

Original Article

Effect of Movement Control Order to Emergency Department Visit in A Teaching University Hospital in Malaysia During COVID-19

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Abstract

Background: Implementation of lockdown was identified as a factor that affects the utilization of Emergency Department (ED) globally during COVID-19 pandemic. **Objective:** To compare the ED utilization rate based on different triage acuity during movement control order (MCO) of COVID-19 pandemic at a teaching university hospital in the capital of Malaysia, Kuala Lumpur. **Methods:** This retrospective study included patients presented to ED during MCO i.e. March 18 to June 9 of 2020) and a similar period of pre-pandemic for comparison. Patients were randomized and segregated to different triage categories. Other outcomes determined include demographics, comorbidities, type of cases, mode of arrival and disposition. The data were analysed using chi-square test. **Results:** Distribution of cases based on triage acuity were consistent between MCO and pre-pandemic period (p=0.063). Lowest triage acuity (TG), had the highest utilization, followed by second triage acuity (TY) and finally highest triage acuity (TR). For TG, adult and elderly (p<0.001), married (p<0.001) and presence of comorbidities groups (p<0.001) were the main presenters and were more likely to require admission during MCO (p=0.01). The TY categories were higher amongst adult and elderly (p<0.001) and married individuals (p=0.003) during MCO. Paediatric age-group was significantly low in both lower triage acuity categories. In term of ambulance arrival, majority of patients belongs to the TY acuity category (p=0.005). TR category patients did not demonstrate significant changes. **Conclusion:** MCO implementation during COVID-19 pandemic did not change the rate of patient presentation based on triage acuity. However, pattern of cases in the lower triage acuity showed some differences.

Keywords: Acuity utilization, COVID-19 pandemic, emergency department, movement control order, triage

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Introduction

COVID-19 which is caused by the 'severe acute respiratory distress syndrome coronavirus 2' (SARS-CoV-2) was first identified in the city of Wuhan, China in December 2019 and since then it has been spreading rapidly across the globe.^{1,2} World Health Organization (WHO) declared COVID-19 as a pandemic on March 11, 2020. In

order to reduce community spread of the disease, most of the countries have implemented measures such as lockdowns, stay-at-home orders or similar restrictions to slow down the spread of the disease. This serves as a temporary measures to reorganize, relocate healthcare resources and to prevent healthcare workers from burnout. Malaysia responded to the COVID-19 pandemic by implementing Movement Control Order (MCO) or

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also known as '*Perintah Kawalan Pergerakan*' on 18th of March to 3rd of May, 2020. During MCO, there were travel restrictions, large gatherings and religious activities were prohibited, all industries were ordered to close except essential services and all nurseries, schools, institute of higher learning were closed. The MCO was successful in bringing down the total number of infected cases, thus, Malaysia went into Conditional Movement Control Order (CMCO) from May 4, 2020 whereby there was relaxation of regulations with the aim of reviving the economy in a controlled manner. CMCO ended on June 9, 2020, with the country entering Recovery Movement Control Order subsequently.³

During the COVID-19 pandemic, the emergency department (ED) which serves as a front-liner plays an important role in controlling the spread of the disease as well as managing non-COVID conditions. Few studies have shown that there was a reduction in ED patients' volume during the pandemic.^{4,6} However, there are scarce data regarding implementation of lockdown on the acuity of the ED visits globally. One study in Australia concluded that State of Emergency restriction was associated with a decreased in ED visits across all ED triages except the most urgent triage category.⁷

In Malaysia, the triage service divides patients into three clinical zones based on patients' acuity according to the Malaysia triage system. It has three categories which consists of critical care service, Triage Red (TR); semi-critical service, Triage Yellow (TY) and non-critical care service, Triage Green (TG). Critical care (TR) zone managed patients who are hemodynamically unstable and treatment should be immediately given. In TY, patients are hemodynamically stable and their lives are not in immediate danger. Care should be provided within 15-20 minutes upon arrival. In TG category, patients are stable and do not require immediate care however should be seen within 90 minutes.⁸ The aim of this study is to study the effect of MCO during COVID-19 pandemic on utilization of ED in terms of patient's acuity in the emergency department in teaching university hospital in Malaysia.

Methods

This is a case-control retrospective study, which has been approved by the ethics committee of our institution. This hospital is a teaching

university hospital which is located in the capital of Malaysia, Kuala Lumpur. The ED is a mixed adult and paediatric ED which receives an average of 70,000 patients per annum. This study included patients that arrived to the ED from March 18 to June 9 of 2020 (MCO during COVID-19 pandemic) and from a similar period in 2019 (pre-pandemic). Based on the number of sample size, seven days in each month of March 18 until June 9, 2020 and seven days in each month of March 18 until June 09, 2020 were randomly selected. Therefore, a total of 21 days were chosen from the selected period from 2019 and 21 days from 2020 in order to get the required number of samples for each comparative period of before and during COVID-19 pandemic. The dates were chosen randomly using computer generated random numbers where there were representative of all days in a week (including weekends). Forty-three patients were randomly selected from the chosen day using computer generated numbers from the list of patients on the particular day which was arranged based on time of registration. A total of 903 patients were initially chosen from year 2019 (pre-pandemic) and 903 patients from a similar period in year 2020 (MCO of COVID-19 pandemic) as comparison.

Primary outcome measured were comparison between utilization rate of patients with different triage acuity that presented to the ED during MCO of COVID-19 pandemic and pre-pandemic. Secondary outcome were association between patients' characteristics and rate of different triage acuity utilization.

All the patients' details were extracted from hospital computerized record log (CHETS system) after randomization. Patients' triage category, characteristics of patients which consist of age, gender and marital status, mode of arrival, presence of comorbidities, types of cases and disposition were determined, entered, cleaned and coded accordingly. All categorical data were compared using chi-square test. Statistical analyses was done using SPSS version 24.0.

Results

A total of 871 from pre-pandemic and 880 patients during MCO were collected (response rate of 96.5% and 97.5% respectively). This study showed that triage utilization of different acuity did not defer significantly during MCO of COVID-19 pandemic period as compared to pre-pandemic

period with the utilization of lowest acuity triage, the non-critical TG remained the highest, followed by semi-critical TY and triage of highest acuity which is the critically ill TR ($p=0.056$) (Figure 1). There were significantly more adult (age 15 to 64) and elderly (>65) patients that visited our ED during MCO in both TG ($p<0.001$) and TY ($p<0.001$) whereas utilization amongst paediatric age groups were significantly lesser (Table 1). No association was found between age group and MCO implementation in TR ($p = 0.524$). Analysis on gender did not find significant association between gender and utilization across all triage acuity during MCO. TG ($p=0.290$), TY ($p=0.368$) and TR ($p=0.194$). On the other hand, analysis on marital status found association between marital status and MCO implementation in TG ($p<0.001$) and TY ($p=0.003$) with non-married more likely to visit ED during pre-pandemic period and married more likely to visit ED during MCO. There was no significant association found in patients in TR ($p=0.522$).

Patients in TG with presence of comorbidities were associated with higher ED utilization during MCO ($p<0.001$). Patients in TY and TR with presence of comorbidities had similar findings but did not reach statistical significance. TY ($p=0.080$), TR ($p=0.811$) (Table 2). Ambulance arrival was significantly more during MCO compared to pre-pandemic period amongst TY patients ($p=0.005$).

However, in TR, ambulance arrival was more during MCO but it was not statistically significant ($p=0.259$). There were no significant association between type of cases (trauma and non-trauma) and MCO implementation across all triage acuity. TG ($p=0.333$), TY ($p=0.828$) and TR ($p=0.736$). However, we found higher non-trauma cases in TG and TY and more trauma cases in TR during MCO period. In term of patient disposition, TG had significantly more patients who were being managed and required in-patient care during MCO ($p=0.01$). No significant difference was observed in between those two periods in term of disposition amongst patients in TR ($p=0.952$) and TY ($p=0.257$).

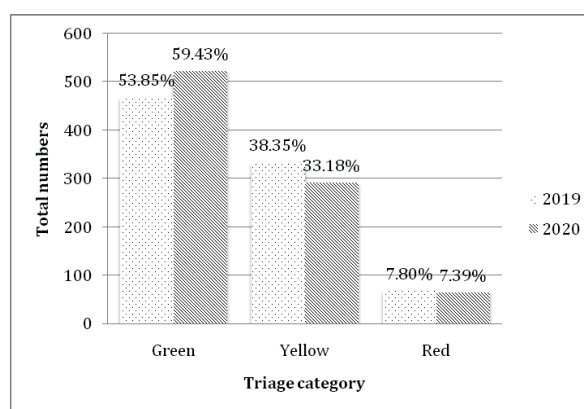


Figure 1. Utilization of triage acuity during pre-pandemic and during MCO of COVID-19 pandemic

Table 1. Comparison for utilization according to patients’ demographics between MCO of COVID-19 pandemic vs pre-pandemic using chi-square test for all triage categories

Variables	Triage	Utilization rate of periods studied		p value	
		Number of patients (N), Percentage (%)			
		2019	2020		
Age	Green	<14	150(32.1%)	74(14.2%)	<0.001
		15 to 64	242(51.8%)	359(68.9%)	
		>65	75(16.1%)	88(16.9%)	
	Total	467	521		
	Yellow	<14	68(20.4%)	21(7.3%)	<0.001
		15 to 64	177(53.2%)	175(60.6%)	
>65		88(26.4%)	93(32.2%)		
Total	333	289			
Red	<14	9(13.6%)	5(7.7%)	0.524	
	15 to 64	27(40.9%)	30(46.2%)		
	>65	30(45.5%)	30(46.2%)		
Total	66	65			

Variables	Triage	Utilization rate of periods studied		p value			
		Number of patients (N), Percentage (%)					
		2019	2020				
Gender	Green	Male	265(56.5%)	278(53.2%)	0.290		
		Female	204(43.5%)	245(46.8%)			
	Total	469	523				
	Yellow	Male	187(56%)	153(52.4%)		0.368	
		Female	147(44%)	139(47.6%)			
	Total	334	292				
	Red	Male	38(56.7%)	44(67.7%)			0.194
		Female	29(43.4%)	21(32.3%)			
	Total	667	65				
Marital status	Green	Married	190(40.7%)	312(60.2%)	<0.001		
		Non-Married	277(59.3%)	206(39.8%)			
	Total	467	518				
	Yellow	Married	195(59.6%)	199(71.1%)		0.003	
		Non-Married	132(40.4%)	81(28.9%)			
	Total	327	280				
	Red	Married	46(70.8%)	47(75.8%)			0.522
		Non-Married	19(29.2%)	15(24.2%)			
	Total	65	62				

Table 2. Comparison for utilization according to patients' presence of comorbidities, mode of arrival, type of cases and disposition between MCO of COVID-19 pandemic vs pre-pandemic using chi-square test for all triage categories

Variables	Triage	Presence of comorbidities	Utilization rate		p value		
			Number of patients (N), Percentage (%)				
			2019	2020			
Presence of comorbidities	Green	Present	177(38.1%)	266(51.1%)	<0.001		
		Not present	288(61.9%)	255(48.9%)			
	Total	465	521				
	Yellow	Present	232(69.7%)	221(75.9%)		0.080	
		Not present	101(30.3%)	70(24.1%)			
	Total	333	291				
	Red	Present	53(82.8%)	54(84.4%)			0.811
		Not present	11(17.2%)	10(15.6%)			
	Total	64	64				
Mode of arrival	Yellow	Non-ambulance	309(92.5%)	250(85.6%)	0.005		
		Ambulance	25(7.5%)	42(14.4%)			
	Total	334	292				
	Red	Non-ambulance	52(76.5%)	44(67.7%)		0.259	
		Ambulance	16(23.5%)	21(32.3%)			
	Total	68	65				

Variables	Triage	Presence of comorbidities	Utilization rate		p value		
			Number of patients (N), Percentage (%)				
			2019	2020			
Type of cases	Green	Trauma	71(15.1%)	68(13%)	0.333		
		Non-trauma	398(84.9%)	455(87%)			
	Total	469	523				
	Yellow	Trauma	36(10.8%)	30(10.3%)		0.828	
		Non-trauma	297(89.2%)	262(89.7%)			
	Total	333	292				
	Red	Trauma	7(10.4%)	8(12.3%)			0.736
		Non-trauma	60(89.6%)	57(87.7%)			
	Total	67	65				
Disposition	Green	Assessed and requiring in-patient care	45(9.7%)	79(15.1%)	0.010		
		Assessed and can be discharged	421(90.3%)	444(84.9%)			
	Total	466	523				
	Yellow	Assessed and requiring in-patient care	191(57.2%)	180(61.6%)		0.257	
		Assessed and can be discharged	143(42.8%)	112(38.4%)			
	Total	334	292				
	Red	Assessed and requiring in-patient care	60(89.6%)	58(89.2%)			0.952
		Assessed and can be discharged	7(10.4%)	7(10.8%)			
	Total	67	65				

Discussion

The emergence of the unprecedented COVID-19 pandemic has changed pattern of utilization of the ED in various ways in different countries with most countries reported a decrease in utilization across all triage categories.^{4,9-10} This study demonstrated that triage utilization of different acuity did not defer significantly during MCO of COVID-19 pandemic period as compared to pre-pandemic period. However, we found that utilization of TG was higher amongst patients with presence of comorbidities group and TG patients were also more likely to be admitted for in-patient care during MCO compared to pre-pandemic period. With these findings, it is postulated that patients that visited the ED during MCO had higher acuity compared to pre-pandemic period although they present to the lowest acuity triage category. These patients had acute conditions which required emergency care and hospitalization. In addition, the study found that ambulance arrival was

significantly more during MCO for TY patients which support the postulation that patients that arrive during MCO had higher diagnoses acuity. Previous study had shown that patients who arrived by ambulance had higher acuity level and they suffered more severe illness.¹¹

The COVID-19 pandemic has brought multiple negative impacts to both physical and mental health. The implementation of MCO had jeopardized jobs and incomes of individuals especially in those with lower income group.¹²⁻¹³ With loss of income especially to the breadwinner of the family, the food security of the family is under threat. Thus, it is expected that more populations will have poor nutrition and poor health.¹⁴ In addition, losing job disrupts one's mental health. It heightened the feeling of anxiety and insecurity leading to more depression. Certain individuals may even resort to illicit drug use or alcohol abuse as a coping mechanism which lead to more health problems. Besides, the order for social distancing itself

may put individual's mental health at stake by disrupting their social rhythm which may be the only way for them to cope with stress.¹⁵

Patients with presence of comorbidities such as hypertension, chronic lung disease, cardiovascular disease and obesity who contracted COVID-19 were reported to have poorer outcome compared to patients without comorbidities.¹⁶ Thus, there have been warnings by Public Health Professionals to these groups of patients to prevent themselves from getting infected. With this knowledge, patients with comorbidities may have heightened anxiety and may seek treatment at the ED when they develop any symptoms. This may explain the higher attendance amongst patients with comorbidities to TG during MCO. Besides, there was a significant reduction of paediatric age groups in both lower acuity categories during MCO. Similar findings were recorded such as studies in Argentina and Canada which found significant reduction in ED visits amongst children and young people especially during the lockdown period.^{5,17} With the implementation of MCO, children and younger people's activities were more restricted due to school, colleges, and universities closure and on top of that, sports activities were not allowed as well. Physical distancing with school closures may play a role in reducing spread of COVID-19 cases as well as other transmissible diseases, thus reducing the number of sick children. Another possible explanation for the observed reduction in paediatric visits may be parental fear of contracting COVID-19 disease in the hospital. The reduction in attendance amongst the younger age group may reflect a possible delay in seeking appropriate medical treatment. When comparing general ED and paediatric ED, Goldman et al.¹⁷ reported that parents had greater preference for paediatric ED and they avoided ED in a general hospital due to the perception of general ED potentially attend more adult COVID-19 patients. In the analysis of patients from triage of highest acuity, the TR showed that there was no significant association between age group and MCO implementation during COVID-19 pandemic. It may be due to the urgent nature of the disease which requires immediate attention that present to the category.

This study found that married individuals in lower triage acuity to have higher ED utilization during MCO. Evidence has shown that marital status is associated with individual's health status with married individuals have better mental health

compared to non-married individuals.¹⁸ The exact reason for higher utilization of lower acuity triage amongst married individuals was unclear.

Earlier report noted a decrease in number of cases of motor vehicle collision during COVID-19 pandemic.⁴ A decline in numbers of trauma due to motor vehicle collision is expected due to the movement restriction, remote work, stay at home orders and closure of businesses. However, this study did not find any association between type of cases (trauma or non-trauma) and implementation of MCO during COVID-19 pandemic across all triage categories. One possible explanation is that this study included all type of trauma patients that also include any traumas that occurs at home. Therefore, further study is required to study association between trauma due to motor vehicle collision and MCO implementation.

Limitations of the study

This study was conducted in an ED of a teaching university hospital and may not be representative of other hospitals in Malaysia. In addition, we only included ambulance arrival through our hospital's ambulance. Lack of reporting regarding arrival through other ambulance services is one of the limitations.

Conclusion

In summary, this study found that implementation of MCO during COVID-19 pandemic did not change the rate of patient presentation based on triage acuity. However, there were some differences in pattern of cases in lower triage acuity. Although the exact reason for these changes requires further investigation, it is crucial for physicians and public health professionals to emphasize on the importance for seeking medical treatment for urgent medical problem during MCO of COVID-19 pandemic.

Conflict of interest: The authors declare no competing interest.

Ethical Approval: The study was approved by the Ethics Review Committee of the Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia.

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Authors' contribution: All authors were involved equally in subject selection, data collection, analysis, manuscript writing, revision and finalizing.

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