

Malaysian Enhanced Movement Control Order (EMCO): a unique and impactful approach to combating pandemic COVID-19

Malaysia
during
COVID-19
pandemic

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Received 14 January 2021
Revised 23 February 2021
Accepted 18 April 2021

Abstract

Purpose – The paper highlights the process-handling during the Enhanced Movement Control Order (EMCO) in combating pandemic COVID-19 in Malaysia.

Design/methodology/approach – Malaysia first issued an EMCO following a cluster that involved a religious gathering. The EMCO was issued to lockdown the area, undertake screening, treat positive cases and quarantine their close contacts. Active case detection and mass sampling were the main activities involving the population in both zones.

Findings – One hundred ninety-three confirmed COVID-19 cases were identified from the total population of 2,599. Of these cases, 99.5% were Malaysians, 31.7% were aged >60 years and all four deaths (Case Fatality Rate, 2.1%) were elderly people with comorbidities. One hundred and one cases (52.3%) were asymptomatic, of which 77 (77%) were detected during mass sampling. The risk factors contributing to the outbreak were contacts that had attended the religious gathering, regular mosque congregants, wedding ceremony attendees and close household contacts. Malaysia implemented an effective measure in the form of the EMCO to contain the COVID-19 outbreak, where the last cases were reported 16 days before the EMCO was lifted.

Originality/value – The residents' compliance and inter-agency cooperation were essential elements to the success of the EMCO. A targeted approach using an EMCO should be implemented in a future pandemic.

Keywords Pandemic, COVID-19, Movement control order, Case detection, Malaysia

Paper type Technical paper

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The authors thank the Director General of Health Malaysia for permission to publish this paper. The authors would also like to thank all the front-liners from the different agencies and the Kluang District Office, who have been very dedicated in responding to the outbreak.



Introduction

A new coronavirus, 2019 novel coronavirus (2019-nCoV, or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has caused the outbreak of coronavirus disease 2019 (COVID-19), a respiratory illness. Coronaviruses are a part of a large family of viruses; some cause illness in humans, and others cause disease in animals. SARS-CoV-2 was first identified during an investigation into an outbreak in Wuhan, China [1]. COVID-19 spreads from person-to-person, and the risk of infection is higher for people who are close contacts of someone known to have COVID-19, for example, healthcare workers or household members. Other people at higher risk for infection are those who live in or have recently been in an area with ongoing COVID-19 spread.

Malaysia announced its first COVID-19 cases on 25th January 2020, which involved three Chinese tourists who had entered Malaysia via Johor from Singapore on 23rd January 2020. The number of cases then rose to 22 by 16th February 2020, representing the first wave of cases [2]. The second wave of cases began on 27th February 2020, and since then, the number of people affected by SARS-CoV-2 has risen to more than 1,000. To stem the number of new cases, the government imposed a two-week Movement Control Order (MCO) nationwide, starting 18th March 2020, to 31st March, 2020, followed by the second-phase MCO that ran until 14th April, 2020, the third-phase MCO that ran until 28th April, 2020 and the fourth-phase MCO that ran until 12th May, 2020. As of 9th May 2020, Malaysia had recorded 6,535 COVID-19 cases, with 4,864 recovered and 107 deaths.

The Kluang district in Johor, Malaysia, reported its first COVID-19 case on 12th March 2020: a participant of a religious gathering held in Selangor, Malaysia. The number of reported COVID-19 cases increased in Bandar Baru Ibrahim Majid (BBIM), in Simpang Renggam, Kluang, and the Kluang District Health Office (PKD Kluang) declared an outbreak on 18th March 2020, followed by an Enhanced MCO (EMCO) starting 27th March 2020, until 28th April, 2020. One hundred ninety-three cases were recorded from the BBIM EMCO, with four deaths.

Chronology of events

On 12th March 2020, the first confirmed COVID-19 case was identified in BBIM, involving the above participant of the Sri Petaling Ijtimak Tabligh, which was held on 28th February–1st March, 2020. [Figure 1a](#) illustrates the chronology of events that leads to BBIM EMCO.

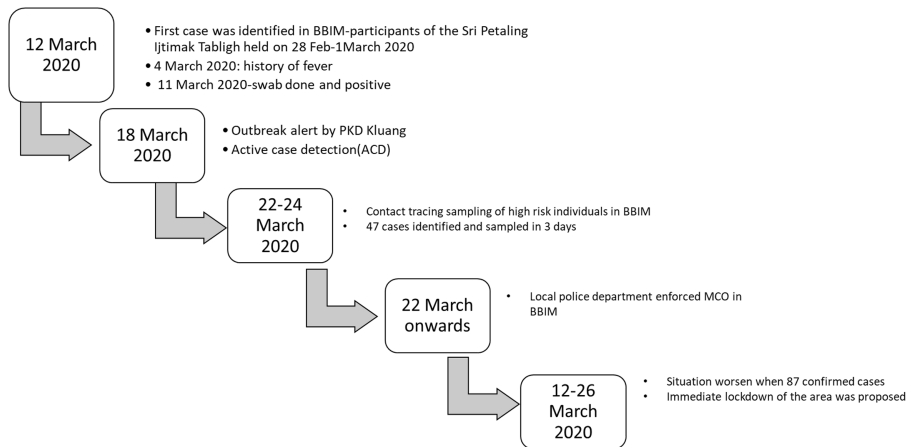
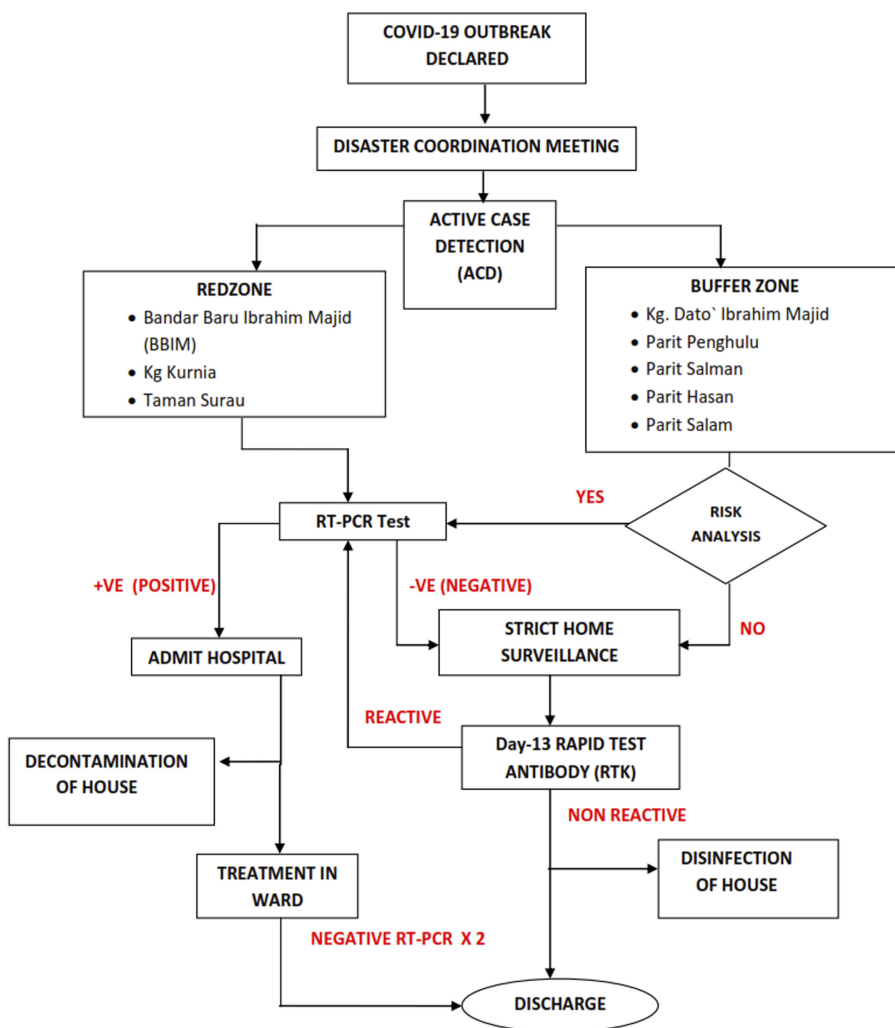


Figure 1.
Chronology of events
and EMCO BBIM
COVID-19 case
management
operational flow-chart

(a)

EMCO BBIM OPERATIONAL FLOW-CHART



(b)

Figure 1.

The primary objective of the lockdown was to control the ongoing public health threat from COVID-19 and to prevent future worsening of the outbreak by containing the infection. To do so, the EMCO was enforced. During the EMCO, permanent and temporary residents in BBIM were prohibited from leaving their homes, while non-residents were forbidden from entering BBIM. Those identified as COVID-19 positive were isolated and admitted to the gazetted hospital (Hospital Enche Besar Hajjah Kalsom (HEBHK), Kluang). The operation was also used as a platform to communicate with the public on the COVID-19 situation in the area. During the EMCO, BBIM residents were advised on personal protection, hygiene and social distancing as the main methods of preventing and controlling COVID-19. This paper

describes the process-handling a localised outbreak of COVID-19 within at the BBIM area in the state of Johor, district of Kluang, Malaysia.

Methods

The targeted approach of the EMCO involved identifying a 2 km² area of BBIM as the red zone (1°45'52.4" N; 103°18'24.0" E). The surrounding area within 20 km² of the red zone was designated the buffer zone. The population in that area numbered 3,570 people.

Step 1: stakeholder meeting and situational analysis

Before the BBIM lockdown was announced, a meeting was held at the Kluang District Office on 26th March, 2020, chaired by the District Officer as the Chief Commander, and involving multiple agencies, including the police department, district council, National Security Council and the District Health Officer as an advisor. The meeting was intended for coordinating the necessary plan to ensure well-planned action between agencies. It was decided that enforcement of the BBIM lockdown/EMCO would be mandatory for containing the spread of COVID-19, upon which the Johor Chief Minister later agreed.

Later, an emergency health coordination meeting was held at PKD Kluang on the late evening of 26th March, 2020, chaired by the Johor State Health Director. Following a discussion on the current COVID-19 situation, an outbreak containment plan was developed. Mass population sampling in the outbreak area was necessary, and it was decided that the sampling site would be Kampung Dato Ibrahim Majid Primary School, Simpang Renggam.

Subsequently, the Malaysian Senior Security Minister announced the EMCO on BBIM and the surrounding 20 km² area effective 27th March, 2020, at 12:00 midnight. The order entailed no movement in or out of the red zone and buffer zone by residents and visitors, while all business activities were to be stopped. During the EMCO, the Social Welfare Department provided basic food supplies to all residents, and the Malaysian Armed Forces established a medical base in the area.

Step 2: operational definitions

- (1) Red zone: The area of BBIM, Taman Surau and Kampung Kurnia.
- (2) Buffer zone: The area of Kampung Dato Ibrahim Majid, Kampung Parit Penghulu, Kampung Parit Salman, Kampung Parit Hassan and Kampung Parit Salam.
- (3) PUI: A resident or person who developed any symptom of COVID-19, such as fever, cough, flu and sore throat. All PUI were referred to the Infectious Disease Specialist and admitted to HEBHK.
- (4) Person under surveillance (PUS): A resident or person residing in the EMCO area and who was free from COVID-19 symptoms. A PUS was sampled twice using nasopharynx swabs on day 1 and underwent antibody testing using a rapid test kit (RTK) on day 13. All PUS were issued a House Surveillance Order (HSO) for 14-day home quarantine.
- (5) COVID-19 case: A person confirmed as COVID-19 positive based on RT-PCR laboratory results. All COVID-19 patients were isolated and admitted to HEBHK for treatment.
- (6) Decontamination: All homes with COVID-19 positive cases were decontaminated by a specialized unit from PKD Kluang.
- (7) Disinfection: All homes that were free from COVID-19 infection were issued disinfection kits and instructions for self-house cleaning. The Simpang Renggam

City Council distributed the kits, and PKD Kluang team members monitored disinfection activities.

- (8) Close contact: A resident or person who attended the Sri Petaling Ijtimak Tabligh, a close contact 14 days before illness onset with a confirmed case of COVID-19 OR attended an event associated with known COVID-19 outbreak.
- (9) RT-PCR test: Real-time RT-PCR is a nuclear-derived method for detecting the presence of specific genetic material from any pathogen, including a virus.
- (10) RTK antibody testing: Traces antibodies as a sign of infection or exposure to COVID-19. It cannot detect the virus for rapid confirmation of disease. Therefore, it cannot be used to aid early detection of COVID-19.

Step 3: command and control

During the COVID-19 outbreak operation at the BBIM EMCO, it was mandatory for each agency to follow a systematic command flow to ensure that the process ran smoothly. The systematic command and control were also vital for:

- (1) Ensuring that the jurisdiction had an outbreak command structure in place to govern roles and responsibilities during a multi-agency, multi-jurisdictional response.
- (2) Establishing a legal preparedness plan at the district level.
- (3) Identifying the authority responsible for activating the COVID-19 response plan during an outbreak.
- (4) Identifying the critical stakeholders responsible for developing and implementing specific components of the COVID-19 plan, including enforcement of isolation, quarantine and other community containment measures, and the closure and decontamination of premises during the EMCO.
- (5) Ensuring that the jurisdiction's elected officials, appointed officials and other agency leaders knew their respective responsibilities during the COVID-19 outbreak.
- (6) Understanding the controlling authority over intra-state and inter-state modes of transportation in the event, and that these needed curtailing during the outbreak.
- (7) Developing/reinforcing relationships with the health authorities of adjoining jurisdictions and with federal agencies to ensure effective communication.
- (8) Identifying an overall authority in charge of coordinating different medical personnel groups during the outbreak.
- (9) Identifying the key individuals from the state and local authorities who would assist in maintaining public order and enforcing control measures during the outbreak.

During the outbreak, appointed officials conducted multiple meetings and visits to ensure that the outbreak management plan was implemented and that the welfare of the residents under EMCO was taken care of accordingly.

Step 4: COVID-19 outbreak management

ACD and contact tracing were carried out via house-to-house surveys. The information gathered included the person's identification details and COVID-19 risk assessment. All residents in the BBIM EMCO area were issued a 14-day HSO to ensure that their movements were restricted. Then, red zone residents were screened using nasopharyngeal swabs for RT-PCR testing. As stated earlier, Kampung Dato Ibrahim Majid Primary School was designated

the field command centre and mass sampling area. The Bandar Dato Ibrahim Majid Community Hall was used as the ACD command centre, and Ibrahim Majid Rural Clinic became a temporary medical base as all residents were prohibited from moving out from the EMCO area. People with a positive RT-PCR test result were admitted to HEBHK for treatment. In contrast, people with negative results were placed under strict home surveillance. Meanwhile, the homes of all positive cases were decontaminated.

In the buffer zone, a strategy of targeted swabbing was implemented. Buffer zone residents with the risk of COVID-19 were summoned for nasopharynx swabbing for RT-PCR testing. The decision to implement targeted swabbing was based on situational analysis of disease exposure and the resident's movements in the area.

On day 13, all red zone residents and buffer zone targeted residents were summoned for a second RTK testing. During the test, people with reactive RTK results were tested again with RT-PCR. [Figure 1b](#) shows the management flow.

Step 5: Active case detection

ACD and contact tracing were performed within the EMCO parameters via house-to-house survey from 27th March, 2020, using a risk assessment form. All residents were issued an HSO under Act 342 (Prevention and Control of Infectious Diseases 1988) to ensure that the public were aware that the EMCO was protected by law. A total of 552 homes were visited and 2,599 people were interviewed.

Ethics

This article was written from the service-based outbreak management report by the Ministry of Health Malaysia. No ethical approval is required by the institution. Approval for manuscript production and publication gained from the National Medical Research Register (NMRR), Ministry of Health, Malaysia.

Results

Overall, 106 cases were detected: 104 from the red zone and two from the buffer zone during the EMCO. In total, there were 183 confirmed COVID-19 cases in the red zone and 10 COVID-19 cases in the buffer zone during the outbreak period. Most of the cases were Malaysian (99.5% in the red zone and 100.0% in the buffer zone). There were more male patients in the red zone, i.e. 95 patients (51.9%), while there were more female patients in the buffer zone, i.e. six patients (60.0%). Four deaths were reported, all involving elderly men with comorbidities ([Table 1](#)).

From the total 193 cases, 103 (53.4%) were asymptomatic ([Figure 2a](#)). The last case was detected on 12th April 2020, 16 days before the EMCO was lifted. The case was quarantined at the quarantine centre before being sent to hospital on 15th April 2020, when a positive result was returned. The epidemic curve showed a point source outbreak ([Figure 2b](#)). The cases began to rise after 3rd March 2020, when three Sri Petaling Ijtimak Tabligh participants returned home and prayed at Al-Huda Mosque, BBIM. The cases peaked between 16th and 18th March 2020, following three mass gatherings held at the residents' homes on 12th to 15th March 2020.

In BBIM, the data analysis showed that 87 COVID-19 cases in the red zone and buffer zone were detected prior to the EMCO, while 106 COVID-19 cases were detected during the EMCO. The disease spanned four generations, with the index cases being those who attended the Sri Petaling Ijtimak Tabligh.

First-generation cases involved the participants' family members and regular congregants of Al-Huda Mosque who were also members of religious classes held among

Sociodemographic		BBIM (red zone)		Buffer zone	
		N	%	n	%
Nationality	Malaysian	181	99.5	10	100.0
	Non-Malaysian	2	0.5	0	0.0
Age (yrs)	<20	27	14.8	0	0.0
	20–29	21	11.5	3	30.0
	30–39	28	15.3	1	10.0
	40–49	11	6.0	1	10.0
	50–59	38	20.8	3	30.0
	≥60	58	31.7	2	20.0
Sex	Male	95	51.9	4	40.0
	Female	88	48.1	6	60.0
Death		4	2.2	0	0.0

Table 1.
Demographic
distribution of COVID-
19 cases during
operation EMCO BBIM

themselves. Of the positive cases, 11 were diagnosed passively, where they visited health care facilities for screening and treatment. Contact tracing was performed to identify potential spread of the disease among the close contacts of the positive cases, resulting in the detection of another 45 cases. Most of the positive cases had at least one family member who was infected, with the highest number of family members infected being nine people in one family.

Cases 15, 29 and 153 each held an event in BBIM prior to the MCO issued on 18th March 2020, which probably increased the risk of exposure among attendees as these were considered mass gatherings. There were 26 positive cases, with the possibility of attending at least one event, and they subsequently spread it among their family members and perpetuated the first generation. Most of the regular congregants of Al-Huda Mosque had also attended at least one event, which increased their risk of exposure to the disease.

Among the 193 BBIM EMCO cases, three had no definite risk factors of the disease, where they were not regular mosque congregants, had not attended any events or had close contact with positive cases. However, they might have been in contact with positive cases on 3rd to 17th March 2020, without realizing it.

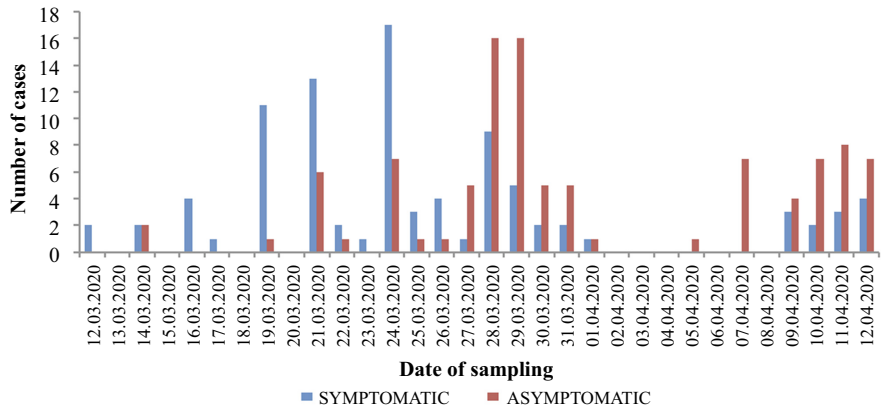
Only 90 of the reported COVID-19 cases (46.6%) developed symptoms, while the remaining 103 (53.4%) were asymptomatic. Based on the 90 symptomatic cases, the minimum incubation period was one day, while the maximum incubation period was 28 days. The median incubation period was 9 days (Figure 2c).

We identified four main risk factors that contributed to the introduction and spread of the disease in the area, namely, people who attended the Sri Petaling Ijtimak Tabligh (1.6%), regular mosque congregants (38.3%), wedding ceremony attendees (54.9%) and close household contacts (50.8%).

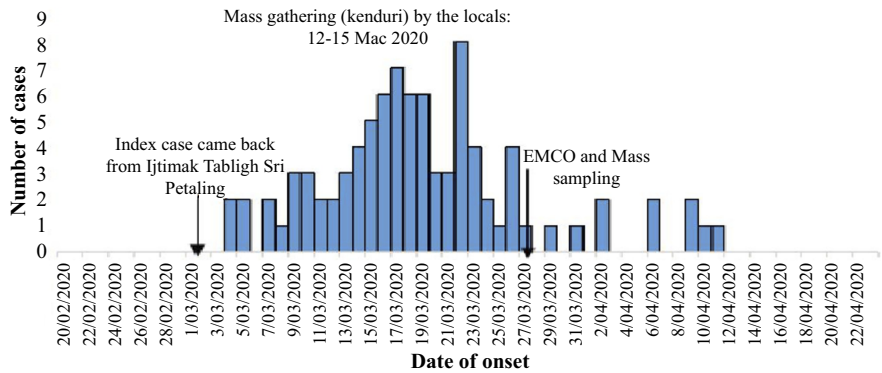
Three index cases that had attended the Sri Petaling Ijtimak Tabligh were identified as the source of introduction of the virus into BBIM. The multiple mass gatherings held, which included routine prayers and religious classes at the local mosque and multiple wedding ceremonies, contributed to the spread of the disease in the community. In addition, close contact within the household of a positive case caused the disease to spread further. Timely diagnosis is crucial for controlling the spread of the disease.

The BBIM EMCO area showed the highest number of infected households, i.e. 86 (31.2%): 43 with single cases and 43 with >1 case (Table 2 and Figure 3).

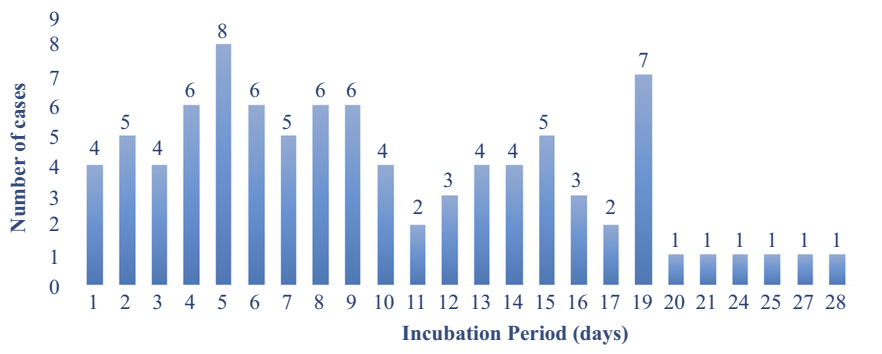
During the BBIM EMCO, decontamination was performed in the homes of all COVID-19 patients. A total of 92 homes were decontaminated in this operation. In addition, the sampling area, ACD centre and Community Clinic, involving all areas and equipment in the sampling area, were decontaminated daily. On the 8th April 2020, disinfection was also carried out in public spaces in collaboration with other agencies and included PKD Kluang (17 staff



(a)



(b)



(c)

Figure 2.
Plotted number of cases over time

- a - Number of cases detected by date of sampling from 12th March to 22nd April 2020
- b - Epidemic Curve of COVID-19 outbreak in EMCO-BBIM until 27th April 2020 ($n = 90$)
- c - Number of COVID-19 cases by days of incubation period

Locality	Total population	Occupied house	Vacant house	House with single case	House with cluster case	Percentage of infected house (%)
<i>RED ZONE</i>						
Bandar Baru Ibrahim Majid (centre)	1,181	246	4	40	43	33.7
Taman Surau BBIM	78	16	3	2	–	12.5
Kg. Kurnia BBIM	57	14	–	1	–	7.1
Total	1316	276	–	43	43	31.2
<i>BUFFER ZONE</i>						
Kg Dato' Ibrahim Majid	534	120	–	–	1	0.8
Kg Parit Penghulu	172	38	–	4	–	10.5
Kg Parit Salman	120	25	–	–	–	0.0
Kg Parit Salam	70	14	–	–	–	0.0
Kg. Parit Hassan and Parit Salleh	387	79	–	–	1	1.3
Total	1,283	276	–	4	2	2.2
<i>Total ACD</i>	2599	552				

Table 2.
Result of ACD activities and number of affected houses by COVID-19 infection during EMCO BBIM

members), the Kluang Fire and Rescue Department (50 staff members), the Simpang Renggam City Council (25 staff members), the Kluang City Council (8 staff members) and Southern Waste Corporation (6 staff members) and involved premises such as mosques, schools and grocery shops. All vehicles used during the BBIM EMCO also underwent decontamination.

For homes that were not COVID-19 positive, the local district authorities, in collaboration with PKD Kluang, distributed decontamination kits (Decon-Kit) along with instructions for each home. The kit consisted of disinfection detergent, personal protection equipment for the procedure and a usage module.

Four deaths were reported from the outbreak area. All were male and aged >60 years with multiple comorbidities (diabetes, hypertension and ischaemic heart disease). They were buried in different locations under the supervision of the Environmental and Health Assistant Officer. Three deaths were notified by HEBHK, while one death was notified by Muar Hospital, Muar, Johor (Table 3).

Mental Health Psychosocial Support (MHPSS) service in BBIM was provided by the PKD Kluang MHPSS team and was assisted by the HEBHK MHPSS team and trained volunteers. The service included online Depression Anxiety Stress Scale (DASS) screening and intervention for those in need via tele-psychosocial consultation, and mental health information-sharing via social media such as Telegram and Facebook. Further, the MHPSS team was also involved in interventions such as relaxation techniques, psychological first aid (PFA) corners and online psychosocial support consultation.

A total of 144 sampling staff members were screened: 14 had abnormal DASS scores and received intervention, and one staff member was referred to a psychiatrist. The PFA team had also anticipated that families in BBIM would be coming to terms with COVID-19 deaths. Accordingly, the PKD Kluang MHPSS team conducted tele-psychosocial sessions with the families of the deceased. In addition, a psychology officer in charge of the MHPSS Permai Hospital Operation Room conducted grieving support sessions for the families of the

No	Age	Sex	Co-morbidity	Date of onset	Date of death	Cause of death
1	71	Male	Diabetes, hypertension and IHD	9.3.2020	23.3.2020	Severe pneumonia with multi-organ failure in high-risk group secondary to sars-cov 2
2	67	Male	Diabetes and hypertension	12.3.2020	25.03.2020	Severe pneumonia with multi-organ failure in high-risk group secondary to sars-cov 2
3	69	Male	Hypertension and diabetes	10.03.2020	26.03.2020	Severe pneumonia with multi-organ failure in high-risk group secondary to sars-cov 2
4	71	Male	Diabetes	17.03.2020	14.04.2020	Severe Covid-19 Pneumonia with hospital acquired infection with multi-organ failure

Table 3.
List of COVID-19 mortality in EMCO BBIM

During the BBIM EMCO, the median incubation period calculated was nine days. Yang *et al.* calculated a new incubation period based on data from the original outbreak in Wuhan, China, i.e. 5.4 days, indicating the time that has elapsed between virus exposure and the presentation of symptoms [4].

Lauer *et al.* conducted a pooled analysis on reports of COVID-19 cases from 50 provinces, regions and countries outside Wuhan between 4th January 2020 and 24th February, 2020. They analysed a total of 181 people with confirmed SARS-CoV-2 infection to estimate the median incubation period for COVID-19, which was 5.1 days (95% confidence interval (CI), 4.5–5.8 days). Of the patients who developed symptoms, 97.5% did so within 11.5 days (95% CI, 8.2–15.6 days). Under conservative assumptions, this indicates that 101 of every 10,000 cases (99th percentile, 482) would develop symptoms after 14 days of quarantine or active monitoring [5].

The EMCO was enforced on 27th March–28th April 2020, to control the outbreak as the epidemiology curve showed high notification of COVID-19 cases in BBIM. The EMCO allowed a targeted approach for detecting, screening, testing, isolating and treating COVID-19 patients in the high-risk group.

The present descriptive analysis found that the BBIM COVID-19 outbreak was directly linked to the Sri Petaling mass gathering that took place on 27 February–2nd March 2020. There was a lag time between the gathering and the imposing of movement restrictions and social distancing, which allowed further spread of COVID-19 in the area. As the attendees of Sri Petaling gathering had returned to their respective hometowns, attended mass prayers at their local mosques and participated in various other cultural and local ceremonies, the second generation of COVID-19 cases began to emerge. Enforcement of the EMCO was one of the strengths in managing the COVID-19 outbreak in BBIM.

The BBIM EMCO operation shows evidence that mosque congregants and household contacts were more likely to be infected as the incidence of asymptomatic cases was high in infected cluster houses. The results provide a foundation of evidence for evaluating the control measures restricting the movement of BBIM residents. Previous studies in China have discussed household contact characteristics, which were evidence of the source of person-to-person transmission [6]. Moreover, our study confirms that frequent household contact is considered a high-risk factor for COVID-19 transmission.

The outbreak control achieved was a success after a tough journey and challenges faced by various agencies. The large number of people to be screened, unconducive environment and the required wearing of suffocating personal protective equipment made screening a tough job for the limited number of health care workers on duty. During mass sampling in

BBIM, a total of 2,384 swabs were taken, with the limited availability of reagent delaying processing and the announcement of results, increasing the risk of transmission among household contacts with the increased duration of exposure.

People who had been negative for COVID-19 upon initial sampling underwent second sampling with antibody RTK. RTK provides faster results that can be obtained within 15 minutes. However, nasal and throat swabs need to be done for reactive RTK cases as a confirmatory test as antibody RTK only detects antibodies in the host, possibly indicating a past infection that has already self-recovered.

People are easily affected emotionally during an MCO, particularly in an EMCO area, when facing a difficult situation. Emotions such as fear, worry and anxiety in dealing with COVID-19 directly or indirectly can lead to emotional conditions such as stress and depression. Thus, the MHPSS team plays a major role in addressing mental health issues [7, 8]. During the BBIM EMCO, we made every effort to address these issues, such as making available online DASS screening, tele-psychosocial support and information-sharing via Telegram and Facebook. These helped the MHPSS team and volunteers approach the community in the EMCO area as well as the health care workers involved in the control measure activities in order to carry out briefings and debriefings, as well as following-up even after the EMCO had been lifted.

Conclusion

Malaysia has implemented an effective measure in the form of the EMCO to contain the COVID-19 outbreak in selected areas, where the last cases were reported 16 days before the EMCO was lifted. This experience demonstrates that the residents' compliance and inter-agency cooperation were essential elements to the success of the EMCO. Effective communication and a coordinated and comprehensive response in managing the COVID-19 outbreak is crucial and speeds up control measures. In the future, an EMCO should be one of the main approaches in combating pandemic disease.

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