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Original Research Article

Health care waste management in health facilities during the COVID-19 pandemic in Ghana

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ABSTRACT

Background: Healthcare waste management (HCWM) system in healthcare facilities is essential in dealing with the spread of infectious diseases, especially during an outbreak period such as the COVID-19 pandemic. The study assessed health care waste management situation in selected healthcare facilities in the greater Accra and Ashanti regions of Ghana during the COVID-19 pandemic.
Methods: This was a multi-facility-based cross-sectional study that used a monitoring tool of the health facilities regulatory agency of Ghana to collect information on health care waste management practices at the peak of the COVID-19 pandemic. Data was gathered from 501 healthcare facilities in the greater Accra (335) and Ashanti (151) regions. Descriptive, Chi-square and multiple logistic regression were performed. All statistical analyses were considered significant at an alpha level of 0.05.
Results: Less than half (45.7%) of the health facilities were assessed as having HCWM systems with majority (54.3%) having effective infectious waste management system. The health facilities in the greater Accra region (38.8%) and Ashanti region (60.9%) were categorized as poor on healthcare waste management system. The assessment levels of governance/leadership, management, quality assurance system, human resource, infection prevention and control equipment and water management were all significantly associated with the adherence to good HCWM systems.
Conclusions: Health facilities were assessed as having good healthcare waste management systems, especially in the greater Accra region compared to the Ashanti, however treatment and safe disposal should be improved.

Keywords: Healthcare waste management, COVID-19 related waste, Ghana

INTRODUCTION

Ghana recorded first two COVID-19 cases on 12 March 2020 and since then has experienced increased number of cases. Ghana health service (GHS) COVID-19 situation update, as of 8 August 2021, Ghana had 6,545 active cases among 109,428 cumulative confirmed cases and 899 cumulative deaths. At the same time a total of

1,271,393 total vaccine doses administered as at 14 July 2021.[1,2]

Precautionary measures have been adopted by various countries to reduce the spread of infection. These include frequent hand hygiene practices, social or physical distancing, the use of a nose and face masks and social etiquettes such as avoiding handshakes and unnecessary touching of surfaces.[3] Other measures included mass testing through contact tracing of suspected exposed groups, quarantine and isolation of suspected exposed and confirmed cases and mass vaccination. In Ghana, the Ministry of Health (MoH) has specially designated some healthcare and some residential facilities to provide medical services to patients infected or suspected with COVID-19 where volumes of infectious waste are generated. These measures are contributing to generation of large volumes of infectious and non-hazardous waste materials such as needles, syringes, vials, packaging, hand gloves, coveralls, face mask, cotton/plastic swabs and tissues that require proper management.

The major challenge in this situation is appropriately managing these waste materials since they may be potentially infectious due to contact with respiratory fluids of infected patients and contaminated surfaces during the caregiving processes. If these infected materials are not properly managed and disposed of, there is a high risk of infecting people who may come in contact with the infectious waste materials either within or outside the health facilities.[4] This is likely to be so since COVID-19 virus has a varying lifespan on surfaces ranging from 4 hours on copper surfaces, 24 hours on cardboards, 2-3 days on stainless steel materials, three days on plastics and sewage and three to four days on faecal waste.[5-7] An appropriate healthcare waste collection and management techniques that properly collect, store, transport, treat and dispose of the waste generated is needed. Additionally, implement a robust infection prevention system as part of the nationwide fight against COVID-19 to prevent further infections in Ghana and save the environment.

Some studies have focused on COVID-19 and medical waste management.[8-18] While most of these researches were conducted in advanced economies, limited studies have assessed medical waste management during COVID-19 pandemic in Sub-Sahara Africa.[19-21] In Ghana, limited studies have reported COVID-19 and healthcare waste management, especially in the two regions which are the epicentres of the pandemic in Ghana.[1,22-24]

In the era of this pandemic, health facilities are the central point of seeking health care, thus making this sector a potential epicentre for the spread of the COVID-19 virus if stringent measures, based on accurate data, are not implemented and enforced.[24] Yet, the data needed to clarify the extent to which organizational systems (governance/leadership) affect healthcare waste management in the era of COVID-19 is difficult to access in Ghana. The above observation was due to insufficient publication data on findings after monitoring and data collection from health facilities by researchers and organizations. Therefore, this paper seeked to fill the information gap by assessing the healthcare waste management in healthcare facilities in the greater Accra and Ashanti regions of Ghana in the COVID-19 era.

METHODS

This multi-facility-based cross-sectional study used quantitative methods to collect data from health facilities using the heath facilities and regulatory agency (HeFRA) HCWM monitoring tool for COVID-19 from May 19 to August 13 2020. This study was conducted in 501 health facilities in the greater Accra and Ashanti regions of Ghana. The two regions were selected for monitoring since they were the epicentres of COVID-19 in Ghana, accounting for over eighty percent (80%) of all cases between May and August 2020. They were government-mandated locked-downs for three weeks from March 30 to April 19 2020. All health facilities designated by the GHS to manage COVID-19 patients in greater Accra and Ashanti regions were included. Additionally, health facilities that have been registered by HeFRA or GHS providers in the locked-down referenced areas were also included. However, health facilities registered by HeFRA or GHS providers but not part of the locked-down areas were excluded.

A HeFMT developed by HeFRA, Ghana was modified to include the Governance and management, infrastructure and safety, sanitation, water management and healthcare waste management component of the water, sanitation for health facilities improvement tool (WASH-FIT) was used to assess the HCWM practices at the 501 selected health facilities.[25] HeFRA had used the HeFMT for monitoring health facilities to ensure they operated within the law. The tool was divided into seven main components as background information of the health facility, organizational system, infrastructure, infection prevention and control, assets, signages and HCWM. The data collection process had been described elsewhere.[24]

The dependent variable was HCWM defined as the availability of waste management policy and guidelines or measures, temporarily holding point or bay for waste, waste transport measures within the facility and final waste disposal.

The independent variables included organizational system (advisory boards, management teams, human resource development, policies, protocols/standard operating procedures); infrastructure (Veronica buckets with running water, carbolic soap, incinerators, placenta pits, labelled sharp boxes and sterilizers); assets (asset registry, planned preventive maintenance schedules, evidence of insurance, power supply systems, water supply systems and running water at all service areas).

The assessment percentage scores for each domain, including the HCWM as well as treatment of missing variables are described elsewhere.[24] The characteristics of health facilities in the study were described using percentages and frequencies. Bar charts were used to describe the percentages of health facilities based on their scorings from the individual items under HCWM and the overall assessment levels of the HCWM, the organizational system, infrastructure, safety, assets and signage assessment levels. The Pearson's Chi square test was used to assess the association between the variables, health facility characteristics, organizational systems, infrastructure, safety, assets, signage assessment levels and HCWM assessment levels. The three levels of HCWM assessment were then dichotomized such that good and moderate assessment levels were combined against poor assessment levels. The crude and adjusted odds ratio of poor HCWM assessment levels were then estimated using the binary logistic regression models. The 95% confidence interval and the corresponding p values of all odds ratios were also calculated. All statistical analyses were considered significant at a p value less than 0.05.

The study was sanctioned by the ethical clearance system of HeFRA and did not affect the rights of individuals in the health facilities and the health facilities. Anonymity of respondents and facilities were assured and findings were not linked to the identity of health facilities.

RESULTS

Descriptive characteristics of health facilities in the study

Out of a total of 501 health facilities initially identified for the study, 486 were included in the final analysis of the study, thus representing a 97% response rate. Fifteen (15) of the sampled facilities were not included in the final analysis due to non-responses from the facilities and incomplete information. The inclusion of such data would have skewed the data analysis/output. More than two-thirds of the health facilities were in the greater Accra (68.9%) and the remaining in the Ashanti region (31.1%). Most of the health facilities were privately owned (87.2%), with 12.8% publicly owned. Over a third of the health facilities were health centres or clinics (36.2%), 32.1% were hospitals, 14.4% medical centres, 6.4% were maternity homes, 4.1% were diagnostic or laboratory facilities, 3.1% were specialist facilities, 2.5% were polyclinics and 1.2% were CHPS compounds (Table 1).

Assessment of health facility on HCWM

Assessment of waste handling

Most of the health facilities were assessed highly (score of 3) for liquid waste disposal (80.0%), availability of safety or sharps boxes in all relevant service areas (52.7%), washroom (45.3%), final waste disposal (42.6%), waste transport measures (38.9%) and temporarily holding point for waste (35.6%). Over a third were also assessed highly (score of 3) for pedal operated bins at all services areas and offices (34.0%).

Table 1: Descriptive characteristics of health facilities in the study.

Characteristics	Frequency (n=486)	Percent
Region		
Greater Accra	335	68.9
Ashanti	151	31.1
Ownership of facility		
Private	424	87.2
Public	62	12.8
Type of facility		
CHPS compounds	6	1.2
Diagnostic/laboratories	20	4.1
Health centres/clinics	176	36.2
Hospitals	156	32.1
Maternity homes	31	6.4
Medical centres	70	14.4
Poly clinics	12	2.5
Specialist facilities	15	3.1

Source: field data, 2020.

Waste treatment assessment

Most of the health facilities were also assessed lowly (score of 0) for posters on appropriate waste management available (69.3%), evidence of treatment of waste at final disposal (57.2%) and access to an incinerator (54.3%) (Figure 1).

In the overall assessment level of facilities on HCWM, 23.3% were assessed as having a good HCWM system, 31.1% as having a moderate HCWM system and 45.7% as having a poor HCWM system (Figure 2).

The organizational system, infrastructure, safety, assets and signage assessment of health facility in the study

In the overall assessment of health facilities on Governance or leadership, 65.6% were assessed good, 16.7% moderately and 17.7% were assessed poorly. For the comprehensive evaluation of health facilities on management, 62.8% were assessed good, 20.2% were assessed moderately and 17.1% were assessed poorly. For the quality assurance system, 42.8% were evaluated as good, 24.5% moderately and 32.7% poorly. For the human resource assessment, 88.1% were good, 6.6% were moderate and 5.3% were poor. For IPC equipment, 67.5% were assessed good, 21.4% moderately and 11.1% poorly. For assets, 64.6% of the facilities were considered good, 23.0% assessed moderately and 12.3% assessed poorly. For signage, 49.2% were evaluated as good, 21.6% were assessed moderately and 29.2% were assessed poorly. However, for water management, 84.2% were assessed good, 11.3% were assessed moderately, and 4.5% were assessed poorly (Figure 3).

Table 2: Association between health facility characteristics and the assessment levels of HCWM.

Factors	N	Healthcare Waste Management Assessment levels				
		Good	Moderate	Poor	χ^2 value	P value
		N (%)	N (%)	N (%)		
N	486	113	151	222		
Region						
Greater Accra	335	96 (28.7)	109 (32.5)	130 (38.8)	20.53	<0.001
Ashanti	151	17 (11.3)	42 (27.8)	92 (60.9)		
Ownership of facility						
Private	424	99 (23.3)	131 (30.9)	194 (45.8)	0.05	0.975
Public	62	14 (22.6)	20 (32.3)	28 (45.2)		
Facility type						
CHPS compound	6	0 (0.0)	1 (16.7)	5 (83.3)		
Diagnostic/laboratory	20	0 (0.0)	6 (30.0)	14 (70.0)		
Health centre/clinic	176	41 (23.3)	50 (28.4)	85 (48.3)		
Hospital	156	39 (25.0)	56 (35.9)	61 (39.1)	22.23	0.074
Maternity home	31	4 (12.9)	9 (29.0)	18 (58.1)		
Medical centre	70	21 (30.0)	19 (27.1)	30 (42.9)		
Poly clinic	12	5 (41.7)	4 (33.3)	3 (25.0)		
Specialist facility	15	3 (20.0)	6 (40.0)	6 (40.0)		

Source: field data, 2020.

Table 3: Binary logistic regression model of factors associated with the poor level of HCWM.

Variables and categories	Unadjusted model		Adjusted model	
	COR (95% CI)	P value	AOR (95% CI)	P value
Region				
Greater Accra	1.00 (reference)	<0.001	1.00 (reference)	
Ashanti	2.46 (1.66, 3.65)		4.26 (2.57, 7.08)	<0.001
Ownership of facility				
Private	1.00 (reference)	0.930	1.00 (reference)	
Public	0.98 (0.57, 1.67)		1.54 (0.74, 3.19)	0.249
Facility type (P)				
Hospital	1.00 (reference)		1.00 (reference)	
CHPS compound	7.79 (0.89, 68.27)	0.064	3.33 (0.28, 40.18)	0.343
Diagnostic/laboratory	3.63 (1.32, 9.97)	0.012	1.50 (0.42, 5.37)	0.532
Health centre/clinic	1.45 (0.94, 2.25)	0.093	1.27 (0.73, 2.22)	0.397
Maternity home	2.16 (0.99, 4.72)	0.054	1.22 (0.48, 3.11)	0.671
Medical centre	1.17 (0.66, 2.07)	0.595	1.64 (0.80, 3.34)	0.175
Poly clinic	0.52 (0.14, 1.99)	0.340	0.70 (0.15, 3.25)	0.646
Specialist facility	1.04 (0.35, 3.06)	0.946	0.78 (0.21, 2.96)	0.719
Governance/leadership				
Good/moderate	1.00 (reference)		1.00 (reference)	
Poor	5.57 (3.22, 9.64)	<0.001	2.22 (1.07, 4.58)	0.032
Management				
Good/moderate	1.00 (reference)		1.00 (reference)	
Poor	4.48 (2.63, 7.65)	<0.001	1.54 (0.75, 3.17)	0.245
Quality assurance system				
Good/moderate	1.00 (reference)		1.00 (reference)	
Poor	3.49 (2.34, 5.20)	<0.001	1.79 (1.00, 3.19)	0.049
Human resource				
Good/moderate	1.00 (reference)		1.00 (reference)	
Poor	10.06 (2.98, 33.96)	<0.001	1.36 (0.31, 5.92)	0.678
IPC equipment				
Good/moderate	1.00 (reference)		1.00 (reference)	

Continued.

Variables and categories	Unadjusted model		Adjusted model	
Poor	9.86 (4.36, 22.32)	<0.001	1.84 (0.66, 5.13)	0.245
Assets				
Good/moderate	1.00 (reference)		1.00 (reference)	
Poor	11.51 (5.11, 25.93)	<0.001	3.52 (1.37, 9.06)	0.009
Signage				
Good/moderate	1.00 (reference)		1.00 (reference)	
Poor	3.45 (2.29, 5.22)	<0.001	2.48 (1.46, 4.22)	0.001
Water management				
Good/moderate	1.00 (reference)		1.00 (reference)	
Poor	8.14 (2.38, 27.90)	0.001	7.19 (1.70, 30.39)	0.007

COR: crude odds ratio. CI: confidence interval. AOR: adjusted odds ratio.

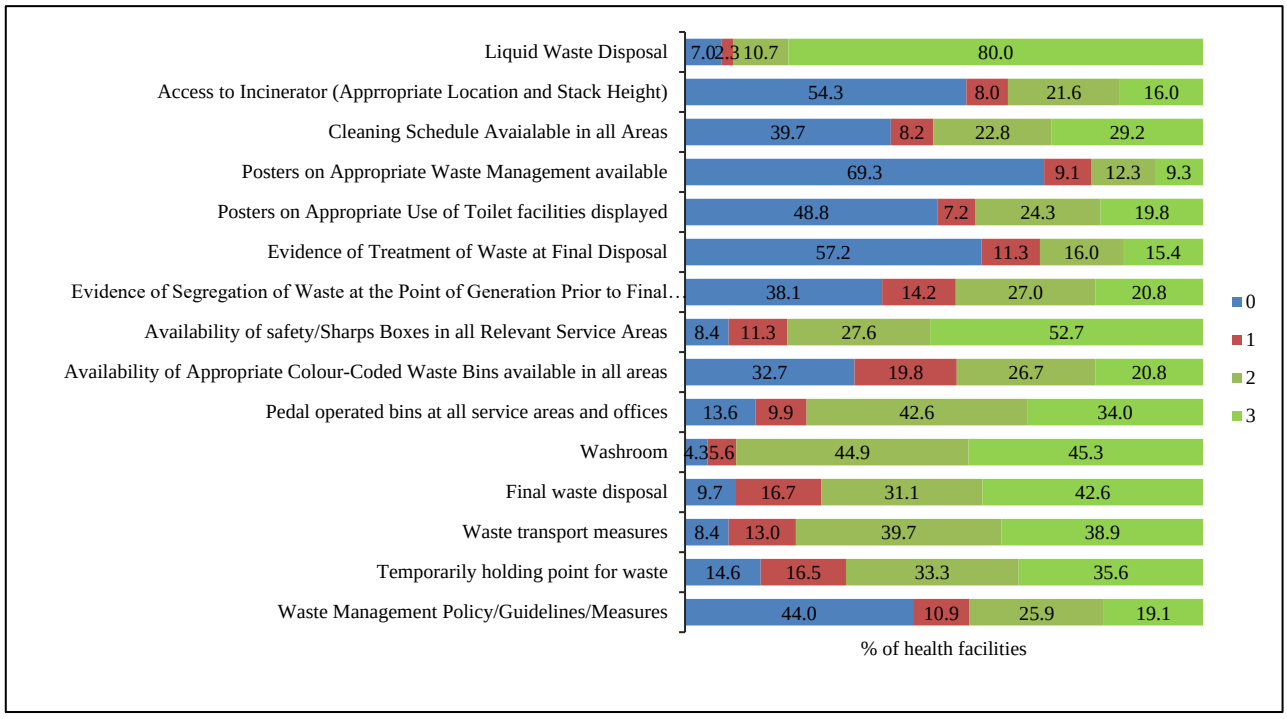

Figure 1: Assessment of health facility on HCWM.

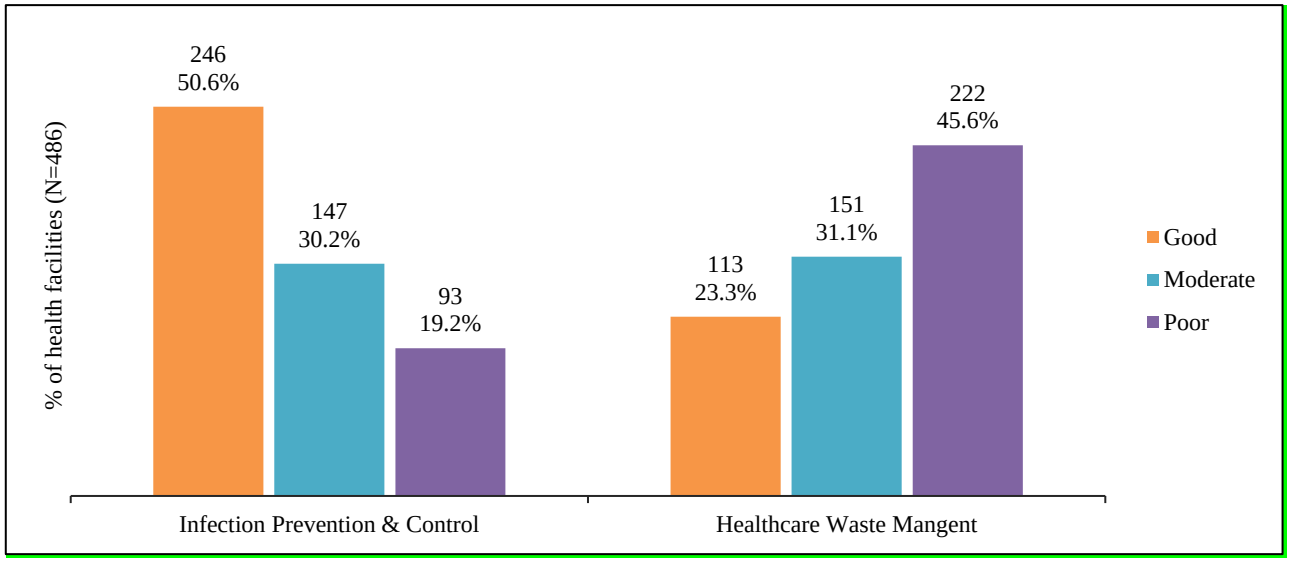

Figure 2: Assessment levels of health facilities on IPC and HCWM.

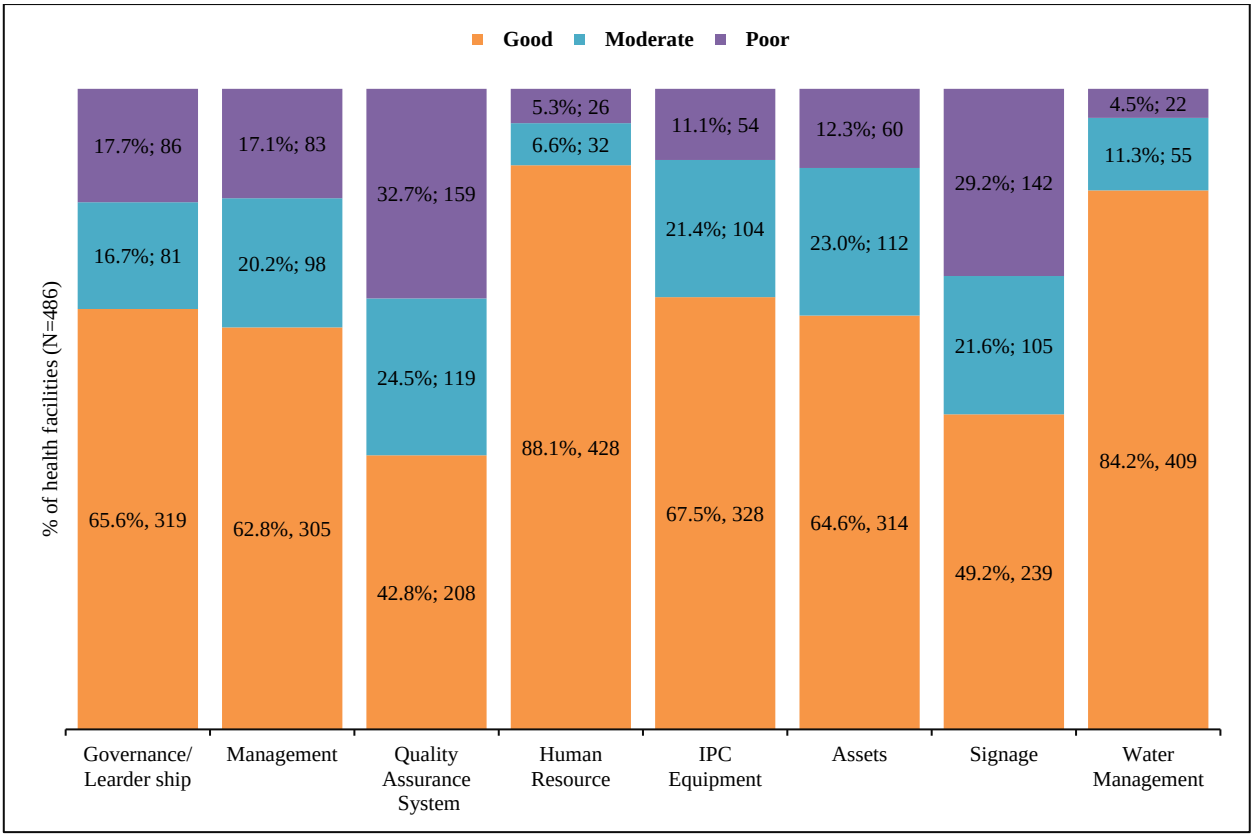

Figure 3: Assessment levels of organizational, infrastructure, safety, assets and signage systems of health facilities.

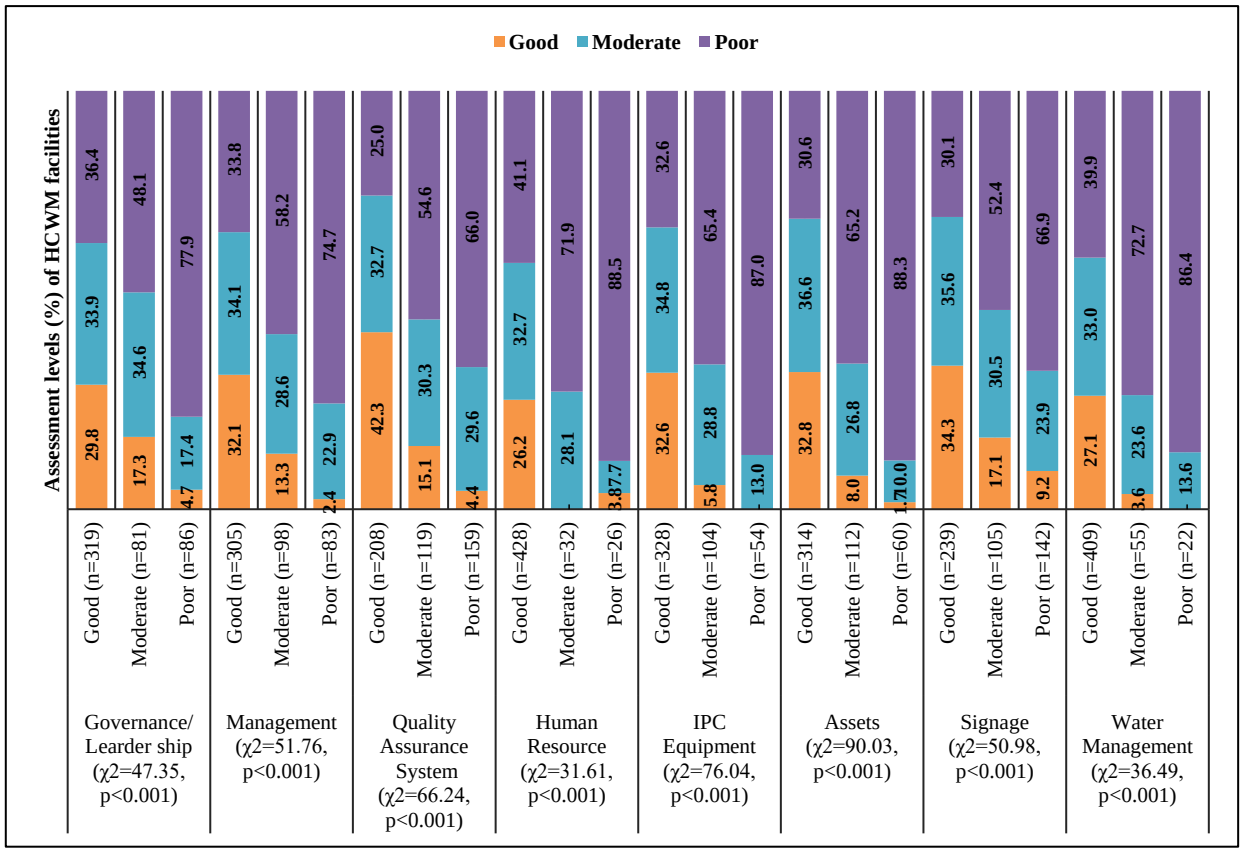

Figure 4: Distribution of HCWM assessment levels across organizational system, infrastructure, safety, assets and signage assessment levels.

Factors associated with HCWM assessment levels

Among the 335 health facilities from the greater Accra region, 28.7%, 32.5% and 38.8% were assessed as good, moderate and poor, respectively on HCWM. And among the 151 health facilities from the Ashanti region, 11.3%, 27.8% and 60.9% were assessed as good, moderate and poor, respectively on HCWM. There was a significant association between the region of location of the health facility and the assessment level on HCWM (χ^2=20.53, p<0.001). The ownership type of health facility and the facility type was not statistically associated with the HCWM assessment levels from the Chi-square test (p>0.05) (Table 2).

Figure 4 describes the distribution of the HCWM assessment levels within the various organizational, infrastructure, safety, assets and signage assessments. The assessment levels of governance/ leadership (χ^2=47.35, p<0.001), management (χ^2=51.76, p<0.001), quality assurance system (χ^2=66.24, p<0.001), human resource (χ^2=31.61, p<0.001), IPC equipment (χ^2=76.04, p<0.001), assets (χ^2=90.03, p<0.001), signage (χ^2=50.98, p<0.001) and water management (χ^2=36.49, p<0.001) were all significantly associated with HCWM assessment levels.

Binary logistic regression model of factors associated with the poor level of HCWM

Results on the unadjusted binary logistic regression model of factors associated with poor assessment level of HCWM are shown in Table 5. Ownership of health facilities was not significant in both the adjusted and unadjusted models. Although significant from the unadjusted model, the poor management, human resource, and IPC equipment assessment levels were not significantly associated with poor HCWM assessment levels in the adjusted model (Table 3).

From the multiple (adjusted) binary logistic regression model, facilities from the Ashanti region had significantly increased odds of poor HCWM assessment compared to facilities from the greater Accra region (AOR: 4.26, 95% CI: 2.57-7.08, p<0.001) (Table 3).

In the adjusted binary logistic regression model, health facilities with poor governance/leadership levels significantly increased the odds of poor HCWM assessment (AOR: 2.22, 95% CI: 1.07-4.58, p=0.032). Also, facilities with poor management assessment levels significantly increased the odds of poor HCWM assessment levels (AOR: 1.79, 95% CI: 1.00-3.19, p=0.049) (Table 3).

Furthermore, facilities with poor assets level significantly increased the odds of poor HCWM assessment level in the adjusted model (AOR: 3.52, 95% CI: 1.37-9.06, p=0.009). Also, facilities with poor signage system assessment levels had a significant increase in the odds of poor HCWM assessments (AOR: 2.48, 95% CI: 1.46-4.22, p=0.001). Likewise, health facilities with poor water management had a significant increase in the odds of poor IPC assessments (AOR: 7.19, 95% CI: 1.70-30.39, p=0.007) (Table 3).

DISCUSSION

The study reported that most of the health facilities scored low for access to incinerators and evidence of treatment of medical waste at final disposal. Lack of access to an incinerator and other waste treatment technologies implies that infectious waste was mixed with general waste or openly burnt at a designated point within the facilities. Mixing infectious waste with general or non-infectious litter has been reported and poses significant health and environmental risks.[22,26-28] Most of the assessed health facilities were categorized as having a good/moderate HCWM system (54.4%). This implied that most of the facilities had adequate HCWM that promotes community sanitation practices. However, a significant proportion (45.6%) of facilities categorized as poor may pose as sources of communicable diseases to patients, healthcare workers and the community at large. Such facilities should be promptly identified and HCWM measures enforced through appropriate regulations.

This study reported the overall assessment of health facilities as good/moderate (82.3%) with respect to the governance and leadership metric. The facilities with good/moderate governance and leadership scored higher on the HCWM assessment metric (over 51%). The implication was that most of the facilities with good/moderate governance and leadership systems supported efficient operations and compliance with regulatory requirements. The effect of poor leadership and governance system can affect how the facilities manage waste associated with infectious disease emergencies or outbreaks (COVID-19) and this may create role conflicts and gaps that can contribute to a possible escalation of nosocomial infections.[29] The finding assured that strengthening governance and leadership at health facilities promoted adherence to HCWM policy and guidelines, which will mitigate the risk of spread of nosocomial infections and promoted good sanitation and hygiene practices.

For human resource assessment, 88.1% were good, 6.6% were moderate and 5.3% were poor.

Most facilities in these regions had access to qualified health workers. The proportion of facilities with poor assessment levels on the HCWM metric in the Ashanti region (60.9%) was significantly higher than in the greater Accra region (38.8%). This meant that majority of the health facilities in the Ashanti region were not complying with the HCWM policy of the country and therefore had poor HCWM systems in place. The ability of such facilities to prevent and control the spread of infection that may be related to the management of health care waste within their operational areas cannot be

assured. Therefore, workers and care seekers (patients) may be vulnerable to nosocomial infections if they became exposed to such environment.

The study did not holistically looked at the infection prevention and control system, but rather focused on the healthcare waste management system in the studied facilities.

CONCLUSION

The monitoring has revealed that most of the health facilities in the two regions (greater Accra and Ashanti) have a good system to ensure effective infection prevention and control and have been adhering to the regulatory requirements of the health facilities regulatory agency. These areas of compliance with adequate performance include healthcare waste management, water supply, human resources, governance, management, quality assurance and assets of the facilities. However, signage was a significant challenge in many facilities, which is likely to affect communication within the facilities on HCWM-related actions. The leadership and Governance system of the health facilities influenced compliance to HCWM regulations, good assets available in the facility positively influenced the HCWM system, and a good water supply system contributed to an enhanced IPC system. In summary HCWM assessment was poor in the Ashanti region compared to the greater Accra Region. Therefore, intensified the monitoring of health facilities, sharing of monitoring results with facilities with recommended actions and sanctions will help facilities commit to improving HCWM systems in their facilities. Capacity building and institutional re-tooling may be helpful to support compliance with HCWM regulatory requirements.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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