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Factors Influencing COVID-19 Mortality in Cancer and Non-Cancer Patients: A Comparative Study at Ayatollah Khansari Hospital in Arak

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Abstract
Background: Cancer patients are particularly vulnerable to coronavirus disease of 2019 (COVID-19) due to their clinical characteristics. The present study investigated factors influencing COVID-19 mortality in cancer versus non-cancer patients.
Method: We retrospectively analyzed medical records of 801 COVID-19 patients, including 738 non-cancer patients and 63 cancer patients at Ayatollah Khansari Hospital, Arak, from March 2018 to March 2019. Data on laboratory results, medications, clinical symptoms, medical history, and imaging findings were collected. Logistic regression assessed the relationship between cancer status and mortality, controlling for age and gender.

Results: Multivariable logistic regression showed higher mortality risk in patients aged ⩾60 (Odds ratio (OR) = 1.61, 95% confidence interval (CI) = 1.01 – 2.60) and men (OR = 1.86, 95% CI = 1.12 – 3.15). The use of anticoagulants (OR = 2.13, 95% CI = 1.18 – 4.02) and antibiotics (OR = 1.30, 95% CI = 1.07 – 1.58) increased mortality risk while corticosteroid use reduced it (OR = 0.35, 95% CI = 0.21 – 0.60). Non-cancer patients had a 59% lower risk of death compared with cancer patients (OR = 0.41, 95% CI = 0.20 – 0.88).
Conclusion: Cancer patients with COVID-19 face significantly higher mortality risks. Tailoring treatment plans, prioritizing vaccination, and enhancing therapeutic interventions for this vulnerable group are essential.

Keywords: COVID-19, SARS-CoV-2, Neoplasms, Mortality, Treatment priority

Introduction

The coronavirus disease of 2019 (COVID-19) pandemic emerged in December 2019 in Wuhan, China, and rapidly spread worldwide, resulting in a high incidence of infections and fatalities.[1] According to the World Health Organization (WHO), as of September 17, 2021, there have been 226,844,344 reported cases and 4,666,334 deaths globally due to COVID-19.[2] This rapid spread has placed immense financial and operational strains on healthcare systems worldwide.[3] In response, extensive research has been conducted to better understand clinical, demographic, immunological, hematological, and radiographic characteristics of COVID-19, to predict disease severity and mortality risk.[4,5,6] Although numerous studies are in progress to find effective treatments, a definitive cure has not yet been found. However, research suggests that a well-functioning immune system can significantly reduce COVID-19 fatalities.[3]

Individuals with compromised immune systems, such as those with cancer, are particularly vulnerable to COVID-19. Cancer and its treatments, including chemotherapy and radiation therapy, have been shown to suppress immune function, heightening both the risk of infection and disease progression in these patients.[3,7] The primary mechanism of Chemotherapy involves inhibiting rapid cell proliferation, including that of immune cells in the tumor area, often resulting in lymphopenia and reduced immune function.[8] Radiation therapy also suppresses immunity by damaging bone marrow, the primary hematopoietic tissue, making it prone to leukopenia and neutropenia.[9,10] Surgical treatments further exacerbate this by triggering inflammatory responses that suppress immune defenses.[9] Additionally, long-term corticosteroid therapy, commonly used alongside cancer treatments, is associated with impaired neutrophil function, as well as reduced cellular and humoral immunity, which collectively increase susceptibility to infections.[9]

For individuals undergoing anti-cancer treatments, precautionary protocols such as serological screening are commonly employed to detect infections like hepatitis or influenza early on.[9] However, these measures are less applicable to COVID-19, given its rapid progression and lack of a definitive treatment. Cancer patients often spend considerable time in healthcare facilities for treatments and follow-up visits, which raises their risk of exposure to COVID-19.[2, 11] Furthermore, comorbidities such as cardiovascular disease, diabetes, kidney failure, metastasis, advanced age, and obesity have been shown to exacerbate COVID-19 in cancer patients.[12]

Given the increased risks faced by cancer patients, it is crucial to assess both COVID-

19 severity and mortality in this vulnerable group. Therefore, the present study aimed to compare factors influencing COVID-19 mortality between cancer and non-cancer patients. In particular, we examined the roles of risk factors such as age, sex, occupation, body mass index (BMI), and comorbidities (e.g., cardiovascular disease, diabetes, and allergies), as well as the impact of prescribed medications on mortality in these groups. Similar studies have been conducted in countries such as China, the United States, Norway, and Turkey, highlighting the global importance of understanding COVID-19 outcomes in cancer patients.[1, 2, 11]

Materials and Methods

Study population

This retrospective study analyzes COVID-19 patients admitted to Ayatollah Khansari Hospital in Arak from March 2018 to March 2019. All patients admitted within this timeframe were included, except those with hospital stays under two days or incomplete clinical data.

Ethics approval

The Research Ethics Committees of Arak University of Medical Sciences approved the study proposal (IR.ARAKMU.REC.1400.345). The participants were informed about the aim of the study and were asked to sign the consent form. All data were kept confidential to preserve the identity of the study participants.

Data collection

Data collection occurred in two phases: laboratory and clinical data gathering. Laboratory data were extracted from the hospital's comprehensive medical information system and included daily fasting blood sugar (FBS), inflammatory and infectious markers, biochemical and hematological values, and details of prescribed medications, such as antibiotics, vitamins (B, C, and D), anti-inflammatory drugs, and anti-nausea agents. Clinical data were drawn from patient records and included symptoms at presentation, disease progression, prior medical and surgical history, allergy information, height, weight, marital status, and occupation. Radiological findings, especially computed tomography scans assessing lung involvement, were analyzed for infectious and non-infectious patterns to gauge disease severity. Vital signs—including respiratory rate, blood pressure, oxygen saturation, and body temperature—were recorded upon admission and tracked daily until discharge. Symptoms were grouped into four categories: General Symptoms (fever, headache, myalgia, sweating, lymphadenopathy, fatigue, and initial consciousness level), Specific Symptoms (loss of taste and smell), Respiratory Symptoms (dry cough, shortness of breath, cyanosis, chest pain), and Gastrointestinal Symptoms (constipation, diarrhea, vomiting, and abdominal pain). Key variables were categorized to aid in analysis: prothrombin time (PT) as $PT \leq 14.5$ (normal) and $PT > 14.5$ (abnormal); activated partial thromboplastin time (PTT) as $PTT \leq 45$ (normal) and $PTT > 45$ (abnormal); erythrocyte sedimentation rate (ESR) as $ESR < 15$ (normal) and $ESR \geq 15$ (abnormal); and C-reactive protein (CRP) as $CRP = 0$ (normal) and $CRP > 0$ (abnormal). The primary outcome measure was mortality status (survivor vs. non-survivor), analyzed separately for cancer and non-cancer patient groups.

Statistical analysis

Statistical analysis was conducted using R software (version 4.2.2).

Descriptive Analysis: Patient demographics and clinical characteristics were summarized based on cancer status. The normality of continuous variables was tested with the Kolmogorov-Smirnov test. Normally distributed variables were analyzed using the student's t-test, while non-normally distributed variables were assessed with the

Mann-Whitney U test. Categorical data were analyzed using chi-square, Fisher's Exact, or Wilcoxon rank-sum tests, depending on variable levels and expected frequencies.

Logistic Regression Analysis: We first performed univariate logistic regression on selected variables. Subsequently, multivariate logistic regression was used to identify predictors of mortality, emphasizing the interpretation of odds ratios (ORs) derived from exponentiated coefficients.[13, 14]

Mixed Effects Model for Longitudinal Data: FBS and oxygen saturation were measured over time, and their trajectories were plotted for visual inspection. Given the repeated measurements, a mixed-effects model with random intercepts and slopes was applied to capture both individual variability and temporal trends. These results were integrated into a logistic regression model to predict COVID-19 mortality, accounting for both individual trajectory data and population-level variables.

Results

Among the 801 hospitalized COVID-19 patients meeting inclusion criteria, 63 (7.9%) were diagnosed with cancer, and 738 (92.1%) were cancer-free. Overall, 440 patients (55%) were male, of whom 405 (92%) were cancer-free, and 35 (8%) had cancer. Among the 361 female patients (45%), 332 (92%) were cancer-free, and 29 (8%) had cancer. The median age for all patients was 62 years, and the median BMI was 25 for cancer patients versus 28 for non-cancer patients, showing a significant difference ($P < 0.001$). Cardiovascular disease and diabetes were the most common comorbidities, seen in 42% and 26% of cases, respectively, with cardiovascular prevalence significantly higher among cancer patients ($P = 0.038$). Bilateral lung involvement, present in 74% of cases, was the most common radiological finding, followed by no lung involvement (24%) and unilateral involvement (1.9%), consistent across both groups. Longitudinal analysis of FBS and oxygen saturation showed significant differences in intercept and slope for saturation between cancer and non-cancer patients. Additional results appear in Table 1.

In total, 143 of the 801 patients (18%) died, with a mortality rate of 23 (36.5%) in the cancer cohort versus 120 (16%) in the non-cancer cohort, showing a statistically significant difference ($P < 0.001$). Leukemia was the most common cancer type, followed by lung, gastrointestinal, and breast cancers, among others. Fever was the most prevalent symptom (81% overall), with a higher incidence and median temperature among cancer patients (92% at 38°C) compared with non-cancer patients (80% at 37.5°C, $P = 0.020$). Other significant differences included shortness of breath, which was more frequent in cancer patients (77% vs. 61%, $P = 0.010$), as well as symptoms like constipation, dyspnea, headache, loss of taste and smell, and fatigue. The median hospital stay was longer for cancer patients (10 vs. 7 days, $P < 0.001$), as shown in Table 2.

Levofloxacin was the primary antibiotic used, given to 85% of patients, with Heparin used in 72%, more frequently among cancer patients (81% vs. 71%). Kaletra was the most common antiviral (used by 36%), and Vitamin C was the most frequent vitamin administered (58% overall, 66% in cancer patients). Antibiotics, gastrointestinal drugs, and corticosteroids showed significant usage differences between cancer and non-cancer groups (Table 3).

Univariate logistic regression analysis revealed several factors associated with increased mortality risk: age ≥60 years (OR = 2.72, 95% confidence interval (CI) = 1.85–4.06), cardiovascular disease (OR = 1.46, 95% CI = 1.02–2.10), drug use (OR = 2.11, 95% CI = 0.98–4.29), respiratory symptoms

(OR = 1.35, 95% CI = 1.15–1.59), anticoagulant use (OR = 3.04, 95% CI = 1.87–5.20), and antibiotic use (OR = 1.67, 95% CI = 1.42–1.97). Elevated PTT, PT values, and lung involvement were also risk factors (Table 4).

Multivariate logistic regression further highlighted that age ≥60 (OR = 1.61, 95% CI = 1.01–2.60), male gender (OR = 1.86, 95% CI = 1.12–3.15), and anticoagulant use (OR = 2.13, 95% CI = 1.18–4.02) were independent predictors of mortality. Each additional antibiotic was associated with a 30% increase in death odds (OR = 1.30, 95% CI = 1.07–1.58), while corticosteroid use was associated with a 65% reduction (OR = 0.35, 95% CI = 0.21–0.60). A history of cancer correlated with a 59% decrease in mortality odds among non-cancer patients (OR = 0.41, 95% CI = 0.20–0.88) (Table 5).

Discussion

The severity of COVID-19 and its associated mortality in cancer patients is a critical area of study. During the COVID-19 pandemic, several investigations were conducted to assess the impact of cancer on COVID-19 outcomes. In this study, we explored and compared factors affecting COVID-19 mortality in cancer and non-cancer patients. Our findings, which show a higher mortality rate in cancer patients, underscore the importance of variables such as age, gender, and medications. These observations align with previous research, which is further discussed below.

Golsin Erdel et al.(2020) reported that cancer patients had a higher COVID-19 fatality rate (58.1%) than non-cancer patients (51.1%). They found that cancer patients were more likely to experience severe symptoms and complications from COVID-19.[12] Yang et al. examined COVID-19 severity in 1,572 patients hospitalized in Wuhan, China, noting a significant relationship between symptom severity and cancer status, particularly among lung cancer patients.[2]

In 2020, Wenjun He et al.studied the impact of COVID-19 on individuals with various hematologic malignancies at two medical facilities in Wuhan. Their findings showed that cancer patients had more severe clinical symptoms and a higher mortality rate compared with non-cancer patients.[15] This disparity may result from the progressive nature of cancer and the adverse effects of treatments like chemotherapy and radiation, which can weaken the immune system.[16]

In a recent investigation, cancer patients undergoing chemotherapy exhibited a significantly elevated mortality risk from COVID-19, with a rate of 18.9%, compared with non-cancer patients. Key factors that adversely affected survival outcomes included metastatic disease, prolonged hospitalization, renal failure, respiratory failure, sepsis, and shock[17].This aligns with previous research indicating that the severity of COVID-19 symptoms can be directly influenced by the presence of cancer and its associated treatments. Cancer patients may experience heightened vulnerability to acute respiratory symptoms following a coronavirus infection due to conditions such as anemia and reduced serum protein levels.[2]

Jiang Let al. demonstrated that factors such as age, sex, metastatic status, and cancer type significantly impacted mortality rates, revealing a tenfold increase among individuals with certain cancers, including hematological malignancies, melanoma, uterine, and ovarian cancers, upon contracting the virus.[18]

Our study also identified demographic factors, particularly age and gender, as significant predictors of mortality. Advanced age and male gender were directly correlated with increased mortality risk, consistent with findings from prior studies.[19-21] This observation may relate to the influence of female hormones and

telomere biology. Telomeres, protective structures at chromosome ends, shorten with age and cellular stress, and are generally longer in females than males from birth. Genetic studies suggest that shorter telomeres in white blood cells are associated with adverse health outcomes, potentially explaining the higher mortality rates observed in males and older individuals.[21] Additionally, the immune response to COVID-19 may be influenced by female hormones such as progesterone and estrogen, suggesting that the risk of severe COVID-19 illness could increase with age and the onset of menopause in women.[21]

Interestingly, our study found a reduced mortality rate among individuals treated with corticosteroids. While long-term, high-dose corticosteroid use can impair neutrophil function and overall immune response,[9] daily administration of 6 mg of dexamethasone or equivalent doses of hydrocortisone or methylprednisolone was associated with improved survival outcomes.[22]

We also examined the impact of antibiotics on mortality. Our findings indicated a direct correlation between antibiotic use and increased mortality rates, corroborating similar observations from the literature.[23, 24] This may be attributed to the immunosuppressive effects of antibiotics, which could compromise the ability of the body to combat viral infections.[25]

Moreover, anticoagulants demonstrated a direct relationship with mortality risk. While anticoagulants can increase bleeding risk,[26] a meta-analysis of 11 studies reported that anticoagulant therapy was associated with reduced mortality in COVID-19 patients.[18] However, another study highlighted a significant risk of bleeding, which contributed to higher mortality rates.[27] Conversely, the administration of prophylactic doses of heparin was linked to decreased mortality risk and reduced bleeding incidents among hospitalized COVID-19 patients.[28]

Another significant limitation is the lack of detailed cancer-related variables, such as cancer stage, recent treatments (e.g., chemotherapy, immunotherapy), and disease trajectory. These factors are known to profoundly influence patient outcomes, particularly mortality. For instance, research has shown that the inherent characteristics of cancer, along with conventional treatment modalities like chemotherapy and radiation, can compromise immune function and heighten the risk of contracting COVID-19.[3] Chemotherapy primarily targets rapidly proliferating cells, including immune cells, leading to lymphopenia and immune suppression.[8] Similarly, radiation therapy affects bone marrow function, potentially resulting in leukopenia and neutropenia.[9, 10] Surgical interventions for tumors may also activate inflammatory processes post-operation, further suppressing the immune response.[9] Unfortunately, these critical variables were not recorded in the hospital's database, limiting our ability to account for their impact.

This study is not without limitations. The small sample size of cancer patients limited our ability to compare different cancer subgroups and their associations with mortality. Furthermore, data collection was confined to a single hospital in Iran, which restricts the generalizability of our findings and excludes patients who did not seek medical attention.

Additionally, we were unable to include socioeconomic factors such as patient income, education, and healthcare access, which are known to influence health outcomes significantly. Similarly, inflammatory markers (e.g., IL-6, ferritin) and D-dimer levels, which could provide deeper insights into the mechanisms driving mortality, were not recorded in our dataset. Future research should aim to address these

gaps, which would enable a more comprehensive understanding of the interplay between cancer-specific characteristics, patient backgrounds, and outcomes in COVID-19 patients, ultimately leading to more targeted and effective interventions.

Conclusion

Given the heightened risk of mortality and increased severity of disease among cancer patients affected by COVID-19, it is crucial to consider modifying or postponing their treatment plans as necessary. Prioritizing this demographic for vaccination and pharmacological interventions is also recommended. Enhanced health protocols in hospital settings tailored to the unique needs of cancer patients are essential. Furthermore, providing comprehensive education for patients and their families is vital to ensure adherence to preventive measures and effective management of their health conditions.

Availability of Data and Materials

The datasets from the current study are included within the article.

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Authors' Contributions

FH: Concept, design, data collection, data analysis, interpretation, critical reviews, final approval

BB: Concept, design, interpretation, writing the article, critical reviews, final approval

NA: Design, data analysis, critical reviews, final approval

FB: Writing the article, critical reviews, final approval

HO: Concept, design, interpretation, critical reviews, final approval

FA: Concept, design, data collection, critical reviews, revision, final approval

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Conflict of Interest

None declared.

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Table 1. Baseline characteristics of COVID-19 patients: Comparison between cancer (patients with a confirmed history of cancer before their COVID-19 diagnosis) and non-cancer (patients with no history of cancer) groups

	Total (n = 801)	History of cancer		*P*-value*
		Cancer (n = 64)	Non-cancer (n = 737)	
	n (%)	n (%)	n (%)	
Sex				0.900
Female	361(45)	29 (45)	332 (45)	
Male	440(55)	35 (55)	405 (55)	
Age				0.600
<60	384 (48)	28 (44)	356 (48)	
≥60	416(52)	35 (56)	381 (52)	
Median (IQR)	62(48,73)	62 (53,71)	62 (48,73)	
BMI				**0.002**
Healthy weight	223(28)	25 (39)	198 (27)	
Obesity	235(29)	13 (20)	222 (30)	
Overweight	333(42)	22 (34)	311 (42)	
Underweight	10(1.2)	4 (6.3)	6 (0.8)	
Median (IQR)	28(25,31)	25 (22,29)	28 (25,31)	
Cardiovascular	336(42)	19 (30)	317 (43)	**0.038**
Diabetes	208(26)	13 (20)	195 (26)	0.300
Drug use	36(4.5)	9 (14)	27 (3.7)	**0.001**
Alcohol consumption	10(1.2)	0 (0)	10 (1.4)	0.999
Current smoker	104(13)	13 (20)	91 (12)	0.069
PTT				0.500
≤45	639(80)	49 (77)	590 (80)	
>45	162(20)	15 (23)	147 (20)	
PT				0.200
≤14.5	636(79)	47 (73)	589 (80)	
>14.5	165(21)	17 (27)	148 (20)	
ESR				0.600
<15	57(0.07)	3 (0.05)	54 (0.07)	
≥15	744(93)	61 (95)	683 (93)	
CRP				
Normal	28(0.04)	1 (0.02)	27 (0.04)	
Non-normal	741(96)	60 (98)	681 (96)	
Lung involvement				0.150
No involvement	194(24)	10 (16)	184 (25)	
One lung	15(1.9)	0 (0)	15 (2.0)	
Two lungs	591(74)	53 (84)	538 (73)	
Intercept saturation, Median (IQR)	-27(-31, -23)	-34 (-38, -31)	-26 (-30, -23)	**<0.001**
Slop saturation, Median (IQR)	0.15(-0.47, 0.43)	-0.29 (-0.94, 0.34)	0.16 (-0.42, 0.44)	**0.016**
Intercept FBS, Median(IQR)	-106(-232,266)	-78 (-140, 62)	-113 (-236,276)	0.200
Slop FBS, Median (IQR)	-4(-8,10)	-4 (-8,0)	-4 (-8,11)	0.300
Days of hospitalization, Median (IQR)	7(5,11)	10 (7,15)	7 (5,11)	**<0.001**
Death	143(18)	23 (36)	120 (16)	**<0.001**

*Pearson's chi-squared test; Wilcoxon rank sum test; Fisher's exact test; BMI: Body mass index; n: Number; COVID-19: coronavirus disease of 2019; PTT: Partial thromboplastin time; PT: Prothrombin time; ESR: Erythrocyte sedimentation rate; CRP: C-reactive protein; FBS: Fasting blood sugar; IQR: Inpatient quality reporting

Table 2. COVID-19-related symptoms in cancer (patients with a confirmed history of cancer before their COVID-19 diagnosis) and non-cancer (patients with no history of cancer) patients

	Total (n = 801)	**History of cancer**		***P*-value***
		Cancer (n = 64)	**Non-cancer (n = 737)**	
	n (%)	**n (%)**	**n (%)**	
Respiratory symptoms				
Dry cough	598 (75)	48 (76)	550 (75)	0.800
Chest. pain	142 (18)	28 (45)	114 (15)	**<0.001**
Shortness of breath	500 (63)	48 (77)	452 (61)	**0.012**
Dispene	157 (20)	19 (30)	138 (19)	**0.034**
Cyanosis	44 (5.5)	15 (24)	29 (3.9)	**<0.001**
Gastrointial symptoms				
constipation	86 (11)	23 (36)	63 (8.5)	**<0.001**
Diarrhea	85 (11)	9 (14)	76 (10)	0.400
Vomiting	322 (40)	36 (58)	286 (39)	**0.003**
Abd. Pain	64 (8.0)	16 (26)	48 (6.5)	**<0.001**
Specific symptoms				
Loss of taste	357 (45)	45 (71)	312 (42)	**<0.001**
Loss of smell	350 (44)	45 (71)	305 (41)	**<0.001**
General symptoms				
Fatigue	519 (65)	52 (83)	467 (63)	**0.002**
Myalgia	542 (68)	50 (79)	492 (67)	0.410
Fever	650 (81)	58 (92)	592 (80)	**0.023**
Headache	207 (26)	30 (48)	177 (24)	**<0.001**
Perspire	315 (39)	33 (52)	282 (38)	**0.028**
lymphadenopathy	33 (4.1)	20 (32)	13 (1.8)	**<0.001**
Consciousness	759 (96)	54 (92)	705 (96)	0.091
ventilator	71 (8.9)	11 (17)	60 (8.1)	**0.015**
Temperature, Median (IQR)	37.5 (37,38)	38 (37.2, 38.2)	37.5 (37,38)	**<0.001**
Respiration rate (RR), Median (IQR)	20 (19,21)	20 (18,21)	20 (20,21)	0.120
Oxygen withoutO2 first, Median (IQR)	88 (80,91)	84 (80,89)	88 (80,91)	**0.022**
Days of hospitalizations, Median (IQR)	7 (5,11)	10 (7,15)	7 (5,11)	**<0.001**

*Pearson's Chi-squared test; Wilcoxon rank sum test; Fisher's exact test; COVID-19: coronavirus disease of 2019; IQR: Inpatient quality reporting

Table 3. Medication usage among COVID-19 Patients: Comparison between cancer (patients with a confirmed history of cancer before their COVID-19 diagnosis) and non-cancer (patients with no history of cancer) groups

	Total (n = 801)	**History of cancer**		***P*-value***
		Cancer (n = 64)	**Non-cancer (n = 737)**	
	n (%)	**n (%)**	**n (%)**	
Anticoagulant drugs				
Heparin	573 (72)	52 (81)	521 (71)	0.073
Antiviral drugs				0.053
Kaletra	287 (36)	23 (36)	264 (36)	0.999
Remdesivir	243 (30)	20 (31)	223 (30)	0.900
Favipiravir	151 (19)	11 (17)	140 (19)	0.700
Antibiotics				**<0.001**
Levofloxacin	682 (85)	56 (88)	626 (85)	0.600
Ceftriaxone	160 (20)	16 (25)	144 (20)	0.300
Vancomycin	364 (45)	40 (63)	324 (44)	0.004
Meropenem	358 (32)	40 (63)	218 (30)	<0.001
Azithromycin	112 (14)	6 (9.4)	106 (14)	0.300
Vitamins				0.070
B	410 (51)	40 (63)	370 (50)	0.059
C	464 (58)	42 (66)	422 (57)	0.200
D	365 (46)	31 (48)	334 (45)	0.600
Diabetes meds				
Insulin	184 (23)	21 (33)	163 (22)	0.051
Gastrointestinal meds				
Ondansetron	239 (30)	29 (45)	210 (28)	**0.005**
Corticosteroids				
Dexamethasone	514 (64)	53 (83)	461 (63)	**0.001**
Pain killers				
Naproxen or ketorolac or acetaminophen	439 (55)	39 (61)	400 (54)	0.300

* Pearson's Chi-squared test; Wilcoxon rank sum test; Fisher's exact test; COVID-19: coronavirus disease of 2019

Table 4. Hazard ratios and 95% confidence intervals for COVID-19 mortality: Univariate logistic regression analysis

	OR	95% CI	*P*-value
Sex (Male)	1.25	(0.87-1.81)	0.200
Age (≥60)	2.72	(1.85-4.06)	**<0.001**
BMI			
Healthy weight	1	Ref	
Obesity	0.94	(0.59- 1.48)	0.800
Overweight	0.65	(0.41- 1.01)	0.056
Underweight	1.65	(0.35-6.19)	0.500
Cardiovascular (Yes)	1.46	(1.02- 2.10)	**0.040**
Diabetes (Yes)	0.99	(0.65- 1.49)	0.999
Current smoker (Yes)	1.37	(0.81- 2.23)	0.200
Drug use (Yes)	2.11	(0.98- 4.29)	**0.046**
Respiration rate	1.00	(0.96- 1.05)	0.800
PTT (≥45)	1.78	(1.17- 2.68)	**0.006**
PT (>14.5)	2.44	(1.63- 3.62)	**<0.001**
ESR (≥15)	1.60	(0.76- 3.93)	0.300
CRP (Non-normal)	1.89	(0.65- 8.02)	
Lung involvement	1.39	(1.10- 1.78)	**0.008**
Respiratory symptoms	1.35	(1.15- 1.59)	**<0.001**
Specific symptoms	1.07	(0.89- 1.29)	0.400
gastrointestinal symptom	1.22	(0.99- 1.50)	0.060
General Symptoms	1.10	(0.95- 1.27)	0.200
Anticoagulant drugs	3.04	(1.87-5.10)	**<0.001**
Antiviral drugs	1.00	(0.76, 1.27)	0.9999
Antibiotics drugs	1.67	(1.42- 1.97)	**<0.001**
Corticosteroids drugs	0.62	(0.43- 0.90)	**0.011**
Diabetes drugs	1.51	(1.00- 2.25)	**0.046**
Gastrointestinal drugs	0.97	(0.65- 1.44)	0.900
Vitamins	0.90	(0.77- 1.05)	0.200
Painkillers	0.75	(0.52, 1.08)	0.120
History of cancer (no cancer)	0.35	(0.20- 0.61)	**<0.001**
Intercept saturation,	1.00	(1.00, 1.00)	0.100
Slop saturation,	0.99	(0.96- 1.02)	0.600
Intercept FBS	1.00	(1.00, 1.00)	0.500
Slop FBS	0.99	(0.98- 1.01)	0.200
Days of hospitalization	1.05	(1.02-1.05)	**0.002**

OR: Odds ratio, CI: Confidence interval; BMI: Body mass index; PTT: Partial thromboplastin time; PT: Prothrombin time; ESR: Erythrocyte sedimentation rate; CRP: C-reactive protein; FBS: Fasting blood sugar; COVID-19: coronavirus disease of 2019

Table 5. Hazard ratios and 95% confidence intervals for COVID-19 mortality: Multivariate logistic regression analysis

	OR	95% CI	*P*-value
Sex (Male)	1.61	(1.01-2.60)	**0.048**
Age (≥60)	1.86	(1.12-3.15)	**0.018**
BMI			
Healthy weight	1	Ref	
Obesity	1.02	(0.58- 1.78)	0.999
Overweight	0.63	(0.36- 1.09)	0.100
Underweight	1.03	(0.16-5.27)	0.999
Cardiovascular (Yes)	1.43	(0.87- 2.37)	0.200
Drug use (Yes)	1.75	(0.65- 4.41)	0.200
Respiration rate	0.98	(0.93- 1.04)	0.600
PTT (≥45)	1.52	(0.84- 2.70)	0.200
PT (>14.5)	1.18	(0.65- 2.09)	0.600
Lung involvement			
No involvement	1	Ref	
One lung involvement	2.79	(0.63- 10.6)	0.150
Two lung involvement	1.69	(0.93- 3.25)	0.100
Respiratory symptoms	1.05	(0.84- 1.30)	0.700
Specific symptoms	1.00	(0.77- 1.31)	0.999
gastrointestinal symptom	1.24	(0.93- 1.64)	0.140
General symptoms	1.02	(0.85- 1.24)	0.800
Anticoagulant drugs	2.13	(1.18-4.02)	**0.015**
Antibiotics drugs	1.30	(1.07- 1.58)	**0.009**
Corticosteroids drugs	0.35	(0.21- 0.60)	**<0.001**
Diabetes drugs	1.66	(0.98- 2.79)	0.058
Gastrointestinal drugs	0.97	(0.65- 1.44)	0.900
History of cancer (no cancer)	0.41	(0.20- 0.88)	**0.018**
Days of hospitalization	1.02	(0.98-1.05)	0.300

OR: Odds ratio; BMI: Body mass index; PTT: Partial thromboplastin time; PT: Prothrombin time; COVID-19: coronavirus disease of 2019