

# Outcome of COVID-19 among homecare patients and its relation to chronic diseases

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## Abstract

**Aim of Study:** To explore the health condition of homecare patients infected with COVID-19, and to assess risk factors for their mortality.

**Methods:** Following a retrospective hospital-based research design, the data of 101 patients registered at the Homecare Department in the Armed Forces Hospitals of Southern Region (AFHSR), in Khamis Mushayt City, Aseer Region, Saudi Arabia, who were infected with COVID-19, were reviewed. A data collection sheet was designed and used for data collection.

**Results:** Most homecare patients were elderly. The mean±SD was 74.9±16.9 years. Females constituted 58.4% of patients. Almost half of the patients (47.5%) were admitted to the hospital. Almost three-quarters of homecare patients (72.3%) were hypertensive, 69.3% were diabetic and 36.6% had chronic kidney disease. Heart diseases included ischemic heart disease (16.8%), congestive heart failure (11.9%) and atrial fibrillation (10.9%). Neurological diseases included cerebrovascular accidents (19.8%), dementia (8.9%), and epilepsy (5%). Case fatality for COVID-19 among homecare patients was

26.7%. Case fatality was significantly higher among those who were hospitalized ( $p<0.001$ ). Moreover, case fatality rates for COVID-19 among our patients were significantly higher among patients with diabetes ( $p=0.002$ ), cerebrovascular accidents ( $p=0.009$ ) and those with epilepsy ( $p=0.017$ ).

**Conclusions:** Most homecare patients infected with COVID-19 have associated comorbidity, mainly in the form of chronic diseases, such as hypertension, diabetes, chronic kidney, heart and neurological diseases. Case fatality rate due to COVID-19 among homecare patients is high, mainly due to their old age and associated morbidity.

**Recommendations:** Case fatality due to COVID-19 among homecare patients can be minimized by prior assessment of the adequacy of home environment for the continuity of care, provision of health education to patients and their family members regarding the recommended health precautions.

**Key words:** COVID-19, Homecare, Case fatality rate, Comorbidity, Saudi Arabia.

## Introduction

In December 2019, several cases of idiopathic pneumonia were reported in Wuhan, China. It was later revealed that the new type of corona virus causes the transmission of respiratory diseases from person to person. The outbreak was declared a Public Health Emergency of International Concern on January 30th, 2020, and on February 11, 2020, the World Health Organization (WHO) identified the novel coronavirus disease COVID-19. The epidemic has rapidly spread to almost all countries all over the world. The first 100,000 cases were reported within 12 weeks. However, the next 100,000 cases took only 12 days to be reported (1). This pandemic has progressively burdened health systems across the world (2-3), with 124,871,140 confirmed COVID-19 cases and 2,744,543 deaths as of March 26, 2021 (4).

The novel corona virus disease 19 (COVID-19) is a newly discovered acute infectious respiratory illness caused by the SARS-CoV-2 virus, which involves multiple organs, such as the respiratory system, heart, digestive system, kidneys, and blood (5). In a published meta-analysis, Hu et al. (6) noted several risk factors for COVID-19. Most cases had diabetes and hypertension with fever as the most common symptoms. However, the severity and mortality were lower than those of severe acute respiratory syndrome (SARS) and Middle East Respiratory Syndrome (MERS).

The Charlson Comorbidity Index was applied to assess the impact of total morbidity on the outcomes and prognosis of COVID-19. Scores above 0 were associated with an increased risk of severe COVID-19 and death, when controlled for age and sex. This expands upon previous findings of individual comorbidities as independent risk factors for poor COVID-19 outcomes (7).

Homecare takes place in the patients and their families' environment, where health professionals are only guests (8). However, nursing home residents have been the most affected by COVID-19 in several countries, representing as many as half of all deaths for COVID-19 in a number of European countries, over three-quarters in Canada, and around 40% in the USA (9-10).

It has been shown that COVID-19 infection causes severe illness among older adults, especially those with chronic health conditions. Mortality from COVID-19 disproportionately impacts older adults with death rates as high as 30%. However, limiting COVID-19 exposure among older adults is challenging, since older adults are more likely to have contact with the healthcare system, reside in a senior residential community (e.g. nursing home), and have close contact with a health care worker, such as a home healthcare aide or caregiver (11).

During the COVID-19 pandemic, home caregivers are expected to fulfill the vital front-line roles. Caregivers are referred to as direct care workers, homemakers, formal caregivers, companions, personal care assistants, home

healthcare aides, and personal attendants (12). They provide essential services, such as aiding with activities of daily living (ADLs), which includes helping older adults with bathing, grooming, meal preparation, and medication assistance (13). Homecare Agencies (HCAs) had to be prepared to support their own safety and the safety of their older adult patients. However, it has been shown that HCAs and caregivers were largely absent from COVID-19 prevention planning (14).

Up to the researchers' best knowledge, there is no published literature discussing the outcome of home health care patients infected with COVID -19 virus in Saudi Arabia. Therefore, the present study aimed to explore the health condition of homecare patients infected with COVID-19, and to assess risk factors for their mortality.

## Methods

Following a retrospective hospital-based research design, the data of 101 patients registered at the Homecare Department in the Armed Forces Hospitals of Southern Region (AFHSR), in Khamis Mushayt City, Aseer Region, Saudi Arabia, who were infected with COVID-19, were reviewed.

The duration of data collection was eight months, from May till December 2020. All homecare patients registered at the study hospital who were infected with COVID-19 were included. A data collection sheet was designed by the researcher. Study variables included patients' age (years), gender, associated chronic diseases, hospitalization, duration of hospital stay, mobility status, and outcome. Data were obtained through the hospital information healthcare system.

Collected data were analyzed using the Statistical Package for Social Sciences (IBM SPSS, version 25). Quantitative data were presented as mean  $\pm$  standard deviation (SD), while qualitative data were presented as frequency and percentages. Chi-square ( $X^2$ ) test (or Fisher Exact test, if two expected counts  $<5$ ) were applied to test significance of differences according to patients' outcome. P-values less than 0.05 were considered as statistically significant.

The ethical approval for the current study was obtained from the Institutional Review Board (IRB) of the AFHSR.

## Results

Table 1: Personal characteristics of homecare patients

Personal characteristics	No.	%
Age groups		
• <60 years	13	12.9
• 60-80 years	48	47.5
• >80 years	40	39.6
• Mean±SD	74.9±16.9 years	
Gender		
• Male	42	41.6
• Female	59	58.4
Hospital admission		
• No	53	52.5
• Yes	48	47.5
Hospital stay (n=48)		
• <7 days	20	41.7
• 7-14 days	19	39.6
• >14 days	9	18.8

Table 1 shows that most homecare patients were elderly, 47.5% were 60-80 years old, while 39.6% were above 80 years old. The mean±SD was 74.9±16.9 years. Females constituted 58.4% of patients. Almost half of patients (47.5%) were admitted to the hospital. Hospital stay of most patients was <7 days (41.7%) or 7-14 days (39.6%). Only 18.8% stayed for more than 14 days.

Table 2: Associated comorbidity among study sample

Associated comorbidity	No.	%
Hypertension	73	72.3
Diabetes mellitus	70	69.3
Chronic kidney disease	37	36.6
Ischemic heart disease	17	16.8
Congestive heart failure	12	11.9
Atrial fibrillation	11	10.9
Cerebrovascular accident	20	19.8
Dementia	9	8.9
Epilepsy	5	5.0
Hypothyroidism	5	5.0
Bronchial asthma	3	3.0
Pulmonary embolism	2	2.0

Table 2 shows that almost three-quarters of homecare patients were hypertensive (72.3%), 69.3% were diabetic and 36.6% had chronic kidney disease. Heart diseases included ischemic heart disease (16.8%), congestive heart failure (11.9%) and atrial fibrillation (10.9%). Neurological diseases included cerebrovascular accidents (19.8%), dementia (8.9%), and epilepsy (5%). Moreover, 5% had hypothyroidism, 3% had bronchial asthma and 2% had pulmonary embolism.

**Figure 1: Outcome of homecare patients infected with COVID-19**

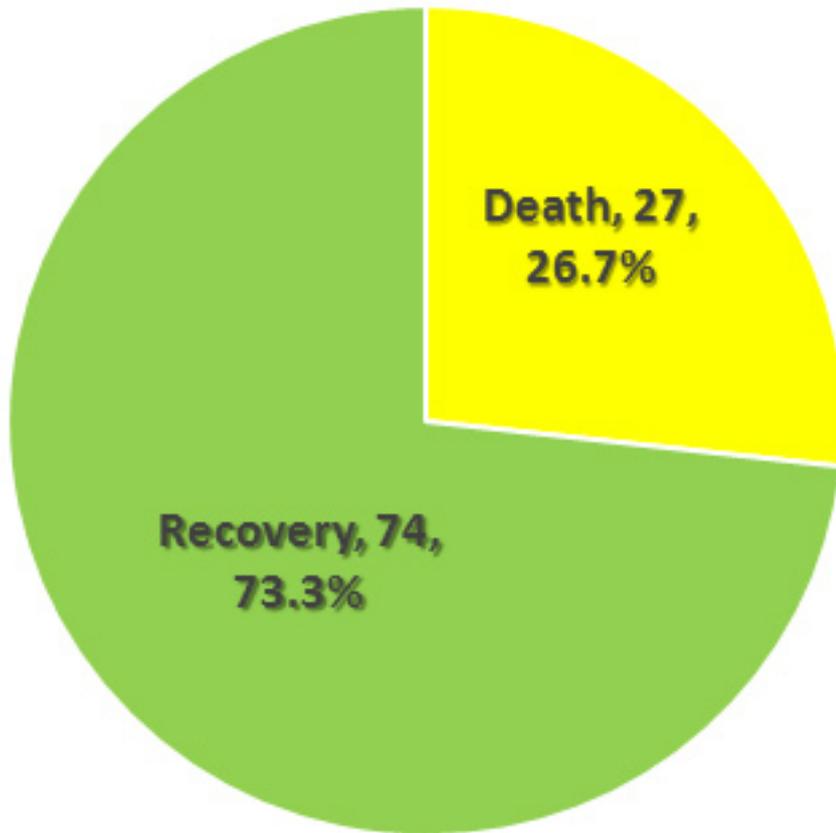


Figure 1 shows that the Case fatality for COVID-19 among homecare patients was 26.7%.

**Table 3: COVID-19 case fatality according to homecare patients' personal characteristics**

Personal characteristics	Death (n=27)		Recovery (n=74)		p Value
	No.	%	No.	%	
Age groups					0.144
• <60 years	1	7.7	12	92.3	
• 60-80 years	12	25.0	36	75.0	
• >80 years	14	35.0	26	65.0	
Gender					0.085
• Male	15	35.7	27	64.3	
• Female	12	20.3	47	79.7	
Admission to hospital					<0.001
• No	3	5.7	50	94.3	
• Yes	24	50.0	24	50.0	
Hospital stay					0.328
• <7 days	8	40.0	12	60.0	
• 7-14 days	12	63.2	7	36.8	
• >14 days	4	44.4	5	55.6	

Table 3 shows that case fatality of homecare patients infected with COVID-19 was higher among older patients aged 60-80 years (25%) or above 80 years (35%). However, case fatality did not differ significantly according to patients' age. Male patients had higher fatality rate than female patients. However, the difference was not statistically significant. Patients admitted to hospital had significantly higher case fatality than those who were not admitted to hospital (50% and 5.7%, respectively,  $p < 0.001$ ). Case fatality of homecare patients infected with COVID-19 was highest among those who stayed 7-14 weeks in the hospital (63.2%). However, case fatality did not differ significantly according to patients' hospital stay.

**Table 4: COVID-19 case fatality according to homecare patients' associated diseases**

Associated diseases		Death (n=27)		Recovery (n=74)		p Value
		No.	%	No.	%	
Hypertension	No	5	17.9	23	82.1	0.212
	Yes	22	30.1	51	69.9	
Diabetes mellitus	No	2	6.5	29	93.5	0.002*
	Yes	25	35.7	45	64.3	
Chronic kidney disease	No	13	20.3	51	79.7	0.055
	Yes	14	37.8	23	62.2	
Ischemic heart disease	No	20	23.8	64	76.1	0.140
	Yes	7	41.2	10	58.8	
Congestive heart failure	No	24	27.0	65	73.0	0.885
	Yes	3	25.0	9	75.0	
Atrial fibrillation	No	23	25.6	67	74.4	0.445
	Yes	4	36.4	7	63.6	
Cerebrovascular accidents	No	17	21.0	64	79.0	0.009*
	Yes	10	50.0	10	50.0	
Dementia	No	26	28.3	66	71.7	0.438
	Yes	1	11.1	8	88.9	
Epilepsy	No	23	24.0	73	76.0	0.017*
	Yes	4	80.0	1	20.0	
Hypothyroidism	No	27	28.1	69	71.9	0.321
	Yes	0	0.0	5	100.0	
Bronchial asthma	No	27	27.6	71	72.4	0.562
	Yes	0	0.0	3	100.0	
Pulmonary embolism	No	25	25.3	74	74.7	0.070
	Yes	2	100.0	0	0.0	

\* Statistically significant

Table 4 shows that case fatality of homecare patients infected with COVID-19 was significantly higher among patients with diabetes ( $p=0.002$ ), cerebrovascular accidents ( $p=0.009$ ) and those with epilepsy ( $p=0.017$ ).

## Discussion

In recent decades, homecare has grown exponentially. It reduces the demand for hospital beds and the overload of the hospital sector, which became even more important in the context of the COVID-19 pandemic. However, there are several reports indicating the high mortality among elderly with COVID-19 receiving home care (15).

The main purpose of the present study was to assess the health condition of homecare patients infected with COVID-19, and to assess the magnitude and risk factors associated with their death.

The majority of our patients had associated chronic diseases. More than half of patients were hypertensive and diabetic, while more than one-third had chronic kidney disease. Cardiac and neurological diseases were also prevalent. Moreover, some patients had hypothyroidism, or bronchial asthma. Moreover, our study revealed a high case fatality rate among homecare patients infected with COVID-19 (26.7%). This rate was high among older

patients aged 60-80 years (25%) and even higher among those aged above 80 years (35%).

This finding is in accordance with that of Gaspar et al. (15), who reported a 19% case fatality rate for COVID-19 patients receiving home care, which mainly included elderly individuals, and all of them with comorbidities. The WHO (1) stated that risk factors for severe COVID-19 include old age (> 60 years), and chronic diseases, e.g., cardiovascular disease, diabetes mellitus, chronic kidney disease, immunosuppression and cancer.

However, the reported case fatality rate in our study is higher than that reported for COVID-19 in Saudi Arabia (1.72%), which ranged from 0.56% in Al-Madinah Region and 2.70% in Makkah Region. In Aseer Region, it was 1.61% (16).

The high case fatality rate in our study is due to the finding that the majority of participant homecare patients (87.1%) were elderly, aged above 60 years, with 47.5% aged 60-80 years and 39.6% aged above 80 years.

It has been reported that advanced age and the presence of comorbidities are associated with increased mortality in the pandemic caused by the novel coronavirus. The high prevalence of this combination, associated with physical environments that provide inadequate barriers for infection control, puts nursing home patients at great risk (15).

Dowd et al. (17) noted that the COVID-19 epidemic has disproportionately affected the elderly, especially those aged above 70 years. These results suggest that an aging population could exacerbate the fatality impact of COVID-19, similar to influenza and respiratory syncytial virus (18).

In Chile, Undurraga et al. (4) reported that the overall national estimate for COVID-19 case fatality rate was 3.72%. However, among men, senior citizens appeared to be severely affected (10.16% for men aged 60–69 years, 28.35% for those aged 70–79 years, and 56.82% for those 80 years old and above). For women, case fatality rates were 6.44% for those aged 60–69 years, 18.18% for those aged 70–79 years, and 41.10% for women aged 80 years old or more.

The high prevalence of hypertension and diabetes among our patients can be attributed to their old age. Babatsikou and Zavitsanou (19) stated that arterial hypertension is highly prevalent among the elderly, with prevalence rates for subjects aged > 60 years estimated to be >60%. On the other hand, Caspersen et al. (20) stated that prevalence of diabetes mellitus is quite high among the elderly. Almost 8 of 10 old people may have some form of dysglycemia. Katulanda et al. (21) stated that recently received observational data suggest that COVID-19 patients experiencing metabolic comorbidities are at high risk of mortality.

To minimize morbidity and mortality for patients managed at home, healthcare professionals should assess the adequacy of home environment for the continuity of care; whether the patient and his/her family can adhere to the recommended health precautions (e.g., hand hygiene, respiratory hygiene, environmental cleanliness, and movement restrictions). Moreover, patients and their family members should receive continued support and health education (8).

Almost half of our patients were admitted to the hospital for management of COVID-19. Those who were hospitalized had significantly higher case fatality than those who were not hospitalized.

The high hospital admission rate among our patients possibly reflects the severity of their condition, which necessitated being hospitalized to receive a higher level of care than that provided through homecare. The significantly higher case fatality among those who were hospitalized compared with those who were not hospitalized confirms this assumption.

The present study revealed the significantly high case fatality rate among homecare patients with diabetes, cerebrovascular accidents and epilepsy.

Several studies identified the presence of a bidirectional relationship between diabetes and COVID-19. Diabetes has been recognized as a significant risk factor for mortality among COVID-19 infected patients (22-23). Moreover, in Wuhan, China, Zhou et al. (24) reported that COVID-19 non-survivors significantly had a higher probability of having diabetes than did the survivors (31% vs. 14%).

Janardhan et al. (25) explained the association between cerebrovascular accidents and COVID-19 by that SARSCoV-2 may directly attack vascular endothelial cells via the ACE2 receptor, resulting in endothelial cell dysfunction and endothelial barrier damage. Furthermore, damage to the endothelium of cerebral capillaries may lead to endothelial ruptures accompanied by hemorrhage within cerebral tissues (26-27).

Cabezudo-Garcia et al. (28) concluded that active epilepsy is an independent risk factor for the incidence of COVID-19, which is associated with a 5.1-fold greater odds ratio of mortality risk.

Gaspar et al. (15) concluded that home care is classically recognized by the social benefits it provides, e.g. patient participation in family life, presents a unique advantage in terms of patient safety and infection control. The patient is naturally maintained in home isolation, assisted by a team of professionals trained to meet the special needs of their care. These, in association with the correct use of individual protection equipment, are key points for safe healthcare in the context of the epidemic. However, home care faced difficulties with the emergence of the COVID-19 epidemic, which created several problems, such as scarcity and overpricing of resources, interruption or reduction of public transport that obstructed the commuting of healthcare providers, increased absenteeism. Nevertheless, homecare showed great ability to adapt quickly and effectively to keep patients safe in their homes and continued to keep hospital beds available.

In conclusion, most patients infected with COVID-19 receiving homecare have associated comorbidity, mainly in the form of chronic diseases, such as hypertension, diabetes, chronic kidney, heart and neurological diseases. Case fatality rate due to COVID-19 among homecare patients is high, mainly due to their old age and associated morbidity.

Case fatality due to COVID-19 among homecare patients can be minimized by prior assessment of the adequacy of home environment for the continuity of care, provision of health education to patients and their family members regarding the recommended health precautions.

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