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Review Article

Factors Influencing Adherence to Proper Health Care Waste Management Practices among Health Workers in Wakiso District, Uganda

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Abstract

The adherence to proper health care waste management practices among health workers in developing country public health facilities is still a major challenge. This study was therefore conducted to identify the factors influencing the adherence within Wakiso District in Central Uganda. The specific objectives were to establish the level of adherence to proper health care waste management practices among health workers through identification of both the individual and the health facility related factors that influence this adherence. This was conducted in selected public health facilities. Quantitative data was collected using the researcher administered questionnaire while qualitative data was collected using the key informant interview guide. Data was analyzed using the Statistical Package for Social Sciences while qualitative data was used to supplement the findings.

The results show that only 10.5% of the health workers adhered to proper health care waste management practices and the most influential health facility factors included the level of Health facility, provision of personal protective equipment and availability of staff and waste handlers to handle.

However, the results also show that the provision of personal protective equipment and the level of Health facility were the only independent factors associated with adherence to proper health care waste management. The study findings further established that none of the individual factors influence adherence to proper health care waste management and that adherence was also less likely to occur in health facilities where health workers were provided with personal protective equipment and among Health workers. It is therefore recommended that there is need to increase funding towards environmental sanitation and to create awareness and training among the health workers on the risks of improper management of health care waste if adherence is to be achieved.

Keywords: Health care waste management; Institutional and individual factors affecting adherence

1. Introduction

Health care waste is a by-product of health care activities which when poorly managed exposes health-care workers, waste handlers and the community to infections, toxic effects and injuries including damage of the environment [1]. In waste management, healthcare wastes hold higher priority due to their hazardous nature which can affect human health and also pollute the environment [2]. In working environments that have improper health care waste management practices, such waste exposes Healthcare workers and patients to infections due to blood borne pathogens [3]. Four ways that can lead to proper health care waste management (HCWM) have been outlined by Pats [4] and they include: plan, waste minimization / reuse of materials, segregation and treatment of the waste prior to disposal. The HCWM guidelines for Uganda [5] are very similar to the four ways listed above. They include: Minimizing waste, Segregation of hazardous from non-hazardous health care waste, safe storage of all waste categories and proper treatment of hazardous waste prior to disposal.

The rationale for proper waste management practices is embedded not only in continuous improving of the environment alongside providing a dignified and secure environment, but also supporting economic productivity and providing direct health benefits [6]. According to the Uganda Ministry of Health [7], the application of proper management practices most pertinently helps in ensuring and securing future generation while currently using the medical products. It also permits control and reduction of nosocomial infections let alone the protection of the surrounding environment. Even globally many efforts have been directed towards proper and safe management of hazardous healthcare waste for both the developed and the less developed countries by different organizations. However, such proper management practices are rarely adhered to among health workers in most health care facilities (HCFs) particularly in developing countries where approximately between 20% to 60% of HCFs are characterized by improper HCWM despite its being an integral part of their national health care systems [2, 5]. Improper waste management is exhibited from segregation at source, storage and through to collection, transportation, alongside treatment and disposal. Such improper waste management renders the environment to become unfavorable for human life as it exposes healthcare workers, waste handlers and the community to infections, toxic effects and injuries [8].

In the Sub-saharan African countries, adherence to proper HCWM was reported at an average of 60% [9]. In Tanzania for example, the level of adherence was at 40% in 2018 [10] and this was attributed to absence of a HCWM plan and also failure of the Health workers to segregate waste due to lack of storage facilities. In Kenya, however, the amount of infectious waste has increased to 50% [11] as opposed to the estimated 20% by the World Health Organization [9]. This high percentage of Infectious waste is a typical evidence of non-adherence to proper HCWM procedures and guidelines. It has also been due to the result of poor segregation and the increasing human population that has increased the amount of health care waste.

In Uganda, health-care waste is often not separated into hazardous or non-hazardous wastes, which has rendered the real quantity of hazardous waste much higher and according to Muhwezi et al. [12], 92% of Health care workers in Uganda had poor waste management methods, 3.4% had acceptable waste disposal methods and 4.6% had good disposal methods. Despite the strong national legislation and regulation policies in Uganda which focus on proper HCWM, the practices by many Health workers in Health facilities are still described as unsafe and poor, thus posing life threatening risks not only to the health workers and patients but also to communities and the environment [13]. In Wakiso district, Uganda, many Health workers do not adhere to the recommended HCWM practices and health care waste is still poorly segregated, carelessly dumped on dustbins, drainage and along the roads [14]. This study therefore investigated the factors influencing adherence to proper health care waste management practices among health workers in selected public health facilities of Wakiso District, and hence contribute to knowledge necessary for developing appropriate practical recommendations.

Despite the Ugandan Ministry of Health efforts to promote proper health care waste management in public health facilities within the country, many health workers in Wakiso District do not adhere to the recommended best practices of HCWM, the waste is still poorly managed. Many health workers in health facilities within Wakiso District, practice poor segregation, handling and disposal methods [7, 14]. Information from the Wakiso District Health Report [14] shows that nearly 45% of the health care waste is improperly managed given that it is carelessly dumped on dustbins, drainage and along the roads. The improper HCWM practices could be attributed to weakness in institutional or health systems and individual factors however what is available is more about the knowledge, attitude and practices [15, 16]. The interventions by the Ministry of Health, Uganda [7] by providing equipment, guidelines and policy on HCWM has not yet yielded any good results and the problem of non-adherence to proper HCWM practices has continued in most health facilities within Wakiso District. It is from the above that this study sought to assess the factors influencing adherence to proper HCWM practices among health workers in selected public health facilities in Wakiso District and this will help in policy making at local and national levels in Uganda.

The general objective was to determine the factors influencing adherence to proper health care waste management practices among health workers in selected public health facilities within Wakiso District, Uganda.

The specific objectives were to:

- Identify the individual related factors that influence adherence to proper HCWM practices among health workers in selected public health facilities within Wakiso District.
- Determine the level of adherence to proper HCWM practices among health workers in selected public health facilities within Wakiso District.
- Identify the health facility related (institutional) factors that influence adherence to proper HCWM practices in selected public health facilities within Wakiso District.

2. Methods

The study used a cross sectional design and mixed methods approach (quantitative and qualitative approaches) of data collection. The quantitative approach numerically provided the extent of the situation while qualitative approach provided reasons as to how and why the prevailing situation. This cross sectional design also enabled the researchers to make observations and undertake measurements at one point in time. The study was conducted in Wakiso District. This district lies in the Central part of Uganda, bordered by the districts of Nakaseke and Luweero to the north and the district of Mukono to the east. To the south this district is bordered by Kalangala district and parts of Lake Victoria and Kampala District. In the southwest and northwest it borders the districts of Mpigi and Mityana respectively. This district was selected because it has both urban and rural areas and it is where the improper HCWM practices were reported in its Annual Health Report of 2015 [14].

The study population constituted health workers in selected public health facilities within Wakiso District at hospital and Health Center IV levels, and key informants. The study was conducted in 6 health facilities, namely, Entebbe General Hospital and the following Health Center IVs: Buwambo, Kasangati, Namayumba, Ndejje, and Wakiso. The above health facilities have 272 health workers including the Medical Superintendents / Officers in Charge of the health facility [17]. The 266 health workers are those directly responsible for generating and segregating healthcare waste. The Key Informants (KI) were the 6 medical superintendents / Officers in Charge of the facilities. These were identified because they are the final authorities in the facilities as far as HCWM practices are concerned.

The sample size (out of the 272 health care workers) was determined using the formula by Yamane [18] and tabulated in (Table 1).

Category of respondents	Target population	Sample size	Sampling technique
Health workers at hospital level	120	71	Simple random sampling
Health workers at HCIV level	146	85	Simple random sampling
Key informants	06	06	Purposive sampling
Total	272	162	-

Table 1: Sample size.

$$n = N/(1 + Ne^2)$$

Where e = 5% or 0.05 that's the level of precision, at 95% confidence level, N = 272, and n = sample size.

$$n = 272/(1 + 272 * 0.05^2)$$

161.9047

≈ 162

Both simple random and purposive sampling procedures were used in selection of Health workers. The simple random sampling design was used to pick the 156 respondents from the total of 266 and Purposive sampling was used in the selection of 06 the in charge / medical superintendent of each health facility. This gave a total of 162 respondents. The Questionnaire tool was used to collect the quantitative data while the interview method was used to collect the qualitative data from the Key Informants. Physical observations were also made to see how health workers manage health care waste. An observation check list was developed and used. This comprised of observable items and on site activities that provided relevant information.

3. Results and Discussion

Out of a target of 162 health workers, a total of 153 (94.4%) responses were received. These were analyzed and discussed below.

3.1 The individual / demographic characteristics of the respondents

The individual / demographic characteristics of the health workers studied were age, sex, marital status, and years spent working at the health facilities. The descriptive results are presented in (Table 2). The results show that the majority (50.3%) of the health workers were aged 25 to 34 years, with a significant proportion (30.7%) of them aged 35 to 44 years. This may be partly because recruitment in Uganda's public health service requires that candidates should have finished post Secondary (High School) education which is about 25 years [19] and the population of Uganda is mainly (75%) youth [20].

Results (Table 2) also show that most (58.8%) of the health workers in these health facilities were females (58.8%). This means that in health care waste management, gender is an important factor as far as its practices are concerned in this district. The majority (49.7%) of the health workers were found to be married followed by those who are single (38.6%). Most (94.1%) of the health workers had worked 6 months and above and a negligible proportion (5.9%) of the health workers had worked for less than 6 months. These demographic results are used in the discussion concerning individual and institutional adherence to use of HCWM practices below.

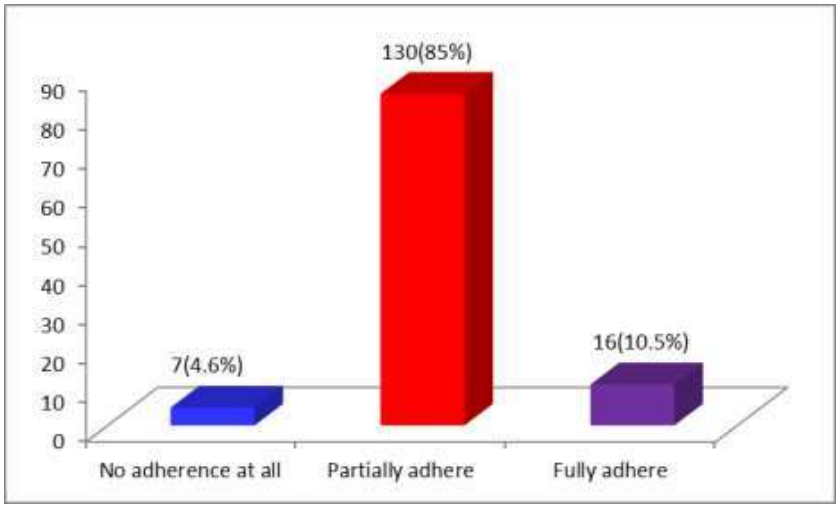
Demographic characteristics		Frequency (N = 153)	Percentage (%)
Age bracket (years)	18-24	21	13.7
	25-34	77	50.3
	35-44	47	30.7
Sex	Female	90	58.8
	Male	63	41.2
Marital status	Single	59	38.6
	Married	76	49.7
	Divorced/Separated	10	6.5
	Widow/Widower	8	5.2
Years of experience	Less than 6 months	9	5.9
	6 months and above	144	94.1

Source: Primary, 2019.

Table 2: The demographic characteristics of the health workers.

3.2 Adherence to proper HCWM practices in health facilities

The health workers were subjected to a questionnaire to determine the level of adherence to proper HCWM practices in the public health facilities and their responses are tabulated in (Figure 1).



Source: Primary, 2019.

Figure 1: Adherence to proper HCWM practices by individual health workers.

The full adherence to proper HCWM practices among health workers in health facilities in this study area was only 10.5% and partial adherence was highest at 85% (Figure 1). This is below the WHO standard which requires a minimum of 80% adherence [21]. The results also differ from those established by US Agency for International Development (USAID) [22] at global level indicating that females had better knowledge and practices (92%) in managing health care waste compared to males (77%). But they agree with studies in Saudi Arabia established by Talaat et al. [23] showing that there is no relationship between the female and male segregation practices of health care waste. The institutional HCWM practices investigated included possession of a waste management plan for the facility, appropriate waste segregation, waste minimization and preliminary treatment of health care waste prior to disposal. The number and percentages adhering to these institutional practices are tabulated below in (Table 3). These results show that most of the health workers (84.3%) reported instances of reuse of materials in health care service provision, use of greener alternatives like the recyclable plastic containers in this health facility.

Adherence to proper HCWM practices		**Frequency (N = 153)**	**Percentage (%)**
Use of greener alternatives such as non-mercury thermometers and recyclable (reusable) plastic containers	Yes	129	84.3
	No	24	15.7
	Yes	86	56.2
	No	67	43.8
Whether health workers segregate health care waste before disposal	Yes	86	56.2
	No	67	43.8
Treatment of generated HCW before disposal	Yes	68	44.4
	No	85	55.6
How hazardous health care waste is treated prior to disposal	Mechanical treatment (shredding and grinding)	7	4.6
	Chemical treatment through disinfectants and steam sterilization	44	28.8
	None of the above	102	66.7

Source: Primary, 2019.

Table 3: HCWM adherence practices in health facilities within Wakiso District.

This was further confirmed by the key informants:

We wash the containers with detergents like Jik to make them safe and also to make sure we don't make

any mistake of leaving the containers in bad shape then later we can reuse the containers (KI3 Male, 30-40 years, 2019).

Similar responses were given by other informants (KI4, KI5 and KI6).

The above findings are comparable to those reported by Patil and Shekdar [24], who reported that waste minimization can be achieved through the purchase of reusable items made of glass, metal and plastics which can be disinfected and reused. While 56.2% reported practicing segregation of health care waste before disposal, this percentage is below the WHO recommended standards of adherence that aims at 80% [21]. This was supported by key informant reporting that:

Sometimes the waste increases beyond normal on different occasions compared to the number of containers at the facility, this affects segregation as the Health workers will end up mixing the waste due to inadequate equipments. (KI1, Female 30-45 years, 2019).

This situation was further explained by one key informant as being due to budgetary constraints:

The budget of the Health sector should be increased so as to cater for HCWM appropriately; this can allow the purchase of enough color coded bins, purchase of reusable gloves that can ease separation of waste by the waste handlers (KI4 Female 35-45 years, 2019).

But according to Mato and Kassenga [25] for segregation to be effective, it should be done at the point of generation where it is separated properly, using well labeled color coded bins appropriate for the specified type of waste. This well-articulated process is not operating well in the study area due to inadequate containers. The results in (Table 3) also show that only (44.4%) of the health care waste generated is treated before disposal. This is a lower percentage to the WHO recommended standards and the ley informants agree:

Here we don't treat Health care waste, we just dispose them, it's on rare cases when we treat them as we lack chemicals to treat the waste, what is available isn't enough compared to the waste (KI2 Male 30-40 years 2019).

Another key informant further explained this situation:

We need an extra incinerator due to the increase in the quantity of Health care waste, also the one that we have is close to the people which is very dangerous, and the government should work upon it (KI3 Male 30-40 years 2019).

The above key informant reports justifies why the level of treatment of health care waste was very low as they lacked disinfectants and functioning incinerators. This despite the fact that the health workers are mainly married females who in some earlier reports were considered important influential factors for a very effective HCWM practices [26]. However these results above are supported by earlier studies which reveal that incinerators and use of disinfectants are crucial in achieving high level of treatment of health care waste [27, 28]. Finally one of the demographic data result above shows that most

(94.1%) of the workers have been working for a period longer than 6 months and this is reported in some cases to be a positive influence in improving HCWM practices [29, 30].

3.3 Health facility related factors associated with adherence to proper HCWM practices

The following health facility factors associated with adherence to HCWM practices were studied: Level of Health Facility (Hospital; or Health Center IV {HC IV}); Provision of Personal Protective Equipment; Supply of disinfectants; Existence of HCWM Plan for the facility; Employment of relevant staff; Existence of HCW service provider and Existence of overall supervision of the HCWM system at the facility. The frequency and percentage results are presented in (Table 4).

Health facility related factors		**Frequency (N = 153)**	**Percentage (%)**
Level of health facility	Hospital	66	43.1
	HC IV	87	56.9
Whether the health facility provide personal protective equipment to use during health care waste management	Yes	139	90.8
	No	14	9.2
Health facility provide or supply disinfectants	Yes	49	32.0
	No	104	68.0
If there is a HCW management plan in place for health care waste management	Yes	145	94.8
	No	8	5.2
Staff and waste handlers employed by the facility in regard to health care waste ,management	10-25	131	85.6
	26-35	13	8.5
	36-45	8	5.2
	46 and above	1	.7
Whether there is any HCW service provider that handles health care waste in the health facility	Yes	122	79.7
	No	31	20.3
Whether there is supervision in as far as health care waste management is concerned	Yes	136	88.9
	No	17	11.1

Source: Primary, 2019.

Table 4: Health facility related factors associated with adherence to proper HCWM practices.

As far as level of health facility is concerned, most (56.9%) of the health workers were from Health Center IVs (HC IV). This is attributed to the arrangement of health system in Uganda where Health Centers are many and refer patients to Hospitals which are fewer in number [7]. The type and size of the health facility affects the compliance to HCWM of solid wastes and self-contained onsite treatment methods are more desirable and feasible in large public healthcare facilities (Hospitals) but are

impractical or uneconomical for smaller health facilities; and logically the size of the health facility dictates the mode of waste management [31, 32].

The results further show that the majority of the workers (90.8%) are provided with personal protective equipment to use during health care waste management (90.8%). This compares well with the national level provision of PPE in general [7]. (Table 4) also shows that 94.8% of the respondents reported that the health facilities have HCWM plan and regulations in place. This may because it is a Ministry of Health, Uganda requirement and enforced by a committee at the health facility as reported by two key informants:

At this health Centre we have members of the section/ committee whose role is to ensure all health care waste is handled in a very good and optimized way (KI6 Female 35 – 45 years, 2019.)

and

At the Health care waste is managed and planned by what we call a committee that handles the waste. This committee is responsible for knowing how much, how it is disposed and treated or burnt in the incinerator (KI2, Male, 30-40 years, 2019).

These findings disagree with those from several sources [33, 34] which reported that in most developing countries HCWM plans are non-existing and had poor operational strategies and other had no documented waste management and disposal policies in place. On the level of staffing of HCW handlers, the results reveal that most health facilities have 10 to 25 health care waste handlers (85.6%) while a very negligible proportion (0.7%) of them have more than 45 HCW handlers. This good for the HC IV level of health facility and as several authors [35, 36] argue so long as they are efficient, motivated and well supervised, HCWM can be undertaken very well. The study results in (Table 4) further show that the majority of health workers (79.7%) reported existence of a HCWM Service Provider. The existence of a service provider indicates high potential for waste being removed adequately from the facility. Related to this is the result that 88.9% of the health workers reported that HCWM was duly supervised. This is very important due to the heavy work load experienced by HC IV staff and need for better monitoring and regulation despite supervision challenges at institutional level [37].

3.4 Personal and health facility factors associated with adherence to proper HCWM Practices in health facilities

To establish the personal and health facility factors associated with adherence to proper HCWM practices in health facilities, the following analyses were conducted: the Pearson Chi square analysis at bivariate analysis level and logistic regression at multivariate level, and a cross tabulations alongside Crude Odds Ratios (COR) were also processed at bivariate analysis level. The results were presented in (Table 5) (Note that in order to meet the asymptotic assumptions underlying the binary logistic regression used responses, the “Not at all” and “Partially” were combined into “Partial”).

The results in (Table 5) show that the personal factors: age, sex, marital status and years of experience, are not significant indictors of adherence to proper HCWM practices in health facilities within Wakiso District, Uganda. Similarly, the health facility

factors: existence of a HCW management plan, existence of HCW service provider and supervision of HCWM, are not significant factors in influencing adherence to proper HCWM practices in health facilities in Wakiso District.

	Outcome	Adherence to proper HCWM practices		χ^2	df	P-Value
		Fully N (%)	Partially N (%)			
Personal factors						
Age in years	18-34	11(11.2)	87(88.8)	0.171	1	0.679
	35 and above	5(9.1)	50(90.9)	-	-	-
Sex	Female	10(11.1)	80(88.9)	0.100	--	0.752
	Male	6(9.5)	57(90.5)	-	-	-
Marital status	Single	8(10.4)	69(89.6)	0.001	-	0.978
	Married	8(10.5)	68(89.5)	-	-	-
Years of experience	< 6 months	2(22.2)	7(77.8)	1.413	-	0.234
	6 months +	14(9.7)	130(90.3)	-	-	-
Health facility related factors						
Level of health facility	Hospital	13(19.7)	53(80.3)	10.582	-	0.001**
	HCIV	3(3.4)	84(96.6)	-	-	-
Personal protective equipment provision	Yes	9(6.5)	130(93.5)	25.732	-	0.000**
	No	7(50.0)	7(50.0)	-	-	-
Existence of a HCW management plan	Yes	15(10.3)	130(89.7)	0.038	-	0.846
	No	1(12.5)	7(87.5)	-	-	-
Staff and waste handlers employed	10-25	9(6.9)	122(93.1)	12.520	-	0.000**
	26 and above	7(31.8)	15(68.2)	-	-	-
Existence of HCW service provider	Yes	11(9.0)	111(91.0)	1.335	-	0.248
	No	5(16.1)	26(83.9)	-	-	-
Supervision in as far as HCWM is concerned	Yes	14(10.3)	122(89.7)	0.035	-	0.852
	No	2(11.8)	15(88.2)	-	-	-

**Significant at 5%;. Source: Primary, 2019.

Table 5: Personal and health facility factors associated with adherence to proper HCWM practices in health facilities.

(Table 5) also however shows that the level of Health facility, provision of personal protective equipment and availability of staff and waste handlers, were the only significant health facility factors associated with adherence to proper HCWM practices in health facilities. Most significantly however, the findings further show that full adherence to proper HCWM practices was highest in health facilities at hospital level (19.7%), and having more than 25 Staff and waste handlers to handle HCW (31.8%) and highest among health workers that reported not being provided with personal protective equipment (50.0%).

3.5 Factors that influence adherence to proper HCWM practices in health facilities

A confirmatory analysis considering all the statistically significant person and health facility factors with each cell counts equal or above 5 in the multivariate analysis, was undertaken using the binary logistic regression. These factors included PPE, Level of Health facility and Staff and waste handlers employed (Table 6). On the Personal Protective Equipment (PPE), the results shows that while health workers reported being provided with the same, 86% are less likely to adhere to proper HCWM practices despite PPE provision being a significant indicator of adherence to these practices. Several authors [38, 39] in their studies at a health facility and clearing agency respectively, reported that despite provision of PPEs most workers did not use them due various reasons including lack of comfort, lack of training in the use of PPEs, and because their colleagues do not use them, an indication of attitude challenges. These authors' observations concur with the results of this study.

Factors	**Adherence to proper HCWM practices**		**COR (95%CI)**	**AOR (95%CI)**	***P*-Value**
	Fully N (%)	**Partially N (%)**			
Personal protective equipment provision					
Yes	9(6.5)	130(93.5)	0.07(0.02-0.24)	0.14(0.03-0.57)	0.006**
No	7(50.0)	7(50.0)	-	-	-
Level of health facility					
Hospital 13(6.9) 53(80.3)			6.87(1.87-25.24)	4.45(1.12-17.66)	0.034**
HCIV 3(3.4) 84(96.6)			-	-	-
Staff and waste handlers employed					
10-25	9(6.9)	122(93.1)	0.16(0.05-0.49)	0.52(0.13-2.05)	0.348
26 and above	7(31.8)	15(68.2)	-	-	-

Table 6: Logistic regression results for the factors that influence adherence to proper HCWM practices in health facilities.

The results in (Table 6) further show that according to the level of health facility, adherence to proper HCWM practices is lowest among health workers at Health Center IV (3.4%) and highest at Hospitals (6.9%). This means that the health workers at Hospitals are 0.0345% more likely to adhere to proper HCWM practices; and hence the level of Health facility is a significant indictor of adherence to proper HCWM practices in health facilities. These findings agree with those earlier published by Almuneef and Memish [32]. With regard to staff and waste handlers, the results (Table 6) indicate that adherence to proper HCWM practices is highest among health facilities whose health workers reported having more staff and waste handlers employed (31.8%), and lowest among health facilities whose health workers reported having less staff and waste handlers (6.9%). This means that Health facilities with less staffs and waste handlers are 48% less likely to adhere to the proper HCWM practices. These results agree with those of Mwanthi and Nyabola [36] who concluded that inadequacies of supervisors, and solid waste management crews were the major obstacles to the management of hospital solid waste in Kenya.

4. Conclusion and Recommendations

In conclusion, the level of adherence to proper HCWM practices was found to be low among the selected public Health facilities in Wakiso District, Uganda. This is a public Health concern since it poses a great danger of infections to Health workers, patients, care takers as well as pollution to the environment. Despite the provision of PPEs, guidelines and policies towards the safe management of HCW by the Uganda Ministry of health, some Health facilities do not adhere to the proper HCWM practices.

This study wishes to recommend that the health facilities encourage the HCWM Committees to increase its education and awareness programs and adherence to HCWM practices in general. It is also further recommended that there should be a significant increase in funding to wards the health facilities to enable HCWM practices and provisions being supported. Finally it is recommended that further studies be undertaken to establish the health worker perceptions and their associated factors towards adherence to the recommended HCWM practices in health facilities and also investigate the factors influencing adherence to proper HCWM practices among health workers in private hospitals in urban and rural settings.

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