

# Medical waste management at community health center: a literature review

Arifah Wulansari\*, Sudarno, Fuad Muhammad

Master Program of Environmental Science, School of Postgraduate, Diponegoro University, Semarang - Indonesia

**Abstract.** Total of medical waste generation from health care activities increased every year. Medical waste must be treated seriously because the hazardous substances have potentially to transmit disease and pollute the environment. According to data in 2018, the ministry of environment and forestry estimates that there are around 8,000 tons of untreated medical waste in Indonesia. This is because the current capacity of medical waste management in Indonesia is smaller compared to the growth of medical waste. Several research results indicate that the conditions for the management of medical waste in community health centers still encounter various obstacles. This paper aims to conduct a literature review on matters relating to the medical waste management in community health center and influencing variables. The results of the study are in the form of a framework for conducting a more comprehensive study in order to overcome the problem of managing medical waste at community health centers.

**Keywords.** medical waste management; community health center; infectious waste; waste generation.

## 1 Introduction

Environment is a gift from God that must be preserved in order to maintain human survival and improve the quality of life itself. In order to utilize natural resources and improve people's welfare, it is necessary to carry out sustainable development that is environmentally friendly. This is because development activities carry the risk of pollution and environmental damage. Development that pays attention to environmental sustainability will be a means to achieve sustainable development as well as a guarantee for the welfare and quality of life of present and future generations.

An integral part of national development is health development which aims to improve the quality of human resources to be productive both socially and economically by realizing the highest levels of health[1]. Increasing access and quality of health services improvement is one of the main targets in health development, which is realized through the provision of both basic and referral health service facilities such as health centers and

---

\* Corresponding author: [arifah.wulansari@gmail.com](mailto:arifah.wulansari@gmail.com)

hospitals. In carrying out health service activities both in health centers and hospitals there is a risk of pollution and environmental damage, namely the generation of hazardous and toxic waste originating from medical services.

Regardless of the amount of medical waste generated by health service facility, it must be treated seriously. This is because the hazardous substances contained in the waste have the potential to transmit diseases and pollute the environment[2]. Various risks to human health and the environment can occur, if the medical waste produced is managed improperly. Injuries to humans due to sharp puncture, infectious diseases to humans by infectious agents, and environmental contamination by toxic and dangerous chemicals, are some of the problems that can arise as a result of inappropriate medical waste management.[3]

Some groups of people who are at risk of being affected by disruption due to medical waste generated by health care facilities, namely, first are patients who come to health care facilities to get help with treatment and care. Second, employees who work in health service facilities. Third, visitors or introductory sick patients who visit health service facilities and fourth, are people who live around health care facilities[4]

The condition of hazardous and toxic waste management from health service facilities in Indonesia is still quite worrying. In 2018, the ministry of environment and forestry (KLHK) states that Indonesia is in an emergency state of medical waste treatment. According to data in 2018, KLHK estimates that there are around 8,000 tons of untreated medical waste in Indonesia. This is because the current capacity of medical waste management in Indonesia is smaller than the growth of medical waste[5]

Based on data from the ministry of health (Kemenkes) at the end of 2018, health service facilities generate a total of 296.86 tons of waste every day. Waste that can be managed is only 168.8 tons. The remaining 128.06 tons cannot be managed. It accumulates and becomes a management burden in the next day. This condition continues continuously, so that the temporary site area in a number of hospitals or health care facilities become full of waste bags. The existence of medical waste that is not managed according to regulations, the impact will be very dangerous because of the potential to transmit various infectious diseases. The waste originating from chemicals will have an impact on polluting the environment[5]

KLHK regulation number P.56/2015 has set in detail about medical waste management. In article 3 of regulation P.56 / 2015 it is stated that there are three scope of health care centre that are the government's priority in the management of hazardous and toxic waste which includes community health center, health service clinics or similar and hospitals[6]. The results of supervision conducted KLHK and kemenkes indicate that medical waste in Indonesia has not been managed according to standards. This is related to the storage of infectious waste that is collected improperly, the accumulation of waste facilities, temporary storage areas that do not meet standards, and the use of non-standard incinerators. Although various facilities have tried to manage their medical waste independently or with the help of third party transport and processing services, some of the facilities are still constrained in terms of the availability of medical waste temporary shelter, do not have a temporary medical waste storage shelter permit, and have not carried out medical waste management procedures with right, such as identification, recording, waste balance and reporting[2].

Such conditions certainly cannot be ignored, bearing in mind the magnitude of the impact that can occur on the environment and public health if medical waste is not managed in accordance with applicable laws and regulations. In addition, there is also the risk of environmental legal sanctions that can be imposed on health service facilities that violate applicable legal regulations. This paper aims to review the literature related to medical waste management in health service facilities so that an appropriate method for conducting a more comprehensive study can be determined.

## **2 Literature review**

### **2.1 Medical waste**

According to health law number 36/ 2009, health services facilities are defined as a place that functions to conduct health service efforts, both promotive, preventive, curative and rehabilitative organized by the government, local government and the community. The number of health service facilities recorded in Indonesia in 2019 is 2,820 hospitals, 9,825 community health center and 7,641 clinics[5]. In order to provide health services to patients and the community, each of these health service facilities generates medical waste.

Waste originating from health services in the form of discharges from health installations, research facilities and laboratories both hospitals, community health cares, clinics, blood banks, dental practices, animal clinics and other health services is referred to as medical waste. Liquid medical waste can contain organic and inorganic materials which are generally measured by the parameters of BOD, COD, TSS and so forth. While solid medical waste consists of rubbish which is easy to rot, flammable and others[7].

According to the research results, the waste generated by this health service facility can be categorized into 2 namely general waste and hazardous waste. The amount of general waste produced by health care facilities is 75 - 90% which is comparable to domestic waste. The remaining 10 - 25% is hazardous waste. Some characteristics that make this waste dangerous are toxicity, infection, chemical reactivity, radioactivity and the sharpness of waste[8].

Medical waste which is discharged directly into the environment will have a very large and accumulative impact, so that its management must be carried out thoroughly, integratedly and sustainably. Medical waste generation which produce by health service activities is 10-25% while the remaining 75-90% is domestic waste[9]. Although medical waste is generated less when compared to domestic waste, the environmental risk posed is huge if medical waste is not handled properly. According to research conducted at Brookdale university hospital and medical center, it was concluded that 70-80% of infectious waste produced by hospitals is non-infectious waste mixed with infectious waste as a result of poor medical waste management activities[10]. The amount of medical waste generated in a country shows a positive relationship with national income. High income can cause an increase in the health status of the community so that the resulting medical waste is lower[11].

### **2.2 Medical waste management at community health center**

#### *2.2.1 Operational technical aspect*

Waste management is defined as the action starting from the collection from source, sorting, storing, transporting and treating the waste from the activity. The purpose of waste management is to reduce the volume, concentration and hazard of waste through physical, chemical or biological processes. However, efforts to reduce or reduce waste are efforts that must be carried out first because they are preventive and provide benefits in the form of cost efficiency of waste management. Assessment studies on medical waste management in developing countries show the same problems in the management of medical waste in health care facilities such as the handling and storage process is not done properly, poor practice of reducing waste, hazardous waste and non-medical waste mixed and disposed of on the spot open or ground disposal, waste incinerators not equipped with emissions control

equipment, chemical waste discharged through public sewage systems and no staff training program[12].

In general, the condition of medical waste management in most health service facilities in Indonesia is still not ideal. Research conducted at 7 community health centers in Sidoarjo regency shows that the existing conditions of medical waste management have not run optimally, at the separation stage still found solid medical waste mixed with food, plastic and paper waste. At the storage stage, it was obtained that most of the medical waste temporary shelter in the community health center did not meet the criteria for the hazardous and toxic waste temporary shelter even found 1 community health center that did not have a temporary shelter so that medical waste was placed in the back area of the community health center in an open space[13].

Medical waste generation found in health service facilities in Padang city is 10% of the total waste produced with the characteristics of toxic waste 40%, corrosive 21% and infectious 17%. Medical waste is almost found in all activities in health facilities including medical service activities and non-medical support[14]. While the results of research conducted at the Sidoarjo district health center showed that the composition of the largest hazardous waste in the inpatient health center was 59% used infusion bottles, in the outpatient health center was 73% non sharps infectious with the rate of emergence at the inpatient health center was 60.47 g / patient.day and outpatient health center 6.37 g / patient.day[13]. Medical waste generation data and medical waste treatment facilities need to be mapped to monitor the adequacy of the generation ratio and the ability to treat waste. If there is a high gap between the values of the two, special management is needed in order to avoid environmental pollution due to hazardous medical waste[2]

### *2.2.2 Regulatory aspect*

In the context of medical waste management, the government has established laws and regulations which must be used as a guideline for parties who produce medical waste. The following are some basic regulations that can be used as a guidelines in the management of medical waste in health care facilities:

- a. UU number 32/2009 concerning environmental protection and management  
Article 59 states that every person who produces toxic and hazardous waste must manage toxic and hazardous waste produced and if he is unable to manage toxic and hazardous waste himself, the management can be left to other parties who have permission to manage waste material poisonous and dangerous
- b. UU number 44 / 2009 concerning hospital  
Article 11 paragraph (1) states that hospital infrastructure may include one of them a waste management installation
- c. PP number 101/2014 concerning management of hazardous and toxic waste  
In this regulation governs waste management from the establishment to disposal
- d. Permen LHK number P56/2015 concerning procedures and technical requirements for hazardous and toxic waste mangement from health service facilities  
In this regulation, technical arrangement regarding storage, transportation, processing, burial and landfill of hazardous and toxic waste in health care facilities.
- e. Permenkes number 27/2017 concerning guidelines for prevention and control of infection in health care facilities  
Regulates the technical obligations of health service to carry out infection prevention and control activities, one of which is sourced from medical waste.
- f. Permenkes number 7/2019 concerning environmental health  
Regulates the technical implementation of securing domestic solid waste, hazardous waste, liquid waste and gas waste in hospitals.

Although various regulations have been prepared that can be used as a reference in managing medical waste in health care facilities, in fact there are still practices of medical waste management that are not compliant with the regulations. Results of research conducted at 5 community health centers in Bantul regency[15] shows that not all community health center in Bantul regency have temporary shelters for medical waste. In addition, there is also all community health center do not have a temporary shelter with a room temperature regulator. In the applicable laws and regulations, it is stated that the storage of infectious medical waste is a maximum of 2 x 24 hours and that is of a chemical nature a maximum of 90 days before being destroyed. Even though the transporter transports waste to the community health center only once a month. This is still a problem in itself because it is not compliant with the KLHK regulation number P.56 / 2015 regarding the procedures and technical requirements for medical waste management from health care facilities.

Research conducted at the Tobelo community health center in North Halmahera district showed similar results, that the community health center had not made efforts to reduce medical waste as regulated in KLHK regulation number P.56 / 2015, did not yet have an infectious waste storage facility in accordance with the standard and medical waste was only buried in a location that was on the front page of the community health center[16].

The problems related to the application of legal regulations for the management of medical waste in health care facilities also occur in other developing countries. Research conducted on 91 brazilian health service facilities located in Brazil consisting of 21 hospitals, 48 community health centers and 22 clinical laboratories showed that related to the management of medical waste in health centers, researchers obtained data that is only 4.2% of health facilities that apply management laws medical waste that applies well, 10.4% have developed a waste management training program for staff, but no one has formed a medical waste committee[17].

### *2.2.3 Financing aspect*

The financing aspect is one of the important resources to drive the wheels of the medical waste management system in the health service facility so that it runs smoothly and according to regulations. The source of costs available at the community health center comes from the community health center operating income consisting of general patient income, capitation from the national health insurance program, income from collaboration and health operational assistance from the national expenditure budget. Sources of income as well as planning of community health center expenditure activities are outlined in the activity implementation plan or budget business plan which forms the basis for preparing the budget implementation list. The financing aspect is also one of the factors causing problems in medical waste management at community health center. Other research conducted at the Borong community health center in East Manggarai regency also showed results that medical waste management had not been carried out properly. This is due to the lack of management support in the form of preparation of regulations and policies, standard operating procedure, adequate budgets and facilities[18].

## **3 Research methodology**

This research uses the literature study method, which is researching scientific literature in the period 1999 - 2019 in the form of journals and the results of studies relating to the medical waste management at health service facilities. The results of this literature review

are then used as a material consideration in developing aspects that will be examined in research on the medical waste management at community health centers.

## **4 Discussion**

Based on literature studies conducted related to the management of medical waste in health service facilities, in broad outline this is related to several aspects namely operational technical aspects, regulatory compliance and financing aspects. These operational technical aspects include the activities of reducing, sorting, storing, transporting to the methods of medical waste treatment carried out by health service facilities. In the applicable legal regulations, these things have actually been regulated in detail, but in reality there are still many health service facilities that have not been able to meet the requirements set out in the legislation because they are constrained by various factors one of which is the limited facilities, infrastructure, funding and also related to human resources issues.

Medical waste generation data is needed to develop appropriate medical waste management strategies. Several factors can affect the amount of medical waste generated by health service facilities, namely the type of health facility, number of beds, the separation of medical waste programs, the location of health service facilities, and the types of services provided [19]. The resulting waste generation needs to be recorded accurately, and the waste must be classified by type, to be used as a basis for consideration in determining the method of waste treatment[20].

Community health center can be selected as research objects because it is one type of health service facility that is the government's priority in the management of medical waste. Some previous studies conducted at the community health center, on average only took a portion of the total number of community health center in a regency or city, so that they were unable to display a map that depicted the condition of the distribution of medical waste in a particular area.

From the literature studies that have been carried out there are research gaps from previous studies, namely not yet conducted a comprehensive review of three aspects namely operational technical aspects, aspects of regulatory compliance and financing aspects at all community health centers in a regency or city area. Future research that can be done to be able to elucidate this problem is an analysis of the implementation of medical waste management as well as a study of the generation of medical waste generated by community health centers, then waste management strategies are developed using SWOT analysis.

## **5 Conclusion**

Based on a literature review and expert opinion, it is deemed necessary to conduct research related medical waste management in health service facilities, namely at the community health center in terms of operational technical aspects, regulatory compliance aspects and financing aspects. Geographic information system can be used to describe the distribution of hazardous medical waste generation in all community health centers in a district or city. The results of this study are expected to be used to develop medical waste management strategies to overcome problems.

## References

1. R. H. H. Rahmat, *Prinsip dasar pembangunan kesehatan* (Yogyakarta: UGM Press,(2018)
2. KLHK, *Peta jalan pengelolaan limbah bahan berbahaya dan beracun dari fasilitas pelayanan kesehatan* , Jakarta (2018)
3. Y. C. Jang, C. Lee, O. S. Yoon, H. Kim, *Medical waste management in Korea*, J. Environ. Manage., **80**, 2, 107–115 (2006)
4. M. Maulana, H. Kusnanto, A. Suwarni, *Pengolahan limbah padat medis dan pengolahan limbah bahan berbahaya dan beracun di rumah sakit swasta Kota Jogja*, in 5th urecol proceeding, February, 184–190 (2017)
5. ICEL, *Sengkarut pengelolaan limbah medis, bikin miris*, icel.or.id (2019)
6. Permen LHK No.56 Tahun 2015 Tentang Tata cara dan persyaratan pengelolaan limbah di fasilitas pelayanan kesehatan ( 2015)
7. Setiyono, *Sistem pengelolaan limbah B3 di Indonesia* (Jakarta: Kelompok Teknologi Pengelolaan Air Bersih dan Limbah Cair, Direktorat Teknologi Lingkungan, Deputi Bidang Teknologi Informasi, Energi, Material dan Lingkungan. Badan Pengkajian dan Penerapan Teknologi, 1999)
8. A. Graikos, E. Voudrias, A. Papazachariou, N. Iosifidis, M. Kalpakidou, *Composition and production rate of medical waste from a small producer in Greece*, J. Waste Manag., **30**, 8–9, 1683–1689 (2010)
9. A. Pruss, E.Giroult, P. Rushbrook, *Safer management of wastes from healthcare activities* (Geneva : WHO, 1999)
10. R. Garcia, *Effective cost reduction strategies in management of medical waste*, Am.J.Infect.Control, **27**(2), 165–175 (1999)
11. E. C. Y. Su, Y. T. Chen, *Policy or income to affect the generation of medical wastes: An application of environmental Kuznets curve by using Taiwan as an example*, J. Clean. Prod., **188**, 489–496 (2018)
12. A. M. M. Moreira, W. M. R. Günther, *Assessment of medical waste management at a primary health-care center in São Paulo, Brazil*, J.Waste Manag., **33**, 1, 162–167 (2013)
13. G. Mayonetta, I. Warmadewanthi, *Evaluasi pengelolaan limbah padat B3 fasilitas puskesmas di Kabupaten Sidoarjo*, J. Tek. ITS, **5**, 2, 227–232 (2016)
14. R. N. Permadi, Y. Ruslinda, *Dampak timbulan , komposisi dan karakteristik sampah bahan berbahaya dan beracun pada sarana kesehatan*, J. Dampak, **2**, 1–6 (2018)
15. R. L. Manila, S. Sarto, *Evaluasi sistem pengelolaan limbah medis Puskesmas di wilayah Kabupaten Bantul*, Ber. Kedokt. Masy., **33**, 12, 587 (2017)
16. D. Yulis, O. Pinontoan, H. Boky, *Sistem pengelolaan limbah bahan berbahaya dan beracun di puskesmas Tobelo Kota Tobelo Kabupaten Halmahera utara*, J. Kesmas, **7**, 5 (2018)
17. C.E. Da Silva, M.M. Ravanello, A.E. Hoppe, N. Mello, *Medical waste management in The South Of Brazil*, J.Waste Manag., **25**, 6 ,600–605 (2005)
18. D. Rahno, J. Roebijoso, A.S. Leksono, *Pengelolaan limbah medis padat di puskesmas Borong Kabupaten Manggarai Timur Propinsi Nusa Tenggara Timur*, J. Pembang. Dan Alam Lestari, **6**, 1, 22–32 (2015)
19. Z. Yong, X. Gang, W. Guanxing, Z. Tao, J. Dawei, *Medical waste management in China: A case study of Nanjing*, J.Waste Manag., **29**, 4, 1376–1382 (2009)
20. M.Tsokana, E. Anagnostopoulou, E. Gidaracos, *Hospital waste mangement and toxicity evaluation*, J. Waste Manag., **27**,7, 912–920 (2007)