



The Transmission Patterns of COVID-19 in the Academic Community: An Epidemiological Study

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Abstract. The COVID-19 pandemic is an ongoing problem in the world. The etiology of this disease is a group of coronaviruses that cause severe acute respiratory syndrome (SARS) and middle east respiratory syndrome (MERS CoV). This virus is still mutating and producing new variants that have the characteristics of faster transmission. The spread occurs rapidly and creates a new pandemic threat. The whole community is at risk of being infected, including the academic community, especially those who are in direct contact with patients. The population in this study is the academic community of the Faculty of Medicine Universitas Muhammadiyah Surakarta (UMS) with a sample of 47 people who have confirmed COVID-19 in the period January to June 2021. This study is an observational study, collecting data using an online form where we aim to find patterns of transmission of COVID-19, determine adherence to procedures among confirmed individuals, survivors' perceptions of where they contracted it. The outcome is expected to provide recommendations to other academics in order to minimize the risk of being exposed to COVID 19. The results obtained were 21 of the 47 respondents who were confirmed to have COVID-19, were students of the clinical clerkship. Many confirmed cases occurred in the first wave of the pandemic, this is in accordance with data that health workers have a higher risk of exposure to COVID-19 than the general public. However, further data results show that 40% clinical clerkship were confirmed to have COVID-19 while at home. Respondents were exposed due to study holidays or conducting online studies. Almost all clinical clerkship also admit that the source of their COVID-19 transmission is not from the patient but the family and the environment around their residence.

Keywords: Academic community · COVID-19 · transmission patterns

1 Introduction

The number of COVID-19 cases In Indonesia was reported that there were 4,167,511 confirmed cases and 138,889 deaths in September 2021 [1]. The COVID-19 pandemic still occurs with the emergence of new variants as a threat that continues to spread from

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H. Nurdianto et al. (Eds.): ICCvD 2021, AHSR 52, pp. 370–377, 2023.

https://doi.org/10.2991/978-94-6463-048-0_43

one country to another country. The addition of these cases is followed by the change of the pattern of transmission. Transmission of the virus from person to person occurs through direct/indirect contact and aerosol/air droplet routes [2].

According to the WHO report, the pattern of spread at the beginning of the spread of this virus was dominated by family clusters [3]. In Indonesia, the level of transmission is turning from superspreader where an individual can infect many people in large numbers to the microspreader level, where individuals transmit only at the family. The distribution of family clusters dominates because children and adolescents have mild symptoms compared to adults. This result is potential for another infection to other household members [4].

Surya et al.'s research explain that the COVID-19 pandemic has a major effect on the risk of infection, especially for health workers [5]. This study shows that there are differences in the pattern of transmission in health workers. Initially, the spread of infection occurred in high-risk places, especially in health services, but turned into transmission in low or moderate risk areas, especially in family clusters. This is due to a lack of compliance in carrying out health protocols. The family is close contact relatives. It becomes the high-risk transmission of covid 19 [6].

Changes in transmission patterns indicate the need for more effective prevention measures and policies. The aim of this study was to determine the transmission patterns of COVID-19, the perception of COVID-19 survivors on the source of transmission, and to improve compliance to health protocols in the community. The expected result of this research is that it can provide recommendations to other academics in order to minimize the risk of being exposed to COVID-19.

2 Method

We collected online questionnaire data from 28 July to 17 August 2021. All samples are individuals who have confirmed COVID-19 that suitable with the "Guidelines for Prevention of Corona Virus Disease (COVID-19)" issued by the Ministry of Health of the Republic of Indonesia in 2020. This research has been approved by the Health Research Ethics Committee, Faculty of Medicine, Universitas Muhammadiyah Surakarta with the number C3752/C.1/KEPK-FKUMS/IX/2021.

This research is a descriptive observational study, the population of this study is all of the academic community of the Faculty of Medicine, Universitas Muhammadiyah Surakarta with a sample of 47 respondents. The characteristic analysis includes aspects of work status, adherence to health protocols (handwashing, eating activities, visits to public places, use of masks), prevention aspects (sports activities, vitamin consumption, and vaccination), sources of transmission, the pattern of symptoms and hospitalization.

3 Result and Discussion

Of the total 47 respondents, 13 (28%) were male and 34 (72%) were female. The characteristics of the most respondents were 21 (45%) a clinical clerkship followed by 19 (40%) students, 5 (11%) non-lecturer staff, and 2 (4%) lecturers. Based on these data, it is known that the subject with many confirmed cases of COVID-19 is a clinical clerkship.

Table 1. CHARACTERISTICS OF RESPONDENTS

Characteristics		n	%
Gender	Male	13	28%
	Female	34	72%
Status	Clinical clerkship	21	45%
	Student	19	40%
	Lecturer	2	4%
	Non-lecturer staff	5	11%
Health Protocol Compliance	Less disciplined	1	2%
	Disciplined	28	60%
	Very disciplined	18	38%
Eating activities	Dine-in	12	26%
	Take away	35	74%
Public place visit	Yes	26	55%
	No	21	45%
Washing hand	Routine	46	98%
	Not routine	1	2%
Physical exercise	Routine	21	45%
	Not routine	26	55%
Vitamin consumption	Routine	31	66%
	Not routine	16	34%
Avoiding the crowd	Yes	45	96%
	No	2	4%
Masks	Combination of surgical & cloth masks	17	36%
	Cloth mask	1	2%
	Surgical mask	13	28%
	KN95	15	32%
	N95	1	2%
Vaccination	Complete	31	66%
	Not complete	16	34%
Symptomatic	Yes	42	89%
	No	5	11%
Inpatient	Yes	8	17%
	No	39	83%

(continued)

Table 1. (continued)

Characteristics		n	%
Confirmed when	WFH	30	64%
	WFO	17	36%
Source of infection	Family	26	55%
	Community	14	30%
	Nosocomial	4	9%
	Unknown	3	6%
Infection from family cluster	Clinical clerkship	10	40%
	Student	14	52%
	Lecturer	1	4%
	Non-lecturer staff	1	4%
Symptoms	Dyspnea	10	21%
	Flu-like symptoms	37	79%

In Table 1, the compliance of the health protocols of the respondents was disciplined 28 (60%), very disciplined 18 (38%), and less disciplined 1 (2%). This information means that a person can potentially be infected with COVID-19 even though they have maintained health protocols with discipline.

Health protocols are washing hands, avoiding visits to public places including eating on the spot and wearing masks. Data shows that 46 (98%) of respondents wash their hands regularly, 45 (96%) of respondents avoid the crowd, 35 (74%) do take away. However, 26 (55%) respondents still visited public places. Then for the use of masks, the most use of masks with a combination of surgical masks and cloth masks by 17 (36%) followed by the use of kN95 masks 15 (32%), surgical masks 13 (28%), N95 masks 1 (2%), and cloth masks 1 (2%).

In addition to health protocols implementation, activities that support health such as exercise and vitamin consumption can be carried out to prevent COVID-19. As many as 31 (66%) respondents regularly take vitamins, but for sports activities, 26 (55%) do not routinely do it. Then one thing that is important to do next is vaccination. Most respondents have done a complete vaccine by 31 (66%). Even though, someone who has been fully vaccinated still has the potential to be confirmed COVID-19.

A person with confirmed COVID-19 can be symptomatic or asymptomatic. The data shows 42 (89%) respondents are people with symptoms. The most experienced symptoms were flu-like symptoms 37 (79%) and as many as 10 (21%) experienced shortness of breath. The incidence of hospitalization experienced by 8 (17%) respondents admitted that they had been hospitalized in a health facility while 39 (83%) stated that they had not.

Most respondents (64%) stated that they were confirmed when working from home and 17 (36%) when working from the office. The most common source of transmission came from 26 families (55%) followed by community sources (workmates and public

places) 14 (30%), then from nosocomial 4 (9%), and 3 subjects (6%) remained uncertain about their source of COVID-19 infection.

4 Discussion

This study shows that the largest number of respondents who were confirmed to have COVID-19 were clinical clerkship. The activities of clinical clerkships are mostly spent in health facilities such as hospitals, health centers, and other health facilities. This is what makes the incidence of this disease high, this is suitable with research that states that health workers who work in health facilities are at high risk of being infected with COVID-19 [5]. The factors that influence the risk are compliance with the use of personal protective equipment, hand hygiene, duration of work time, high-risk procedures, and environmental [5].

In efforts to prevent and reduce the transmission of COVID-19, an individual must comply with and implement health protocols. Health protocols in this case are washing hands, avoiding visits to a public place, physical distancing, and wearing a mask [7]. Regular hand washing can reduce the risk of transmitting the virus by 55% [8]. Although 98% of respondents wash their hands regularly, this does not prevent the possibility of being infected with COVID-19. Then, 55% of respondents stated that they still visit public places even though they have tried to avoid crowds. These public places include shopping places, offices, salons, public transportation, bars/coffee shops, places of worship, and restaurants. According to Fisher et al.'s research, the public place with the highest transmission rate of COVID-19 was in a restaurant with a p-value of 0.01 [9]. Therefore, the risk of eating in restaurants against COVID-19 transmission is high, even though 74% of respondents have eaten at home. The use of masks to prevent COVID-19 transmission can reduce the risk of transmission significantly ($n = 2647$; aOR 0.15, 95% CI 0.07 to 0.34, RD -14.3% , -15.9 to -10.7 ; low certainty), with stronger associations with N95 or similar respirators compared with disposable surgical masks or similar (e.g. reusable 12–16-layer cotton masks; p-interaction = 0.090; posterior probability > 95%, low certainty) [10]. Based on the data of this study, most respondents wore masks a combination of surgical masks and cloth masks, the use of this mask was also recommended by the CDC with an effectiveness of 85.4% [11]. Although the use of masks is effective in reducing the transmission of COVID-19, it does not rule out the possibility of being exposed to and infected with COVID-19. Health protocols have been implemented but it is undeniable that other factors that affect the transmission of COVID-19 still exist.

In addition to health protocols, taking vitamins can fight COVID-19 infection that accordance with the previous study. The previous study states that vitamin C consumption can reduce mortality ($p = 0.035$) [12]. This is suitable with 66% of respondents regularly consuming vitamins and only 17% of respondents who are hospitalized.

A person infected with COVID-19 can have various symptoms or even have no symptoms. The most complained symptoms were flu-like symptoms which were a collection of symptoms such as fever, cough, fatigue, headache, and sore throat [13]. This is suitable with the characteristics of our data, which is 79% experiencing flu-like symptoms. Then, data shows that 17% of respondents have been hospitalized.

The source of transmission in the respondents of this study was obtained by 64% of respondents who claimed to be confirmed during work from home (WFH) and the

36% during work from an office (WFO). The WFH spectrum in this study is all learning activities and work that is done from home, while transmission during WFO is defined as transmission from the workplace such as workmates, public places, and patients in health facilities. It can be interpreted that the most common source of transmission is during WFH, this is contrary to previous research which stated that the source of transmission has a high risk in health services where the majority of our academics work. The distribution of data shows that clinical clerkship who have confirmed COVID-19 (40%) stated that they were confirmed at home from their perception it was coming from family, the same thing was experienced by students at 52%, 4% for lecturers, and 4% for non-lecturer staff. More students are confirmed at home because they are undergoing online learning.

The pattern of transmission in the family cluster is caused by children and adolescents who have asymptomatic and mild symptoms, so that impacts continued transmission to all household members unconsciously [3]. SARS-CoV-2 will bind to and enter the body through the angiotensin-converting enzyme (ACE). Recent hypotheses suggest that children and adolescents exhibit lower ACE2 gene expression than older adults so that it can protect children from more severe symptoms [4]. Another thing that can affect is the shedding of the virus can occur before the onset of symptoms and can contribute to the spread of this virus [6].

The pattern of transmission that comes from the family is the largest number of our respondents. This is suitable with previous studies which stated that transmission was faster in family clusters [6]. Other data stated that the delta variant of COVID-19 transmission in family clusters compared to the alpha variant was significantly higher transmission among families with $p < 0.001$ [14].

5 Conclusion

COVID-19 is still spreading throughout the country, efforts to prevent and deal with the pandemic are still ongoing. The pattern of transmission that occurs in the academic community is influenced by many factors including health protocols such as washing hands, wearing masks, staying away from crowds, and physical distancing. The most common source of transmission is in the family due to very close interactions and lack of adherence to health protocols when dealing with family. Health protocols among family members need to be increased compliance and awareness. Asymptomatic symptoms and the different onset of symptoms should be cautious and early screening to stop the wider spread.

Author's Contribution. PI and DA designed the survey, collected data, analyzed data, and wrote the manuscripts; IN and YA conceptualized, collected, and analyzed data. All authors agreed with the content of the manuscript and approved the final manuscript.

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