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Research Article



## Association between close contact history and the risk of COVID-19 in Purwakarta District, Indonesia

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### ABSTRACT

**Background:** COVID-19 pandemic is a global problem. One of the risk factors for COVID-19 is close contact, which has a greater risk of being confirmed because virus transmission generally occurs directly through droplets. Based on regional risk zoning mapping, Purwakarta District is categorized as a moderate risk zone, and most of the confirmed cases are caused by a history of close contact. Still, people with a history of close contact only sometimes become established patients. This study aimed to determine the relationship between close contact status and the incidence of COVID-19 in the Purwakarta district year 2020.

**Method:** This study used observational analysis and a cross-sectional study design. The research data is secondary data from the Purwakarta Regency Health Office. Purposive sampling was used to select 2,650 people for the study. The data analysis method used is chi-square.

**Results:** According to the respondents' characteristics, most are in their early adulthood (26.8 %) and male (52.3 %). According to bivariate analysis, there is a p-value = 0.002 relationship between close contact status and the incidence of COVID-19. People with close contact status are 1.040 times more likely than people who do not have close contact status to get COVID-19 (95 % CI = 1.013-1.069).

**Conclusion:** Close contact status is a risk factor for COVID-19 transmission in Purwakarta Regency during 2020.

**Keywords:** COVID-19; close contact; risk factor.

### INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-COV-2).<sup>1</sup> Symptoms that arise due to COVID-



19 infection include fever, cough, and shortness of breath. The average incubation period is about 5-6 days, with the longest being 14 days. Coronavirus is a family of viruses that can cause mild to severe symptoms. In extreme cases, COVID-19 can cause pneumonia, kidney failure, acute respiratory syndrome, and even death.<sup>2</sup> Several types of Coronavirus are known to have severe symptoms, namely Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).

The urgency of the COVID-19 disease was marked by the WHO's determination of pandemic status on March 12, 2021.<sup>1</sup> The first report received by WHO on January 3, 2020, explained that the case originated in Wuhan, China, with 44 patients diagnosed with severe pneumonia.<sup>3</sup> The emergence of extraordinary events in Wuhan, Hubei province, China, marked this disease spreading. The problems caused by COVID-19 are not only local problems for residents of Wuhan, China. But also a severe problem worldwide due to increased cases that continue to increase daily.<sup>4</sup>

In 2020, there were 83,060,276 confirmed cases of COVID-19, with the death toll reaching 1,812,046 worldwide. The increase in COVID-19 cases is relatively fast; the spike evidences this in occasional cases. Based on the WHO report, the United States is one of the regions with the most confirmed cases, namely 20,216,991 cases with 350,778 deaths. Meanwhile, in the Asian region, the countries with the highest number of confirmed cases were India, Turkey, Iran, and Indonesia.<sup>5</sup> The first 5 cases in Indonesia were confirmed on March 2, 2020. The increase in COVID-19 cases is still increasing every day. Based on a report from the Indonesian Ministry of Health, as of August 30, 2020, there were 172,053 confirmed cases with a higher mortality rate than global data, which was 4.3% or 7,343 deaths. The province with the highest number of confirmed cases is DKI Jakarta, with 39,037 cases. Meanwhile, the province with the lowest number of cases was East Nusa Tenggara, with 177 cases.<sup>6</sup>

According to the Indonesia National Disaster Management Agency (BNPB), daily data on COVID-19 showed the five provinces with the highest number of cases: DKI Jakarta, East Java, Central Java, South Sulawesi, and West Java, which counted up to September 5, 2020.<sup>7</sup> The number of confirmed cases in Indonesia recorded throughout 2020 was 743,198 cases. This number continues to increase in cases every day. Twenty-five provinces experienced an increase in cases, one of which is West Java Province, with 83,579 cases. Based on the national COVID-19 case fatality rate, there has also been an increase of 22,138 people who died.<sup>8</sup>

Risk factors for COVID-19 infection included comorbid conditions in patients, such as comorbid hypertension and diabetes mellitus. In addition, close contact factors, age, gender, and smoking habits also potentially risk COVID-19. Close contacts are suspected of having a greater chance of being confirmed because exposure to confirmed cases carried out continuously for more than 15 minutes will make people with close contact status more susceptible to contracting the virus.<sup>9</sup> People with a history of close contact with confirmed cases are at high risk for exposure to the virus through droplet transmission. This generally occurs in cases of close household contact. Droplets from respiratory fluids can happen when a person is within one meter of an infected person. At the same time, contact transmission that occurs indirectly can be through the transmission of contaminated object surfaces or is called fomite transmission.<sup>10</sup>

The case report showed that the confirmed cases are related to transmission from COVID-19 patients and generally have a history of close contact with confirmed COVID-19 patients.<sup>11</sup> People who have closed contact with COVID-19 patients are considered to be most at risk for contracting the SARS-CoV-2 virus. The same goes for people caring for patients, medical personnel, and family members.<sup>12</sup> The results of research conducted in 2020 show that the SARS-COV-2 virus has a transmission rate of 5% to 6% in people with a history of close contact with patients with confirmed COVID-19. Transmission rates are higher when close contacts are in the family environment, up to 10%.<sup>13</sup> The health workforce is one of the close contact groups most susceptible to catching the virus; previous research found a substantial correlation between a history of close contact and verified COVID-19 cases in Makassar city, with close contacts having a 6.802 times higher probability of being diagnosed with COVID-19 than those without a history of close contacts.<sup>11</sup>

Confirmed cases of COVID-19 in West Java continued to increase every day until December 20, 2021; there were 73,948 confirmed cases of COVID-19, with a cumulative incidence of 163.49 per 100,000 population.<sup>8</sup> The number of deaths in West Java due to COVID-19 infection was 1,095 people. Based on the regional risk zoning mapping in 2020, Purwakarta District was categorized in the moderate risk zone.<sup>8</sup> Purwakarta District is one of the regencies in West Java's province. During the pandemic, the Purwakarta district was not spared from confirmed cases of COVID-19. The first confirmed case occurred on March 15, 2020, with an increase in cases weekly. However, the incidence of COVID-19 in Purwakarta District is relatively unstable; this is because, in June 2020, Purwakarta District had reached zero cases which also coincided with the implementation of Large-Scale Social Restrictions called PSBB in several areas in Purwakarta District.<sup>14</sup>

According to information from the Purwakarta District Health Office, most confirmed cases were also caused by prior close contact with patients who tested positive. Apart from the frequent interactions between workers at the same workplace, it is believed that the COVID-19 virus was spread when workers went home without realizing it had already entered their bodies. So that interactions taking on in the environment around us become unrestrained. The Purwakarta District Health Office claimed that exchanges take place regularly. The chance of COVID-19 cases being transmitted to family members and coworkers is increased by a history of close interaction with relatively long-term confirmed patients (most of them are asymptomatic). A history of close interaction with positive patients, primarily from household and business clusters, increases the number of confirmed cases. However, not all individuals with a history of close interaction are verified sick. A small percentage of close contact cases only sometimes progress to confirmed cases,<sup>4</sup> as observed from the COVID-19 surveillance report of the Purwakarta District Health Office. This study aimed to determine the relationship between a history of close contact and the prevalence of COVID-19 in Purwakarta. This investigation will contribute to efforts to prevent and control COVID-19.

## METHOD

This was an analytic observational study with a cross-sectional design using secondary data from the Purwakarta District Health Office between March and December 2020, recorded in surveillance data at the Purwakarta District Health Office. We collected 4,986 data during that period. Based on a calculation of the minimum sample, we needed 357 samples. Purposive

5 sampling was used to select the sample with inclusion criteria Purwakarta District residents who screened for COVID-19 in 2020 by conducting a PCR swab test, rapid antibody, and antigen tests. The exclusion criteria in this study were respondents with incomplete data. Two thousand six hundred fifty people were obtained based on the inclusion and exclusion criteria, and all were included in this study. The chi-square test was used to analyze the data.

## RESULTS

A few percent of the respondent (28.9%) of the cases of close contact belonged to the early adult age group, and 53.1% were male (Table 1).

**Table 1.** Distribution of respondents with close contact status by age and gender in Purwakarta District in 2020 with (n=2,650)

Characteristics	Close contact history			
	Yes		No	
	n	%	n	%
Age				
Toddler (0-5)	33	1.8	14	1.7
Children (5-11)	33	1.8	13	1.6
Early teenager (12-16)	45	2.5	12	1.5
Late teenager (17-25)	227	12.4	108	13.3
Early adult (26-35)	531	28.9	179	22.0
Late adult (36-45)	430	23.4	136	16.7
Early elderly (46-55)	326	17.8	165	20.2
Late elderly (56-65)	167	9.1	114	14.0
Elderly (>65)	43	2.3	74	9.1
Gender				
Male	974	53.1	412	50.6
Female	861	46.9	403	49.4

**Table 2.** Frequency distribution of respondents with confirmed COVID-19 status by age and gender in Purwakarta Regency in 2020 (n=2,650)

Characteristics	COVID-19 confirmation status			
	Yes		No	
	n	%	n	%
Age				
Toddler (0-5th)	39	1.6	8	3.6
Children (5-11th)	39	1.6	7	3.2
Early teenager (12-16th)	53	2.2	4	1.8
Late teenager (17-25th)	302	12.4	33	15.0
Early adult (26-35th)	657	27.0	53	24.1
Late adult (36-45th)	519	21.4	47	21.4
Early elderly (46-55th)	449	18.5	42	19.1
Late elderly (56-65th)	260	10.7	21	9.5
Elderly (>65th)	112	4.6	5	2.3
Gender				
Male	1,280	52.7	106	48.2
Female	1,150	47.3	114	51.8



The description of respondents based on the confirmed status of COVID-19 shows that most of the confirmed cases of COVID-19 also belong to the early adult age group of 27.0% and males at 52.7% (Table 2). The contact status variable was closely related to the incidence of COVID-19 with a value of sig = 0.002. The Prevalence Ratio (PR) = 1.040 (95% CI = 1.013-1.069), which means that people with close contact status have a 1.040 times greater risk of contracting COVID-19 than people without close contact status (Table 3).

**Table 3.** The results of the bivariate test of the relationship between close contact status and the incidence of COVID-19 in Purwakarta Regency in 2020

Close contact history	Status of COVID-19				Sig	PR (CI 95%)
	Yes		No			
	n	%	n	%		
Yes	1,704	70.1	132	69.2	0.002	1.040 (1.013-1.069)
No	727	29.9	88	30.8		
Total	2,430	100	220	100		

## DISCUSSION

COVID-19 is transmitted from person to person with close relationships with family members, friends, relatives, or direct contact with patients confirmed to be COVID-19,<sup>15</sup> especially for those in close contact with confirmed cases. A person who is declared to have close contact is if he has a history of contact with a probable COVID-19 case, he can be caught because he is close to a possible case within a 1-meter radius for 15 minutes or more, direct physical touch, people who provide direct care without using tools self-protection.<sup>16</sup> It increases the risk of COVID-19 transmission in the community, particularly for those in close contact with confirmed cases. This is confirmed by the WHO statement, which states that the transmission of the SARS-CoV-2 virus occurs through droplets and close contact with asymptomatic infected cases.<sup>10</sup>

Public awareness<sup>11</sup> of maintaining their distance and implementing health protocols is the primary key to breaking the chain of transmission of COVID-19. Public knowledge and awareness about the Coronavirus can provide deeper insight into current perceptions and practicing habits to prevent COVID-19.<sup>17</sup> People may have gained awareness and learn about the disease and its transmission via television, newspaper, and other platforms, to protect themselves and their families.<sup>18</sup> Low public awareness in accessing health services will also exacerbate the situation, causing high cases of COVID-19.<sup>19</sup>

The main transmission occurs through droplets originating from the respiratory tract. In addition, the transmission also occurs due to close contact with COVID-19 sufferers. Thus, people with a history of close contact have a high risk of exposure to the SARS-CoV-2 virus.<sup>20</sup> People at risk of contracting COVID-19 have close contact with COVID-19 patients, including those who care for patients.<sup>21</sup> In direct close contact, indicating that a healthy person accidentally touched a person infected with the SARS-CoV-2 virus or the person touched the surface of an object that a person touched with confirmed COVID-19 (fomite transmission). In general, the surface of these objects has been contaminated with droplets containing the SARS-CoV-2 virus from COVID-19 patients. The virus can remain stable for a certain period.

Therefore, it can support the entry of the virus into the body of healthy people, and the infection process will continue.<sup>22</sup>

The household member number is the most significant proportion of the risk of exposure to COVID-19. The analysis results in China also found that 78-85% of the clusters occurred within the household. This proves that the transmission occurred in long, close contact.<sup>23</sup> Confirmation cases originating from the company cluster occurred due to close contact with the same activity in a closed room for an hour or more with confirmation cases, which can pose a high risk for the infected.<sup>10</sup> Seventy percent of the cases identified were from close household contacts. Close household contact is also considered one of the most dangerous contacts.<sup>24</sup> This is due to the relatively small scope of the household, which allows high-speed person-to-person transmission.

Of the proportion of close contacts diagnosed with COVID-19, 44.2% were asymptomatic. This is more concerning because the risk of spreading the virus to others is greater and uncontrollable. According to WHO, the community's asymptomatic infection rate is still unknown. The proportion of asymptomatic cases may vary according to age and the presence of coexisting conditions.<sup>24</sup> However, efforts made to trace contacts and epidemiological investigations of cases and close contacts can provide information for disease management planning. Information gleaned from contact tracing suggests that asymptomatic people are less likely to transmit the virus than symptomatic people.<sup>10</sup>

The SARS-CoV-2 virus is more likely to be transmitted between household members through droplets or direct contact with contaminated surfaces. People with confirmed patients have a higher risk of infection than those who do not live in the same environment as confirmed patients. Patients demonstrated as symptomatic or asymptomatic are advised to perform independent isolation at home. On the other hand, implementing self-isolation for exposed family members allows for much greater exposure and risk for other family members, which causes close contact status, especially for families unable to provide a particular room for patients to isolate properly.<sup>23</sup>

We observed that most confirmed and close contact cases in Purwakarta District are dominated by early adulthood. According to the Health Office of Purwakarta District, this is most likely caused by transmission due to close contact in the work environment. Exposure to viruses in the workplace can occur anytime and anywhere, whether on business trips or while working in a room. Close contact in the work environment is related to age and can be exacerbated by comorbid diseases in patients. According to WHO, the risk of occupational exposure to COVID-19 depends on the likelihood of close contact (distance between people of less than 1 meter) or the frequency of contact with an infected person. Transmission can also occur through contact with surfaces contaminated with the SARS-CoV-2 virus.<sup>25</sup> Respiratory tract secretions released from infected persons can contaminate objects in the surrounding environment, causing the formation of fomites (contaminated surfaces). People who come into contact with contaminated surfaces often have close contact with infectious people, so droplet and fomite transmission are challenging to distinguish.<sup>10</sup>

The importance making efforts to break the spread of the COVID-19 virus can be done by complying with existing health protocols as a preventive measure in the spread of COVID-19. Efforts that all parties can take include social distancing, using masks outside the home,

washing hands with soap, and immediately cleaning up after activities outside the home.<sup>26</sup> Social distancing has a vital role in efforts to minimize interactions and crowds with many people. Social distancing is also one way to prevent the spread of the SARS-CoV-2 virus in a social group. This is because social distancing behavior will limit the reproduction rate in the spread of the virus among communities. In maintaining social distancing, people are strongly advised to postpone/avoid traveling to densely populated areas because they have a high risk of exposure.<sup>22</sup> Another thing that can be done is a regional quarantine, also stated in the health emergency regulations. Regional quarantine is a restriction on the population in an area, including the entrance area and its contents suspected of being infected with a disease, to prevent the possibility of a more massive spread of COVID-19.<sup>21</sup>

## CONCLUSION

The conclusion is made in one paragraph without any citation. The conclusion should not merely repeat points made in the preceding sections.

### Acknowledgment

Based on the results and discussion, it can be concluded that contact is closely related to COVID-19 and is a risk factor. The community is expected to have the awareness to properly implement health protocols and minimize exposure by continuing to use masks if it requires activities with many people as an effort to reduce risks due to close contact.

### Declarations

#### Authors' contribution

The first and second authors contributed to the research design, data collection, analysis, and manuscript.

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#### **Conflict of interest**

There is no conflict of interest in this research.

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