



## Hazardous and Toxic Solid Waste Analysis at Covid-19 Isolation Site (Case Study: Hotel X Bojonegoro Regency)

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**Abstract** - Covid-19 is one of the pandemics that be a problem in Indonesia. This condition becomes one of the urgencies that must be handling seriously to break the chain of transmission. The one ways to handling can be taken by isolating people who are suspected and infected with the corona virus. Bojonegoro is one of the cities in Indonesia that implemented solutions with isolation. As a seriously action to handling can be seen by making Hotel X Bojonegoro for isolation locations. Handling carried out at this location bring a correlation to the emergence of solid waste from covid patients where it becomes one of the sources of B3 waste. This research aims to find out the management of B3 waste (medical solid) at Hotel X in Bojonegoro Regency which is used as a place for isolation of covid-19 patients. The type of research that used in this study is qualitative descriptive with the location of the research determined intentionally (purposive). This study uses primary data obtained from the results of interview methods and uses secondary data derived from literature studies of various existing data and research and correlated to the theme of this study. The results of the investigation showed that the source of waste came from activities in dealing with covid-19 patients so that all kinds of goods that have contact with patients are considered in this type of waste categorized as B3 waste management is done with coordination on third parties which is taken by officers and brought pharmaceutical and medical device installations (INFALKES) for further handling process. In its processing operations are carried out with incentives of funds provided by the government. With this research, it is expected that the supervision of B3 waste can provide more supervision of B3 waste management in hotels where covid-19 isolation is located.

**Keywords** – Hazardous and Toxic Solid Waste, Medical Waste, Solid Waste, Covid-19 Isolation Waste Management

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### 1. Introduction

Covid-19 is one of the serious problems caused by the spread of a new type coronavirus from Severe Acute Respiratory Syndrome (Sars-Cov-2). On March 11, 2020, the World Health Organization (WHO) declared the virus a pandemic. Pandemic is interpreted as an epidemic with a large scale that crosses international borders and generally affects a large number of people (Putra and Roosandriantini, 2021). Based on research conducted by Levani et al. (2021), for those infected by this virus, the initial symptoms felt are generally fever, cough and shortness of breath. Meanwhile, in more detail clinical symptoms that in patients appear in a variety, ranging from such as symptoms of the common cold (cough, cold, throat pain, muscle pain, headache) to severely competent (pneumonia or sepsis). This virus will have a different effect for each infected individual, therefore proper

treatment is needed to decide the rate of transmission. According to various studies, techniques or methods of spreading this virus are through respiratory tract droplets and close contact with sufferers. Droplets themselves are interpreted as small particles from the mouth of sufferers that contain viral diseases, which are produced when coughing, sneezing, or talking. These droplets can reach up to a certain radius but are generally about 1 meter. In the infection for the spread of the virus, a droplet will stick to clothes or objects around the patient when sneezing or coughing.

The existence of a pandemic certainly has a bad impact on the lives of people and countries. This is because pandemics are able to affect the economic, political, social, and psychological stability of society. This psychology leads to high levels of stress. High stress will cause social problems such as hoarding medical devices and also panic

(Rahmawati, 2021). This panic arises because many news that report cases of covid-19. High stress is also caused by boredom because people cannot behave as usual and feelings of restraint (Setyaningrum and Yanuarita, 2020).

One of the handling efforts carried out for those indicated by Covid-19 is the enactment of an isolation system. The application of isolation is included to separate covid-19 patients so as to prevent the expansion of infection to others. An isolate can make the network density decrease and not centralized in the middle of the network so that this effort is considered as a commensurate for the risk (Mona, 2020). The location for this isolation can be divided into the location provided and the location of the self. One of the places that is used as self-isolation is a hotel. There are several hotels that cooperate with the government (Task Force Covid-19) in providing a place as an independent isolation of people exposed to Covid-19 and OTG (People without Symptoms) (Parantika and Juliandra, 2021). However, there are some hotels that refuse to be a place of isolation. One of the locations used as a special place for isolation is located at Hotel X in Bojonegoro Regency.

Bojonegoro is one of the cities in Indonesia located in East Java located at a position of 60 59' to 70 37' South Latitude and 1120 25' to 1120 09' East Longitude, with a distance of + 110 km from the provincial capital. The area of Bojonegoro Regency is 230,706 ha with a population at the end of 2018 of 1,311,042 people, and administratively has a regional boundary that is north of Tuban Regency, south of Madiun, Nganjuk and Jombang, East of Lamongan regency and west of Ngawi regency and Blora regency (Central Java province). The division of Bojonegoro Regency consists of 28 sub-districts, covering 11 villages and 419 villages. In the spread of the corona virus that affects Indonesia, Bojonegoro is also one of the cities affected by the spread of coronavirus cases. In the update of covid cases in Bojonegoro, in early July 2021, coronavirus cases reached a high surge in the number of patients to reach 900 cases. This makes there is a surge of patients in hospitals where in bojonegoro city there are not many hospitals that can accommodate and handle. This condition becomes one of the very urgent problems to be handled because it concerns the lives of many people. Quoting from corona virus monitoring at hospitals throughout 2020 there were 552 patients and 109 patients died. Then until June 2021 there were 2200 patients and 743 patients died,

The COVID-19 pandemic has made the emergence of global waste dynamics so it needs special attention (Axmalia and Sinanto, 2020). The running of handling covid-19 at the site makes a correlation to the emergence of solid waste Covid-19, where this waste is included in waste B3. Covid-19 medical waste is widely all remnants of unused activities and has the potential to be contaminated with infectious substances (Nurwahyuni et al., 2020). B3 waste from handling covid-19 is waste contaminated with pathogens (Yolarita and Kusuma, 2020). Where the intensity is not routine in the environment and pathogenic

organisms in large quantities and virulence that have great potential to transmit disease to humans themselves. Examples of covid-29 waste include infectious waste including masks, used gloves, Personal Protective Equipment (APD), injections and used infusion sets, bandages, and food and beverage traces from covid isolation patients themselves. As for some categories of solid medical waste B3 other than infectious can be categorized into pathological waste where this type of waste comes from human tissue or organs of the body, sharp object waste where this category can come from the rest of the procedural treatment of the disease with sharp tools such as syringes, disposable scalpels, scissors or razors to be used, then chemical waste where this with examples of chemicals from health facilities is reagent fluids used for laboratory tests and residual disinfectant fluids, then there is pharmaceutical waste where this waste comes from drugs that have expired, then there is cytotoxic waste where this type of waste is waste waste or toxic waste that has a very dangerous siat because it can trigger cancer potemsial to cause gene mutations, Then there is radioactive waste where this type of waste comes from the existence of radiological procedures that can be in the form of tools or materials that have been exposed or can radiate radioactive waves such as MRI, X-ray or CT scan.

Currently, solid waste from handling Covid-19 continues to increase. Moreover, the government is currently carrying out mass vaccinations for the community. Mass vaccinations that are being launched by the government can potentially produce medical solid waste. The packaging of vaccine bottles and syringes produced almost every day is feared to be a new problem. One of the results of medical waste belongs to the category of solid medical waste. Judging from the impact, if the management of solid medical waste is not processed properly then it will be a means for the development of the virus to lingkungan and cause many new sufferers. In addition, if the waste of health services is affordable by nuisance animals or insects such as flies, cockroaches, rats and others then it can be a medium of disease transmission (Masruddin et al., 2021).

In article 123 pp No. 101 of 2014 on waste management of hazardous and toxic materials states that B3 waste producers are not able to do their own B3 waste management, for that B3 waste management can be submitted to three parties, namely companies or PT B3 waste processors. Actually B3 waste producers can manage B3 waste on their own as long as they meet the applicable standards and requirements (Hesti, 2020). However, there are still few hospitals that have managed their own B3 waste. Then based on the Regional Coordination Meeting of KLHK on the management of B3 medical waste COVID-19 stated that if the hospital does not have a medical B3 waste processor, it can be cooperated with the cement factory (Maharani, 2021). One of the meaningful aspects in the control of the COVID-19 outbreak is about handling infectious waste produced, both from COVID-19 sufferers

themselves and from medical personnel (Trisnawati and Suwanda, 2021). So that the management of medical B3 waste with proper and correct handling becomes the main key in controlling the spread of COVID-19. The understanding of the existence of B3 waste should be one of the knowledge that must be possessed in each individual. This happens because if the understanding can be possessed by each individual it will correlate with awareness to be able to pay attention to the cleanliness of the environment of each location and circumstances.

Derived from the description that has been presented, the review of the existence of management becomes an important thing to do especially in places and locations that contribute a lot of hazardous and toxic waste materials (B3). Therefore, this research team has an interest in conducting research on one of the places used as a place of isolation for handling covid-19 cases. In more detail, this research has the goal to find out the analysis of B3 waste management (solid) at the Isolation Site of Hotel X Bojonegoro Regency.

**2. Materials and Methods**

The type of research used in this study is qualitative descriptive with the location of the research determined intentionally (purposive). Descriptive approach will focus on problems in a study or problems that are actual and describe the facts studied. While the qualitative method used has the purpose for further discussion analysis of sampling data. Meanwhile, the selection of sampling subjects conducted with purposive used in the study will select sources to obtain information from staff and nurses who work at isolation sites. The study was conducted for 2 weeks starting from October 25, 2021 to October 18, 2021. The equipment used in the study included ATK (work stationery), laptops and smartphones.

The types of data used are divided into two types including primary data sources and secondary data sources. This type of primary data is carried out by data collection techniques through interviews with subjects based on the consideration of someone who is considered to understand and engage in the management of solid medical waste at the Isolation Site of Hotel X Bojonegoro Regency. Meanwhile, secondary data is obtained with literature and applicable laws and regulations to support the conformity of processing carried out. Credible sources that have a connection with the theme discussion in this study.

**3. Result and Discussion**

**3.1 Source of Waste**

The source of waste is one of the important things to note. This is because the source of waste will be a factor for how to determine the next step so that if the handling has been analyzed first from the source then the ease to run the process will be much more weighted. In the research project conducted then the researcher asked the first question posed to the source, namely on the data of waste

sources. Questions asked by the interviewer about the search for waste source data are:

"Where does the source of B3 waste come from the Covid-19 Hotel X Isolation site of Bojonegoro Regency?"

The results of the interview obtained are as follows:

"Because this location is a place of self-isolation of patients affected by the covid 19 virus, so, the source of waste produced also comes from the patient's handling activities. Well, actually the waste produced from this place is the same as the waste produced like other medical waste. Meanwhile, because the patients treated are patients suffering from covid 19, this waste management is also included in the category of hazardous waste."

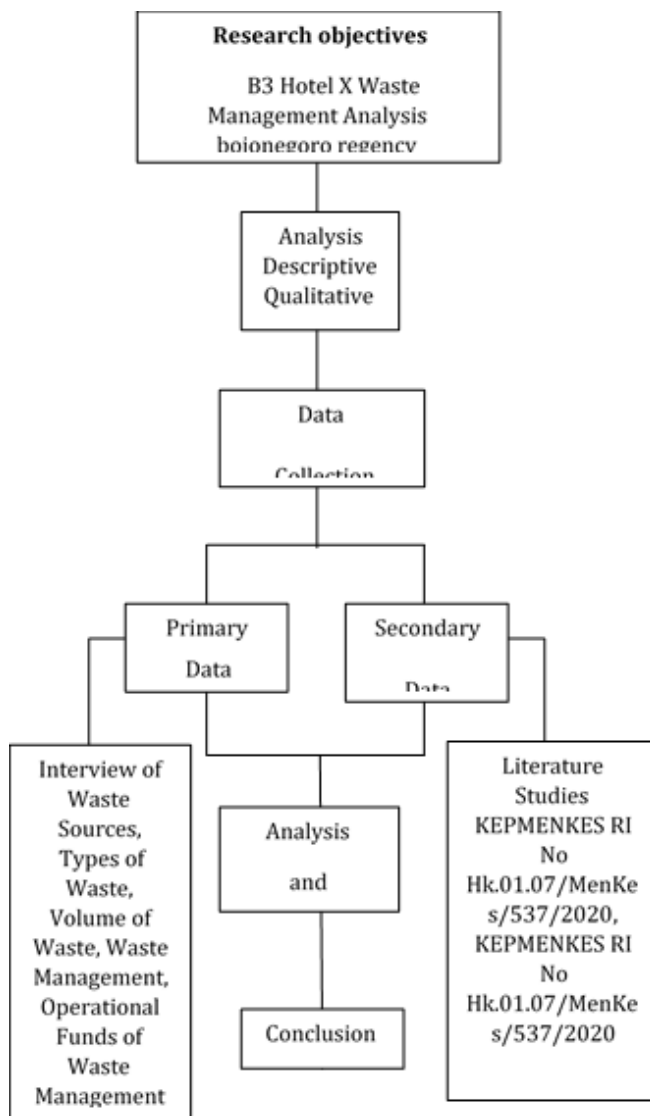


Figure 1. Research flowchart

Based on the analysis data obtained from the interview results, the source of waste at the location clearly comes from handling Covid-19 patients. The waste generated from handling Covid-19 patients is infectious waste. Infectious waste is waste that has been

contaminated by organisms that transmit disease to vulnerable humans (Nugraha, 2020). Considering the understanding of solid Medical B3 Waste Covid-19 in kepmenkes ri No Hk.01.07 / MenKes / 537/ 2020 "Solid medical B3 waste is the goods or materials left over from unused activities that have the potential to be contaminated by infectious substances or contact with patients and / or officers in health care facilities that handle COVID-19 patients". Handling covid-19 patients makes all the attributes used to be the source of B3 waste. This is because the nature of the needs that have been used in handling it has direct contamination of the virus.

### 3.2 Types of Waste

This type of waste is one of the important links in the analyzing carried out for this research. Apart from the source of waste that must be considered. This type of waste becomes one of the very important aspects because it will concern the clarity of the next processing step. In the research conducted, to obtain information on this, the research team submitted questions to obtain data about the type of waste generated from this isolation location.








"What kind of type of B3 waste is generated from the Covid-19 Hotel X Isolation Place of Bojonegoro Regency?"

The information from the interview results obtained is as follows:

"Existing types of waste include used masks, used gloves, used tissues, used beverage and food plastic, used food and beverage paper, used syringes, used infusion sets and used personal protective equipment (APD), this is categorized as B3 because it is a type of infectious waste"

Based on the results of the data obtained, the type of waste that exists comes from used masks, used gloves, used tissues, used plastic drinks and food, used food and beverage paper, used syringes, used infusion sets and personal protective equipment (APD). Categorization of this type of waste is based on the presence of infectious waste, where this type of waste is categorized as waste B3. Some of the examples of waste mentioned are actually a common type of waste in the prevention of covid. However, because the location at this research site is an area of isolation location, it will contain direct virus contamination due to exposure from patients who have tested positive for the corona virus. Therefore, the processing of waste produced at this location is treated like infectious B3 waste. This is because according to Kriswibowo et al., (2021), medical waste that is not managed properly, can potentially cause new problems in the future.

Table 1. Solid Medical B3 Waste Types at Hotel X Isolation Locations in Bojonegoro Regency

| Type of Waste B3   | Category of waste types |
|--|-------------------------|
|  <p>Used masks</p>                         | Infectious              |
|  <p>Used gloves</p>                        | Infectious              |
|  <p>Used tissue</p>                        | Infectious              |
|  <p>Plastic paper used food and drink</p> | Infectious              |
|  <p>Syringe</p>                          | Sharps                  |
|  <p>Former infusion set</p>              | Sharps                  |
|  <p>Personal Protective Equipment</p>    | Infectious              |

### 3.3 Volume of Waste

Waste volume is the next aspect that researchers target in collecting data. The information will be the volume of waste will be data that can be used to assess how the processing review is conducted. The volume of waste that is too much stacked will give a high probability to the spread of the virus contained if the management is not clearly

determined. In this case the research team asked questions of the source as a form to obtain data. Questions asked about the waste volume point asked are:

"How much B3 waste is generated from the Covid-19 Hotel X Isolation Site of Bojonegoro Regency and is there any data for each waste generated?"

The results of the interview obtained are as follows:

"So for every day the waste generated from this handling is stored first before being managed and destroyed. Well, for the volume itself also does not vary for the first start of covid itself where pasien also increasingly the waste produced is also more than 2 to 5 boxes of strerofoam however, for the time being alhamdulillah patients are also decreasing and even almost zero patients so the waste produced is also only 2 boxes for one transport. For the data itself from us there is no data that we archive so indeed the volume of waste that exists is directly separated and managed"

Based on the results of data obtained from the interview process, it is known that the waste generated at the site has an average intensity of about 2 to 5 strerofoam for the initial period where covid patients increase. However, for the last period of time the number of patients is decreasing, making the amount of waste also reduced. This makes the value is less accurate because from the results of the interview conducted, it cannot be mentioned precisely for each weight of waste produced. Reviewing from this, it can be indicated that there is no weighing of medical waste carried out at the Isolation Location of Hotel X Bojonegoro Regency every day. This is not in line with some studies that can usually specify how much the results of solid medical waste B3 produced per month with units of kg. The weighing is intended so that the resulting medical waste weighing can be used as a strategy in preparing the management of solid waste B3 in the future at the Isolation Location of Hotel X Bojonegoro Regency.

### 3.4 Waste Management

Medical waste management is one of the core of how this research analysis is conducted. In this case, poorly structured management will have a worse impact on the environment or health conditions in the surrounding location. Solid waste, especially in the place of isolation / quarantine produced is certainly very potential in causing environmental and health problems. In this case information related to how management is done becomes one of the things that need to be questioned for clarity because it will greatly affect living and non-living things around it. When collecting data with interviews on medical waste management with questions

"What is the stage of management to the destruction of waste produced?"

The results of the interview obtained are as follows:

"So, initially the waste produced every day will be put in a plastic bag well when the plastic bag is full then moved into the strerofoam case to secure the waste. Furthermore, there are officers from the service known as the Public Safety

Center (PSC) to take the waste and be brought to the Pharmaceutical and Medical Device Installation (INFALKES) which is located on Ahmad Yani Street No.02 bojonegoro regency. And later in INFALKES the waste will be destroyed through burning that has previously been sprayed with disinfectant. In burning is not only medical waste but also with cardboard boxes strerofoamnya as well."

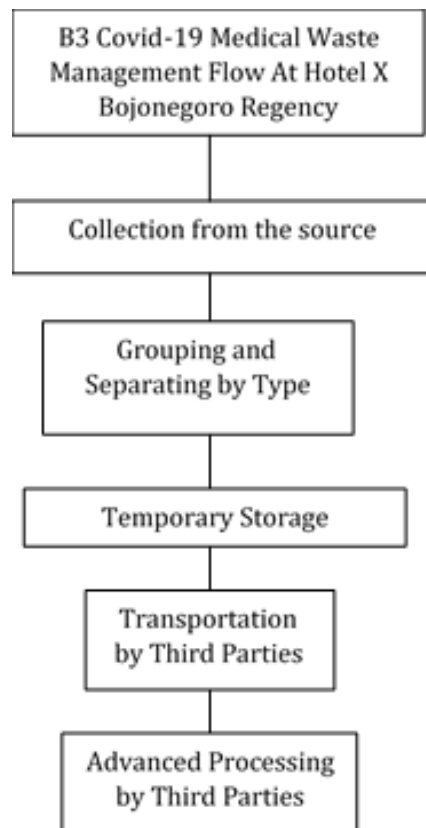


Figure 2. Waste treatment flow chart

Based on the results of interviews that have been conducted, the process of managing B3 solid medical waste at hotel X Isolation Location of Bojonegoro Regency was carried out with the coordination of third parties. As the results of the interview obtained, it is said that the location of the isolation site only collects and secures various solid medical waste produced, which will then be handed over to the relevant agency for further treatment.

In this case, specifically the stages carried out in the management of solid medical waste locations of Hotel X Bojonegoro Regency, initially conducted sorting of waste resulting from the handling of covid at the location. At the research site of the analysis of the stages of sorting solid medical waste has been said to be in accordance with the Ministry of Health No Hk.01.07 / MenKes / 537 / 2020, namely the sorting process is carried out from the source and separated between medical and non-medical waste. This sorting stage is done to facilitate the process to the next stage so that the resulting waste results can be processed in accordance with the rules and regulations.

Sorting done at the location has also been done by paying attention to the source of the waste. This will correlate to the categorization and classification of waste which is expected to help for the next stage of processing. Waste sorting is one of the important aspects because B3 waste has its own hazard classification. In addition to infectious, B3 waste can have other properties including pathological, pharmaceutical, sharp objects, cytotoxic, chemical, radioactive, and waste with high heavy metal content or pressurized containers. Sorting that is done must also be considered to the room or place used. To facilitate the sorting at the location must be provided a separate trash can between medical and non-medical which is then labeled. The nature of the trash can used must also be considered where it will be very safe if the well-used is a strong material so as to minimize the amount for damage or leakage. Quite light and easy to clean so that in the process of transportation or sterilization will be easier for officers, stainless because rust can trigger other problems especially when not knowing how the reaction is predicted when reacting with a substance, and lastly watertight can maintain the dryness of garbage.



Figure 3. Garbage collection done with the use of yellow plastic bags

The next stage is from the results of sorting the solid medical waste produced put into a plastic bag of medical B3 waste. This stage has also been in accordance with *kepmenkes ri No Hk.01.07 / MenKes / 537/2020* which states that only solid-shaped medical B3 waste can be put into plastic bags of medical B3 waste in yellow. On the packaging of waste / waste B3 Covid-19 is disinfected by spraying disinfectant (in accordance with the dose that has been set) on plastic waste that has been bound. Solid medical B3 waste that has been tied up, disinfected using chlorine-based disinfectant concentration of 0.5% when it will be transported to a processor.

In the results of the interview that has been conducted, the next stage is done by moving the resulting solid waste into the safety box or in this case used *dus* styrofoam. Based on this, if categorized in more detail this condition falls into

the category of temporary storage where the storage of B3 medical waste in this covid case must be carefully considered by storing medical waste according to the group.

Differentiating packaging by paying attention to color variations in storage containers can be done to further maximize the effectiveness of storage carried out. The ineffectiveness of a storage can trigger conditions for changes in the environmental health of the placement location. Some factors that can be the cause of this for example in the lack of attention to the garbage collected. In addition to the procedure of treatment, things that need to be reviewed also come from the length of storage time for piles of garbage that have been attached to this temporary storage area.



Figure 4. Temporary storage box

The results of the interview then said that in one month, the results of medical solid waste were only carried out for further processing. This is an indication of the lack of appropriate action taken because it refers to *kepmenkes ri No Hk.01.07 / MenKes / 537/2020* after 3/4 full or at most 12 hours, waste / waste B3 that has been packaged should be transported for processing. The next step is the processing carried out by a third party. In the results of the interview conducted there are officers from the service who will carry out transportation and commonly referred to as public safety center (PSC), the results of the transportation are then taken to the Pharmaceutical and Medical Device Installation (INFALKES) which is located on Ahmad Yani Street No.02 Bojonegoro Regency. From the analysis of this process, it has been said to be suitable for the treatment of

solid medical waste carried out with the help of third-party services. At this stage, the person from the isolation location who became the source claimed to not know in detail the processing process carried out but from some sources who answered on this said that there would be burning. In the results that have been presented by the source providing information that the transport officer has used PPE, it is an operational conformity of waste management. The escort officer is one of the things that must also be considered for his safety, direct contact when the transportation process causes a great risk of effects on his health. Quoting from research conducted khumaidi (2016), in a transport, officers who run the process must wear APD uniforms, masks, head coverings, aprons, boots and latex gloves. Transportation is also carried out must use special transportation with infectious symbols and labels and with the caption "Very Infectious Waste. Special Infectious".



Figure 5. Symbol of Infectious Waste on transportation

### 3.5 Operational Funds

Operational funds are one of the things asked by the research team because operational funds will greatly affect the intensification of processing carried out. Less clear sources of funds will cause hampered handling. When collecting data with interviews regarding medical waste management operational funds with the question:

*"Responding to the statement that the extermination was carried out outside of a private location and distribution also cost money. For its own waste management, where is this management fund obtained?"*

The results of the interview obtained are as follows:

"Because this covid 19 case is a new problem that is the responsibility of the government as well and us as health workers as people who and as much as possible carry out our duty to save the lives of others. So, 100% of the costs used, both for the cost of drugs, other dal waste management processes that occur in this self-isolation location are charged by the bojonegoro district government

which is submitted or represented through the regional health office."

From the interviews that have been conducted from here can be withdrawn information that the operational funds of waste management B3 (Medical Solid) is derived from regional funds or fully from the government. This refers to the government's responsibility in reducing the number of vector covid-19. This condition is a concern that needs to be taken seriously by the state, especially with the economy of the population that is not evenly able to afford to pay for the cost of treatment. The government fully prepares management instruments through facility support and budget to address the amount of covid-19 medical waste that basically belongs to B3 medical waste whose quantity will adjust according to the conditions. According to the Ministry of Health No. 1204 of 2004 infectious waste is a waste related to patients who require isolation of infectious diseases (intensive care) or laboratory waste related to a microbiological examination of polyclinics and treatment rooms or isolation of infectious diseases. As is known that covid-19 is a disease that requires intensification of treatment because it is in dire need of special care to handle it. From the information that has been presented by the source, it is less clear how specific funds the government operationalizes in handling at the isolation site of Hotel X. Bojonegoro Regency. This became a shortcoming in this study because, the research team could not meet and dig more deeply from staff who work in the affairs of fund management.

### 4. Conclusion

Solid medical waste resulting from handling the isolation site of Hotel X Bojonegoro Regency produces type B3 waste due to the characteristics of this waste that is infectious. The waste can include used masks, used gloves, used tissues, used plastic drinks and food, used food and beverage paper, used syringes, used infusion sets and personal protective equipment (APD). In the analysis of solid medical waste management B3 Covid-19 at Hotel X Bojonegoro Regency, the management analysis has been good with the conformity of procedures in sorting and shelter. Conformity analysis can also be indicated from the transportation process carried out with the help of third parties where when the process takes place, the transport officer has used a complete APD then accompanied by special marked transportation. However, there are indications of discrepancies in the length of transportation carried out. This is a concern so that from this study, the researchers suggest that parties related to this handling process can conduct better reviews and supervision.

### References

- Axmalia, A. dan R. A. Sinanto. (2021). Pengelolaan Limbah Infeksius Rumah Tangga Pada mas Pandemi Covid-19. *Jurnal Kesehatan Komunitas*. 7(1) : 70-76.
- Hesti, Y. 2020. Upaya Penanganan Limbah B3 Dan Sampah Rumah Tangga Dalam Mengatasi Pandemi Corona

- Sesuai Dengan Surat Edaran No. Se. 2/Menlhk/Pslb3/Plb. 3/3/2020 tentang Pengelolaan Limbah Infeksius (Limbah B3) Dan Sampah Rumah Tangga Dari Penanganan Corona Virus Disease (Co. *Jurnal Pro Justitia*. 1(2) : 2745-8539.
- Khumaidi, I., Subagiyo, A. and Widiyanto, T. (2016). Analisis Pengolahan Limbah Medis Padat Pada 2 (Dua) Puskesmas Rawat Inap Dan 2 (Dua) Puskesmas Non Rawat Inap Di Kabupaten Banyumas Tahun 2016. *Buletin Keslingmas*. 35(4) : 389- 396.
- Kriswibowo, A., A. Wahyuningtiyas, N. W. Kusmayadi, dan K. Prasetyo. (2020). Kerjasama Pemerintah dan Swasta dalam Pengelolaan Limbah Medis Covid-19 di Kota Madiun. *Jurnal Administrasi Publik*. 6 (1): 8-18.
- Levani, Y., A. D. Prasetya dan S. Mawaddatunnadila. (2021). Coronavirus Disease 2019 (COVID-19): Patogenesis, Manifestasi Klinis dan Pilihan Terapi. *Jurnal Kedokteran dan Kesehatan*. 17(1) : 44-57.
- Maharani, S. E. 2021. Pengelolaan Limbah Medis Rumah Sakit Rujukan Covid-19 Di Provinsi Bali. *Jurnal Ecocentrism*. 1(2) : 96-102.
- Masruddin, B. Yulianto, S. A. Mulasari dan S. I. Sari. (2021). Pengelolaan Limbah B3 Fasilitas Pelayanan Kesehatan (Medis Padat) Di Puskesmas X. *PREPOTIF Jurnal Kesehatan Masyarakat*. 5(1) : 378-386.
- Mona, N. (2020). Konsep Isolasi Dalam Jaringan Sosial untuk Meminimalisasi Efek Contagious (Kasus Penyebaran Virus Corona Di Indonesia). *Jurnal Sosial Humaniora Terapan*. 2(2) : 117-125.
- Nugraha, C. (2020). Tinjauan Kebijakan Pengelolaan Limbah Medis Infeksius Penanganan *Corona Virus Disease* 2019 (Covid-19). *Jurnal Untuk Masyarakat Sehat*. 4 (2): 216-229.
- Nurwahyuni. N.K., L. Fitria, O. Umboh dan D. Katiandagho. (2020). Pengolahan Limbah Medis COVID-19 Pada Rumah Sakit. *Jurnal Kesehatan Lingkungan*. 10(2) : 52-59. DOI: 10.47718/jkl.v10i2.1162.
- Parantika, A., dan S. Juliandra. (2021). Kebijakan Promosi Selama Pembatasan Sosial Berskala Besaar di The Sultan Hotel & Residence, Aryaduta Sutttes Semanggi dan Grandhika Iskandarsyah. *Tourism Scientife Journal*. 6 (2): 239-250.
- Putra, H. A. dan J. Roosandriantini. (2021). Ruang Perawatan Isolasi Sebagai Bentuk Ruang Pemisah Pasien Covid-19 Di Rumah Sakit Umum Haji Surabaya. *Jurnal Arsitektur dan Perencanaan (JUARA)*. 4(1) : 49-61.
- Rahmawati, T. (2021). Peningkatan Pengetahuan dan Manajemen Stress di Masa Pandemi Covid-19 bagi Masyarakat. *Jurnal Masyarakat Mandiri*. 5 (1) : 125-134.
- Setyaningrum, W., dan H. A. Yanuarita. (2020). Pengaruh Covid-19 Terhadap Kesehatan Mental Masyarakat di kota Malang. *Jurnal Ilmu Sosial dan Pendidikan*. 4(4) : 550-556.
- Trisnawati, A. A., dan E. Suwandana. 2021. Evaluasi Pengelolaan Limbah Padat Rumah Sakit Rujukan Covid-19 di Provinsi Nusa Tenggara Barat. *Sulolipu: Media Komunikasi Sivitas Akademika dan Masyarakat*. 21(1) : 14-23.
- Yolarita, E., dan D. W. Kusuma. 2020. Pengelolaan Limbah B3 Medis Rumah Sakit Di Sumatera Barat Pada Masa Pandemi Covid-19. *Jurnal Ekologi Kesehatan*. 19(3)