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Original Article

Early transmission dynamics of SARS-CoV-2 in Indonesia

Mudatsir Mudatsir[1,2,3]*, Synat Keam[4], Wira Winardi[5], Amanda Yufika[6], Ali A. Rabaan[7], Alfonso J. Rodriguez-Morales[8,9], Kuldeep Dhama[10], Abram L. Wagner[11] and Harapan Harapan[1,2,3]

[1]Medical Research Unit, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia; [2]Tropical Disease Centre, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia; [3]Department of Microbiology, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia; [4]School of Medicine, The University of Western Australia, Perth, Australia; [5]Department of Pulmonology and Respiratory Medicine, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia; [6]Department of Family Medicine, School of Medicine, Universitas Syiah Kuala, Banda Aceh, Indonesia; [7]Molecular Diagnostic Laboratory, Johns Hopkins Aramco Healthcare, Dhahran, Saudi Arabia; [8]Public Health and Infection Research Group, Faculty of Health Sciences, Universidad Tecnológica de Pereira, Pereira, Risaralda, Colombia; [9]Grupo de Investigación Biomedicina, Faculty of Medicine, Fundación Universitaria Autónoma de las Américas, Pereira, Risaralda, Colombia; [10]Division of Pathology, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh, India; [11]Department of Epidemiology, University of Michigan, Ann Arbor, Michigan, MI, USA.

*Correspondence:

Mudatsir Mudatsir
Medical Research Unit,
School of Medicine,
Universitas Syiah Kuala

E-mail address:
mudatsir@unsyiah.ac.id

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Abstract

The objective of this study was to determine the transmission dynamics of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and to evaluate the vigilance of the health system during the early phase of coronavirus disease 2019 (COVID-19) outbreak in Indonesia. The early epidemiology and transmission chains of COVID-19 were analyzed based on data from the Directorate General of Disease Prevention and Control of the Indonesian Ministry of Health. The results of this study shown although Indonesia is a country with a high relative importation risk of SARS-CoV-2, the first two cases of COVID-19 were identified on March 2, 2020. This relatively late date by regional standards raises the possibility of undetected cases beforehand. The first case was a foreigner citizen who visited the capital city of Jakarta and later was diagnosed COVID-19 after returning from Indonesia. One week later after the first case, 27 confirmed COVID-19 cases had been reported in Indonesia, and the majority of the cases were clustered together. Apart from the possibility of underdetection of COVID-19 cases in the country, the government has strengthened the disease surveillance system and established an outbreak preparedness system to diagnose and control COVID-19.

Keywords: COVID-19, SARS-CoV-2, transmission dynamic, pandemic, Indonesia

Introduction

The World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), as a Public Health Emergency of International Concern (PHEIC) on January 30, 2020, and a pandemic on March 11, 2020. As of August 21, 2020, based on data of Coronavirus COVID-19 Global Cases (Dong et al., 2020), more than 20 million confirmed cases had been reported with more than half million deaths.

In the early of pandemic, importation of cases from other parts of the word is facilitated by the interconnectedness of the countries and influenced by the air flight volume. Countries around the world have implemented multiple measures to prevent possible importation cases from China, the epicenter of the epidemic, to prevent local transmission. Because the implementation of these measures depends on the pre-existing public health system, laboratory infrastructures, and medical and political resources, some countries with weaker health systems, such as those in southeast Asia and Africa are reporting fewer COVID-19 cases than expected. Indonesia is one such country. Indonesia is the fourth most populous country in the world, and is ranked top 15 in import risk estimates (Salazar et al., 2020). Yet, no COVID-19 cases had been reported in the country before March 2, 2020, when two confirmed cases were identified. The objective of this study was to analysis of the early transmission pattern of COVID-19 in Indonesia and provides the vigilance of the country in terms of infrastructure, resources, and outbreak preparedness.

Methods

We reported on the epidemiology of disease and the transmission chains of early COVID-19 outbreak in Indonesia as of March 10, 2020, based on data from the Directorate General of Disease Prevention and Control of the Indonesian Ministry of Health (MoH). The case definition and criteria of COVID-19 used by the Indonesian Directorate General of Disease Prevention and Control follows the WHO criteria (WHO, 2020). Only confirmed COVID-19 cases were included. A confirmed case is defined as a COVID-19 case with laboratory confirmation, irrespective of clinical signs, and symptoms (WHO, 2020).

Results

Indonesia has a close geographical location with mainland China. Based on Indonesia Statistics Bureau, there were 1.2 million tourists from mainland China in 2019, and there are direct flights from Wuhan, China. Before the suspension of air travel between China and Indonesia on February 5, 2020, there were 134 flights per week from China to Indonesia, accounting for 5,000 passengers per day.

Using a worldwide air transportation network (WAN), a computational model found that Indonesia was ranked 12th in import risk estimates with an imported risk estimate 0.425%.4 The interpretation of this number is that if there are 1000 infected persons aboard a plane at an airport in the affected region, four are expected to have Indonesia as their final destination. Among the 20 countries with the highest risk, only Indonesia reported no cases as of February 1, 2020 (Humboldt University of Berlin and the Robert Koch, 2020). Among cities in Indonesia, Denpasar and Jakarta are the top two cities that have the highest risk. Another modeling study using data of imported cases of COVID-19, daily air travel volume, and disease surveillance capacity found that the daily air travel volume is positively correlated with the number of imported COVID-19 cases.2 The study predicted that Indonesia's situation lies below the 95% prediction interval of the model in which it was expected that approximately five cases existed already in Indonesia as of February 4, 2020. Using mobile phone data, air passenger itinerary, COVID-19 case reports, a study was conducted to estimate the relative importation risk from 18 high-risk cities in mainland China from February to April (Lai et al., 2020) The study also found that Indonesia ranked as the top 11th receiving the air travelers from those high-risk cities in which Denpasar and Jakarta rank 11th and 29th, respectively.

On March 2, 2020, the first two confirmed COVID-19 cases were detected in Indonesia. The patients were females, a 31-year-old (case 1), and a 64-year-old (case 2), from West Java province. Case 1 is the daughter of case 2. Case 1 had been in contact at a venue for social activity in Jakarta on February 14 with a Japanese citizen, who later tested positive on February 27 in Malaysia. The Japanese then had informed the case 1 on February 28 that he had been infected with COVID-19. After tracing, quarantining, and testing seven people who had close contact with cases in this cluster, two additional confirmed cases (case 3 and case 4) were identified on March 6, 2020, resulting in four confirmed COVID-19 cases (called as Cluster 1) (Figure 1).

Concurrent tracing and testing have been continued, and on March 9, 2020, 15 new cases were identified, of which five cases were associated with Cluster 1 (case 5, 10, 11, 12, and 13) (Figure 1). Eight cases were imported cases, and two cases (case 8 and case 16) were local community members who got infected by imported case 7 and case 15, respectively. On March 10, eight additional new confirmed cases were identified. Of those two cases (case 20 and case 21) were also associated with Cluster 1; five cases were imported cases where three were Indonesian, and two were non-Indonesian

(Figure 1). Interestingly, case 27 was not associated either with Cluster 1 or any imported cases, suggesting there was an existing cluster of infection.

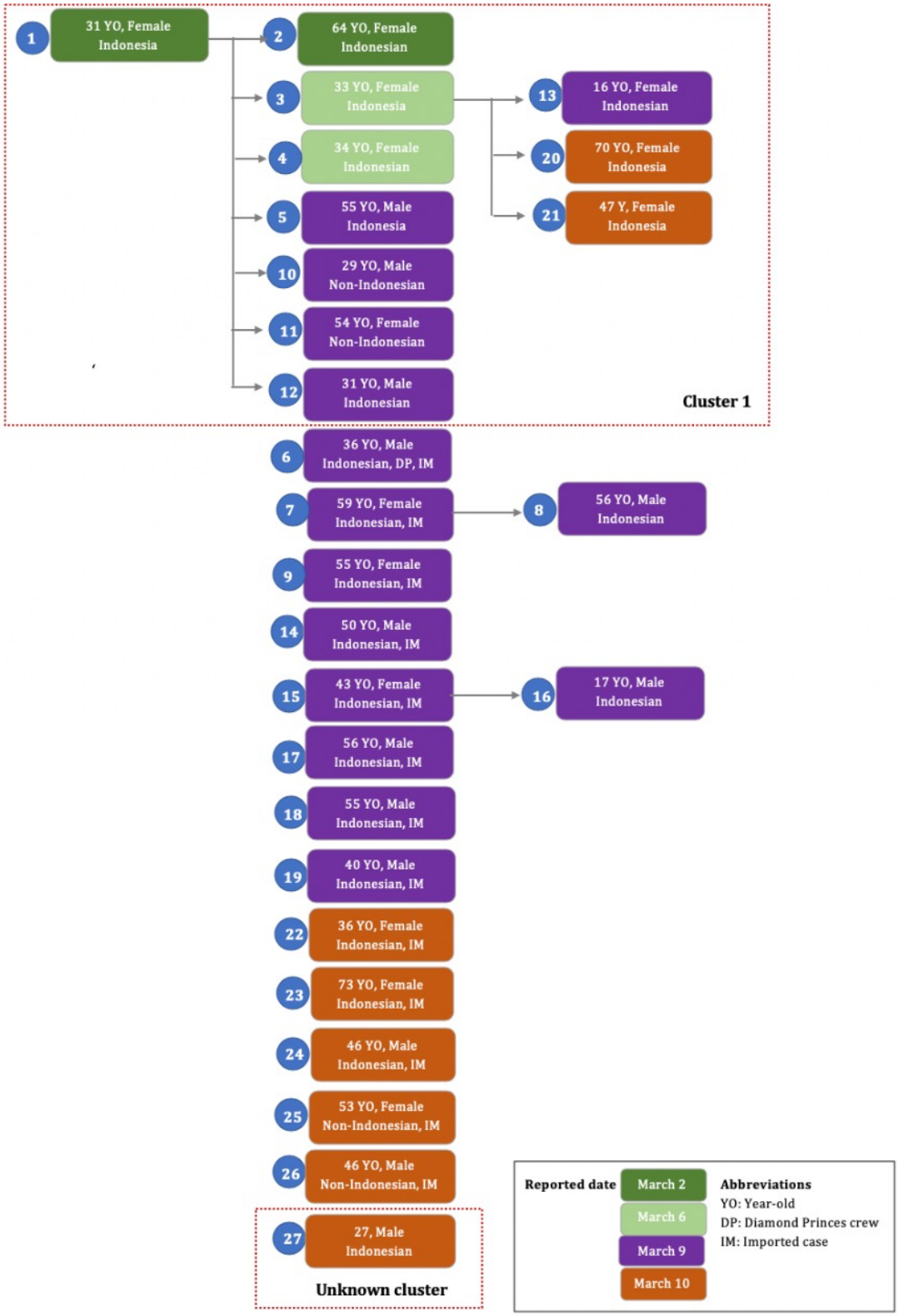

Figure 1. Transmission dynamics of early COVID-19 cases in Indonesia

Discussion

Even with the high R0 of SARS-CoV-2 and heavy inbound air passengers from Wuhan and other Chinese significant cities, Indonesia reported no case of COVID-19 until March 2, 2020. Hence, the question lies in whether Indonesia has indeed been coronavirus free or if there were untested virus carriers before March 2, 2020. It could be true that SARS-CoV-2 has already been in Indonesia before March 2. They remain missing. One possible explanation is the lack of understanding of the virus and the disease. For instance, infected people may think they are having a cold rather than COVID-19 as the symptoms of COVID-19 could be mild and mimic the common cold. Individuals with mild illness may not seek healthcare services or be screened for the virus. Also, healthcare infrastructure in Southeast Asia is generally substandard, especially in areas outside the capital cities. Hence, inadequate healthcare infrastructure (i.e., lacking equipment and facilities to identify the cases) in some areas may also contribute to less case detection. In the context of Indonesia, for instance, all samples collected from suspected cases have to be shipped to the capital city of Jakarta. Accordingly, the availability of a trained team of healthcare workers in each region of the country is critical to quickly process samples and identify cases.

A comparison with Zika can also shed light on difficulties diagnosing COVID-19. For Zika, although Indonesian health authorities never officially confirmed any cases, studies have reported confirmed Zika in travelers was coming from and presumably exposed in Indonesia (Kwong et al., 2013) or immigrant worker from Indonesia (Perng et al., 2019). Besides, a study found that 9.1% out of 662 healthy children aged 1–4-year-old from 30 urban sites across Indonesia were Zika virus seropositive (Sasmono et al., 2018). Interestingly, a study found that only 36% out of 442 doctors and 36% out of 242 had a good knowledge of Zika infection (Harapan et al,. 2017) and good attitude towards Zika infection (Harapan et al., 2018), respectively. In the recent study, out of 370 general practitioners who were asked about their attitude toward Zika test among patient with dengue-like illness, approximately 30% had a poor attitude (Yufika et al., 2021). These situations indicates that there may be challenges in health care services in diagnosing and screening of new diseases like Zika or COVID-19. Our data also suggest that only 70.8% of frontline healthcare workers in the country had good attitudes toward testing for Zika infection among patients with dengue-like illness (unpublished data). Overall, these findings might be related in part to no confirmed case of Zika being reported in Indonesia.

As of March 20, 2020, there have been 27 confirmed COVID-19 cases identified in Indonesia. At least one of these cases has no known chain of transmission, and there may be other cases associated with the other clusters. Both imported cases and local transmission have been reported in Indonesia. New cases are now epidemiologically linked to not only imported cases but domestic cases. This chain of transmission indicates that local and active human-to-human transmission of SARS-CoV-2 has been confirmed in Indonesia, the third most populous country in the world, with 260 million people. This outbreak requires timely and effective measures and strategies from Indonesian health authorities.

Prevention and control of COVID-19 transmission are carried out across ministries under the Coordinating Ministry for Human Development and Cultural Affairs. The Indonesian government has adopted several policies ranging from tightening inspection at 135 country entrances, including ports and airports, limiting international traffic, and strengthening community health services. On February 5, 2020, the Ministry of Transportation officially banned any flight to and from China to impede COVID-19 transmission to Indonesia. Inspection at country entrances is carried out by the Port Health Office (PHO) under the coordination of the MoH. All travelers are checked using a thermal scanner, and the travelers who have a fever will

undergo further examination and interviews. If a traveler fits the criteria for being under supervision, the traveler will be transferred to a designated hospital. Besides, the PHO officers will conduct contact tracing and put close contacts on the observation list. All findings are being reported to the Public Health Emergency Operation Centre of MoH.

At the community level, surveillance of COVID-19 is mostly carried out by Community Health Centers (known as Puskesmas). Each Puskesmas is responsible for serving around 30,000 residents, and Puskesmas in Indonesia cover about 86% of Indonesian healthcare services and provide both community and individual health services. The COVID-19 surveillance is conducted using the criteria issued by MoH and is supposed to be implemented in all Puskesmas in Indonesia under the coordination of the Provincial Health Office. Under these guidelines, all patients who have an influenza-like illness (ILI), pneumonia, and upper respiratory tract infection (URTI) and have close contact history to COVID-19 patients, or working and visiting a health care facility which treats COVID-19 patient(s), or having a previous trip to Hubei province of China, or close contact to the individual who has travel history to Hubei province of China within 14 days are strictly monitored and considered as cases being under supervision. For contact tracing, COVID-19 patients' close contacts are tightly evaluated and observed for 14 days. All COVID-19 close contacts are advised to stay at the observation site. Those who have symptoms will be referred immediately to a designated hospital for further medical assessments.

To prevent COVID-19 transmission in a health care facility, the MoH has set up a protocol of infection control. Clinical triage is carried out to separate patients with ILI or upper respiratory airway infection for further evaluation and monitoring, including a prompt laboratory evaluation. A patient who fits COVID-19 criteria will immediately be quarantined in a designated COVID-19 isolation room. In short, the national disease surveillance system has been strengthened since in the early of outbreak in Indonesia, and emergency responses have been activated as the nation responds to COVID-19 outbreak. To achieve success in controlling the epidemic, commitment, and financial support from national and local governments is required.

Conclusion

Active and local transmission of SARS-CoV-2 currently occurs in Indonesia and necessitates speedy and effective control measures from Indonesian health authorities. The Indonesian government has strengthened the disease surveillance system, established an outbreak preparedness system, and emergency team responses to control the outbreak.

Authors' contributions

Conceptualization: MM and HH; Data Curation: MM, SK, WW, and AY; Formal Analysis: MM and HH; Resources: HH; Validation: MM, SK, WW, AY, AAR, AJR, KD, and ALW; Visualization: HH; Writing – Original Draft Preparation: MM, SK, WW, AY and HH; Writing – Review & Editing: MM, SK, WW, AY, AAR, AJR, KD, ALW and HH.

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Conflict of interest

The authors declare that they have no competing interests.

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