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Comorbidities and clinical features related to Invasive Ventilatory Support among COVID-19 cases in Selangor, Malaysia

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by a Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). On March 11, 2020, the World Health Organization declared COVID-19 a pandemic1. Malaysia has also not been spared from the pandemic with a total of 4,987 infected people and 82 deaths up to April 14, 2020 2. A number of studies have shown that underlying comorbidities are predictors of severe disease outcome and greatly affect the prognosis of the COVID-19 patients3-4. COVID-19 causes severe acute respiratory syndrome and is often associated with intensive care unit (ICU) admission and subsequent mortality. Identifying the risk factors that predicts severity and outcome of COVID-19 patients early in the presentation would be extremely helpful for clinicians in managing the patients

OBJECTIVE

This study determined comorbidity and additional predictive factors for invasive ventilatory support (intubated) among Malaysian COVID-19 patients

METHODOLOGY

- This is a retrospective study using data collected during COVID-19 outbreak in Selangor, Malaysia.
- COVID-19 confirmed cases in Selangor that were notified up to 13th April 2020 were included into this study.
- A positive case of COVID-19 is confirmed based on positive Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) testing.
- The outcome variable was ICU admission that required intubation with mechanical ventilatory support. Predictor variables included socio demographic characteristics, comorbidities and main symptoms of COVID-19.
- This information were based on the case investigation reports obtained from district health offices in-charge of each patient. All the admitted COVID-19 cases were then followed up and verified via hospital medical report for information on ICU admission requiring intubation.
- Multiple logistic regression analysis was performed to identify the factors associated with intubation among COVID-19 cases

RESULTS & DISCUSSION

- A total of 1,287 COVID-19 positive cases were included in the analysis.
- Consistent with other studies, the most common presenting symptoms in this study were fever followed by cough, dyspnoea and lethargy[5,6].
- The most common comorbidities among COVID-19 patients were hypertension (15.5%) and diabetes (11.0%) and it was consistent with the finding on the clinical features of COVID-19 in Wuhan[6].
- Among intubated cases, 68.0% had hypertension, 88.0% had fever, 40.0% had dyspnoea and 44.0% was lethargic.
- Multivariable regression demonstrated that the odds of being intubated among older COVID-19 patients (≥ 60 years) was 3.9 times (aOR: 3.90, 95% CI: 1.41, 10.80) higher than those aged below 60 years. Similar to the reports from China & Italy, the risk for poor prognosis is higher in older age groups[7,8].
- Those who had underlying hypertension had 5.7 times more odds of being intubated compared to those with no underlying hypertension (aOR: 5.71, 95% CI: 1.99, 16.45). Systematic review and meta-analysis done by Jing Yang et al. (2020) showed that the pool odds of hypertension in severe patients compared to non-severe patients was 2.36 (95% CI: 1.46-3.83)[9].
- The presenting symptoms related to COVID-19 infection also play an important role in predicting poor prognosis. Presenting symptoms such as fever (aOR: 9.8, 95% CI: 2.48, 38.95), dyspnoea (aOR:9.61, 95% CI: 3.31, 27.96) and lethargy (aOR:7.92, 95% CI: 2.84, 22.09) had significantly higher risk for intubation.

Table 2: Proportion of Intubated cases of COVID-19 by socio demographic, NCD comorbidities and clinical presentation

Variables	COVID-19 Positive Cases		
	Total (n = 1287)	Intubated (n=25)	Not Intubated (n=1262)
Sex, n (%)			
Male	750 (58.3)	18 (72.9)	732 (58.0)
Female	537(41.7)	7 (28.0)	530 (42.0)
Age groups, n (%)			
<60 years	1086 (84.4)	11 (44.0)	1075 (85.2)
60 years and above	201 (15.6)	14 (56.0)	187 (14.8)
Comorbidities, n (%)			
Hypertension	200 (15.5)	17 (68.0)	183 (14.5)
Diabetes	141 (11.0)	10 (40.0)	131 (10.4)
Heart disease	50 (3.9)	4 (16.0)	46 (3.6)
Chronic respiratory disease	40 (3.1)	0 (0.0)	40 (3.2)
Chronic kidney disease	18 (1.4)	3 (12.0)	15 (1.2)
Cancer	7 (0.5)	0 (0.0)	7 (0.6)
Current smoker	57 (4.4)	1 (4.0)	56 (4.4)
Symptoms, n (%)			
Fever	564 (43.8)	22 (88.0)	542 (42.9)
Cough	477 (37.1)	14 (56.0)	463 (36.7)
Lethargy	78 (6.1)	11 (44.0)	67 (5.3)
Dyspnoea	71 (5.5)	10 (40.0)	61 (4.8)
Diarrhoea	71 (5.5)	3 (12.0)	38 (3.0)
Arthralgia	53 (4.1)	1 (4.0)	30 (2.4)
Myalgia	41 (3.3)	1 (4.0)	52 (4.1)
Headache	31 (2.4)	0 (0.0)	71 (5.6)

Table 2: Factors associated with intubation among positive case COVID-19 cases using binary logistic regression model (n=1287)

Risk factors	Simple Logistic Regression (SLR)			Multiple Logistic regression (MLR)		
	b	Crude OR (95 % CI)	p-Value	b	Adjusted OR* (95 % CI)	p-Value
Sex						
Male		1			1	
Female	-0.62	0.54 (0.22, 1.30)	0.166	-0.21	0.82 (0.30, 2.22)	0.689
Age group						
< 60 years		1			1	
≥ 60 years	1.99	7.32 (3.27, 16. 36)	<0.001	1.36	3.90 (1.41, 10.80)	0.009
Hypertension						
No		1			1	
Yes	2.53	12.53 (5.33, 29.46)	<0.001	1.74	5.72 (1.99, 16.45)	0.001
Diabetes						
No		1			1	
Yes	1.75	5.76 (2.53, 13.07)	<0.001	0.06	1.06 (0.35, 3.23)	0.914
Heart Disease						
No		1			1	
Yes	1.62	5.04 (1.66, 15.26)	0.004	-0.18	0.84 (0.22, 3.23)	0.796
Chronic Kidney Disease						
No		1			1	
Yes	2.43	11.34 (3.06, 41.99)	<0.001	1.19	3.30 (0.62, 17.50)	0.161
Current smoker						
No		1			1	
Yes	-0.11	0.90 (0.12, 6.75)	0.916	-1.32	0.27 (0.02, 3.34)	0.307
Fever at presentation						
No		1			1	
Yes	2.28	9.74 (2.90, 32.72)	<0.001	2.29	9.83 (2.48, 38.95)	0.001
Cough at presentation						
No		1			1	
Yes	0.787	2.20 (0.99, 4.88)	0.053	-0.21	0.81 (0.31, 2.13)	- 0.672
Dyspnoea at presentation						
No		1			1	
Yes	2.58	13.13 (5.66, 30.42)	<0.001	2.26	9.61 (3.31, 27.96)	<0.001
Lethargy at presentation						
No		1			1	
Yes	2.64	14.01 (6.13, 32.05)	<0.001	2.07	7.92 (2.84, 22.09)	<0.001
Diarrhoea at presentation						
No		1			1	
Yes	1.48	4.39 (1.26, 15.31)	0.020	0.15	1.16 (0.24, 5.51)	0.853

*Backward LR Multiple Logistic regression was applied. Multicollinearity and interactions were checked and not found. Hosmer Lameshow test P value = 0.951, Classification Table (overall correctly classified percentage = 98.2%) and ROC curve (area under ROC curve=94.6 %) were accepted to check model fitness.

CONCLUSION

COVID-19 patients aged 60 years old and older, who had hypertension, or who presented with fever, dyspnoea, or lethargy, were more likely to be intubated and ventilated. These patients need to be screened for COVID-19 when presented to any healthcare facility and monitored closely by clinicians upon diagnosis and admission. In addition, public health interventions should aim to provide additional protection to older population or people with comorbidity such as hypertension found to be more vulnerable to severe disease progression if infected with COVID-19.

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