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Epidemiology of COVID-19 in Indonesia: common source and propagated source as a cause for outbreaks

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Abstract

Introduction: The COVID-19 outbreak first occurred in China and has developed throughout the world, including Indonesia. The Indonesian government reports that up to May 22, 2020 there have been 21,430 confirmed cases. The purpose of this study is to describe the epidemiology, clinical symptoms and comorbidities of COVID-19 as well as the various government interventions to reduce the rate of incidence.

Methodology: A retrospective cohort study was designed. The population in this study is based data from the official Indonesian government website run by the Task Force for the Acceleration of Handling COVID-19. The sample was observed from March 2 to April 24, 2020. The total sample included 8,211 cases of patients diagnosed with COVID-19, among these 1,002 recovered and 689 died. Data analysis used percentages from various recorded epidemiological variables.

Results: The results showed that COVID-19 epidemiological features were mostly observed in men (56.5%) and patients of productive age (31-59 of age) by 57.5%; most deaths were recorded in patients aged > 60 years (43.6%). The most recurrent clinical symptom was cough (77.8%), the most recurrent comorbidity was hypertension (52.4%), and the province with the highest COVID-19 incidence was DKI Jakarta (34.3%).

Conclusions: The combination of common sources and propagated source was observed during the COVID-19 outbreak in Indonesia. Special attention should be given to protecting vulnerable populations such as children, health care providers, and the elderly. The community is expected to participate in preventing the transmission of COVID-19 by complying with health protocols.

Key words: Epidemiology; COVID-19; Propagated; Common Source.

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Introduction

The COVID-19 outbreak initially emerged from Wuhan, Hubei, China at the end of 2019, and almost the entire world reported cases in their respective countries. It was originally reported as a case of pneumonia caused by an unknown pathogen. The International Committee on Virus Taxonomy in China collected pneumonia samples from several locations and detected samples of the pathogen that caused pneumonia, the corona virus SARS COV-2 [1]. Furthermore, on January 30, 2020, the World Health Organization (WHO) established the Public Health Emergency of International Concern (PHEIC) and on February 11, 2020, the pathogen was named COVID-19 [2]. Since appearing in Wuhan, at the end of 2019, the corona virus has now spread to more than 213 countries with 2,724,809 patients with and 187,847 deaths. The spread of the COVID-19 was very fast, especially in the country where the case began. As reported by the RRC National Health Commission by February 2020 there have been 80,000 cases with more than 2000 deaths [3]. Indonesia first

announced COVID-19 cases through an official statement by the president on March 3, 2020, the first two people infected (64 years and 31 years of age). The Indonesian patients had contact with Japanese people who contracted the coronavirus while in Indonesia [4]. According to data collected, by April 24, 2020 the total number of COVID-19 cases in Indonesia reached 8,211 cases. Of these, 1,002 have been declared cured and, 689 died while the rest are still undergoing treatment at the time of writing. As many as 39,943 people were examined so that the ratio increased to 173 cases / one million people [5]. The Indonesian government reported that as of May 22, 2020 21,430 cases were confirmed; of the latter, 14,413 people (69.3%) were under treatment, 5,057 people recovered (24.32%) and 1,326 people died (6.4%). Based on the incidence ratio, there was an increase to 173 cases / 1 million people [6]. The purpose of this study was to describe the epidemiology, clinical symptoms and comorbidities of COVID-19 patients as well as the various government interventions to reduce the rate of incidence.

Methodology

The design of the study was based on a retrospective cohort. Study population consisted of data on COVID-19 cases from the official Indonesian government website managed by the Task Force for the Acceleration of Handling COVID-19 [6]. Observation of the sample took place between March 2 to April 24, 2020. Of the total sample of 8,211 COVID-19 cases, a total of 1,002 patients recovered and 689 died. During the observation period, existing epidemiological data included: gender, age, clinical symptoms, comorbidities, daily curves, and the distribution of cases in Indonesia. In addition, some information from the official website of the regional government, with the highest COVID-19 incidence, include DKI Jakarta, Central Java, East Java related to policy interventions carried out to reduce the rate of COVID-19 infection [7,8,9]. Data analysis uses percentages from various recorded epidemiological variables.

Ethical Considerations

All procedures performed in this study were in accordance with the national research committee's ethical standards. The study was approved by the Health Research Ethics Commission, Muhammadiyah

University of Purwokerto, by Number: KEPK/UMP/15/VII/2020.

Results

The results of this COVID-19 epidemiological retrospective cohort study in Indonesia showed several epidemiological variables an overview of the COVID-19 events is shown in Figure 1, with a higher percentage of male than female patients. Positive COVID-19 patients were males in 56.5% of cases and 54,4% of patients hospitalized because of COVID-19 were males, Among patients recovered 60.6% were males and 63.8% of deceased were men. The incidence of COVID-19 based on age classification, is shown in Figure 2, with following results: the highest mortality occurred at age > 60 years 43.6%, then 46-59 years of age 40% and the lowest rate was observed in children and toddlers 0,7%. Furthermore, for the COVID-19 cure rate variable, the highest percentage was in patients of 31-45 years of age 31.3%, then 46-59 years old 29.7% and the lowest was 0-5 years 1.2%. Most of the COVID -19 patients were 31-45 years old 29.9% and the smallest group was 0-5 years old patients 1.9%. The incidence of COVID-19 was reported mostly by 31-45 years old patients 29% and the least affected were patients in the age 0-5 years 1.7%. Figure 3 shows the

Figure 1. Covid-19 incidence based on Gender.

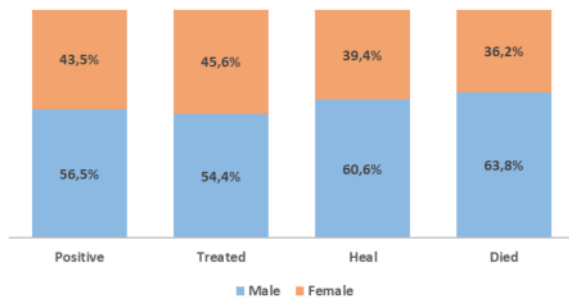


Figure 3. Covid-19 base on clinical symptoms.

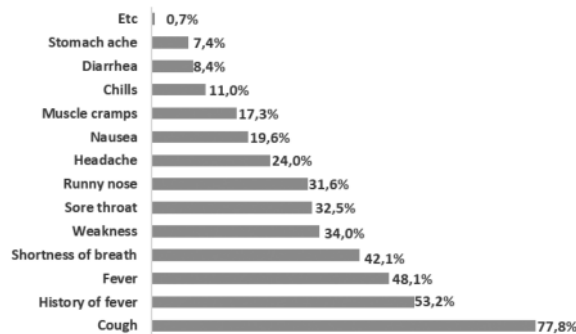


Figure 2. Covid-19 incidence based on age.

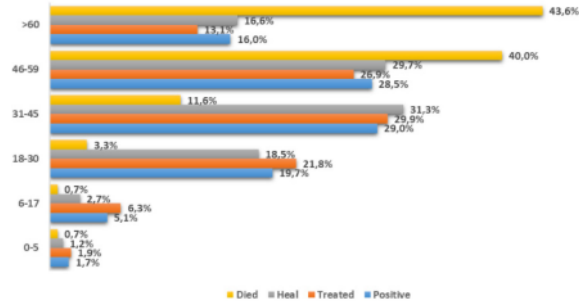
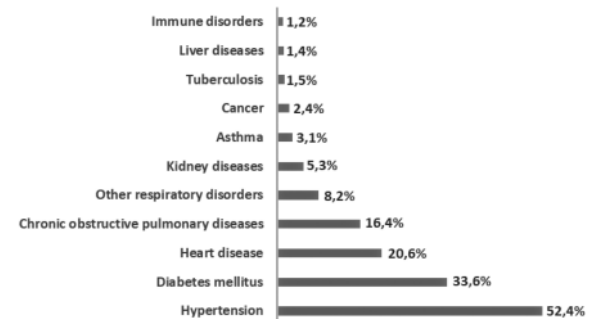


Figure 4. Covid-19 incidence based on comorbidities.



variable of COVID-19 clinical symptoms: 77.8% cough, 53.2% have a history of fever, 48.1% have fever, 42.1% have shortness of breath and 34.0% experience weakness. Figure 4 shows that COVID-19 is more common in people with comorbidities. The data showed 52.4% of patients with a history of hypertension, 33.6% with a history of diabetes mellitus, 20.6% with a history of heart disease. Figure 5 illustrates that COVID -19 mostly occurs in areas with high population density and mobility. The existing data shows Jakarta as the capital city of Indonesia with the highest number of deaths 34.3%, followed by East Java 12.3% and West Java 9.4%. Figure 6 shows the incidence of COVID -19 from March 2 to April 24 2020, with a total of 689 deaths. The graph shows case fluctuation, an upward trend, although there has been a decline over time. The new COVID-19 incidence graph based on approximately one month of observation shows an outbreak. The COVID-19 outbreak was possible initially because of exposure to the same and common sources, including mobilization abroad, mobilization to areas with a high incidence of COVID-19. In addition, the second cause was due to the massive person-to-person transmission. Transmission can occur due to touch, crowds in activities, etc. Thus, based on the graph of COVID-19 incidence that occurred in Indonesia during the observation of more than one month, it is predicted that the two types of causes of the outbreak (common source and propagated source) were involved.

Discussion

Figure 1 describes that the majority COVID-19 patients were male (56.5%). The higher number of COVID-19 cases in men is partly due to the higher mobility of men compared to women especially when they have to go out to work. In addition to the aspect of mobility at work, biologically men are more susceptible to viruses. This has also been reported by the CDC's Morbidity and Mortality Weekly Report, which found

Figure 5. Covid-19 incidence by region.

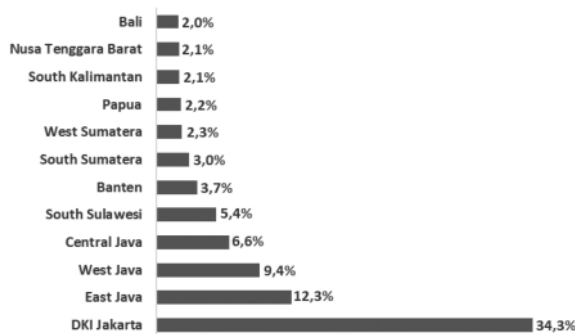
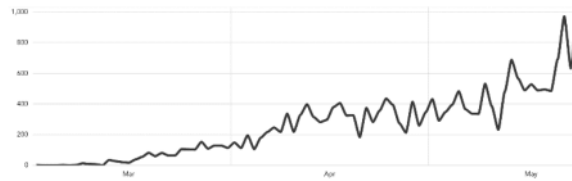


Figure 6. Covid-19 base on time.



a higher prevalence of patients experiencing COVID-19 in men in every age group, including children, newborns and infants. Studies reported more than in 2,500 children - aged 0 to 18 years diagnosed with COVID-19, around 57% were male, showing that biological factors make men more susceptible to the virus [10]. This result is in line with a report from the Chinese National Reporting System which reports that of all COVID-19 cases 51.1% were men [11]. Figure 2 provides information on COVID-19 cases, showing that most deaths from COVID-19 occur in the elderly. The same thing happened in Wuhan, where most deaths occurred at age > 60 years [11]. This is because in old age the immune system is weaker, allowing the development of a faster viral infection. This is was reported in USA by Lisa Maragakis, Senior Director of Infection Prevention at Johns Hopkins Medicine University, showing that 8 out of 10 deaths from COVID-19 in the US are in patients over 65 years of age. That was caused by several factors including [12]:

- (i) older people have long-term health problems so they are more at risk when exposed to the virus;
- (ii) person's immune system decreases when he reaches old age, making it difficult to fight infection;
- (iii) the lining of the lungs is less elastic in old age, so diseases such as COVID-19 might be deadly;
- (iv) Inflammation in old age can be more dangerous, and cause damage to organs.

Figure 3 provides information on clinical symptoms of patients with COVID-19, most of whom experienced cough (77.8%) and, history of fever (53.2%). In line with some previous research, which concluded that COVID-19 clinical symptoms included fever, cough, fatigue, pneumonia, headache, diarrhea, hemoptysis, and dyspnea [13]. According to the results of Huang, *et al.*, COVID-19 clinical symptoms include: fever, some patients reported difficulty breathing, and X-rays show extensive pneumonia infiltrates in both lungs. According to the results of preliminary epidemiological investigations, most of the Preparedness Guidelines for Coronavirus Disease (COVID-19) are based on previous MERS and SARS events, so COVID-19

transmission is the same as MERS and SARS. Human-to-human transmission occurs through droplets, contact and contaminated objects [1]. The results of this study are in line with previous studies, there is a similarity in clinical symptoms in COVID-19 patients: common symptoms were fever (85.71%), cough (60.71%), brachypnea (7.14%), chest distress (7.14%), headache (7.14%), diarrhea (7.14%), and hemoptysis (7.14%) [14]. Corona virus can also cause infection in some animals such as tigers, cats, dogs, and humans, especially infecting the respiratory system such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). Most patients have mild symptoms and a good prognosis. So far, some patients with COVID-19 have progressed to severe pneumonia, pulmonary edema, vital organ failure and death [15,16].

Empirical estimates from time series intervals from the beginning of the disease in the first case (a primary case) to the disease in the next case (a secondary case) are needed to understand the change of case generation and disease transmission. Several epidemiological studies using contact tracking data from cases reported in Hubei Province at the start of the epidemic estimated an average serial interval at 7.5 days [17]. This is in line with previous studies, which reported infection for Severe Acute Respiratory Syndrome (SARS) with an average interval of 8.4 days [18]. Recent research on COVID-19 showed the estimated median serial interval of COVID-19 at 4.0 days, shorter than the incubation period, this shows that the rapid transmission cycle and case isolation are very fast [19]. Figure 4 shows that as far as co-morbidities are concerned most of COVID-19 patients are at risk of hypertension (52.4%). The research concluded that COVID-19 patients with a history of hypertension had significantly lower lymphocyte counts. Therefore being old and affected by comorbidities such as hypertension can act together as a risk factor leading to a poor prognosis in patients with COVID-19 [20]. The same conclusion was drawn by previous studies, which concluded that hypertension is the most reported comorbidity in COVID-19 patients, followed by diabetes mellitus, cardiovascular disease, chronic pulmonary disease or malignancies [11]. The next most commonly reported comorbid disease in COVID-19 patients is diabetes. This shows that someone who has diabetes is at high risk of getting COVID-19, both for type 1 diabetes or type 2 diabetes. This is due to an increase in blood sugar. High level of sugar in blood can exacerbate existing diseases, including COVID-19. This is because high level of sugar in blood affects the ability of the virus to infect a

person. Diabetes also increases the risk of inflammation and worsens the immune system functions [12]. The same thing was concluded from the study of Weina Guo, *et al.* who found that 24 COVID-19 patients without other comorbidities but with diabetes had a higher risk of developing severe pneumonia, release of enzymes associated with tissue injury, inflammatory response and dysregulation of glucose metabolism. In addition, serum levels of inflammation-related biomarkers such as IL-6, C-reactive protein, serum ferritin and the coagulation index, D-dimer, were significantly higher ($P < 0.01$) in diabetic patients compared to those without diabetes. This suggests that patients with diabetes are more susceptible to inflammation which ultimately leads to a faster risk of deterioration in COVID-19 [21]. Diabetes a risk factor for COVID-19 has been linked to obesity as a risk factor for diabetes. This is was reported in the research by Barry, *et al.* which concluded that obesity is a risk factor for COVID-19 [22]. Other comorbidities are lung disease and COVID-19 is the disease that mostly infects the lungs and the respiratory tract, the two organs work together to deliver oxygen throughout the body. Chronic Obstructive Pulmonary Disease (COPD) is a condition of the lungs that causes difficult breathing, including emphysema. This disease is characterized by damaged air sacs in the lungs and chronic bronchitis which is a long-term condition that triggers inflammation of the airways of the lungs. People with COPD are more likely to get infected by corona virus because their epithelial lining is damaged, making it more likely for the virus to enter the body. Someone who has acute lung diseases such as COPD, asthma, fibrosis and other lung diseases, will most likely become more severe when infected with COVID-19. When the lung is infected, the heart must work harder for the task to continue. The American Heart Association states that diseases similar to COVID-19 pose a risk of heart attack due to plaque or blockages in blood vessels. Research says that the blockage can cover the blood vessels as a whole when the body is infected with a virus such as corona [12]. Although tuberculosis as a comorbidity is reported only in 1.5% of cases, this shows that some cases of COVID-19 have also been diagnosed with tuberculosis, such as in the study by Sarinoglu *et al.*, who reached the same conclusion based on results from a study on two patients who were positive for COVID-19 and tuberculosis. One patient was diagnosed with tuberculosis to be positive for COVID-19 and one patient was treated as positive for COVID-19 and the final diagnosis was positive for tuberculosis and human

immunodeficiency virus infection [23]. Figure 5 shows the highest number of deaths due to COVID-19 per province. The high percentage of COVID-19 in the Provinces of DKI Jakarta and East Java was caused by the fact these two provinces constitute a significant access to the country: the mobility of the population is very high so that very high numbers of positive contact cases are possible. In addition, many cases of COVID-19 in the DKI Jakarta region were revealed, because DKI Jakarta Health Office was very active in conducting contact tracing. Contact tracing is an identification of people who come in contact with positive COVID-19 patients with the aim to prevent the spread of infection to the community through the transmission chain termination [24].

Contact tracing is the main means of controlling the spread of infectious diseases such as COVID-19, STDs, Ebola and tuberculosis. This is a concept used to detect the number of infected people after close contact with positive cases. For example in the case of COVID-19, the pandemic that has infected hundreds of thousands of people worldwide is contagious. Transmission of the virus can take place through droplets (splashing of saliva particles from coughing, sneezing or while talking), so close contact with people infected with the virus allows spread. The crowd is one of the potential spread systems of the virus, because frequently infected patients do not even realize they are carrying the virus in their bodies. Therefore, it is important to trace contacts and control the movements of people who have the potential to be infected. The concept of contact tracing is intended to provide a quick response to people who are new or suspected to be infected and monitor them closely. This step is part of preventing further spread of the virus. According to WHO, contact tracing is carried out in three steps. First, identify contacts. Here, infected people are asked to trace their activities since the onset of symptoms and the number of people they have visited or contacted, for example, family, friends, relatives, colleagues or health workers. Second, register contacts. In this process, anyone who has made direct contact with a positive patient will be recorded. Infected individuals are also given information on why they need to carry out independent quarantine at this early stage. It should be noted that independent quarantine is important to stop the spread of infection to the community. Third, follow-up contact. Here, routine follow-up is carried out to all people who have been registered. Monitoring of symptoms is carried out routinely and periodically. They are also asked to carry out independent quarantine for disease prevention [25].

Figure 6 shows the daily curve of COVID-19 cases, although the daily curve of COVID-19 cases cannot be called an epidemiological curve, due to several weaknesses, including: the decrease in the number of daily cases cannot be read directly as a decrease in the daily infection rate and the length of time that passed from when the sample was taken with the results of the examination reported to the Ministry of Health; however the data has identified the COVID-19 incidence as an outbreak in Indonesia. The COVID-19 daily curve shows the high number of COVID-19 cases in Indonesia. Some of the causes of the high case of COVID-19 in Indonesia included: Indonesia's population density reached 268 million people so it becomes more vulnerable to the spread of the virus. Based on the 2017 National Socio-Economic Survey the density of people living in cities reached 52.9% and the population living in homes with a floor area of less than 8 m²/capita, was around 14.8%. Communities with improper hand washing practices based on 2018 basic health research data reached 50.2 percent. Another factor is high incidence of pneumonia that based on 2016 BPJS data reached 1.3/1000. Pneumonia or respiratory disorders, before the emergence of COVID-19, had already occurred due to air pollution caused by transports, cigarette smoke, etc [26]. WHO makes the transmission of MERS and SARS a reference for COVID-19 transmission because the cause from the same group of viruses, the coronavirus. COVID-19 transmission can occur through droplets or liquid droplets that come from coughing and sneezing, personal contact such as touching and shaking hands, touching objects or surfaces that are contaminated with viruses on it, then touching the mouth, nose, or eyes before washing hands [27]. Analysis of the various factors that cause COVID-19 transmission as above, can be seen from the daily curve of COVID-19 cases. In Figure 6, it is possible to combine common source and propagated source. These results represent an early retrospective cohort study of the occurrence of COVID-19 cases. Early observation of an outbreak, the possibility of an outbreak due to exposure to the same and common source, for example exposure due to mobilization abroad or to areas with a high incidence of COVID-19. Furthermore, with the number of infections, there has been an increase in cases due to person-to-person transmission (propagated source) through droplets when someone coughs, sneezes, sings, talks, and breathes. When doing these activities, the air that comes out of the nose and mouth releases small particles or aerosols at close range. The COVID-19 outbreak period that lasts a long time, might be possibly

influenced by the number of people who are susceptible to being exposed to the COVID-19 virus, the time period when that person is infected, and the COVID-19 virus incubation period [28]. Some places that are at risk of contracting COVID-19 include: restaurants, nightclubs, places of worship, workplaces or offices, choir training places, and fitness classes. Prevention can be done by adhering to health protocols, such as washing hands, wearing a mask, keeping a distance of at least one meter, avoiding crowded places, avoiding closed rooms with poor ventilation, and if necessary, wear a face shield [29]. Some of the policies carried out by the Indonesian government, from several areas with the highest number of COVID-19 infections include the following: the DKI Jakarta provincial government formed a COVID-19 Response Team based on Governor Decree No.291 / 2020, Home Learning based on the Letter of the Head of the Education Office No. 27/2020 and No. 32/2020 [7]. The Central Java provincial government introduced the obligation to wear masks and home quarantine procedures based on the Central Java Governor Circular No. 440/0007223, restrictions on travel for people based on Central Java Governor Circular No. 4 of 2020 [8]. The East Java provincial government established large-scale social restrictions based on Governor's Decree No. 202/2020 [9]. Various strategies have been carried out by the Indonesian government, as it has been done by several countries regarding the control of COVID-19. But in general, in several countries, the COVID-19 control strategy has not been carried out in an integrated and standardized manner, each country and government has tested various policy efforts and sustainable management strategies based on their national management systems [30]. Special attention and efforts to protect or reduce transmission must be applied in vulnerable populations including children, health care providers, and the elderly [27]. Limitations in this study, might be related to the fact that data used is secondary data from the website, so authors could not see various other variables that were not displayed in the presentation of the existing data, besides that the researcher cannot see the identity of the respondent: thus the study carried out is only a descriptive study without being able to conduct a study on risk factors from various variables.

Conclusions

Indonesia is one of the countries that reported a COVID-19 outbreak with epidemiological figures occurring mostly in males (56.5%) and productive ages (31-59 years) by 57.5%, deaths in most cases > 60 years

(43,6%). Clinical symptom mostly reported was cough (77.8%), comorbidities are mostly hypertension (52.4%), and the four provinces with the highest number of COVID-19 infections were DKI Jakarta (34.3%), East Java (12.3 %), West Java (9.4%) and Central Java (6.6%). Combination of common source and propagated source caused the COVID-19 outbreak in Indonesia. Special care must be taken to protect vulnerable populations such as, children, health care providers, and elderly. The public is expected to participate in preventing COVID-19 transmission by avoiding close contact with patients, frequently washing hands with soap or keeping clean with hand sanitizers with a minimum of 70% alcohol content, avoiding contact with farms or wild animals without protection, maintaining and strengthening the body immunity, wearing masks and adhering to social distancing protocols in public places. With full community participation in these activities, it is hoped that the spread of COVID-19 can continue to decline.

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