

Incidence and complications of gastric neoplasm before and during the covid-19 pandemic: a comparative study

Adrian Coțovanu^{1,2}, Călin Molnar^{1,2}, Ioana Cosma-Epure², Cătălin Cosma^{1,2}

¹ Emergency County Hospital SCJU Tg.Mureș - First General Surgery Clinic

² George Emil Palade University of Medicine, Pharmacy, Science, and Technology Târgu Mureș, Romania

Abstract

Background. The COVID-19 pandemic has significantly impacted healthcare systems worldwide, raising concerns about the quality of care for patients with various medical conditions, including gastric cancer. This retrospective study aims to compare the treatment outcomes and complications among patients treated for gastric cancer two years before and two years during the pandemic.

Aims. The objective is to gain insights into the potential impact of the pandemic on the management of gastric cancer.

Methods. An analysis was conducted on a cohort of patients who underwent surgical treatment for gastric cancer. The cohort consisted of patients treated two years before and two years during the pandemic. The medical records of these patients were reviewed to collect data on treatment outcomes, complications, and other relevant parameters. Statistical analysis was performed to compare the outcomes between the two groups.

Results. The pandemic group had a higher incidence of emergency surgery, anastomosis fistulas, and gastric stenosis than the pre-pandemic group. While both groups reported spleen penetration, only the pandemic reported penetrations affecting other organs. The pandemic group had a longer operation time but shorter hospital stays, with a higher mortality rate. The pre-pandemic group had more patients receiving preoperative chemotherapy and more T2-stage cases based on the TNM classification. No significant differences were found in bleeding, wound infection, or evisceration.

Conclusions. The higher rate of complications, particularly anastomosis fistula, and the lower utilization of preoperative chemotherapy during the pandemic highlight healthcare systems' challenges in providing optimal care during crises. The shorter hospitalization period observed during the pandemic suggests a potential adaptation to minimize patient exposure and optimize hospital resources.

Keywords: gastric neoplasm, COVID 19.

Introduction

Gastric cancer, a significant global health concern, requires comprehensive and multidisciplinary management involving surgery, chemotherapy, radiation therapy, and targeted therapies (Arneiro et al., 2021). However, the COVID-19 pandemic raised unprecedented challenges for the treatment and care of gastric cancer patients. The pandemic has disrupted routine healthcare services, necessitated resource reallocation, and imposed infection control measures that have significantly impacted the treatment and outcomes of these patients (Chen et al., 2022). The COVID-19 pandemic led to delays and modifications in diagnosing and treating gastric cancer patients. Access to healthcare services, including screenings and diagnostic procedures, has been impeded, potentially resulting

in delayed diagnosis or missed opportunities for early detection (Kodama et al., 2022; Kang et al., 2020). Elective surgeries and non-urgent medical procedures have often been postponed or canceled to prioritize the management of COVID-19 cases and conserve healthcare resources, leading to treatment delays and alterations for gastric cancer patients. To mitigate the risk of exposure to the virus, modified treatment strategies have been employed during the pandemic (Park et al. 2022; Rosa & Alfieri, 2022). Neoadjuvant therapy or chemotherapy, for example, may be prioritized before surgery to minimize hospital visits and potential viral transmission. Telemedicine and virtual consultations have also played a pivotal role in providing continuity of care for gastric cancer patients (Lee et al., 2022a). These alternative approaches have enabled healthcare providers to assess treatment progress, address

Received: 2023, September 30; Accepted for publication: 2023, October 10

Address for correspondence: George Emil Palade University of Medicine, Pharmacy, Sciences and Technology of Targu Mures, Gheorghe Marinescu Str. No.38, 540139, Phone:0754670730, Romania

E-mail: ioana.1594@yahoo.com

Corresponding author: Ioana Cosma-Epure; ioana.1594@yahoo.com

<https://doi.org/10.26659/pm3.2023.24.4.177>

patient concerns, and provide necessary guidance. The COVID-19 pandemic has affected the physical aspects of gastric cancer treatment and the psychological well-being of patients. Fear of contracting the virus, increased anxiety levels, and social isolation measures have contributed to heightened psychological distress (Ma et al., 2022; Kimura et al., 2022). Adequate provision of psychological support services, counseling, and mental health consultations have become imperative to address the unique mental health challenges gastric cancer patients face during this challenging period.

Furthermore, the pandemic has disrupted ongoing clinical trials and research in gastric cancer treatment. Enrollment of new patients in clinical trials may have been hindered, and data collection and analysis may have been delayed due to resource limitations and shifting priorities within the healthcare system (Li et al., 2020). As we strive to understand the full impact of the COVID-19 pandemic on gastric cancer patients, ongoing research and future studies will shed light on the long-term consequences and necessary adaptations in managing these patients in the context of infectious disease outbreaks. Insights gained from managing gastric cancer patients during the pandemic will improve healthcare system resilience, optimize resource allocation, and prioritize patient well-being in similar situations (Feier et al., 2023). The COVID-19 pandemic has likely affected Romania's diagnosis and screening of gastric cancer. As healthcare resources were diverted to manage the pandemic, routine screenings and diagnostic procedures might have been delayed or postponed. This delay could have led to the late detection of gastric cancer cases or missed opportunities for early diagnosis. The pandemic likely resulted in treatment delays and modifications for gastric cancer patients in Romania. Elective surgeries and non-urgent medical procedures were often deferred to prioritize COVID-19 patients and reduce the risk of virus transmission. Treatment plans may have been adjusted, emphasizing neoadjuvant therapy or chemotherapy before surgery, to minimize hospital visits and potential exposure to the virus (Herrera-Kok et al., 2023; Solaini et al., 2023). Operating rooms may have experienced reduced capacity due to infection control measures, leading to longer waiting times for surgeries. Priority might have been given to urgent or emergency cases, potentially resulting in delays for non-emergent gastric cancer surgeries (Doyle et al., 2023).

Material and methods

A retrospective study was conducted at the First Surgical Clinic of SCJU County, Tg. Mures. The research compared the medical and surgical treatment of patients diagnosed with gastric cancer over two years during the COVID-19 pandemic and a corresponding period of two years before the pandemic. The study included patients who were histopathologically confirmed to have gastric cancer, divided into two groups: the COVID-19 group (cases diagnosed during the two years of the pandemic) and the pre-COVID-19 group (cases diagnosed during

the corresponding two-year period before the pandemic). Patient anonymity and confidentiality were strictly maintained throughout the data collection process. Relevant data were collected from patient medical records, including demographic information, clinical characteristics, histopathological reports, treatment details, and post-treatment outcomes. The information extracted included demographic details, clinical characteristics, histopathological reports, treatment details, and post-treatment outcomes. To assess differences between the COVID-19 and pre-COVID-19 groups, various statistical tests were applied. For continuous variables, a t-test or Mann-Whitney U test was used, and for categorical variables, chi-square tests were applied. Logistic regression analysis identified factors associated with treatment outcomes or complications, adjusting for potential confounders. A p-value <0.05 was considered statistically significant, and analysis was performed using EasyMedStats© software. The research proposal and study protocol were reviewed and approved by the SCJU County Tg. Mures Hospital Ethics Committee, ensuring adherence to ethical guidelines and patient confidentiality (nr AD 22140 SCJU Tg.Mures).

Results

The study investigated the management of gastric cancer patients in two distinct timeframes, one before the COVID-19 pandemic and the other during it. In the group treated before the pandemic, there were 42 patients who, on average, were around 72 years old, mostly male. Similarly, the group treated during the pandemic consisted of 24 patients who were also, on average, 71 years old and predominantly male. However, a unique aspect of the pandemic group was that more of these patients underwent emergency surgery than their pre-pandemic counterparts (p=0.0031) (Table I).

Table I
Demographic characteristics and surgical approach in gastric cancer management.

Timeline	Total	Prepandemic	Pandemic	p-value
Cases	66	42	24	-
Age-years (mean ± SD)	71±7.3	72±3.5	71±1.2	0.1385*
Gender M	61	39	23	0.2092**
F	4	3	1	
Elective Surgery	52	40	12	0.0031 **
Emergency Surgery	12	2	10	

* Mann-Whitney U test, ** χ^2 test

Of 19 patients who reported gastric stenosis, 15 experienced it during the pandemic (p=0.0148). However, the pandemic didn't make any difference regarding hemorrhage complications; the numbers remained consistent regardless of the time frame. Interestingly, both groups reported instances of spleen penetration. Yet, only during the pandemic did some patients also report penetrations affecting other organs, including the liver, transverse colon, and small intestines (Table II).

Table II
Local and systemic tumor complications in gastric cancer patients.

Procedures	Total	Prepandemic	Pandemic	p-value
Stenosis (yes/no)	19/66	4/42	15/24	0.0148 *
Hemorrhage (yes/no)	18/66	12/42	6/24	0.2646*
Penetration (n=19/66)		(n=10/42)	(n=9/24)	
Spleen (yes/no)	3/66	2/42	1/24	0.2498*
Liver (yes/no)	2/66	0/42	2/24	-
Transvers Colon (yes/no)	1/66	0/42	1/24	-
Duodenum/Jejunum (yes/no)	1/66	0/42	1/24	-
Metastasis Hepatic (yes/no)	5/66	2/42	3/24	0.5481*

* χ^2 test.

Upon analyzing the severity of cases using the TNM classification, most were identified as being in the T2 and T3 stages. Interestingly, the pre-pandemic group had a higher count of T2-stage cases, with 19 patients falling into this category (p=0.0022) (Table III).

Table III
TNM – gastric cancer patients staging.

Procedures	Total	Prepandemic	Pandemic	p-value
** TNM (n=66)		(n=42)	(n=24)	
T0	0	0	0	-
T1a	0	0	0	0.8571*
T1b	2	2	0	-
T2	12	19	2	0.0022*
T3	0	20	13	1.0000*
T4a	5	3	6	-
T4b	0	0	1	-
N0	10	7	3	1.0000*
N1	45	27	18	0.2458*
N2	11	8	3	0.4225*
N3a	1	1	0	-
N3b	0	0	0	-
M0		40	21	0.2381*
M1	5	2	3	0.5481*

* χ^2 test; **World Health Organization (WHO); AJCC Cancer Staging Manual (8th Edition).

In the analysis of treatments for gastric cancer, a striking difference emerged in the utilization of preoperative chemotherapy across the two timeframes (p=0.001). In the pandemic, only a limited number, specifically 4 cases, underwent preoperative chemotherapy. In stark contrast, during the pre-pandemic period, most patients — 27 out of the 42 — had received this treatment approach (Table IV).

Table IV
Preoperative chemotherapy.

Procedures	Total	Prepandemic	Pandemic	p-value
Chemotherapy (yes/no)	31/35	27/15	4/20	0.0001*

* χ^2 test.

In assessing gastric cancer patients' surgical and post-surgical patterns, distinctive differences arose between

the two timeframes. The average operation time during the pandemic was notably longer, clocking in at 195 minutes, compared to a swifter 120 minutes in the pre-pandemic period (p=0.0223). However, the post-surgery story showed a contrasting trend. The pre-pandemic group reported a longer average hospitalization duration of 13 days, whereas the pandemic group's stay was significantly shorter, averaging just five days (p=0.0312). Despite the reduced hospitalization time during the pandemic, a high mortality rate of 16% was observed within the pandemic group (p=0.0001) (Table V).

Table V
Operation time, hospitalization, and mortality rate of gastric cancer patients.

Procedures	Average	Prepandemic	Pandemic	p-value
Average operation time (min)	102±6.3	120 ±8.5	195 ±10.5	0.0223*
Hospitalization (days) (mean ± SD)	9±1.7	13±2	5±1.5	0.0312*
Mortality	5 (7,5%)	1 (2,3%)	4 (16%)	0.0001**

* Mann-Whitney U test ** χ^2 test.

In examining postoperative complications of gastric cancer patients, there was a notable difference in the incidence of anastomosis fistulas between the two groups (p=0.0001). The pandemic group reported a higher occurrence, with 6 cases, while the pre-pandemic group had only one. However, no significant differences were observed between the pandemic and pre-pandemic groups when evaluating other complications such as hemorrhage, wound infection, and evisceration (Table VI).

Table VI
Postoperative complications – Post gastrectomy procedure.

Procedures	Total	Prepandemic	Pandemic	p-value
Anastomosis fistula (yes/no)	7/59	1/41	6/18	0.0001*
Hemorrhage/Hematoma (yes/no)	5/60	3/39	2/21	0.5155*
Wound Infection (yes/no)	11/54	4/38	7/16	1.0000*
Evisceration (yes/no)	1/65	0/42	1/23	-

* χ^2 test.

Discussion

The findings of this retrospective study comparing gastric cancer treatment outcomes during and before the COVID-19 pandemic are consistent with several similar studies conducted in the field. These studies collectively shed light on the impact of the pandemic on cancer management and provide valuable insights for healthcare systems. There was a significant rise in emergency surgeries compared to before the pandemic. Echoing this trend, literature from various parts of the world pointed to similar patterns. With the pandemic causing disruptions in regular screenings and consultations and patients wary of visiting hospitals, many presented at more advanced stages of their condition. These delays often pushed them toward

the need for immediate surgical interventions. Across the globe, researchers noticed that the pandemic's grip didn't just affect infection rates but also shadowed other critical health areas, such as cancer treatments. The tales from these studies serve as a cautionary note on the unintended consequences of global health crises on routine medical care. The higher rate of complications observed during the pandemic period, particularly the increased incidence of anastomosis fistula, aligns with the results reported in other studies. For example, a study by Li et al. (2022), conducted in a different geographical region also found an elevated rate of anastomosis fistula in gastric cancer patients during the pandemic. These consistent findings across different studies emphasize the disruptive effect of the pandemic on surgical outcomes and the need for additional precautions and enhanced perioperative care during this challenging time. Moreover, the lower rate of preoperative chemotherapy observed in our study during the COVID-19 period is consistent with research conducted by Parray et al. (2022), Polkowski et al. (2020) and Yazici et al. (2022). These studies demonstrated a decreased utilization of neoadjuvant therapies, including chemotherapy, during the pandemic due to various factors such as treatment delays, resource allocation, and patient concerns. This reduction in preoperative chemotherapy raises concerns about the potential impact on disease control and overall survival rates for gastric cancer patients. Additionally, the shorter average hospitalization period during the pandemic, as observed in our study, aligns with other investigations. Studies by Lee et al. (2022b) and Hesary & Salehiniya (2022) also reported decreased hospital stays for gastric cancer patients during the pandemic, likely attributed to the implementation of accelerated recovery protocols, increased use of minimally invasive procedures, and the need to minimize hospital exposure for patients during a highly contagious period. Furthermore, it is worth noting that studies examining the impact of the COVID-19 pandemic on cancer management have also highlighted additional challenges, such as delays in cancer diagnosis, treatment modifications, and changes in healthcare delivery models. For instance, research by Tokunaga et al. (2022) and Polkowski et al. (2020) demonstrated reduced cancer screening rates and delays in diagnostic procedures during the pandemic, which could lead to advanced disease stages at the time of diagnosis and potentially poorer treatment outcomes. The consistency of our study's findings with previous research collectively reinforces the notion that the COVID-19 pandemic has significantly impacted gastric cancer treatment outcomes. These findings underscore the importance of implementing strategies to mitigate the disruption caused by infectious disease outbreaks, such as ensuring access to essential cancer treatments, optimizing perioperative care, and integrating telemedicine solutions to maintain regular follow-ups and monitor disease progression remotely. It is worth noting that while this study provides valuable insights, there are certain limitations to consider. The retrospective nature of the analysis may introduce biases, and the sample size, especially for the pandemic group, was relatively small. Future prospective studies with larger cohorts and more extended follow-up periods are warranted to validate these findings

further and gain a more comprehensive understanding of the long-term implications of the pandemic on gastric cancer management. Additionally, conducting studies that compare different healthcare systems and regions can provide a more comprehensive understanding of the global impact of the pandemic on gastric cancer treatment outcomes.

Conclusions

1. During the pandemic, a marked increase in complications was observed, together with reduced preoperative chemotherapy utilization, and shorter hospital stays.
2. These shifts, combined with other challenges, such as delays in diagnosis and altered healthcare delivery, highlight the necessity to adapt and strengthen healthcare strategies in the face of global disruptions.
3. However, the study's limitations, including its retrospective nature and smaller sample size for the pandemic group, suggest the need for more extensive, prospective studies to fully comprehend the pandemic's long-term effects on cancer management.
4. Comparing different healthcare systems would further enhance our understanding of the global ramifications.

Acknowledgments

No funding sources.

Conflict of interests

The authors declare no conflicts of interest.

References

- Arneiro AJ, Ramos MFKP, Pereira MA, Dias AR, Zilberstein B, Ribeiro JU, Sergio Nahas C. Impact of COVID-19 pandemic on the surgical treatment of gastric cancer. *Clinics (Sao Paulo)*. 2021;76:e3508. doi:10.6061/clinics/2021/e3508.
- Chen F, Dai Z, Huang C, Chen H, Wang X, Li X. Gastrointestinal Disease and COVID-19: A Review of Current Evidence. *Dig Dis*. 2022;40(4):506-514. doi:10.1159/000519412.
- Doyle JP, Patel PH, Doran SLF et al. The Cancer Hub Approach for Upper Gastrointestinal Surgery During COVID-19 Pandemic: Outcomes from a UK Cancer Centre. *Ann Surg Oncol*. 2023;30(4):2266-2275. doi:10.1245/s10434-022-12571-4.
- Feier CVI, Faur AM, Muntean C et al. The Challenges of Gastric Cancer Surgery during the COVID-19 Pandemic. *Healthcare (Basel)*. 2023;11(13):1903. doi:10.3390/healthcare11131903.
- Herrera-Kok JH, Parmar C, Bangash AH et al. Global impact of COVID-19 pandemic on gastric cancer patients. *Eur J Surg Oncol*. 2023;49(4):876-877. doi:10.1016/j.ejso.2023.02.016.
- Hesary FB, Salehiniya H. The Impact of the COVID-19 Epidemic on Diagnosis, Treatment, Concerns, Problems, and Mental Health in Patients with Gastric Cancer. *J Gastrointest Cancer*. 2022;53(3):797-804. doi:10.1007/s12029-021-00692-0.
- Kang WZ, Zhong Y-X, Ma F-H et al. Treatment strategies for gastric cancer during the COVID-19 pandemic. *World J Clin Cases*. 2020;8(21):5099-5103. doi:10.12998/wjcc.v8.i21.5099.
- Kimura A, Morinaga N, Wada W et al. Patient with gastric cancer who underwent distal gastrectomy after treatment of COVID-19 infection diagnosed by preoperative PCR

- screening. *Surg Case Rep.* 2022;8(1):12. doi:10.1186/s40792-022-01367-z.
- Kodama M, Miyamori D, Kanno K, Ito M. The impact of early-stage COVID-19 pandemic on the diagnosis and treatment of gastric cancer: A cross-sectional study using a large-scale cancer registry in Hiroshima, Japan. *DEN Open.* 2022;3(1):e180. doi:10.1002/deo2.180.
- Lee K, Lee YY, Suh M et al. Impact of COVID-19 on cancer screening in South Korea. *Sci Rep.* 2022b;12(1):11380. doi:10.1038/s41598-022-15778-3.
- Lee K, Suh M, Jun JK et al. Impact of the COVID-19 Pandemic on Gastric Cancer Screening in South Korea: Results From the Korean National Cancer Screening Survey (2017-2021). *J Gastric Cancer.* 2022a;22(4):264-272. doi:10.5230/jgc.2022.22.e36.
- Li J, Bai H, Qiao H et al. Causal effects of COVID-19 on cancer risk: A Mendelian randomization study. *J Med Virol.* 2023;95(4):e28722. doi:10.1002/jmv.28722.
- Li YX, He C-Z, Liu Y-C et al. The impact of COVID-19 on gastric cancer surgery: a single-center retrospective study. *BMC Surg.* 2020;20(1):222. doi:10.1186/s12893-020-00885-7.
- Ma J, Zhu C, Li W et al. The Effect of Delayed Oncology Surgery on Survival Outcomes for Patients With Gastric Cancer During the COVID-19 Pandemic: Evidence-Based Strategies. *Front Oncol.* 2022;12:780949. doi:10.3389/fonc.2022.780949.
- Park H, Seo SH, Park JH et al. The impact of COVID-19 on screening for colorectal, gastric, breast, and cervical cancer in Korea. *Epidemiol Health.* 2022;44:e2022053. doi:10.4178/epih.e2022053.
- Parray AM, Chaudhari V, Bhandare MS et al. Impact of Covid-19 on gastrointestinal cancer surgery: A National Survey. *Langenbecks Arch Surg.* 2022;407(8):3735-3745. doi:10.1007/s00423-022-02675-6.
- Polkowski WP, Sędlak K, Rawicz-Pruszyński K et al. Treatment of Gastric Cancer Patients During COVID-19 Pandemic: The West is More Vulnerable. *Cancer Manag Res.* 2020;12:6467-6476. Published 2020 Jul 30. doi:10.2147/CMAR.S260842.
- Rosa F, Alfieri S. Possible impact of COVID-19 on gastric cancer surgery in Italy. *Minerva Chir.* 2020;75(5):380-381. doi:10.23736/S0026-4733.20.08381-9.
- Solaini L, Bencivenga M, Rosaet F al. Consequences of the COVID-19 pandemic on the diagnosis and treatment of gastric cancer in referral centers in Italy. *Tumori.* 2023;109(1):121-128. doi:10.1177/03008916211072586.
- Tokunaga M, Yoshikawa T, Boku N et al. Impact of COVID-19 on gastric cancer treatment in Japanese high-volume centers: a JCOG stomach cancer study group survey. *Surg Today.* 2022;52(2):231-238. doi:10.1007/s00595-021-02329-y.
- Yazici H, Eren A, Uprak TK et al. Gastric Cancer Surgery During the Pandemic: What It Costs?. *J Gastrointest Cancer.* 2022;53(4):848-853. doi:10.1007/s12029-021-00751-6.