Medical waste management at Idaman Hospital in Banjarbaru during the covid-19 pandemic

E Labaty Silapurna
Idaman Hospital Banjarbaru, Jl. Trikora No. 115, Guntung Manggis, Banjarbaru, South Kalimantan, Indonesia
E-mail: endahlabaty2004@gmail.com

Abstract. Covid-19 coronavirus spreads among persons via droplets from the nose or mouth of infectious persons when they breathe or cough. These droplets land on a surface, which another person then touches. When that person then touches her eyes, nose or mouth, the virus enters the new host. The virus can also infect directly when the droplets get inhaled by someone near the infected person. Another problem in the covid-19 pandemic is hazardous medical waste, which can become another vector for a viral infection to hospital patients, medical staff, and the community around the hospital. Covid-19-contaminated medical waste consisting of used needles and infusion kits, PPE, masks and gloves, used paper and plastic food containers, bandages and tissue paper increased the waste volume at Idaman Hospital Banjarbaru by 30%, requiring optimization of waste management. This study aims to identify medical waste potentials and impacts at Idaman Hospital in Banjarbaru during the covid-19 pandemic and evaluate covid-19 medical waste management at Idaman Hospital in Banjarbaru. This study utilizes the descriptive observational method by collecting secondary data. According to the types of waste, the study indicates that medical waste management at Idaman Hospital in Banjarbaru already meets the Regulation of Environment and Forestry Minister Number 56-year 2015, including reducing and separating hazardous and poisonous waste storage, transportation, and management.

1. Introduction
Covid-19 spreads coronavirus between persons via droplets from the nose or mouth of infectious persons when they breathe or cough. These droplets land on a surface, which another person then touches. When that person then touches her eyes, nose or mouth, the virus enters the new host. The virus can also infect directly when the droplets get inhaled by someone near the infected person.

The covid-19 pandemic has become a major interest globally due to its extreme virulence and high mortality rate [1]. In December 2019, Wuhan city in Hubei province of China became the epicenter of a new pneumonia epidemic of unknown origin [2]. The first case in Indonesia was discovered on March 2, 2020, in Jakarta [3]. The covid-19 pandemic situation in South Kalimantan during the first 20 days of March 2020 was getting increasingly worse.

One important aspect that must not be overlooked during the pandemic is managing infectious medical waste from infected patients and the attending medical staff. The management of this infectious waste was becoming important because of the concern that this may become one of the viral infection vectors if it’s not managed properly.

Healthcare workers have great potential to be exposed to coronavirus disease. An activity that causes healthcare workers to be potentially exposed to coronavirus disease is when they interact
directly with covid-19 patients but do not use Personal Protective Equipment (PPE). Another activity that triggers exposure to covid-19 transmission to healthcare personnel is medical action on covid-19 patients that produce aerosols such as bronchoscopy, nebulization, tracheal intubation, non-invasive ventilation, tracheostomy, pulmonary resuscitation, manual ventilation before intubation, swab taking, dental examinations such as ultrasonic scaler and high-speed air-driven, and throat examination. [13]

The use of Personal Protective Equipment (PPE) causes positive and negative impacts on the surrounding environment. The positive impact is protecting healthcare workers from the covid-19 transmission. In contrast, the negative impact is an increase in medical waste generation (infectious waste). Examples of medical waste that fall into the category of infectious waste (A337-1) are personal protective equipment (PPE) waste that healthcare workers have used for caring of covid-19 patients, residual swabs, rapid test residues, syringe wastes, cotton or tissue from patients, which is indicated to be infected with covid-19. Medical waste is included in the category of Hazardous Waste [14].

Medical waste Covid-19 needs to be taken seriously. Research proves that the cause covid-19 virus Severe Acute Coronavirus Respiratory Syndrome 2 (SARS-CoV-2) survives under conditions (temperature and humidity) in particular. Take a few days for the virus to be inactive infect humans, depending on media surface material type alive. However, with the process of standard disinfection (use soap, disinfectant or with warming), the virus will be inactive or, in other words, not contagious [15]

Based on data on waste at Idaman Hospital in Banjarbaru up to December 31, 2020, there was an increase of medical waste from 61kg/day to 215kg/day as the number of covid-19 patients admitted increased. Covid-19 medical waste such as used syringes, needles, infusion kits, PPE, masks, gloves, plastic and paper food containers, bandages and tissue paper caused the increase of the waste produced at Idaman Hospital in Banjarbaru such that the destruction of such waste must be maximized.

Stopping the transmission of infectious diseases is based on the principle of cutting the chain of hosts. In facing this covid-19 pandemic, the Indonesian Association of Internal Medicine Specialists (PAPDI) recommends cutting the chain of hosts with various methods. One way of cutting this viral transmission chain can be done by managing infectious medical waste properly according to the correct procedures [12].

This study aims to identify the potentials and impacts of medical waste at Idaman Hospital in Banjarbaru during the covid-19 pandemic and evaluate the covid-19 medical waste management at Idaman Hospital in Banjarbaru to compare it against the Regulation of Environment and Forestry Minister Number P. 56-year 2015, including the reduction and separation of hazardous and poisonous waste, its storage, transport and management.

2. Methods
This study was done using the descriptive study method by collecting and compiling data from medical waste staff at Idaman Hospital in Banjarbaru, a covid-19 referral hospital in Banjarbaru, South Kalimantan. The study covers the period from January 2020 up to December 2020.

3. Results and discussion
The appearance of the covid-19 pandemic at the end of 2019 through 2020 generated a significant increase in the volume of medical waste in hospitals worldwide. At the pandemic's peak, hospitals in Wuhan generated medical waste 6 times that of the pre-pandemic level, at the level of 240 metric tons, necessitating the construction of a new waste processing plant and 46 mobile waste processing facilities [4].

Recognizing the potential dangers of covid-19 infected medical waste, the Ministry of Environment and Forestry issued guidance for managing this medical waste. This guidance was issued in SE.2/MENLKH/PSLB3/3/2020 regarding managing infectious waste (Hazardous and Poisonous Waste) and household waste from the management of covid-19, dated March 24, 2020 [5]. These circular states that infectious waste originating from health care facilities and household waste or the
like used for handling COVID-19 is categorized as infectious waste. Therefore, Covid-19 medical waste at Idaman Hospital in Banjarbaru includes waste from medical staff who handles covid-19 patients, including bandages, syringes, masks, plastic/paper food containers, used tissue paper and used PPE.

As the covid-19 pandemic progresses, medical waste at Idaman Hospital in Banjarbaru increased from April to December 2020.

**Table 1.** Medical waste volume at Idaman Hospital in Banjarbaru in 2019.

| No | Month   | Medical Waste Total RSDI (kg) |
|----|---------|------------------------------|
| 1  | January | 1,513                        |
| 2  | February| 1,474                        |
| 3  | March   | 1,773                        |
| 4  | April   | 1,881                        |
| 5  | May     | 1,329                        |
| 6  | June    | 1,485                        |
| 7  | July    | 1,434                        |
| 8  | August  | 1,337                        |
| 9  | September | 1,215                       |
| 10 | October | 1,215                        |
| 11 | November| 1,172                        |
| 12 | December| 1,748                        |
|    | Total   | 17,576                       |

**Table 2.** Medical waste volume at Idaman Hospital in Banjarbaru in 2020.

| No | Month       | Covid-19 Waste Volume (kg) | Other Medical Waste (kg) | Medical Waste Total RSDI (kg) |
|----|-------------|----------------------------|--------------------------|-------------------------------|
| 1  | January     | 0                          | 1,588                    | 1,588                         |
| 2  | February    | 0                          | 1,592                    | 1,592                         |
| 3  | March       | 0                          | 2,316                    | 2,316                         |
| 4  | April       | 83                         | 1,991                    | 2,074                         |
| 5  | May         | 880                        | 1,937                    | 2,817                         |
| 6  | June        | 2,814                      | 2,741                    | 5,555                         |
| 7  | July        | 4,248                      | 2,607                    | 6,855                         |
| 8  | August      | 3,330                      | 3,064                    | 6,394                         |
| 9  | September   | 2,896                      | 3,195                    | 6,091                         |
| 10 | October     | 1,557                      | 2,630                    | 4,187                         |
| 11 | November    | 1,992                      | 2,679                    | 4,671                         |
| 12 | December    | 2,362                      | 2,982                    | 5,344                         |

|    | Total       | 20,146                    | 29,317                   | 49,463                        |

It can be seen from Table 1 and Table 2 that covid-19 waste increases the volume of medical waste in April 2020 compared to the previous month.
A standard procedure is needed to manage and process such a large volume of covid-19 medical waste. The following procedures to handle infectious medical waste are in place at Idaman Hospital in Banjarbaru:

3.1. Reduction and separation
Procedures to improve the effectiveness of waste management, including procedures to separate hazardous waste, so it is not mixed with non-medical waste. Medical waste is already separated by staff/nurses when put in the waste container [8].

3.2. Transportation
Three-quarters of full medical waste containers are transported by special cleaning staff in full PPE. Plastic bags that are ¾ full are packed into cartons then wrapped to differentiate from non-covid-19 waste. These are then transported to waste collection centers using dedicated trolleys. During the pandemic, the frequency of waste collections is increased from the normal once per shift to 2-3 times per shift. There was an increase in the medical waste volume during the pandemic, especially waste from units handling covid-19 patients [9].

3.3. Weighing
Before transporting medical waste to the waste collection center, they are weighed and logged in the logbook according to the type. The incinerator staffs are the ones handling the weighing [10].

3.4. Medical waste storage
Storage of medical waste at the waste collection center must not exceed 2×24 hrs. The temporary storage of covid-19 medical waste requires special procedures for handling and safety to prevent transmission to staff. The waste collection center is also routinely disinfected.

The storage step follows the health ministry’s regulation No.7 2019 [3], which stipulates that storage time must not exceed 2×24 hours, solid waste must always be contained in black plastic bags, and that stored waste may not be opened until final disposal by the hospital.

3.5. Medical waste management
Covid-19 medical waste management is done according to Environment and Forestry minister’s circular letter no. SE.2/MENLHK/PLSB3/PLB.3/3/2020 on the management of infectious waste and household waste of handling of Covid-19 that is using hazardous waste incinerator with minimal
incineration temperature of 800ºC with strict procedures around the management, operation, and monitoring.

Waste is incinerated every day. Idaman Hospital utilizes a semi-automatic smokeless incinerator system with a 200 kg capacity and incineration temperature of 800ºC – 1000ºC in the first chamber and 1000ºC – 1200ºC in the second chamber. The incinerator uses LPG for fuel. The resulting ash is packed into 200 kg drums, then topped with concrete and then sent to Environment and Forestry Ministry certified 3rd party for subsequent handling [11].

Figure 2. Waste transport and management flow.

4. Conclusion
Idaman Hospital, as a covid-19 referral hospital, has implemented health protocol and waste management procedures according to the guidance as a referral hospital and emergency hospital in handling Covid-19 patients by implementing waste collection at the wards, transporting it to the waste collection and destroying it in the incinerator. The ash from the waste is then packed into drums and sent to 3rd party.

The hospital’s complex procedures create a positive impact on the surrounding communities but can perhaps also create a negative impact from improperly processed waste. Improper hospital waste processing presents a risk of work accidents and disease transmission. Therefore, to ensure the safety and health of hospital staff and other people nearby the hospital, proper policies must be implemented on work safety and health management by properly managing and monitoring hospital waste as an important indicator.

The differences in medical waste processing before and during the covid-19 pandemic are the categorization of medical waste, collection frequency, and waste management. Medical waste management at Idaman Hospital in Banjarbaru follows the Regulation of Environment and Forestry Minister Number P 56-year 2015 [6].

Acknowledgment
We are extremely grateful for the help of the chief and all the Facilities and Resources Maintenance unit staff to provide all the data needed to complete this study.

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