ORIGINAL RESEARCH

Mortality Predictors Among COVID-19 Elderly in Taif, Saudi Arabia

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Background: By December 2021, the COVID-19 pandemic had caused more than 266 million cases and 5 million deaths, especially among geriatric patients.

Objective: To identify determinants of COVID-19-related death in geriatric patients.

Methods: This is a comparative retrospective study involving 145 COVID-19 hospitalized patients who are more than 60 years old, conducted at King Faisal Medical Complex in Taif, Saudi Arabia, from June 2020 to August 2020. The main outcome studied was COVID-19-related death.

Results: Out of 145 elderly COVID-19 patients, 11% have died. There was a significant difference between those who died and the surviving group regarding hospital stay duration, with a higher duration median among those who died (22 days vs 12 day respectively, p=0.002). Transfer to ICU, mechanical ventilation, low oxygen saturation, shortness of breath, respiratory support, x-ray trend, and prolonged QT interval showed significant statistical differences between them (p<0.001, <0.001, 0.017, 0.045, <0.001, <0.001, 0.004, respectively). After doing logistic regression of predictors for progression to death, putting patients on oxygen only vs mechanical ventilation was statistically significant, with an adjusted odds ratio (AOR) of 0.038 (p=0.012). Worse x-rays vs constant also were statistically significant and had AOR of 23.459 (p=0.001). There was a significant moderate positive correlation between duration of hospital stay and duration from admission to medication start (SP=0.336 and p<0.001).

Conclusion: We recommend accurately monitoring patients using x-rays to determine which patients have worse x-rays. However, the cost–benefit of using radiation must be well assessed and needs further research to determine if its benefit outweighs its risks, especially in high-risk patients. Furthermore, mechanically ventilated patients must be carefully monitored. Finally, the duration of hospital stay was highly correlated with the duration from admission to medication start. Therefore, proper treatment must be started as early as possible.

Keywords: COVID-19, mortality, elderly, ICU

Introduction

SARS-CoV-2, which is a highly infectious respiratory virus, caused a widespread pandemic of corona virus disease 2019 (COVID-19). This pandemic caused enormous human and economic losses. By December 2021, it had caused more than 266 million cases and 5 million deaths.[1] In Saudi Arabia, there were more than 500,000 cases, with about 8800 deaths.[2] High budget was assigned by Saudi Arabia to face the pandemic. Intensive care units were increased, hundreds of clinics were opened to make sure that anyone having COVID-19 symptoms received the needed care.[3]

COVID-19 symptoms range from mild to severe that require ICU transfer.[4] Different symptoms such as diarrhea and vomiting are frequently caused by the virus.[5] Many risk factors were identified as causing severe COVID-19 with bad prognosis, such as substance abuse, diabetes mellitus, heart diseases, renal diseases, liver diseases, cerebrovascular diseases, cancer, organ transplantation, immunosuppressive drugs, old age, pregnancy, and obesity.[6]

Infection with SARS-COV 2 was associated with cytokine storm development,[7–10] which is an important cause for acute respiratory distress syndrome, multiple organ failure and death.[11,12] In addition, viral droplet infections increase the probability of developing bacterial co-infection, causing more severe disease.[13] Another risk factor for respiratory co-infections is old age and chronic diseases such as COPD.[14] Co-infection with Influenza A was reported among severely ill COVID-19 cases.[15]

Stages of COVID-19 and the importance of starting different medication at the proper time must be well known for management to be effective. Three stages were identified: "early infection, pulmonary phase, and hyper inflammation phase".[16] The early use of some medications such as hydroxychloroquine, favipiravir and ivermectin was suggested to be effective for management of COVID-19. However, the late administration of antiviral drugs is usually ineffective.[17]

A previous study conducted in Saudi Arabia by Malik et al discussed the impact of COVID-19 on co-morbidities. It observed that 75% of COVID 19 patients hospitalized had at least one associated co-morbidity. The commonest co-morbidities reported were hypertension, diabetes, cancer, and cardiovascular diseases. It also reported that pre-existing polypharmacy and geriatric patients have worse complications of COVID-19.[18]

Currently, there are several vaccines developed showing favorable efficacy under clinical trials. Some of them were approved for use in many countries, such as Pfizer-BioNTech, Moderna, Oxford/AstraZeneca and Johnson & Johnson's Janssen.[19–21]

Management plans are challenging due to limited access to intensive care units and shortage of oxygen supplies, particularly in low- or middle-income countries.[22,23] Thus, we need to well understand the usual risk factors that predict mortality in COVID-19 patients to be able to early decide which patients are prioritized to have an intensive care unit.

The current study aims to find out the different predictors for mortality associated with COVID-19 among the elderly.

Methods and Patients

This study was a comparative retrospective cohort study involving 145 COVID-19 hospitalized patients whose age was more than 60 years old. It was conducted at King Faisal Medical Complex in Taif, Saudi Arabia, from June 2020 to August 2020.

Sample Size Calculation

Sample size was calculated using the website: https://www.surveysystem.com/sscalc.htm.[24] The estimated sample size is 111 patients, at a confidence level of 95% and a power of 80%. To guard against drop out, the research team increased it by 20%, so the sample size is 145 patients. The estimated confidence interval is 10, the decided on minimum and maximum mortality among elderly patients.[5–10]

Inclusion Criteria

All elderly patients hospitalized with RT-PCR with a confirmed diagnosis of COVID-19 whose age was more than 60 years.

Exclusion Criteria

Pregnant women and patients whose age was less than 60 years old.

Study Tools

Data of patients was obtained from patients' files and electronic information systems. Data included demographic characteristics, medical history, including symptoms and comorbidities, vital signs, laboratory investigations, and medications. The main outcome studied was COVID-19-related death.

Ethical Approval

Ethical approval was obtained from the Directorate of Health Affairs, Taif, research and studies department, and Medical Complex in Taif Research and Ethics Committee (Approval no. HAP-02-T-67).

Statistical Analysis

Data entry and analysis were done using SPSS software version 25 (IBM SPSS Statistics for Windows, version 25, IBM Corp., Armonk, N.Y., USA). Quantitative variables were summarized as mean ± standard deviation or median and 25th and 75th percentiles. Qualitative data were expressed using numbers and percentages. The test of significance used for qualitative data was Chi-square test; however, for quantitative data, it was student *t*-test for normally distributed data and Mann–Whitney *U*-test for non-normally distributed data. Spearman correlation was used to find correlation between quantitative variables. Logistic regression was used for finding out the predictors for morbidity associated with COVID-19. *P*-value <0.05 was considered statistically significant.

Results

Out of 145 COVID-19 patients, 11% died while about 89% survived (Figure 1).

The mean age of the surviving patients was 69.3±7.5, while the mean age of the patients who died was 69.2±8.2; 12.3% of females died while 10% of males died. There was no significant difference between those who died and those who survived regarding age and gender (p=0.962 and 0.659, respectively). The mean duration of hospital stay was 23±35 days, while the median duration of hospital stay was 13 days. There was significant difference between those who died and the surviving group regarding the duration of hospital stay, with higher median duration among those who died (22 days vs 12 days, respectively, p=0.002). The median duration from admission to medication start was 3 days for those who died vs 1 day for the surviving group, with no significant difference between them (Table 1).

When comparing patients who died and and the surviving group regarding medical history, all diseases (such as diabetes, hypertension, ischemic heart diseases, asthma, and obesity) showed no significant differences except mental retardation, where the only COVID-19 patient who had mental retardation died (p=0.004). This mentally retarded patient was a 66-year-old male, who was transferred to ICU. He did not have any co-morbidity except for hepatitis. In addition, after stratification of patients according to the number of chronic diseases they had, no statistically significant difference was found when comparing those who died and and the surviving group using chi-square with linear trends test. However, we can notice that 30% (n=3) of patients having more than 2 chronic disease died as compared to 7% (n=2) of patients having no chronic diseases (Table 2).

Of patients transferred to ICU, 61.5% died. Moreover, 90% of patients who had mechanical ventilation also died. Only 14.5% of patients with low oxygen saturation died. In addition, only 15.5% of patients who had shortness of breath
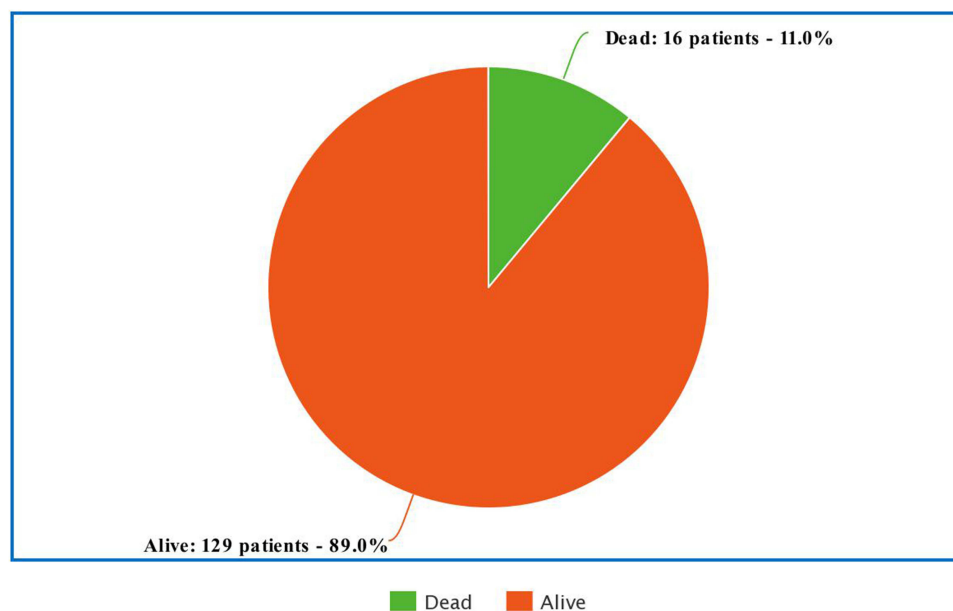

Figure 1 Outcome of COVID-19 patients (n=145).

Table 1 Demographic and Hospital Characteristics of Covid-19 Patients Who Died vs Those Alive (n=145)

Demographic Data		Total	Dead		Alive		χ2	p-value
		N	N	%	N	%		
Gender	Female	65	8	12.3%	57	87.7%	0.195	0.659[a]
	Male	80	8	10.0%	72	90.0%		
Age in years		(mean±SD)	(mean±SD)		(mean±SD)		t	p-value
		69.22±8.12	69.21±8.22		69.31±7.54		0.048	0.962[b]
		Median (min–max)	Median (min–max)		Median (min–max)			
		66(60–105)	67(60–87)		66(60–105)			
Hospital data		Median (min–max)	Median (min–max)		Median (min–max)		z	p-value
Duration of hospital stay		13(8.5–21.5)	22(15–50)		12(8–20)		3.152	**0.002[c]**
Duration from admission to medication start		1(0–4)	3(0–5)		1(0–4)		1.085	0.278[c]

Notes: [a]Chi-square test was used. [b]Student *t*-test was used. [c]Mann–Whitney *U*-test. Bold font indicates statistical significance.

Table 2 Medical History of Covid-19 Patients Who Died vs Those Alive (n=145)

		Total	Dead		Alive		χ2	p-value
		N	N	%	N	%		
Diabetes	No	61	4	6.6%	57	93.4%	2.150	0.143[a]
	Yes	84	12	14.3%	72	85.7%		
Hypertension	No	85	11	12.9%	74	87.1%	0.761	0.383[a]
	Yes	60	5	8.3%	55	91.7%		
Heart diseases	No	128	14	10.9%	114	89.1%	3.137	0.077[a]
	Yes	17	2	11.8%	15	88.2%		
Asthma	No	139	15	10.8%	124	89.2%	0.202	0.653[a]
	Yes	6	1	16.7%	5	83.3%		
Obesity	No	141	15	10.6%	126	89.4%	0.817	0.366[a]
	Yes	4	1	25.0%	3	75.0%		
Mental retardation	No	144	15	10.4%	129	89.6%	8.118	**0.004[a]**
	Yes	1	1	100.0%	0	0.0%		
Chronic diseases	No	28	2	7.1%	26	92.9%	0.942	0.332[b]
	1 disease	72	9	12.5%	63	87.5%		
	2 diseases	35	2	5.7%	33	94.3%		
	More than 2 diseases	10	3	30.0%	7	70.0%		

Notes: [a]Chi-square test was used. [b]Chi-square with linear trend was used. Bold font indicates statistical significance.

died. Of patients who did not require oxygen, 100% survived, while 6% of patients who needed oxygen-only died. About 70% of patients whose x-rays became worse died. No patient with improved x-ray died. The only patient with prolonged QT interval died. Transfer to ICU, mechanical ventilation, low oxygen saturation, shortness of breath, respiratory support, x-ray trend and prolonged QT interval showed significant statistical differences between patients who died and those who did not (p<0.001, <0.001, 0.017, 0.045, <0.001, <0.001, 0.004, respectively) (Table 3).

Regarding medications (such as favipiravir, hydroxychloroquine, standard of care, dexamethasone, aspirin, bronchodilators, clopidogrel, proton pump inhibitors, calcium channel blockers, statins, oseltamivir, beta-blockers, vitamin C, zinc, enoxaparin, ARPs, and diabetes medications) given to patients, all medications showed no statistically significant differences between patients who died and those who did not. Moreover, there was no significant difference between them regarding the number of medications for COVID-19, medications for chronic diseases, or medications for both

Table 3 Symptoms, Signs and Investigations of Covid-19 Patients Who Died vs Those Alive (n=145)

		Total	Dead		Alive		χ^2	p-value
		N	**N**	**%**	**N**	**%**		
Transfer to ICU	No	119	0	0.0%	119	100.0%	82.314	**<0.001**
	Yes	26	16	61.5%	10	38.5%		
Mechanical ventilation	No	135	7	5.2%	128	94.8%	68.224	**<0.001**
	Yes	10	9	90.0%	1	10.0%		
Low oxygen saturation	No	35	0	0.0%	35	100.0%	5.722	**0.017**
	Yes	110	16	14.5%	94	85.5%		
Shortness of breath	No	61	3	4.9%	58	95.1%	4.013	**0.045**
	Yes	84	13	15.5%	71	84.5%		
Respiratory support	No oxygen	20	0	0.0%	20	100.0%	68.867	**<0.001**
	Oxygen only	115	7	6.1%	108	93.9%		
	Mechanical ventilation	10	9	90.0%	1	10.0%		
Fever	No	34	1	2.9%	33	97.1%	2.963	0.085
	Yes	111	15	13.5%	96	86.5%		
X-ray trend	Improve	60	0	0.0%	60	100.0%	69.480	**<0.001**
	Constant	62	2	3.2%	60	96.8%		
	Worse	25	14	60.9%	9	39.1%		
Prolonged QT	No	144	15	10.4%	129	89.6%	8.118	**0.004**
	Yes	1	1	100.0%	0	0.0%		

Notes: Chi-square test was used. Bold font indicates statistical significance.

COVID-19 and chronic diseases, although 13.7% of patients with polypharmacy (more than 4 drugs) died versus 6% of patients not taking any medications for either COVID-19 or chronic diseases. Furthermore, when patients stopped treatment due to adverse effects, this was not associated with death or not dying (Table 4).

Antibiotics given to patients showed no statistically significant difference between patients who died and those who did not (Table 5).

After doing logistic regression of predictors for progression to death among COVID-19 patients, putting patients on oxygen only vs mechanical ventilation was statistically significant and had an adjusted odds ratio of 0.038 (p=0.012). Worse x-rays vs constant also were statistically significant and had an adjusted odds ratio of 23.459 (p=0.001) (Table 6).

There was a significant moderate positive correlation between duration of hospital stay and duration from admission to medication start (Spearman coefficient=0.336 and p<0.001). Furthermore, there was a significant strong positive correlation between duration of hospital stay and duration from medication start to discharge (Spearman coefficient=0.901 and p<0.001) (Table 7, Figures 2 and 3).

Discussion

Understanding mortality predictors among COVID-19 patients (especially those who are older than 60 years) is a critical matter that should be thoroughly investigated. This is because if we predict which patients would die, we can direct them to the optimal care to prevent their death either by initiating the proper medications at the proper time or even transferring them to ICU if needed. In addition, this can save the limited number of ICU units for only those with severe disease.

In the current study, there was an association between mortality and mental retardation, transfer to ICU, mechanical ventilation, low oxygen support, shortness of breath, respiratory support, x-ray trend and prolonged QT interval. On doing logistic regression to find out mortality predictors among COVID-19 elderly patients, the need of mechanical ventilation and X-ray that is getting worse were significant predictors. There was a significant moderate positive correlation between duration of hospital stay and duration from admission to medication start.

Table 4 Medications Given to Covid-19 Patients Who Died vs Those Alive

		Total	Dead		Alive		χ2	p-value
		N	N	%	N	%		
Medication	Favipiravir	97	10	10.3%	87	89.7%	2.167	0.338
	Hydroxychloroquine	38	6	15.8%	32	84.2%		
	Standard of care	10	0	0.0%	10	100.0%		
Dexamethasone		107	15	14.0%	92	86.0%	3.704	0.054
Aspirin		8	1	12.5%	7	87.5%	0.019	0.892
Bronchodilators		5	1	20.0%	4	80.0%	0.424	0.515
Clopidogrel		3	0	0.0%	3	100.0%	0.380	0.538
PPI		102	12	11.8%	90	88.2%	0.187	0.666
CCB		19	2	10.5%	17	89.5%	0.006	0.940
Statin		9	2	22.2%	7	77.8%	1.223	0.269
Oseltamivir		6	0	0.0%	6	100.0%	0.776	0.378
B blockers		3	0	0.0%	3	100.0%	0.380	0.538
Hydroxychloroquine		38	6	15.8%	32	84.2%	1.168	0.276
Zinc		2	1	50.0%	1	50.0%	3.137	0.077
Vitamin C		0	0	0.0%	0	0.0%		-
Enoxaparin		132	14	10.6%	118	89.4%	0.275	0.600
ARBs		22	1	4.5%	21	95.5%	1.112	0.292
Diabetes medications		84	12	14.3%	72	85.7%	2.667	0.102
Medications for COVID-19	Zero	0	0	0.0%	0	0.0%		-
	1–4 drugs	145	16	11.0%	129	89.0%		
Medications for chronic diseases	Zero	2	0	0.0%	2	100.0%	0.321	0.852
	1–4 drugs	122	14	11.5%	108	88.5%		
	More than 4 drugs	21	2	9.5%	19	90.5%		
Medications for chronic and COVID-19 diseases	1–4 drugs	50	3	6.0%	47	94.0%	1.970	0.160
	More than 4 drugs	95	13	13.7%	82	86.3%		
Patients stop treatment due to adverse event	No	142	15	10.6%	127	89.4%	1.552	0.213
	Yes	3	1	33.3%	2	66.7%		

Note: Chi-square test was used.

Table 5 Antibiotics Given to Covid-19 Patients Who Died vs Those Alive

	Total	Dead		Alive		χ2	p-value
	N	N	%	N	%		
Vancomycin plus ceftriaxone plus azithromycin	10	0	0.0%	10	100.0%	5.319	0.723
Vancomycin plus ceftriaxone plus moxifloxacin	8	1	12.5%	7	87.5%		
Vancomycin plus meropenem plus ciprofloxacin	9	2	22.2%	7	77.8%		
Ceftriaxone plus azithromycin	60	5	8.3%	55	91.7%		
Ceftriaxone plus moxifloxacin	42	6	14.3%	36	85.7%		
Meropenem plus ciprofloxacin	9	2	22.2%	7	77.8%		
None	3	0	0.0%	3	100.0%		
Moxifloxacin	1	0	0.0%	1	100.0%		
Moxifloxacin plus anti-MRSA	3	0	0.0%	3	100.0%		

Note: Chi-square test was used.

The mortality rate in the current study was 11%. A previous meta-analysis study conducted in Saudi Arabia found a similar mortality rate of 11.5% among hospitalized COVID-19 patients after excluding critical cases. However, the total mortality rate was 17% and among critical cases was up to 40%.[25]

Age and gender showed no significant differences between those who died and the surviving group; however, the mean age was slightly higher among those who died. Male patients were higher than female patients; however, mortality

Table 6 Logistic Regression of Predictors for Progression to Death Among COVID-19 Patients

	B	Significance	AOR	95% CI for AOR	
				Lower	Upper
No oxygen vs mechanical ventilation	−21.214	0.998	0.000	0.000	
On oxygen-only vs mechanical ventilation	−3.275	0.012	0.038	0.003	0.487
Improved x-ray vs constant	−17.481	0.997	0.000	0.000	
Worse x-ray vs constant	3.155	0.001	23.459	3.851	142.899
Constant	−0.207	0.878	0.813		

Abbreviation: AOR, adjusted odds ratio.

Table 7 Spearman Correlation Between Duration of Hospital Stay and Other Variables Among Covid-19 Patients

	Duration of Hospital Stay	
	Correlation coefficient	p-value
Age	0.002	0.978
Duration from admission to medication start	0.336	**<0.001***
Duration from medication start to discharge	0.901	**<0.001***

Note: Bold font indicates statistical significance.

was unexpectedly higher among females than males with no significant difference, which contradicts most literature. This is contrary to a previous study that found that males had higher mortality, higher risk of respiratory intubation and longer length of hospital stay than females.[26] Another previous study conducted in Saudi Arabia reported that males outnumbered females in admission to hospitals by 2:1, with worse metabolic profile than females, although no clinical outcome differences.[27] Other studies reported worse morbidity and mortality among men, establishing that male gender is a predictor for COVID-19.[28–30] This can be rationalized by the fact that females have a higher immune response mostly due to estrogen, which is immune boosting, as opposed to testosterone, which is immune suppressing.[31] Higher hospital admissions among Saudi males can be attributed to the higher number of Saudi male population and to being more socially mobile making them at higher risk for being infected with COVID-19.[27]

The mean duration of hospital stay was 23 days. This is close to the mean duration of hospital stay in a previous study in China, which was 20 days.[32] However, this 3-day difference is an important matter which may be due to higher proportion of patients in our study having co-morbidities than in this previous study (81% vs 48%). The median duration
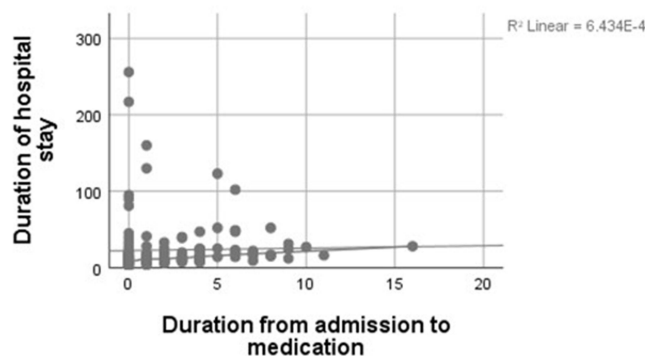
Figure 2 Correlation between duration of hospital stay and duration from admission to medication start among Covid-19 patients.
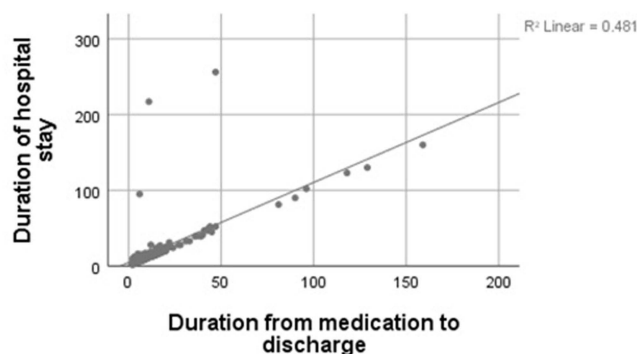
Figure 3 Correlation between duration of hospital stay and duration from medication to discharge among Covid-19 patients.

from admission to medication start was 3 days for those who died vs 1 day for those in the surviving group; however, there was no significant difference between them. This could be due to the small difference between the two groups, which is just 2 days. However, we recommend starting treatment as early as possible.

Regarding co-morbidities, diabetes mellitus (DM) was the commonest disease followed by hypertension. A previous study conducted in Saudi Arabia found the same result.[33] Although mortality was higher among diabetics than non-diabetics, the difference was non-significant. The American Diabetes Association mentioned that there is not enough data to suggest that DM increases the likelihood of infection with COVID-19; however, it increases the complications resulting after the infection.[34] Interestingly, mortality was higher among non-hypertensive patients than hypertensive patients, which is contrary to what is found in the literature.[35] However, the difference also was non-significant. The previous study conducted by Al-Ansari et al also found no significant difference between patients having DM or hypertension and those free from them.[33] Also, the polypharmacy did not show any significant difference in mortality and this goes with the non-significant results we see with co-morbid conditions.

The only COVID-19 patient who had mental retardation died. This patient was a 66-year-old male, who did not have any co-morbidity except for hepatitis. Although mental retardation was significantly associated with mortality, we cannot rely on this as it is only one patient. Thus, more patients are needed. In addition, respiratory infections were found to be the leading cause for death among people with intellectual disabilities.[36]

About 61% of patients transferred to ICU died and there was a significant difference between them and the surviving group. This mortality rate among ICU admitted patients was similar to what was found in a previous study conducted in Saudi Arabia, which was 58% among patients whose mean age was 55 years old.[37]

Furthermore, 90% of patients who had mechanical ventilation also died. This is a very high mortality rate, as a previous study conducted in Brazil found mechanically ventilated patients' mortality to be 58%.[38] However, the median age of patients participating in this previous study was less than the current study (54 years vs 66 years), which may be the cause for this lower rate. Another study conducted in developing countries found total mortality of 30–44% in their populations, while it was more than 70% in low-income countries.[39] In addition, many studies found age to be a predictor for mortality.[40] Therefore, the reason for this high mortality among mechanically ventilated patients in the current study can be the old age of the participating patients. However, in the current study, only 14% of patients with low oxygen saturation died. Similarly, 15% of patients who had shortness of breath died. Fortunately, all patients who did not require oxygen survived.

Unfortunately, 70% of patients whose x-rays became worse died. No patient with improved x-ray died. Similarly, a study found that Brixia score, which is a new chest X-ray scoring system developed for COVID-19 pneumonia, was a predictor for in-hospital mortality.[41]

The only patient with prolonged QT interval died. Transfer to ICU, mechanical ventilation, low oxygen saturation, shortness of breath, respiratory support, x-ray trend and prolonged QT interval showed significant statistical differences between patients who died and those who did not.

After doing logistic regression of predictors for progression to death among COVID-19 patients, the significant predictors were putting patients on oxygen-only and worse x-rays. Putting patients on oxygen-only vs mechanical ventilation had an adjusted odds ratio of 0.038. This means that putting patients on oxygen-only rather than mechanical ventilation decreases the likelihood of mortality by 96%. Worse x-rays had an adjusted odds ratio of 23.459, which means that worse x-rays increase the likelihood of mortality 23 times more than having constant x-ray.

There was a significant moderate positive correlation between duration of hospital stay and duration from admission to medication start. However, we could not find previous studies investigating this correlation. However, we recommend starting treatment as early as possible.

Limitations of the Study

One of the study limitations is the small sample size. Also, the generalizability of the study might be limited to the population in the study.

Conclusion and Recommendations

This study aimed to investigate predictors of mortality among COVID-19 geriatric patients. We found an association between mortality and mental retardation, transfer to ICU, mechanical ventilation, low oxygen support, shortness of breath, respiratory support, x-ray trend, and prolonged QT interval. However, logistic regression found only the need for mechanical ventilation and X-ray that is getting worse to be the significant predictors. Thus, we recommend accurately monitoring patients using x-rays to determine which patients had worse x-rays than their initial x-rays when they came to the hospital. However, the cost–benefit of using radiation must be well assessed and needs further research to determine if its benefit outweighs its risks, especially in high-risk patients.

Furthermore, mechanically ventilated patients must be carefully monitored as they are at very high mortality risk. In addition, the duration of hospital stay was found to be highly correlated with the duration from admission to medication start. Therefore, proper treatment must be started as early as possible.

Institutional Review Board Statement

The study was conducted according to the guidelines of the bioethics and research committee of the King Faisal Medical Complex, Taif, Saudi Arabia, and approved by Taif Research and Ethics Committee (Approval # HAP- 02-T-67) under the reference number of (Reference Approval # HAP-02-T-67). As there is a cooperation between the Saudi Arabia ministry of higher education and the ministry of health, the research proposal was submitted to the health affair in Taif. Since the research idea was about psychiatric disease, the health affair in Taif directed the research to Mental Health Hospital in Taif.

Informed Consent Statement

This study was a comparative retrospective cohort study. At hospital admission, patients' consents were taken to use their data with complete confidentiality. This study was compliant with the Declaration of Helsinki. Confidentiality was respected and data was not used for any other purpose.

Disclosure

The authors declare no conflicts of interest in this work.

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