Original Article

Factors Associated with COVID-19 Mortality at Setiu District, Terengganu State of Malaysia in 2021

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Abstract:

Background: COVID-19 infections caused a range of morbidities and mortalities especially in the high-risk group patients. ***Objective:*** To determine the factors associated with COVID-19 related mortality in a population of Malaysia. ***Materials and methods:*** A case-control study was conducted that utilized secondary data from line listing of COVID-19 patients at Setiu district in Terengganu state of Malaysia, from January to September of 2021. For both case and control groups, only samples aged 18 years old and above were included. Patients under home surveillance orders and were not admitted to hospitals or treatment centres, brought in dead cases and incomplete data of 20% or more were excluded from this study. A total of 126 samples that fulfilled the study criteria were selected for this study. Simple random sampling was done. Multiple logistic regression analysis was done to determine factors associated with COVID-19 mortality using SPSS version 26.0. ***Results:*** Among the mortality cases, majority were aged ≥60 years old (66.7%), female (61.1%), having comorbidities (83.3%), with incomplete vaccination (83.3%) and were admitted at tertiary hospital (55.6%). Factors associated with COVID-19 mortality were presence of comorbidity (AdjOR: 14.40, 95% CI:2.26, 91.79) and incomplete vaccination (AdjOR: 4.51, 95% CI:1.01, 20.16). ***Conclusion:*** COVID-19 patients with comorbidities and incomplete vaccination must be more closely monitored as they are more likely to succumb to death. Explicit preventive measures against COVID-19 mortality and its determinants must be implemented by the stakeholders so that patients' survival can be improved.

Keywords: COVID-19, mortality, morbidity, COVID-19 vaccination, Malaysia

Introduction

COVID-19 infection was declared as a global pandemic by the World Health Organization (WHO) in March 2020.[1] As of September 21, 2021, the WHO has received reports of 228,807,631 confirmed cases of COVID-19, with 4,697,099 fatalities.[2] Rapid mutation and emergence of new variants of concern such as Delta increase the infectivity and pathogenicity of the virus due to immune evasion.[3] The disease is primarily spread by droplets through coughing and sneezing and could result in acute respiratory illness.[4] Many efforts have been implemented worldwide to contain the disease from spreading and to reduce the associated mortality and morbidity such as initiation of lockdown, mass screening, quarantine and vaccination. The first COVID-19 case was reported in Malaysia back on January 25, 2020, and was tracked back to three individuals who

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had close contact with an infected individual in Singapore.[5] As of 22nd September 2021, a total of 2,123,165 cases with 24,078 deaths were reported in Malaysia.[6]On the country's way forward out of the COVID-19 pandemic, the government had introduced a recovery plan that consists of four phases. Progression to the next recovery phase will be determined by the number of COVID-19 cases reported each day, the capacity of the healthcare system, including the number of beds available in intensive care units (ICU), and the percentage of the population vaccinated against COVID-19.[7]A reducing trend in the number of daily cases and ICU beds occupation had been seen lately as more than 80% of the adult population in the country had already completed vaccination.[6]

Setiu is a district in Terengganu with a population of around 60,000. Most of the population are Malays.[8] They are mainly involved in agriculture as farmers and fishermen. As of 22nd September 2021, a total of 3395 COVID-19 cases were recorded in the district. This contributed to around 7% of COVID-19 cases in Terengganu.[9]Around 80.3% of the adult population in Terengganu had already completed vaccination against COVID-19 as of 23rd September 2021.[6]

There are limited published studies that discussed factors associated with COVID-19 mortality in Malaysia, let alone at the district level. Therefore, sufficient data need to be obtained for further improvement of preventive measures. Every COVID-19 case needs to be properly evaluated and stratified accordingly so that, complications including death can be minimalized. Findings from this study can be presented to the stakeholders so that effective strategies can be implemented to reduce the burden of the problems. This study aims to determine the factors associated with COVID-19 mortality at Setiu district, Terengganu state of Malaysia.

Methods

This case-control study was conducted using secondary data from the line listing of COVID-19 cases recorded at Setiu Distrcit from January to September of 2021. The sampling frame was all COVID-19 cases at Setiu for the year 2021 (January 2021 – September 2021) and fulfilled the study criteria. Only samples aged 18 years old and above were included in the study. Cases under home surveillance orders and were not admitted to hospitals or treatment centres, brought in dead cases and incomplete data of 20% or more were

excluded from this study. The sample size was calculated for each variable of factors associated with COVID-19 mortality using power and sample size calculation software (dichotomous – two proportions formula).[10] The largest estimated sample for each group was 58 using the proportion of COVID-19 mortality status by the factor of age ≥ 60 years old (0.44) (11), an estimated proportion of 0.20, 5%type 1 error, and 80% power. Therefore, the total sample size required is 116 patients with COVID-19 infection.As only 18 mortality cases were recorded at Setiu from January 2021 – September 2021, a 1:6 ratio of cases to controls was applied and 108 controls were selected to be included in this study.

A total of 3569 COVID-19 cases were recorded at Setiu from January 2021 – September 2021 as of 27th September 2021. Of these 3569 cases, 2043 cases were eligible for this study. Due to limited data, for cases, no sampling method was applied. All 18 mortality cases were included in the study. 108 controls were selected among patients that survived, matched to the gender of cases. Simple random sampling was done using an Excel spreadsheet to select all the controls. Data were extracted into an Excel spreadsheet and then into the SPSS database. The variables required were age, gender, comorbidity, vaccination status and type of treatment centre. Data were collected from the COVID-19 cases line listing for Setiu District which was also in Excel spreadsheet. For operational definition, COVID-19 mortality case was defined as any certified case that succumbs to death due to COVID-19 infection. Presence of comorbidity was defined as the presence of any medical illness prior to diagnosis of COVID-19 infection. Complete vaccination was defined as completed at least 14 days after the second dose vaccine for Pfizer-BioNTech (COMIRNATY), Sinovac and Astra Zeneca (AZD1222) or at least after 21 days from the single-dose vaccine such as CanSino.

Data were entered and analysed using SPSS Statistics version 26.0. Descriptive statistics were used to summarize all factors. Categorical data were presented as frequency (percentage). Age was categorized into less than 60 years old (reference group) and 60 years old and above. Gender was categorized into female (reference group) and male. Presence of comorbidity was categorized into absent (reference group) or presence of any of pre-existing illness.Vaccination

status was categorized into complete (reference group) and incomplete. Type of treating centre was divided into tertiary hospitals (reference group) and others that include district hospitals and COVID-19 Quarantine and Treatment centres (PKRC).To determine the factors associated with COVID-19 mortality, simple logistic and multiple logistic regression analyses were performed. Simple logistic regression was done to all variables and presented as crude odds ratio. Only variables with p-value less than 0.25 or any clinically important factors were selected for multiple logistic regression via enter method. The variables selected for multivariate analysis were age, comorbidity, vaccination status and type of treatment centre.Multicollinearity and interaction between significance variables were checked. Goodness of fit model was checked. The test was presented as adjusted odds ratio and p-value of < 0.05 was considered significant.

Results

Among the mortality cases, the majority were aged ≥ 60 years old (66.7%), female (61.1%), having comorbidities (83.3%),with incomplete vaccination (83.3%) and were admitted at the tertiary hospital (55.6%). Table 1 illustrates the characteristics of COVID-19 patients of the present study.The odds of death among patients with comorbidity were greater than the odds of death among patients without comorbidity by a factor of 14.40 (95% CI: 2.26, 91.79). On the other hand, the odds of death among patients with incomplete vaccination were greater than the odds of death among patients with complete vaccination by a factor of 4.51 (95% CI: 1.01, 20.16). Table 2 illustrates the factors associated with COVID-19 mortality.

Table 1. Characteristics of selected COVID-19 patients at Setiudistrict, Terengganu Sate in 2021 (n=126)

Variables	Overall n (%)	Mortality	
		No n (%)	Yes n (%)
Age group			
< 60	87 (69.0)	81(75.0)	6 (33.3)
≥ 60	39 (31.0)	27 (25.0)	12 (66.7)
Gender			
Female	78 (61.9)	67 (62.0)	11 (61.1)

Variables	Overall n (%)	Mortality	
		No n (%)	Yes n (%)
Male	48 (38.1)	41 (38.0)	7 (38.9)
Comorbidity			
No	92 (73.0)	89 (82.4)	3 (16.7)
Yes	34 (27.0)	19 (17.6)	15 (83.3)
Vaccination			
Complete	50 (39.7)	47 (43.5)	3 (16.7)
Incomplete	76 (60.3)	61 (56.5)	15 (83.3)
Treatment centre			
Tertiary hospital	22 (17.5)	12 (11.1)	10 (55.6)
Others	104 (82.5)	96 (88.9)	8 (44.4)

Table 2. Factors associated with COVID-19 mortality at Setiu District, Terengganu Sate in 2021 (n=126)

Variables	Crude OR (95% CI)	p-value[a]	Adjusted OR (95% CI)	p-value[b]
Age group				
< 60	1.00			
≥ 60	6.00 (2.05, 17.54)	0.001	1.36 (0.32, 5.77)	0.677
Gender				
Female	1.00			
Male	1.04 (0.37, 2.90)	0.940		
Comorbidity				
No	1.00			
Yes	23.42 (6.16, 88.99)	< 0.001	14.40 (2.26, 91.79)	0.005*
Vaccination				
Complete	1.00			
Incomplete	3.85 (1.05, 14.09)	0.041	4.51 (1.01, 20.16)	0.049*
Treatment centre				
Tertiary hospital	1.00			
Others	0.10 (0.03, 0.30)	< 0.001	0.59 (0.13, 2.72)	0.500

[a]Simple logistic regression

[b]Multiple logistic regression

No multicollinearity and no interaction were found.Hosmer Lemeshow test, p-value=0.083. Classification table 88.1% correctly classified.The area under Receiver Operating Characteristics (ROC) curve was 88.0%.

*p-value < 0.05.

Discussion

A total of 2 factors had been identified to be associated with COVID-19 mortality in this study. The odds of death among patients with comorbidity were greater than the odds of death among patients without comorbidity. This finding is in line with another published study that highlighted the presence of comorbidities such as chronic respiratory diseases, Diabetes Mellitus, hypertension and cardiovascular disease to have an increased risk of death from COVID-19.[12] Such conditions were found to be related to derangement of inflammatory markers resulting in the more severe form of infection, leading to mortality.[13] The presence of comorbidities also increased the risk for coagulopathy as part of the systemic inflammatory response syndrome of severe COVID-19 infection.[14]

In the present study, data showed that the odds of death among patients with incomplete vaccination were greater than the odds of death among patients with complete vaccination. This finding is in line with another published study that reported unvaccinated persons as two times more likely to die due to COVID-19 compared to those with completed vaccinations.[15] Vaccination against COVID-19 had been shown to be effective in clinical and community trials. The efficacy of two doses of the BNT162b2 vaccine was 93.7% in people with the alpha variant and 88.0% in people with the delta variant while the efficacy of two doses of the ChAdOx1 nCoV-19 vaccine was 74.5% in people with the alpha variant and 67.0% in people with the delta variant.[16] The COVID-19 vaccines provide disease protection by eliciting an immune response to the SARS-Cov-2 virus. Acquiring immunity by vaccination reduces the likelihood of developing the illness and its effects.[17]

Other variables in this study were found not to be significant predictors for COVID-19 mortality. This could be due to the small sample size of the study. Age and type of treatment centre were significant at the univariate level but became not significant at the multivariate level. This could also be contributed by the high number of patients with comorbidity that were less than 60 years old of age due to a wider definition for the presence of comorbidity by the data manager. Another logical explanation would be patients with well-controlled comorbidity were managed at district hospitals and COVID-19 Quarantine and Treatment centres (PKRC) rather than tertiary hospitals.[18] On the other hand, gender was not significant possibly due to matching criteria applied.

There were some limitations of this study. As the study utilized secondary data, variables such as smoking, and laboratory profiles were not included as they were not recorded in the original database. These variables had been shown of importance in the literatures. Apart from that, although data on symptoms and patients' category were available in the line listing, the data entry for those variables were done prior to clinical assessment at COVID-19 assessment centre, thus was not accurate. On top of that, a small sample size due to the limited number of mortality cases at Setiu district in 2021 is another limitation. Therefore, future studies could be done by merging data from other districts or states as well with more variables from primary data collection so that, more detailed analysis can be done.

Conclusion

Explicit preventive measures against COVID-19 mortality and its determinants must be implemented by the stakeholders. COVID-19 patients with comorbidity must be monitored at proper institutions such as hospitals or COVID-19 Quarantine and Treatment Centre (PKRC) as currently being practised in Malaysia (18). Continuous surveillance on close contact with comorbidity despite being asymptomatic is also essential. Other than that, efforts for vaccination against COVID-19 must be hastened so that more people can be protected. Health promotion strategies and correcting the misconception about COVID-19 vaccines will then be deemed to be beneficial in achieving universal coverage, hence reducing the burden of disease.

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