ORIGINAL ARTICLE

LOOKING BACK AT A YEAR OF COVID-19 INFECTION IN KINTA DISTRICT, MALAYSIA: THE PUBLIC HEALTH EXPERIENCE TO SUPPRESS THE PANDEMIC

Peter **Gan Kim Soon**[*1], Asraf Ahmad bin **Qamruddin**[2] **and** Awanis binti **Muhammad Sharif**[1]

[1]*Kinta District Health Office, Ministry of Health Malaysia*
[2]*Manjung District Health Office, Ministry of Health Malaysia*

***Corresponding author:** Peter **Gan Kim Soon**
Email: kimsoon9@gmail.com

ABSTRACT

COVID-19 has overwhelmed the healthcare system and crippled the economic and social activities globally. This study aims to analyse the epidemiological and presenting symptoms of COVID-19 and understand the public health intervention. Retrospective review of COVID-19 confirmed cases registered in Kinta District, Malaysia between 14th March 2020 to 28th March 2021. Descriptive statistics were used to describe the cases, and the association between the 2nd and 3rd waves of infection was determined using Pearson's chi-squared tests or student t-tests. 3051 COVID-19 confirmed cases were reported during the 2nd wave and 3rd wave. The characteristics associated with the 2nd and 3rd waves were age, ethnicity, nationality, and transmission location. Asymptomatic cases account for 67.3% and 66.0% during the 2nd and 3rd waves, respectively. Presenting symptoms such as fever with respiratory symptoms, respiratory symptoms only, ageusia or anosmia were associated with the transmissions. Diabetes mellitus, hypertension, chronic kidney disease and multimorbidity were significantly associated with the 2nd and 3rd waves. As most confirmed cases were asymptomatic, a coordinated and systematic approach to tracing, testing, and isolating close contacts is critical to managing the pandemic. It highlights the importance of the public health experience in providing a comprehensive and integrated response to managing the COVID-19 pandemic.

Keywords: *COVID-19 infection, epidemiology, presenting symptoms, Malaysia*

INTRODUCTION

The pathogen severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the cause of Coronavirus Disease 2019 (COVID-19), which began as an outbreak of pneumonia cases of unknown origin in Wuhan, China (1). The infection rapidly spread across China and the globe which prompted the World Health Organisation (WHO) to escalate the declaration of COVID-19 as a Public Health Emergency of International Concern (2) to a pandemic (3). As of 22nd July 2021, an estimated 190 million people have been infected with COVID-19, with 4 million deaths reported globally (4).

The first confirmed case of COVID-19 in Malaysia was reported in late January 2020, which involved a foreign nationality. In the subsequent month, the number of COVID-19 cases was mainly attributed to overseas travellers. Malaysia's response to the pandemic was lauded for its preparedness and effective communication (5). However, a radical change with a surge in COVID-19 cases overwhelmed the healthcare system and crippled the economic and social activities (6). As of 22nd July 2021, Malaysia has recorded 964,918 COVID-19 cases, 142,051 active cases and 7,574 deaths (7). In this study, we analysed the epidemiological and presenting symptoms of patients diagnosed with COVID-19 in Kinta to understand the transmission and associated factors by providing insights into the public health intervention implemented.

METHODS

Setting

Perak is the 3rd state with the largest number of elderly populations in Malaysia after Selangor and Johor, with Kinta district having the most elderly people in Perak at 38.1% (8). Ipoh, the state administrative capital, is also situated in the Kinta district. Kinta district was a former booming mining valley in the state of Perak. It is currently the densest district in Perak, with a population of 841,800 people in a total land area of 791 km^2(9). The district is divided into eight subdistricts, with the northern region being the most populated (refer to figure 1).

Study design and sample selection

This study is a retrospective review of COVID-19 patients registered with Kinta, Malaysia, between 14th March 2020 and 28th March 2021. COVID-19 patients' infection was diagnosed by nasopharyngeal and oropharyngeal samples using a reverse transcription-polymerase chain reaction (RT-PCR) test. The COVID-19 diagnosis was based on Malaysia's case definition (10). The information on confirmed cases was extracted from Kinta Health District's COVID-19 database, which was collected manually by the health district for the daily update of COVID-19 cases.

The second wave of the COVID-19 epidemic began on 27th February 2020 and continued to 19th September 2020 (11). In comparison, the third epidemic wave started on 20th September

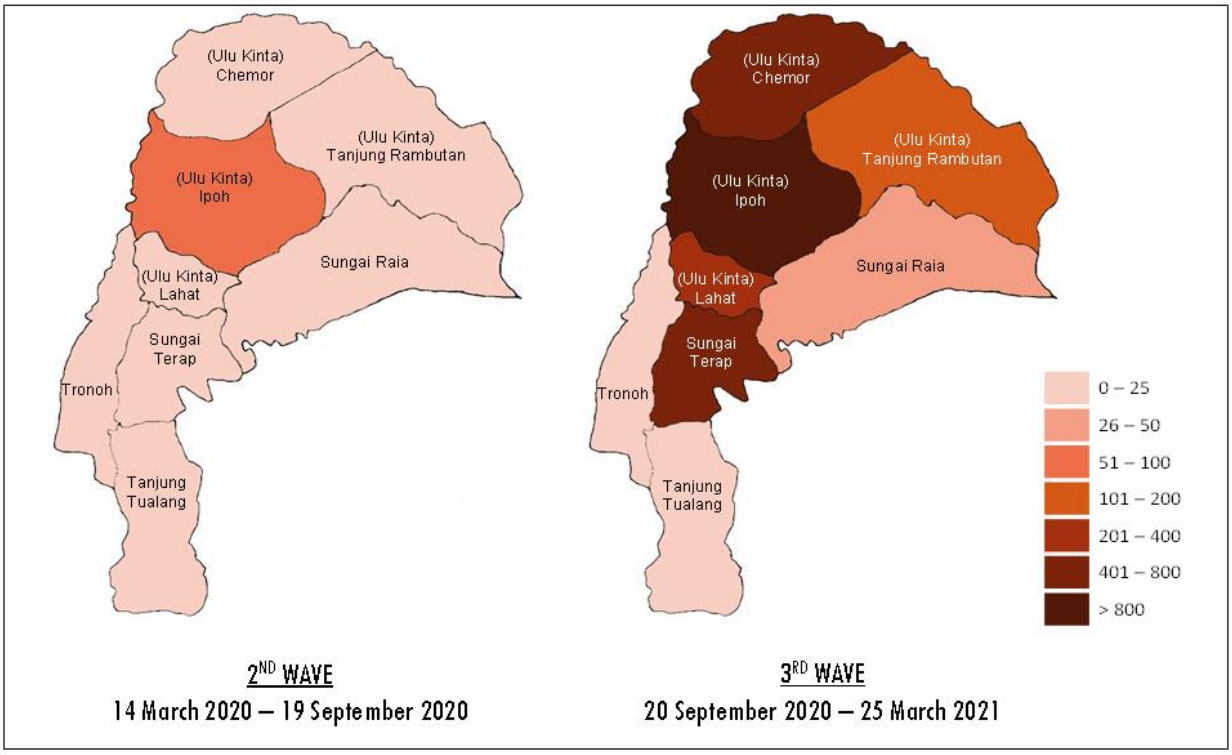

Figure 1: Case distribution in the 2nd and 3rd waves of COVID-19 infection according to the Sub-District in Kinta

2021 until the present (12). A COVID-19 cluster is identified when a group of 5 or more cases shares a common epidemiological link (e.g. place or event with a high risk of transmission) (13). The cluster includes the secondary transmission of cases within the same household. This study was conducted according to the World Medical Association Declaration of Helsinki and the Malaysian regulation. Ethical approval was obtained from the Medical Research and Ethics Committee of the Ministry of Health Malaysia.

Statistical analyses

Data cleaning was conducted using range checking and logical checking. Descriptive statistics were used to describe the cases. Categorical variables were described by frequencies and percentages, while analysis between groups was performed using Pearson's chi-squared tests. For continuous variables, mean and standard deviation was used to report the data, while analysis was performed using a student t-test. An a priori two-tailed level of significance was set at 0.05. The statistical analyses were performed using International Business Machines (IBM) Statistical Package for the Social Sciences (SPSS), version 22.

RESULTS

Distribution of COVID-19 cases

After a year of responding to COVID-19, Kinta District registered 3051 confirmed cases between March 2020 and 2021 (refer to Figure 2). The initial phase of the 2nd wave of reported cases of COVID-19 in the Kinta District were participants of a religious event held in Kuala Lumpur and Malaysians returning from overseas. The 3rd wave began with the first transmission from Sabah and subsequently increased the number of cases. The first rise in infections associated with a cluster originated from a mass gathering from other state and workplace-related clusters. The second and third spike in cases in the 3rd wave was due to clusters related to a detention centre and a workplace, respectively.

Characteristics of COVID-19 patients in the 2nd and 3rd waves

Table 1 shows the sociodemographic characteristics of COVID-19 patients. The median age of patients in the 2nd and 3rd waves was 42 years (interquartile range, 30 - 63) and 31 years (interquartile range, 24 - 42), respectively. The 18-40 years age group has the highest number of patients in the 2nd and 3rd waves of infection. Within the two cohorts, most of the patients were male, ethnically Malay, with transmission taking place locally in Kinta District and were mainly screened because they have a history of close contact with a confirmed case. The characteristics associated with the 2nd and 3rd

waves were age, ethnicity, nationality, location of transmission, place and reason for sampling.

The presenting symptoms and comorbid conditions of the confirmed cases from the 2nd and 3rd waves of COVID-19 infection are shown in Table 2. The early clinical presentations of patients that were associated with the 2nd and 3rd waves were fever with respiratory symptoms (p-value = 0.003), respiratory symptoms only (p-value <0.001), ageusia or anosmia (p-value = 0.003) and others (p-value <0.001). While comorbidities that were associated with the 2 cohorts of COVID-19 infection were diabetes mellitus (p-value = 0.042), hypertension (p-value <0.001), chronic kidney disease (p-value = 0.003) and multimorbidity (p-value <0.001). Close to all patients were non-smokers in the 2nd and 3rd waves of infection at 100% and 93.8%, respectively

Table 1: Sociodemographic characteristics of confirmed cases of COVID-19 in Kinta

Characteristics	Total (N)	Cases, n (%)		*P*-Value
		Frequency, n (%) 2nd wave (total = 104)	Frequency, n (%) 3rd wave (total = 2946)	
Age, years, median (IQR)	3051	42 (30, 63)	31 (24, 42)	<0.001*
Age, years	3051			<0.001
<18		7 (6.7%)	244 (8.3%)	
18-40		43 (41.3%)	1919 (65.1%)	
41-60		23 (22.2%)	573 (19.5%)	
>60		31 (29.8%)	211 (7.1%)	
Gender	3051			0.673
Male		60 (57.7%)	1761 (59.8%)	
Female		44 (42.3%)	1186 (40.2%)	
Ethnicity	3051			<0.001
Malay		70 (67.3%)	1512 (51.3%)	
Chinese Malaysian		10 (9.7%)	191 (6.5%)	
Indian Malaysian		20 (19.2%)	390 (13.2%)	
Others		4 (3.85%)	854 (29.0%)	
Nationality	3051			<0.001
Malaysian		100 (96.2%)	2093 (71.0%)	
Non-Malaysian		4 (3.8%)	854 (29.0%)	
Transmission location	3051			<0.001
Within Kinta		55 (52.9%)	2742 (93.0%)	
Other Districts within Perak		27 (26.0%)	2 (0.1%)	
Other States in Malaysia		15 (14.4%)	162 (5.5%)	
Overseas		7 (6.7%)	41(1.4%)	
Sampling Place	3051			<0.001
Kinta Health Office		63 (60.6%)	1830 (62.1%)	
Government Hospital		39 (37.5%)	182 (6.2%)	
Private Health Facilities		2 (1.9%)	935 (31.7%)	
Sampling Reason	3051			<0.001
Close Contact		70 (67.3%)	1964 (66.6%)	
Symptomatic		16 (15.4%)	319 (10.8%)	
Suspected individuals		13 (12.5%)	7 (0.2%)	
Others		5 (4.8%)	657 (22.3%)	

** Independent T-Test*

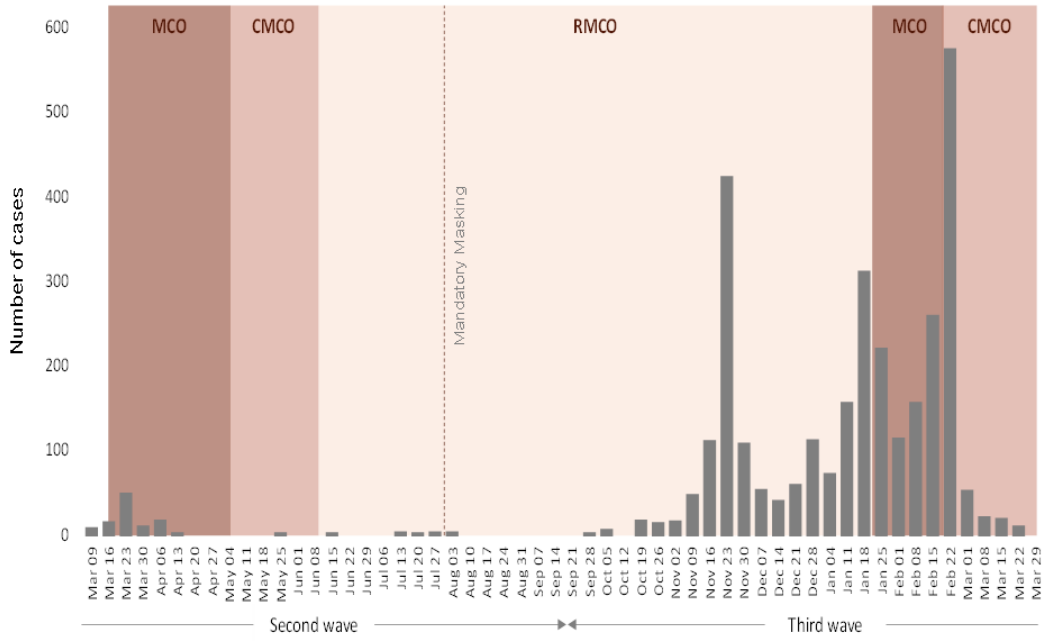

Figure 2: Epidemiological curve illustrating the weekly distribution of COVID-19 cases from 14th March 2020 to 28th March 2021. MCO, Movement control order; CMCO, Conditional movement control order; RMCO, Recovery movement control order.

Table 2: Medical characteristics of confirmed cases of COVID-19 in Kinta

Characteristics	Total (N)	Cases, n (%)		*P*-Value
		Frequency, n (%) 2nd wave (total = 104)	Frequency, n (%) 3rd wave (total = 2946)	
Smoking	3051			0.009
Current smoker		0 (0.0%)	182 (6.2%)	
Non-smoker		104 (100.0%)	2764 (93.8%)	
Symptoms				
Asymptomatic	2014	70 (67.3%)	1944 (66.0%)	0.776
Fever only	242	4 (3.8%)	238 (8.1%)	0.117
Fever with respiratory symptoms*	224	0 (0.0%)	224 (7.6%)	0.003
Respiratory symptoms only*	152	42 (40.4%)	112 (3.8%)	<0.001
Ageusia and/or anosmia	225	0 (0.0%)	225 (7.6%)	0.003
Others+	338	0 (0.0%)	338 (11.5%)	<0.001
Chronic Disease				
Diabetes Mellitus	160	10 (9.6%)	150 (5.1%)	0.042
Hypertension	174	16 (15.4%)	158 (5.4%)	<0.001
Respiratory Disease	54	2 (1.9%)	52 (1.8%)	0.904
Heart Disease	128	5 (4.8%)	123 (4.2%)	0.751
Chronic Kidney Disease	44	5 (4.8%)	39 (1.3%)	0.003
Multimorbidity	143	13 (12.5%)	130 (4.4%)	<0.001
Outcome	3051			0.001
Recovered		100 (96.2%)	2933 (99.5%)	
Dead		4 (3.8%)	14 (0.5%)	

* *Respiratory symptoms include cough, coryza, sore throat and shortness of breath*
+ *Other symptoms include myalgia, diarrhoea, headache and fatigue*

DISCUSSION

This retrospective study extracted data from the comprehensive surveillance of the Health District of Kinta. It provided an insight into the epidemiology and clinical presentation of COVID-19 infection from the start of the outbreak in Kinta. Consistent with the national trend, the surge in the early phase of the 2nd wave was mainly due to the cluster of a religious

gathering. Similar to the religious events in South Korea(14) and India(15), the 3-days event in

Malaysia was a super spreader that was mainly attended by highly mobile young men, which caused the transmission to neighbouring countries as well as within the country. The infection spread to all corners of the country within weeks.

Like many countries globally (16-18), a local and international lockdown in Malaysia termed the Movement Control Order (MCO) was initiated on 18th March 2020, lasting for about six weeks to curb the transmission. It was part of the government's strategy to confine local communities within their homes and restrict travel by closing borders, halting all international flights and mandatory quarantine for all individuals travelling into Malaysia. Local lockdown instituted the closure of schools and non-essential workplaces (work-from-home) as well as prohibiting mass gatherings (e.g., events and meetings) and limiting visitors to hospitals (16).

The age-old public health practice adopted by the government was to swiftly identify all confirmed cases of COVID-19 infections and treat them with appropriate medical attention. While high-risk individuals with a history of contact and recent travel from high prevalence areas were traced for testing and mandatory quarantine. The two-prong public health strategies of containment and mitigation by the public health authority in Malaysia effectively controlled the initial spread of COVID-19 infection during the 2nd wave (refer to figure 2). At the same time, public health measures such as handwashing, universal masking, and physical distancing were adopted as a reminder and subsequently by legislative regulation.

During the COVID-19 pandemic, the community would want to be well informed regarding the preventive measures. Due to the rapid evolution of the disease, the public health authorities need to be dynamic in disseminating health education and promotion to the public. The public was taught to create a healthy setting by creating new social norms that encourage preventive behaviour, such as universal masking in public areas and maintaining a physical distance. This public health approach was not only effective in combating the transmission of COVID-19 but also in other communicable diseases like dengue (19), influenza (20) and measles (21).

When comparing the 2nd, and 3rd waves, age, ethnicity, and nationality were associated with COVID-19 infection. Individuals between the ages of 18 and 40 were the most commonly infected population based on our analysis. This finding is consistent with many studies conducted locally(22, 23) and internationally (24-26). However, when comparing the 2nd and 3rd waves, new cases among the people ages 18 and 40 years increased by 23.8% and the elderly above 60 years reduced by 22.7%. With the transition from MCO to Conditional Movement Control Order (CMCO) and later Recovery Movement Control Order (RMC), many industries were allowed to operate, and the workforce returned to full capacity. It led to the spikes of cases in the Kinta district during the 3rd wave between November 2020 and February 2021 associated with the workplace (refer to figure 2). It infected many non-Malaysian factory workers because overcrowded living and transport conditions with the inability to physical distance themselves at work are high-risk factors for rapid transmission. The swift response from the public health authority was vital to suppressing the COVID-19 transmission at the workplace, which doesn't just protect the employees' health but also the economic impact to supply chains and downstream businesses (27).

Although guidelines are in place before the operationalisation of businesses, employees working in close proximity at workplaces are at risk for infection. The health authority would perform a risk assessment once a workplace cluster is detected to curb the transmission of COVID-19 by determining shared spaces where workers would congregate even when the workforce has been reduced. It has been demonstrated that the inability to distance themselves at the workplace physically is the leading cause of transmission (28). Therefore, the employer must demonstrate that a system is in place to ensure employees practise masking at all times, physical distancing on duty and breaks, and working from home if unwell. To ensure workplace compliance, enforcement and unprompted monitoring by the public health authority are done regularly.

The majority of patients diagnosed with COVID-19 were asymptomatic in the 2nd and 3rd waves at 67.3% and 66.0%, respectively. Recent literature has suggested that a quarter of the confirmed cases of COVID-19 infection were asymptomatic (29, 30). Our study highlights that majority of confirmed cases presented with no symptoms at the 2nd and 3rd wave of infection at 67.3% and 66%, respectively. The high incidence of asymptomatic COVID-19 patients at the point of testing may be attributed to the effective detection of close contacts with the COVID-19 patients by the public health authority. Once a confirmed case is identified, all the close contacts with a clear history of exposure are made to quarantine and screened twice using an RT-PCR test before being released. Although the risk of transmission of asymptomatic patients is low (30), it may still present a public-health risk if not quarantined because they are more likely to be out in the community (31).

We found that symptoms associated with the 2nd and 3rd wave of infection are fever with respiratory symptoms, respiratory symptoms only, ageusia or anosmia and other non-respiratory symptoms such as myalgia, diarrhoea, headache and fatigue. COVID-19 cases detected via symptomatic-based screening were at 15.4% and 10.8% at the 2nd and 3rd wave, respectively. It highlights the importance of actively screening patients who present with symptoms at any healthcare facility. The integration of public health oversight on case definition into primary care has impacted the identification of COVID-19 cases considerably by using serological rapid test kits on symptomatic patients presented to healthcare facilities.

Limitation of study

The findings of this study should be interpreted in the context of the limitations inherent, like the data on presenting symptoms used. This information was collected from preliminary assessments of the confirmed cases and was not obtained from their medical records. A more comprehensive retrospective or prospective cohort study needs to be conducted to include clinical follow-up and find independent risk factors for the disease progression in these COVID-19 patients.

CONCLUSION

It is our priority to address the pandemic to avoid straining the healthcare system. With most of the confirmed COVID-19 cases being asymptomatic, it is necessary to identify the transmission pattern using the established public health practice and prevention to fight this pandemic. This study suggests that the systematic epidemiological investigation and time-tested coordinated public health approach of tracing and testing close contacts, treating confirmed cases appropriately, and isolating close contacts are pivotal in managing the pandemic effectively. Without a clear pharmacological treatment for COVID-19, providing routine health promotion and education is central to breaking the infection chain. The pandemic highlights the importance of the public health experience in providing a comprehensive and integrated response as part of the solution to managing the COVID-19 pandemic.

Conflict of interest

The authors declare no potential conflict of interest.

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Disclosure

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REFERENCES

1. Wang F, Cao J, Yu Y, Ding J, Eshak ES, Liu K, et al. Epidemiological characteristics of patients with severe COVID-19 infection in Wuhan, China: evidence from a retrospective observational study. International journal of epidemiology. 2020;49(6):1940-50.

2. World Health Organization. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV) 2020 [Available from: https://www.who.int/news/item/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov).

3. World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19-11th March 2020: Geneva, Switzerland; 2020 [Available from: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020.

4. European Centre for Disease Prevention and Control. COVID-19 situation update worldwide, as of week 28, updated 22nd July 2021 2021 [Available from: https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases.

5. Hamzah NM, Yu M-M, See KF. Assessing the efficiency of Malaysia health system in COVID-19 prevention and treatment response. Health Care Management Science. 2021:1-13.

6. Miller IF, Becker AD, Grenfell BT, Metcalf CJE. Disease and healthcare burden of COVID-19 in the United States. Nature Medicine. 2020;26(8):1212-7.

7. Ministry of Health Malaysia. COVID-19 (Latest Updates) 2020 [Available from: https://covid-19.moh.gov.my/.

8. Marzuki AA, Nor NNFM, Rashid SMRA. AGING POPULATION TREND IN THE STATE OF PERAK, MALAYSIA. Quantum Journal of Social Sciences and Humanities. 2021;2(5):1-9.

9. Ahmad S, Jones D. Investigating the mining heritage significance for Kinta District, the industrial heritage legacy of Malaysia. Procedia-Social and Behavioral Sciences. 2013;105:445-57.

10. Ministry of Health Malaysia. Case Definition of COVID-19 2021 [Available from: http://covid-19.moh.gov.my/garis-panduan/garis-panduan-kkm/ANNEX_1-Case_definition_11052021.pdf.

11. Ng CFS, Seposo XT, Moi ML, Tajudin MABA, Madaniyazi L, Sahani M. Characteristics of the COVID-19 epidemic and control measures to curb transmission in Malaysia. International Journal of Infectious Diseases. 2020;101:409-11.

12. Bernama. No fourth wave: Malaysia still handling the third wave of Covid-19 infections, says Dr Adham 2021 [Available from: https://www.thestar.com.my/news/nation/2021/04/17/no-fourth-wave-malaysia-still-handling-the-third-wave-of-covid-19-infections-says-dr-adham.

13. Furuse Y, Sando E, Tsuchiya N, Miyahara R, Yasuda I, Ko YK, et al. Clusters of coronavirus disease in communities, Japan, January–April 2020. Emerging infectious diseases. 2020;26(9):2176.

14. Kim H-J, Hwang H-S, Choi Y-H, Song H-Y, Park J-S, Yun C-Y, et al. The delay in confirming COVID-19 cases linked to a religious Group in Korea. Journal of Preventive Medicine and Public Health. 2020;53(3):164.

15. Yadav AK. Impact of lockdown to control over Novel Coronavirus and COVID-19 in India. Journal of Family Medicine and Primary Care. 2020;9(10):5142.

16. Onyeaka H, Anumudu CK, Al-Sharify ZT, Egele-Godswill E, Mbaegbu P. COVID-19 pandemic: A review of the global lockdown and its far-reaching effects. Science Progress. 2021;104(2):00368504211019854.

17. McCall B. Shut down and reboot—preparing to minimise infection in a post-COVID-19 era. The Lancet Digital Health. 2020;2(6):e293-e4.

18. Rawson T, Huntingford C, Bonsall MB. Temporary "circuit breaker" lockdowns could effectively delay a COVID-19 second wave infection peak to early spring. Frontiers in public health. 2020;8:899.

19. Ong S-Q, Ahmad H, Mohd Ngesom AM. Implications of the COVID-19 lockdown on dengue transmission in Malaysia. Infectious disease reports. 2021;13(1):148-60.

20. Jones N. How coronavirus lockdowns stopped flu in its tracks. Nature (Lond). 2020.

21. Nicolay N, Mirinaviciute G, Mollet T, Celentano LP, Bacci S. Epidemiology of measles during the COVID-19 pandemic, a description of the surveillance data, 29 EU/EEA countries and the United Kingdom, January to May 2020.

Eurosurveillance. 2020;25(31):2001390.

22. 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.

23. Ganapathy SS, Chong ZL, Rodzlan Hasani WS, Rifin HM, Ab Majid NL, Shahein NA, et al. Epidemiological and Clinical Characteristics of 1,375 Cases of COVID-19 in Selangor, Malaysia. 2020.

24. Guan W-j, Ni Z-y, Hu Y, Liang W-h, Ou C-q, He J-x, et al. Clinical characteristics of coronavirus disease 2019 in China. New England journal of medicine. 2020;382(18):1708-20.

25. Alshukry A, Ali H, Ali Y, Al-Taweel T, Abu-Farha M, AbuBaker J, et al. Clinical characteristics of coronavirus disease 2019 (COVID-19) patients in Kuwait. PLoS One. 2020;15(11):e0242768.

26. Surendra H, Elyazar IR, Djaafara BA, Ekawati LL, Saraswati K, Adrian V, et al. Clinical characteristics and mortality associated with COVID-19 in Jakarta, Indonesia: a hospital-based retrospective cohort study. The Lancet Regional Health-Western Pacific. 2021;9:100108.

27. Ivanov D. Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case. Transportation Research Part E: Logistics and Transportation Review. 2020;136:101922.

28. Kabir H, Maple M, Usher K. The impact of COVID-19 on Bangladeshi readymade garment (RMG) workers. Journal of Public Health. 2021;43(1):47-52.

29. Alene M, Yismaw L, Assemie MA, Ketema DB, Mengist B, Kassie B, et al. Magnitude of asymptomatic COVID-19 cases throughout the course of infection: A systematic review and meta-analysis. PloS one. 2021;16(3):e0249090.

30. Kronbichler A, Kresse D, Yoon S, Lee KH, Effenberger M, Shin JI. Asymptomatic patients as a source of COVID-19 infections: A systematic review and meta-analysis. International journal of infectious diseases. 2020;98:180-6.

31. Nogrady B. What the data say about asymptomatic COVID infections. Nature. 2020;587(7835):534-5.