HIGEIA JOURNAL OF PUBLIC HEALTH RESEARCH AND DEVELOPMENT

Education Unit's Characteristics and Covid-19 Positivity Rate in Yogyakarta : Ecological Study

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Article Info

Abstrak

Pembelajaran Tatap Muka (PTM) Terbatas saat pandemi COVID-19 memungkinkan terjadinya interaksi antar populasi yang menyebabkan terjadinya penularan COVID-19 di sekolah. Faktor yang mempengaruhi penularan COVID-19 di sekolah perlu diketahui untuk meminimalisir penyebaran kasus yang lebih luas. Penelitian ini bertujuan untuk menguji hubungan antara karakteristik satuan pendidikan seperti lokasi sekolah, jenjang pendidikan, status sekolah, jumlah peserta PTM, dan penerapan protokol kesehatan, terhadap positivity rate testing tracing COVID-19 pada satuan pendidikan di Daerah Istimewa Yogyakarta. Desain penelitian ini adalah cross-sectional studi ekologi dengan satuan pendidikan sebagai unit analisis. Sampel sebanyak 292 satuan pendidikan bersumber dari data sekunder Surveilans PTM Terbatas dianalisis secara univariat dan bivariat dengan uji *Chi-Square*. Hasil penelitian menunjukkan penerapan protokol kesehatan (p=0,022; PR=1,657; 95%CI=1,128-2,435) memiliki hubungan yang signifikan terhadap positivity rate COVID-19. Lokasi sekolah, jenjang pendidikan, status sekolah, dan jumlah peserta PTM tidak memiliki hubungan yang signifikan dengan positivity rate COVID-19. Sekolah dengan karakteristik apapun perlu mendorong warga sekolah untuk tetap menerapkan protokol kesehatan guna mencegah penularan COVID-19 di sekolah.

Abstract

Limited Face-to-Face Learning (PTM Terbatas) during COVID-19 pandemic allowed interaction between populations which led to COVID-19 transmission in schools. Factors affecting the COVID-19 transmission in schools need to be known to minimize the wider spread of cases. This study aims to examine the relationship between education unit's characteristics such as school location, educational level, school status, number of PTM participants, and health protocols implementation, to the COVID-19 positivity rate in education units in Daerah Istimewa Yogyakarta. The research design is cross-sectional ecological study with education unit as the unit analysis. Sample of 292 education units sourced from secondary data of PTM Terbatas Surveillance was analyzed univariately and bivariately with Chi-Square test. Results showed health protocols implementation (p=0.022; PR=1.657; 95% CI=1.128-2.435) had a significant relationship to the COVID-19 positivity rate. School location, educational level, school status, and the number of PTM participants had no significant relationship to the COVID-19 positivity rate. Schools with any characteristics need to encourage school communities to keep implementing health protocols to prevent COVID-19 transmission in schools.

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INTRODUCTION

The COVID-19 pandemic is one of the health issues that become the global main focus, because it is an infectious disease that spreads rapidly (Liu, 2020). COVID-19 or Coronavirus Disease is caused by SARS-CoV-2 which belongs to the genus Betacoronavirus and subgenus Sarbecovirus (Khan, 2021). This virus can infect humans and animals (Shi, 2020). Human-to-human transmission occurs through droplets or aerosols from the mouth and nose of an infected person. This virus can also be transmitted through direct contact with surfaces that have been contaminated with SARS-CoV-2 (van Doremalen, 2020). Suspect cases of SARS-CoV-2 infection have clinical signs such as fever, nasal congestion, sore throat, cough, nausea, diarrhea, and myalgia.

At the end of 2019, a cluster of cases with symptoms identical to acute pneumonia was found in Wuhan City, China. Within days, the cases spread to other cities in China and various countries (Munster, 2020). As of 11 December 2022, globally there have been 645 million confirmed cases of COVID-19 with a total death of more than 6.6 million so the global Case Fatality Rate (CFR) is 1.02% (World Health Organization, 2022). In Southeast Asia, Indonesia is the country with the highest number of new cases, namely 6.8 new cases per 100,000 population. In the COVID-19 Daily Report of the Ministry of Health of the Republic of Indonesia, Indonesia's COVID-19 Positivity Rate is 5.92% with a CFR of 2.39% (Kementerian Kesehatan RI, 2022a). Daerah Istimewa Yogyakarta (DIY) is the province that ranks sixth highest with the highest number of COVID-19 cases (3.5%) among 34 other provinces (Kementerian Kesehatan RI, 2022). As of September 30, 2022, the number of positive confirmed cases of COVID-19 in DIY was recorded at 224,741 cases.

Large-scale social restrictions during the COVID-19 pandemic resulted in learning and teaching activities being carried out from home. This has a significant impact on education, one of which is the occurrence of learning loss or reduced academic ability (Hasudungan, 2021). In the Joint Decree of the Minister of Education, Culture, Research and Technology, Minister of Religion, Minister of Health, and Minister of Home Affairs concerning Guidelines for Organizing Learning During the COVID-19 Pandemic, learning activities during the COVID-19 pandemic can be carried out through Limited Face-to-Face Learning (Pembelajaran Tatap Muka Terbatas/PTM Terbatas) by carrying out epidemiological surveillance which the results can be used to evaluate the readiness of PTM Terbatas and used as a basis for determining the continuation of PTM Terbatas implementation. PTM Terbatas Surveillance consists of monitoring the implementation of health protocols and finding active cases through periodic survey testing-tracing COVID-19 which involves puskesmas (Kementerian Kesehatan RI, 2021).

As much as 13.5% of the total confirmed cases of COVID-19 in Indonesia came from the age group of fewer than 18 years (UNICEF, 2022). The implementation of PTM Terbatas allows for meetings and social interaction between populations which can lead to the transmission of COVID-19 in schools for both students and teaching staff. Although school-age children are at lower risk of being infected with COVID-19, adults are at a greater risk of being susceptible to SARS-CoV-2 (Viner, 2021). School policies also play a role in influencing the spread of COVID-19 in schools. This was proven by a study that stated that schools without regulations on the use of masks had a 3.5 times greater risk of an outbreak of COVID-19 than schools with regulations on the use of masks (Jehn, 2021). The spread of COVID-19 cases in the population can be known through the positive ratio or positivity rate of COVID-19 which can measure the number of daily checks and positive confirmed cases (Al Dallal, 2021).

Several things that distinguish this research from previous research are this research was carried out in education units located in the Special Region of Yogyakarta and focused on the COVID-19 positivity rate as the dependent variable. The variables used in this study refer to

Technical Guidelines for Implementation of PTM Terbatas Surveillance of the Republic of Indonesia Ministry of Health 2021. To identify factors related to the spread of COVID-19 cases in schools, this study aims to examine the relationship between the characteristics of education units consisting of school location, educational level, school status, number of PTM participants, and implementation of health protocols to positivity rate of COVID-19 testing-tracing in education units in DIY. The hypothesis of this study is that there is a relationship between the characteristics of education units and the positivity rate of testing-tracing COVID-19.

METHOD

The research design used was a cross-sectional ecological study which is an observational study that compares exposures and outcomes over the same period with populations or groups as the unit of analysis. The population used as the unit of analysis in this research is the education units in DIY. This study used secondary data on PTM Terbatas Surveillance which reported in the period of January 1 until September 20, 2022 with a total of 384 educational units in DIY that were recorded in the PTM Terbatas Surveillance recording and reporting system, Directorate of Health Surveillance and Quarantine,

Directorate General of P2P, Ministry of Health of the Republic of Indonesia. The independent variables of this study were the characteristics of the education unit which consisted of school location, education level, school status, number of PTM participants, and implementation of health protocols. The dependent variable of this study is the positivity rate of COVID-19 testing tracing. The data source for the school status variable was obtained from the Reference Data open-source website of the Ministry of Education, Culture, Research, and Technology, to determine whether the educational unit has status as a public or private school.

The sampling technique in this study was purposive sampling. The sample in this study was education units that had implemented PTM Terbatas Surveillance and the results were reported in the PTM Terbatas Surveillance recording and reporting system, with exclusion criteria such as education units with multiple data, incomplete data, and invalid data. Education units that did not meet the criteria were found in 92 samples, so the sample size used was 292 samples. Univariate analysis was used to describe the frequency and percentage of the variables studied. Bivariate analysis with Chi-Square test used to test the relationship between variables of school location, education level, school status, number of PTM participants, and implementation of health
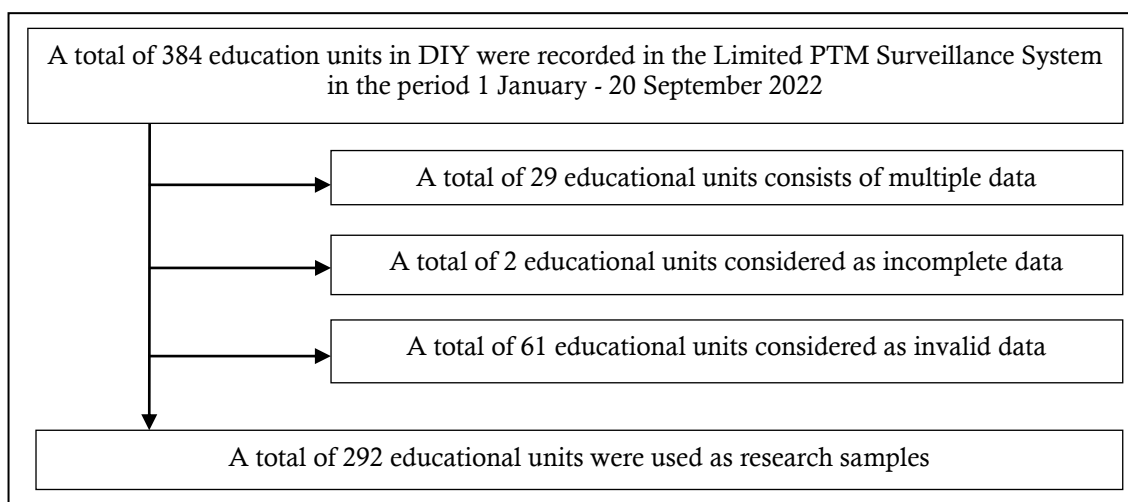

Figure 1. The flow of research sampling

protocols, with a positivity rate of COVID-19 testing-tracing.

Implementation of PTM Terbatas Surveillance in education units consist of surveillance on health protocols implementation and periodic survey of COVID-19 testing-tracing. Although the data used in this study were from data recorded in the period of January 1 to September 20, 2022, the execution of surveillance on health protocols implementation and periodic surveys of testing tracing for COVID-19 in education units was carried out at various times between September 2021 to September 2022. Executor surveillance of the health protocols implementation and periodic survey testing-tracing for COVID-19 is puskesmas. In this study, the categories on the variable number of PTM participants, implementation of health protocols, and positivity rate of COVID-19 testing tracing were adjusted based on the Technical Guidelines for Implementation of PTM Terbatas Surveillance of the Republic of Indonesia Ministry of Health 2021. The categories for the variable number of PTM participants included >300 and ≤300, while the categories for health protocols implementation consisted of poor and good. Surveillance of the health protocols implementation is carried out by the puskesmas by observing 10 people or school communities at each monitoring point such as the classroom area and the gate area or rest area. The aspects observed were individual compliance in (1) wearing masks properly, (2) maintaining a minimum distance of 1.5 meters, and (3) washing hands with soap/hand sanitizer (only applies to the gate area/rest area). The categories of health protocols implementation are determined based on scores derived from counting the number of people implementing the aspects observed (1 to 10) multiplied by the weights that have been determined at the two monitoring points. The total score that is categorized as a good health protocols implementation is ≥80, while a total score of <80 is categorized as a poor health protocols implementation (Kementerian Kesehatan RI, 2021). There is a potential for selection bias in

the selection of research subjects, because the observation of the health protocol implementation in PTM Terbatas Surveillance was carried out by observing aspects of the health protocols on 10 school communities in the related monitoring area which depended on the selection of subjects by the puskesmas officers.

Variable of positivity rate COVID-19 testing tracing is obtained through periodic surveys which include finding active cases through testing and if a positive case is found, it will be followed by first close contact tracing as well as second tracing if needed. The counting of the positivity rate consists of nominators that include the entire number of positive samples from the samples examined (from implementation testing to close contact tracing), while the denominator includes the entire number of samples that tested positive and negative results (from implementation testing to close contact tracing), which are then grouped into categories positivity rate of ≥5% and <5%. This study was carried out after obtaining Ethical Clearance (EC) approval from the Semarang State University Health Research Ethics Commission with Number: 474/KEPK/EC/2022.

RESULT AND DISCUSSION

The results of the univariate analysis in Table 1. show that out of 292 education units, the majority of educational units are located in Sleman District (50%). One of the factors that may influence the high number of educational units in Sleman District in this study is that Sleman District is the area with the largest population among other districts and cities in DIY. In the 2021/2022 school year the number of education units located in Sleman District is the largest compared to the education units in other regencies and cities (Badan Pusat Statistik Provinsi DIY, 2022). Based on the variable of educational level, Elementary School (Sekolah Dasar/Madrasah Ibtidaiyah - SD/MI) is more dominant (55.1%) compared to other levels of education such as Junior High School (Sekolah

Table 1. Univariate Analysis of Education Unit's Characteristics and Positivity Rate of

Variable	Frequency	Percentage (%) (n=292)
School Location		
Bantul District	28	9.6
Gunung Kidul District	26	8.9
Kulon Progo District	58	19.9
Sleman District	146	50
Yogyakarta City	34	11.6
Educational Level		
SD/MI	161	55.1
SMP/MTs	65	22.3
SMA/SMK/MA	66	22.6
School Status		
Public	205	70.2
Private	87	29.8
Number of PTM Participants		
>300	114	39
≤300	178	61
Health Protocols Implementation		
Poor	60	20.5
Good	232	79.5
Positivity Rate of COVID-19 Testing Tracing		
≥ 5%	80	27.4
< 5%	212	72.6

Menengah Pertama/Madrasah Tsanawiyah - SMP/MTs) and Senior High School (Sekolah Menengah Atas/Madrasah Aliyah - SMA/MA). SD/MI education units in DIY also have the highest number of education units compared to other education levels.

In other variables, the majority of education units have status as public schools (70.2%) and the number of PTM participants of ≤300 (61%). The number of education units that included into the category of poor health protocols implementation is 20.5% or 60 education units, while the education units that included as having good health protocols implementation are 232 education units or 79.5%. Based on the Technical Guidelines for Implementation of PTM Terbatas Surveillance (Real-Time Polymerase Chain Reaction), but areas that have limited PCR can use Antigen RDT (Rapid Diagnostic Test Antigen). PCR or

of the Ministry of Health Republic Indonesia 2021, education units that are classified as having poor health protocols implementation are recommended to return to conducting assessments related to school readiness in implementing health protocols and implementing PTM Terbatas in school, while recommendations for education units that have good health protocols implementation is routine development.

In the periodic survey testing tracing of COVID-19, it was found that 212 (72.6%) educational units have a positivity rate of <5% and 80 (27.4%) education units have a positivity rate of ≥ 5%. The high cases of COVID-19 in children can be caused by mild infections or are not characterized by any symptoms, so cases of COVID-19 in children are not easily detected (Asanati, 2021).

Based on the Technical Guidelines for the Implementation of PTM Terbatas Surveillance of the Ministry of Health of the Republic of Indonesia 2021, if the positivity rate of COVID-19 testing tracing in education units is found to be ≥5%, then the implementation of PTM Terbatas in the education unit is temporarily suspended for a minimum of 7x24 hours. One of the efforts to accelerate the prevention of the spread of COVID-19 cases in the population is to carry out early detection of cases through rapid tests and close contact tracing.

In order to monitor the incidence of COVID-19 cases in the education unit environment, the puskesmas carries out active case finding and close contact tracing through periodic surveys of COVID-19 testing-tracing in education units.

Testing is an early case-finding effort carried out with the aim of detecting whether a person has been infected with COVID-19, while tracing is an examination carried out with the aim of tracing close contacts of cases found in testing (Tiara, 2021). The recommended examination method is RT-PCR

molecular tests have a more specific sensitivity in identifying viral RNA, so it is recommended by the World Health Organization as a

confirmation of the diagnosis in individuals who have symptoms of COVID-19. The antigen method is used as a detection tool for high-risk individuals, protects vulnerable populations, determines the status of individuals undergoing quarantine, and creates a safe environment for a country's economic recovery (Peeling, 2022). One of the indicators used in handling a pandemic is the positivity rate which is calculated by comparing the number of people who have confirmed positive for COVID-19 with the total number of people who have been examined. A high positivity rate can occur because the number of people who have confirmed positive for COVID-19 is too high or the number of people who have been tested is too low. A study proves that there is a maximum correlation between the daily

positivity rate and the death rate and the number of patients in the Intensive Care Unit (ICU), which leads to the conclusion that a better indicator of the spread of COVID-19 is to use the positivity rate compared to the number of confirmed positive cases of COVID-19 because it measures the number of daily checks and positive confirmed cases (Al Dallal, 2021).

Table 2. shows that the characteristics of the education unit such as school location, education level, school status, and the number of PTM participants do not show a significant relationship to the positivity rate of testing tracing COVID-19 in schools. The statistical test value for the school location variable is p=0.049 (p<0.05) and the Prevalence Ratio (PR= 2.504) 95% CI=0.978-6.408. This shows that there is no significant relationship between school

Table 2. Bivariate Analysis of Education Unit's Characteristics on Positivity Rate of COVID-19 Testing Tracing in Education Units in Daerah Istimewa Yogyakarta

Education Unit's Characteristics	Positivity Rate of COVID-19 Testing-Tracing				Total		p-Value	Prevalence Ratio (95% CI)
	PR ≥5%		PR <5%		n	%		
	n	%	n	%				
School Location								
District	76	29.5	82	70.5	58	100	0.049	2.504 (0.978-6.408)
City	4	11.8	30	88.2	34	100		
Educational Level								
Primary School	49	30.4	112	69.6	161	100	0.247	1.286 (0.874-1.892)
Secondary School	31	23.7	100	76.3	131	100		
School Status								
Public	51	24.9	154	75.1	205	100	0.181	0.746 (0.510-1.092)
Private	29	3.3	58	66.7	87	100		
Number of PTM Participants								
>300	28	24.6	86	75.4	14	100	0.462	0.841 (0.567-1.248)
≤300	52	29.2	126	70.8	178	100		
Health Protocols Implementation								
Poor	24	40	36	60	60	100	0.022*	1.657 (1.128-2.435)
Good	56	24.1	176	75.9	232	100		

Description: *significant p-value <0.05

location and the positivity rate of COVID-19 testing tracing, so that education units located in districts and cities have no effect on the COVID-19 positivity rate in these education units. In a study using Local Indicators of Spatial Association (LISA) analysis, it was found that the pattern of the COVID-19 spread in several districts in East Java that have a low population density tends to have a low incidence of

COVID-19 as well (Sahara, 2022). Population density does not have a large effect on the morbidity ratio, because population density can have an impact on increasing interaction between residents while on the other hand population density also affects access to better health services (Khavarian-Garmsir, 2021). Although high population density plays a role in increasing social contact in society during

normal conditions, the demographic age of the population has a greater influence on morbidity than population density (Nguimkeu, 2021).

Based on the results of the bivariate analysis of the educational level variable obtained p=0.247 which indicates that there is no significant relationship between the educational level of an educational unit and the positivity rate of COVID-19 testing tracing. This result is different from a study that found that elementary school students have a lower risk of being infected with SARS-CoV-2 than high school students (Yuan, 2022), because children aged <10 years are at lower risk of being infected with SARS-CoV-2 (Viner, 2021).

Education units in Indonesia consist of schools with public and private status. Several things differentiate between private and public schools, including ownership, curriculum, study time, facilities, ethical values, and costs (Cakranegara, 2021). This differentiation allows the school status variable to have a relationship with the positivity rate of testing tracing COVID-19. However, in the results of this study, school status did not have a significant relationship with the positivity rate of COVID-19 testing tracing as shown by p=0.181. The variable number of PTM participants also did not have a significant relationship with the positivity rate of COVID-19 testing tracing with p=0.462, both schools with more than 300 or less than 300 PTM participants did not have a significant relationship with the positivity rate of testing tracing COVID-19 in schools.

Transmission of COVID-19 occurs through droplets at a certain distance, so the strategy to limit the transmission of COVID-19 in the population is prevention through social distancing, wearing masks, and washing hands with soap regularly (GÜNER, 2020). In the implementation of the health protocols variable, a significant relationship was found with the positivity rate of testing tracing COVID-19 with p=0.022 and PR=1.657; 95% CI=1.128-2.435. Education units with poor health protocols implementation are 1.65 times more at risk of having a positivity rate of COVID-19 testing tracing of ≥5%. This shows that in this study

only the variable of health protocol implementation was found to have a significant relationship with the positivity rate of testing tracing COVID-19. Therefore, education units with any characteristics, both in terms of school location, educational level, school status, and the number of PTM participants, need to encourage their respective school communities to keep implementing health protocols properly and correctly in order to prevent the spread of COVID-19 in schools. Previous research also stated that the possibility of an outbreak of COVID-19 in schools that do not have regulations on the use of masks is 3.5 times greater than in schools that have regulations on the use of masks earlier (Jehn, 2021). In previous research, it was found that there was a decrease in the spread of COVID-19 in schools (aOR: 0.25, 95% CI: 0.19–0.32) when preventive measures in the form of regulations on physical distancing and wearing masks were implemented (Yuan, 2022). Implementation of health protocols for school-age children is influenced by parental support in the form of attention, good practices from parents, and direct supervision (Wati, 2022). Knowledge and attitudes of students were related to compliance of health protocols implementation (Santi, 2022). The role of peers also influences the implementation of health protocols by students (Indriyanti, 2022). Not only in terms of students, school facilities that support the implementation of health protocols and the behavior of teaching staff in implementing health protocols also need to be a consideration. Because according to research at elementary schools in Palembang City, sanitation facilities were found that were not optimal and teaching staff was not yet disciplined in implementing health protocols such as washing hands with soap, maintaining distance, and using masks (Ardillah, 2021).

The percentage positivity rate is a calculation of the number of positive COVID-19 against the number of COVID-19 examination tests carried out. In dealing with the COVID-19 pandemic, an increase in COVID-19 tests needs to be implemented because the number of

positive COVID-19 found is certainly influenced by the total number of tests carried out (Sitompul, 2022). The more COVID-19 examination tests are carried out, the more potential positive cases of COVID-19 will be found in asymptomatic cases. The number of COVID-19 tests carried out also affects the percentage of positivity rate, because the more of the number of tests carried out, the lower of percentage of positivity rate for COVID-19. In the periodic survey of testing tracing COVID-19 in PTM Terbatas Surveillance, the number of samples is determined based on the number of PTM participants in each education unit. If the number of PTM Terbatas participants is ≤300, then the samples taken are 30 students and 3 PTK (educators or teachers). If the number of PTM Terbatas participants is> 300 people, then the sample taken is 10% of students and PTK from the education unit. However, in this study, it was found that 108 education units carried out COVID-19 tracing testing with a sample size that was not in accordance with the Technical Guidelines for PTM Terbatas Surveillance of the Indonesian Ministry of Health 2021. Therefore, the results of the positivity rate of COVID-19 testing tracing in this study were not sufficient to represent an overview of the spread of COVID-19 in education units in DIY.

In general, an increase in COVID-19 cases is influenced by various factors, such as humidity, rainfall, and wind speed in an area that has a significant relationship with an increase in COVID-19 cases (Azhari, 2021). The existence of holidays has an effect on population movement through the use of public transportation so it has an impact on the transmission of COVID-19 (Wahdaniah, 2022). The implementation of COVID-19 tracing testing in education units is carried out at different ranges of times so that the positivity rate of testing tracing COVID-19 in educational units can also be affected by the fluctuating COVID-19 positivity rate nationally.

CONCLUSION

Based on the study results from the analysis of PTM Terbatas Surveillance data, it can be concluded that there is a significant relationship between health protocols implementation to the positivity rate of COVID-19 testing tracing in education units in DIY. There is no significant relationship between school location, educational level, school status, and the number of PTM participants to the positivity rate of testing tracing COVID-19 in education units in DIY. Therefore, all education units with any characteristics are expected to be able to encourage all school communities to keep implementing health protocols as an effort to prevent COVID-19 transmission in schools.

The weakness of this study lies in the research design which focuses on the population level so that the research results cannot be generalized to the individual level. In this study, the COVID-19 positivity rate nationally has not been studied, so the suggestion for further research is to conduct research that includes variable of the daily COVID-19 positivity rate nationally.

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