

Original Research



Healthcare waste management practices in rural state hospitals, Ampara, Sri Lanka

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Abstract

Introduction: Healthcare waste encompasses all waste generated by healthcare facilities, including that from medical procedures. Approximately 10-25% of healthcare waste is hazardous while 75-90% are non-hazardous. Hazardous waste consists of sharp objects, infectious materials, pharmaceuticals, biological substances, cytotoxic agents, chemicals and radioactive materials. Effective management of healthcare waste involves reducing generation, segregating, collecting, transporting, storing, treating and disposing of it properly.

Objectives: To assess healthcare waste management practices and state of related healthcare waste management facilities in rural state hospitals in the Regional Director of Health Services (RDHS) Area, Ampara

Methods: A cross-sectional study was conducted in all secondary and primary level state hospitals (n=26) in the health region, Ampara. Data collection utilised observational checklists, desk review of relevant documents and interviews with key persons by using an interviewer-administered questionnaire. Descriptive analysis was conducted using relative frequencies, while significant relationships were evaluated through Chi-squared and Fisher's exact tests.

Results: The research achieved a 100% response rate allowing observations, desk reviews and questionnaire administration in all selected hospitals. Only two hospitals demonstrated satisfactory healthcare waste management practices. None of the hospitals had a proper mechanism to transport healthcare waste. Significant associations were found between the healthcare waste management practices of the hospitals and factors such as the presence of a healthcare waste management plan in the hospital (p=0.02), the existence of a focal point for healthcare waste management activities (p=0.03) and the availability of a mechanism for regular staff training (p=0.04).

Conclusions & Recommendations: The study recommends developing healthcare waste management plans, appointing focal points, establishing regular training mechanisms, allocating a separate budget, and forming healthcare waste management committees within hospitals.

Keywords: healthcare waste, rural state hospitals, healthcare waste management, waste management practice

Introduction

Healthcare waste is the waste produced by healthcare facilities such as hospitals, clinics, medical laboratories and research centres. It also includes waste originating from the healthcare activities undertaken in the home (e.g. self-administration of injectable medicines, home dialysis and palliative care) (1). Healthcare waste can be categorised as hazardous and non-hazardous. The majority of the waste (75-90%) generated by healthcare facilities is usually non-hazardous healthcare waste and the remaining 10-25% of healthcare waste is considered hazardous (2).

Non-hazardous healthcare waste, also known as general waste, is free from hazardous substances. It includes biodegradable materials such as food scraps, uncontaminated plastic and paper items, garden waste, construction debris, etc. (3). Hazardous healthcare waste is categorized into various types, including infectious waste, pathological waste, sharp waste, pharmaceutical waste, chemical waste, cytotoxic waste, radioactive waste and waste containing heavy metals (4). Hazardous healthcare waste comprises pathogenic microorganisms capable of causing infections among hospital patients, healthcare staff, waste handlers and the broader community (5). Improper handling of hazardous healthcare waste poses environmental and health hazards by releasing drug-resistant microorganisms and toxic pollutants into the surroundings (6). Healthcare waste management (HCWM) can be defined as the safe management of waste in healthcare facilities and during healthcare procedures. Fundamental procedures in HCWM include segregating, collecting, storing, transporting, treating and disposing of waste. The issue of managing healthcare waste is rapidly escalating because of rapid urbanization and population expansion, posing a significant threat to environmental health (7). The World Health Organization (WHO) highlighted the causes of HCWM deficiencies in the absence of an effective HCWM system, insufficient financial and

human resources, lack of prioritization by both governmental and institutional bodies, absence of national regulations and deficiencies in implementing existing regulations (8).

Recognizing HCWM challenges holds significant importance for crafting an efficient HCWM strategy. It aids in mitigating hospital-acquired infections, curbing environmental pollution, ensuring patient safety, cutting unnecessary waste disposal costs, and reducing occupational health hazards for healthcare workers. Moreover, it enhances healthcare service delivery for the residents of the study area (9). In Sri Lanka, there have been assessments and studies conducted in hospitals, primarily concentrating on urban areas. The primary causes of inadequate HCWM include the absence of a robust waste management and disposal infrastructure, insufficient allocation of resources, and a lack of priority accorded to waste management (10). Although several studies have assessed HCWM in urban hospitals in Sri Lanka, comprehensive evidence from rural hospitals is limited. Variations in geographical and socio-demographic factors, multicultural settings, unequal distribution of resources (including human, physical, and financial), and challenges related to training and knowledge management suggest that findings from urban areas cannot be readily applied to rural areas. This study aims to assess HCWM practices and their association with available healthcare waste management facilities in primary and secondary level state hospitals in Ampara.

Methods

A hospital-based cross-sectional study was carried out at the RDHS area, Ampara which is one of the 26 health regions in Sri Lanka. The study was done from December 2021 to February 2022. All primary and secondary care hospitals under the purview of provincial administration were selected for the study. State ayurvedic hospitals were excluded.

Data collection was done by the principal investigator and one data collector. Two observational checklists and interviewer-administered questionnaires were used for data collection. Interviews of the key persons by using an interviewer-administered questionnaire were performed with the participation of the medical superintendents (n=2), matrons (n=2) and infection control nursing officers of base hospitals (n=2), medical officers-in-charge (n=24) and responsible nursing officers of infectious control (n=7) at divisional hospitals and primary medical care units, to collect relevant data regarding the availability of a sustainable HCWM system. The interview was performed to assess the availability of facilities to maintain a sustainable HCWM system in the hospital such as the availability of an in-written waste management plan, availability of a focal point for waste management, nominated staff for waste management activities, regular supply and availability of buffer stock of essential items, conducting waste management committee meetings regularly, availability of a tool for supervisions and availability of regular mechanism for staff training. Feedback during the interviews was cross-checked with the relevant documents during the desk review by using the first observational checklist.

The first observational checklist included the availability of an in-written waste management plan, the availability of a working roster prepared for waste management activities, maintaining stock ledgers for essential items for waste management, waste management committee reports, completed supervision tools during the last six months, evidence for staff training conducted during past five years (e.g. training database if available, signature lists of participants, photographs of training programmes etc.) and availability of training plan for the hospital. The second observational checklist was used to assess HCWM practices such as measures taken on waste minimisation, waste segregation, proper waste collection, proper transportation, proper storage proper disposal and treatment. The principal investigator and the data collector made hospital

visits without prior notice. Observations were done during working hours at the healthcare waste accumulating points (e.g. out-patient department, wards, laboratories, theatres, etc.), during the waste collection by the healthcare assistants or sanitary labourers, during the waste transportation within the hospital, waste transportation to the incinerator facilities, at waste storage points and at the waste disposal points. Validation of the study instruments by the face, content and consensual validity. Pretesting of the study instruments was done in three hospitals in the RDHS area, Kalmunai.

Positive observations and inputs from key informants that were essential to implementing HCWM properly were assigned a score. Based on the score for each aspect, study units were categorized as having 'satisfactory' or 'unsatisfactory' practices related to that aspect of healthcare waste management. An overall score of 50% or above was considered satisfactory practices, and less than 50% was taken as unsatisfactory practices. Significant associations between variables were examined in the Chi-squared test and Fisher's exact test. The significance level was calculated as five per cent with the exact p-value of 0.05 as the probability level. All inferential statistics were performed at a 95% confidence level.

Results

All primary and secondary hospitals under the purview of provincial administration were included in this study. Therefore, two base hospitals, seven divisional hospitals and 17 primary healthcare institutions were included. Only 15.4% (n=4) of hospitals had implemented measures to reduce waste generation. A mere 7.7% (n=2) had taken steps to ensure proper waste segregation. Only 11.5% (n=3) had established measures for waste collection, storage, treatment, and disposal. No hospitals had implemented any measures for waste transportation. Therefore, only two hospitals (7.7%) had satisfactory healthcare waste management practices overall (Table 1).

Table 1: Distribution of healthcare facilities by healthcare waste management (HCWM) practices (N=26)

Area observed	HCWM practices			
	Satisfactory		Unsatisfactory	
	No.	%	No.	%
Measures have been taken for waste minimisation	4	15.4	22	84.6
Measures have been taken for waste segregation	2	7.7	24	92.3
Measures have been taken for proper waste collection	3	11.5	23	88.5
Measures have been taken for proper transportation of waste	0	0.0	26	100.0
Measures have been taken for the proper storage of waste until disposal	3	11.5	23	88.5
Mechanisms were used for waste treatment and disposal (having incineration facilities)	3	11.5	23	88.5
Overall HCWM practices	2	7.7	24	92.3

When evaluating the existing HCWM systems in hospitals, only 15.4% had written guidelines for hazardous waste management. Only 19.2% had designated a focal point for hospital waste management and 11.1% had assigned healthcare staff specifically for hazardous waste management. None of the hospitals had waste management committees. Although two hospitals (7.7%) developed a checklist

for supervising waste management, only one (3.8%) conducted regular supervision of these activities. Additionally, 23.1% of hospitals had a system in place for reporting injuries related to hazardous materials and a similar percentage a regular mechanism for ongoing staff training in healthcare waste management (Table 2).

Table 2: Distribution of healthcare facilities by the availability of an established sustainable healthcare waste management (HCWM) system (N=26)

Component	Availability of an established mechanism for sustainable HCWM system			
	Satisfactory		Unsatisfactory	
	No.	%	No.	%
Availability of HCWM plan inside the hospital	4	15.4	22	84.6
Availability of focal point on hospital waste management	5	19.2	21	80.8
Availability of assigned healthcare staff for waste management	3	11.5	23	88.5
Maintains adequate buffer stocks of essential items	20	76.9	6	23.1
Availability of waste management committees	0	0.0	26	100.0
Conducting waste management supervision	1	3.8	25	96.2
Availability of checklist (tool) for the supervision of waste management	2	7.7	24	92.3
Availability of reporting mechanism on relevant injuries and events with hazardous materials	6	23.1	20	76.9
Availability of regular mechanisms for health staff training	6	23.1	20	76.9
The regular supply of essential items for HCWM	15	57.7	11	42.3
Separate financial allocation for HCWM	0	0.0	26	100.0

Better HCWM practices in the hospitals were significantly associated with the availability of an HCWM plan in the hospital ($p=0.02$), a focal point on

HCWM activities ($p=0.03$) and a mechanism for regular staff training ($p=0.04$) (Table 3).

Table 3: Association between the availability of sustainable system for healthcare waste management (HCWM) practices in the hospitals

Component	OR (95% CI)	p value
HCWM plan within the institute	2.0 (0.7-5.3)	0.02
Availability of focal point on HCWM activities	1.7 (0.8-3.4)	0.03
Availability of assigned healthcare workers on HCWM activities	11.1 (0.4-250.8)	0.22
Maintain adequate buffer stocks of essential items	0.7 (0.4-1.2)	0.07
Conducting regular supervision of HCWM activities	0.04 (0.01-0.27)	0.07
Using a checklist(tool) for supervision of HCWM activities	1.9 (0.5-7.7)	0.15
Availability of mechanism for regular health staff training	1.5 (0.9-2.6)	0.04
The regular supply of essential items for HCWM	0.71 (0.04-12.83)	1.00

Discussion

In this study, it was revealed that the majority of hospitals ($n=24$; 92.3%) exhibited unsatisfactory HCWM practices, with only two hospitals demonstrating satisfactory practices. Almost 15.4% ($n=4$) of the hospitals in the RDHS area, Ampara are available with the HCWM plan. However, a study carried out in base hospitals within the district of Colombo found that none of the hospitals had HCWM plans in place (11). This study highlighted that satisfactory HCWM practices were notably linked with the presence of an HCWM plan ($p=0.02$). Similar results were observed in studies from Pakistan ($p=0.007$) and India ($p=0.009$), indicating the beneficial impact of having an HCWM plan on achieving satisfactory HCWM in hospitals (12-13).

Furthermore, the presence of a designated focal point for HCWM was found to be positively associated with satisfactory HCWM practices ($p=0.03$), mirroring findings from a study in India which similarly identified a significant association ($p=0.005$) between satisfactory HCWM status and the

existence of a designated individual for monitoring HCWM activities (12).

In this study, the presence of a system for consistently training staff had a beneficial impact on achieving satisfactory HCWM practices within hospitals, demonstrating a notable association ($p=0.04$). Similarly, a study in Pakistan revealed a significant relationship ($p=0.001$) between satisfactory HCWM status and regular staff training, with 23% of staff having undergone HCWM training (13). The WHO highlights the importance nominate a designated waste-management officer to supervise and implement the waste-management plan (1). However, this research indicated that having designated healthcare personnel for HCWM is not a contributing factor ($p=0.22$) to achieving satisfactory HCWM practices in the hospital. In a study conducted in India, it was found to be a contributing factor ($p=0.003$) (12). Out of the hospitals chosen for the study, only three had a designated healthcare representative for HCWM. Interestingly, among these three, only one hospital exhibited satisfactory HCWM practices. This aspect significantly influenced the study's outcomes.

In this study, ensuring a consistent provision of essential items for HCWM and keeping reserve supplies did not correlate with achieving satisfactory HCWM practices in the hospital. Nevertheless, research conducted in India reveals a noteworthy connection ($p=0.002$) between having sufficient personal protective equipment (PPE) and maintaining satisfactory HCWM standards in the hospital (12). While 70% ($n=20$) of the hospitals possessed a sufficient supply of essential items for HCWM, only 3.6% ($n=2$) exhibited satisfactory HCWM practices might affected the outcome of the study.

Research carried out at the National Hospital of Sri Lanka has pinpointed a robust supervision, monitoring, and evaluation framework for HCWM as a crucial element in hospital waste management (14). Meanwhile, a study conducted in Ethiopia emphasises the association between regular inspection by supervisory bodies and the availability of satisfactory HCWM practices in healthcare facilities ($p<0.01$) (15). However, this study indicates that there is no correlation ($p=0.07$) between satisfactory HCWM practices and the presence of consistent supervisory mechanisms for HCWM, including the utilization of a supervisory checklist during inspections ($p=0.15$). While previous research in Sri Lanka and other countries has underscored the importance of sustainable supervisory mechanisms for satisfactory HCWM, this aspect was not emphasized in the present study, likely due to the limited number ($n=2$) of hospitals implementing such supervision, with one exhibiting unsatisfactory HCWM practices.

The WHO recommend establishing waste management committees within the hospital for better healthcare waste management. A study conducted in Ethiopia highlights the importance of the availability of functional HCMW committees for satisfactory HCWM practices in public hospitals ($p=0.039$) (16). unavailability of HCWM committees in any of the hospitals in the RDHS area, Ampara hinders the ability to assess the association between the presence

of HCWM committees and the HCWM practices of the hospital. Additionally, the absence of separate financial allocations for HCWM in any of the hospitals precludes determining the association between adequate financial support and the HCWM practices within the hospital. Therefore, this study emphasizes the necessity of a well-established HCWM system within hospitals to ensure satisfactory HCWM practices. Even with an adequate supply of essential items, the presence of an HCWM plan, a designated focal point for HCWM, and a mechanism for staff training are essential for achieving satisfactory HCWM standards.

Conclusions & Recommendations

A standardized HCWM strategic plan should be documented at the RDHS level and each hospital must have a documented plan for effective HCWM. The development of guidelines and protocols for HCWM is necessary, and these should be accessible to all staff members. The HCWM training programmes should be integrated into the annual training plan at the RDHS level. Creation of compelling Information, Education and Communication (IEC) material, along with announcements for public addressing systems at hospitals and their distribution to hospitals is also a successful method to share knowledge.

The findings reveal significant deficiencies in sustainable HCWM systems, primarily due to the absence of a designated focal point in most hospitals. To address this, it is recommended to nominate appropriate medical officers or nursing officers as focal points at various levels, including the RDHS level, base hospitals, divisional hospitals, and primary care units, to enhance communication and coordination. Medical officer-planning, medical officer-environmental and occupational health or medical officer-quality management can be nominated as the focal point at the RDHS level. Establishing HCWM committees in hospitals can further ensure the active involvement of all staff

categories. Allocating a dedicated annual budget at the RDHS level is essential for improving waste segregation, transportation, storage, treatment, and disposal processes. To optimize hazardous waste transportation, clustering incinerator facilities and providing vehicles between hospitals and incinerators can reduce infrastructure costs, as only a few hospitals currently have incinerators. Additionally,

forming a supervisory team at the RDHS level and implementing robust monitoring and evaluation mechanisms at hospital and regional levels can significantly enhance HCWM practices. Future research should focus on studying HCWM conditions in other RDHS regions to identify disparities and assess the effectiveness of these recommendations through intervention studies.

Public Health Implications

- Only 7.7% of the state hospitals consist of satisfactory HCWM practices.
- A strategic plan, guidelines and protocols must be developed for HCWM.
- Assigning a focal point for HCWM and conducting regular training improves the HCWM practices in the hospitals
- It is needed to identify other underlying factors associated with HCWM practices in healthcare facilities such as the availability of HCWM committees, a regular supervisory mechanism and separate budgetary allocation which could not be identified in this study.

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: Ethics clearance was granted by the Ethics Review Committee of the Postgraduate Institute of Medicine, Colombo. Informed written consent was obtained from each participant before data collection. Administrative clearance was obtained from the Provincial Director of Health Services Eastern Province and the RDHS, Ampara.

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