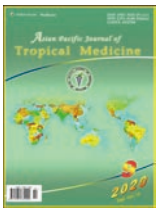

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Treatment for COVID-19 patients in Vietnam: Analysis of time-to-recovery

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ABSTRACT

Objective: To describe the recovery time and related factors among COVID-19 patients in Vietnam.

Methods: We used the secondary data obtained from the official database of the Ministry of Health of Vietnam and other public data sources that were available by April 9th, 2020. Cox proportional hazards model was carried out to identify factors related to recovery time among COVID-19 patients.

Results: By April 9th, 2020, the cumulative number of COVID-19 cases detected in Vietnam was 255, of which 129 (50.6%) patients had fully recovered. The median recovery time of patients was 17 (95% *CI*=16-19) days. Older patients had a lower likelihood of recovery (*HR*=0.98, 95% *CI*=0.97-0.99, *P*<0.001), whereas patients with a history of international incoming travel had a higher likelihood of recovery (*HR*=1.57, 95% *CI*=1.03-2.40, *P*=0.036). There was no statistically significant difference in the recovery time of patients treated in different hospital settings.

Conclusions: More attention is needed for older patients and who did not have international travel history. Patients confirmed with COVID-19 could be treated at local health facilities to avoid unnecessary referrals and burdens to specialized hospitals at the central level.

KEYWORDS: COVID-19; Coronavirus; Recovery; Vietnam

1. Introduction

Coronavirus disease 2019 (COVID-19) is a new infectious disease caused by severe acute respiratory syndrome coronavirus 2[1]. The disease was first reported in Wuhan, China on December 31st, 2019. On March 11th, 2020, the World Health Organization declared the COVID-19 a pandemic as this disease has spread to over 143 countries outside of China[2]. By April 9th, a total of 1 600 590 COVID-19 cases were reported globally, with 98 804 deaths and the recovery rate was 21.7%[3].

In Vietnam, the 1st confirmed case was identified in Ho Chi Minh City with a travel history from Wuhan on January 23rd, 2020. By April 9th, 2020, a total of 255 confirmed cases were reported[4]. The COVID-19 pandemic in Vietnam can be summarized in three pandemic phases[5]. The first phase was from the first identified case to February 25th, 2020, with all 16 cases were tracked with Wuhan-related and recovered. In the second phase, from March 6th to 19th, 2020, a total of 69 cases were reported and traced with the link outside of China. From March 20th, 2020, Vietnam has entered the third phase with some clusters in high population density areas. These untraceable sources have posted potential risks for community spreads so that the Vietnamese nationwide quarantine policy had ordered from April 1st to 15th, 2020.

The severity of COVID-19 symptoms can range from very mild to severe, affecting both lungs, leading to organ failure, and even death[6]. It is predicted that the low-and-middle-income countries would bear greater burden of COVID-19 due to their lack of financial support, equipment and medical capacity[7]. Thus, it is important to provide evidence for the low-and-middle-income countries to promptly respond to the pandemic. The objective of our paper is to describe the recovery time and factors related to the recovery time of COVID-19 patients in Vietnam.

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2. Materials and methods

2.1. Data sources

The main data source for this paper was from the official database of the Ministry of Health of Vietnam (available from: https://ncov.moh.gov.vn). The additional data sources were from the World Health Organization website (available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019) and from provincial centers for disease control in Vietnam. Data were collected from January 23rd, 2020 (*i.e.*, date of the 1st confirmed case in Vietnam) to April 9th, 2020 (*i.e.*, analysis date and in the third phase of the pandemic in Vietnam). Data from all patients were analyzed.

2.2. Variable definition

2.2.1. COVID–19 confirmed case

A confirmed case of COVID-19 was defined as a patient positive with severe acute respiratory syndrome coronavirus 2 by high-throughput sequencing or RT-PCR of nasal and pharyngeal swab specimens, irrespective of clinical signs and symptoms[8].

2.2.2. Outcome variable

The outcome variable was recovered from COVID-19, defined as a patient who had: (a) at least two consecutive negative test results, collected at ⩾24-hour intervals by the RT-PCR method; (b) no fever for at least three days; and (c) good general health status[9].

The observation period for each patient was the time from hospital admission to recovery or the analysis date (*i.e.*, April 9th, 2020) depending on which came first. If the analysis day occurred first, then a patient's observation period was considered right censored.

2.2.3. Background information

The background information includes: age, sex, nationality, international travel history case which was defined as a confirmed case with a history of international travel in the 14 days before the onset, date of hospital admission, date of recovery, and types of hospitals where patients have been treated.

2.3. Data analysis

Descriptive statistics were used with frequencies and percentages for categorical variables and means with standard deviations (SD) for quantitative variables. Median and its 95% confidence interval (95% *CI*) were used to describe the time to recovery of patients. The log-rank tests were used to determine whether recovery distribution differed statistically among groups. Cox proportional hazards model was carried out to identify factors related to recovery time from COVID-19. *P*-value <0.05 was considered as statistically significant. All statistical analysis was conducted using *R* (version 3.5.0, *R* Foundation for Statistical Computing, Vienna, Austria).

2.4. Ethical considerations

The protocol of this study was approved by the Scientific and Ethical Committee in Biomedical Research (No. 141/2020/YTCC-HD3) of the Hanoi University of Public Health.

Table 1. Patients' characteristics [*n* (%)].

Characteristics	Recovered (*n*=129)	Not recovered (*n*=126)	Total (*n*=255)
Age (mean±SD, year)	34.1±16.1	37.9±15.8	36.0±16.0
Age group (years)			
<20	13 (10.1)	11 (8.7)	24 (9.4)
20-39	78 (60.5)	56 (44.4)	134 (52.5)
40-59	23 (17.8)	48 (38.1)	71 (27.8)
⩾60	15 (11.6)	11 (8.7)	26 (10.2)
Sex			
Female	66 (51.2)	72 (57.1)	138 (54.1)
Male	63 (48.8)	54 (42.9)	117 (45.9)
Nationality			
Vietnamese	98 (76.0)	109 (86.5)	207 (81.2)
Others	31 (24.0)	17 (13.5)	48 (18.8)
International travel history			
No	31 (24.0)	59 (46.8)	90 (35.3)
Yes	98 (76.0)	67 (53.2)	165 (64.7)
Treatment location			
National hospital	61 (47.3)	75 (59.5)	136 (53.3)
Field hospital	17 (13.2)	15 (11.9)	32 (12.5)
Others (local hospital)	51 (39.5)	36 (28.6)	87 (34.1)
Time from onset to discharged/follow-up (mean±SD, day)	15.8±5.0	13.4±6.7	14.6±6.0

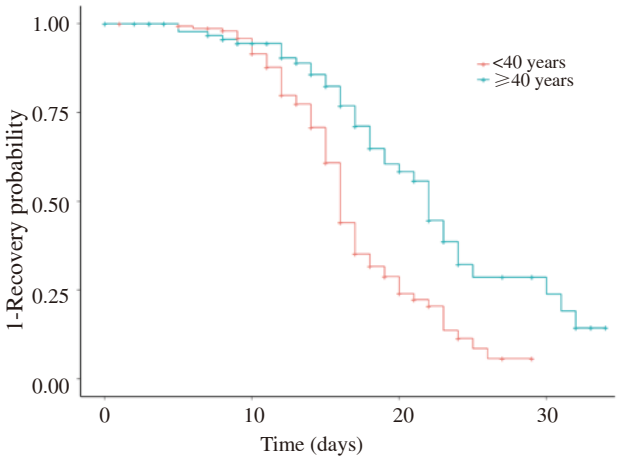

Figure 1. Kaplan-Meier curve for time to recovery by age group.

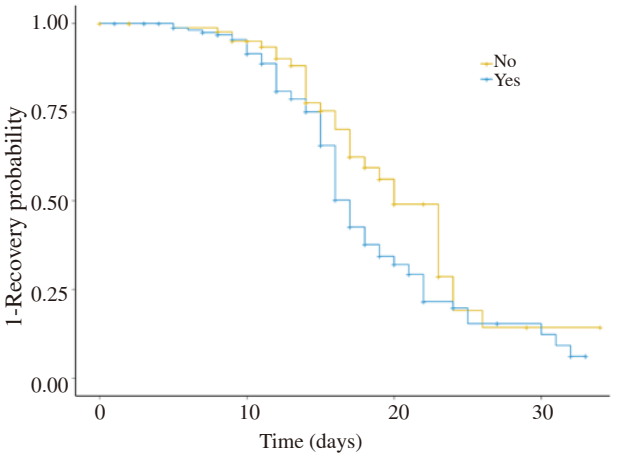

Figure 2. Kaplan-Meier curve for time to recovery by history of international incoming travel.

3. Results

The cumulative number of COVID-19 cases detected in Vietnam was 255, and no death was reported by April 9th, 2020. There were 129 (50.6%) COVID-19 patients fully recovered and were discharged. Patients' characteristics are shown in Table 1. The mean age of patients was (36.0±16.0) years. More than half of the patients were females (54.1%) and from 20-39 years old (52.5%). Most of the patients were Vietnamese (81.2%) and had a history of international travel within 14 days before the onset (64.7%). There were 53.3% of patients had been treated in national hospitals.

Table 2 shows time from hospital admission to discharge by patients' characteristics. Figure 1 and Figure 2 present Kaplan-Meier curve for time to recovery by age group and history of international incoming travel. Overall, the median recovery time of patients was 17 days (95% *CI*: 16-19 days). Patients who were younger than 40 years old had the median recovery time of 16 days, compared to 22 days of those who were older than 40 years old (P<0.001). Patients with the history of international incoming travel had the median recovery time shorter than those who did not (17 days *vs*. 20 days). The recovery times were similar across sex, nationality or hospital classification where patients received treatment.

The multivariable Cox proportional hazard model of factors related to recovery time of patients is shown in Figure 3. After controlling for other variables in the model, age and history of international incoming travel were shown to be statistically significant correlates of recovery time of patients. Older patients had a lower likelihood of recovery (*HR*=0.98, 95% *CI*: 0.97-0.99, P<0.001), whereas patients with a history of international incoming travel had a higher likelihood of recovery (*HR*=1.57, 95% *CI*: 1.03-2.40, P=0.036). There was no statistically significant difference in the recovery time of patients treated in national hospitals, field hospitals or local hospitals.

Table 2. Comparison of time from hospital admission to recovery by patients' characteristics.

Characteristics	Median (95% *CI*)	*P*-value
All	17 (16-19)	
Age group (years)		
<40	16 (16-17)	<0.001
⩾40	22 (19-25)	
Sex		
Female	17 (16-22)	0.590
Male	18 (17-20)	
Nationality		
Vietnamese	17 (16-19)	0.140
Others	19 (17-22)	
International travel history		
No	20 (17-24)	0.056
Yes	17 (16-18)	
Treatment location		
National hospital	18 (16-22)	0.840
Field hospital	17 (16-22)	
Others (local hospital)	17 (16-21)	

Time is presented in 1-day unit. *P* values were obtained from log-rank tests.

4. Discussion

The spread of the COVID-19 pandemic has posed great threats globally. The confirmed cases had reached over 1.5 million worldwide by April 9th, 2020, with the estimated global mortality rate of 5.83%[3]. Recorded first on January 13th, 2020 in Thailand, 16 479 COVID-19 cases were then reported within ASEAN countries with a mortality rate of 3.59%[10]. During three phases, the number of cases detected per day in Vietnam were at 0.5, 4.9, and 8.1, respectively. The spread of COVID-19 in Vietnam, a developing country, highlights the need for the government to have appropriated rapid responses in different phases to keep the transmission spread at a manageable level. However, given that Vietnam shares the border with China, and the number of confirmed cases was limited to 255, without any reported death, indicating a sign of initial success in disease prevention and treatment.

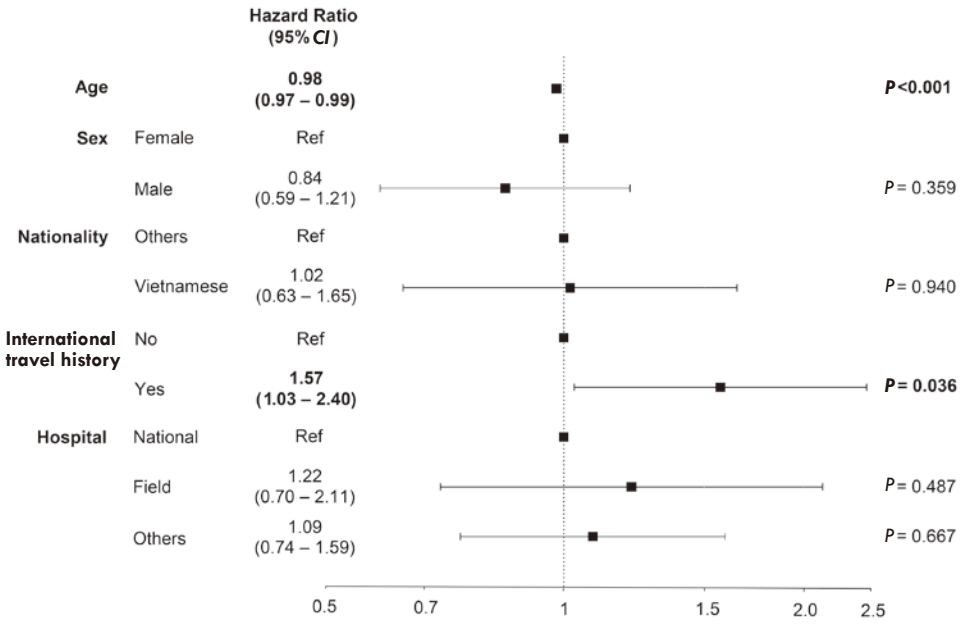

Figure 3. Multivariable Cox proportional hazard model of factors related to recovery time of COVID-19 patients.

In this study, the median duration of hospitalized for COVID-19 was 17 days, which was 3-7 days longer than that reported in China[11,12]. We found that, older patients had a lower likelihood of recovery. The impact of COVID-19 on the elderly has been well-documented[11,13]. Older patients are likely to be associated with faster diseases progression and require ICU care[11,13]. A study in Wuhan, China showed that the median age of those treated in ICU was 66-year-olds, 15 years older than the non-ICU group[11]. The study of Zhuo *et al*. in Shichuan, China found that the length of stay for patients ⩾45 years was 21 days, which was longer than 18 days for those aged <45[14]. Additionally, higher mortality rates were also recorded among the elderly people in China[15], Italy[16], and the United States[17], which ranged from 6% to 18%.

There was a high prevalence (64.7%) of confirmed cases had travel history, including Wuhan-related in phase one and international epidemic centers in phase two. Most of them were oversea workers and students who returned Vietnam in March, 2020. This trend is associated with the high proportion of younger age group hospitalizing in Vietnam, with a mean age of (36±16) years, compared with the median age of cases detected in China (52 years) or outside China (45 years)[3]. There was a higher likelihood of recovery among patients with a history of international incoming travel. This might be due to those patients were incubating the disease or concealing onset symptoms during their travel, while patients who had close contacted with infected person were screened and hospitalized right after their laboratory tests were positive for COVID-19. Additionally, from March 22nd, 2020, Vietnam has required passengers to provide mandatory health declaration and banned all foreigners to enter the country. Since several untraceable cases and clusters were identified in the third phase, notable the Bach Mai National Hospital cluster, from April 1st to 15th, 2020, the Vietnam Government had ordered the National social distancing policy to fight COVID-19 pandemic[4]. Our study also showed that there was no statistically significant difference in the recovery time of patients treated in different hospital settings. It indicates that patients confirmed with COVID-19 could be treated at local health facilities to avoid unnecessary referrals and burdens to specialized hospitals[18].

This study was a snapshot of the COVID-19 pandemic in Vietnam and factors related to recovery among patients infected with COVID-19 using secondary data sources. More attention is needed for older patients and who did not have international travel history as they have longer recovery times. In addition, patients confirmed with COVID-19 could be treated at local health facilities to avoid unnecessary referrals and burdens to specialized hospitals. Further studies with clinical and socio-economic factors, and with longer follow-up time should be conducted to provide more information regarding the recovery of COVID-19 patients.

Conflict of interest statement

The authors declare that there is no conflict of interest.

Authors' contributions

KQL and HVM conceptualized the idea and analysed data. HHH prepared database. KQL and HHH wrote the first draft. KQL, LNQ and TTTH reviewed and edited the final version. The manuscript has been read and approved by all the authors.

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