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Assessing the Knowledge, Attitudes, and Practices of Janitorial Staff on Healthcare Waste Management in Selected Sri Lankan Hospitals

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Abstract*—Inadequate healthcare waste (HCW) management poses serious health and environmental risks. Janitorial staff is particularly vulnerable due to their frequent direct exposure to hazardous waste. This study assessed the knowledge, attitudes, and practices (KAP) regarding HCW management among janitorial staff at the Infectious Diseases Hospital, Angoda (IDH) and Base Hospital, Mulleriyawa (BHM) in Sri Lanka. A descriptive cross-sectional study was conducted from March to November 2015 among all 87 janitorial workers meeting inclusion criteria. Interviewer-administered surveys and observation checklists were used to gather the data. The majority of participants (78.2%) understood that hospital waste might be hazardous and showed a strong theoretical understanding of color-coded waste segregation. However, substantial gaps were observed between knowledge and practice. More than 80% were not seen using personal protective gear (PPE), and there were differences between what people said they did and what was actually seen. Additionally, 40.2% had received no formal training. Despite these shortcomings, attitudes were largely positive, with over 90% expressing a willingness to undergo training. Although knowledge and attitudes toward HCW management were generally satisfactory, unsafe practices remain prevalent, largely due to inadequate training, limited PPE availability, and discomfort with existing equipment. Strengthening waste management systems through mandatory, periodic training, adequate PPE provision, continuous supervision, and targeted interventional research is essential to enhance safety and compliance.*

***Keywords*—** *Healthcare Waste Management; Janitorial Staff; Knowledge; Attitudes; Practices; Occupational Health.*

I. Introduction

Healthcare services are designed to protect and improve public health; however, they inevitably generate waste that may itself pose serious health and environmental hazards. Healthcare waste (HCW) carries a higher potential for infection and injury compared to general waste, and when improperly handled, it can have far-reaching consequences for both human health and ecosystems (1). Therefore, the proper handling of HCW is an essential aspect of healthcare delivery, making sure that accidental hazards resulting from waste mismanagement do not negate the advantages of medical treatment.

Healthcare waste encompasses all forms of waste produced by healthcare institutes, including hospitals, laboratories, and home-based care settings (1, 2). Approximately 75–90% of HCW is non-hazardous general waste, while the remaining 10–25% is classified as hazardous comprising infectious, pathological, sharps, pharmaceutical, chemical, genotoxic, and radioactive materials (3, 4). Even general waste can become hazardous if mixed with infectious materials due to poor segregation practices, a problem particularly observed in low- and middle-income countries where HCW Management systems are often sufficient (5, 6).

Improper management of HCW can have both direct and indirect health impacts. Directly, improper handling exposes healthcare workers and waste handlers to infections such as Hepatitis B, Hepatitis C, and HIV through sharp injuries and contact with contaminated materials (7). WHO estimates that unsafe injections and poor HCW management contribute to millions of such infections globally each year (3). Indirectly, environmental contamination arises from inappropriate waste disposal practices such as open burning and poorly controlled incineration, which release harmful pollutants including dioxins and furans. Contamination of soil and groundwater through landfills and occupational exposure at disposal facilities further exacerbate the problem (8).

Healthcare Waste Management (HCWM) refers to the systematic control of waste handling from generation to final disposal, encompassing segregation, collection, transportation, treatment, and safe elimination. Effective HCWM requires appropriate planning, staff training, the provision of protective equipment, and adherence to safety protocols (9). In Sri Lanka, HCWM is regulated under the National Environmental Act (No. 47 of 1980 and No. 53 of 2000) and is considered an integral element of infection control within healthcare facilities (10). However, in practice, challenges persist. Hazardous waste is frequently mixed with general waste without prior treatment, and although color-coded bins are introduced in many healthcare institutes, a standardized system for segregation, collection, and final disposal remains limited (11). Daily hazardous waste generation in government hospitals is estimated to range between 7,662 and 42,697 kilograms, highlighting the magnitude of the problem (12).

Globally, studies indicate that inadequate HCWM remains a significant challenge, particularly in developing countries. Poor segregation, lack of training, and insufficient resources have been identified as major barriers to effective HCWM (6,

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13). Research across South Asia and Africa shows that even clinical staff, such as nurses and physicians, often demonstrate suboptimal knowledge and practices regarding HCW handling (14, 15). Consequently, the risk is even greater for janitorial staff, who are directly responsible for waste handling including collection, transport, and disposal.

Janitorial staff constitutes the most vulnerable group within healthcare settings, as they routinely handle hazardous materials with limited training, low education levels, and minimal protective resources (16). Many of these workers come from socioeconomically disadvantaged backgrounds, which may compound their health risks due to poor access to healthcare and potentially compromised immunity. Despite being critical to infection control, this group remains understudied, especially in the Sri Lankan context. Given the growing reliance on outsourced janitorial services in hospitals, there is a clear gap in evidence regarding their knowledge, attitudes, and practices (KAP) toward HCWM.

This study addresses that gap by examining the KAP of janitorial staff in two distinct hospital settings: the Infectious Diseases Hospital, Angoda (IDH) a specialist facility dealing with contagious diseases and the Base Hospital, Mulleriyawa (BHM), a general secondary care institution. Understanding the disparities between these settings can inform targeted interventions, strengthen HCWM protocols, and contribute to safer and more sustainable healthcare environments.

II. Methodology

This descriptive cross-sectional study was conducted to assess the knowledge, attitudes, and practices (KAP) regarding healthcare waste management (HCWM) among janitorial staff employed at the Infectious Diseases Hospital, Angoda (IDH) and the Base Hospital, Mulleriyawa (BHM) in Sri Lanka. IDH serves as a tertiary-level institution specializing in communicable diseases, while BHM functions as a general secondary-care facility. The inclusion of both hospitals enabled a contextual comparison of waste management practices across two healthcare settings.

The study was carried out between March and November 2015, with data collection undertaken in September 2015. The study population consisted of all janitorial workers employed by contracted service providers at the two hospitals who had completed at least two months of continuous service. Supervisory personnel and workers on long-term leave were excluded. Because the total number of eligible workers was relatively small, a census approach was adopted, including all 87 janitorial workers 41 from IDH and 46 from BHM.

Data collection was conducted in two phases. The first phase involved direct observation of HCWM practices using a structured checklist developed in line with World Health Organization (WHO, 2014) guidelines. Observations focused on worker behavior before, during, and after handling healthcare waste, as well as their response to accidental exposure incidents. The second phase assessed participants' knowledge, attitudes, and self-reported practices using a pre-tested interviewer-administered questionnaire. The instrument, translated into Sinhala and Tamil, ensured comprehension and cultural relevance. The knowledge section consisted of questions addressing types of hazardous waste, disease transmission, and safe handling and disposal methods, scored as 1 for correct and 0 for incorrect responses. Attitudes were measured using a three-point Likert scale (agree, uncertain, disagree), and practices were evaluated through self-reported behaviors relating to waste segregation, transport, and disposal.

The principal investigator and a trained Tamil-speaking medical officer conducted all data collection activities. Institutional permission was obtained from both hospitals, and informed written consent was secured from each participant. Observations were conducted prior to questionnaire administration to minimize bias, and strict confidentiality was maintained throughout the study to protect participants' identities.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were applied to summarize findings: frequencies and percentages for categorical variables, and means with standard deviations or medians with interquartile ranges for continuous data. Comparative analyses between IDH and BHM were undertaken to explore contextual variations in KAP related to healthcare waste management.

Ethical approval for the study was obtained from the Ethical Review Committee of the National Hospital of Sri Lanka, Colombo. Institutional clearance was also obtained from the respective hospital authorities prior to data collection. Participants were aware that their participation was voluntary and that they might opt out at any moment. The data were treated anonymously, and none of the study results contained any identifying information.

III. Results

A total of 87 janitorial workers participated in the study, including 41 from the Infectious Diseases Hospital, Angoda (IDH), and 46 from the Base Hospital, Mulleriyawa (BHM). All participants met the inclusion criteria and completed both observation and questionnaire components.

A. Socio-demographic Characteristics

The majority of the study population were older adults, with 40.2% aged 51–60 years and 42.5% over 60 years. At IDH, 87.8% of the workforce were aged 51 years or above, compared to 78.2% at BHM. This indicates a predominantly aging workforce, which may influence physical capacity, motivation, and training adaptability.

Educational attainment was generally low. While 81.6% of participants had attended some level of formal schooling, nearly one in five (18.4%) reported having no formal education. Only 19.6% had completed the General Certificate of Education (Ordinary Level). These findings highlight the need for training methods emphasizing verbal and practical instruction rather than written materials.Summary of the socio-demographic characteristics of study participants is given in table 1 below.

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TABLE 1. Socio-demographic characteristics of janitorial staff (n=87)

Variable	Category	IDH n (%)	BHM n (%)	Total n (%)
Age (years)	≤30	0 (0.0)	1 (2.2)	1 (1.2)
	41–50	5 (12.2)	9 (19.6)	14 (16.1)
	51–60	17 (41.5)	18 (39.1)	35 (40.2)
	>60	19 (46.3)	18 (39.1)	37 (42.5)
Highest education level	No formal education	10 (24.4)	6 (13.0)	16 (18.4)
	Grade 1–5	7 (17.1)	12 (26.1)	19 (21.8)
	Grade 6–8	19 (46.3)	16 (34.8)	35 (40.2)
	GCE O/L	5 (12.2)	12 (26.1)	17 (19.6)
	GCE A/L	0 (0.0)	0 (0.0)	0 (0.0)

B. Training and Occupational Characteristics

Training exposure was limited among participants. Overall, 40.2% of workers reported receiving no training on healthcare waste management, while 39.1% had received only on-the-job instruction without any formal guidance. Pre-employment training was reported by just 20.7% of respondents. The results reflect a systemic gap in structured capacity-building mechanisms for waste handlers. Less than half of the respondents (48.3%) reported consistent PPE use. The predominant reasons for non-use included discomfort (39.2%) and inadequate supply (29.4%). These findings suggest both resource and behavioral barriers to PPE adherence. Table 2 presents details of training exposure and PPE use among participants.

TABLE 2. Training exposure and PPE use among janitorial staff (n = 87)

Variable	IDH n (%)	BHM n (%)	Total n (%)
Training received			
None	21 (51.2)	14 (30.4)	35 (40.2)
Before starting work	5 (12.2)	13 (28.3)	18 (20.7)
On-the-job training only	15 (36.6)	19 (41.3)	34 (39.1)
Self-reported PPE usage	20 (48.8)	22 (47.8)	42 (48.3)
Reasons for not using PPE			
Not supplied	5 (9.6)	5 (8.6)	10 (9.2)
Not supplied adequately	14 (27.0)	18 (31.0)	32 (29.4)
Time-consuming/uncomfortable	21 (40.4)	22 (38.0)	43 (39.2)
Not useful	5 (9.6)	9 (15.5)	14 (12.2)
Not instructed	7 (13.4)	4 (6.9)	11 (10.1)

C. Knowledge on Healthcare Waste Management

Knowledge levels varied across waste types. Sixty percent of participants recognized chemical waste as harmful, while only 46% identified clinical waste a finding of concern given its high infectious potential. Both hospitals demonstrated a strong awareness of color-coded segregation systems, with over 80% of respondents correctly identifying yellow-coded bins (hazardous waste) at 87.1% accuracy. While knowledge of segregation guidelines was high, the lower awareness of the hazards of clinical waste indicates critical educational gaps that need addressing. Table 3 summarizes the knowledge on healthcare waste types

TABLE 3. Knowledge on healthcare waste types and color-coding (n = 87)

Knowledge Component	IDH (%)	BHM (%)	Total (%)
Recognized as harmful			
Chemical waste	48.8	69.6	60.0
Clinical waste	51.2	41.3	46.0
Garden waste	36.6	43.5	40.2
General waste	34.1	50.0	42.5
Wastewater	41.5	50.0	57.4
Correct color-coding knowledge			
Black (general)	90.2	93.5	92.0
Green (degradable)	78.0	82.6	80.3
Yellow (hazardous)	82.9	91.3	87.1

D. Attitudes toward Healthcare Waste Management

Attitudes were predominantly positive. All respondents agreed that handling hospital waste should be done carefully and that they held personal responsibility for precautions. However, misconceptions persisted: 31% believed that acquiring diseases from hospital waste handling was a myth, and 57.5% agreed that wearing PPE was uncomfortable or hindered their work. Encouragingly, 93.1% expressed interest in receiving further in-service training.

Table 4 presents attitudes on healthcare waste management among participants in both healthcare settings taken for the study.

TABLE 4. Attitudes toward healthcare waste management (n = 87)

Attitude Statement	IDH (%)	BHM (%)	Total (%)
Handling hospital waste should be done with care	100.0	100.0	100.0
It is my responsibility to take precautions	100.0	100.0	100.0
Getting diseases from handling waste is a myth	39.0	23.9	31.0
Wearing PPE causes discomfort/difficulty in work	46.3	67.4	57.5
Would benefit from in-service training	92.7	93.5	93.1
Would opt for another job if possible	41.5	45.7	43.7

E. Practices Related to Healthcare Waste Management

Self-reported practices suggested high compliance. A large majority claimed regular PPE use (84%) and consistent hand washing (97.7%) after handling waste. However, 67.8% admitted to occasionally collecting waste with bare hands, and 57.5% reported chewing betel during work practices inconsistent with infection control norms. Table 5 gives frequency distributions of the self-reported practices among study participants.

TABLE 5. Self-reported waste handling practices (n = 87)

Practice	IDH (%)	BHM (%)	Total (%)
Regularly use PPE	87.8	80.4	84.0
Wash hands after handling waste	95.1	100.0	97.7
Use color-coded bins	97.6	63.0	73.3
Work in awkward postures	65.9	69.6	67.9
Collect waste bare-handed at times	65.9	69.6	67.8
Chew betel while working	43.9	69.6	57.5

Direct observational data, however, painted a contrasting picture. PPE use was observed to be alarmingly low across all

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units. In wards, only 17.2% used any PPE, and glove use reached just 20.7%. Masks and boots were rarely worn, even in high-risk areas. These discrepancies highlight a considerable "knowledge–practice gap," wherein awareness and self-reported compliance fail to translate into consistent safe behaviors.

Frequency distributions of direct observational practices in two healthcare institutes is given below in table 6.

TABLE 6. Observed PPE use across hospital units (n = 83 unit observations).

Hospital Unit	Any PPE Used (%)	Gloves (%)	Mask (%)	Boots (%)
Wards (n=29)	17.2	20.7	13.8	3.5
OPD/Clinics (n=5)	20.0	20.0	0.0	0.0
Kitchen (n=5)	0.0	0.0	0.0	0.0
Garden (n=33)	27.2	27.2	0.0	3.0
Other units (n=11)	0.0	0.0	0.0	0.0

Overall, the results demonstrate that while janitorial staff possess a reasonable level of theoretical knowledge and positive attitudes toward HCWM, these are not adequately reflected in actual practices. Inadequate training, lack of PPE, and discomfort with protective equipment were the major contributing factors to unsafe waste handling behaviors.

IV. Discussion

This study reveals a critical disconnects between the knowledge, attitudes, and actual practices of janitorial staff with respect to healthcare waste management (HCWM). As a workforce directly engaged in waste handling, these staff occupy a pivotal position in infection prevention; yet their occupational vulnerability is heightened by gaps in training, supervision, and resource provision.

The socio-demographic profile observed a predominantly older, female workforce with modest educational attainment reflects the socio-economic marginalization characteristic of this occupational group. The high percentage of employees lacking official training (40.2%) is alarming and likely to be a contributing factor to hazardous behavior. This pattern is consistent with evidence from India, where inadequate training and supervision have been strongly linked to suboptimal HCWM practices (17). Despite these limitations, participants in the present study demonstrated relatively good theoretical knowledge, particularly regarding segregation and colour coding. This may be attributed to experiential learning through routine exposure, as well as to Sri Lanka's comparatively stronger baseline education and public health infrastructure relative to some regional counterparts, such as Pakistan (16).

Attitudes toward HCWM were generally favorable. The near-universal recognition of personal responsibility and the expressed willingness to undergo further training indicate a strong motivational foundation for behavioral improvement. However, persistent beliefs that personal protective equipment (PPE) is uncomfortable or hinders work emerged as substantial barriers. Similar findings have been reported in other South Asian contexts, where practical discomfort and insufficient PPE supply have undermined compliance despite awareness of risk (18). Addressing these perceptual and ergonomic challenges is therefore essential for improving adherence.

The most striking finding is the profound gap between self-reported and observed practices. Although over 80% of participants claimed regular PPE use, direct observation revealed minimal compliance, with more than four-fifths observed handling waste without adequate protection. Such discrepancies suggest social desirability bias in self-reported data and highlight the normalization of unsafe behaviour. This "knowledge–practice gap" reinforces that awareness alone is insufficient to drive behavioral change unless supported by institutional enforcement, adequate supplies, and a culture of accountability.

Practical barriers, including ill-fitting or uncomfortable PPE, must also be addressed through improved ergonomic design and user feedback. The observed practice of collecting waste with bare hands and chewing betel while working reflects poor risk internalization and emphasize the need for comprehensive behavioral interventions that go beyond technical training.

The greater self-reported adherence to color-coded separation at the Infectious Diseases Hospital (97.6%) than at the Base Hospital (63%) probably indicates that the specialist facility has a better infection control culture. However, field observations indicated that even when segregation was correctly implemented at the point of collection, subsequent transport and storage often resulted in waste mixing an issue previously reported within Sri Lanka's healthcare system (11). This suggests a systemic failure extending beyond individual worker behaviour to institutional process management.

Overall, the findings are consistent with global evidence identifying sanitary and janitorial workers as among the most at-risk occupational groups within healthcare settings (16,19). These findings which align with global literature, reinforces that knowledge and attitude improvements alone are insufficient to ensure safe practice. Sustainable behavioral change requires an enabling environment adequate PPE provision, ongoing supervision, continuous in-service training, and strong administrative commitment (18).

V. Conclusions And Recommendations

This study highlights the critical yet often overlooked role of janitorial staff in healthcare waste management within Sri Lanka's hospital system. The findings reveal a workforce largely composed of older female employees with limited education and incomes below the national average, reflecting both socioeconomic and occupational vulnerability. Despite their central involvement in healthcare waste handling, formal training opportunities remain scarce, with only one in five workers receiving structured pre-employment instruction.

The results indicate that theoretical knowledge regarding waste hazards, segregation procedures, and colour-coded systems was generally satisfactory, and that attitudes toward safe waste handling were overwhelmingly positive. Participants expressed a strong desire for further training, suggesting openness to behavioral and skill development. However, the study identified a substantial gap between

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reported and observed practices. Although many workers claimed regular use of personal protective equipment (PPE) and adherence to safety protocols, direct observation revealed widespread non-compliance, poor hand hygiene, and unsafe waste handling behaviours. This knowledge practice gap highlights that awareness alone is insufficient to ensure safety without adequate supervision, consistent supply of resources, and a supportive institutional culture.

Systemic factors such as the inadequate and irregular provision of PPE, poor ergonomic design of equipment, and weak oversight exacerbate unsafe practices. Furthermore, lapses in the later stages of the waste management chain, particularly during transport and storage, undermine initial segregation efforts and pose ongoing risks to occupational and public health. Collectively, these findings suggest that improving healthcare waste management requires interventions that address not only individual behaviour but also structural and managerial determinants.

To strengthen the HCWM system, it is recommended that formal, competency-based training programmes be made mandatory for all janitorial workers at recruitment and reinforced through periodic in-service sessions emphasizing practical skills and PPE compliance. Hospitals should ensure the continuous supply of high-quality, ergonomically designed protective gear to encourage consistent use. Enhanced supervision, with clear accountability mechanisms and regular feedback, is essential for reinforcing safe practices and sustaining behavioral change. Additionally, ergonomic improvements in work design can mitigate physical strain and enhance compliance.

At the institutional level, the healthcare waste management chain should be systematically reviewed to prevent re-mixing of segregated waste and ensure alignment with national and World Health Organization standards ad recommendations. Finally, further interventional and behavioral research is warranted to identify context-specific strategies that effectively bridge the knowledge–practice gap. Such evidence will be crucial for developing sustainable, worker-centred approaches to safe healthcare waste management in Sri Lanka and similar low- and middle-income settings.

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