

Study of Medical Hazardous And Toxic (B3) Waste Management From Health Clinic

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Article history

Received	Received in revised form	Accepted	Available online
27 Desember 2022	30 January 2023	22 February 2023	23 February 2023

Abstract: Medical waste is classified as hazardous and toxic material waste (B3) and the management of which is required to be carried by regulations established by the government. The goals of this study are to ascertain the quantity of B3 medical waste, to recognize B3 waste, and to acquire knowledge regarding the processes involved in managing B3 waste that is produced by clinical health activities. The study was conducted in one of the health clinics in Sri Katon Village, Buay Madang Timur District, East Ogan Komering Ulu Regency (East OKU), South Sumatra Province, from October to November 2021. Based on the findings of the study, it can be concluded that the health clinic's B3 waste management activities, including storage, supporting facilities, and infrastructure, comply all applicable B3 waste management laws and regulations. Waste management and storage activities commence with the identification of B3 waste, the storage procedure, and the packaging of B3 waste. Additional management activities in partnership with the third licensee

Keywords: health clinic, medical hazardous and toxic (B3) waste, processing, a temporary storage place

1. Introduction

Medical waste in Indonesia is classified as hazardous and toxic waste (B3), whose management is regulated in Government Regulation Number 22 of 2021 concerning the Implementation of Environmental Protection and Management [1]. B3 waste is the residue of a business or activity that contains hazardous and toxic materials, either directly or indirectly, that can damage the environment and endanger health [2]. Even though the amount is relatively small, it still has the potential to harm the environment and resources [3]. The level of poisoning hazard caused by waste also depends on the type and characteristics of the waste [1, 3]. Several types of waste fall into the B3 medical waste category, including sharps waste, infectious waste, pathological waste, pharmaceutical waste, chemical waste, pressurized packaging waste, and heavy metal waste [1].

B3 waste generators can carry out B3 waste management themselves as long as they can fulfil the requirements. However only a few health facilities can meet these requirements, namely, location requirements and equipment and technical operation of thermally hazardous waste treatment equipment with incinerators, as stated in the Minister's Regulation of Environment and Forestry of the Republic of Indonesia Number 56 of 2015 concerning Procedures and Technical Requirements for Management of Hazardous and Toxic Waste from Health Service Facilities [4]. So, management needs help from outside sources, as stated in PP RI Number 22 of 2021 Article

123, which says that B3 waste producers who cannot treat their B3 waste can give it to B3 waste processors (third parties) [1].

Health service facilities (HSF) produce around 75–90% of domestic waste or so-called harmless waste, originating from administrative rooms, kitchens, and households. The remaining about 10–25% is classified as dangerous and toxic waste (B3), including sharp object waste, infectious waste, pathological waste, pharmaceutical waste, cytotoxic waste, chemical waste, and radioactive waste that has the potential to have an impact on health and the environment [5].

Based on the results of the supervision, the Ministry of Environment and Forestry (KLHK) found several problems in the management of B3 medical waste, including the buildup of infectious waste, temporary storage that did not meet the standards, not having yet carried out B3 waste management procedures to correct black and pollutant emissions, the limitations of B3 waste processing services, and others [6].

If B3 waste is not managed properly, it is feared that it can cause environmental pollution that adversely affects the health of living things [7]. Based on this, an effort must be made to pay attention to B3 waste management activities properly and correctly. The purpose of this study is to determine the number of B3 medical wastes, identify B3 waste, and find out the procedures for the B3 waste management process resulting from health clinic activities.

2. Material and Methods

The study was conducted from October to November 2021 at a health clinic located in Sri Katon Village, Buay Madang Timur District, East Ogan Komerling Ulu Regency (East OKU), South Sumatra Province (Figure 1).

The method used is the descriptive-qualitative method [8]. A descriptive method can be defined as a method that is intentionally done to collect information about a phenomenon, as in the actual condition [9], mainly by examining verbal data [10], and is not

intentionally done to examine a hypothesis but only to describe an exact situation [8, 11].

Data sources were obtained from secondary data obtained from the Health Clinic X and East OKU Environmental Agency (DLH).

Following data collection is data analysis, which is the decomposition of a subject into its various parts and the study of the parts themselves as well as the relationships between the parts to quickly grasp and comprehend the significance of the whole. The collected data are tabulated, analyzed, and discussed descriptively and qualitatively [12].

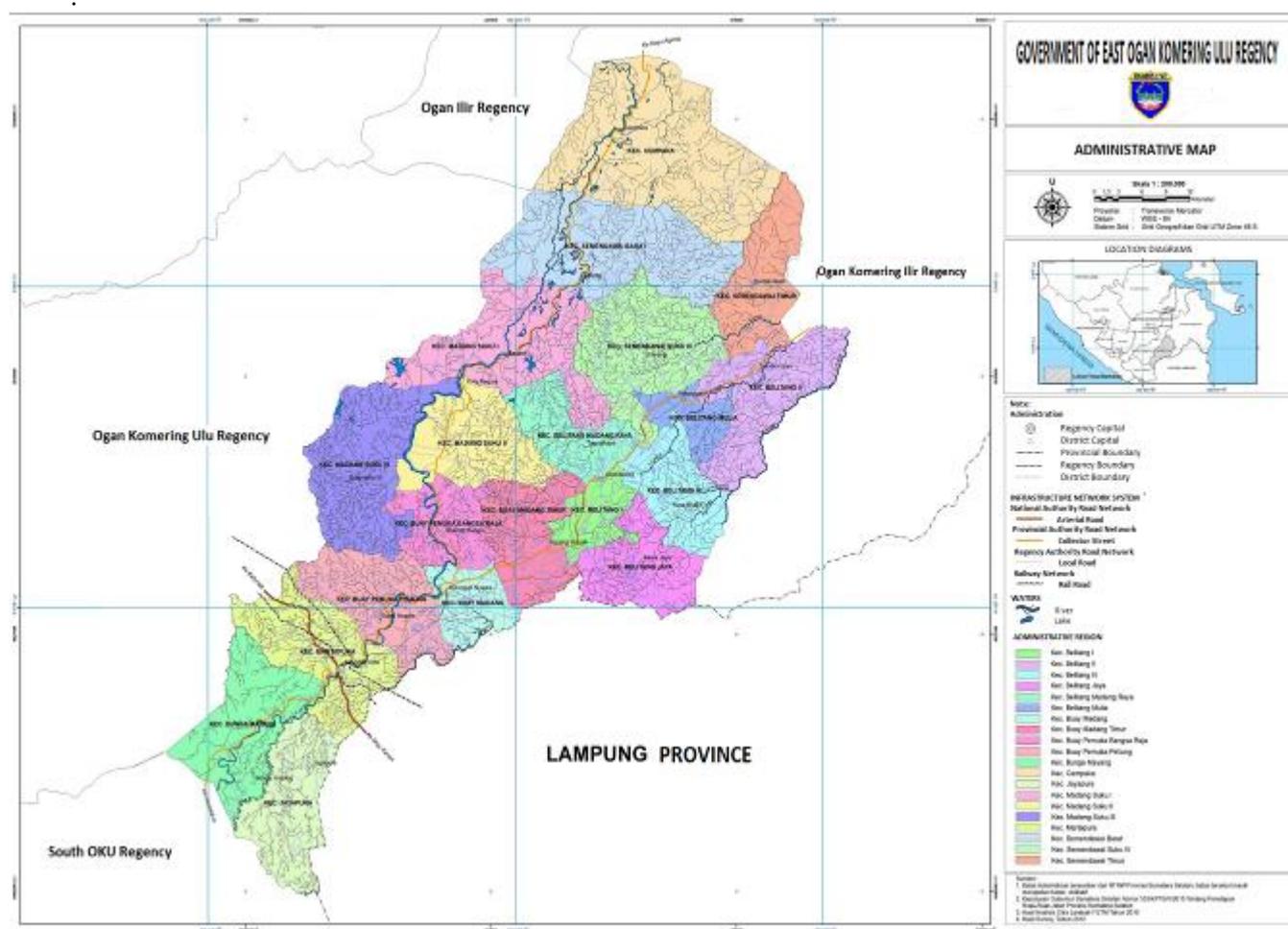


Figure 1. Administrative Map of East Ogan Komerling Ulu Regency (East OKU)

3. Results and Discussion

3.1. Identification of Waste and Amount of Hazardous Waste To Be Stored

Medical waste is divided into liquid, gaseous, and solid waste. Medical B3 solid waste includes infectious waste, sharps, chemicals, pharmaceuticals, and pathology [14]. Before carrying out B3 waste treatment activities, Health Clinic X carried out data collection and inventory of B3 waste to know the hazard category, source, characteristics, and amount of B3 waste produced per unit of time.

The hazard category can be identified in the list of

B3 waste as stated in the law on B3 waste management, while the characteristics of other B3 waste are known from the codification of B3 waste produced following the law on B3 and non-B3 waste management. Based on its source, hazardous waste consists of specific and non-specific sources, as well as materials that do not meet product specifications and have expired [13].

Table 1. shows that B3 medical waste of Health Clinic X is included in the category of solid medical waste originating from four rooms, namely the doctor's room, polyclinic, inpatient care unit, and pharmacy room. Among the four rooms, the most common types of B3 medical waste produced include 350 bss strips per

month from the doctor's room and inpatient room, 300 handsoons per month from the polyclinic, and three expired drugs per month from the pharmacy room. Meanwhile, solid medical waste was one of the few types of medical waste found in the four rooms, namely as much as 1 kg. Factors that influence the generation

of solid medical waste include the patient's economic, social, occupancy rates, types of health services provided, cultural status, and geographic location [15]. All medical waste can contain infectious, pathogenic microorganisms as well as toxic chemicals, some of which contain radioactive materials [16].

Table 1. List of Hazardous and Toxic Materials Medical Waste X Health Clinic

No	Waste Source	Type Waste	Waste Code	Waste Hazard Category	Nature of Waste			Character of Waste	Amount Produced		
					Solid	Liquid	Gas		Total	Units	Time Range
1.	Doctor's Room	Cotton	A337-1	1	√			Infectious	2	Kg	Months
		Gauze	A337-1	1	√			Infectious	1	Kg	Months
		Handsoon	A337-1	1	√			Infectious	200	Pcs	Months
		Naid	A337-1	1	√			Sharps	300	Pcs	Months
		Vial	A337-1	1	√			Sharps	20	Pcs	Months
		Ampoules	A337-1	1	√			Sharps	150	Pcs	Months
		Syringe	A337-1	1	√			Sharps	200	Pcs	Months
		Strip Bss	A337-1	1	√			Infectious	350	Pcs	Months
		Alcohol Swab	A337-1	1	√			Infectious	3	Kg	Months
2.	Polyclinic	Cotton	A337-1	1	√			Infectious	1	Kg	Months
		Gauze	A337-1	1	√			Infectious	1	Kg	Months
		Handsoon	A337-1	1	√			Infectious	300	Pcs	Months
		Naid	A337-1	1	√			Sharps	250	Pcs	Months
		Vial	A337-1	1	√			Sharps	25	Pcs	Months
		Ampoules	A337-1	1	√			Sharps	150	Pcs	Months
		Syringe	A337-1	1	√			Sharps	250	Pcs	Months
		Strip Bss	A337-1	1	√			Infectious	250	Pcs	Months
3.	Inpatient	Cotton	A337-1	1	√			Infectious	2	Kg	Months
		Gauze	A337-1	1	√			Infectious	2	Kg	Months
		Handsoon	A337-1	1	√			Infectious	200	Pcs	Months
		Naid	A337-1	1	√			Sharps	300	Pcs	Months
		Vial	A337-1	1	√			Sharps	20	Pcs	Months
		Ampoules	A337-1	1	√			Sharps	150	Pcs	Months
		Syringe	A337-1	1	√			Sharps	200	Pcs	Months
		Strip Bss	A337-1	1	√			Infectious	350	Pcs	Months
		Urine Bag	A337-4	1	√			Infectious	5	Kg	Months
		<i>Fie Bottle</i>	A337-5	1	√			Infectious	18	Kg	Months
		<i>Blood Bag</i>	A337-3	1	√			Infectious	1	Kg	Months
<i>Infuse bottle</i>	A337-2	1	√			Infectious	10	Kg	Months		
4.	Pharmacy Room	Expired Drugs	A337-2	1	√			Infectious	3	Pcs	Months
		Reagent	A337-3	1	√			Infectious	1	Kg	Months
		Bottles of Eta	A337-4	1	√			Infectious	1	Kg	Months
		Syringe	A337-1	1	√			Infectious	1	Kg	Months
		Gauze	A337-1	1	√			Infectious	1	Kg	Months
		Cotton	A337-1	1	√			Infectious	1	Kg	Months
		Naid	A337-1	1	√			Infectious	1	Kg	Months

a. *B3 Medical Waste Handling Activities*

The procedures for handling B3 medical waste at Health Clinic X are:

1. Process supervision

- a) Supervised from transportation to the storage of medical waste.



- b) Monitoring of medical waste in each room is carried out to find out whether medical waste has been separated from nonmedical waste.
 - c) Ensure that trash cans are always lined with plastic bags.
2. Process handling
- a) Medical waste is separated according to the category or type of waste that is put into a tub that has been lined with plastic bags. Black plastic bags are used for domestic waste; yellow plastic bags are used for medical waste.
 - b) The plastic bag and its contents must be removed every day or when it is 2/3 full so that it is safe to tie the plastic bag and collect it in one place. During the transportation process, officers from Health Clinic X separated the waste based on the characteristics of waste.
 - c) Transportation to Health Clinic X has been carried out every day by sanitarian officers to the B3 waste tps (temporary storage area).
 - d) Officers have weighed and recorded the B3 medical waste logbook every time they enter and leave the B3 waste tps (temporary storage area).
 - e) Officers have reported the balance of B3 waste management to the East Oku regency environment service at least once every six months.
3. The process of handing over waste to third parties
- a) Health Clinic X has entered into a cooperation agreement (MOU) with a third party, in this case, PT. Z is the transporter/transporter of B3 waste with a license from the ministry of environment and forestry.
 - b) For every transport of B3 medical waste by a third party, Health Clinic X also requests proof of transportation and a manifest, or ftr, from the carrier.
 - c) In terms of clarity on the continued management of the transported waste, Health Clinic X already has a copy of the third-party mou data from PT. Z with an advanced manager or a licensed B3 waste destroyer from the ministry of environment and forestry.

3.2. Hazardous Waste Storage Place

B3 medical waste management begins with the collection and continues with the transportation of sorted waste to a treatment site or final waste disposal [17]. One of the activities in the management series is storage [18]. Storage is the activity of storing B3 waste, carried out by entrepreneurs, collectors, users, processors, and hoarders of B3 waste to store it temporarily [19].

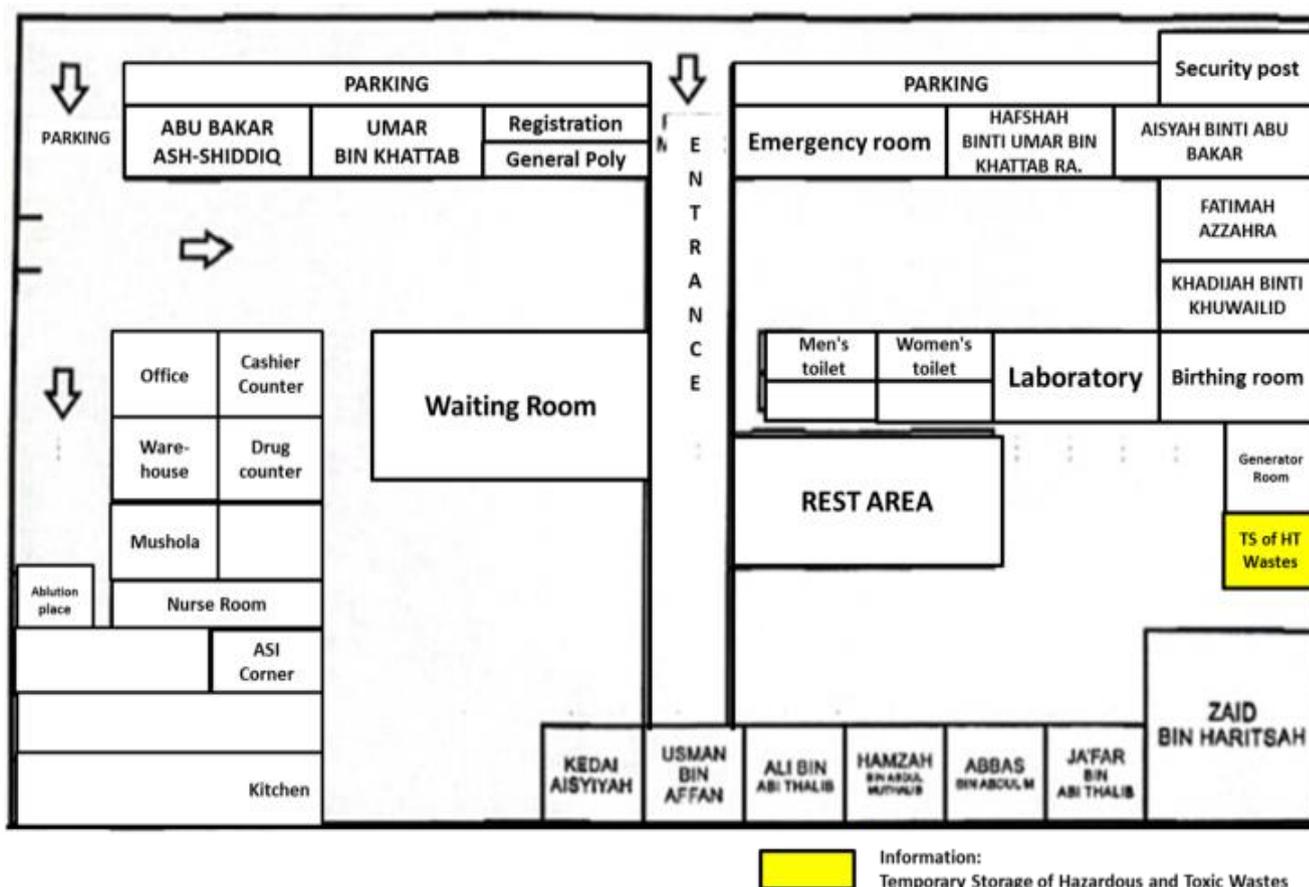


Figure 2. The Layout of Hazardous Waste Storage Locations

The storage facility for B3 waste in Health Clinic X is 2×3 m in size and has been designed to avoid hazards to the environment and human health, especially if spills and/or spills occur as a result of errors in storage handling. This is important because the impact of a B3 spill can be in the form of a potential explosion or fire hazard, the formation of toxic gas, and so on. The spill not only endangers the workers in the surrounding area but also the people living around the area [20, 21].

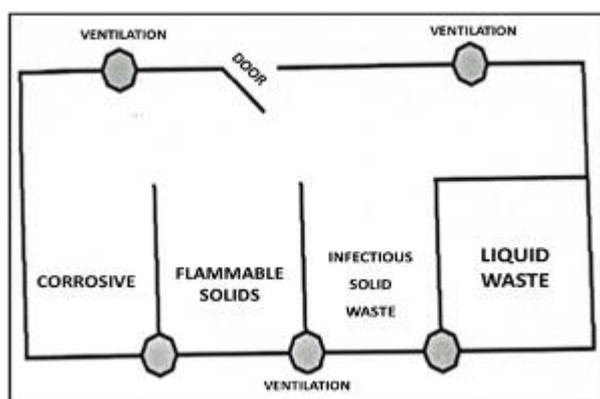


Figure 3. The Layout of The Hazardous Waste Temporary Storage

The B3 waste storage facility is in the form of a building consisting of several storage sections, with the provision that each storage facility is only used for the storage of one characteristic of B3 waste. Then, between one section and the other, a dividing line or embankment has been made to prevent mixing or spillage of B3 waste into other parts of the B3 waste storage. The temporary storage area for Health Clinic X can protect B3 waste from rain and has a waterproof floor. The location for storing B3 waste is free from flooding and not prone to natural disasters (landslides, volcanic hazards, earthquakes, faults, sinkholes, subsidence, tsunamis, and mud volcanoes). The outside of the B3 waste temporary storage area has been equipped with a B3 waste symbol and label under statutory provisions [22].

3.3. B3 waste packaging

The monitoring and control system for B3 waste urgently requires adequate management facilities and infrastructure in the process of handling, transporting, processing, and disposing of it. Because even a sufficient number of supervisors does not guarantee that the supervisory function can run optimally [23]. Packaging for B3 waste uses packaging in the form of a safety box to accommodate solid medical waste with sharp objects (syringes, ampules, vials) and containers for solid infectious medical waste. The packaging used has been given a B3 waste symbol and label under the provisions of the applicable B3 waste management laws and regulations.

Health Clinic X has packaged the B3 waste based on the suitability of the packaging for the type and characteristics of the B3 waste and then given a sign or label to make it easier for officials to pay attention to the allowable storage time; arranged them based on the type of packaging and provided a distance of more than one meter between the piles of packages and the roof; as well as storing packaging with a block system. Health Clinic X also provides special waste packaging that is non-leaking, rust-resistant, and suitable for use.



Figure 4. B3 Waste Packaging Symbols and Labels

The type of B3 waste packaging used meets the requirements for B3 waste packaging as stipulated in the regulation of the minister of environment and forestry of the republic of Indonesia No. 6 of 2021 concerning procedures and requirements for managing hazardous and toxic waste materials [24]. Good B3 waste packaging must not leak, rust, or be damaged and have the shape, size, and packaging materials for B3 waste according to the characteristics of the B3 waste that is packaged, considering aspects of safety and ease of handling [25].

The marking of B3 waste packaging is intended to provide identity for B3 waste so that it can be easily recognized. Through tagging, basic information about the type and characteristics of the B3 waste can be obtained for the management implementer, the B3 waste management supervisor, and every person or community around it. The tagging of B3 waste is also important for tracing and determining B3 waste management. There are two types of signs used, namely the B3 waste symbol and the B3 waste label [26].

The B3 waste management officer carries out routine inspections to ensure that there is no damage or leakage on the packaging due to corrosion or other factors. Aside from that, the company produces a report on the B3 waste management activities that it performs. This activity is also intended to be part of the monitoring system. A strict monitoring and control system for B3 waste urgently requires adequate management facilities and infrastructure in the process of handling, transporting, processing, and disposing of it. Because even a sufficient number of supervisors does not

guarantee that the supervisory function can run optimally [27].

4. Conclusion

Based on the research results, it can be concluded that the hazardous and toxic waste management activities of Health Clinic X have been going well. In addition, facilities and infrastructure to support waste management activities comply with applicable government regulations. The management and storage of hazardous and toxic waste at Health Clinic X start with collecting medical waste, identifying waste (based on source, characteristics, and quantity), storing and packaging hazardous and toxic waste, and finally transporting the waste to a treatment or final disposal site. Health Clinic X cooperates with licensed third parties for advanced waste management.

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