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SOLID MEDICAL WASTE MANAGEMENT IN SURABAYA JEMURSARI ISLAMIC HOSPITAL 2024

ABSTRACT

Medical waste generated by hospitals can have health impacts because it contains toxic and hazardous materials. The preliminary survey results show that solid medical waste management at RSI Surabaya Jemursari is still not well implemented. This study aim to assess the management of solid medical waste management at RSI Surabaya Jemursari in 2024.

Descriptive research is the type of research used, and data were collected through filling out observation sheets and interviews. The data analysis used was descriptive analysis based on the Minister of Health Regulation Number 2 of 2023 concerning the Implementation Regulation of Government Regulation Number 66 of 2014 concerning Environmental Health.

The research results show that the supporting infrastructure for solid medical waste management at RSI Surabaya Jemursari in 2024 achieved a score of 82%, meeting the required criteria. Sequential observations indicate that the processes of reduction, containment, temporary storage, and transportation scored 86%, 88%, 82%, and 86%, respectively, meeting the required criteria. The sorting process scored 50%, not meeting the required criteria. Overall, the management of solid medical waste at RSI Surabaya Jemursari attained a score of 79%, indicating compliance with Minister of Health Regulation Number 2 of 2023.

The conclusion of this study was that the management of solid medical waste at RSI Surabaya Jemursari in 2024 met the criteria, though several aspects were not fulfilled. Suggestions included monitoring the condition of plastic bags, providing the appropriate type of plastic bags, training all solid medical waste officers, and sanctioning officers who did not use the appropriate PPE.

Keywords: *Solid Medical Waste, Infrastructure, Human Resour*

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INTRODUCTION

Hospitals are healthcare facilities providing medical services and care to patients, encompassing departments like emergency, surgery, inpatient, outpatient, diagnostic labs, and radiology (1). Managed by professionals such as doctors and nurses, hospitals offer specialized services like cardiology, neurology, and oncology, aiming to treat, care for, and prevent diseases, and promote public health (2). However, hospital operations generate various types of waste, including medical (infectious, pathological, pharmaceutical, cytotoxic, radioactive, and sharps), non-medical (domestic and chemical), and hazardous and toxic waste (B3) (3).

B3 waste, from activities containing hazardous materials, poses significant risks to human health and the environment if improperly managed (3). Hospital sources of B3 waste include labs, care rooms, and pharmacies (4), with 15-25% of hospital waste being hazardous.

Proper management is crucial to prevent serious health risks and environmental contamination (5)

In 2022, Indonesia had 13,446 healthcare facilities, but only 5,224 managed medical waste according to standards, with 38.8% compliance nationally (6). Challenges in waste management include inadequate human resource planning, budget constraints, suboptimal SOP implementation, and geographic issues affecting waste storage and transportation (7)

RSI Surabaya Jemursari, a class B general hospital, produces approximately 241.98 kg of solid medical waste monthly. Waste management involves containerization, segregation, and temporary storage, with final disposal handled by PT. Wastec International. A preliminary survey in December 2023 identified issues like improper PPE use by cleaning staff, poor waste segregation, and damaged waste bags, indicating suboptimal management. Thus, this study titled "Solid Medical Waste Management at RSI Surabaya Jemursari in 2024" was conducted.

METHODS

In this research, the author conducted research on solid medical waste management at RSI Surabaya Jemursari in 2024 using a descriptive observational approach. The study was carried out at RSI Surabaya Jemursari, with subjects including 50 cleaning staff. The object of the research was the solid medical waste management system. Data sources came from direct observation and interviews. Primary data were obtained from observations and interviews. Secondary data included the hospital profile, organizational structure, SOPs, and data on the types and weights of medical waste. The research instruments used were observation and interviews based on Permenkes No.2 of 2023, with a Guttman scale.

RESULT

A. Solid Medical Waste Generation at RSI Surabaya Jemursari in 7 Days

The following is the solid medical waste generation at RSI Surabaya Jemursari in 7 days:

Table 1. Solid Medical Waste Generation Per Day at RSI Surabaya Jemursari 2024

Day	Non-sharps waste weight (kg)	Sharps medical waste weight (kg)	Amount
Monday	249,7 kg	28 kg	277,7 kg
Tuesday	253 kg	28,5 kg	281,5 kg
Wednesday	226,3 kg	11 kg	237,3 kg
Thursday	223,3 kg	15,3 kg	238,6 kg
Friday	237,7 kg	27,5 kg	265,2 kg
Saturday	183,8 kg	17,5 kg	210,3 kg

Day	Non-sharps waste weight (kg)	Sharps medical waste weight (kg)	Amount
Sunday	110,3 kg	28,5 kg	138,8 kg
Amount	1.484,1 kg	156,3 kg	1.649,4 kg
Average	212 kg	22,3 kg	235,6 kg

B. Medical Waste Generation, Solid Per Room at RSI Surabaya Jemursari in 7 Days

The following is the amount of solid medical waste generated in each room at RSI Surabaya Jemursari :

Table 2. Solid Medical Waste Generation per Room at RSI Surabaya Jemursari 2024

No.	Source	Weight per Day (Kg)							Amount	Average
		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday		
1.	Inpatient	122,2	122	102,3	100,6	99,2	112,3	97,8	756,4	108,1
2.	ICU	9	11	5	4	6,5	5	1	41,5	5,9
3.	IGD	14	14	14	13	8,5	5	20	88,5	12,6
4.	OK	14	24	17	10	35	11	16	127	18,1
5.	Radiology and Lab	13,5	9	10	4	9	4	4	53,5	7,6
6.	Hemodialysis	105	99	87	107	104	73	-	575	82,1
7.	Outpatient	-	1,5	2	-	3	-	-	6,5	0,9
	Amount	**277,7**	**281,5**	**237,3**	**238,6**	**265,2**	**210,3**	**138,8**	**1.649,4**	**235,6**

C. Infrastructure Facilities for Solid Medical Waste Management at RSI Surabaya Jemursari in 2024

The results of the assessment of facilities and infrastructure were presented in the following table :

Table 3. Assessment of Solid Medical Waste Management Facilities and Infrastructure at RSI Surabaya Jemursari in 2024

No.	Requirements	n	Results	Description
1.	Hazardous waste TPS location	9	8	Qualified
2.	Medical waste container	13	10	Qualified
	Amount	22	18 (82%)	Qualified

D. Characteristics of Human Resources in Solid Medical Waste Management at RSI Surabaya Jemursari in 2024

The results of research on human resource characteristics based on Education Level, Length of Service, Training, and Compliance Using PPE are presented in the following figure :

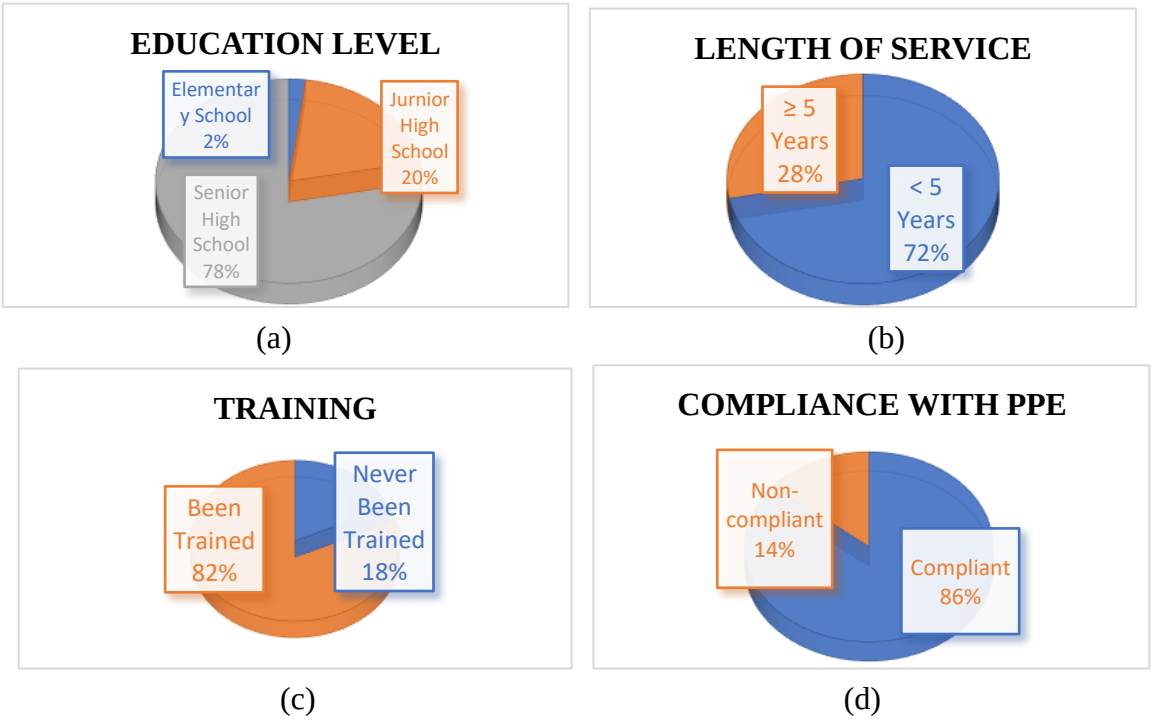


Figure 1. Human resource characteristics (a) education level, (b) length of service, (c) training, and (d) compliance with PPE

E. Solid Medical Waste Management at RSI Surabaya Jemursari in 2024

The results of the assessment of solid medical waste management at RSI Surabaya Jemursari were presented in the following table :

Table 4. Assessment of Solid Medical Waste Management at RSI Suarabaya Jemursari in 2024

No.	Solid Medical Waste Management Process	n	Observation Results	Description
1.	Subtraction process	7	6 (86%)	Qualified
2.	Containerization process	8	7 (88%)	Qualified
2.	Sorting process	8	4 (50%)	Not Qualified
3.	Temporary storage process	17	14 (82%)	Qualified
4.	Transportation process	7	6 (86%)	Qualified
	Amount	47	37 (79%)	Qualified

DISCUSSION

A. Solid Medical Waste Generation at RSI Surabaya Jemursari in 7 Days

Based on table 1, the total weight of non-sharps waste reached 1,484.1 kg, while the total weight of sharps waste was 156.3 kg. The average weight of non-sharps medical waste was 212 kg, while sharps waste averaged 22.3 kg. The total waste amounted to 1,649.4 kg with an average of 235.6 kg.

B. Medical Waste Generation, Solid Per Room at RSI Surabaya Jemursari in 7 Days

The table 2 showed that the largest amount of waste was generated on Tuesday, weighing 281.5 kg, and the lowest on Sunday, at 138.8 kg. On Mondays and Tuesdays, hemodialysis bottle waste increased due to hemodialysis services. Inpatient rooms generated the most solid medical waste, averaging 108.1 kg over 7 days, due to daily medical activities. Conversely, the outpatient rooms generated the least waste, averaging 0.9 kg over 7 days. Solid medical waste collection was done twice a day routinely, with scheduled transportation and adequate storage.

C. Infrastructure Facilities for Solid Medical Waste Management at RSI Surabaya Jemursari in 2024

Based on the table 3, the facilities and infrastructure supporting solid medical waste management at RSI Surabaya Jemursari achieved a result of 82%, meeting the criteria of Permenkes No. 2 of 2023. Of the 9 components assessed for the hazardous waste TPS location indicator, 1 component was not met. For the indicator of the place/container of medical waste, 3 components were not met: B3 waste containers were not differentiated according to characteristics, radioactive waste did not use a red container, cytotoxic waste did not use a purple container, and expired chemical and pharmaceutical waste did not use a brown container. RSI Surabaya Jemursari used yellow bags for infectious waste and safety boxes for sharp waste. The related regulatory guidelines were not fully met (8).

The lack of appropriate facilities and infrastructure impacted the sorting of medical and non-medical waste (7). It was recommended that the facility maintenance installation provide containers that matched the characteristics of B3 waste to ensure a safe and healthy work environment and to comply with Permenkes No. 2 of 2023.

D. Characteristics of Human Resources in Solid Medical Waste Management at RSI Surabaya Jemursari in 2024

1. Education Level

Based on the figure 1 (a), the majority of cleaning service officers had a high school education background (78%), with 20% having a junior high school education and 2% having an elementary school education. Officers with elementary education had more than 10 years of work experience. Other studies have shown a correlation between medical waste management and the education level of officers. Anisa at Hadji Boejasin Pelaihari Hospital ($p = 0.007$) (9), Wulandari at Untung Raya Banjarmasin Health Center ($p = 0.017$) (10), and Lestari at Grestelina Makassar Hospital ($p = 0.000$) (11) found a significant relationship between education and medical waste management.

Officers with higher education tended to perform better in waste management. It was recommended that the housekeeping and facility maintenance installations selected

officers with at least a high school education to prevent risks associated with solid medical waste management.

2. **Length of Service**

Based on the figure 1 (b), the results of interviews with cleaning service officers at RSI Surabaya Jemursari showed that 72% had worked for less than 5 years, while 28% had worked for 5 years or more. Research by Wulandari (2023) showed (p = 0.014) (10), Yuanika (2022) showed (p = 0.001) (12), and Oktavia (2020) showed (p = 0.013) (13), all indicating a significant relationship between tenure and solid medical waste management. Officers' proficiency in managing solid medical waste increased with tenure. Work experience deepened and broadened their work abilities, and improved their competence and speed in task completion.

3. **Training**

Based on the figure 1 (c) A total of 18% of cleaning service staff at RSI Surabaya Jemursari had never received training in solid medical waste management, while 82% had attended training combined with PPI and BLS materials. RSI Surabaya Jemursari did not provide training to new officers (<5 years) due to schedule adjustments. Other studies showed a correlation between training and medical waste management: Akmal *et al.,* (2022) at Aceh Government Mother and Child Hospital Banda Aceh (p = 0.037) (14), and Sandria (2023) at Ernaldi Bahar Hospital, South Sumatra Province (p = 0.010) (15). It was advised that RSI Surabaya Jemursari synchronize training for all solid medical waste management officers to avoid the risk of disease transmission.

4. **Compliance With PPE**

Based on the figure 1 (d) Based on the results of the interview, 14% of cleaning service officers at RSI Surabaya Jemursari did not use PPE, while 86% used PPE. Arfan's research at Talan Ubi Hospital (2023) found a significant relationship between PPE use and medical waste management (p = 0.000) (16). Maulidia's research (2023) at Khidmat Sehat Afiat Hospital in Depok City also found a similar relationship (p = 0.007) (17).

Officers recognized the need for PPE when handling waste, although they sometimes found it difficult to use. Amrullah's research (2019) found that some officers only used masks and gloves for convenience but still recognized the importance of PPE for personal protection (18). It was recommended that the housekeeping and facility

maintenance installations synchronized their efforts to monitor and sanction officers who violated the rules or did not use the provided PPE to avoid disease transmission.

E. Solid Medical Waste Management at RSI Surabaya Jemursari in 2024

Based on the table 4, RSI Surabaya Jemursari reduced waste by recycling infusion bottles and hemodialysis jerry cans through cooperation with other parties, as per Purwanti's research (19). They also implemented a FIFO system and recorded using stock sheets for solid medical waste management, as documented in Khansa's study in Bogor, which complied with the rules and monitored the procurement of hazardous products by the environmental health team (20).

The containerization process at RSI Surabaya Jemursari reached 88%, meeting the criteria. Cleaning service officers handled the collection of medical waste, including sharps, using safety boxes according to research by Rochmawati *et al.*, (2023) (1).Waste was disposed of in sturdy containers with stainless steel lids, watertight, and marked with the B3 symbol. Yellow plastic bags were used for all types of waste except sharps, with small yellow bags separating diapers and pads before being put into large yellow bags, in line with Purwanti's study (19).

The sorting process at RSI Surabaya Jemursari achieved a result of 50%, not meeting the requirements. Solid medical waste was sorted into sharp and non-sharp categories; non-sharp waste was put into yellow infectious plastic bags, and sharp waste into safety boxes before being combined with other yellow bags. They did not differentiate waste such as radioactive, cytotoxic, or heavy metals. In contrast, Rahim *et al.*, study showed segregation of hazardous waste using various colors for containers: brown for pharmaceutical, purple for cytotoxic, red for radioactive, and yellow for infectious, as per Permenkes No. 2 Year 2023 (21).

The temporary storage process at RSI Surabaya Jemursari reached 82%, meeting the requirements. Solid medical waste was temporarily stored in a B3 waste site before being transported. This site, located behind the hospital and licensed by the Surabaya City Environmental Agency, was chosen to be away from residential and healthcare operational areas to ensure a flood-free environment (22). Hazardous waste was stored in yellow trolleys labeled as infectious with security facilities such as PPE and fire extinguishers. Security measures included fences, padlocks, clear markers, as well as logbooks and hazardous waste management SOPs for proper record-keeping and emergency response.

The transportation process at RSI Surabaya Jemursari achieved a result of 86%, meeting the requirements. They cooperated with PT Wastec International for the

transportation and treatment of solid medical waste, with a government license and regulated by a three-party agreement. Each shipment of waste was accompanied by an official manifest according to the research of Hanako *et al.*, (22). Transportation was carried out once a day, in contrast to the research of Rochmawati *et al.*, which showed a twice-daily schedule (1). Overall, RSI Surabaya Jemursari achieved solid medical waste management results of 79%, meeting the requirements according to Permenkes No. 2 of 2023 concerning Environmental Health.

CONCLUSION

In 2024, RSI Surabaya Jemursari recorded an average of 212 kg per day of non-sharp solid medical waste and 22.3 kg per day of sharp waste, with a percentage of 90% non-sharp and 10% sharp. The waste management infrastructure scored 82% with qualified criteria, and the majority of officers had a high school education (78%), had worked for less than 5 years (72%), had received training (82%), and complied with the use of PPE (86%). The waste management process, including reduction, containerization, temporary storage, and transportation, met the requirements. However, the sorting process did not meet the requirements. Overall, solid medical waste management at RSI Surabaya Jemursari reached 79%, meeting the requirements according to the Minister of Health Regulation No. 2 of 2023.

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