

## Health Products And Waste Management Strategies For AIDS, Tuberculosis, and Malaria In Indonesia: Literature Review

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### Abstrak

*Medical waste is considered a subcategory of hospital waste and includes “potentially” infectious waste generated from health facilities. Safe and effective management of health products and medical waste is a key element in supporting the success of AIDS, Tuberculosis (TB) and Malaria control programs in Indonesia. Therefore, this research aims to provide a systematic review of medical waste management in the AIDS, Tuberculosis and Malaria Program, in order to identify the environmental and social impacts implemented by countries to ensure reliable waste management. The study design used was literature review method. This method is done by searching or collecting articles that have titles that match the theme of the article taken. Despite the challenges, implementing well-planned strategies, supported by strong policies, education, training, and modern technology, can significantly improve the safety and effectiveness of these health programs.*

**Keywords:** Aids, Malaria, Medical waste, Tuberculosis

### INTRODUCTION

Health service facilities consist of community health centers, hospitals, and healthcare clinics with the goal of improving public health through a series of preventive, curative, promotive, and rehabilitative activities. These activities have both positive and negative impacts on the community. The positive impact is the improvement of public health, while the negative impact can cause to the increasing of medical or non-medical waste that may cause diseases and environmental pollution. In Indonesia, national hospitals are estimated to produce 376,089 tons/day of waste. According to data from the Ministry of Environment and Forestry in September 2018, there are 95 hospitals with licensed incinerators, with a total capacity of 45

tons/day. Meanwhile, data from the Medical Waste e-Monitoring in December 2019 by the Directorate of Environmental Health of the Ministry of Health indicates that about 42% of hospitals meet the standards for medical waste management.

Medical waste is considered a subcategory of hospital waste and includes “potentially” infectious waste generated from health facilities (Patrício Silva et al., 2021). What is meant by "medical waste" in this research is all potentially infectious waste generated during diagnosis, treatment, testing and research in public hospitals, clinics, veterinary clinics and research institutions (Kalantary et al., 2021). Therefore, this research aims to provide a systematic review of medical waste management in the AIDS,

Tuberculosis and Malaria Program, in order to identify the environmental and social impacts implemented by countries to ensure reliable waste management. In addition, this research is used to ensure safe and effective disposal of hospital waste, taking into account the details of this pandemic situation.

HIV/Aids, is an exposure to infectious diseases that can cause obstacles to economic growth in a country caused by the large number of workers who are unable to work optimally. This is due to the morbidity derived from exposure to HIV/AIDS which causes a decrease in productivity in everyone, so they are unable to work freely because of regulations that limit the number of workers working in an agency both government and private which certainly hampers GDP per capita growth in real terms. Then the exposure to HIV/AIDS infectious diseases can not only inhibit the rate of economic growth in real terms, but also have an impact on the quality of public health degrees globally, because the exposure to infectious diseases can cause various kinds of threats received by the community globally, including can cause death in children which can affect the number of life expectancy (Bidzha et al., 2024). The exposure of the structure of HIV/AIDS disease is not only at the Ministry of Health level, but has also spread to various global, regional bodies as well as various ministries and various stakeholders in a country. Based on the results of research conducted by UNAID, there are

data in 2021 as many as 85% of people infected with HIV/AIDS, further data was found as many as 88% of people who are positive suffering from HIV/AIDS, then data was also found as many as 98% of patients suffering from HIV/AIDS who are on treatment. So that the target that will be in 2025 is expected to be able to declassify HIV/AIDS diseases that can threaten public health globally (Mangoya et al., 2023).

Furthermore, the problem of tuberculosis arose when the government issued a lockdown policy. So that the existence of this policy causes ignorance about information about TB disease management, for example how to detect patients infected with TB disease, along with the treatment that must be done when patients contract TB disease, so that the results of research that have been conducted by previous researchers have been found as much as 29% reduced information about TB disease exposure detection. This is also due to the reduction in sputum samples of patients infected with TB disease, as well as people who are reluctant to go to health services when TB disease is detected, and accompanied by many health workers who still prioritize patients infected with Covid-19 compared to patients infected with TB disease. And this has been proven from the results of research that has been conducted by previous researchers that found a figure of 41% of the population of South Africa who did not know information about the detection of TB disease, then in India found data as many as 25% of the population who

did not know information about the detection of TB disease, so this caused major disruptions in 17 countries that made TB cases higher (Chanda-Kapata et al., 2022).

**METHOD**

The study design used was literature review method. This method is done by searching or collecting articles that have titles that match the theme of the article taken. We got these articles from various official journal sites such as Google Scholar, Pubmed, and Science Direct where the articles searched for have been

filtered by year, namely between 2019-2024, and the keywords used have been adjusted to the theme taken. After collecting relevant articles, systematic analysis and interpretation of the data is then carried out so that the articles obtained are in accordance with the chosen theme, do not deviate far from the themes that have been determined together, and the relevant articles are not published less than five years of publication. So that the references used are articles that are the latest or are still hot to be discussed.

**RESULTS AND DISCUSSION**

Tabel

Researcher	Title	Objective	Method	Research Result
Aini, F.	Pengelolaan Sampah Medis Rumah Sakit atau Limbah B3 (Bahan Beracun dan Berbahaya) di Sumatera Barat	To observe the implementation of medical waste/B3 waste management and compare it with the implementation of law regarding the management of medical waste/B3 waste in hospitals in West Sumatra.	Qualitative Descriptive	The existence of several cases in hospitals in West Sumatra is considered by the hospital to be a failure to implement the management of medical waste and B3 hazardous waste in accordance with statutory regulations. The government and also the hospital leaders still lack of concern, commitment and understanding regarding the management of B3 waste or medical waste and its impact on the environment, along with the associated sanctions.
M. Rony, Lensoni, Yayuk	Analisis Pengolahan Limbah Medis di Puskesmas Indra Jaya Kabupaten Aceh Jaya	This research aims to analyze medical waste management at the Indra Jaya Health Center and to raise public awareness about hospital waste management globally.	Descriptive	The collection of solid medical waste at the Indra Jaya Health Center meets health requirements because the solid medical waste is collected according to type, and both the collection site and the collectors meet the standards. Tempat Penyimpanan Sementara (TPS) meets the requirements because the building used as the TPS has ventilation or air regulation. The Indra Jaya Health Center

				has a waste processing device provided by the government, but the device is not functional because it does not meet the standards. Therefore, the medical waste at the health center is collected by a third party, PT Tenang Jaya Sejahtera.
Endang Wahyati, Yustina, Eko Nurmardiansyah, Rika Saraswati, Marcella Elwina Simandjuntak	How to Optimize Local Government Supervision of Medical Waste Management in Healthcare Facilities?	This study aims to determine local governments' authority in supervising medical waste management in health service facilities, to realize public health protection.	Qualitative	Medical waste management has not followed the regulations as a result. Generally speaking, partners' inadequate capacity waste management instruments are the source of obstacles. Another thing that prevents B3 waste management from being implemented in healthcare settings is inadequate oversight.
Ikhsan Masyhuri, Tita Ratya Utari, Kusbaryanto	Implementation Standard Precaution of Risky Dental Treatments on Patient with HIV-AIDS in X Public Health Center Yogyakarta	Based on the description of the problem above, the researcher would like to analyze the implementation standard precautions as prevention and control of HIV-AIDS infection in high-risk dental treatments at X Public Health Center Yogyakarta	Qualitative	The results are broken down into great detail with regard to environmental management, patient care equipment, and hand hygiene. Although not entirely comprehensive, the ones that deal with PPE, managing garbage and sharp objects, and safeguarding the health of employees are mentioned. Furthermore, there is no documentation of the outcomes for safe injection practices, linen maintenance, or cough etiquette.
Syukra Alhamda, Eri Barlian, Abdul Razak, Bambang Slamet Riyadi, Nova Herawati, Ariff Trisetia Anggara	Deviation of Management of Medical Waste from Hospital Implication upon Environmental Damage in West Sumatera, Indonesia	The study aims to expose and analyze potential power abuse by hospital administrators. These officials such as Ministry of the Environment of North Sumatera are suspected of enabling the illegal disposal of hazardous medical waste, potentially causing	Qualitative	The study reveals a critical gap between hospital waste management practices and established hospital and environmental regulations. Researchers propose measures for preventing environmental crime, aiming to stop and ultimately reverse environmental damage.

		environmental damage or even AIDS or hepatitis B.		
Nur Malika Jamil, Ari Tri Wanodyo Handayani, Dewi Junita Koesoemawati	Strategi Administrasi dan Lingkungan Pengelolaan Limbah Medis Berdasarkan Kinerja Petugas di Puskesmas Kabupaten Jember	The primary objective of research on the performance of puskesmas officers in Jember Regency in managing medical waste is to evaluate the effectiveness of medical waste management practices in puskesmas.	Observational Quantitative	It is concluded that in order to increase the benefits of an organization itself, it is necessary to increase the budget used to meet the needs of adequate facilities and infrastructure, and can develop optimally. Promotion was needed to improve the performance carried out by officers regarding PHBS in the surrounding environment and also to improve medical waste storage activities so that environmental quality could be guaranteed.

### Medical Waste

Medical waste (MW) is a significant part of infectious waste, which is potentially hazardous because it contains pathogenic agents. The production of this waste will continue to be an ongoing phenomenon due to human activities. Public awareness regarding the management of hospital waste has globally increased, especially in developing countries where financial and technological resources for medical waste management are still lacking. World Health Organization defines medical waste as waste generated by healthcare activities that can include various materials such as used syringes, soiled dressings, body parts, diagnostic samples, blood, chemicals, medications, medical equipment, and radioactive materials. When hazardous healthcare waste is not properly managed, exposure to it can lead to infections, infertility, genital deformities, hormone-

induced cancers, mutagenicity, dermatitis, asthma, and neurological disorders in children (Syahputra, 2023)

Proper management in the stages of collection, segregation, storage, transportation, and treatment of waste must be carried out correctly and safely to prevent hospital-acquired (nosocomial) infections. The treatment of medical waste needs to be given serious attention because it can serve as a medium for the transmission of various diseases such as HIV/AIDS, Hepatitis B, Hepatitis C, and other blood-borne diseases (Arlinda et al., 2022)

### HIV/AIDS

Indonesia is currently facing a rapidly developing HIV and AIDS epidemic, primarily affecting the younger population. This epidemic is driven by high-risk behaviors such as unprotected sexual intercourse, both homosexual and

heterosexual, with multiple partners, and intravenous drug use. The proportion of female AIDS patients in Indonesia is rising sharply, with most being housewives and the primary mode of transmission being sexual contact. The rapid spread of HIV/AIDS and its ease of transmission, particularly among partners and infants of HIV-positive mothers, is a cause for grave concern. It is heartbreaking when an infant contracts this virus, facing suffering from a young age and a life under threat. HIV infection is a major health concern and a communicable disease that can significantly impact maternal and child mortality. Moreover, in the realm of reproductive healthcare, crucial issues that demand attention include maternal health, infertility, and women's reproductive health in general (Santoso et al., 2023)

HIV/AIDS case data in Indonesia has been steadily increasing year after year. As shown in the figure below, the number of HIV cases in Indonesia peaked in 2019 at 50,282 cases over the past eleven years. According to WHO data from 2019, 78% of new HIV infections occur in the Asia Pacific region. The highest number of AIDS cases over the past eleven years was recorded in 2013, at 12,214 cases. As of March 2022, the cumulative number of reported People Living with HIV/AIDS (PLHIV) (HIV cases) in Indonesia stands at 329,581. Meanwhile, the cumulative number of reported AIDS cases stands at 137,397. (Santoso et al., 2023)

HIV/AIDS can be transmitted through various means, including injections. According to the World Health Organization (WHO), an estimated 16 billion injections are administered worldwide every year. However, not all syringes are disposed of safely, posing a risk of injury, infection, and potential reuse. WHO further reports that in 2010, unsafe injections were still responsible for 33,800 new HIV infections, 1.7 million hepatitis B infections, and 800,000 hepatitis C infections (Nursafira et al., 2023)

### **Tuberculosis**

Tuberculosis (TB) poses a significant public health challenge worldwide. In 1992, the World Health Organization (WHO) declared TB a global emergency. Annually, approximately 4 million new TB cases emerge, both infectious and non-infectious. Every second, an individual contracts TB, and one-third of the world's population harbors TB bacteria (WHO, 2000). Indonesia salah satu negara dengan masalah TB terbesar ketiga di dunia, setelah India dan Cina, tetapi prevalens HIV tidak terlalu tinggi dan tidak menyebar merata di seluruh wilayah (Dikromo et al., 2011).

Tuberculosis (TB) infection spreads to others through the air. When a TB patient coughs, they can release more than 5000 TB bacilli from their lungs into the air. This contaminated air can then be inhaled by others, who may go on to develop a TB infection and/or disease. Anyone can be exposed to TB bacilli, especially if they have close contact with a TB patient. Other

known risk factors include newborn babies, the elderly, diabetes, people undergoing steroid treatment or cancer chemotherapy (which weakens the immune system), smoking, and malnutrition. The social and psychological impacts experienced by TB patients include a lack of self-confidence in socializing, inability to work optimally, becoming a burden on the family, and facing negative stigma from society (Sianipar et al., 2024)

### **Malaria**

Malaria is one of the significant public health problem, particularly in developing countries such as Indonesia. According to World Health Organization (WHO) report in 2021, Indonesia had an estimated 800.000 malaria cases, the second highest number in South-east Asia after India (WHO, 2021). Despite setting an ambitious goal of eliminating malaria by 2030, Indonesia has seen stagnant case numbers in recent years. While a significant portion (around 130 million) resides in high-risk areas, malaria transmission is unevenly distributed across the country. In 2022, over two-thirds (68.3%, or 351 districts) achieved malaria-free certification (Depkes RI, 2022). However, the remaining areas grapple with varying levels of prevalence, ranging from a low of 0.02% to a high of 12.07% (Elyazar et al., 2011). Even though most provinces experience low to moderate malaria transmission (hypoendemic to mesoendemic), eastern Indonesia, including parts of Borneo

(Kalimantan), faces pockets of intense transmission (Sugiarto et al., 2022)

A 2008 report by the World Health Organization (WHO) revealed a significant discrepancy between their estimations and those reported by Indonesia's Ministry of Health (MoH) regarding malaria cases and deaths in 2006. The WHO estimated a staggering 2.5 million malaria cases, whereas the MoH reported a mere 0.3 million, indicating a potential under-reporting of 86.2%. Similarly, the WHO's estimated malaria deaths exceeded 3,000, compared to the MoH's reported figure of 494, suggesting an under-reporting of deaths by around 85.8%. This highlights a potential issue with under-reporting of malaria cases and deaths in Indonesia (Elyazar et al., 2022)

### **Medical Waste Management**

The management of medical waste in healthcare services presents a multitude of intricate challenges. This waste stream demands meticulous handling in accordance with established regulations, necessitating a systematic and sustainable approach to environmental management. Consistent implementation of planning, execution, and continuous improvement measures is paramount for effective management of healthcare facilities. Furthermore, the availability of human resources equipped with a comprehensive understanding of environmental issues and management practices is crucial for achieving optimal environmental performance (Adisasmito, 2008).

According to data from the Asian Development Bank, the volume of medical waste in five Southeast Asian countries is as follows: the Philippines (280 kg/day), Indonesia (212 kg/day), Malaysia (154 kg/day), Thailand (210 kg/day), and Vietnam (160 kg/day). Based on data from the Ministry of Health in 2020, Indonesia has 2,820 hospitals, 9,825 community health centers, and 7,641 clinics. The total medical waste generated from these healthcare facilities across Indonesia can reach up to 296.86 tons per day, while the existing processing capacity is only 115.68 tons per day. The Asian Development Bank (ADB) estimates that Jakarta alone will produce 212 tons of medical waste per day (Laksono et al., 2021)

Waste management can be defined as actions taken with respect to waste from the collection stage at the source, transportation, storage, to the final treatment stage, which means disposal or destruction (Dionisus, 2015). Factors related to waste management behavior include:

1. Predisposing Factors: These are factors that facilitate or predispose an individual's behavior, such as knowledge, attitudes, beliefs, traditions, and values.
2. Reinforcing Factors: These provide policies, such as the attitudes and behaviors of officials, regulations, and laws.
3. Enabling Factors: These are factors that make the disposal of medical waste

possible, such as the availability of facilities like gloves, boots, and plastic bags.

4. Knowledge is a fundamental factor for the successful management of medical waste in hospitals. Waste management officers (PPL) must possess knowledge about waste management as they are directly responsible to the hospital director. The success of hospital waste management is determined not only by the level of knowledge but also by attitudes. Attitudes influence the behavior of staff to act correctly and appropriately in handling and disposing of waste. Support in terms of knowledge and attitude directly impacts the actual behavior in managing waste. The availability of facilities and infrastructure serves as tools to achieve goals and supports the processes necessary to reach desired outcomes (Donsu, 2017).

## CONCLUSION

Safe and effective management of health products and medical waste is a crucial component in the AIDS, Tuberculosis and Malaria control program in Indonesia. Waste management can be defined as actions taken with respect to waste from the collection stage at the source, transportation, storage, to the final treatment stage, which means disposal or destruction. Despite the challenges, implementing well-planned strategies, supported by strong policies, education, training, and modern technology, can

significantly improve the safety and effectiveness of these health programs. Support from various knowledge and attitudes influence, the availability of facilities and infrastructure serves to achieving this goal.

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