

ORIGINAL ARTICLE

Clinical characteristics and outcomes in cancer patients affected by COVID-19: a study from a Peruvian cancer center

Características clínicas y desenlace en pacientes oncológicos afectados por el COVID-19: estudio de un centro oncológico en el Perú

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ABSTRACT

Objective: To describe the clinical features and outcomes of COVID-19 infection in cancer patients and evaluate the risk factors associated with severe disease.

Materials and methods: An observational retrospective study was performed in Oncosalud-AUNA. We included patients with diagnosis of invasive cancer with a SARS-CoV-2 confirmed infection by RT-PCR assay. Univariate and multivariate binary logistic regression analysis were performed to evaluate the risk factors associated with severe disease.

Results: A total of 36 patients were included. Median age was 61 years old; 36.1% males; 58.4% with ≥ 1 comorbidity. Breast cancer was the most frequent malignancy. 72% of patients were on anticancer treatment. All patients were symptomatic. 16.7% were admitted to the ICU and 27.8% of patients died. The severity of disease was: mild, 27.8%; moderate, 33.3%; severe, 22.2%; and critical – ARDS, 16.7%. Patients with severe or critical disease were frequently >60 years old, male, in ECOG 2-3 and were receiving treatment with palliative intention. **Conclusions:** COVID-19 cancer patients were frequently overweight older adults with at least one comorbidity with active treatment and developed typical COVID-19 symptoms. Severe or critical COVID-19 occurred in more than one third of patients. Male patients and those >60 years old were at greater risk of developing severe or critical COVID-19.

Keywords

Cancer; COVID-19; SARS-CoV-2; Breast neoplasms (source: MeSH NLM).

RESUMEN

Objetivo: Describir las características clínicas y el desenlace clínico de los pacientes con cáncer infectados por COVID-19 y evaluar los factores de riesgo asociados a la enfermedad grave. **Materiales y métodos:** un estudio retrospectivo observacional fue llevado a cabo en Oncosalud-AUNA. Se incluyeron pacientes

con diagnóstico de cáncer invasivo con infección confirmada por SARS-CoV-2 mediante ensayo RT-PCR. Se realizaron análisis de regresión logística binaria univariante y multivariante para evaluar la asociación entre las características clínicas y la gravedad. **Resultados:** Se incluyó un total de 36 pacientes. La mediana de edad fue de 61 años; 36,1% hombres; 58,4% con ≥ 1 comorbilidad. El cáncer de mama fue la neoplasia más frecuente. El 72% de los pacientes estaban en tratamiento activo contra el cáncer. Todos los pacientes fueron sintomáticos. El 16,7% ingresó en la UCI y el 27,8% de los pacientes fallecieron. La gravedad de la enfermedad fue: leve, 27,8%; moderada, 33,3%; severa, 22,2%; y crítico –SDRA, 16,7%. Los pacientes con enfermedad grave o crítica fueron frecuentemente mayores de 60 años, varones, en ECOG 2-3 y recibían tratamiento con intención paliativa. **Conclusiones:** Los pacientes oncológicos con COVID-19 fueron frecuentemente adultos mayores con sobrepeso y al menos una comorbilidad en tratamiento activo contra el cáncer y desarrollaron síntomas típicos de COVID-19. Se produjo COVID-19 severo o crítico en más de un tercio de los pacientes. Los pacientes varones y los mayores de 60 años tuvieron mayor riesgo de desarrollar COVID-19 severo o crítico.

Palabras clave

Cancer; COVID-19; SARS-CoV-2; Neoplasias de la mama (fuente: DeCS BIREME).

INTRODUCTION

The world is experiencing a global pandemic due to a new coronavirus of zoonotic origin, SARS-CoV-2. In early March 2020, the World Health Organization (WHO) officially announced the COVID-19 pandemic ⁽¹⁾ and as of January 6th, 2021, 86,809,552 confirmed cases and 1'876,156 deaths have been reported ⁽²⁾. During 2020, Latin America emerged as the epicenter of the pandemic.

Cancer patients represent a population susceptible to developing infections and SARS-CoV-2 does not seem to be the exception. Overall, accumulating data indicates that cancer patients have a higher prevalence of COVID-19 infection ^(3,4) and a greater chance of developing a more severe illness and death when compared with non-cancer patients ^(3,5,6). The effect of recent anti-cancer therapy on mortality risk remains uncertain ⁽⁷⁻⁹⁾.

Although there is increasing information on the epidemiological and clinical features of COVID-19 in cancer patients, this information is still scarce and comes mostly from the USA, China, and Europe; with results that are not necessarily applicable to a Latin American setting. The aim of this study was to describe the clinical features and outcomes of COVID-19 infected cancer patients and to evaluate the risk factors associated with severe disease.

MATERIALS AND METHODS

Study design and setting

We conducted a retrospective observational study at Oncosalud-AUNA, the largest specialized private cancer center in Peru.

Subjects

Patients with a previous diagnosis or history of invasive cancer with a SARS-CoV-2 confirmed infection as assessed by RT-PCR assay from nasopharyngeal swabs diagnosed between 13 March 2020 and 22 August 2020 were included.

Study definitions

COVID-19 disease severity was assessed according to the interim guidance of WHO for COVID-19 and classified into mild, moderate (pneumonia), severe (severe pneumonia) and critical disease (acute respiratory distress syndrome, sepsis/septic shock) ⁽¹⁰⁾. Nosocomial transmission was considered definite if a patient developed symptoms at least 14 days after being admitted ⁽¹¹⁾. As previously described ⁽⁹⁾, a severe clinical event was defined as a condition requiring admission to an intensive care unit (ICU), the use of mechanical ventilation, or death. Active anticancer therapy was defined as any modality of treatment (surgery, radiotherapy, or systemic treatment) administered within 30 days of the COVID-19 diagnosis.

Instrument and procedure

Our source was the clinical history and the data was collected in a data repository.

Data collection

Clinical data were collected from the electronic medical records, including demographic, epidemiological and clinical information and laboratory and radiological findings. Patients were contacted by phone to retrieve any missing data.

Data analysis

For the descriptive analysis, categorical variables were presented through frequencies and percentages and continuous variables through summary measures (average, median, range as appropriate). Fisher's exact test was used to contrast variables between patients who developed severe or critical disease vs. those who did not. A univariate binary logistic regression was performed to assess relationship between demographic or clinical characteristics and severity with a CI of 95%. A multivariate binary logistic regression was performed with the statistically significant variables found in the univariate analysis.

Statistical analysis was carried out using SPSS Statistics version 26.0 (IBM, New York, NY). A two-sided P-value <0.05 was considered statistically significant.

Ethical approval

This study was approved by the Institutional Review Board (IRB) of Oncosalud-AUNA. An informed consent was waived by the Ethics Committee, according to the statuses of Oncosalud-AUNA.

RESULTS

We included 36 patients. Demographic and clinical characteristics are summarized in Table 1. The median age was 61 years (36- 85); 23 (36.1%) of them were males. In addition to cancer, 21 (58.4%) patients had at least one or more comorbidity, obesity (27.8%) and hypertension (33.3%) were the most frequent. Patients had an ECOG performance status of 1 or 2 in 91.6% of cases.

Data regarding cancer characteristics and treatment is shown in Table 2. Breast cancer was the most frequent type of malignancy (n=9, 25.0%), followed by hematological cancer (n=7, 19.4%) and colorectal cancer (n=5, 13.8%). While 18.8% of patients were diagnosed with stage IV cancer, 31.8% of patients had metastases at the diagnosis of COVID-19. Seventy two percent (n=26)

Table 1. Demographic and clinical characteristics.

Patients	n=36	%
Age		
Median (range)	61 (36, 85)	
<60	17	47.2
≥60	19	52.8
Sex		
Male	13	36.1
Female	23	63.9
Comorbidities		
None	15	41.7
1	14	38.9
2	5	13.9
≥3	2	5.6
Type of comorbidities		
BMI		
Low weight: <18.5	1	2.8
Normal: 18.5 – 24.99	6	16.7
Overweight: 25 – 29.99	19	52.8
Obese: ≥30	10	27.8
Hypertension		
No	24	66.7
Yes	12	33.3
Hypercholesterolemia		
No	18	78.3
Yes	5	21.7
Unknown	13	-
Other cardiovascular diseases		
No	34	94.4
Yes (CVA, cardiac arrhythmia)	2	5.6
Diabetes		
No	32	88.9
Yes	4	11.1
Asthma/COPD		
No	34	94.4
Yes	2	5.6
Smoking		
No	32	91.4
Yes	3	8.6
Unknown	1	-
Alcohol		
No	27	77.1
Yes	8	22.9
Unknown	1	-
Status performance (ECOG)		
1	17	47.2
2	16	44.4
3	3	8.3

BMI: Body Mass Index; COPD: Chronic obstructive pulmonary disease; ECOG: Eastern Cooperative Oncology Group.

were on active anticancer therapy at the diagnosis of COVID-19 either with curative (50%) or palliative intent (50%). Systemic treatment (n=22, 84.6%) was the most

Table 2. Data regarding cancer characteristics and treatment.

Patients	n=36	%
Type of neoplasms		
Breast	9	25
Hematological	7	19.4
Colorectal	5	13.8
Prostate	3	8.3
Stomach	2	5.6
Cervix	2	5.6
Other	8	22.4
Clinical Stage (at diagnosis)		
I	3	9.4
II	12	37.5
III	11	34.4
IV	6	18.8
NA	4	-
Metastasis (at diagnosis of COVID-19)		
No	15	68.2
Yes	7	31.8
Unknown	1	-
Neoplasm status (at diagnosis of COVID-19)		
In follow-up without cancer	7	19.4
In follow-up with cancer	3	8.4
In cancer treatment (during or within 30 days)	26	72.2
Intent of current cancer treatment (n=26)		
Curative	13	50
Palliative	13	50
Current treatment (n=26)		
Surgery	3	11.5
Radiotherapy	1	3.9
Systemic Therapy	22	84.6
Current systemic treatment (n=22)		
Chemotherapy	11	50
Target therapy	4	18.2
Hormonotherapy	4	18.2
Biological Therapy	3	13.6

common modality as follows: chemotherapy (n=11, 50%), target therapy (n=4, 18.2%), hormonal therapy (n=4, 18.2%) and biological treatment (n=3, 13.6%).

COVID-19 characteristics, treatment and outcomes are summarized in Table 3. In 94.4% of patients, COVID-19 was acquired at a community level and in 5.6% a nosocomial transmission was considered definite. The former group came to the ER with symptoms. Median time from the onset of symptoms to the diagnosis was 3 days. All patients were symptomatic. The most commonly presented symptoms were fever (n=26, 72.2%), cough (n=20, 55.6%) and dyspnea (n=18, 50%). The SpO₂ at diagnosis were: 55.6% between 94-100%, 33.3% between 90-93% and 4% ≤90%.

Table 3. COVID-19 characteristics, treatment, and outcomes.

Patients	n=36	%
Type of transmission		
Comunitary	33	94.4
Nosocomial	2	5.6
Time from symptom onset to diagnosis	3 (0, 14)	
Symptoms / Signs		
Fever	26	72.2
Difficulty breathing	18	50
Cough	20	55.6
Rhinitis	4	11.1
Myalgia	4	11.1
Anosmia	4	11.1
Asthenia	4	11.1
Diarrhea	4	11.1
Dysgeusia	2	5.6
Headache	1	2.8
O ₂ saturation at diagnosis of COVID-19 (%)		
94 – 100	20	55.6
90 – 93	12	33.3
<90	4	11.1
Use of supplemental O ₂		
No	19	52.8
Yes	17	47.2
O ₂ supplement type		
Nasal cannula	11	64.7
Venturi mask	1	5.9
Reservoir mask	1	5.9
Mechanical ventilation	4	23.5
Medical Treatment		
Azithromycin	11	30.6
Hydroxychloroquine	7	19.4
Antiviral	2	5.6
Tocilizumab	5	13.9
Corticosteroids	8	22.2
Other antibiotics	21	58.3
Severity of COVID-19		
Mild	10	27.8
Moderate	12	33.3
Severe	8	22.2
Critical	6	16.7
ARDS, sepsis and septic shock	3	-
ARDS, sepsis	1	-
ARDS	2	-
Other complications		
Arrhythmia	3	-
Heart failure	1	-
Encephalitis	1	-
Serious clinical event (MV, ICU or death)		
No	24	66.7
Yes	12	33.3

(Va a la pág. 9)

Table 3. COVID-19 characteristics, treatment, and outcomes. (Viene de la pág. 8)

Patients	n=36	%
Clinical Outcome		
Discharged (including 9 outpatient clinics)	26	72.2
Remains hospitalized *	-	
Death	10	27.8
ICU Death	6	66.7
Death cause		
Related to COVID-19	9	90
Related to Cancer	1	10
Patients	36	
Symptoms onset time to diagnosis	3 (0, 14)	-
Patients	24	
Symptoms onset time to hospitalization (range)	3.5 (0, 11)	-
Patients	6	
Time from hospitalization to ICU admission		
Patient 1-3	0 days	-
Patient 4	4 days	-
Patient 5	5 days	-
Patient 6	7 days	-
Patients	10	
Symptoms onset time to death (range)	11.5 (5, 33)	-

A total of 17 patients (47.2%) required oxygen supplementation and 4 of them were put on invasive mechanical ventilation. Thirty percent of cases (n=11) were administered azithromycin; 19.4% (n=7), hydroxychloroquine; 5.6% (n=2), antivirals and 58.4% (n=21), empirical antibiotics. Systemic corticosteroids were given to 22.2% of patients (n=8), 7 of them with severe disease. Tocilizumab was prescribed to 13.9% of patients (n=5).

At the time of writing this report all patients had either been discharged or had died. Seventy five percent of patients (n=27) were admitted as inpatients with a median hospital stay of 12 days (4 – 30) and 16.7% (n=6) were admitted to the ICU with a median stay of 11 days (5- 24).

Overall, the severity of disease was mild, moderate, severe, and critical (ARDS) in 27.8% (n=10), 33.3% (n=12), 22.2% (n=8) and 16.7% (6) of patients, respectively. Among inpatients, the severity of disease was mild, moderate, severe, and critical (ARDS) in 11.1% (n=3), 37.0% (n=10), 29.6% (n=8) and 22.2% (n = 6) of patients, respectively. Thirty-three percent of patients developed a severe clinical event: 11.1% (n=4) were put on mechanical ventilation, 16.7% (n=6) were admitted to ICU and 27.8% (n=10) of the patients died (overall mortality). Among inpatients mortality was 37%, however, the cause of death

Table 4. Laboratory and radiological findings.

Patients	n=29	%
Leukocytes cel/uL (range)	5500 (1780, 44300)	
≤4500	5	17.2
4500 – 11000	21	72.4
>11000 (use of Colony Stimulating Factor)	3	10.3
Lymphocytes cel/uL (range)	876 (160, 3514)	
≤1300	22	75.9
>1300	7	24.1
Neutrophils cel/uL (range)	4268 (831, 39870)	
≤1500	2	6.9
>1500	27	93.1
Patients	27	
PCR mg/dL (range)	7.54 (0.44, 37.49)	
≤0.5	3	11.1
>0.5	24	88.9
PCR mg/dL		
≤10	18	66.7
>10	9	33.3
Patients	26	
DHL U/L (range)	278 (171, 4119)	
≤225	6	23.1
>225	20	76.9
Dímero-D ug/ml (range)	0.87 (0.11, 4.00)	
≤0.5	9	34.6
>0.5	17	65.4
Patients	24	
Ferritin ng/mL (range)	551 (59, 10088)	
≤400	10	41.7
>400	14	58.3
Patients	11	
IL-6 pg/ml (range)	47.3 (6.0, 928.0)	
≤7	1	-
>7	10	-
Patients	32	
Chest CT	32	
Diffuse opacity in ground glass	20	62.5
Focal opacity in ground glass	5	15.6
Focal nodular and diffuse opacity in ground glass	3	9.3
Focal nodular	1	3.1
Diffuse Nodular	1	3.1
Normal	2	6.3

was related to COVID-19 in 9 cases and related to cancer in 1 (inpatient specific mortality 33.3%). The median time from admission to death was 11.5 days (5-33).

For patients who were eventually able to continue treatment with either systemic therapy, radiation or surgery, median time from COVID-19 diagnosis to restart was 41 days.

Table 5. COVID-19 infection severity according to clinical characteristics. Univariate logistic regression.

Patients	Mild - Moderate		Severe - critical		p
	n=22	%	n=14	%	
Age					
<60	14	63.6	3	21.4	0.019
≥60	8	36.4	11	78.6	
Sex					
Female	18	81.8	5	35.7	0.014
Male	4	18.2	9	64.3	
Comorbidities					
No	8	36.4	7	50	0.644
Yes	14	63.6	7	50	
Obesity					
No	15	68.2	11	78.6	0.797
Yes	7	31.8	3	21.4	
HTA					
No	15	68.2	9	64.3	1
Yes	7	31.8	5	35.7	
Type of tumor					
Solid	17	77.3	12	85.7	0.681
Hematological	5	22.7	2	14.3	
Current cancer treatment					
On Follow-up	8	36.4	2	14.3	0.255
On treatment	14	63.6	12	85.7	
Intent of current treatment					
Curative	10	71.4	3	25	0.049
Palliative	4	28.6	9	75	
ECOG					
1	14	63.6	3	21.4	0.033
2-3	8	36.4	11	78.6	
Laboratory findings					
Leukocytes					
<4500	7	46.7	3	21.4	0.245
>4500	8	53.3	11	78.6	
LDH					
<225	5	41.7	1	7.1	0.065
>225	7	58.3	13	92.9	
CRP					
<0.5	2	15.4	1	7.1	0.596
>0.5	11	84.6	13	92.9	
CRP					
<10	11	84.6	7	50	0.103
>10	2	15.4	7	50	
D-dimer					
<0.5	4	33.3	5	35.7	1
>0.5	8	66.7	9	64.3	

ECOG: Eastern Cooperative Oncology Group; LDH: Lactate dehydrogenase; CRP: C-reactive protein.

Laboratory and radiological findings are found in Table 4. The blood count results showed leukopenia in 17.2% of patients, leukocytosis in 10.3% and lymphopenia in 75.9% patients. High levels of lactate dehydrogenase

Table 6. Factors associated with the severity of COVID 19 infection. Multivariate logistic regression.

	OR (IC95%)	p
Age		
<60	Reference	
>60	8.6 (1.4, 53.5)	0.021
Sex		
Female	Reference	
Male	9.0 (1.5, 54.7)	0.017
Obesity: No vs. Yes	-	0.647
Hypertension: No vs. Yes	-	0.44
Comorbidities: No vs. Yes	-	0.222
Type of tumor: Solid vs. Hematological	-	0.829
Metastasis: No vs Yes	-	0.522
Actual treatment: Follow-up vs in treatment	-	0.377

were found in 76.9% of patients, elevated D-dimer in 65.4% and elevated ferritin in 58.3%. Highly sensitive C-reactive protein levels were observed in 88.9% of patients and in 33.3% it was over 10 mg/dL. All but 2 patients had abnormal findings on chest CT with ground-glass opacities (GGO) being the predominant CT imaging pattern, observed in 78.1% patients (diffuse in 62.5% and focal in 15.6%). GGO associated with patchy consolidation was the second most common finding in 9.3% of patients.

Table 5 shows risk factors for severe disease. When comparing mild and moderate vs. severe and critical illness, significant differences were found. Cancer patients with severe or critical disease were more frequently over 60 years old (78.6% vs 36.4%; $p=0.019$), male (64.3% vs 18.2%; $p=0.014$) in status performance of ECOG 2-3 (78.6% vs 36.4%; $p=0.033$) and were receiving treatment with palliative intention (75% vs 28%; $p=0.049$). In the multivariate logistic regression analysis, patients over 60 years old and male patients were 8.6 and 9 times more likely to develop severe or critical illness, respectively (Table 6). No significant differences were found in the presence of obesity, hypertension or other comorbidities, the type of tumor, the presence of metastases at COVID-19 diagnosis, active antitumor treatment, or laboratory findings.

DISCUSSION

Since December 2019, infection from the SARS-CoV-2 virus has virtually spread worldwide, posing enormous pressure over all healthcare systems.

Even before the pandemic, Latin American health care systems, which are generally overburdened, fragmented

and underfunded were struggling to meet basic needs for their population affected by a high prevalence of endemic infections as well as an increasingly higher rates of non-communicable diseases⁽¹²⁾. The ability to respond to the pandemic has been therefore limited and the large human toll is striking. Containing only 8.2% of the world population, the region had 28% percent of deaths worldwide by the end of December 2020⁽¹³⁾. The COVID-19 lethality rate in Latin America is 6 times higher than Europe. Peru and Brazil are among the countries with the higher reproductive number (Rt) in the region 2.4 and 2.2, respectively⁽¹⁴⁾. A recent position paper which compared 2019 and 2020 data from 9 Latin American countries found a major decrease in the number of first-time visits to oncology services and chemotherapy, radiotherapy, surgery, and pathology usage as well as screening in both public and private cancer institutions⁽¹⁵⁾. ONCOSALUD-AUNA, the biggest private Peruvian cancer center, has maximized efforts in trying to guarantee the continuity of cancer therapy while treating affected patients. Herein we report the characteristics and outcomes of a cohort of 36 cancer patients with COVID-19 treated in our institution, the majority of whom were receiving active treatment.

In agreement with what has been previously reported^(13,16-19), mean age of presentation for patients from the present series was 60 years old and the majority had comorbidities^(3,5), with hypertension as the most frequent. The high proportion of patients with obesity (27%) reported herein in addition to those overweight (59%), leads to a striking 86% of patients who had a nutritional disorder when diagnosed with COVID-19. A robust case-control study reported an increase in the risk of COVID-19 infection in association with increasing BMI, suggesting that it is not only a risk factor for developing severe COVID-19 disease, but also for acquiring the infection itself⁽²⁰⁾.

Based on our analysis, the highest incidence of COVID-19 infection was found among breast cancer patients, followed by those with hematological malignancies and colorectal cancer. The largest cohort reported to date, which included 928 oncological patients with COVID-19, found that patients with hematological malignancies, followed by those with breast and prostate cancer were the most affected⁽⁷⁾. Other series reported a predominance of lung cancer, followed by esophageal and breast cancer⁽⁹⁾. In general, the distribution of oncological diagnoses varies among the multiple series, probably due to the epidemiological profile of each individual treating institution. However, according to the UK Coronavirus Cancer Monitoring Project (UKCCMP) report, patients with hematological malignancies appear to be at a significantly increased risk of COVID-19 infection, as they were overrepresented in their setting, but this was not

observed in our center⁽²¹⁾. The proportion of patients from our series presenting with metastatic disease at COVID-19 diagnosis was 31.8%, lower than what has been reported by other series ranging from 36 to 60%^(8-10,22). Importantly, 72% percent of patients from our study were on active anticancer therapy at the diagnosis of COVID-19. This contrasts with most series, which have on average 20% of patients in active cancer treatment⁽⁶⁻⁹⁾. Our results are unusual, they are only surpassed by Hospital 12 de Octubre's results, where 96% of the patients evaluated were in active treatment⁽²³⁾.

All patients presented COVID symptoms similar to those reported in non-cancer patients. In general, laboratory and radiological findings from our series were alike those previously reported. We observed that 75% of patients presented lymphopenia, a common characteristic in patients receiving anticancer treatment that has also been spotted in COVID-19 patients⁽²⁴⁾. Among the inflammation markers, we found increased DHL in 77%, as well as D-dimer in 65% of patients. C-reactive protein (CRP) was increased in almost 90% of patients, with a median of 7.54 (range 0.44- 37.49) and one third of patients with values over 10mg/dL. Levels of CRP greater than 10 have been found to be related to moderate or critical illness and these patients are at higher risk of developing severe disease from COVID-19⁽²⁵⁾. Regarding radiological findings, 93.7% of the patients presented abnormalities in the chest CT scan; 68% had diffuse-type ground-glass opacities as the only pattern and an additional 13% of patients exhibited this pattern in combination with nodular-type opacities; therefore, in a total of 81% of patients a diffuse ground-glass pattern was present.

In line with the UKCCMP report, in which 45% of patients developed severe or critical disease, we found that 51.8% of the patients from the present series presented the same⁽⁸⁾. Our results also paralleled those reported by the CCC19⁽⁷⁾ in terms of ICU admission (14% vs 16.7% in the current study) and need for mechanical ventilation (12% vs 11.1% in the current study). Even though more than half of the patients developed severe or critical illness, the admission rate to the intensive care unit remained relatively low. While 37% of our patients met the criteria for ICU admission, only 16.7% were admitted. The reason why few patients were considered for this specialized treatment could be related to the low perceived usefulness of intensive support in patients with very advanced or uncontrolled cancer disease. A situation similar to that was reported in the study presented by the Hospital 12 de Octubre, where no cancer patients underwent mechanical ventilation or were admitted to the intensive care unit as the services were reserved for non-comorbid patients⁽²³⁾. Overall, mortality from the present series was 27.8%, which is consistent with the 25.6% case fatality rate reported by a systematic literature search

that included 52 studies and 18,560 patients with both COVID-19 and cancer⁽²⁶⁾. Likewise, in the Latin American setting, the Brazilian National Cancer Institute reported a COVID-19 specific mortality for inpatients of 33.1%⁽²⁷⁾, which is equal to the inpatient mortality reported by the present series.

Although our analysis is limited by the size and heterogeneity of the analyzed group, well-recognized risk factors for severe COVID-19 in the general population appear to be relevant for cancer patients as well^(9,10,22,23). Men and patients older than 60 years had an 8- and 9-times greater risk of developing severe disease, respectively. These data can help identify patients requiring admission or a closer follow-up and inform treatment decisions. More importantly, we did not find an increased risk of severe COVID-19 nor death in those patients who had received recent anti-cancer treatment. In fact, the effect of recent treatment on COVID-19 severity and outcomes remains controversial. The UKCCMP reported that among 800 patients with cancer, the receipt of any systemic treatment or radiotherapy within the previous 4 weeks did not affect mortality from COVID-19. The authors concluded that mortality from COVID-19 in cancer patients appeared to be mainly driven by gender, age, and comorbidities⁽⁸⁾. Also, the CCC19 study did not find an association between 30-day mortality and recent anticancer therapy⁽⁷⁾. Conversely, a retrospective analysis from nine Chinese hospitals, which included 205 patients, found that those who received chemotherapy within 4 weeks before the symptom onset had a higher risk of death.

Some limitations should be considered when interpreting the findings of this study. First and foremost, the small sample size limits the interpretation of results. Second, patients were naturally restricted to those with symptomatic disease who sought help at our center. Patients who were receiving long term low risk treatments such as hormone therapy, or those undergoing a longer follow-up, were probably treated with non-cancer insurance outside of our center if they developed COVID-19. Having said this, the group studied is not representative of all patients with cancer and COVID-19, but we think it is representative of cancer patients undergoing active treatment.

In conclusion, COVID-19 cancer patients in our study were frequently overweight older adults with at least one comorbidity, who were receiving active treatment and developed typical COVID-19 symptoms. Severe or critical COVID-19 occurred in more than a third of the patients, with men and those over 60 years of age being a population highly susceptible to developing this form of disease. The mortality rate reported in our study is high and consistent with that reported for other groups of

patients. Nevertheless, most cancer patients recovered from COVID-19 despite active anticancer treatment.

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