Survival and Hospital Stay Characteristics of COVID-19 Patients in Karnataka, India

Amrutha AM[1], Vijayalaxmi Mangasuli[1], Sudharani M[1], Bhagyashree Khatari[2], Nagendra Gowda MR[3], Bhoovana Chandra[2]

[1]Assistant Professor, [2]Post Graduates, [3]Professor and Head, Department of Community Medicine, Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India

Abstract

The rapid transmission of this virus from human to human made the World Health Organization (WHO) to declare this as the public health emergency of international concern and called it as global pandemic. As on July 21, 2020, globally 14562550 COVID-19 cases have been reported and caused 607781 deaths.[2]

The first case of the COVID-19 pandemic in India was reported on 30 January 2020. As on 22 July 2020, the MOHFW, Government of India has reported 411133 confirmed cases from 33 states with 28732 deaths and 753049 cured/discharged.

The case fatality rate was 1.9% and the recovery rate was 98.1% Following the test positivity, the mean length of stay among COVID-19 patients with definitive outcomes was 15.41 days COVID-19 cases with SARI at the time of admission and those with travel history had significantly lower length of hospital stay as compared to their counterparts. There was no difference in the length of hospital stay by gender and age .Among those without definitive outcomes (245/3162), the length of stay in the hospital following test positivity ranged from 40 to 114 days.

The Kaplan–Meier analysis showed an overall survival rate of 98.8% at 7 days and

98.1% at 14 days. The survival probability at 21 days is 98.5%.COVID-19 cases who were ≥ 60 years and who have presented with SARI had significantly higher risk of mortality when compared to the counterparts ($p<0.001$). However, the risk of mortality did not differ much among male and female COVID-19 patient ($p=0.88$).

Having SARI at the time of admission (adjusted hazard ratio: 0.07 (0.04-0.14); $P <$

0.001), being aged ≥ 60 years (adjusted hazard ratio: 0.2 (0.1-0.3); $P < 0.001$) and having travel history (adjusted hazard ratio: 3.7 (1.7-8.2); $P < 0.001$) were the significant predictors of mortality .

Key Words: *COVID 19, Pandemic, Survival*

Corresponding Author :
Dr Sudharani M
Assistant Professor, Department Of Community Medicine, BMCH, Chitradurga Address- CK Pura Kelagot, Chitradurga, Karnataka- 577501
E-Mail : su.13aug@gmail.com

Introduction

Coronavirus or novel coronavirus which is taxonomically termed as SARS-CoV-2and named by

World Health organization (WHO) as COVID-19 which emerged from Wuhan city, Hubei Province of China by the end of 2019 has caused unprecedented panic across the world. Positive cases of COVID-19 and

deaths due to this virus have been reported in almost every country in the world.[1] The rapid transmission of this virus from human to human made the World Health Organization (WHO) to declare this as the public health emergency of international concern and called it as global pandemic. As on July 21, 2020, globally 14562550 COVID-19 cases have been reported and caused 607781 deaths.[2]

The first case of the COVID-19 pandemic in India was reported on 30 January 2020. As on 22 July 2020, the Ministry of Health and Family Welfare, Government of India has reported 411133 confirmed cases from 33 states with 28732 deaths and 753049 cured/discharged. Karnataka reported its first COVID case on March 9, 2020. As of July 22, 2020, Karnataka has reported 71069 positive cases with 24549 discharges/cured and 1464 deaths.[3]

The available data show that the rate of fatal cases is not very high in the young population.[4] However, older people (over 60 years) and people with co-morbidities (such as diabetes and heart disease) may be more vulnerable and mortality can be high in this population.[5]

As of now, there is abundant information on the descriptive statistics (confirmed cases, active cases, and death) of COVID-19 in India which provide only crude information.With the progression of global pandemic of COVID-19, the information on the duration of hospital stay and the survival of patients may be helpful in the planning of allocation of medical resources, improving treatment outcomes, and designing effective interventions.[6] However, such information for COVID-19 have not been well described in the Indian context.

With this in background, we aimed to investigate the factors associated with hospital stay and death among COVID-19 patients for the entire state of Karnataka, India.

Materials and Methods

The retrospective cohort analysis was done using the health bulletin data on COVID-19 published by the Department of Health and Family Welfare, Government of Karnataka (GoK). Karnataka is a southern state in India with 30 districts and a total population of 6,10,95,297 which accounts for 5% of total population of India.[7]

The cohort for the study included all the COVID-19-positive cases that were published in the GoK media bulletin from March to May 31, 2020. Data from the health bulletin were entered into the excel sheet which formed our cohort database. The data included the variables on Patient Id, Gender, Age, Place of hospital admission, Place of residence, Exposure/Travel history, Severity of symptoms, Date of test positivity and Date of discharge/death.

Our fixed cohort was followed till 40 days (July 10, 2020) for definitive outcomes (death/discharge). Those patients without definitive outcome till July 10, 2020, were right censored.

Data analysis

Descriptive statistics were computed for demographic and clinical characteristics. The ttest was used to compare the differences in the length of hospital stay between the various groups of patients with definitive outcomes.

Kaplan–Meier method was used to estimate the survival probability of COVID-19 patients at 7, 14, and 21 days. The risk factors associated with COVID-19 mortality were assessed through the Cox proportional hazard regression. All analyses were performed using SPSS16 software.

Results

Of the total 3221 patients of our cohort across the entire state of Karnataka, 59 patients data was missing from health bulletin. So among 3162 cases, 2917 (92.25%) had definitive outcomes till July 10, 2020. Majority of the patients were male (60.8%) and belonged to the age group <60 years (93.6%). Among those with definitive outcomes, 51 (1.7%) had SARI at the time of admission [Table 1].

The case fatality rate was 1.9% (55/2917), and the recovery rate was 98.1% (2862/2917). Following the test positivity, the mean length of stay among COVID-19 patients with definitive outcomes was 15.41 days (SD: 6.55). COVID-19 cases with SARI at the time of admission and those with travel history had significantly

lower length of hospital stay as compared to their counterparts. There was no difference in the length of hospital stay by gender and age [Table 1]. Among those without definitive outcomes (245/3162), the length of stay in the hospital following test positivity ranged from 40 to 114 days.

The Kaplan–Meier analysis showed an overall survival rate of 98.8% at 7 days and

98.1% at 14 days. The survival probability at 21 days is 98.5%.COVID-19 cases who were ≥ 60 years and who have presented with SARI had significantly higher risk of mortality when compared to the counterparts (p<0.001). However, the risk of mortality did not differ much among male and female COVID-19 patient (p=0.88).

Having SARI at the time of admission (adjusted hazard ratio: 0.07 (0.04-0.14); *P* <

0.001), being aged ≥ 60 years (adjusted hazard ratio: 0.2 (0.1-0.3); *P* < 0.001) and having travel history (adjusted hazard ratio: 3.7 (1.7-8.2); *P* < 0.001) were the significant predictors of mortality among COVID-19 patients [Table 3]. Age had confounding effect on the severity of symptoms and survival as Model-1 and Model-2 were compared.

Table 1: Characteristics of COVID-19 cases by length of hospital stay

Variables		Frequency (%)	Mean Length of Hospital stay in days (SD)	t-test	
				t-value	p-value
Gender	Male	1774 (60.8)	15.48 (6.5)	0.758	0.45
	Female	1143 (39.2)	15.29 (6.5)		
Age (Years)	<60	2729 (93.6)	15.46 (6.4)	1.764	0.07
	≥60	188 (6.4)	14.59 (8.1)		
Travel history	Absent#	990 (33.9)	15.97 (7.3)	3.342	0.001
	Present	1927 (66.1)	15.12 (6.1)		
Severity of symptoms	SARI	51 (1.7)	9.73 (8.3)	6.285	<0.001
	Others	2866 (98.3)	15.51 (6.5)		
	Overall	2917 (100)	15.41 (6.5)		

Primary and secondary contacts

Table 2: Predictors of mortality among COVID-19 cases using univariate cox-proportional hazard regression

Variabl	es	Univariate model	
		Unadjusted hazard ratio (95%CI)	**p-value**
Gender	Female	Reference	0.9
	Male	1.041 (0.6-1.8)	
Severity of symptoms	with SARI	Reference	<0.001
	No SARI	0.02 (0.01-0.03)	
Age (Years)	≥60	Reference	<0.001
	<60	0.06 (0.03-0.09)	
Travel history	Absent#	Reference	<0.001
	Present	9.7 (4.7-19.9)	

Primary and secondary contacts

Table 3: Predictors of mortality among COVID-19 cases using multivariate cox proportional hazard regression

Variables		Multivariate Model 1		Multivariate Model 2		Multivariate Model 3	
		Adjusted hazard ratio (95%CI)	**p-value**	**Adjusted hazard ratio (95%CI)**	**pvalue**	**Adjusted hazard ratio (95%CI)**	**p-value**
Gender	Female	0.9 (0.5-1.6)	0.83	0.9 (0.5-1.6)	0.76	0.9 (0.5-1.5)	0.71
	Male	Reference		Reference		Reference	
Severity of symptoms	No SARI	Reference	<0.001	Reference	<0.001	Reference	<0.001
	With SARI	0.02 (0.01-0.03)		0.05 (0.02-0.09)		0.07 (0.04-0.14)	
Age (Years)	<60	-	-	Reference	<0.001	Reference	<0.001
	≥60			0.15 (0.08-0.29)		0.2 (0.1-0.3)	
Travel history	Absent#	-	-	-	-	Reference	0.001
	Present					3.7 (1.7-8.2)	

*Model 1 included sex and severity of symptoms as predictors; Model 2 included sex, severity of symptoms, and age as predictors; Model 3 included sex, severity of symptoms, age, and travel history as predictors.

SARI: Severe Acute Respiratory Illness, CI: Confidence interval

Discussion

Karnataka reported the first COVID-19 death for India on March 13, 2020.[8] The overall case fatality rate for our cohort with definitive outcome was 1.9%, and this was much lower than the overall national figure (7%) as on July 22, 2020.[3] This might be because the cases and deaths reported from Karnataka increased drastically after lockdown release and our cohort represented data during lockdown.

COVID-19 patients who are ≥60 years and those with serious illness (SARI) at the time of admission were found to have poor prognosis, whereas gender had no effect on the mortality. Similar results have been reported by Mishra, *et al*.[9] This stresses on the attention and additional medical resource allocation to be given to vulnerable elderly populations irrespective of the gender.

More importantly, the study emphasizes the need for reverse quarantine (protecting the highly vulnerable elderly population from the highly mobile younger population with a high prevalence of COVID-19).[10]

The mean length of stay reported in the present study was 15.4 days. Mishra, *et al*. [9] reported a17 days in their study in Karnataka. This was higher than that reported from China (14-days) and outside China (5-days).[11] This may be explained by the differences in early detection, severity, admission and discharge criteria, and different timing within the pandemic. [11]

We reported the case fatality rate of 1.9%. Mishra, *et al*. [9] reported 5.1%. We reported the survival rate of 98.8% at 7 days and 98.1% at 14 days whereas Mishra, *et al*. [9] reported survival rate of 95.7% at 7 days and 95.5% at 14 days. This difference might be because of the difference in virility of the virus (higher during start of the pandemic).

Having SARI at the time of admission and being aged ≥ 60 years were the significant predictors of mortality among COVID-19 patients. Similar results have been reported by Mishra, *et al*. [9]

Systematic data collection, a cohort with large data on definitive outcome and robust analyses of survival characteristics were the strengths of the study.

Our limitations are few data which were missing from health bulletin were excluded from the study and also we could not analyze cause of death and co-morbidities.

The overall picture of COVID-19 can be obtained only after the end of epidemic; however, these preliminary evidences would be sufficient for health resource planning and resource allocation

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Ethical Clearance: Ethical Committee BMCH

References

1. Health emergencies [Internet]. Euro.who.int. 2020 [cited 23 July 2020]. Available from: http://www.euro.who.int/en/health-topics/health-emergencies/
2. Coronavirus disease (COVID-19) – World Health Organization [Internet]. Who.int. 2020 [cited 23 July 2020]. Available from: https://www.who.int/emergencies/diseases/novelcoronavirus-2019
3. MoHFW | Home [Internet]. Mohfw.gov.in. 2020 [cited 23 July 2020]. Available from: https://www.mohfw.gov.in/
4. Wu Z, McGoogan J. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China. JAMA. 2020;323(13):1239.
5. Lu R, Zhao X, Li J, Niu P, Yang B, Wu H et al. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for

virus origins and receptor binding. The Lancet. 2020;395(10224):565-574.novel coronavirus: implications for virus origins and receptor binding. Lancet. 2020;395:565-574.

6. Wang Z, Ji JS, Liu Y, Liu R, Zha Y, Chang X, *et al*. Survival analysis of hospital length of stay of novel coronavirus (COVID-19) pneumonia patients in Sichuan, China. medRxiv [Preprint] 2020. Available from: doi.org/10.1101/2020.04.07. 20057299.
7. Karnataka Population Sex Ratio in Karnataka Literacy rate data 2011-2020 [Internet]. Census2011.co.in. 2020 [cited 23 July 2020]. Available from: https://www.census2011.co.in/census/state/karnataka.html
8. Health Department Bulletin - COVID-19 INFORMATION PORTAL [Internet]. Covid19.karnataka.gov.in. 2020 [cited 23 July 2020]. Available from: https://covid19.karnataka.gov.in/new-page/Health%20Department%20Bulletin/en
9. Amudhan S, Mishra V, Burma A, Das S, Parivallal M, Rao G. COVID-19-Hospitalized Patients in Karnataka: Survival and Stay Characteristics. Indian Journal of Public Health. 2020;64(6):221.
10. Reverse Quarantine: 10 steps to protect the elderly and the vulnerable from COVID19 [Internet]. OnManorama. 2020 [cited 23 July 2020]. Available from: https://www.onmanorama.com/lifestyle/health/2020/04/17/reverse-quarantine-10-stepsprotect-elderly-vulnerable-from-covid-19.html
11. Rees EM, Nightingale ES, Jafari Y, Waterlow N, Clifford S, Jombert T, *et al*. COVID-19 length of hospital stay: a systematic review and data synthesis. medRxiv [Preprint] 2020. Available from: doi.org/10.1101/20 20.04.30.20084780.