

Topic: Artificial Intelligence and Technology in Academia and Profession

Abstract title: Assessment of medical waste management by hospitals of Dhaka city

**CO- Authors: Sharmin Haque Prima¹, Sabrina Binte Shahadut²,
Md. Younus Ali³, Quanita S.Saleque⁴, Nibia Sharmin⁵, Faysal Mollah⁶,
Shamim Reza⁷**

1,2,3,4,5,6,7 Department of Public Health, University of South Asia

Abstract

Hospital waste are the waste produced in the course of healthcare activities during treating diagnosing and immunizing human beings or animals or whole doing study / research activities. Improper handling of medical wastes, which is common in Bangladesh, could adversely affect the hospital environment and community at large, and poses a serious threat to public health. This study is aimed to assess the knowledge and practices regarding medical waste management (MWM) among healthcare providers (HCPs). This Cross Sectional Study was carried out to evaluate the level of medical waste management by hospitals of Dhaka city. We estimated the sample size through simple random sampling and used both open & close-ended questionnaire for data collection. The Data were collected using a self-administered questionnaire. Informed consent has taken from all the participants. Then the data analysis was done by using SPSS. We use the source of health care waste: Government hospital, Private hospital, Nursing homes, Physician office, Dentist office, Dispensary, Mortuaries, Blood bank and collection centre, Animal house, Laboratories, Research organization. The study population was health professional at hospital in Dhaka city, Bangladesh. 379 sample sizes were selected to assess the Knowledge, attitude and Practice regarding hospital waste management among them by face to face interview. The strengthening and expansion of on-going educational programs/training is necessary to improve knowledge, attitude and practices regarding MWM.

Keywords: Health and environmental impact, Waste disposal, Infection control, Waste management policy, Public health risk, Healthcare facilities

1.1 Background

Hospital waste are the waste produced in the course of healthcare activities during treating diagnosing and immunizing human beings or animals or whole doing study / research activities. The waste produced in the course of healthcare activities carried a higher potential for infection and injury than any other type of waste. Inadequate and inappropriate knowledge of handling may have serious health consequence and a significant impact on the environment as well. Hospital waste pose a serious public health problem. The problem is getting worse with the increasing number of hospital, clinic & diagnostic laboratories in Dhaka city. Inadequate and improper technique may cause serious health Hazard and environmental pollution.

Non-hazardous waste does not pose special handling problems to human health or environment. In this study, non-hazardous waste is classified into two categories such as general waste and reusable waste. General waste includes food waste, paper waste, non-infectious materials, waste originated from catering services and administrative establishment where as reusable waste includes ampoules, empty syrup bottles, barrel, plunger, empty saline bag and set without needles and nozzles that is not contaminated with blood or body fluid etc. On the other hand, hazardous waste is responsible for spreading of infections and epidemic diseases and should pose special care in handling. In this study, hazardous waste is also classified into two categories such as clinical waste and sharp waste. Clinical waste include blood bag, bloods contaminated saline/set, blood and body fluid contaminated materials, body parts/organs, catheter, clothes used by AID and barrier's patients, drainage tube, gauge, bandage and cotton, surgical sponge etc. On

the other hand, sharp waste includes BP blades, broken glass, cover slip, infusion set, knives, needles, nozzle of syringe, scalpels blades etc.

Source of health care waste: Government hospital, Private hospital, Nursing homes, Physician office, Dentist office, Dispensary, Mortuaries, Blood bank and collection centre, Animal house, Laboratories, Research organization.

2.1 Literature review

The wastes generated during the process of diagnosis, treatment, operation, or-immunization or in research activities, are termed as medical wastes. It is an on going problem for many countries and poses a serious public health problem. Due to modernization of medical services and increased number of patients, healthcare institutions generate large amounts of medical wastes. (M. Azage,2013)

Approximately 75–95% of bio-medical wastes are non-hazardous and the remaining 10–25% are hazardous to humans or animals and detrimental to the environment. It is very important to realize that if both of these types are mixed together, then all waste becomes harmful. Reports in the literature shows 80% of all medical wastes are mixed with general wastes. The World Health Organization (WHO) estimated that, during 2000, injections with contaminated syringes caused 21million hepatitis B virus infections, 2 million hepatitis C virus infections, and 260 000 cases of human immunodeficiency virus (HIV) infections. Cases with staphylococcal bacteriemia and endocarditis were reported among cleaning staff after needle injury.

Healthcare providers (HCPs) are at risk of occupational dangers as they perform their jobs in hospitals. Serious diseases may develop in HCPs as well as patients and the general public. The highest rates of occupational injury among all workers who may be exposed to healthcare wastes were reported by cleaning personnel and waste handlers; the annual rate

in the United States was 180 per 1000. Based on types of wastes and hospital category, medical waste management (MWM) scenarios at hospitals in Bangladesh are not satisfactory.

There are approximately 1300 government hospitals with 43 000 beds, including public specialized hospitals, medical college hospitals (tertiary level), district hospitals (secondary level), and upazila (primary level) health complexes in Bangladesh. Many private hospitals and clinics also provide healthcare. The waste generation rate for infectious waste and sharps waste from government hospitals were 0.11 and 0.03 kg/bed/day, respectively. Most health facilities do not have adequate and effective systemic approaches to medical waste disposal. The medical wastes are simply mixed with the municipal wastes in the collecting bins at the road side and some percentage are buried without any pre-cautions or are burned in the open. The pollution of the environment with toxic substances is a serious public health problem in Bangladesh. Public awareness of healthcare wastes has grown recent years, especially with the emergence of acquired immunodeficiency syndrome (AIDS). (M. Molla, 2009)

In the past 10 years, due to increased number and size of healthcare facilities, medical services and use of medical disposable products, the generation of healthcare wastes has increased rapidly. The Ministry of Health and Family Welfare, Bangladesh, started to address the MWM as a priority program. HCPs has become part of the extensive MWM-related training program and logistics, including different colored bins, were supplied among the healthcare institutions; however, the situation is not yet satisfactory. Very few studies had reported on different isolated components of MWM in Bangladesh. One study reported on the health effect of medical practices towards medical wastes.

Another study identified the types and amount of medical waste generation. There has been no published study among HCPs regarding awareness of knowledge and practices, and possible barriers to proper MWM in Bangladesh. The WHO recommended raising awareness of medical waste risks and promoting safe and sound practices to improve the situation. Therefore, it was necessary to conduct this study with the objective of assessing relevant knowledge and practices, and to identify possible barriers to proper MWM among HCPs. The association of knowledge and practices with back-ground characteristics was also evaluated.

Recommended colour coding for hospital waste.

Type of waste	Colour of container and marking	Type of container
Clinical waste	Yellow	Strong, leak-proof plastic bag or container
Sharpswaste	Red	Puncture proof container
Reusable waste	Black	Leak-proof plastic bag or container
General waste	Green	Plastic bag or container



CAPCDR 8th CONFERENCE

CAPCDR 8th CONFERENCE

2.2 Objective of the study

Main objective of this study is to assess the level of medical waste management by hospitals of Dhaka city. The specific objectives of this study are to identify hazardous and non-hazardous hospital waste & find out problems associated with hospital waste. Other specific objectives are to assess the knowledge about step of hospital waste management with identification of socio-demographic characteristics of healthcare professionals Dhaka, Bangladesh. Also to prevent transmission of disease by hospital waste from patient to patient and from patient to health workers.

3.1 Research Methodology

This chapter's primary goal is to concentrate on research methods appropriate for analysis. This study is aimed to assess the knowledge and practices regarding medical waste management (MWM) among healthcare providers (HCPs). This Cross Sectional Study was carried out to evaluate the level of medical waste management by hospitals of Dhaka city. The target population is Among healthcare professionals of different private and government hospital on Dhaka city.

These were male and female patients at Different private and government hospital on Dhaka city. This approach employed a cross-sectional analysis with 379 patients in different private and government hospitals of Dhaka city, Bangladesh. This cross-sectional study was conducted from June to August 2023 among different level hospitals in Dhaka City, Bangladesh. One tertiary level hospital was selected purposively from Dhaka City In the first stage, 3 out of 17 district (secondary level) hospitals were selected using a simple random sampling (SRS) method. In the second stage, we also selected 3 upazila (primary level) hospitals, 1 from each of the above-mentioned districts, by applying the SRS. The Sample has collected by systemic random sampling method of positive cases. The following were the inclusion criteria for this study Participants had to be employed by the hospital under study. Willingness to participate in the study after signing the consent form. Be literate in English language.

The following healthcare workers were excluded from the study—All professional healthcare workers not permanently employed by the hospital. Any staff members who were not willing to sign the consent to participate. The Data were collected using a self-administered open & closed questionnaire. The questionnaire was pretested to ascertain ease of understanding and to determine if it was worded to elicit all the materials of interest for this research study. Therefore, this process was concerned with assessing content validity of the questionnaire. Participants for the pretesting stage were drawn from the heads of Department at the study hospital which included doctors & nurse practitioners. Pretesting of the questionnaire was conducted at the same hospital as the study. However, those involved in the pretesting phase were not allowed to participate in the actual study. Findings from this process showed that all respondents were

satisfied & that the questionnaire was adequate for the purpose of the study. The data to be collected and analyzed using SPSS and presented in form of tables, pie charts and Bar graphs. Computations were included index, percentage of waste management among healthcare professionals. The study was carried out in only a few selected government, non-government hospitals, clinics and diagnostic centres of Dhaka City mainly for HWM. Selected HCCs were considered and visited to quantify the hazardous and non-hazardous portion of HW generated in Dhaka. The rate of waste generation was known for a few selected HCCs. The seasonal variation of waste generation rate could not be considered due to lack of enough time. The radioactive wastes and radon gas emission from HCCs are not considered here, because no equipment was available to detect the presence and concentration of gas. From the findings of this study, we able to know assessment of the level of medical waste management by hospitals of Dhaka city.

4.1 Results

4.2 Descriptive statistics

4.2.1 Socio demographic characteristics of the participants

4.2.2 Distribution of the participants by gender

Among 379 respondents 273(72.1%) male and 106 (27.9%) female.

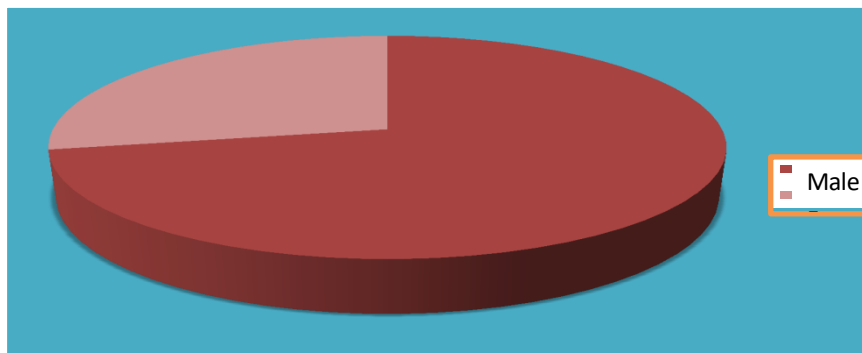


Fig 1 : Distribution of the participants by gender

4.2.3 Distribution of the participants by age

Among 379 respondents maximum 105 (27.7%) belong to 21 to 30 years, 100(26.4%)

belong to 31 to 40 years, 93(24.5%) belong to 41 to 50 years and 81(21.4%) belong to 51 to 60 years.

Age group	Number	Percentage %
21 to 30	105	27.7%

31 to 40	100	26.4%
41 to 50	93	24.5%
51 to 60	81	21.4%
Total	379	100%

Table: 01: Distribution of the participants by age

4.2.4 Distribution of the participants by Religion.

On asking about religion majority of them 221(58.3%) Muslim, 140(36.9%) Hindu, 10(2.6%) Christian and 8(2.1%) Buddhist.

Table no 2: Religion.

Religion	Number	Percentage %
Muslim	221	58.3%
Hindu	140	36.9%
Christian	10	2.6%
Buddhist	8	2.1%
Total	379	100%

4.2.5. Distribution of the participants by Education level

Below figure showed that among 379 respondent 37(9.8%) primary level, 40(10.6%) secondary level, 63(16.6%) higher secondary, 140(36.9%) Graduation and 99(26.1%) Diploma on education.

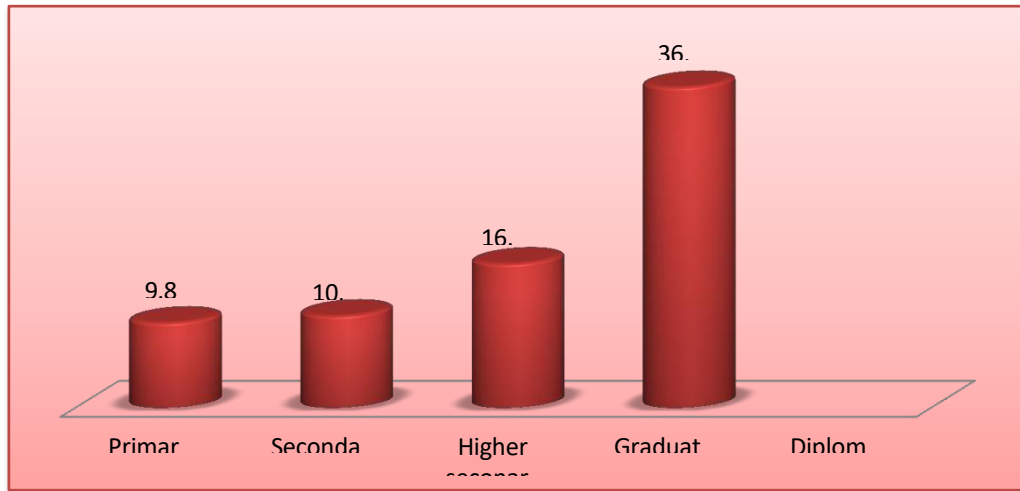


Figure 2: Educational Level

4.2.6. Distribution of the participants by Designation

On asking about their occupational designation majority of them 102(26.9%) Nurse, 71(18.7%) Doctor, 88(23.2%) Paramedic, 100(26.4%) cleaner and 18(4.7%) other staff.

Table 3: Designation

Designation	Number	Percentage %
Doctor	71	18.7%
Nurse	102	26.9%
Paramedic	88	23.2%
Cleaner	100	26.4%
Others	18	4.7%
Total	379	100%

4.2.7. Distribution of the participants by Hospital Waste Disposal Policy

On asking about any Hospital Waste Disposal Policy In their Hospital majority of them 341(89.9%) answered yes they have and 38(10.1%) answered No.

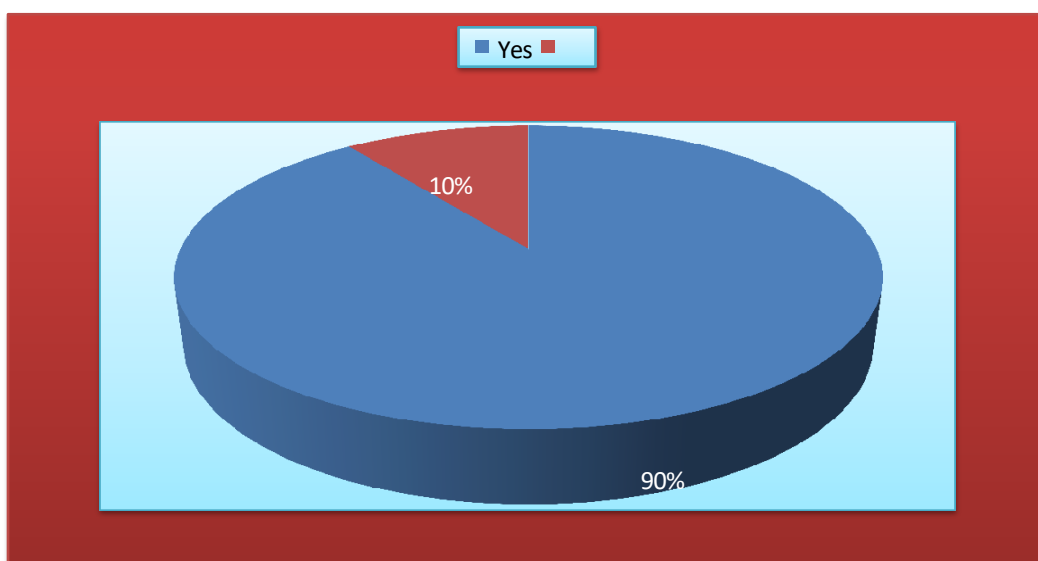


Figure no 3: Hospital Waste Disposal Policy

4.2.7. Distribution of the participants by Follow colour coding for hospital waste

On asking about follow colour coding for hospital waste majority of them 322(84.9%) answered yes and 57(15.1%) answered no.

Table no 5: Follow colour coding for hospital waste

Follow colour coding for hospital waste	Number	Percentage %
Yes	322	84.9%
No	57	15.1%
Total	379	100%

4.2.8. Distribution of the participants by Disposal plastic items

On asking about Used disposal plastic items are disposal of 204(53.8%) answered yellow bags, 72(19%)red bags, 66(17.4%) blacks bags and 37(9.8%) answered don't know.

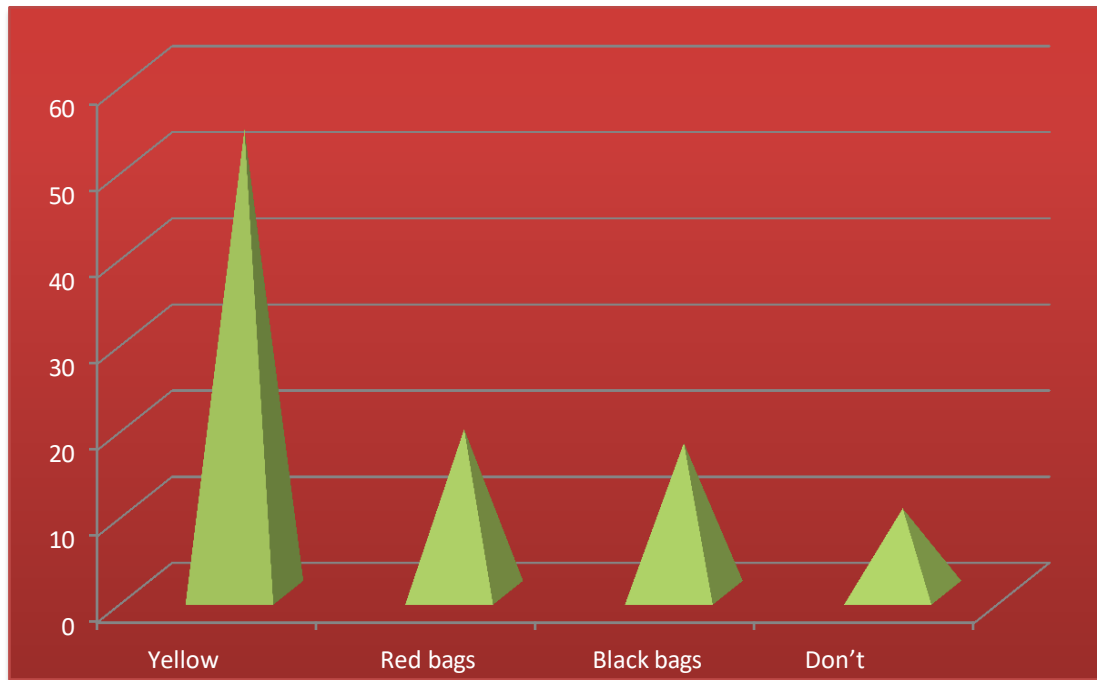


Figure no 4: Disposal plastic items are disposal to dispose.

4.2.9. Distribution of the participants by Solid waste recycling

On asking about solid waste recycling majority of them 205(54.8%) answered yes, 108(28.5%) No and 66(17.4%) not sure.

Solid waste recycling	Number	Percentage %
Yes	205	54.8%
No	108	28.5%
Not sure	66	17.4%
Total	379	100%

Table no 7: Solid waste recycling

4.3. Distribution of the participants by Waste management education programs

On asking waste management education programs in their majority of them 311(82.1%) answered yes, 40(0.6%) answered no and 28(7.4%) no response.

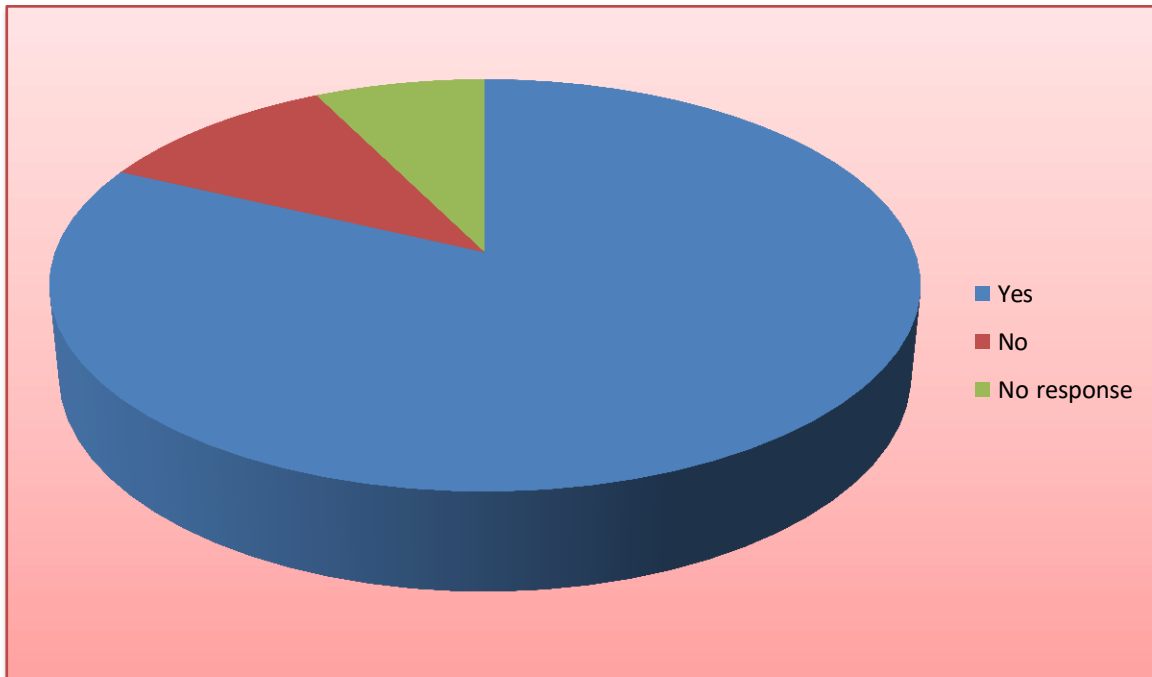


Figure no 5: Waste management education programs

5.1 Discussion

A descriptive cross section study was done at Dhaka city, Bangladesh. The study population was health professional at hospital in Dhaka city, Bangladesh. 379 sample sizes were selected to assess the Knowledge, attitude and Practice regarding hospital waste management among them by face to face interview. The significant finding of this study in the area on discussed according to the analysis of the table & figures. The major findings of the socio demographic results of this study indicates that Among 379 respondents 105 (27.7%) belong to 21 to 30 years, 100(26.4%) belong to 31 to 40 years, 93(24.5%) belong to 41 to 50 years and 81(21.4%) belong to 51 to 60 years.. Similar The results revealed that the majority of the 344 respondents were female (87.2%) with the most common age range being 20–29 years old (36.9%). (International Committee of the Red Cross,2018)

The findings of among 379 respondent 37(9.8%) primary level, 40(10.6%) secondary level, 63(16.6%) higher secondary, 140(36.9%) Graduation and 99(26.1%) Diploma on education. Another study was found that 39.6% were from higher secondary level. (Jianlin Nie, 2016). Their occupational designation majority of them 102(26.9%) Nurse, 71(18.7%) Doctor, 88(23.2%) Paramedic, 100(26.4%) cleaner and 18(4.7%) other staff. Another study majority of doctors (83.3%), paramedics (80%), and medical students (66.7%) at King George's Medical and Dental University, Lucknow, India, had good knowledge about methods of final waste disposal. On asking about Used disposal plastic items are disposal of 204(53.8%) answered yellow bags, 72(19%) red bags, 66(17.4%) blacks bags and 37(9.8%) answered don't know.

Similar study showed that 36% of the clinics who participated in this study disposed their medical waste in a public garbage container provided by the municipal waste transportation service. (Phuket Provincial Health Office,2017)

CAPCDR 8th CONFERENCE

6.1 Conclusion and Recommendation

Inadequate knowledge and poor practices were observed among HCPs Bangladesh. Inadequate knowledge and poor practices were more prevalent among technologists and cleaning staff than medical doctors and nurses. Insufficient PPE, lack of instruments for final disposal, lack of staff, lack of appropriate guidelines, and lack of incinerators were identified as the top 5 possible barriers. Practice-based training regarding MWM.

Recommendation

- ❖ Improved waste management facility.
- ❖ Improved waste management knowledge for every staff.
- ❖ Organized waste management education programme.

CAPCDR 8th CONFERENCE

References

1. E. A. Udofia, J. N. Fobil, and G. Gulis, —Solid medical waste management in Africa,|| *African Journal of Environmental Science and Technology*, vol. 9, no. 3, pp. 244– 254, 2015.View at: [Google Scholar](#)
2. B. Mugabi, S. Hattingh, and S. C. Chima, —Assessing knowledge, attitudes, and practices of healthcare workers regarding medical waste management at a tertiary hospital in Botswana: a cross-sectional quantitative study,|| *Nigerian Journal of Clinical Practice*, vol. 21, pp. 1627–1638, 2018.View at: [Google Scholar](#)
3. B. Nagaraju, G. Padmavathi, D. Puranik, M. Shantharaj, and S. Sampulatha, —A study to assess the knowledge and practice on bio-medical waste management among the health care providers working in PHCs of Bagepalli Taluk with the view to prepare informational booklet,|| *International Journal of Medicine and Biomedical Research*, vol. 2, no. 1, pp. 28–35, 2013.View at: [Publisher Site](#) | [Google Scholar](#)
4. M. A. Sarker, M. Harun-Or-Rashid, T. Hiroswawa et al., —Evaluation of knowledge, practices, and possible barriers among healthcare providers regarding medical waste management in Dhaka, Bangladesh,|| *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research*, vol. 20, no. 20, pp. 2590–2597, 2014.View at: [Publisher Site](#) | [Google Scholar](#)
5. I. M. Ismail, A. G. Kulkarni, S. V. Kamble, S. A. Borker, R. Rekha, and M. Amruth, —Knowledge, attitude and practice about bio-medical waste management among personnel of a tertiary health care institute in Dakshina Kannada, Karnataka,|| *Al Ameen Journal of Medical Sciences*, vol. 6, no. 4, pp. 376–380, 2013.View at: [Google Scholar](#)

6. World Health Organization (WHO), *Waste Related to Health Care. Aide-Memoire No. 253*, World Health Organization (WHO), Geneva, Switzerland, 2015, <https://www.who.int/en/news-room/factsheets/detail/health-care-waste>.
7. J. D. Ntirenganya, *Knowledge, Attitudes and Practices of Health Professionals on the Management of Hospital Waste*, Saint Joseph University, Goma, Congo, 2010, <https://www.memoireonline.com/11/13/7979/Connaissances-attitudes-et-pratiques-des-professionnels-de-sante-sur-la-gestion-des-dechets-hosp.html>.
8. Ministry of Public Health (MINSANTE), *Sectoral Strategy for Health. Yaoundé, Republic of Cameroon*, Ministry of Public Health (MINSANTE), Nonthaburi, Thailand, 2016, http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_%20repository/cameroon/sss_officiel_2001-2015.pdf.
9. Ministry of Public Health (MINSANTE), *National Plan of Sanitary Development. Yaoundé: Republic of Cameroon*, Ministry of Public Health (MINSANTE), Nonthaburi, Thailand, 2014, https://www.uhc2030.org/fileadmin/uploads/ihp/Documents/Country_Pages/Cameroon/Cameroon_National_Health_Plan_2011-2015_French.pdf.
10. D. SCHWARTZ, *Statistical Methods for Physicians and Biologists*, Flammarion Médecins Sciences, Paris, France, 1969.
11. A. Younes, E. B. Mohamed, H. Mohamed, K. Abderrazzak, O. T. Ahmed, and S. H. Ahami, —Waste management of infectious risk care activities in diffuse environments: medical analysis laboratories, in the Gharb region of Morocco,|| *International Journal of Science and Research*, vol. 13, pp. 163–172, 2015. View at: [Google Scholar](#)
12. M. Ndiaye, L. El Metghari, M. M. Soumah, and M. L. Sow, —Gestion des déchets biomédicaux au sein de cinq structures hospitalières de Dakar, Sénégal,|| *Bulletin de la*

Société de pathologie exotique, vol. 105, no. 4, pp. 296–304, 2012. View at: [Publisher Site](#) | [Google Scholar](#)

13. J. Ndie, —Study of the management of hospital structures in the reference health structures of the North-Cameroon region, *European Scientific Journal*, vol. 2, pp. 362–364, 2015. View at: [Google Scholar](#)
14. J. Mouankie, B. Abena, and A. Diakouka Diambou, —Management of biomedical waste in Brazzaville, Congo, *European Scientific Journal*, vol. 11, no. 23, pp. 317–324, 2015. View at: [Google Scholar](#)
15. J. Saizonou, E. M. Ouendo, V. Agueh, E. Tokplonou, and M. Makoutodé, —Evaluation of the quality of solid biomedical waste management in Klouekane and Toviklin-Lalo health zones in Benin, *International Journal of Travel Medicine and Global Health*, vol. 1, pp. 1–11, 2014. View at: [Google Scholar](#)
16. C. Perrot, *Management of Waste from Pharmacy and Laboratory Activities in Health Facilities*, National School of Public Health (ENSP), Rennes, Portugal, 2011, <https://documentation.ehesp.fr/memoires/2001/phisp/perrot.pdf>.
17. J. B. Mokoko, B. I. Atipo, J. F. Mimiesse, P. J. Iloukou, and R. Takale, —Management of hospital waste and biomedical equipment of the University Hospital in Brazzaville, *Health and Medical Sciences*, vol. 19, pp. 1–5, 2017. View at: [Google Scholar](#)
18. V. Sengodan, —Segregation of biomedical waste in an South Indian tertiary care hospital, *Journal of Natural Science, Biology and Medicine*, vol. 5, no. 2, pp. 378–382, 2014. View at: [Publisher Site](#) | [Google Scholar](#)

CAPCDR 8th CONFERENCE