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The Deployment of Drones in Sending Drugs and Patient Blood Samples COVID-19

Sri Anggraeni[1], Aulia Maulidina[1], Mauseni Wantika Dewi[1], Salma Rahmadianti[1], Yulian Putri Chandra Rizky[1], Zulfa Fathi Arinalhaq[1], Dian Usdiyana[1], Asep Bayu Dani Nandiyanto[1,], Abdulkareem Sh. Mahdi Al-Obaidi[2]*

[1]Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi no 229, Bandung 40154, Indonesia

[2]School of Engineering, Taylor's University, 1, Jalan Taylors, 47500 Subang Jaya, Selangor, Malaysia

* Correspondence: Nandiyanto@upi.edu (A.B.D. Nandiyanto); Tel.: +62-22-5000-279

ABSTRACTS

At present, most countries all over the world are being hard hit by the COVID-19 pandemic and some even are being hit harder than others. This condition has caused widespread disruption of the economic, social, and educational systems in those countries. Under these conditions, transportation systems also need to be considered. There are problems of distribution of drugs and kits of test equipment to areas far from large cities in the center of the corona pandemic due to access difficulty. Remote locations, being difficult to reach, make the distribution of drugs and equipment for rapid testing uneven so that the recovery rate of patients in the area has a low percentage. Meanwhile, it is essential to ensure the availability of drugs and rapid test equipment in every public health center in all directions of Indonesia. One possible solution is the use of drones to distribute these things to areas that are difficult to reach. This solution is expected to at least improve healing and reduce mortality for patients infected with COVID-19 in remote areas.

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1. INTRODUCTION

The Coronavirus was first found in the City of Wuhan, Hubei Province, China in December 2019. Then the virus infected many people in Wuhan. When these patients were admitted to hospitals they showed symptoms of respiratory problems. The Pandemic of Covid-19 has claimed hundreds of thousands of lives world wide. It is expected that the virus will spread to all parts of the world if it is not treated properly and quickly. The Coronavirus is a contagious new strain. It can infect the respiratory system and cause death. Historically, the coronavirus was first identified as a cause of the common cold in 1960 (Al-Osail *et al.,* 2017). There was a re-

port that there was an outbreak of pneumonia associated with a virus called the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2)(Huang *et al.,*2020; Zhu *et al.,* 2020; Li *et al.,* 2020). Infection from the virus spread rapidly to all regions in China and other countries throughout the World in the next few weeks (Phan *et al.,* 2020; Holshue *et al.,* 2020; Giovanetti *et al.,* 2020).

Meanwhile, according to the World Health Organization, the coronavirus is one that causes the common cold to more severe illness such as the Middle East Respiratory Syndrome (Mers-CoV) and severe acute respiratory syndrome (SARS-CoV). Until now, there was no vaccine to prevent coronavirus infection transmitted from human to human. (Whitworth, 2020).

The number of cases confirmed COVID-19 from January 22, 2020, until March 31, 2020, indicated a significant surge. The recorded number of reported cases worldwide was as many as 802.639 with the number of deaths amounted to 39.014 people and the number of patients successfully treated reached 172.319 (Woldometers, 2020).

Coronavirus positive case data (COVID-19) in Indonesia today still shows a significant increase in the number of patients infected with SARS-CoV-2. Acceleration Task Force-19 Handling COVID-19 announced, the total number of positive cases corona in Indonesia climbed to 4,839 patients, on Tuesday, April 14, 2020, at 4:10 pm. Corona patients who survived amounted to 426 people. However, this number is still below the total number of deaths of patients COVID-19 in Indonesia which increased to 459 people. The increase in mortality has caused COVID-19's case fatality rate (CFR) in Indonesia to peak at 9.49 percent. Previously, the CFR level had dropped to 8 percent. Official data showed that most positive cases of coronavirus infection occurred in Jakarta, namely 2,335 cases and secondly, 530 cases in West Java.

There is a problem with the distribution of medicine and rapid test instruments to remote and hard-to-reach areas due to transportation constraints. Unequal distribution of drugs appeared to have caused low rates of recovery of patients in remote areas.

One proposed solution to this problem is the deployment of drones in distributing drugs and rapid test kits to areas that are difficult to reach. Distribution of drugs using drones is at least expected to improve recovery for patients affected by COVID-19 and reduce mortality in remote areas.

Here the purpose of this study was to analyze the understanding our ideas in the possibility for using drones for distributions drugs and medicine. In short, the study used survey and quessionaire. This study is also completed with illustration for the use of drone in distributing drugs and medicine.

2. MATERIALS AND METHODS

In this study, the survey research method was used by filling out questionnaires distributed on social media. Survey research is another type of research which obtains data to determine the specific characteristics of a group. In short, the questionnaires were distributed to all people, especially those living in West Java and the Special Capital Region of Jakarta. The data were obtained from 113 respondents. After all, data were collected, the data were processed and presented in tables and graphs.

3. RESULTS AND DISCUSSION

3.1. Illustration of Drone for Distributing Drugs and Medicine

Figure 1 illustrates the application of drones for the distribution of drugs or blood samples from a large city to remote areas or vice versa. A special box is prepared to carry medicine and blood samples. A special box is prepared to carry medicine and blood samples. The box is sterile, resistant to temperature changes and shocks so that the goods

carried remain safe, sterile, intact and light according to the capacity of the drone. The goods carried can be done more efficiently.

The drone operating system is designed to reach a distance of more than 1 km. This drone is controlled by two pilots, each recipient and the sender hospitals. When the drone has entered the receiving hospital area, the drone will be taken over by the pilot who is on standby at the hospital. This drone is also equipped with a tracker to avoid theft. This condition is also happening for the drone when coming back from hospital, in which when it is near the object area, the pilot from the object area can take over the control of the drone.

The drone is equipped with a propeller that is strong, light, and of good quality so that it can withstand strong winds. The fuel used by the drones that we make is solar energy, through the placement of solar panels. When flying in the air, this drone can while charging. A building box is available to be opened and closed and provides a landing place. In addition, the box can be sterilized using a disinfectant sprayer.

3.2. The Situation and Conditions of The Respondent

The results revealed that generally, the area around of the respondents was still in fairly good condition as shown in **Figure 2a**. The rest of areas were the red zones in the spread of the COVID-19, as in **Figure 2b**. In addition, **Figure 2c** shows that large-scale social restrictions have not been implemented as a whole so that the increase in COVID-19 patients will continue to increase. The policy of the Large-Scale Social Restrictions has been issued by the government to accelerate the handling of COVID-19 in Indonesia. The criteria of the regions that apply the Large-Scale Social Restrictions are areas that have had significant and rapid increases in the number of cases and deaths from COVID-19. The respondents' understanding of COVID-19 precaution was very good, as shown in **Figure 2d**. The results showed that respondents have already well-versed in COVID-19 precautions. These precautions are not leaving the house if you do not have an urgent need, doing social distancing, wearing a mask when going out of the house, doing physical distancing, Diligently washing your hands, and basking in the morning as shown in **Figure 2e**.

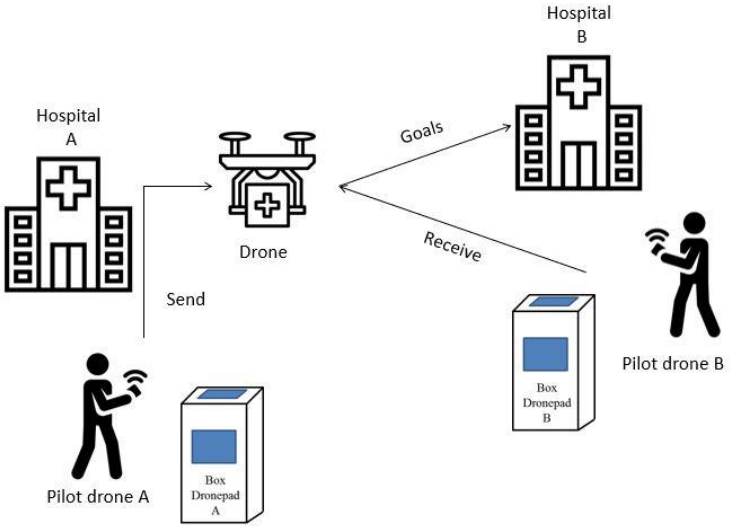

Figure 1. Illustration of description of ideas

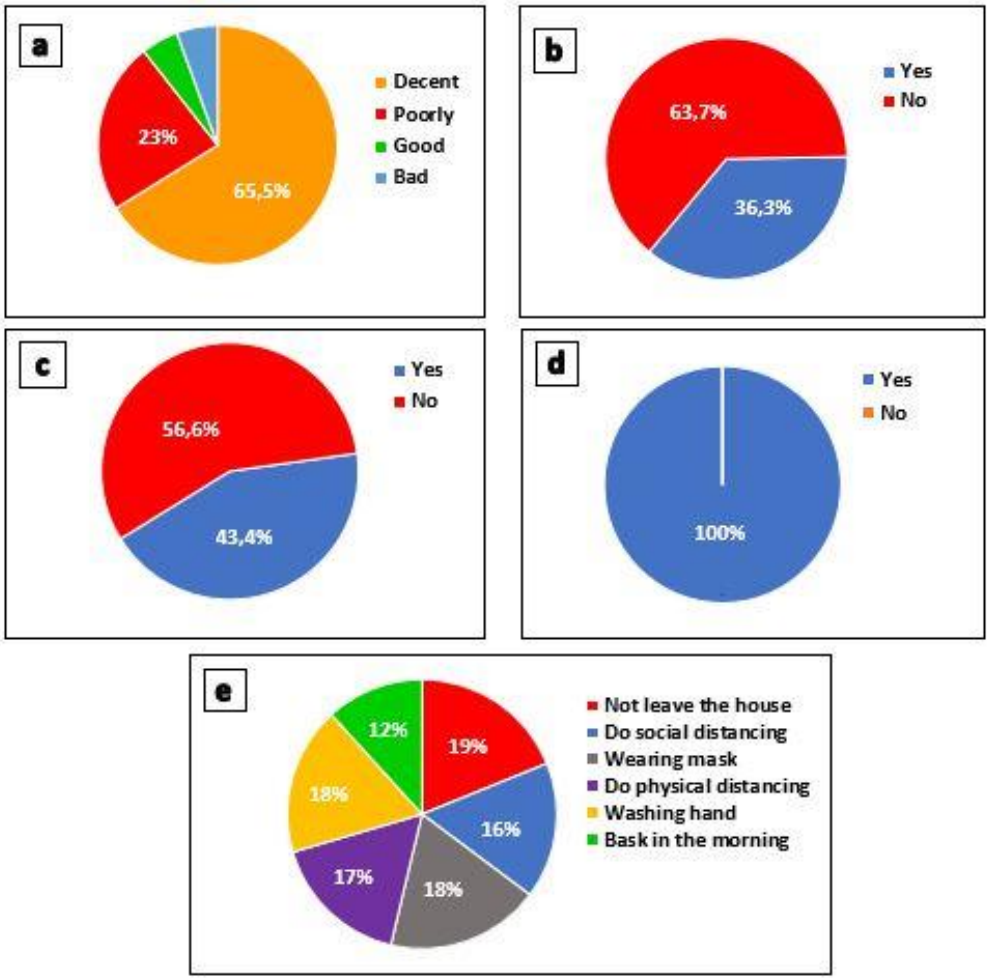

Figure 2. (a) the situation and condition of the respondent's environment, (b) the red zone in the respondent's area, (c) the Large-Scale Social Restrictions in the respondent's area, (d) knowledge of preventive procedures, (e) types of preventive procedures

3.3. Medicines transportation system at the time of Covid-19

During this COVID-19 outbreak, it is essential to consider several dimensions necessary in the pandemic, one of which is the transport system in delivering drugs. Some areas in Indonesia are not easily accessible. There are some challenges in transporting goods to these areas. According to the results of the questionnaires presented in **Figures 3a** and **3b**, there are some areas that are difficult to access to deliver drugs. The access obstacles encountered in sending drugs to remote areas are due to lack of road facilities and mountainous geographical contours, causing difficulty of goods transportation. This obstruction further slows down the delivery of drugs. The availability of transportation in drug distribution is the most important aspect of handling the COVID-19 pandemic, as shown in **Figures 3c** and **3d** especially for community Health centers or small clinics far from cities. The majority of respondents considered that the distribution of drugs is quite good (**Figure 3e**), but it would be faster if the distribution of medicines is carried through the air by advanced transportation such as drones. It was approved by 100 of the 113 respondents in **Figure 3f**.

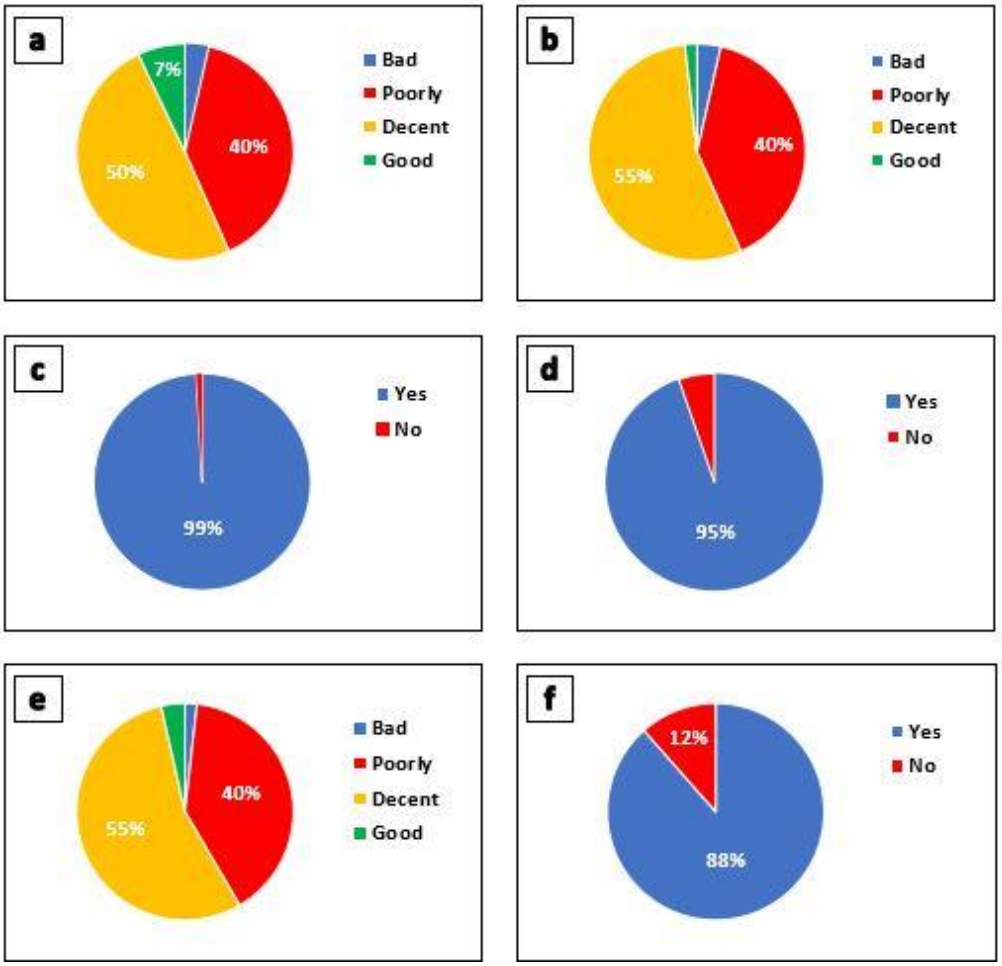

Figure 3. (a) the current pandemic transportation system, (b) access to medicines delivery and blood samples (c) distribution of medicines to hospitals, (d) transportation to *community Health centers*, (e) equitable distribution of medicines distribution, (f) sophisticated transportation for distribution

3.4. Transportation System Delivering Rapid Test Results for COVID-19 Patients

Figure 4a shows that a small proportion of respondents stated that their area of residence had begun to carry out a rapid test. However, sending rapid test kits to hospitals via land transportation is considered to be not very effective, as shown in **Figure 4b**. This is because of the difficulty of access from the respondents' area to the central hospital. The use of land transportation to send the results of rapid tests to hospitals usually takes a very long time. In addition, it causes much air pollution as shown in **Figure 4c** and **4d**, the community agreed if this happens due to the slow movement of transportation to the hospital. Therefore, the respondents (the community) agreed with the solution by deploying a new type of vehicle to deliver covid-19-related equipment. Thus, it is a transport designed specifically for sending rapid test results to the hospitals.

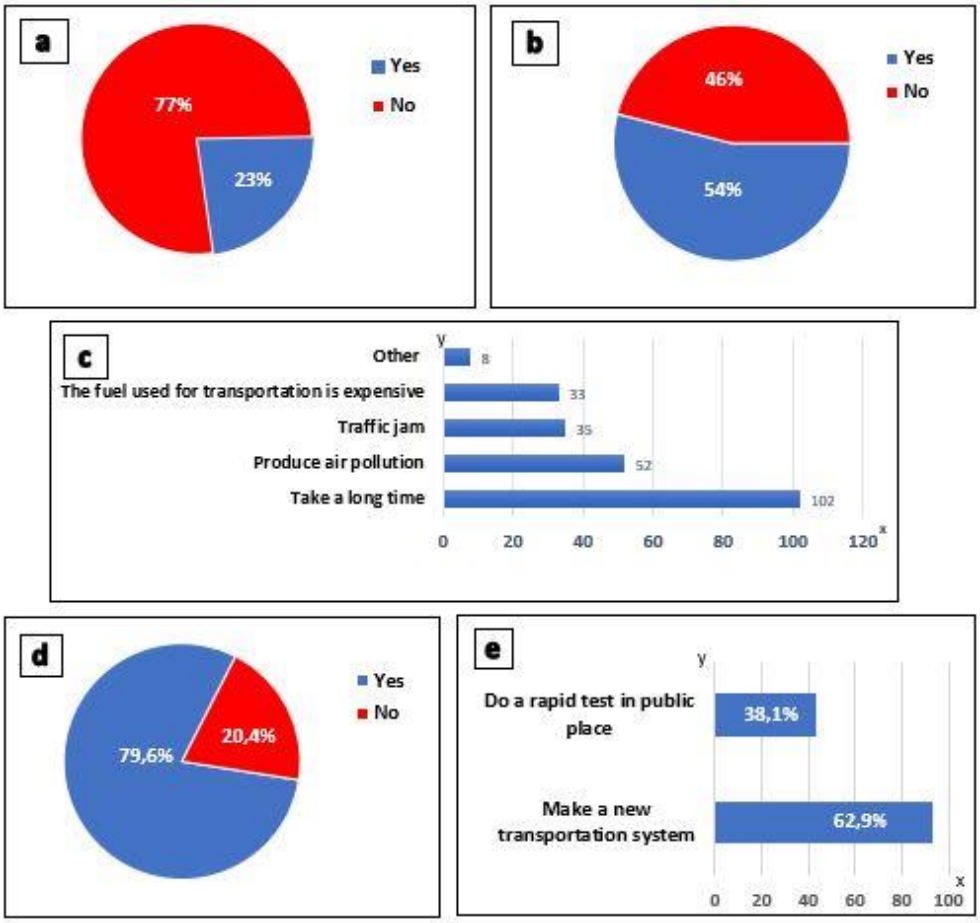

Figure 4. (a) rapid test in the respondents' area, (b) the effectiveness of sending rapid test results to the hospital, (c) the constraints of sending rapid test results, (d) slow transportation to hospital, (e) solution for sending rapid test results

From the presentation of the idea of Drone Introduction to Drugs and Blood Samples of COVID-19 Patients, based on **Figure 5a** the Sender Drone Ideas for Drugs and COVID-19 Blood Samples Patients, has been accepted by respondents with highly positive responses. The transport system using these drones will be more effective than land transportation system. This is evidenced in **Figure 5b** which indicates that the respondents agreed and if it is applied in Indonesia, especially in areas that have been categorized as red zones. With the large scale social restrictions, this effort would be much more effective.

3.4. Drone transport system for drug delivery and COVID-19 patient rapid test results

Based on the results of the study in **Figure 6a**, the fuel used by drones is generally environmentally friendly and Drone Introduction to Drugs and Blood Samples COVID-19 Patients need environmentally friendly fuels so as not to affect the equipment carried, things this is proven by **Figure 6b**. Drones can use environmentally friendly fuels, for example, fuel from organic waste, solar panels, electricity, or batteries. However, according to the results of the study, people prefer to use solar panel fuel as a solution for environmentally friendly fuels, which is shown in **Figure 6c**.

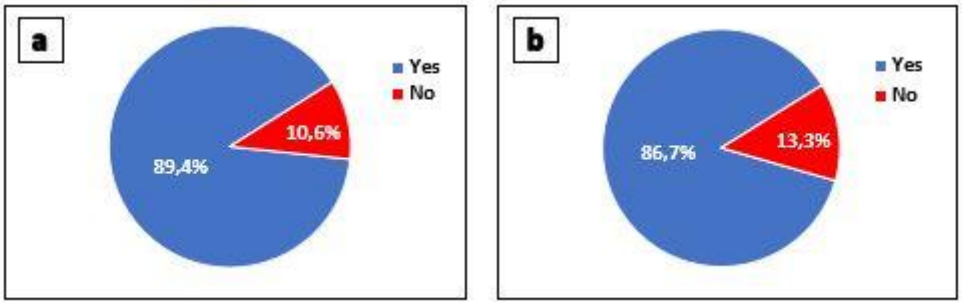

Figure 5. (a) drones as distribution transportation, (b) the effectiveness of drones as a means of transportation

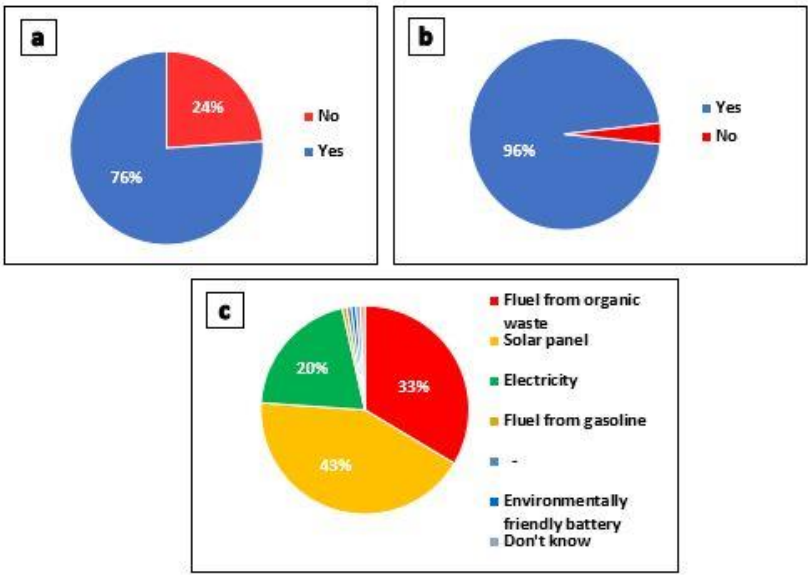

Figure 6. (a) current drone fuel, (b) environmentally friendly fuel, (c) environmentally friendly fuel solution for drones

4. CONCLUSION

During the COVID-19 pandemic, social distancing was applied. This condition has an impact on the transportation system especially in areas affected by large-scale social restrictions. As a solution, we propose a drone as a means of transportation in the delivery of drugs and blood samples of COVID-19 patients. This drone will be controlled by two pilots. Each pilot is in each hospital. This drone is equipped with a tracker, to be able to know its position. Its fuel using solar panels. Thus, it will not cause pollution to the environment. Drone Delivery of Drugs and Blood Samples COVID-19 The patient received good responses from the community.

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6. AUTHORS' NOTE

The author(s) declare(s) that there is no conflict of interest regarding the publication of this article. Authors confirmed that the data and the paper are free of plagiarism.

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