CONTAINING AN ISLAND: CORONAVIRUS (COVID-19) OUTBREAK IN PERHENTIAN ISLANDS, TERENGGANU STATE OF MALAYSIA, IN 2021

Abd Wahab AT[1,2], Samsury SF[1,2], Awang H[1], Yaacob EL[3], Ahmad Daud A[1], Ishak MS[1], Alias NA[1], Ghazali NH[1], Abdullah AH[1], Abd Rahman MA[3], and Embong K[3].

[1]Besut District Health Office, Kampung Raja, 22200 Besut, Terengganu, Malaysia

[2]Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia, 15200 Kubang Kerian, Kelantan, Malaysia

[3]Terengganu State Health Department, Wisma Persekutuan, 20920 Kuala Terengganu, Terengganu, Malaysia

Correspondence:
Dr Hafizuddin Bin Awang,
Public Health Medicine Specialist,
Besut District Health Office,
22200 Besut, Terengganu, Malaysia
Email: drhafizuddin@moh.gov.my

Abstract

Background: The spread of COVID-19 was inevitable and has not spared small and isolated communities, including the community on Perhentian Island in Besut District, Terengganu. Managing clusters in small islands can be difficult, given the limited resources. This study explores the characteristics of COVID-19 cases and the experience of outbreak containment at Perhentian Island.

Methodology: A retrospective study involving record review of COVID-19 cases and at-risk individuals registered under the Perhentian Cluster were retrieved from the Besut District Health Office COVID-19 online registry from the 16th August 2021 until 6th October 2021. All notified cases and close contacts who fulfilled the inclusion criteria were extracted and analysed using descriptive statistics.

Results: A total of 1,093 out of 2,500 community members of Perhentian Island were screened of which 170 (15.5%) tested positive for COVID-19, while 923 (84.5%) tested negative. Among individuals who tested positive, the majority were adults (52.4%), males (51.8%), Malays (98.8%), and villagers (96.5%). Clinical characteristics were categorized into: asymptomatic (55.9%), had no known medical comorbidities (90.6%), low-risk groups (87.1%), vaccinated (57.6%), and admitted to PKRC (97.1%) for treatment. Multiple agencies were involved in the outbreak containment of the Perhentian Cluster, working collectively and in good coordination.

Conclusion: The outbreak was attributed to community gatherings and close interactions among villagers. Prompt actions, targeted planning, and inter-agency collaboration were the key factors in successful containment of further spread of COVID-19 in Perhentian Island.

Keywords: COVID-19, Island, Community Transmission, Terengganu

Introduction

Coronavirus disease (COVID-19) is a highly contagious and infectious viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which began in Wuhan, Hubei Province, Central China, and spread out around the world (1). Globally, as of 1st November 2021, there have been 246,594,191 confirmed cases of COVID-19, including 4,998,784 deaths, reported to the World Health Organization (2). In Malaysia, there have been 2,420,222 confirmed cases of COVID-19 as of 22nd October 2021. Since the pandemic, there were 5,717 clusters recognised in Malaysia of which 580 clusters were active as of 27th November 2021 (3). Out of thousands of clusters declared, there were only two islands recorded to have experienced COVID-19 clusters, i.e., in Tioman Island in the state of Pahang and Perhentian Islands in the state of Terengganu (4, 5).

Terengganu, a state in the east coast region of Peninsular Malaysia, recorded 69,885 confirmed COVID-19 cases with 463 deaths as of 1st November 2021. Besut district which is located in the northern region of Terengganu, reported 10,050 confirmed COVID-19 cases with 91 cumulative deaths (6). Perhentian islands, located in Besut district, are among the thirteen gazetted islands in Terengganu

and home to one of Malaysia's most pristine marine parks. Perhentian islands consist of two main islands, namely, Perhentian Besar (big island) and Perhentian Kecil (small island) islands. These islands are situated in the South China Sea, about 10.8 nautical miles from Kuala Besut Jetty on the mainland and can be reached by 45 minutes of boat ride from the mainland jetty (7, 8). The most populated area is located in Perhentian Kecil and has public amenities such as kindergartens, primary schools, mosques, community hall, police station, health clinics, fire station, cemeteries, and shop lots (9). Klinik Kesihatan Pulau Perhentian (Perhentian Health Clinic), currently the only health facility serving the two islands, has one medical officer, two assistant medical officers, and two community nurses (10). For the past ten years, the main economic activities among the villagers have been tourism; however, during the COVID-19 pandemic with the Movement Control Order, the villagers had to carry out odd jobs like farming and fishing (11).

In Malaysia, there were only two clusters out of 5,717 COVID-19 clusters that involved small island community members. None of these island cluster management strategies has been explored and published yet. Thus, this study aims to explore the characteristics of COVID-19 cases and to share the management of outbreak containment in Perhentian Islands to facilitate other settings in adapting and replicating similar strategies and management.

Materials and Methods

Population, setting, and sampling

From 1st October 2021 until 30th October 2021, a descriptive cross-sectional study was conducted in Besut District Health Office through retrospective record review of COVID-19 cases and close contacts notified to Besut District Health Office, Terengganu. The sampling frame is the cluster period of 16th August 2021 until 6th October 2021. The reference population were all confirmed cases of COVID-19 and their close contacts registered under the Perhentian Cluster. Samples with an incomplete record of 30% variable were excluded from the study.

A total of 1,093 community members of Perhentian Island were screened from 16th August 2021 until 6th October 2021 as part of a contact tracing process with RT-PCR for COVID-19, after one confirmed case of COVID-19 (a healthcare worker) was detected at Klinik Kesihatan Pulau Perhentian. The healthcare worker (a nurse) had direct contact with many patients as she routinely visited patients at home around the village.

Data collection

Data were collected from Besut District Health Office COVID-19 Online Registry. Data were then recorded in cases pro forma. The retrieved information included socio-demographic features, residency, comorbidities, risk groups, presence of symptoms, clinical severity of COVID-19, vaccination status, and facility of admission.

Operational definitions

Specific operational definitions were employed in this study. A confirmed case of COVID-19 was defined as an individual with positive results of reverse transcription-polymerase chain reaction (RT-PCR) for COVID-19. The residency was categorized as villagers and non-villagers. Villagers were people who live and work in Kampung Pulau Hantu, Perhentian Island. People from the mainland who came to Perhentian Island for business or social activities were non-villagers. People with comorbidities were people who suffered from cardiovascular disease, cerebrovascular and kidney disease (chronic illness). The risk group were elderly, more than 60 years old individuals with chronic illness, and pregnant women. Every COVID-19 case was stratified according to clinical stage of severity; these include category I (asymptomatic); category II (symptomatic without pneumonia); category III (pneumonia without hypoxia); category IV (hypoxic pneumonia which requires supplemental oxygen); and category V (critically ill and requires mechanical ventilation).

Data analysis

Descriptive statistics were used for data analysis by using SPSS Statistics (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Descriptive statistics with mean and standard deviation (± SD), frequency and percentages were calculated.

Results

Among the 1,093 community members who were screened, 170 (15.6%) were positive for COVID-19, while 923 (84.5%) were negative. Among the 170 positive cases, their mean (± SD) age was 26.2 (± 18.52), and the majority were adult (52.4%), male (51.8%) and of Malay race (98.8%). Their clinical characteristics revealed that most were in the low-risk group (87.1%), had no known medical illness (90.6%), vaccinated with COVID-19 vaccine (57.6%), thus asymptomatic (55.9%). Most cases (97.1%) were admitted to the COVID-19 Quarantine and Treatment Center (Pusat Kuarantin dan Rawatan Covid-19, PKRC) for treatment and observation.

On the other hand, among the 923 contacts who were identified, the mean (± SD) age was 27.8 (± 17.93), the majority were adult (58.3%), male (52.5%) and Malay (95.7%). Their clinical characteristics revealed that most were in the low-risk group (88.5%), had no known medical illness (92.7%), vaccinated with COVID-19 vaccine (57.2%), and asymptomatic (96.1%). All contacts were given an order for 14 days of home quarantine. Details of the analysis are summarized in Table 1.

Table 1: Socio-demographic and clinical characteristic of COVID-19 cases in Perhentian Islands, Besut District, Terengganu (n=1093)

Characteristics	Frequency, n (%)	
	COVID -19 cases (n=170)	COVID- 19 contacts (n= 923)
Age [a]	26.2 (18.52)	27.8 (17.93)
Age group (years old)		
Infants (≤ 1)	4 (2.4)	3 (0.3)
Children (1 to ≤18)	65 (38.2)	327(35.4)
Adults (19 to <60)	89 (52.4)	538 (58.3)
Elderly (≥60)	12 (7.0)	55(6.0)
Gender		
Female	82 (48.2)	438 (47.5)
Male	88(51.8)	485 (52.5)
Race		
Non-Malay	2 (1.2)	40 (4.3)
Malay	168 (98.8)	883 (95.7)
Residency		
Non villager	6 (3.5)	44 (4.8)
Villager	164 (96.5)	879 (95.2)
Comorbidities		
No	154 (90.6)	856 (92.7)
Yes	16 (9.4)	67 (7.3)
High risk groups		
No	148 (87.1)	817 (88.5)
Yes	22 (12.9)	106 (11.5)
Covid-19 category (severity)		
Category 1	95 (55.9)	0 (0.0)
Category 2	73 (42.9)	0 (0.0)
Category 3	0 (0.0)	0 (0.0)
Category 4	2 (1.2)	0 (0.0)
Category 5	0 (0.0)	0 (0.0)
Symptomatic		
No	95 (55.9)	887 (96.1)
Yes	75 (44.1)	36 (3.9)
Vaccination status		
No	72 (42.4)	395 (42.8)
Yes	98 (57.6)	528 (57.2)
Admission facilities		
Home	1 (0.5)[b]	923 (100.0)[c]
PKRC	165 (97.1)	0 (0.0)
Hospital	4 (2.4)	0 (0.0)

[a]Mean (± SD)
[b]Home Isolation Order (HIO) at home
[c]Home Surveillance Order (HSO) at home

Discussion

The COVID-19 positivity rate in Perhentian Islands cluster was 15.6%. In comparison, another island cluster in Malaysia, the cluster in Tioman Island, Pahang, had a lower positivity rate of 1.26%, i.e., 118, were detected as confirmed cases out of 2,428 screened for COVID-19 with RT-PCR (4). The lower incidence of COVID-19 cases in the Tioman Island setting could be due to a larger denominator of screened population. In addition, Tioman Island has a larger populated area as compared to Perhentian Islands, Tioman being the largest island in the east coast of peninsular Malaysia (12).

Majority (96.5%) of COVID-19 cases were reported in local community members of Perhentian islands while the rest of the cases were reported in outsiders who work at local resorts. The majority of the positive cases were adult and male with 52.4% and 51.8%, respectively. The higher number of cases among adults was expected as most of the children stayed at home due to the closure of schools and other educational institutions as part of the Movement Control Order (MCO) issued by the government since 12th May 2021 (13). In terms of gender, cases among females were lower than males as it is postulated that the female group is more protected against COVID-19 infection due to the role of oestrogen hormone and lower expression of ACE-2 protein (14). During this cluster, the index case was a 38-year-old female nurse who worked in Perhentian Health Clinic. She went for screening for COVID-19 using RT-PCR after developing symptoms of fever, nausea and vomiting on 16th August 2021. Three days later, her result was positive and contact tracing was promptly done involving three of her household contacts in Perhentian Island, five patients who had direct contact with her, three healthcare workers who worked with her in the health clinic and another eight of her family members who stayed in the mainland. Out of these, three of them (household contacts) were detected positive for COVID-19.

Further investigation done by Besut District Health Office discovered that this index case travelled from the island to the mainland on a regular basis, as she commuted from her residence on the mainland, which was a hotspot for COVID-19 during that time, to the island every week. The hotspot is postulated to have a higher risk of COVID-19 transmission as more than 41 COVID-19 confirmed cases were clustered in that area (15). In addition, investigation also revealed that the index case had a history of doing routine home visits across the community on Perhentian Island, as well as having direct contact with the local people. Investigations on Perhentian Island also revealed that most of the locals did not comply to the COVID-19 preventive measures by not wearing masks and did not practise physical distancing, which increased the risk of COVID-19 infection (16). Apart from that, according to geographical investigation, the community in the village lived close to each other in a congested environment, thereby increasing the risk of transmission, notably without complying with the COVID-19 preventive measures (17).

In preventing more catastrophic COVID-19 infections in the local community, Besut District Health Office promptly conducted mass screening to detect COVID-19 cases from 20th to 26th of August 2021. This was held in Perhentian island primary school, with help from the Besut District Educational Office and the District Land Authority, where a total of 1,081 local communities were screened. From the mass screening and close contact screening (involving contacts from the mainland as well), 169 positive cases were identified; 163 cases were from the local community and the 6 remaining cases were from the mainland. Consequently, the District Catastrophe Management Committee of Besut, with advice from Besut District Health Office, decided to use a containment strategy to prevent further community transmission. The committee agreed to implement cordon sanitaire in Perhentian Island for a period of two weeks, from 25th August 2021 until 7th September 2021, where all economic and social activities, and all movement into and out of Perhentian Island was strictly prohibited. A study by Li et al. (18) in China revealed that this approach was able to effectively prevent community transmission of COVID-19. Apart from that, all cases were either admitted to hospital or quarantined at COVID-19 Quarantine and Treatment Centres (PKRC) based on severity, while close contacts were given Home Surveillance Order (HSO). This approach has been shown to be effective in preventing COVID-19 transmission (19, 20). In addition, Besut District Health Office expanded their health promotion activities and implemented strict enforcement to ensure that all preventive measures, such as wearing masks and physical distancing, were followed and practised in the community.

However, these strategies were challenging for both the government and local community in many aspects as they were influenced by many factors such as human resource, financial and community welfare, safety of the staff, climate change and logistics. Apart from that, inter-agency collaboration was the key factor in successfully managing this cluster. In combating COVID-19 in the Perhentian cluster, various agencies worked together; these involved Besut District Health Office, District Land Authority, Royal Malaysian Police, Department of Social Welfare, Malaysia Marine Department, Fire and Rescue Department, Malaysia Civil Defence Department and Besut District Council. Besut District Health Office was responsible to screen and provide medical care to the local community besides enforcing the Prevention and Control of Infectious Diseases Act (Act 342). The Royal Malaysian Police, in collaboration with the Marine Department, was responsible to monitor and control all movement in and out of the island, as well as ensuring that all individuals complied to movement control orders. Daily necessities such as food and provision of diapers and formula milk were managed by the Department of Social Welfare. The Malaysia Civil Defence Department and District Council were responsible to coordinate transportation of COVID-19 cases to PKRC, while the Fire and Rescue Department conducted continuous disinfection after the transfer process. The Besut District Officer (Head of District Land Authority) coordinated the whole mission and played an effective role in ensuring that all agencies worked collectively to ensure that COVID-19 transmission was halted.

There were a few challenges in managing the COVID-19 cluster in Perhentian island. The first challenge encountered was during the mass screening activities and the deployment of the teams. The mass screening become challenging due to the difficulty in accessing the island as boats were the only means of transportation to get there. Many factors have to be considered, including the transportation, the cost, the climate, and the staff's safety throughout the boat journey. The cost-benefit analysis had to be considered when testing the asymptomatic population. The detection of cases and a high positivity rate could cut the chain of transmission, contain the spread, and increase the economic returns of the society (21). This requires quick, detailed and structured planning considering all of these factors. The action plan was successfully executed with an experienced and well-trained team and inter-agency collaboration.

There were also challenges in overcoming the community's health literacy. There were challenges in giving health education and convincing the community members who were close contacts to do screening as they were asymptomatic. Health education also needed to be strengthened to ensure that the community understood the importance of obeying the Home Surveillance Order.

Limitation of human resources to monitor the contacts under Home Surveillance Order (HSO) and control the movement of people within the island and from the island to the mainland was also a great challenge. Moreover, only four healthcare personnel worked at the local health clinic prior to the COVID-19 cluster. As there is no road network to the island, only limited numbers of staff could be mobilized to the island.

Conclusion

In conclusion, prompt mass screening and isolation of cases and contacts from the public played an important role in mitigating the spread of virus in the community. In addition, inter-agency collaboration was the key factor in successfully managing this cluster. In order to optimize healthcare services delivery in remote areas such as islands, more resources including human resources and medical equipment should be allocated to ensure that there is adequate supply during an unexpected outbreak or a public health emergency situation.

Future recommendations

One of the recommendations is to upgrade the health facility, health services, number of healthcare personnel and transportation services in the island to reduce the gap and equity of the island population and mainland population. These measures would expedite the process of COVID-19 screening and treatment, besides requiring less

healthcare personnel to be mobilized to the island should another outbreak occur. Also, regular disaster drills should be conducted to train multiple agencies in collaborating and managing large outbreaks of infectious disease in an island setting.

Acknowledgement

The authors would like to thank the Director General of Health Malaysia for allowing us to use the secondary data from Terengganu state COVID-19 online registry and SIMKA Outbreak system. Our gratitude also goes to family medicine specialists, medical officers and staff at Besut District Health Office and Terengganu State Health Department for their assistance during data collection.

Competing interests

The authors declare that they have no competing interests.

Ethical Clearance

This study was approved by the Medical Review and Ethical Committee from National Institute of Health, Ministry of Health Malaysia (NMRR-21-30-58174).

References

1. Shereen MA, Khan S, Kazmi A, Bashir N, Siddique R. COVID-19 infection: emergence, transmission, and characteristics of human coronaviruses. J Adv Res. 2020;24:91-8.
2. World Health Organisation. WHO Coronavirus (COVID-19) dashboard. 2021. Available at: https://covid19.who.int. Accessed 12 November 2021.
3. Ministry of Health Malaysia. Kenyataan akhbar KPK 27 November 2021 – situasi semasa jangkitan penyakit Coronavirus 2019 (COVID-19) di Malaysia. 2021. Available at: https://kpkesihatan.com/2021/11/27/kenyataan-akhbar-kpk-27-november-2021-situasi-semasa-jangkitan-penyakit-coronavirus-2019-covid-19-di-malaysia/. Accessed 15 November 2021.
4. Ministry of Health Malaysia. Tiga belas (13) kluster baharu dilaporkan hari ini (15/03/2021) Covid- 19 Malaysia. 2021. Available at: https://covid-19.moh.gov.my/sorotan/2021/03/tiga-belas-13-kluster-baharu-dilaporkan-hari-ini-15032021. Accessed 1 November 2021.
5. Ministry of Health Malaysia. Kenyataan akhbar KPK 25 Ogos 2021 – situasi semasa jangkitan penyakit Coronavirus 2019 (COVID-19) di Malaysia. 2021. Available at: https://kpkesihatan.com/2021/08/25/kenyataan-akhbar-kpk-25-ogos-2021-situasi-semasa-jangkitan-penyakit-coronavirus-2019-covid-19-di-malaysia/. Accessed 10 November 2021.
6. Terengganu State Health Department. Situasi terkini Covid- 19 negeri Terengganu sehingga 1 November 2021. 2021. Available at: https://www.facebook.com/photo/?fbid=256467929849791&set=pcb.256467986516452. Accessed 12 November 2021.
7. Besut Land Council. Sejarah Besut laman web rasmi pejabat daerah dan tanah Besut. 2014. Available at: http://pdtbesut.terengganu.gov.my/index.php?option=com_content&view=article&id=81&Itemid=53. Accessed 12 November 2021.
8. Masitah M, Mohamed B. An assessment on destination characteristics: the case study of Pulau Perhentian. SHS Web of Conferences. 2014;12.
9. Besut District Council. Pulau Perhentian. Portal Rasmi Majlis Daerah Besut. 2016. Available at: http://mdb.terengganu.gov.my/ms/pelawat/destinasi-menarik/pulau-perhentian. Accessed 12 November 2021.
10. Terengganu State Health Department. Direktori klinik kesihatan dan klinik desa negeri Terengganu. Portal Rasmi Jabatan Kesihatan Negeri Terengganu. 2021. Available at: https://jknterengganu.moh.gov.my/v1/index.php/direktori-jknt/direktori-klinik-kesihatan-klinik-desa. Accessed 12 November 2021.
11. Ali NF. PKP 3.0: Dulu 'ditinggalkan', kini penduduk Pulau Perhentian kembali bertani, menangkap ikan. Astro AWANI Network Sdn. Bhd. 2021. Available at: https://www.astroawani.com/berita-malaysia/pkp-30-dulu-ditinggalkan-kini-penduduk-pulau-perhentian-kembali-bertani-menangkap-ikan-306557. Accessed 12 November 2021.
12. Ibrahim Y. Island community in development era: are marginalised or had marginalised? Akademika. 2007;70(1):57-76.
13. Dawn Chan TAY. Nationwide MCO 3.0 from May 12. New Straits Times (NST). 2021. Available at: https://www.nst.com.my/news/nation/2021/05/689347/nationwide-mco-30-may-12. Accessed 12 November 2021.
14. Awang H, Mohamed KA, Ahmad MH, Ning GS, Zamre NSN. COVID-19 outbreak in a religious secondary school in Setiu District, Terengganu state of Malaysia: incidence and associated factors. Int J Public Health and Clin Sci. 2021;8(4):78-86.
15. Zamzuri MAIA, Ibrahim FE, Reffien MAM, Hanan MFM, Dasani MHM, Ali NKM, *et al.* Epidemiological Characteristics of COVID-19 in Seremban, Negeri Sembilan, Malaysia. Open Access Macedonian Journal of Medical Sciences. 2020;8(T1):471-5.
16. Talic S, Shah S, Wild H, Gasevic D, Maharaj A, Ademi Z, *et al.* Effectiveness of public health measures in reducing the incidence of Covid-19, SARS-CoV-2 transmission, and covid-19 mortality: systematic review and meta-analysis. BMJ. 2021;375:e068302.
17. Jones NR, Qureshi ZU, Temple RJ, Larwood JPJ, Greenhalgh T, Bourouiba L. Two metres or one: what is the evidence for physical distancing in covid-19? BMJ. 2020;370:m3223.
18. Li Z, Chen Q, Feng L, Rodewald L, Xia Y, Yu H, *et al.* Active case finding with case management: the key to tackling the COVID-19 pandemic. Lancet. 2020;396(10243):63-70.

19. Al-Tawfiq JA, Sattar A, Al-Khadra H, Al-Qahtani S, Al-Mulhim M, Al-Omoush O, *et al*. Incidence of COVID-19 among returning travelers in quarantine facilities: A longitudinal study and lessons learned. Travel Med Infect Dis. 2020;38:101901.
20. Dreher N, Spiera Z, McAuley FM, Kuohn L, Durbin JR, Marayati NF, *et al.* Policy interventions, social distancing, and SARS-CoV-2 transmission in the United States: a retrospective state-level analysis. Am J Med Sci. 2021;361(5):575-84.
21. López Seguí F, Estrada Cuxart O, Mitjà IVO, Hernández Guillamet G, Prat Gil N, Maria Bonet J, *et al*. A cost-benefit analysis of the COVID-19 asymptomatic mass testing strategy in the North Metropolitan Area of Barcelona. Int J Environ Res Public Health. 2021;18(13).