Microbes and Infectious Diseases 2025; 6(1): 1-11

Microbes and Infectious Diseases

Journal homepage: https://mid.journals.ekb.eg/

Original article

COVID-19 in geriatric population: Prevalent symptoms and risky parameters

Rabab Maher[1], Shimaa Afify[2], Hend Shousha[3], Mohamed El-Kassas [4], Noha Asem [5,6], Eman Fouad [5], Eshak Bahbah[7], Nermin Mostafa[8], Ehab Mostafa[9], Mohammed Medhat[9], Amr Abdelazeem[4], Hazem Elmorsy[10], Rateba Mohammed[11], Bassem Elsayed [12], Sabrin Abdel Wahab[1], Nagwa Salah[13], Basma Elawady[8]

1) *Students Hospital, Cairo University, Giza, Egypt*
2) *Gastroenterology Department, National Hepatology & Tropical Medicine Research Institute, Cairo, Egypt*
3) *Endemic Medicine Department, Faculty of Medicine, Cairo University, Cairo, Egypt*
4) *Endemic Medicine Department, Faculty of Medicine, Helwan University, Cairo, Egypt*
5) *The Public Health Department, Faculty of Medicine, Cairo University, Cairo, Egypt*
6) *Egyptian Ministry of Health and Population, Cairo, Egypt*
7) *Faculty of Medicine, Al-Azhar University, Damietta, Egypt*
8) *Medical Microbiology and Immunology Department, Faculty of Medicine, Cairo University, Cairo, Egypt,*
9) *Department of Tropical Medicine and Gastroenterology, Faculty of Medicine, Assiut University, Assiut, Egypt*
10) *15 Mayo Smart Hospital, Ministry of Health and Population, Cairo, Egypt*
11) *Occupational and Environmental Medicine Department, Faculty of Medicine, Cairo University, Cairo, Egypt*
12) *Gastroenterology Department, National Hepatology & Tropical Medicine Research Institute, Cairo, Egypt*
13) *Clinical Pathology National Hepatology and Tropical Medicine Research Institute, Egypt*

ARTICLE INFO

Article history:
Received 18 July 2024
Received in revised form 24 October 2024
Accepted 8 November 2024

Keywords:
COVID-19
Elderly
Hepatorenal dysfunction
Gastrointestinal symptoms
Fibrosis-4

ABSTRACT

Background: Geriatric patients with Coronavirus Disease 2019 (COVID-19) are prone to severe acute respiratory syndrome. Hepatic and gastrointestinal tract affections have been recognized with variable severity. **Aim:** to assess risk factors, clinical features, and laboratory parameters of COVID-19 infection and outcomes in elderly patients. **Methods:** A multicenter cohort study was carried out from April to July 2020 on COVID-19-positive cases confirmed by polymerase chain reaction (PCR). Data was gathered from four quarantine hospitals connected to the Egyptian Ministry of Health. Records included demographics, laboratory results, the patient's outcome, and therapy. **Results:** Our study was conducted on 80 geriatric patients/547 COVID-19 patients, of whom 20 died during hospitalization, 59 were recovered, and one lost to follow-up. The elderly age group was associated with elevation of aspartate transaminase (AST), ferritin, creatinine, and urea with decline in serum albumin, and estimated glomerular filtration rate (eGFR). Analysis for factors affecting survival among the elderly age group revealed mild and moderate COVID-19 disease; normal urea level; and factors associated with increased mortality (lung consolidation; intensive care unit (ICU) admission; critical COVID-19 disease. Elevated AST or alanine transaminase (ALT) levels are linked to several variables, including lung involvement, smoking, hypertension, chronic hepatitis C, and male gender. Fibrosis-4 score (FIB-4) was higher in ICU patients. Among 80 patients with gastrointestinal symptoms, 5 patients had diarrhea. Additionally, elderly patients had fever, dyspnea, sore throat, headache, and dry cough. **Conclusion:** Compared to GIT symptoms, pulmonary symptoms were more prevalent in elderly people with COVID-19 illness, with a higher risk of critical illness and death.

DOI: 10.21608/MID.2024.304244.2091
* *Corresponding author:* Nermin Zaky Mostafa
E-mail address: *nerminzaky@gmail.com*

Introduction

The emergence of the highly infectious coronavirus disease 2019 (COVID-19) led to a global pandemic [1]. In February 2020, the first COVID-19 case in Egypt was verified. Egypt was the second most impacted African nation (after South Africa) when the virus began to spread three months later to other African nations as well as the Eastern Mediterranean region [2]. A wide spectrum of COVID-19-associated symptoms has evolved with variable clinical presentations from being asymptomatic to developing acute respiratory distress syndrome (ARDS), which could lead to possibly fatal septic shock [3] multiorgan affection, respiratory failure, thrombosis, and mortality risk [4].

Multiple organ dysfunctions were attributed mainly to the binding of the virus to angiotensin-converting enzyme-2 (ACE2) receptors, leading to edema and damage to the target organ [5]. The liver and kidney are potential targets for direct infection since ACE2 receptors are found in cholangiocytes, hepatocytes, and kidneys [6]. Disturbance in laboratory findings of COVID-19-infected patients with hepatorenal affection may include elevation of alanine aminotransferase (ALT) and aspartate aminotransferase (AST), abnormalities of gamma-glutamyl transpeptidase, alkaline phosphates, as well as total bilirubin, albumin, and prothrombin time [7]. COVID-19 tends to impact older people more severely, especially liver infections. A study targeting this age group in particular is required [8]. People over the age of 59 are expected to have a higher risk of dying than people between the ages of 30 and 59 [9]. This study aimed to assess risk factors, clinical features, and laboratory parameters of COVID-19 infection and outcomes in elderly patients.

Methodology

Study population and data collection

This multicenter, prospective cohort study recruited 547 consecutive patients from April 15, 2020 to July 29, 2020 who were hospitalized in four quarantine centers affiliated to the Egyptian Ministry of Health and Population in three Egyptian governorates: 15 Mayo Smart Hospital in Cairo governorate, National Hepatology and Tropical Medicine Research Institute in Cairo governorate, Students Hospital in Giza governorate, and Alraghy Hospital in Assiut governorate. This study included patients with a confirmed diagnosis of severe acute respiratory syndrome-Corona virus-2 (SARS-CoV-2), defined as a positive real-time reverse transcriptase polymerase chain reaction assay of nasal and pharyngeal swab specimens. Patients were followed until discharge or death.

Ethics statement: The authors assert that all procedures contributing to this work complied with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. All procedures involving human subjects or patients were approved by the research ethics committee of the Faculty of Medicine at Cairo University (number N-37-2020, May 14, 2020) and the research ethics committee of the Ministry of Health and Population (number 17-2020/8, June 21, 2020). Written informed consent was obtained from all patients before they participated in the study.

Geriatric patients (65 years of age or older) were recruited in this study from a total of 547 COVID-19-positive patients. In this cohort study we collected data included gender, comorbidities, cigarette smoking, clinical presentation, and laboratory investigations, e.g., complete blood count (CBC), renal function tests (creatinine, urea, and estimated glomerular filtration rate eGFR), liver function tests, serum ferritin, coagulation profile, D-dimer, and C-reactive protein (CRP). Three times elevation of transaminase exceeding the upper limit of normal denotes liver injury [10]. The fibrosis-4 index (FIB-4) was calculated using Sterling's equation.

Classification of patients was according to FIB-4 cut-off values (≥ 3.25 and ≤ 1.45) to predict advanced liver fibrosis [11]. Other data included CT chest findings, therapeutic measures, and outcomes. The Egyptian Ministry of Health and Population's (MOHP) management protocol classified the severity of COVID-19 disease into three categories: mild, moderate, and severe.

Asymptomatic and symptomatic patients with lymphopenia or leukopenia without radiological evidence of pneumonia were considered mild instances. Patients exhibiting symptoms and radiological evidence of pneumonia, with or without lymphopenia or leukopenia, were considered moderate cases. The following criteria were used to identify cases as severe and critical: respiratory rate greater than 30 per minute, SaO2 less than 92 in the absence of oxygen therapy, PaO2/FiO2 ratio less than 300 in the absence of

oxygen or less than 200 in the presence of oxygen, chest radiography showing more than 50% lung involvement or progressive lung affection within 24 to 48 hours. Critical and severe cases have been transferred to the intensive care unit. The protocol was followed for administering treatment [12].

Statistical analysis

SPSS 25 for Windows was used to analyze the data (Armonk, NY, United States). The mean, standard deviation, median, and 25th and 75th percentiles are used to display numerical variables. The presentation of categorical variables is done using percentages (%) and numbers (n). Appropriate tests were employed for inferential statistics based on the numerical data distribution. To compare two sets of independent variables, the Mann-Whitney U test or the Kruskal-Wallis and Wilcoxon test were utilized [13]. The Chi-square test (χ 2) was utilized for comparing categorical variables. When one or more predicted cells were less than five, Fisher's exact test was utilized rather than the Chi-square test. P-values are used to express the results. Logistic regression studies, both univariate and multivariate, were used to determine the factors linked to the outcome (recovery or death) [14].

Results:

Eighty elderly COVID-19 patients and 467 non-elderly COVID-19 patients who were admitted to four quarantine hospitals affiliated with the Egyptian MOHP were included in the current study. Among the studied cohort, 80 (14.6%) were 65 years of age or older. And 300 (54.94%) were male. Regarding comorbidity, hypertension, diabetes, and chronic hepatitis C infection were significantly higher among the elderly age group (**Table 1).** Among the studied cohorts, the percentage of severe and critical COVID-19 disease was significantly high among the elderly age group. The same finding was observed regarding symptoms like fever, headache, dry cough, and dyspnea. Regarding the treatment of COVID-19: steroids, antibiotics, and S.C. Heparin preparation administration was significantly higher among the elderly age group. Patients were followed up till discharge or death, and adverse outcomes of COVID-19 like ICU admission and death were also higher among the elderly age group **(Table 1).** The elderly age group showed an elevation of white blood cell count, neutrophils, neutrophil/lymphocyte ratio, AST, ferritin, creatinine, and urea. On the other hand, the elderly age group was associated with a decrease of lymphocyte absolute count, lymphocyte percentages, serum albumin, and eGFR **(Table 2).**

Univariate analysis among the elderly age group revealed several factors associated with survival (mild and moderate COVID-19 disease; normal urea level) and several associated with increased mortality (lung consolidation; ICU admission; critical COVID-19 disease) **(Table 3).** Multiple stepwise logistic regression analyses were carried out to identify the independent predictors for the elderly COVID-19 disease group's outcomes, as shown in **Table 4.**, which showed that severe COVID-19 disease, lung consolidation, and ICU admission were predictors of death.

Table 1. Patient characteristics, treatment, and outcome.

Variable Number (percent)		Elderly (≥ 65)			P value
		Yes 80 (14.6%)	No 467 (85.6%)	Total	
Gender	Male	49 (16.3)	251 (83.7)	300 (100)	0.43
	Female	31 (12.6)	215 (87.4)	246 (100)	
Cigarette Smoking		5 (23.8)	16 (76.2)	21 (100)	0.26
Hypertension		36 (27.7)	94 (72.3)	130 (100)	0.001
Diabetes		37 (27.2)	99 (72.8)	136 (100)	0.001
Chronic hepatitis C		6 (42.9)	8 (57.1)	14 (100)	0.009
Type of symptoms	Respiratory	70 (92.1)	299 (84.7)	369 (86.0)	0.09
	GIT	6 (7.9)	54 (15.3)	60 (14.0)	
Symptoms	Asymptomatic	4 (5.0)	114 (24.4)	118 (21.6)	< 0.001
	Fever	61 (76.3)	238 (51.0)	299 (54.7)	< 0.001
	Headache	33 (41.3)	125 (26.8)	158 (28.9)	0.008
	Dry cough	53 (66.3)	234 (50.1)	287 (52.5)	0.008
	Dyspnea	39 (48.8)	139 (29.8)	178 (32.5)	0.001
	Sore throat	9 (11.3)	79 (16.9)	88 (16.1)	0.20
	Diarrhea	5 (6.3)	47 (10.1)	52 (9.5)	0.28
COVID-19 disease Classification	Mild	10 (12.5)	239 (51.3)	249 (45.6)	< 0.001
	Moderate	36 (45.0)	141 (30.3)	177 (32.4)	
	Severe	19 (23.8)	40 (8.6)	59 (10.8)	
	Critical	15 (18.8)	46 (9.9)	61 (11.2)	
Steroids		32 (40.0)	96 (20.6)	128 (23.4)	< 0.001
Lactoferrin		4 (5.0)	42 (9.0)	46 (8.4)	0.23
Hydroxyl-chloroquine		22 (27.5)	116 (24.8)	138 (25.2)	0.61
Chloroquine phosphate		42 (52.5)	272 (58.2)	314 (57.4)	0.34
Vitamin C		49 (61.3)	292 (62.5)	341 (62.3)	0.83
Azithromycin		14 (17.5)	109 (23.3)	123 (22.5)	0.25
Other Antibiotics		44 (55.0)	149 (31.9)	193 (35.3)	< 0.001
S.C heparin preparations		60 (75.0)	163 (34.9)	223 (40.8)	< 0.001
Oral anticoagulants		3 (3.8)	30 (6.4)	33 (6.0)	0.35
CT chest	Normal	11 (13.9)	187 (40.7)	198 (36.7)	< 0.001
	Abnormal	68 (86.1)	273 (59.3)	341 (63.3)	
Lung Consolidation		20 (25.6)	49 (10.8)	69 (12.6)	< 0.001
ICU Admission		34 (42.5)	88 (18.9)	122 (22.3)	< 0.001
Outcome	Recovery	59 (74.7)	433 (93.1)	492 (90.4)	< 0.001
	Death	20 (25.3)	32 (6.9)	52 (9.6)	

Table 2. Laboratory characteristics according to the age groups.

Variable Number (percent)	Elderly (≥ 65)			P value
	Yes Median (IQR)	**No** Median (IQR)	**Total**	
HSI	38.22 (32.58: 43.80)	37.47 (33.69: 44.27)	37.47 (33.63: 44.18)	0.81
BMI	28.07 (23.40: 32.93)	27.76 (23.89: 32.09)	27.76 (23.73: 32.01)	0.83
Hemoglobin (gm/L)	12.40 (11.93: 13.58)	12.60 (12.00: 14.00)	12.60 (12.00: 13.90)	0.36
white blood cell count ($x10^9$)	6.60 (4.93: 10.83)	5.00 (4.30: 7.00)	5.00 (4.40: 7.60)	< 0.001
Absolute Neutrophils count	4.86 (2.56: 7.62)	2.70 (1.60: 5.00)	2.95 (1.70: 5.60)	< 0.001
Neutrophils percentage	65.50 (47.43: 84.45)	54.50 (42.48: 70.00)	56.50 (42.63: 70.75)	.026
Absolute Lymphocytes count	1.42 (1.00: 1.80)	1.60 (1.17: 2.30)	1.58 (1.10: 2.20)	.003
Lymphocytes percentages	22.00 (14.10: 30.60)	36.00 (22.10: 46.10)	32.70 (20.15: 45.00)	< 0.001
Neutrophils/ lymphocytes ratio	5.25 (2.22: 6.63)	2.54 (1.56: 4.79)	3.11 (1.56: 6.16)	.004
Platelet Count	209.50 (167.00: 295.50)	208.00 (187.00: 269.00)	208.00 (184.00: 272.00)	.057
AST	36.00 (26.00: 60.00)	26.00 (18.00: 40.00)	28.00 (19.00: 43.00)	< 0.001
ALT	33.00 (20.00: 48.00)	26.00 (18.00: 46.00)	27.00 (18.00: 46.00)	0.12
Alkaline phosphatase	107.00 (77.00: 162.00)	88.00 (70.00: 113.00)	89.00 (71.00: 114.50)	0.19
GGT	72.00 (45.00)	34.00 (21.50: 47.50)	34.00 (22.00: 50.00)	.009
Total bilirubin	0.70 (0.50: 0.98)	0.90 (0.60: 1.20)	0.80 (0.60: 1.13)	0.18
Serum albumin	3.70 (3.20: 4.00)	4.20 (3.83: 4.50)	4.20 (3.80: 4.50)	0.003
D-dimer	0.58 (0.40: 1.10)	0.58 (0.39: 1.10)	0.58 (0.40: 1.10)	0.26
Ferritin	354.50 (200.00: 847.75)	268.00 (110.00: 560.00)	300.00 (132.80: 590.00)	.0002
C-reactive protein	43.50 (32.00: 64.00)	45.00 (6.60: 64.00)	45.00 (8.25: 64.00)	0.23
Creatinine	1.30 (1.00: 78.25)	1.00 (0.90: 57.25)	1.10 (0.95: 60.78)	.004
Urea	27.15 (8.36: 43.75)	18.00 (5.47: 30.00)	19.00 (6.20: 32.00)	< 0.001
eGFR	66.53 (48.82: 79.84)	91.77 (71.48: 111.03)	87.63 (67.30: 106.93)	< 0.001
LDH	265.00 (209.00: 324.50)	215.00 (167.25: 308.50)	218.00 (174.00: 314.00)	.036

HSI = Hepatic Steatosis Index
BMI = Body Mass Index
AST= Aspartate Transferase
ALT= Alanine Transferase
GGT= Gamma-Glutamyl Transferase
eGFR= Estimated Glomerular Filtration Rate
LDH= Lactate Dehydrogenase

Table 3. Univariate analysis for factors associated with recovery and death among elderly.

Variable Number (percent)		Outcome among elderly ≥ 65			P value
		Death	Recovery	total	
Gender	**Male**	12 (25.0)	36 (75.0)	48 (100.0)	0.94
	Female	8 (25.8)	23 (74.2)	31 (100.0)	
Cigarette smoking	**Yes**	1 (20.0)	4 (80.0)	5 (100.0)	1.00
	No	2 (16.7)	10 (83.3)	12 (100.0)	
Hypertension	**Yes**	9 (25.7)	26 (74.3)	35 (100.0)	0.94
	No	11 (25.0)	33 (75.0)	44 (100.0)	
Diabetes	**Yes**	10 (27.8)	26 (72.2)	36 (100.0)	0.65
	No	10 (23.3)	33 (76.7)	43 (100.0)	
Pulmonary diseases	**Yes**	1 (33.3)	2 (66.7)	3 (100.0)	1.00
	No	19 (25.0)	57 (75.0)	76 (100.0)	
Symptoms	**Asymptomatic**	1 (25.0)	3 (75.0)	4 (100.0)	1.00
	Symptomatic	19 (25.3)	56 (74.7)	75 (100.0)	
Type of symptoms	**Respiratory**	19 (27.5)	50 (72.5)	69 (100.0)	0.33
	GIT	0 (0.0)	6 (100.0)	6 (100.0)	
Symptoms	**Fever**	18 (30.0)	42 (70.0)	60 (100.0)	0.13
	Headache	7 (21.9)	25 (78.1)	32 (100.0)	0.56
	Dry cough	16 (30.8)	36 (69.2)	52 (100.0)	0.12
	Dyspnea	14 (35.9)	25 (64.1)	39 (100.0)	0.03
	Sore throat	1 (11.1)	8 (88.9)	9 (100.0)	0.43
	Diarrhea	0 (0.0)	5 (100.0)	5 (100.0)	0.32
Steroids		8 (25.0)	24 (75.0)	32 (100.0)	0.96
Lactoferrin		0 (0.0)	4 (100.0)	4 (100.0)	0.57
Hydroxy- Chloroquine		4 (19.0)	17 (81.0)	21 (100.0)	0.44
Chloroquine phosphate		12 (28.6)	30 (71.4)	42 (100.0)	0.48
Vitamin C		9 (18.4)	40 (81.6)	49 (100.0)	0.07
Azithromycin		2 (15.4)	11 (84.6)	13 (100.0)	0.50
Other antibiotics		9 (20.5)	35 (79.5)	44 (100.0)	0.27
SC Heparin		16 (26.7)	44 (73.3)	60 (100.0)	0.77
Oral anticoagulants		0 (0.0)	3 (100.0)	3 (100.0)	0.57
HSI	< 30	1 (100.0)	0 (0.0)	1 (100.0)	0.17
	30: 29	0 (0.0)	2 (100.0)	2 (100.0)	
	≥ 36	0 (0.0)	3 (100.0)	3 (100.0)	
AST	Normal	15 (31.3)	33 (68.8)	48 (100.0)	0.17
	1 -2 UNL	2 (20.0)	8 (80.0)	10 (100.0)	
	2 - 3 UNL	1 (20.0)	4 (80.0)	5 (100.0)	
	>3 UNL	1 (33.3)	2 (66.7)	3 (100.0)	
ALT	Normal	15 (31.3)	33 (68.8)	48 (100.0)	0.15
	1 -2 UNL	2 (20.0)	8 (80.0)	10 (100.0)	
	2 - 3 UNL	1 (20.0)	4 (80.0)	5 (100.0)	
	>3 UNL	1 (33.3)	2 (66.7)	3 (100.0)	
COVID-19 disease classification	Mild	0 (0.0)	10 (100.0)	10 (100.0)	< 0.001
	Moderate	5 (13.9)	31 (86.1)	36 (100.0)	
	Sever	4 (22.2)	14 (77.8)	18 (100.0)	
	Critical	11 (73.3)	4 (26.7)	15 (100.0)	
CT chest	Normal	1 (9.1)	10 (90.9)	11 (100.0)	0.27
	Abnormal	19 (28.4)	48 (71.6)	67 (100.0)	
Lung consolidation	Yes	12 (63.2)	7 (36.8)	19 (100.0)	< 0.001
	No	8 (13.8)	50 (86.2)	58 (100.0)	
ICU admission	Yes	15 (45.5)	18 (54.5)	33 (100.0)	< 0.001
	No	5 (10.9)	41 (89.1)	46 (100.0)	

Fibrosis 4-score	< 1.45	4 (21.1)	15 (78.9)	19 (100.0)	0.16
	1.45: 3.25	6 (22.2)	21 (77.8)	27 (100.0)	
	> 3.25	9 (45.0)	11 (55.0)	20 (100.0)	
Creatinine	Normal	13 (21.3)	48 (78.7)	61 (100.0)	0.13
	1 -2 UNL	4 (30.8)	9 (69.2)	13 (100.0)	
	2 - 3 UNL	1 (100.0)	0 (0.0)	1 (100.0)	
	>3 UNL	2 (50.0)	2 (50.0)	4 (100.0)	
Urea	Normal	8 (20.5)	31 (79.5)	39 (100.0)	0.05
	1 -2 UNL	7 (35.0)	13 (65.0)	20 (100.0)	
	2 - 3 UNL	2 (50.0)	2 (50.0)	4 (100.0)	
	>3 UNL	3 (75.0)	1 (25.0)	4 (100.0)	

HSI = Hepatic Steatosis Index
AST= Aspartate Transferase
ALT= Alanine Transferase
ICU= Intensive Care Unit

Table 4. Univariate and Multivariate regression for factors affecting outcome in elderly patients.

Variable		**Univariate regression**		**Multivariate regression**	
Number (percent)		**OR (95% CI)**	**P value**	**OR (95% CI)**	**P value**
Gender		1.04 (0.37 – 2.94)	0.94		
Cigarette Smoking		0.80 (0.06 -11.50)	1.00		
Hypertension		0.96 (0.35 – 2.67)	0.94		
Diabetes		0.79 (0.29 – 2.18)	0.65		
Pulmonary diseases		0.67 (0.06 – 7.77)	1.00		
Symptomatic or not		1.02 (0.10 – 10.38)	1.00		
Respiratory or GIT		0.73 (0.63- 0.84)	0.33		
Symptoms	**Fever**	0.28 (0.06- 1.31)	0.13		
	Headache	1.37 (0.48 – 3.92)	0.56		
	Dry cough	0.39 (0.12 – 1.32)	0.12		
	Dyspnea	0.32 (0.12 – 0.93)	**0.03**	1.44 (0.31 – 6.75)	0.65
	Sore throat	2.98 (0.35 – 25.45)	0.43		
	Diarrhea	1.37 (1.19 – 1.57)	0.32		
Steroids		0.03 (0.37- 2.89)	0.96		
Lactoferrin		1.36 (1.19 – 1.56)	0.57		
Hydroxy- Chloroquine		1.62 (0.47 – 5.55)	0.44		
Chloroquine phosphate		0.69 (0.25 – 1.93)	0.48		
Vitamin C		2.57 (0.91 – 7.25)	0.07		
Azithromycin		2.06 (0.42 – 10.23)	0.50		
Other Antibiotic		1.78 (0.64 – 4.96)	0.27		
SC Heparin		0.73 (0.21 – 2.54)	0.77		
Oral anticoagulants		1.36 (1.19 – 1.55)	0.57		
COVID-19 disease Classification		17.05 (3.87 – 75.19)	**< 0.001**	12.84 (1.91 – 86.14.)	0.009
CT Chest normal or not		3.96 (0.47 – 33.08)	0.27		
Lung Consolidation		0.09 (0.03 – 0.31)	**< 0.001**	11.05 (2.49 – 48.96)	0.002
ICU Admission		0.15 (0.05 – 0.46)	**< 0.001**	11.40 (1.80 – 72.21)	0.01

Discussion

ARDS caused by SARS-CoV-2 may develop in individuals with more aggressive COVID-19 clinical behavior, which is more common in the elderly [15]. As reported by the Istituto Superiore di Sanità (ISS), 96.8% of patients who died in the hospital were found to have ARDS. Concerning the prevalence of ARDS, it has been reported to be greater among the elderly and those with acute heart, liver, and renal function abnormalities [16]. In this study, elderly patients were more likely to have abnormal CT chest imaging, and lung consolidation was more prevalent among them than younger patients. Elderly patients may present with an unusual first imaging

appearance of consolidative opacities superimposed over GGO. The older group was more likely to have multiple lobe involvement than the young and middle-aged group [17]. The elderly group also had a larger percentage of patients who needed to be admitted to the intensive care unit. Furthermore, the death rate for individuals who were not elderly was 6.9%, but it was 25.3% for the elderly group. The available literature indicates that older COVID-19 patients who were admitted to the ICU had a greater death rate than younger patients. [18].

The mortality rate in the study by Yang *et al.*, was 74.1% among the 27 individuals older than the age of 60 [19]. Similarly, Xu et al. found that 73.2% of 112 critically ill patients aged 65 years and older died [20]. According to Alshukry *et al.* and Bhatraju *et al.*, mortality rates in patients 65 years old were comparable in both studies (68% and 62%), respectively [21]. Comparable mortality rates were reported by Mitra *et al.*, 23%, Aleva et al. 33%, Burrell *et al.*, 25.8%, and Shi et al. 36% [22]. The mortality rate for individuals younger or older than 65 who did not get mechanical ventilation was 1.988% and 26.6%, respectively, according to Richardson et al. [23]. Elderly and comorbid patients (> 60 years) were significantly more likely to die from COVID-19, with a mortality rate of 75.9% (101/194) compared to 24.1% for patients under 60 years of age in the Wang et al. study [24].

Our findings showed that elderly patients were associated with elevated WBCs, neutrophils, neutrophil-to-lymphocyte ratio (NLR), AST, ferritin, creatinine, and urea. On the other hand, they were associated with reduced lymphocyte absolute count, lymphocyte percentages, serum albumin, and eGFR. A meta-analysis showed that lymphopenia and leukopenia were the most common hematological findings among elderly patients with COVID-19 [25]. In a Saudi study, elderly patients were associated with elevated neutrophils ($p = 0.011$), urea (<0.001), creatinine ($p = 0.001$), LDH ($p = 0.024$), bilirubin ($p = 0.043$), D-dimer ($p = 0.006$), and ESR ($p = 0.009$). On the other hand, they were associated with reduced lymphocytes ($p = 0.009$) and platelet count ($p = 0.014$) [26]. COVID-19 has also been linked to higher neutrophils and lower lymphocyte counts in recent studies [27]. Elderly 2019-nCoV-infected individuals are more vulnerable to bacterial infection, which might explain why neutrophil counts were higher in our study [28]. The number of lymphocytes in old patients was also shown to be lower than in adult patients, according to this study. It was found that the percentage of lymphocytes in elderly COVID-19 patients was considerably lower than in younger patients (p 0.001) in a retrospective study [28].

Regarding symptoms, respiratory symptoms were more common than GIT symptoms among elderly patients, according to our findings. Fever, headache, dry cough, and dyspnea were more common in the elderly than others. A systematic review demonstrated that shortness of breath, cough, and fever were the most frequently developed symptoms among patients with COVID-19, including older adults [18]. Shortness of breath was more common in elderly patients compared to younger ones, which was associated with a poor prognosis [29]. Additionally, elderly patients had anorexia, nausea, diarrhea, sore throat, nasal congestion, myalgia, and fatigue [24, 29]. Delirium, abdominal pain, and low-grade fever are infrequent symptoms in the elderly [19, 30]. Kennedy *et al.*, demonstrated that patients over 65 were shown to have the highest prevalence of delirium symptoms, such as inattention, disorientation, and confusion. Delirium was shown to be associated with poor clinical outcomes, such as ICU admission or mortality, in 37% of patients without fever or shortness of breath [30]. A meta-analysis of 47 studies showed that the most common symptoms in elderly patients with COVID-19 were fever (83%), cough (60%), dyspnea (42%), and fatigue (33%). Anorexia (31%) and diarrhea (18%) were the two most prevalent gastrointestinal symptoms reported [25].

Regarding the COVID-19 classification, the majority of young adults were mild cases; moderate to severe cases were more common in the elderly than young adults (68.8% vs. 38.9%). Likewise, the proportion of critical cases in the elderly was 18.8%, while in young adults it was 9.9%. In moderate cases, the mortality rate was 13.9%, while in severe cases it was 22.4%, and in critical cases, it was 73.3%. Patients with lung consolidation and those who were admitted to ICU were associated with a high mortality rate (63.2% and 45.5%), respectively. The independent predictors of mortality were COVID-19 classification, lung consolidation, and ICU. An Egyptian multicenter study demonstrated that age (>60 years), elevated serum ferritin, cancer, diabetes, low Glasgow coma scale, and low oxygen saturation were independent predictors of critical illness in patients with COVID-19 [31]. A different

study found that among Egyptian hospitalized COVID-19 patients, age >60, tachycardia, hypoxemia, altered consciousness, and comorbidities were independent predictors of mortality [31]. These findings suggest that a patient's odds of dying, being admitted to an intensive care unit, and developing a serious illness increase with age. Limitations of this study include the small number of geriatric patients.

Conclusion

In this study, elderly patients were more likely to have abnormal CT chest imaging, and lung consolidation was prevalent among them. Respiratory symptoms were more common than GIT symptoms among elderly patients, according to our findings. Fever, headache, dry cough, and dyspnea were more common in the elderly than others. Our findings showed that elderly patients were associated with elevated WBCs, neutrophils, NLR, AST, ferritin, Creatinine, and urea. On the other hand, they were associated with reduced lymphocyte absolute count, lymphocyte percentages, serum albumin, and eGFR. These findings suggest that a patient's odds of dying, being admitted to an intensive care unit, and developing a serious illness increase with age.

Funding:

None declared

Competing interests:

None declared

References

1- Wu HHL, Athwal VS, Kalra PA, Chinnadurai R. COVID-19 and hepatorenal syndrome. World J Gastroenterol. 2022;28(39):5666-5678. doi:10.3748/wjg.v28.i39.5666.

2- Gaye YE, Agbajogu C, El Oakley R. COVID-19 on the Nile: Review on the Management and Outcomes of the COVID-19 Pandemic in the Arab Republic of Egypt from February to August 2020. Int J Environ Res Public Health. 2021;18(4):1588. Published 2021 Feb 8. doi:10.3390/ijerph18041588.

3- Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, Liu S, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome [published correction appears in Lancet Respir Med. 2020 Apr;8(4): e26. doi: 10.1016/S2213-2600(20)30085-0]. Lancet Respir Med. 2020;8(4):420-422. doi:10.1016/S2213-2600(20)30076.

4- Said ZNA, El Habashy SA, Zaky S; ESCMID Study Group for Viral Hepatitis. COVID-19-induced transaminitis and hyperbilirubinemia: Presentation and outcomes. World J Gastroenterol. 2023;29(7):1123-1130. doi:10.3748/wjg.v29.i7.1123.

5- Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China [published correction appears in JAMA. 2021 Mar 16;325(11):1113. doi: 10.1001/jama.2021.2336]. JAMA. 2020;323(11):1061-1069. doi:10.1001/jama.2020.1585.

6- Chai X, Hu L, Zhang Y, Han W, Lu Z, Ke A, Zhou J, et al. ACE2 expression in cholangiocytes may cause liver damage after 2019 nCoV infection. 2020 Preprint. Available from: bioRxiv:931766.

7- Zaky S, Alboraie M, El Badry M, Metwally MA, Abdelaziz A, Fouad Y, Abd-Elsalam S, et al. Management of liver disease patients in different clinical situations during COVID-19 pandemic. Egypt Liver J. 2021;11(1):21. doi:10.1186/s43066-021-00091-x.

8- Neumann-Podczaska A, Al-Saad SR, Karbowski LM, Chojnicki M, Tobis S, Wieczorowska-Tobis K. COVID 19 - Clinical Picture in the Elderly Population: A Qualitative Systematic Review. Aging Dis. 2020;11(4):988-1008. Published 2020 Jul 23. doi:10.14336/AD.2020.0620.

9- Wu, J.T., Leung, K., Bushman, M. et al. Estimating clinical severity of COVID-19 from the transmission dynamics in Wuhan, China. Nat Med 2020;26, 506–510.

10- Neuschwander-Tetri BA, Unalp A, Creer MH; Nonalcoholic Steatohepatitis Clinical Research Network. Influence of local reference populations on upper limits of normal for serum alanine aminotransferase levels. Arch Intern Med. 2008;168(6):663-666. doi:10.1001/archinternmed.2007.131.

11- Frater JL, Zini G, d'Onofrio G, Rogers HJ. COVID-19 and the clinical hematology laboratory. Int J Lab Hematol. 2020;42 Suppl 1(Suppl 1):11-18. doi:10.1111/ijlh.13229.

12- Ministry of Health and Population, Egypt Management protocol for COVID-19 Patients. [cited 30 May 2020].

13- Chan YH. Biostatistics 102: quantitative data--parametric & non-parametric tests. Singapore Med J. 2003;44(8):391-396.

14- Chan YH. Biostatistics 202: logistic regression analysis. Singapore Med J. 2004;45(4):149-153.

15- Ferguson ND, Fan E, Camporota L, Antonelli M, Anzueto A, Beale R, et al. The Berlin definition of ARDS: an expanded rationale, justification, and supplementary material [published correction appears in Intensive Care Med. 2012 Oct;38(10):1731-2]. Intensive Care Med. 2012;38(10):1573-1582. doi:10.1007/s00134-012-2682-1.

16- Liu K, Chen Y, Lin R, Han K. Clinical features of COVID-19 in elderly patients: A comparison with young and middle-aged patients. J Infect. 2020;80(6):e14-e18. doi:10.1016/j.jinf.2020.03.005.

17- Rinaldi L, Milione S, Fascione MC, Pafundi PC, Altruda C, Di Caterino M, Monaco L, et al. Relevance of lung ultrasound in the diagnostic algorithm of respiratory diseases in a real-life setting: A multicentre prospective study. Respirology. 2020;25(5):535-542. doi:10.1111/resp.13659.

18- Gkoufa A, Maneta E, Ntoumas GN, Georgakopoulou VE, Mantelou A, Kokkoris S, Routsi C, et al. Elderly adults with COVID-19 admitted to intensive care unit: A narrative review. World J Crit Care Med. 2021;10(5):278-289. Published 2021 Sep 9. doi:10.5492/wjccm.v10.i5.278.

19- Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, Yu T, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study [published correction appears in Lancet Respir Med. 2020 Apr;8(4):e26. doi: 10.1016/S2213-2600(20)30103-X]. Lancet Respir Med. 2020;8(5):475-481. doi:10.1016/S2213-2600(20)30079-5.

20- Xu J, Yang X, Yang L, Zou X, Wang Y, Wu Y, Shang Y, et al. Clinical course and predictors of 60-day mortality in 239 critically ill patients with COVID-19: a multicenter retrospective study from Wuhan, China. Crit Care. 2020;24(1):394. doi:10.1186/s13054-020-03098-9.

21- Alshukry A, Ali H, Ali Y, Al-Taweel T, Abu-Farha M, AbuBaker J, Devarajan S, et al. Clinical characteristics of coronavirus disease 2019 (COVID-19) patients in Kuwait. PLoS One. 2020;15(11):e0242768. doi:10.1371/journal.pone.0242768.

22- Burrell AJ, Pellegrini B, Salimi F, Begum H, Broadley T, Campbell LT, Cheng A, et al. Outcomes for patients with COVID-19 admitted to Australian intensive care units during the first four months of the pandemic [published correction appears in Med J Aust.

2021 Jun;214(10):483. doi: 10.5694/mja2.51090]. Med J Aust. 2021;214(1):23-30. doi:10.5694/mja2.50883.

23- Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW,Qiuet M,et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area [published correction appears in JAMA. 2020 May 26;323(20):2098. doi: 10.1001/jama.2020.7681]. JAMA.2020;323(20):2052-2059. doi:10.1001/jama.2020.6775.

24- Wang Y, Lu X, Li Y, Chen H, Chen T, Su N, Wang J, et al. Clinical Course and Outcomes of 344 Intensive Care Patients with COVID-19. Am J Respir Crit Care Med. 2020;201(11):1430-1434. doi:10.1164/rccm.202003-0736LE.

25- Tsheten T, Clements ACA, Gray DJ, Adhikary RK, Wangdi K. Clinical features and outcomes of COVID-19 and dengue co-infection: a systematic review. BMC Infect. Dis. 2021;21:1–9. doi: 10.1186/s12879-021-06409-9.

26- Ibrahim ME, Al-Aklobi OS, Abomughaid MM, Al-Ghamdi MA. Epidemiological, clinical, and laboratory findings for patients of different age groups with confirmed coronavirus disease 2019 (COVID-19) in a hospital in Saudi Arabia. PLoS One. 2021;16(4):e0250955. Published 2021 Apr 29. doi:10.1371/journal.pone.0250955.

27- Yan Y, Yang Y, Wang F, Ren H, Zhang S, Shi X,Yu X, et al. Clinical characteristics and outcomes of patients with severe covid-19 with diabetes. BMJ Open Diabetes Res Care. 2020;8(1):e001343. doi:10.1136/bmjdrc-2020-001343.

28- Liu K, Chen Y, Lin R, Han K. Clinical features of COVID-19 in elderly patients: A comparison with young and middle-aged patients. J Infect. 2020;80(6):e14-e18. doi:10.1016/j.jinf.2020.03.005.

29- Chen T, Dai Z, Mo P, Li X, Ma Z, Song S, Deng L, et al. Clinical Characteristics and Outcomes of Older Patients with Coronavirus Disease 2019 (COVID-19) in Wuhan, China: A Single-Centered, Retrospective Study. J Gerontol A Biol Sci Med Sci. 2020;75(9):1788-1795. doi:10.1093/gerona/glaa089.

30- Kennedy M, Helfand BKI, Gou RY, Gartaganis SL, Webb M, Moccia JM, Davenport K,et al. Delirium in Older Patients With COVID-19 Presenting to the Emergency Department. JAMA Netw Open. 2020;3(11):e2029540. Published 2020 Nov 2. doi:10.1001/jamanetworkopen.2020.29540.

31- Omran D, Al Soda M, Bahbah E, Esmat G, Shousha H, Elgebaly A, Eltayar A, et al. Predictors of severity and development of critical illness of Egyptian COVID-19 patients: A multicenter study. PLoS One. 2021;16(9):e0256203. Published 2021 Sep 23. doi:10.1371/journal.pone.0256203.

Maher R, Afify S, Shousha H, El-Kassas M, Asem N, Fouad E, Bahbah E, Mostafa N, Mostafa E, Medhat M, Abdelazeem A, Elmorsy H, Mohammed R, Essa B, Abdel Wahab S, Salah N, Elawady B. COVID-19 in geriatric population: Prevalent symptoms and risky parameters. Microb Infect Dis, 2025; 6(1): 1-11.