly greater percentage of patients diagnosed with malignancy (9, 10). In a study comparing the 6-month period from the beginning of the pandemic in the UK (April to October 2020) to the same period of the previous year, it was shown that colonoscopies performed across the country dropped by 46% and colorectal cancer diagnosis was missed in over 3500 patients. While the number of colonoscopies was reduced by 92% in April 2020, the figures increased to an expected level in October 2020 (11). In the current study, a 6-month interval during the pandemic period was compared to the same period of 2018 and 2019 in terms of the number of endoscopies performed and a significant reduction was found in all three endoscopic procedures (flexible rectosigmoidoscopy, esophagogastroduodenoscopy, colonoscopy) ($p<0.001$) during the lockdown. The cancer detection rate per procedure was 0.023% in 2018, 0.024% in 2019 and 0.038% in 2020. In line with literature data, increased cancer detection rate was observed despite a reduction in the overall number of endoscopic procedures during the pandemic ($p=0.057$). Contrastingly, the cancer detection rate that we found both before and during the pandemic was lower compared to those previously reported in the literature. We think that this may be related to the fact that endoscopic procedures are easily accessible and relatively inexpensive in our country and they are also performed in secondary care centers. Therefore, it can be assumed that fewer cases of cancer were diagnosed in tertiary referral hospitals like our hospital.

Looking at the demographic characteristics of the patients, the mean age of the patients was and the percentage of male

patients undergoing endoscopic screening were found to be slightly but not significantly lower during the lockdown compared to the pre-pandemic period in D'Ovidio et al.'s study (5). In another study, it was reported that advanced age and male sex were significantly more common in patients undergoing an endoscopic procedure during the pandemic versus pre-pandemic era (8). In our study, male sex and age 65 years or older were non-significantly more common among patients diagnosed with cancer on endoscopic biopsy during the pandemic compared to the pre-pandemic period ($p=0.983$, $p=0.241$).

In a study from Japan, a group of patients with colorectal cancer undergoing surgery during and before the pandemic were analyzed retrospectively. While the number of patients undergoing colonoscopy was reduced significantly during the pandemic, no significant difference was found in the number of colorectal cancer surgeries performed. However, there was a significantly higher rate of obstructive colorectal cancers requiring emergency surgery in that patient group compared to pre-pandemic period. The authors reported that numerically, more patients presented with stage 3 or 4 CRC and fewer patients presented with stage 0, 1 or 2 CRC during the pandemic period (12). Similarly, it was found that more patients admitted with stage 3 or 4 cancer and fewer patients presented with stage 0, 1 or 2 cancers during the pandemic versus the pre-pandemic period but the difference was non-significant ($p=0.374$).

Regarding tumor location, the most prevalent gastrointestinal cancer was colorectal cancer, followed by gastric, esophageal and small intestine cancers (13). The most common pathological diagnosis was adenocarcinoma. Other pathological diagnoses included squamous cell carcinoma, neuroendocrine tumor, lymphoma, gastrointestinal stromal tumor and malignant melanoma. In line with previous reports, the largest patient population comprised of colorectal cancer patients, followed by patients with gastric cancer. Adenocarcinoma was the most common pathological diagnosis, followed by neuroendocrine tumor, squamous cell carcinoma and others (gastrointestinal stromal tumor, malignant melanoma). In the present study, no significant changes were found in the distributions of tumor location and pathological diagnosis of study patients during the pandemic compared to pre-pandemic years ($p=0.494$, $p=0.849$).

A number of limitations should be noted for our study. Since this was a retrospective study, data on the indications for endoscopic procedures were not available. In our center, routine COVID-19 testing has not been done before and after endoscopic procedures, especially in the beginning of the pandemic. Therefore, information about the safety of our endoscopic procedures in relation to infection control could not be obtained.

Our study stands out from previous studies because we examined the distributions of tumor locations and pathological

diagnoses from the pandemic period and the study adds valuable relevant data to the literature.

A remarkable finding of our study was the increase in cancer detection rate, albeit non-significantly, despite the decline in the number of endoscopic procedures during the lockdown.

Strictly ensuring safety in the endoscopy units in terms of infection prevention, implementation of infection control measures to protect patients and healthcare personnel and sharing these safety strategies on social media will help individuals requiring an endoscopic procedure make informed decisions.

In conclusion; the experience from the pandemic has clearly shown the need for the development of different, easily applicable and non-invasive techniques to detect malignancies. Survey studies with an in-depth analysis of the opinions of individuals choosing or refusing to undergo endoscopic procedures during the pandemic may provide valuable insights. Interruptions in access to gastrointestinal endoscopy may lead to delays in the treatment of patients with gastrointestinal cancer. We believe that studies on larger patient series using different methodologies and assessments will improve our understanding of the impact of COVID-19 on healthcare utilization and patient outcomes, and help guide future planning.

Conflict of interest

All authors declare no conflict of interest regarding this manuscript.

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None to declare.

Authors' contributions

Concept: T.Ş., T.A., Design: T.A., Data Collection or Processing: T.Ş., Analysis or Interpretation: T.Ş., T.A., Literature Search: T.Ş., T.A., Writing: T.Ş., T.A.

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