



Tracing COVID-19 cluster during offline learning in the new era of pandemic

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ARTICLE INFO	ABSTRACT
<p>Article history Received: 2023-07-14 Revised: 2023-10-05 Accepted: 2023-10-20 Published: 2024-02-28</p> <p>Keywords COVID-19 Cluster Pandemic Tracing Transmission</p>	<p>Since January 2022, offline learning in the COVID-19 pandemic era has been going on for nearly a year. The government is attempting to revive the education sector, including universities. Nonetheless, this policy may result in the formation of a new SARS-CoV-2 infection cluster on campuses. One of the prevention measurements is conducting COVID-19 examinations. To support this effort, the infectious disease research team at Atma Jaya Catholic University of Indonesia (AJCU) examined COVID-19 infection by saliva specimens using RT-qPCR method, along with the completion of related questionnaire and epidemiology investigation form. Throughout the first week of December 2022, community service was conducted at the Pluit campus of AJCU with 749 participants (98.9% students). According to RT-qPCR results, only 12 participants (1.6%) were infected with SARS-CoV-2 virus. Most participants demonstrated positive compliance with health protocols, particularly, PeduliLindungi application scanning, hand washing, and mask usage. The implementation of health protocol resulted in a low positive rate compared to North Jakarta's statistics for the same week, preventing the formation of new COVID-19 clusters. The activity effectively controlled the spread of SARS-CoV-2 in AJCU environment, continuing the postponed 2030 agenda of the third Sustainable Development Goal to ensure good health and well-being.</p>
<p>Kata Kunci COVID-19 Klaster Pandemi Pelacakan Transmisi</p>	<p>Pelacakan Klaster Covid-19 saat Pembelajaran Luring di Era Baru Pandemi. Sejak Januari 2022, Pembelajaran Tatap Muka di era pandemi COVID-19 telah berlangsung selama hampir satu tahun. Pemerintah berupaya menghidupkan kembali sektor pendidikan, termasuk perguruan tinggi. Meskipun demikian, kebijakan tersebut dapat mengakibatkan terbentuknya klaster infeksi SARS-CoV-2 baru di kampus. Salah satu pendekatan dan solusi dari masalah tersebut adalah dengan melakukan pemeriksaan COVID-19 di lingkungan kampus. Guna mendukung kegiatan tersebut, tim peneliti penyakit menular Universitas Katolik Indonesia Atma Jaya (UJAJ) melakukan pemeriksaan infeksi COVID-19 dengan spesimen pooling air liur menggunakan metode RT-qPCR pada minggu pertama Desember 2022 di kampus Pluit Atma Jaya. Kegiatan tersebut melibatkan 749 partisipan (98,9% siswa). Menurut hasil RT-qPCR, 12 partisipan (1,6%) terinfeksi virus SARS-CoV-2. Hasil kuesioner menunjukkan kepatuhan peserta terhadap protokol kesehatan, terutama mengenai skrining aplikasi PeduliLindungi, mencuci tangan, dan menggunakan masker. Protokol kesehatan yang diimplementasikan di kampus membuat presentase positif rendah jika dibandingkan dengan data positif wilayah Jakarta Utara dan tidak terciptanya kluster baru COVID-19 di kampus. Pemeriksaan mampu mendeteksi adanya kasus positif dan mencegah penularan virus lebih lanjut. Melalui kegiatan tersebut telah dibuktikan bahwa persebaran COVID-19 dapat dikendalikan dengan baik di lingkungan UAJ. Menurunnya kasus positif diharapkan dapat mendukung pelaksanaan kegiatan Sustainable Development Goals (SDGs) yang tertunda khususnya agenda-agenda pada tujuan SDGs yang ke-3 dalam mencapai kesehatan dan kesejahteraan yang baik.</p> <p style="text-align: right;">Copyright © 2024, Kaisar et al This is an open access article under the CC-BY-SA license</p> <div style="text-align: right;">  </div>

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INTRODUCTION

The COVID-19 disease, which is caused by the SARS-CoV-2 virus, has been declared a global pandemic as of March 11, 2020. The declaration was made after the number of COVID-19 cases outside of China increased thirteenfold, with over 118,000 cases in 114 countries resulting in 4,289 fatalities (World Health Organization, 2020b). Consequently, it is affecting the process of achieving the third Sustainable Development Goal (SDG), which is to ensure healthy lives and promote well-being for all at all ages and impeding global efforts to achieve the 2030 agenda. Prior to the pandemic, substantial regional disparities hampered progress in many areas of health, including reproductive, maternal, and child health, immunization coverage, and the treatment of communicable diseases. COVID-19 had infected more than 500 million people worldwide by the middle of 2022. The latest estimates indicate that by the end of 2021, the number of global "excess deaths" directly and indirectly attributable to COVID-19 could have reached 15 million. The pandemic has severely disrupted essential health services in 92% of the 129 countries surveyed by the end of 2021, increased the prevalence of anxiety and depression, lowered global life expectancy, derailed progress toward eradicating HIV, tuberculosis (TB), and malaria, and halted two decades of work toward achieving universal health coverage. As a consequence, overall vaccination rates for diphtheria, tetanus and pertussis (DTP) declined for the first time in ten years, and approximately 14.9 million direct and indirect deaths and TB and malaria deaths increased. The pandemic had a substantial negative impact on the achievement of all 17 Sustainable Development Goals (SDGs), including the third objective to achieve "good health and well-being" (World Health Organization, 2022b, 2022a). According to Yuan et al. (2023), a number of adverse consequences associated with COVID-19 undermine the achievement of the third SDG: heightened healthcare demands, limited hospital services, and diminished medical resources allocated to other ailments. Therefore, continued effort in reaching this SDG remains crucial and we can resume the achievement of this goal by first tackling COVID-19.

As of October 11, 2021, Indonesia was ranked 1st in having the highest numbers of SARS-CoV-2 infections in Southeast Asia with 4.2 million confirmed cases (ASEAN Biodiaspora Virtual Center, 2021); however, as of June 20, 2022, Vietnam surpassed Indonesia with 6 million cases (ASEAN Biodiaspora Virtual Center, 2022). Based on Government Regulation No. 21/2020, the government issued the Large-Scale Social Restriction (LSSR) policy in response to the rising number of cases. In addition to the closure of schools and workplaces, the policy also restricted religious and other public activities. The policy was subsequently modified to Community Activities Restrictions Enforcement (CARE) at the beginning of 2022. It permitted restricted offline education for the education sector, dining together in public places (restaurants, cafes, etc.) with a maximum capacity of 50% for a limited time, and restricted work from the office for both essential and non-essential sectors. Entrance to public facilities also requires screening via the PeduliLindungi application (Indonesian Ministry of Home Affairs, 2022). By September 2022, there were a total of 6.4 million confirmed COVID-19 cases on a national scale. The number has decreased compared to the prior period. This might be related to the regulation and, in particular, the rapid mass administration of the COVID-19 vaccine that has been disseminated since the beginning of 2021, resulting in a decline in the number of positive cases throughout the years. The initial, second, and third vaccination doses were administered on January 14, 2021, February 17, 2021, and January 12, 2022, respectively. In Indonesia, the distribution and administration of COVID-19 vaccines vary based on the level of COVID-19 transmission. Due to the high frequency of transmission, DKI Jakarta in particular is one of the prioritized provinces. According to UNICEF data retrieved on 6 October 2022, the government's vaccination program has been fairly effective, with approximately 204 million people receiving their first dose, 171.1 million receiving second doses of the COVID-19 vaccine, and an additional 63.3 million receiving their third dose or first booster shot.

The pandemic, which lasted for almost three years, had a significant impact on teaching and learning activities, hampering the education sector, including higher education. To prevent the transmission of SARS-CoV-2 and ensure educational progress, online learning activities were initiated at the onset of the pandemic. In this new era of normalcy, the Indonesian government has implemented offline learning and social gathering that might result in new virus clusters due to natural virus that is still undergoing mutation and causing periodic infection surges. This incidence therefore concerns the formation of a campus cluster as it could extend to their own household after contact with infected individuals. The government was still encouraging people to continue adhering to health protocols, limiting the number of people in public areas, and in particular administering vaccinations. It is expected that the spread will be prevented through these activities; thus, as academicians at the university level, we would like to verify whether or not the program being implemented is effective in preventing clusters by observing positive cases on campus. The recent emergence of Omicron sub-variants, specifically XBB, has contributed to an increase in the prevalence of positive cases in Indonesia. Thus, the periodic screening of direct offline learning participants using NAAT (Nucleic Acid Amplification Test)-based diagnosis is one feasible and reliable strategy (World Health Organization, 2020a). Despite this, the diagnosis of SARS-CoV-2, which typically utilizes nasopharyngeal and oropharyngeal swab specimens (NPOP), can be considered impractical because it requires special preparation and might cause discomfort (Williams et al., 2021). Therefore, saliva as a specimen to detect SARS-CoV-2 with the RT-qPCR method is regarded as more practical and has been implemented in previous community service activities at multiple elementary schools from 2021–2022. In early December 2022, the academic communities of Atma Jaya Catholic University of Indonesia (AJCU) participated in similar campus-based activities. Since offline learning has resumed, it urges the AJCU academic community to ensure that learning activities were not affected or minimally affected by the COVID-19 pandemic. Subsequently, this situation necessitates an urgency for us to monitor and prevent both the transmission of COVID-19 and the formation of new virus clusters. The objectives of the community

service were tracing COVID-19 infection on the AJCUI campus, minimizing the transmission of COVID-19, and determining people's awareness of vaccination and health protocols, thus accelerating global efforts back on track to achieve the 2023 agenda of the third SDGs, ensuring health and wellbeing.

METHOD

The community service activity was held in the first and second week of December 2022, with 749 participants, the majority of whom were AJCUI students (98.93%), followed by AJCUI lecturers, employees, and relatives of the academic community (1.07%). The activity was conducted in collaboration with the coordinator and staff of the Pluit campus (AJCUI COVID-19 Laboratory), the undergraduate program, and the Biomedicine Master program from the School of Medicine and Health Sciences, Atma Jaya Catholic University of Indonesia. The activities were conducted in four parts: community service activity coordination and socialization, specimen collection, SARS-CoV-2 detection in the laboratory, and data analysis and results report.

Community Service Activity Coordination and Socialization

Prior to specimen collection, our team coordinated with the staff of relevant departments at AJCUI to conduct examinations among students, employees, and relatives of both targeted participants. Information and a schedule of the activities were disseminated via digital media, posters, and brochures. Comprehensive explanations regarding COVID-19 detection using saliva specimens and their collection are provided in the video via a link embedded on the poster, which serves to educate individuals who review the poster (Figure 1). The digital media contained an explanation of the efficacy of a screening method that was previously implemented in an elementary school as part of a community service initiative to prevent the spread of the virus following direct offline learning at school. Additionally, a concise overview of the COVID-19 detection process, from specimen collection to reverse transcription polymerase chain reaction (RT-PCR), was also presented. Explanations regarding the usage of saliva specimens were proven non-invasive and preferable by the students, thus supporting the method of saliva specimen collection in this current community service. In addition, the link provided access to the previously published paper by Mahendra et al. (2021), which specified the validity of saliva-based COVID-19 RT-PCR detection.

The brochure is titled "Penelitian & Pengabdian Masyarakat" (Research & Community Service) and is from FKIK UNIKA ATMA JAYA. The main heading is "PEMERIKSAAN COVID-19 GRATIS DENGAN METODE PCR SALIVA" (FREE COVID-19 TESTING WITH SALIVA PCR METHOD). It features an illustration of a laboratory and a person in a red cap. The dates are "30 November 2022 | 2, 5, 7, 9, 12 Desember 2022". Locations and times are listed: Kampus Pluit UNIKA Atma Jaya (10.00-14.00), Kampus Semanggi (Klinik) UNIKA Atma Jaya (09.00-14.30), and Kampus Cisauk (Klinik) UNIKA Atma Jaya (09.00-14.00). A note states: "Pemeriksaan ini diperuntukkan bagi seluruh Civitas Akademika UNIKA Atma Jaya dan keluarga, baik dengan dan/atau tanpa gejala maupun riwayat kontak dengan pasien positif." (This examination is intended for all UNIKA Atma Jaya academic community and family, both with and/or without symptoms and/or contact with positive patients). The brochure includes four numbered steps: 1. Read information about Saliva PCR and Video Tutorial at bit.ly/infopcrsaliva; 2. Download and fill informed consent, questionnaire, and epidemiology investigation form at bit.ly/formsaliva; 3. Bring documents to the testing location; 4. Collect saliva in a provided container. Contact information: WA Riset Infeksi 085693296645, risetinfeksi.fkikuaj@gmail.com. A QR code and a "REGISTER" button are also present.

Figure 1. Community Service Information Brochures

Specimen Collection

Participants were requested to provide informed consent on-site, complete the registration form, the COVID-19 questionnaire prepared by the research team and epidemiology investigation form issued by the Indonesian Ministry of Health, followed by the collection of saliva specimens in an open area at each predetermined location. Participants were required to fast 15–30 minutes prior to specimen collection. Each participant was instructed to collect 0.5–0.75 mL of saliva using a collection tube. The questionnaire form particularly inquired about participants' prior SARS-CoV-2 infection, vaccination history, and attitude toward five health protocols. Figure 2 depicted the community services' overall workflow.



Figure 2. COVID-19 Community Service Activity at Atma Jaya Pluit Campus: (a) Procedure for participant registration, completion of informed consent and questionnaire; (b) Distribution of tubes for self-collected saliva specimens; and (c) Saliva specimen collection by participants per research team instructions

SARS-CoV-2 Detection in the Laboratory

The detection of SARS-CoV-2 from saliva specimens was conducted at the enhanced biosafety level 2 (BSL 2) laboratory at the Faculty of Medicine and Health Science, AJCUI. The specimens were heated at 95°C for 10 minutes for the inactivation process. We also conduct the saliva pooling method prior to the heating process (Mahendra et al., 2021). This method has proven reliable with an overall agreement greater than 85% and has accelerated the testing capacity up to fourfold (Kaisar et al., 2022). Followed by virus detection using RT-qPCR with the xABT Multiple Real-Time PCR Kit to detect three target genes: Open Reading Frame 1ab (ORF1ab), Nucleocapsid (N), and Envelope (E). The RT-qPCR method was operated from November 30 to December 14, 2022.

Data Analysis and Results Report

The RT-qPCR results and questionnaire data were input and stored in Microsoft Excel. In addition, the distribution and frequencies for every question were generated. The RT-qPCR results would be delivered to each participant individually via WhatsApp within a maximum of 24 hours. Participants who were tested negative would only receive notification of results, which cannot be used as legal evidence for travel or other activities, whereas participants who were tested positive would receive both notification and COVID-19 test result from AJCUI COVID-19 laboratory, which can be used as legal evidence for follow-up treatment or independent isolation.

RESULTS AND DISCUSSION

Based on the RT-qPCR detection, 1.6% (12 of 749) of the participants tested positive for the SARS-CoV-2 virus. Within 24 hours, the participants were notified of the PCR results via WhatsApp and the PeduliLindungi (PL) application. In addition to the COVID-19 PCR test performed on saliva specimens, participants also completed the questionnaire and epidemiological investigation form. The data revealed that 97.7% of respondents had received the full dose of the COVID-19 vaccine, and 88.58% had also received the initial booster dose. Furthermore, 1.46% of participants had already received the second booster, which all were medical students of AJCUI. Compliance with health protocols was observed for "compliance with PL application scanning," which was always performed by more than 73% of participants; "hand washing activities," which were performed 5–10 times per day by nearly 60% of participants; and "wearing masks outside," which was performed by 85% of participants. However, 75% of participants occasionally engaged in "eating together with non-family members," and 76% rarely engaged in "social distancing >1.5 meters." Overall, the generally positive behavior of AJCUI residents to apply the COVID-19 health protocols in their daily activities resulted in 98.4% negative COVID-19 detections. Our research indicates that vaccination and adherence to health protocols, such as wearing masks and frequent handwashing, contributed to the low COVID-19 positivity rate. Previous studies also demonstrated that COVID-19 infection can be prevented through the consistent use of face masks, hand washing, and social distancing (Doung-Ngern et al., 2020; Masa et al., 2021; Egunjobi, 2020). The results are presented in Table 1 and Table 2.

Data collected from positive participants were analyzed separately (Table 3). According to the data, all infected participants had at least received the COVID-19 vaccine up to the first booster. Interestingly, 50% of the students who were positive when tested had previously been infected with SARS-CoV-2. This might be due to a number of factors, but one in particular involves the virus's mutagenic potential; an individual cured of the original SARS-CoV-2 is not effectively protected against its viral mutations or new infection. Upon infection with SARS-CoV-2, the host develops humoral immunity; however, the virus' mutagenic potential may enable it to adapt and infect individuals who have recovered (Costa et al., 2021; Fabiánová et al., 2021; Krishna et al., 2020). Moreover, on the implementation of health protocols, infected participants complied with the rules for wearing masks, although the majority of them do not always practice social isolation and dine with non-family members. This condition also applies to those who are tested negative in this examination, as they have also been vaccinated and adhere to the health protocol. With a positive rate of only 1.6%, which is lower than North Jakarta's positive rate of 5.84% of the corresponding week (Darmawan, 2022), the exact causes

of the infection cannot be precisely determined since there might be numerous contributing parameters such as a person's mobility, the people they meet, the health of their family at home, or their own immunity (Liu et al., 2020; Rashedi et al., 2020; Shereen et al., 2020).

Table 1. Previous COVID-19 infection history, vaccination history, and of participants

Parameter(s)	Total (%)
Demography (100% to each parameter)	
	2019
	2020
Students	2021
	2022
Lecturers and employees	
Others*	
	Private vehicle
	Public vehicle
Transportation	Private vehicle (>50%)
	No answer
	North Jakarta
	South Jakarta
	East Jakarta
Domicile	West Jakarta
	Central Jakarta
	Outside Jakarta
	No answer
COVID-19 infection history (according to antigen or PCR test; 100% towards each criterion)	
Never	
One time	
Two times	
Three times	
Four times	
Vaccination history (100% towards each criterion)	
1 st dose	
2 nd dose	
1 st booster	
2 nd booster	
1 st additional dose	
2 nd additional dose	
No answer	

*Relatives of students or employee

Table 2. Participant adherence to the health protocol

Parameter(s)	Total (%)
Health protocols (100% towards each criterion)	
	Sometimes
PL application scanning when entering public area(s)	Always
	Never
	No answer
	<5 times
Hand washing activities/day	5-10 times
	>10 times
	No answer
	In closed/crowded places
Masks usage	Always (outside home)
	No answer
	Never
Social distancing >1.5 meter	Sometimes
	Always
	No answer
	Never
Dining together with people (not family)	Sometimes
	Always
	No answer

Table 3. Survey results of participants with COVID-19 positive result

Parameter(s)		Total (%)
Demography (100% to each parameter)		
Students	2019	1 (8.33)
	2020	3 (25)
	2021	4 (33.33)
	2022	4 (33.33)
Transportation	Private vehicle	3 (25)
	Public vehicle	7 (58.33)
	Private vehicle (>50%)	2 (16.67)
Domicile	North Jakarta	5 (41.67)
	South Jakarta	1 (8.33)
	East Jakarta	3 (25)
	West Jakarta	2 (16.67)
	Central Jakarta	0
	Outside Jakarta	1 (8.33)
COVID-19 infection history (according to antigen or PCR test; 100% towards each criterion)		
Never		6 (50)
One time		5 (41.67)
Two times		1 (8.33)
Three times		0
Four times		0
Vaccination history (100% towards each criterion)		
1 st dose		12 (100)
2 nd dose		12 (100)
1 st booster		12 (100)
2 nd booster		10 (83.33)
1 st additional dose		0
2 nd additional dose		0
Health protocols (100% towards each criterion)		
PL application scanning when entering public area(s)	Sometimes	3 (25)
	Always	9 (75)
	Never	0
Hand washing activities/day	<5 times	0
	5-10 times	11 (91.67)
	>10 times	1 (8.33)
Masks usage	In closed/crowded places	2 (16.67)
	Always (outside home)	10 (83.33)
Social distancing >1.5 meter	Never	2 (16.67)
	Sometimes	10 (83.33)
	Always	0
Dining together with people (not family)	Never	0
	Sometimes	7 (58.33)
	Always	5 (41.67)

The COVID-19 testing using RT-qPCR revealed a low prevalence of SARS-CoV-2 infections in the environment of AJCUI. Based on the data, participants generally have positive attitudes and practices toward health protocols, which the Indonesian government encourages, such as using masks properly, maintaining social distance, and frequently washing hands with soap. Leech et al. (2022), Brooks and Butler (2021), and Cheng et al. (2021) demonstrated that mask-wearing behavior reduced COVID-19 transmission significantly. Other non-pharmaceutical public health interventions, such as social distancing and handwashing, have also been demonstrated to reduce COVID-19 cases (Manikandan, 2020; Talic et al., 2021; Wong et al., 2022). The successful implementation of health protocols protected participants from viral infections. To effectively halt the spread of COVID-19 and prevent tens of thousands of additional fatalities, it is essential to provide equitable access to safe and effective vaccines. The WHO has mandated that 70% of individuals in all nations receive vaccinations by the middle of 2022. However, global vaccine distribution is far from equitable. As of May 2022, approximately 17% of individuals in low-income countries had received at least one dose of a vaccine, compared to over 80% in high-income nations. During this community service, 174.8 million out of 273.5 million Indonesian citizens were recorded to have received both vaccination doses (62.9% vaccination coverage), with 68.5 million and 1.2 million citizens administered for the first and second booster, respectively, per December 2022 according to UNICEF. Based on UNICEF data in 2022, the ratio of AJCUI residents who have received the initial dose of vaccination to the national vaccination coverage is approximately 1:238,000, which has already been established as a satisfactory action of compliance in getting vaccinated to prevent COVID-19 transmissions. The majority of participants' (>80%) awareness and willingness to participate in vaccination programs could also contribute to the restoration of the third SDGs.

This community service at AJCUI supports offline learning in the new era of the pandemic by tracing the incidence of COVID-19 infection on the Pluit campus, allowing individuals to undergo independent isolation. In addition, COVID-19

testing helps prevent further transmission and the formation of new COVID-19 clusters on campus. Moreover, all faculty members and students should continue to implement the health protocols to avoid the spread of SARS-CoV-2.

CONCLUSION

The COVID-19 examination was able to detect 12 positive cases in individuals who were feeling healthy or without symptoms; therefore, they attended offline classes. Thus, this examination is beneficial for preventing further transmission of the virus by tracing contacts and requesting independent isolation. The activity effectively controlled the spread of COVID-19 in the AJCUI environment, therefore continuing the postponed 2030 agenda of the third SDGs to increase good health and well-being. In addition, a questionnaire-based form revealed participants' compliance with vaccination programs and health protocols. This study also demonstrated that no clusters have formed and that direct offline learning activities are safely conducted. We suggested that future research incorporate direct socialization activities to promote adherence to safety protocols and routine screening procedures to effectively prevent the transmission of viruses. In addition, our community service was positively received by the targeted participants; thus, further university-based initiatives targeting a different disease type can be executed similarly.

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