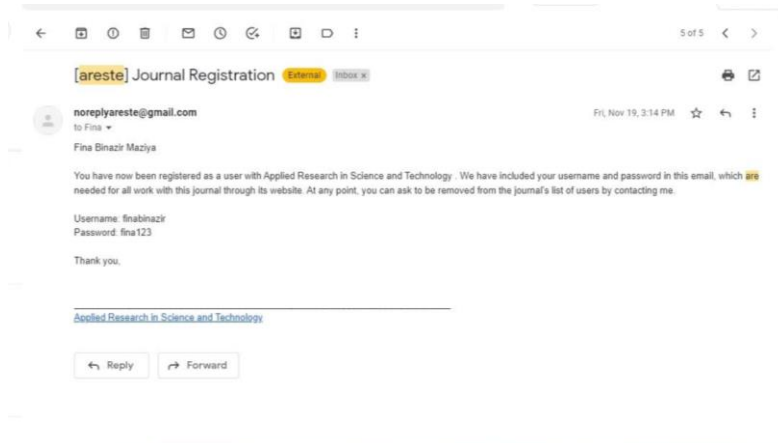
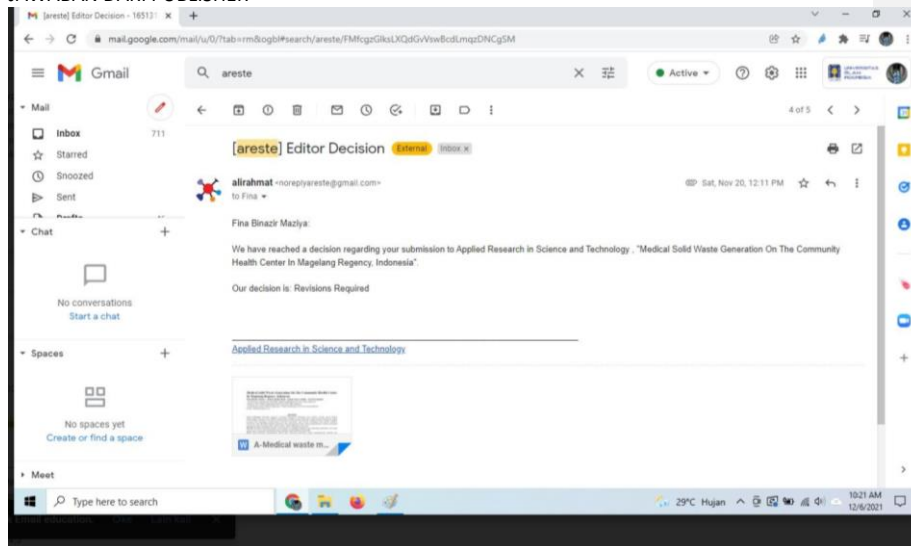


BUKTI KORESPONDENSI KARYA ILMIAH
"Medical Waste Generation of Community Health Centers (PUSKESMAS) In Magelang Regency, Indonesia"

1. BUKTI SUBMIT



2. JAWABAN DARI PUBLISHER



3. HASIL REVIEW DAN PERBAIKAN

Medical Solid Waste Generation On The Community Health Center In Magelang Regency, Indonesia

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ABSTRAK

Latar belakang: Keaktifan mayoritas penduduk Kabupaten Magelang yang terdaftar sebagai peserta Badan Penyelenggara jaminan Sosial (BPJS) menyebabkan aktifnya peran puskesmas sebagai fasilitas pelayanan tingkat pertama yang menangani permasalahan kesehatan masyarakat. Hal tersebut berdampak pada jumlah timbulan limbah B3 yang dihasilkan kegiatan puskesmas dan penanganan petugas dalam pengelolaannya. Karena kesalahan penanganan dapat membahayakan seluruh elemen dalam lingkungan puskesmas.

Metode: Penelitian dilakukan dengan sistem purposive sampling meninjau jenis pelayanan puskesmas rawat inap dan non rawat inap serta melakukan analisis lapangan terkait timbulan Limbah B3.

Hasil: Hasil penelitian menunjukkan bahwa jenis pelayanan puskesmas sangat mempengaruhi timbulan dan komposisi limbah B3 yang dihasilkan setiap hari. Komposisi limbah infeksius non benda tajam dihasilkan sebanyak 82% dan limbah infeksius benda tajam sebesar 18%

Simpulan: Potensi limbah yang dihasilkan dari kegiatan pelayanan puskesmas di Kabupaten Magelang sebanyak 33,66 kg per hari.

Kata kunci: Limbah Medis, Limbah Bahan Berbahaya dan Beracun, Timbulan Limbah

ABSTRACT

Background: The majority of the population of Magelang Regency is registered as participants and actively uses the Indonesian Health Insurance Program, i.e., the National Health Insurance (JKN), which is administered by the Healthcare and Social Security Agency (BPJS Kesehatan). This makes the active role of Puskesmas (Community Health Center) a first level service institution that takes care of public health problems. This has an impact on the amount of hazardous waste generated by the activities of the community health centers and how officials are able to manage it. This is because mishandling can endanger all the elements surrounding the community health center

Method: The study was carried out to identify the types and calculate the amount of hazardous waste generated by the operations of community health centers. The study was conducted using a purposive sampling technique, examining the types of community health center services (e.g., hospitalization and out-patient care) and conducting field analysis in relation to medical waste generation

Result: The results of the study indicate that the type of community health center services has a major impact on the daily generation and composition of hazardous waste. The composition of non-sharp infectious waste produced was as much as 82% and that of sharp infectious waste being 18% ,

Conclusion: The potential for waste generated from health center service activities in Magelang Regency amounting to as much as 33.66 kg per day.

Keywords: Medical waste, Hazardous waste, Generation waste

INTRODUCTION

Magelang is one of the districts with the highest population growth in the Central Java province, i.e., 0.92% per year with a total population of 1,268,396 people based on data from Statistics Indonesia (BPS) in 2018. 59.04% of the population of Magelang Regency has health insurance and is an active participant registered in the health insurance of the Healthcare and Social Security Agency (BPJS Kesehatan) with a morbidity rate of 16.97% (BPS, 2019).

BPJS Kesehatan is an independent legal institution or body established by the government to administer social insurance programs for the community consisting of health and employment insurance. BPJS

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Kesehatan helps to organize health insurance for the community, which is directly supported by Puskesmas in each sub-district throughout Indonesia as First Level Health Facilities (FKTP) (BPJS, 2019).

FKTP is also a place for BPJS Kesehatan patients to receive referrals to second and higher-level health facilities such as hospitals. Due to the increase in services in Puskesmas, patient visits to Puskesmas in Magelang Regency also increased by 9.39% from 2018-2019 (BPS, 2019). This lead to an increase in the rate of generation and composition of hazardous and toxic waste, so this needs to be balanced with a good management system for hazardous waste so that the environment is not polluted.

Separation of medical waste from all other waste in waste producing sites is one of the keys to good waste management. This is highly influenced by health workers as they are the first people to separate medical waste. Based on the final report on the survey of health facilities in 2011, it was found that nationwide, the number of Puskesmas who had separated medical and non-medical waste was 64.6% of Puskesmas in Indonesia (Ministry of Health, 2012). The results of research in several areas, including within the hospital environment, are still not committed to comply with current regulations regarding the management of solid medical waste generated every day (Astuti, 2014; Asmarhany, 2014) and there is still a need to provide training and protection for health workers (Kusumayanti, 2017). Improper management can jeopardize the health of the environment and society. The management officer is the first element that has the potential to be exposed to nosocomial infections as these infections can be transmitted from patients to health workers (Kusumayanti, 2017).

In view of this, there is a need to conduct research to identify and analyze the generation and composition of hazardous and toxic waste from Puskesmas activities. It is expected that the results of this study will provide data on the existing condition of Puskesmas waste generation for further planning and proper management of hazardous and toxic waste

MATERIAL AND METHODS

This study applies descriptive research that analyzes quantitative data. Quantitative data is data that is presented in the form of numbers so that we can see the amount of generation and composition of hazardous and toxic solid waste produced at Puskesmas in Magelang District. Descriptive research itself is research conducted to analyze the value of one or more (independent) variables without making comparisons or connections with other variables (Sugiyono, 2012).

In this study, direct observation and sampling were also conducted in-field to identify, measure and analyze the amount of solid medical waste generated and the management of solid medical waste applied. The method of determining the sample was done through purposive sampling as the types of Puskesmas services available were reviewed. There are two types of Puskesmas services in Magelang Regency, i.e., hospitalization and out-patient care.

RESULT AND DISCUSSION

The type of hazardous and toxic waste arising in Puskesmas is divided into two types, i.e., non-sharp and sharp infectious waste. This is in accordance with Permen LHK No. 56 of 2015 on Procedures and Technical Requirements for the Disposal of Hazardous and Toxic Wastes from Health Care Facilities. Non-sharp infectious waste includes gauze, gloves, cotton, masks, bandages, used bandages and wipes. Sharp infectious waste includes lancet needles and syringes contaminated with patient blood and body fluids, broken vial bottles and broken glass utensils.

Based on the results of the analysis of the existing conditions conducted by Puskesmas in Magelang Regency in the disposal of hazardous and toxic waste, Puskesmas separated solid hazardous and toxic waste into 2 (two) containers, i.e., infectious waste and sharp waste. The determination of generation and composition is done by measuring the weight and volume of hazardous and toxic waste generated by Puskesmas and sorting the solid hazardous and toxic waste into two types according to the existing management conditions, i.e., infectious waste and sharp object waste. The sources and types of hazardous and toxic waste generated in Puskesmas in Magelang Regency can be seen in Table 1

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Table 1. Sources and Types of Hazardous and Toxic Waste at Puskesmas in Magelang District

No	Waste Type	Emergency Room	Dental Clinic	Mother and Child clinic	Laboratory	Delivery Room	Ward
1	Infectious non sharp objects						
2	Infectious sharp objects						
3	Human blood/body fluids				Liquid		
4	Washing laboratory equipment				Liquid		

Puskesmas are the first level of the health facility for the community in carrying out treatment, both daily out-patient and hospitalization care. Some Puskesmas have hospitalization service facilities for patients with moderate to severe health diagnoses. The acceptability of the number and application of measures to patients per day also differs between the two types of health centers. Table 2 shows the number of patients treated in a day in the two types of Puskesmas with hospitalization and out-patient care. The number of patients treated in hospitalization at Puskesmas tends to be higher because they have the capacity to provide intensive care services to patients. The average number of patients treated per day in Puskesmas with hospitalization is 117, while in out-patient care an average of 70 people are treated per day. The details can be seen in Table 2.

Table 2. Number of Patients at Puskesmas in Magelang District

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Puskesmas with type of service	Average number of patients (person/day)
out-patient care	70
hospitalization	117
Number of Puskesmas Patients	188

5.

Puskesmas medical services generate various types of medical waste, which are categorized as hazardous and toxic waste according to Government Regulation No. 101 of 2014 on Hazardous and Toxic Waste Management. The amount and type of waste varies and is uncertain every day. This is due to the varying number of patients treated per day and the service capacity of each Puskesmas. Waste generation can be determined by collecting primary data at Puskesmas using the method of collecting and measuring samples of MSW generation and composition in SNI 19-3964-1994. This is because Puskesmas are among the urban public facilities that produce waste on a daily basis, both household-type waste and specific waste, such as hazardous and toxic waste.

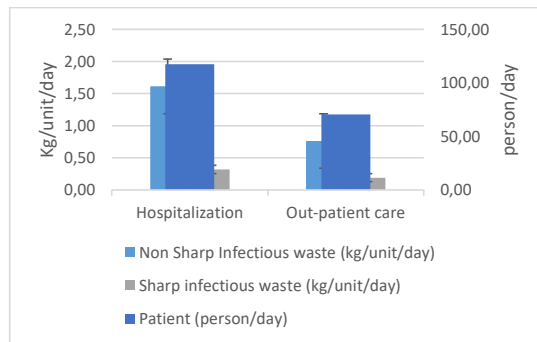
Measurement of hazardous and toxic waste generation is carried out to identify and collect actual and accurate information on the generation rate and composition of hazardous and toxic waste generated. According to Korkut (2018), information on the amount and composition of hazardous and toxic waste generation is needed to determine the average amount of hazardous and toxic waste produced per day to help in determining the appropriate waste management method.

Due to the large number of treatment operations that are carried out using equipment that can become hazardous and toxic waste, the generation of hazardous and toxic waste is greater in hospitalization at Puskesmas. This is because the treatment is given when the patient is no longer able to be cured by the

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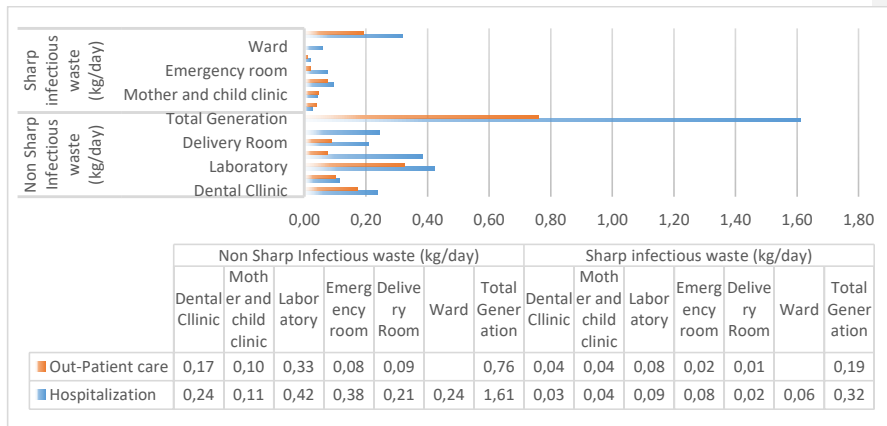
administration of drugs alone. The amount of waste generated by Puskesmas is greatly influenced by the service facilities, the type of Puskesmas, and the number of patients served in service day units. Komilis et al. (2012) found that the rate of hazardous and toxic waste generation is influenced by the size and type of public health service facilities. The rate of hazardous and toxic waste generation can be influenced and identified by the size of the medical care event and the proportion of disposable items used in treatment activities and medical care of patients (Utami, 2017).

The comparison of average hazardous and toxic waste generation between hospitalization and out-patient care at Puskesmas can also be seen in Figure 1, which also shows that out-patient care at Puskesmas generates less hazardous and toxic waste than the hospitalization one. This is due to the availability of various service facilities as well as a lesser number of patient visits compared to out-patient care at Puskesmas. Hospitalization at Puskesmas provides more health care facilities than the services offered by out-patient care. Hazardous waste generated mainly from activities in hospitalization at Puskesmas are from laboratory tests, delivery actions and actions of doctors in out-patient care and hospitalization, while in out-patient care at Puskesmas, the number of patient visits per day does not affect the hazardous and toxic waste generated. This is because doctors generally only perform actions such as counseling and administering generic medications, so less hazardous and toxic waste is generated each day.



6. Figure 1. Hazardous and Toxic Waste Generation from Puskesmas

Figure 2 is the result of determining the amount of waste generated for each unit in Puskesmas. From the graph, it can be seen that the unit that produces the most waste during the sampling period is the laboratory. Each Puskesmas has a laboratory to assist in providing services to the surrounding community. The laboratory in Puskesmas is capable of conducting blood type examinations, complete blood tests, sediment, plano tests, blood sugar analysis, cholesterol, triglycerides, serum creatinine, uric acid, urine and sputum testing. Possessing laboratory services makes it easier for Puskesmas medical staff to make accurate diagnoses of patients based on the disease they are suffering from, thereby increasing the accuracy of diagnosing diseases felt by the community.



7. Figure 2. Average daily weight per unit in Puskesmas

The services offered are tests of blood, urine and other parts of the human body. Not all laboratory test results can be obtained on the day the test is performed on the patient. Some data can be generated in a period of more than a day, so the hazardous and toxic waste generated by the working process in the laboratory is also directly proportional to the duration of the testing time of the samples from the patient, so the testing period continues to generate hazardous and toxic waste. In addition, the waste generated by the laboratory is not directly proportional to the number of tests performed on patients, since laboratory testing services are not always provided to patients who come to Puskesmas, but to patients with advanced indications in relation to their health status, which tend to stagnate for several days. According to Himayati et al (2018), the types of hazardous and toxic medical waste generated in the laboratory are disposable masks, disposable gloves, syringes, body tissues, body fluids, blood, specimen cups, chemical tubes, hematology tubes, napkins, wipes, contaminated paper/tissue, pipettes and chemical reagents. According to Rahno et al. (2015), one of the services from hospitalization Puskesmas that produces a lot of medical waste is the delivery room of Puskesmas which produces a lot of used gauze, soaked cloths, disposable pads and sanitary napkins from mothers who delivered their babies.

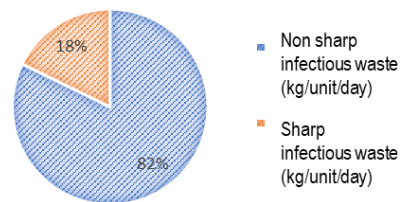
In addition to the different types of waste and the process of sorting waste at the health center, the results of the as-is analysis still include a proportion of household waste in the form of food waste and wrapper and paper in non-sharp infectious waste containers. By nature, paper waste, plastic waste and other household waste are not hazardous and toxic waste, but because they have been contaminated with hazardous and toxic waste, the characteristics of such household waste have changed to hazardous and toxic waste.

This happens because the level of knowledge and awareness of officials on how to deal with hazardous and toxic waste management tends to be low. Leonita and Yulianto (2014) noted that the stages of sorting are basically done by the medical staff of the health center but there are still medical staff who mix medical waste with non-medical waste. These attitudes and actions are the cause of mixing of wastes and contamination of non-hazardous and toxic wastes. In addition, it is also caused by too many health workers serving patients, which results in health workers not paying more attention to the waste generated.

Routinely bringing awareness to the issue and monitoring hazardous and toxic waste management in Puskesmas is very important and should be done. The target is not only the sanitation staff but also the team of health workers. They should be enabled to perform their respective duties in the best possible way and implement good and proper management of hazardous and toxic waste in Puskesmas. In addition to the methods and techniques of handling hazardous and toxic waste, there is also a need to bring more awareness regarding the negative effects that can be caused by hazardous and toxic waste so that no more household

waste is mixed with hazardous and toxic waste. Another procedure that should also be implemented is the use of the full Personal Protective Equipment for Puskesmas employees.

According to Ramirez and Gonzalez (2019), sanitation officers must be high-level officials in the application of waste management, especially hazardous and toxic waste, as the knowledge of the problem of waste generated is considered very capable. These conditions can meet the requirements to serve as leaders and carry out the proper implementation of waste management in the Puskesmas environment. Training activities and practices in waste management for the waste officers must be planned by the sanitarians so that waste management is done according to the standards and so the quality of environmental control can be improved. Based on the results of the analysis of hazardous waste generation from Puskesmas sample sites, both hospitalization and out-patient care services generally tend to have a greater composition of non-sharp infectious waste. The average composition of hazardous and toxic waste for infectious types of sharps is 82% and for non-sharps is 18%. According to the explanation in the analysis of the results in Figure 3, this condition is influenced by the type of service, since the treatment of each patient is different and not all require treatment with a syringe or lancet, as well as the presence of waste from laboratory activities and delivery rooms, which are also quite large.



8. Figure 3. Composition of Hazardous Waste from Puskesmas Activities in Magelang District

Based on Table 3, Magelang Regency has the potential to produce hazardous and toxic waste from service activities of Puskesmas, 33.66 kg per day from operational activities of 29 active Puskesmas. This becomes problematic when a transport service is delayed or a handling error occurs, resulting in the contamination of household-type waste. The management system is also not interrupted at Puskesmas, but also in relation to the transport of hazardous and toxic waste to reprocessors or other parties. Waste from this medical activity can be stored for a maximum of 2x24 hours at a storage temperature of 00 Celcius (Ministry of Environment, 2015). Therefore, if transportation system for hazardous and toxic waste still does not comply with the rules of the regulation, ideally at least a temporary storage place for hazardous and toxic waste from Puskesmas activities can be provided to minimize the negative impact of the distribution of hazardous and toxic waste on the environment.

9. Table 3. Hazardous and Toxic Waste Generation from Puskesmas in Magelang District

Types of Puskesmas Services	Number of Puskesmas (units)	Hazardous waste generation per unit (kg/day)	Total generation in all Puskesmas (kg/day)
Hospitalization	6	1.93	11.58
Out-patient care	23	0.96	22.08
Total	29	2.89	33.66

CONCLUSION

Puskesmas, as the first level health facility for the community, are the starting point for community health care, which produces a large amount of hazardous and toxic waste. This needs to be reconciled with the

increasing knowledge of health workers and sanitarians in handling this. The generation and composition of hazardous and toxic waste in Puskesmas is influenced by several factors, including the type of Puskesmas service, the number of patients and treatments provided, and the extent of laboratory services. Magelang Regency, with a total of 29 health centers, has the potential to produce 33.66 kg of hazardous and toxic waste per day, with a composition of 82% non-sharp infectious waste and 18% sharp infectious waste.

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10. PAPER DITERIMA

