THE PATTERN OF NON-COVID-19 PAEDIATRIC ADMISSIONS IN MALAYSIA TEACHING HOSPITALS: BEFORE AND DURING THE COVID-19 PANDEMIC WITH MOVEMENT CONTROL ORDER

Muhammad SA[1], Taib F[1,3], Mohd Rawi R[1,3], Ariffin WN[2], Anuar MA[4,5], Abu Bakar A[4,5], ABD Hamid IJ[6], and Syed Abdul Hamid AK[4,5].

[1]Department of Paediatric, School of Medical Sciences, Universiti Sains Malaysia, 16150, Kubang Kerian, Kelantan, Malaysia

[2]Biostatistic and Research Methodology Unit, School of Medical Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia

[3]Hospital Universiti Sains Malaysia, 16150, Kubang Kerian, Kelantan

[4]Department of Paediatric, Kuliyyah of Medicine, International Islamic University Malaysia, 25200, Kuantan, Pahang.

[5]Sultan Ahmad Shah Medical Centre @IIUM, 25200, Kuantan, Pahang.

[6]Primary Immunodeficiency Diseases Group, Department of Clinical Medicine, Institut Perubatan & Pergigian Termaju, Universiti Sains Malaysia, Bertam, 13200 Kepala Batas, Pulau Pinang.

Correspondence:
Fahisham Taib,
School of Medical Sciences,
Universiti Sains Malaysia,
16150 Kubang Kerian, Kelantan, Malaysia,
Email: fahisham@gmail.com

Intan Juliana Abd Hamid,
Primary Immunodeficiency Diseases Group,
Department of Clinical Medicine,
Institut Perubatan & Pergigian Termaju,
Universiti Sains Malaysia, Bertam,
13200 Kepala Batas, Pulau Pinang,
Email: intanj@usm.my

Abstract

To study the characteristics of paediatric patients admitted to two non-COVID-19 teaching hospitals before and during the implementation of the Movement Control Order (MCO) in Malaysia. The retrospective study was performed in two phases (before MCO between February to March 2020, and during MCO lockdown between March to April 2020) in two teaching hospitals on the East Coast of Peninsular Malaysia. Hospitalized children <18 years were included and those coming for elective procedures or oncology treatment were excluded. The clinical data were retrieved from both hospitals' admission records. There was a total of 496 and 191 admissions to two teaching hospitals on the East Coast of Peninsular Malaysia, respectively. A significant reduction in the number of non-COVID-19 hospital admissions was seen in both hospitals. For Hospital Universiti Sains Malaysia, the daily hospital admissions were reduced with a mean of 10 (before MCO) to 7 (during MCO) admissions/day (95% CI 1.54,7.54, p=0.001). In Sultan Ahmad Shah Medical Centre, a reduction in hospital admission was seen from 5 (before MCO) to 3 (during MCO) admissions/day (95% CI 0.61, 3.15, p=0.005). Our study observed a general drop in non-COVID-related respiratory illnesses and infectious disease cases during the MCO period. There were significant differences in neurological (p=0.029) and accident (p = 0.001) cases admissions observed between the two periods. Public health social distancing has indirectly reduced the non-COVID-19 related cases in the hospital settings with an increase in accidental injuries among the children during the MCO period.

Keywords: COVID-19, Non-COVID-19 cases, Paediatric, Movement control order, Hospital admission

Introduction

Dental A novel coronavirus was discovered in December 2019, in Wuhan, a city in the province of Hubei, China (1, 2). The virus, initially known as SARS-CoV-2, has been named coronavirus disease 2019 (COVID-19). It has caused massive economic, financial, social, and medical challenges globally. The World Health Organization categorised the COVID-19 outbreak initially as Public Health Emergency of International Concern and later declared it a Pandemic, as it has infected more than

600 million people worldwide with more than 6.5 million deaths by September 2022 (2, 3). The number of confirmed COVID-19 cases in Malaysia has been significant, similar to other countries worldwide. The Malaysian government has implemented the Movement Control Order 2020 (MCO) or strict social distancing, initially from March 18 until the April 14, 2020, then subsequently has been extended to August 1, 2021, in few phases (4).

The MCO is a cordon sanitaire to curb the spread of the disease during which mass gatherings were prohibited, movement of people were severely restricted, closure of all governmental and private institutions and offices except for essential services along with closure of all religious, social, cultural and sports activities among others (5). The restrictions imposed have broad consequences on the lives of the population, including the children. The purpose of this measure is to reduce new COVID-19 infections, thus flattening the epidemiological curve into a manageable scenario (4, 5). Restricting population mobility is one of the strategies to control the spread of the disease by airborne pathogen transmission. Strict reinforcement throughout MCO stresses staying at home, reducing needless travel and exercising personal cleanliness. The indirect effect of this directive has prohibited children from attending school and socializing with their peers. The social distancing measure should, in theory, reduce the burden of non-COVID-19 infective illnesses and hospitalizations. A previous study focuses on the effect of MCO on the general population in Malaysia without specific detail on the non-COVID-19 health-related conditions among children (6). The pattern of non-COVID-19-related admission is vital to understand the indirect impact of social distancing or MCO in Malaysia.

MCO has been executed based on few measures that have been practiced, similar to past influenza pandemics such as school closure, reducing workplace attendance, lessening social and community contact and enforcing home isolation of symptomatic individuals (7-9). The implementation of these measures has been shown to significantly reduce the caseloads and thus combat the epidemic development (11-13). Some studies also documented on the reduction in the incidence of other viral respiratory diseases from public social distancing (9, 10). During the COVID-19 pandemic, MCO limits children's movement and interaction with other children. Social distancing adherence is expected to reduce the cross infection and even transmission of seasonal viruses within the community (10-12).

To the best of our knowledge, there are very few studies exploring the effect of MCO or social distancing on non-COVID-19 paediatric admissions in the local hospital setting (13). Therefore, this study aims to investigate the pattern of hospital admissions for paediatric patients during the pandemic period.

Materials and Methods

A retrospective record review was conducted in two university hospitals - Hospital Universiti Sains Malaysia (USM) and Sultan Ahmad Shah Medical Centre (SASMEC@IIUM). Both are the major teaching hospitals located on the East Coast of Peninsular Malaysia. Hospital USM is a tertiary and teaching hospital with 723 beds capacity, located in the northeast state of Kelantan. The hospital was considered a COVID-19 free hospital at the time of the study, but actively performing the screening for severe acute respiratory infection. The hospital can accommodate confirmed COVID-19 cases if the pandemic worsened. SASMEC@IIUM is a tertiary teaching hospital with 350 beds capacity in the state of Pahang. It is also a non-COVID-19 designated hospital but could operate to receive the efflux of non-COVID-19 patients from the COVID-19-designated hospitals locally.

This study has been approved by Human Research Ethics Committee of the Medical School of Medical Sciences (USM/JEPeM/COVID19-06) and the IIUM Research Ethics Committee (IREC 2020-067). The data collection was done in 2 phases. Phase 1 was the period between 19th February 2020 and 17th March 2020. This was the four-week period preceding the start of MCO lockdown. Phase II was the 4 weeks' time frame during MCO lockdown (18th March 2020 until 14th April 2020). Children under the age of 18-year-old who were admitted to general paediatric wards with a non-COVID-19 presentation, including admissions to the paediatric surgical ward, were included in the study. Paediatric cases admitted to the intensive care unit (ICU) were also included. Any subjects with confirmed COVID-19 infection, admission to the oncology ward or elective admission cases were excluded. Information on socio-demographic characteristics, hospital admission rate and characteristics of cases admitted were analysed. The total number of admissions, median age, the median length of stay, area of living, co-morbidity, presenting symptoms, diagnosis at discharge and number of ICU admissions were compared between before MCO and during the MCO period. Hospital admission rate refers to the number of hospital admissions per person per day. The urban area of living is based on the gazetted areas with their adjoining built-up areas, which had a combined population of 10,000 or more at the time of the Census 2010 with at least 60 % of population (aged 15 years and above) were involved in non-agricultural activities for the urban area. Rural area is defined as areas outside urban including settlements with a population of fewer than 10,000 people, having agriculture and natural resources in which their population are either clustered, linear or scattered.

The data were analysed using the Statistical Package for the Social Science (SPSS) version 27 (SPSS, Inc, Chicago, IL). Descriptive statistics were obtained for sociodemographic variables. The categorical data were presented as number and percentage while the numerical data were presented as mean and standard deviation (SD) for normally distributed numerical data or median and inter-quartile range (IQR) for the skewed numerical data. Admission rates per day between before and during MCO at both

centres were compared using an independent t-test. Characteristics of cases were analysed using the chi-squared test and Mann-Whitney test and were presented in cross-tabulation tables. A p-value <0.05 was considered statistically significant.

Results

Demographic characteristics

There were a total of 496 and 191 admissions to Hospital USM and SASMEC@IIUM respectively during the study period. As shown in Table 1, there were 283 (57.1%) boys and 213 (42.9%) girls admitted to Hospital USM and 105 (55%) boys and 86 (45%) girls admitted to SASMEC@IIUM, with Malay as the predominant ethnic. Most children admitted to Hospital USM and SASMEC@IIUM were between the age of 1-7 years old with the median interquartile range (IQR) age of 2.3 and 2.4 years respectively. The majority of the patients were in the pre-school age group (< 5-year-old) with 341 (68.1%) patients for Hospital USM and 132 (69.1%) patients for SASMEC@IIUM, respectively.

There were 264 (53.2%) patients from Hospital USM and 137 (71.7%) patients from SASMEC@IIUM who came from urban/suburban settings (Table 1). There was a variation in the cohort of patients coming to both hospitals. One of the possible postulations is because these two hospitals are not designated as COVID-19 hospitals and, at the time of the study, there was fear among the public about the COVID-19 cross-transmission in the hospital setting. Most patients (n = 345; 69.6%) admitted to Hospital USM were from low socioeconomic background whereas most patients (n = 109; 57.1%) admitted to SASMEC@IIUM were from middle socioeconomic background. The median number of households for both centres was 5 people a household.

There were 104 (21%) from Hospital USM and 63 (33%) from SASMEC@IIUM who had pre-existing complex and chronic conditions. Most patients admitted to Hospital USM and SASMEC@IIUM had a median length of stay of 3 days and 2 days respectively.

Pattern in Admissions

The overall admission rate per day to Hospital USM and SASMEC@IIUM is shown in Table 2. Following the implementation of MCO, hospital admissions to both hospitals were significantly reduced. For Hospital USM, the daily hospital admissions reduced from a mean of 10 admissions/day to 7 admissions/day (95% CI: 1.54, 7.54, p=0.001). Similarly, the daily hospital admissions rate to SASMEC@IIUM reduced from 5 admissions/day prior to MCO to 3 admissions/day during the MCO period (95% CI: 0.61, 3.15, p=0.005).

Characteristics of admissions

There were 430 hospital admissions before the MCO as compared to 257 hospital admissions during the MCO period itself for both centres. This is shown in Table 3. As seen before the MCO, patients of younger ages are admitted more frequently, the median age was 2.5 years old as compared to median age of 2 years old during the MCO (p=0.033). In both time periods, there were significant differences in patients' admission from urban and rural areas (p=0.004). On the other hand, a longer hospital stay of 3 days was seen during the MCO period as compared to 2 days before the MCO (p=0.05). The most common presentation was fever which accounted about 64% before the MCO and 61.5% during the MCO, albeit not statistically significant between these two periods.

Regarding diagnosis at discharge, respiratory cases were the most encountered in both before the MCO and during the MCO period. There was a slight reduction of patients admitted to the hospital due to respiratory illnesses observed whereby 196 (45.6%) patients admitted before the MCO and 112 (43.6%) patients during the MCO. Similarly, the confirmed infectious disease cases have shown some reduction from 29 (6.7%) patients to 15 (5.8%) patients. A significant reduction in neurological cases (p=0.029) was observed between the two periods. In contrast, trauma and accidents cases have shown a significant increase (p <0.001) between the two MCO periods.

Discussion

The outbreak of COVID-19 infection has given an immense impact on society socially and financially. The spread of COVID-19 cases has forced the Malaysian government to introduce the MCO on March 18, 2020. The effect of the public health implementation measures has shown reduction of the non-COVID-19 cases indirectly, despite the effort was to curb COVID-19 cases. Our study has shown a reduction of non-COVID-19 hospital admissions following these public health measures. Overall, the proportion of total admissions showed some reduction, with neurological cases as the most significant. Infectious and respiratory cases also have shown a reduction in the caseloads and number, but this was not statistically significant. We suspect the social distancing measure would control infectious diseases in the community but not eradicate the infection.

The longer hospital stay during the MCO may be associated with the severity of the illness's presentation and thus the needs for longer therapy. Nevertheless, there was no increment of number of admissions to the intensive care unit (ICU) observed in our study, especially within the respiratory disease category.

Globally, there have been an increasing number of publications on the changes in overall hospital admissions following the COVID-19 pandemic. One study has shown a significant reduction of overall emergency healthcare utilisation by children during the lockdown period with no immediate, measurable severe adverse effects on physical child health at a population level observed (14). Another study examining the volume of paediatric emergency department attendances during the COVID-19 pandemic has shown that emergency department attendances have decreased in line with nationwide public health measures during the COVID-19 pandemic and even SARS outbreak

(15).

Table 1: Sociodemographic characteristics of patients admitted to Hospital USM and SASMEC@IIUM

Sociodemographic Variables	**No (%)**	
	Hospital USM, n=496	**SASMEC@IIUM, n=191**
Sex		
Male	283 (57.1)	105 (55.0)
Female	213 (42.9)	86 (45.0)
Age (years)		
<1	120 (24.2)	47 (24.6)
1-7	272 (54.8)	107 (56.0)
7-12	93 (18.8)	36 (18.8)
>12	11 (2.2)	1 (0.5)
Age on admission	2.3 (4.4)*	2.4 (4.8)*
Race		
Malay	484 (97.6)	184 (96.3)
Chinese	6 (1.2)	1 (0.5)
Indian	1 (0.2)	4 (2.1)
Others	5 (1.0)	2 (1.1)
Family income (22)		
Low	345 (69.6)	67 (35.1)
Middle	106 (21.4)	109 (57.1)
High	45 (9.1)	15 (7.9)
Area of living		
Urban/ suburban	264 (53.2)	137 (71.7)
Rural	232 (46.8)	54 (28.3)
Number of households	5 (2)*	5 (1)*
Co-morbidity		
None	392 (79.0)	128 (67.0)
Neurology	21 (4.2)	6 (3.1)
Respiratory	30 (6.1)	33 (17.3)
Cardiology	7 (1.4)	1 (0.5)
Genetic	11 (2.2)	2 (1.1)
Others	35 (7.1)	21 (11.0)
Length of stay	3.0 (3.0)*	2.0 (2.0)*
Schooling		
Preschool (< 5-year-old)	341 (68.8)	132 (69.1)
Kindergarten (5- 6-year-old)	42 (8.5)	22 (11.5)
Primary school (7–12-year-old)	105 (21.2)	37 (19.4)
Secondary school (13-17-year-old)	8 (1.6)	0 (0.0)

*Median (IQR)

Table 2: Comparison of hospital admission rate per day between pre-MCO and during MCO period

Hospital	Admission rate/day, Mean (SD), n = 28		Mean difference (95% CI)	p-value#
	Pre-MCO	During-MCO		
Hospital USM	10.7 (4.0)	7.0 (3.8)	3.64 (1.54, 5.74)	0.001
SASMEC@IIUM	5.0 (2.4)	3.1 (1.5)	1.88 (0.61, 3.15)	0.005

#Independent t-test

Table 3: Comparison on the characteristics of cases admitted between pre-MCO and during MCO period in both Hospital USM and SASMEC@IIUM

	Pre-MCO, n (%)	During MCO, n (%)	Z-statistics*/ X^2 (df)#	*p*-value
Total no of admission	430	257		
Age **	2.5 (5.0)	2.0 (4.9)	-2.13*	0.033
Co-morbidity				
Yes	111 (25.8)	56 (21.9)	1.35 (1)	0.245
No	319 (74.2)	200 (78.1)		
Length of stay **	2.0 (3.0)	3.0 (2.0)	-1.96*	0.050
Fever				
Yes	275 (64.0)	158 (61.5)	0.423 (1)	0.516
No	155 (36.0)	99 (38.5)		
Respiratory symptoms				
Yes	256 (59.5)	144 (56.0)	0.812 (1)	0.368
No	174 (40.5)	113 (44.0)		
Seizure				
Yes	53 (12.3)	21 (8.2)	2.89 (1)	0.089
No	377 (87.7)	236 (91.8)		
Diarrhoea				
Yes	150 (34.9)	94 (36.6)	0.201 (1)	0.654
No	280 (65.1)	163 (63.4)		

Underlying illness				
Respiratory				
Yes	42 (9.8)	21 (8.2)	0.471 (1)	0.493
No	388 (90.2)	235 (91.8)		
Cardiology				
Yes	6 (1.4)	2 (0.8)	0.525 (1)	0.469
No	424 (98.6)	254 (99.2)		
Neurology				
Yes	17 (4.0)	10 (3.9)	0.01 (1)	0.975
No	413 (96.0)	246 (96.1)		
Genetic				
Yes	8 (1.9)	5 (2.0)	0.007 (1)	0.931
No	422 (98.1)	251 (98.0)		
Others				
Yes	38 (8.8)	18 (7.0)	0.698 (1)	0.403
No	392 (91.2)	238 (93.0)		
Area of living				
Urban	233 (54.2)	168 (65.4)	8.28 (1)	0.004
Rural	197 (45.8)	89 (34.6)		
ICU				
Yes	23 (5.3)	10 (3.9)	0.748 (1)	0.387
No	407 (94.7)	247 (96.1)		
ICU admission due to respiratory illness				
Yes				
No	8 (1.9)	4 (1.6)	0.087 (1)	1.000
	422 (98.1)	253 (98.4)		
Diagnosis at discharge				
Yes	29 (6.7)	15 (5.8)	0.221 (1)	0.638
No	401 (93.3)	242 (94.2)		
Respiratory				
Yes	196 (45.6)	112 (43.6)	0.261 (1)	0.610
No	234 (54.4)	145 (56.4)		
Neurology				
Yes	61 (14.2)	22 (8.6)	4.79 (1)	0.029
No	369 (85.8)	235 (91.4)		
Gastroenterology				
Yes	19 (4.4)	18 (7.0)	2.11 (1)	0.146
No	411 (95.6)	239 (93.0)		
Trauma/Accidents				
Yes	24 (5.6)	36 (14.0)	14.3 (1)	<0.001
No	406 (94.4)	221 (86.0)		

*Mann-Whitney test, #Chi Squared test, **Median (IQR)

Multiple reasons could have led to the reduction of paediatric hospital admission during the MCO period. There are genuine parental concerns about nosocomial COVID-19 infection, leading to refusal for hospital admission and delay in seeking treatment (16). The message on COVID-19 has brought lifestyle change as a result of contagion and a sense of civic responsibility which have contributed to the reduction in the hospital admissions. In our study, we did not explore the effect of delayed hospital admissions during the COVID-19 pandemic. The awareness of good personal hygiene such as frequent hand washing, and the use of hand sanitizer, could potentially reduce the transmission of viruses and bacteria through physical contact (17). This practice would indirectly lower the case morbidity and disease transmission. Public health measures such as school and non-essential workplace closure, cancellation of public gatherings and implementation of social distancing in all places have led to less interactivity between people, thus reducing respiratory droplet-related diseases including common childhood pneumonia (7, 8). On the other hand, the fear of COVID-19 infection in the community has increased the awareness for compliances to these measures (16). Compliance with these measures would be the most important factor in reducing viral and bacterial transmission in the community, particularly among children. This would reflect in the reduction in the infection and respiratory cases following MCO.

The family spend most of their time at home with their children during the MCO. This has improved the parental supervision towards their child's compliance to medications, especially for those with chronic medical conditions. A significant reduction in neurological cases admission could be attributed to good parental supervision, and better adherence to medications. This would indirectly reduce the frequency of seizure exacerbation by compliance with the prescribed antiepileptic medications (18).

On the contrary, trauma and home accident cases were noted to be significantly increased in our study. Most accident cases were related to home-based injuries, such as poisoning, burns, drowning and fall. This could have led to more serious injuries like concussions and fractures. The rise of these cases during MCO is a relevant finding. Home based injuries have become an important risk when most children spent their time at home despite parental supervision (19, 20). During the MCO period, children would not be able to venture outside their home thus their activity would be confined in their house. It has been reported that children, especially boys, are prone to accident as they are physically active and adventurous, compared to girls, without the understanding of the potential danger of their actions. The significant unintentional home injuries would also signify the differences in home environment setting and culture in the specific population (21). However, these incidents could be prevented by appropriate supervisions, extra parental attention, and precaution when the children are at home.

Our work has several strengths. We have explored a shift in paediatric admissions during the COVID-19 pandemic, including possible reasons for these changes. This work provides important insights into changes in health care utilization that occur during the pandemic, which are valuable nationally and globally. Our findings potentially could be used to modulate an effective safety plan, especially in the surge of accidental injury cases during the pandemic. This may include increasing the awareness among the parents on applying the public health measures consistently, monitoring children in the home environment and compliance with routine medications for children with complex medical needs.

However, the study has a few limitations due to the shorter time of study period. This was due to uncertainty of the MCO timing at that time. The surge of the initial COVID-19 pandemic has resulted in multiple phases of the MCO. Because of this, a shorter study period was more feasible and achievable objective. Our study did not explore the potential predictive factors among the participants for hospital admission during the COVID-19 outbreak. It would also be beneficial if the study measures the disease pattern in the post-lockdown period to compare with the currently available result. We suspect the number of non-COVID-19 related conditions will be reduced, however, this will not eradicate the pattern of endemic cases in the community. Other weaknesses of the study include susceptibility to biases, difficulty to make a causal inference and inability to study rare disease pattern due to the nature of retrospective data.

Conclusion

The current COVID-19 pandemic has had a great impact on society globally. Public health measures, such as the MCO, were meant to contain the COVID-19 outbreak in Malaysia. The study has shown a reduction of non-COVID-19 cases admission in the teaching hospitals with the increased number of accident and home injuries among children during the MCO period.

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Competing Interests

The authors declared no conflict of interest.

Ethical Clearance

This study has been approved by Human Research Ethics Committee of the Medical School of Medical Sciences (USM/JEPeM/COVID19-06) and the IIUM Research Ethics Committee (IREC 2020-067).

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