

## A STUDY FOR A SUSTAINABLE ENVIRONMENT: A RESEARCH REGARDING BIOMEDICAL WASTE MANAGEMENT IN DHAKA

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### ABSTRACT

Biomedical waste is generated from biological and medical sources and activities, such as the diagnosis, prevention, or treatment of diseases. Proper management of this waste is an environmental concern. If it is not dealt with in a certain fashion, the waste may cause infections and other dangers to humans and other living organisms that are exposed to it. The training and awareness-building campaign for biomedical waste management (BMWM) in Bangladesh started in February 2005. This article has both scientific and ethical goals. The scientific goal is to analyze the current scenario of BMWM in Dhaka, Bangladesh, and compare it to WHO standards. The ethical goals, on the other hand, include the discussion of the negative effects of an improper BMWM on both health and environment. This article also looks forward to promoting hygiene and reduce the risk of any disaster that may happen if proper BMWM is not ensured. Furthermore, this study aims to offer suitable steps for improved BMWM that is also environment friendly. Due to limited documentation of local information, available data in various researches and surveys were collected for said article.

**KEYWORDS:** Energy, Global Warming, Contextual analysis, Human, Point, Building.

### I. INTRODUCTION

#### a) Background

If we take a look at the history of mankind, the contraction of nature is evident with the steady development of the human race. Essentially, the balance among them was split. Biomedical waste, if not managed appropriately, is dangerous to the exposed populace. Every day, a relatively large amount of potentially infectious and hazardous waste is generated in the hospitals and health care facilities around the world [1] World Health Organization (WHO) was first to issue strictures in this concern. In 1996 it issued the first medical report about waste management.[2] Soon though forms a small portion of environmental management; it has become an important public issue with the tremendous increase in incidences of diseases like AIDS, Hepatitis B, etc. and also dangerous for the environment. These factors made a new branch of Bio-Medical waste as a part of Hospital waste management.

#### b) Definition of Bio medical waste

Any waste, generated from the diagnosis, surgery, or immunization of humans or other animals is regarded as biomedical waste. They are commonly generated in hospitals, health care facilities, medical research laboratories, offices of medical practitioners, and morgues. According to the World Health Organization (WHO), biomedical waste can be defined as that portion of a healthcare or research facility's total waste stream that contains potentially infectious agents, hazardous chemicals, or radioactive materials.

#### c) Categories of Biomedical Waste

Aggregate sum of waste created by health-care activities, around 85% is general, non-dangerous waste equivalent to local waste. The staying 15% is viewed as hazardous material that might be irresistible, chemical or radioactive (World Health Organization, 2013)

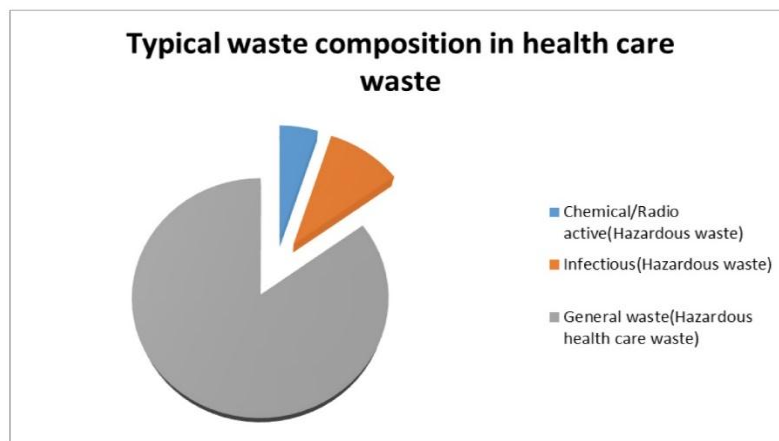


Fig-1 : Category of health Care Waste (WHO,2013)

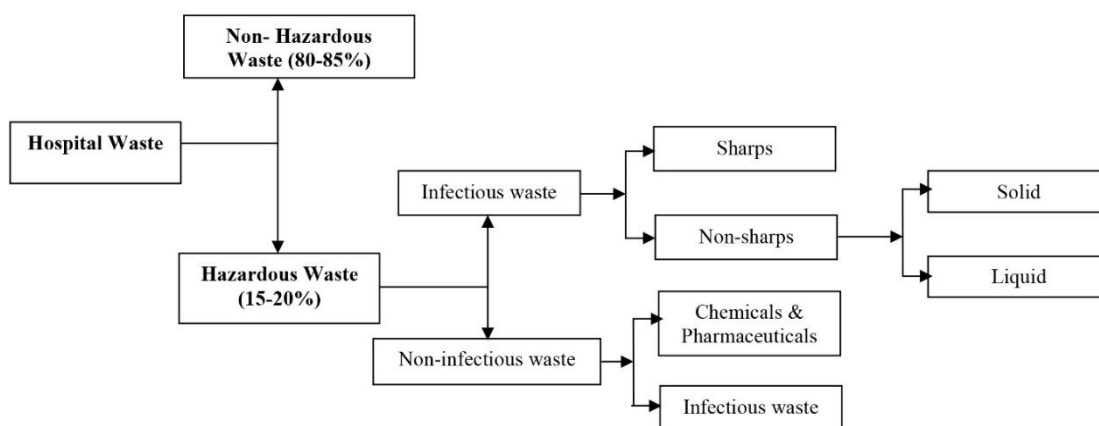


Fig-2: Different Types Hospital Wastes

Source: WHO,2001

Table-1 : Waste Category

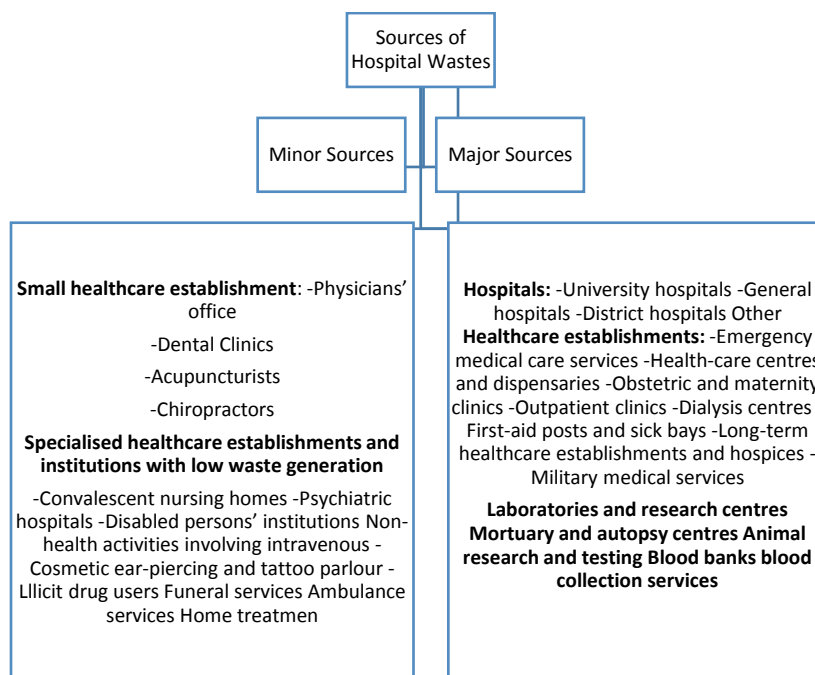
Option	Waste Category	Treatment & Disposal
Category No. 1	Human Anatomical Waste (human tissues, organs, body parts)	incineration/deep burial
Category No. 2	Animal Waste (animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge from hospitals, animal houses)	incineration/deep burial
Category No. 3	Microbiology & Biotechnology Waste (wastes from laboratory cultures, stocks or specimens of microorganisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, d	local autoclaving/microwaving/incineration

	ishes and devices used for transfer of cultures)	
<b>Category No. 4</b>	Waste sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps)	disinfection (chemical treatment/autoclaving/microwaving and mutilation/shredding)
<b>Category No. 5</b>	Discarded Medicines and Cytotoxic drugs (wastes comprising of outdated, contaminated and discarded medicines)	incineration@/destruction and drugs disposal in secured landfills
<b>Category No. 6</b>	Soiled Waste (Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, bandages, other material contaminated with blood)	Incineration/ autoclaving/microwaving
<b>Category No. 7</b>	Solid Waste (wastes generated from disposable items other than the waste sharps such as tubing's, catheters, intravenous sets etc.).	disinfection by chemical treatment/autoclaving/ microwaving and mutilation/ shredding
<b>Category No. 8</b>	Liquid Waste (waste generated from laboratory and washing, cleaning, house keeping and disinfecting activities).	disinfection by chemical treatment and discharge into drains
<b>Category No. 9</b>	Incineration Ash (ash from incineration of any biomedical waste)	disposal in municipal landfill
<b>Category No. 10</b>	Chemical Waste (chemicals used in production of biologicals, chemicals used in disinfection, as insecticides, etc.)	Chemical discharge into drains for liquids and secured landfill for solids

[Source- The Bio Medical Waste (Management and Handling) Rules, 1998]

#### d) Sources of Medical Waste:

The sources of medical waste can be grouped as major and minor according to the quantities produced. The minor sources are scattered that produces similar kinds of waste as major sources but these waste does not contain radioactive wastes, no human body parts and among the sharps they consist mainly of hypodermic needles [4]



## II. GOALS & OBJECTIVES

The main goal of this paper was concerning the management of medical waste. Also analysing is how regulation is gathered, packaged, is temporarily stored, moved and disposed of the waste in Dhaka which will pay special attention to hazardous waste to prevent environmental pollution and contamination as health in Dhaka.

- creating consciousness among the people about the influence of waste (Dhaka, the most overpopulated city)
- encourage waste for energy improvement
- making sure of protected disposal of waste.
- to secure wellbeing, prosperity and condition.
- to limit the creation of waste.

## III. PRESENT SCENARIO OF BANGLADESH

Biomedical waste cannot just have positive wellbeing conditions to people, it can likewise immediate contamination of creatures if clinical waste isn't dealt with appropriately and they combine with this loss on landfills. In Bangladesh management of medical waste, has although entered the development arena, several efforts to be diverted to attain it.

Implementation Committee (NICC) that took place on 26.8.2007 by the active effort of MOHFW, where representation from different ministries and organizations took place and various related issues related to collection and proper management of MW up to final disposal were discussed and required steps were taken in meeting and many subsequent meetings were held for various development on the issues.[5]

PRISM Bangladesh (Project in Agriculture, Rural Industry, Science and Medicine), a rumoured national NGO in Bangladesh, with the money related help from Canadian International Development Agency (CIDA) has as of late built up a transfer office for ease medicinal waste treatment and administration in Dhaka City (Shareefdeen, 2012).

**Table-2 :** Division-wise No. of health care facilities and functional beds, according to Health Bulletin, 2010

Division	District and general HCFs		Medical/ Dental colleges/ Alternative medicine HCFs		UHC/THC HCFs		Union level HCFs*		Specialized HCFs		Infectious/ Chest/ Leprosy HCFs		HCFs Under DGFP**		Other HCFs	
	No. of HC Fs	No. of beds	No. of HCFs	No. of beds	No. of HCFs	No. of beds	No. of HCFs	No. of beds	No. of HCFs	No. of beds	No. of HCFs	No. of beds	No. of HCFs	No. of beds	No. of HCFs	No. of beds
Barisal	06	750	01	600	33	1175	09	140	-	-	1	20	72	1600		
Chittagong	11	1850	02	1510	85	2912	12	140			3	190				
Dhaka	17	2400	08	3945	103	3687	05	100	9	2264	2	130			3	180
Khulna	10	1350	01	500	50	1816	02	30			3	140			1	25
Rajshahi	14	1850	04	2550	111	3935	06	80	1	500	6	200			1	50
Sylhet	04	700	01	900	31	1056	02	30			4	176			1	50
<b>Total</b>	<b>62</b>	<b>8900</b>	<b>17</b>	<b>10005</b>	<b>413</b>	<b>14581</b>	<b>36</b>	<b>520</b>	<b>10</b>	<b>2764</b>	<b>19</b>	<b>856</b>			<b>72</b>	<b>1600</b>

Thus, the total functional beds in public HCFs = 39,531 and the total number of functional beds in private HCFs = 42,237 (as per Health bulletin, 2010), totalling to 81,768 nos. of functional beds in the whole country.

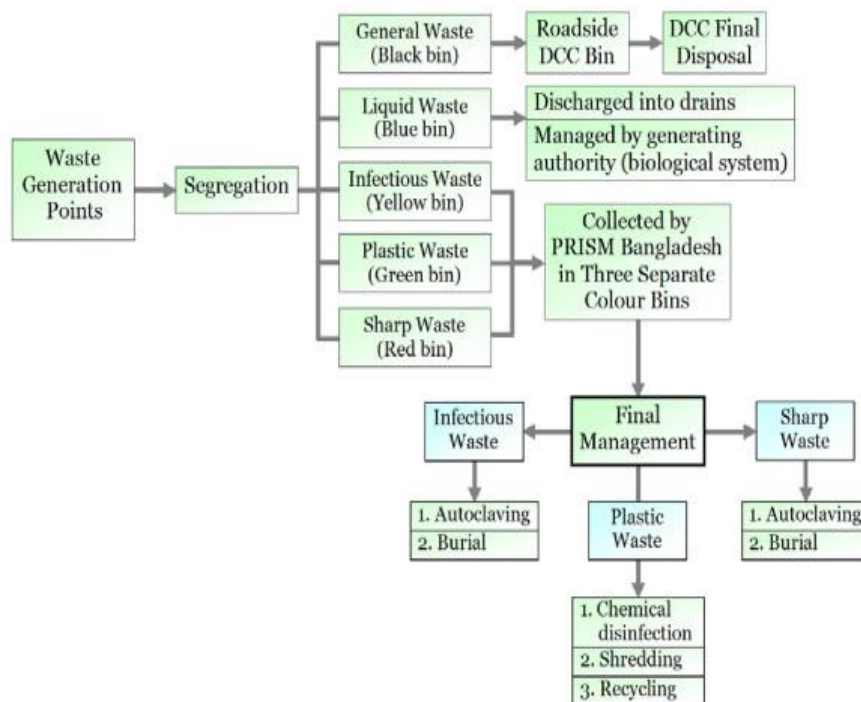
Source: Data on union level HCFs are taken from Health Bulletin, 2009; \*\* Beds of DGFP include 2 large MCWCs at Azimpur and Mohammadpur, Dhaka and 70 MCWCs spread around the country.

Medical waste generation in Bangladesh is 0.8-1.67 kg/bed/day or 1.16 kg/bed/day of which 0.17 kg/bed/day is hazardous. [6]

**Table-3 :** Quantity of different type of MW according to above survey

No of HCFs	No of inpatients	Total quantity of HC waste	General waste	Total hazardous	Infectious waste	Plastic waste	Liquid waste	Sharp items
60	2,927	5,562	4,305	1,257	790	211	189	67
Waste in per cent		100.0	77.4	22.60	14.2	3.8	3.4	1.2

At the time of the study (2005-2006) 2 big hospitals of Dhaka city, DMCH (public) and BMCH (private) would disclose their waste into the DCC bins without any segregation. A few private HCFs used to segregate their waste and send it to the International Centre for Diarrheal Disease and Research in Bangladesh (ICDDR, B) for incineration. (Development Program (HPNSDP))



**Fig-3:** Current management system in PRISM, Bangladesh

PRISM (Project in Agriculture, Rural Industry, Science and Medicine) are the three NGOs who are working in the field of hospital waste management in Bangladesh. PRISM Bangladesh along with DCC is properly collecting and treating the hospital waste up to final disposal. There are only 342 hospitals, clinics and diagnostic centres under PRISM Hospital waste management program (In conversation with PRISM). Tarannum Dana2011)

#### IV. MEDHEDOLOGY

The methodology is significant for any kind of research or task to hold the goal of the work and systematically bring the whole procedure in a nutshell. The Data collection and analysis of this journal was based on qualitative data.



**Fig-4:** Hospital management cycle (WHO)



Waste from the hospital can be stored temporarily at the central storage of the hospital from then it may be transferred in volume to the site of final disposal once or twice a day depending upon the quantum of waste.

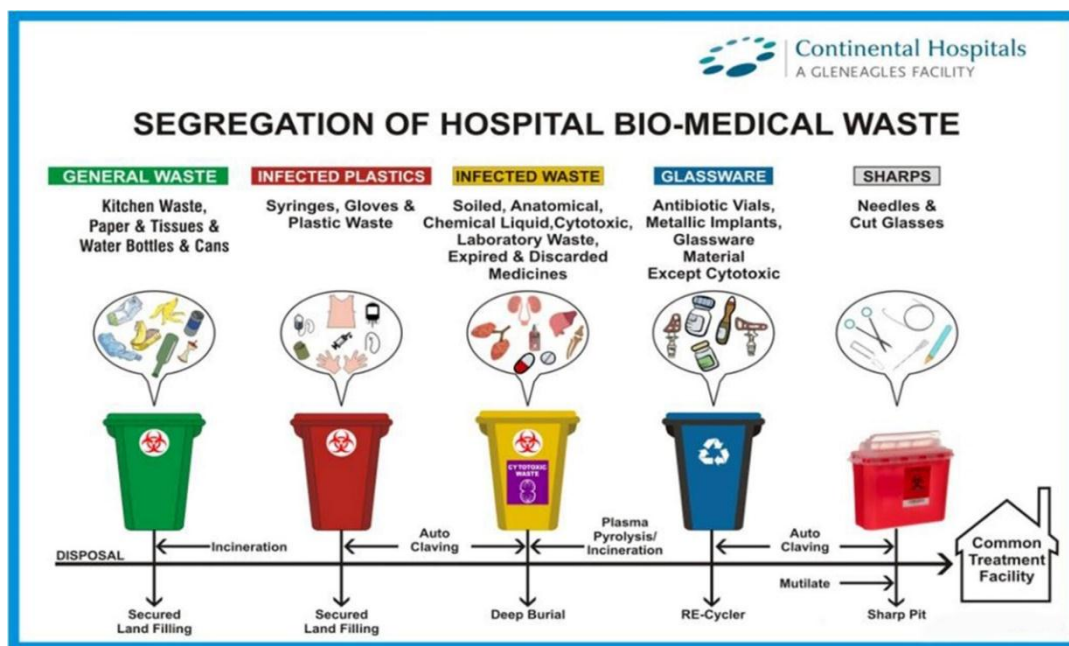


Fig-5: Segregation of hospital waste

Source: [juniordentist.com/management-and-handling-of-dental-hospital-waste-color-coding-for-waste-disposal.html](http://juniordentist.com/management-and-handling-of-dental-hospital-waste-color-coding-for-waste-disposal.html)

## V. RESULT

### a) Effects of Medical Waste

**Meningitis:** Meningitis is an inflammation of the meninges. The meaning is the three membranes that cover the brain and spinal cord. Meningitis can occur when fluid surrounding the meninges becomes infected. [7]

**Parasitic infections:** Medical waste can also lead to parasitic infections. Materials that are contaminated with parasites may come from research institutions or laboratories. [8]

**Blood poisoning:** Presence of bacteria in the blood which can produce severe infections or other health difficulties.

**Infections of the skin:** Skin diseases are generally brought about by microscopic organisms entering the skin through injuries or spreads. Skin diseases if people connect with the sullied material.

**Hepatitis:** Hepatitis can be transmitted through medical waste if reused syringes are not disinfected properly.

**Diseases from vaccines:** Vaccines are quite helpful to humans to prevent serious health conditions. However, if the used vaccine material is not disposed properly, it may pose serious health issues to the environment since the waste may still contain living pathogens which may spread into the environmental system and contaminate animals as well as humans. [8]

**Methicillin-resistant Staphylococcus aureus (MRSA):** MRSA can cause serious health issues since the bacteria is resistant against many antibiotics. People with a weak immune system may suffer from severe health conditions or may even die since MRSA can often not be treated efficiently. An infection with MRSA can happen if medical waste methods are not applied properly. [8]

**Sexual infections:** Herpes and other sexual infections can be transmitted if medical waste is not disposed properly.

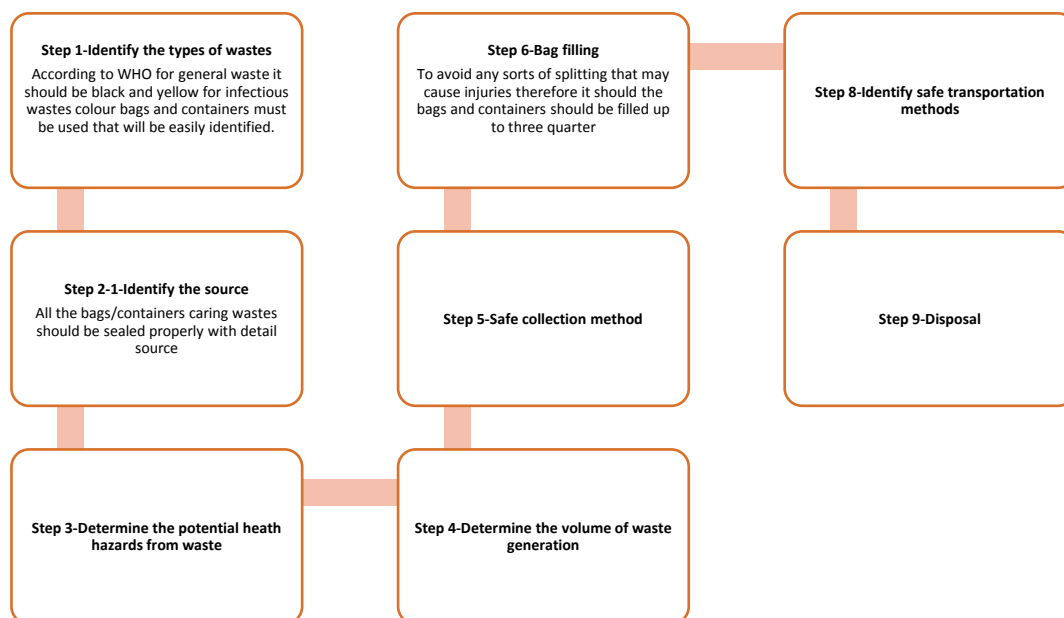
**HIV:** HIV can also be caused by the use of contaminated syringes or other materials that get in touch with a patient’s blood. Although HIV can be currently treated much better than in former times, it still is a quite serious and life-threatening disease. (8)A person who experiences one needle stick injury from a needle used on an infected source patient has risks of 30%, 1.8%, and 0.3% respectively of becoming infected with HBV, HCV and HIV.[WHO]

**Environmental impact:**

Medical waste can not only have dangerous health conditions to people, but it can also lead to an infection of animals if medical waste is not treated properly and they get in touch with this waste on landfills

- Biomedical waste leads to the pollution of drinking, surface, and groundwaters if those landfills are not properly formed.
- Al Raisi et al. (2014) assessed and found that heavy metals in leachate were exceeding the drinking water standards. The concentrations of Al, V, Cr, Mn, Co, Ni, Ba, Pb, and Fe  
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2.050, 0.9775, 2.800, 0.503,0.128, 0.773, 0.8575, 0.130, and 39.25mg/L, respectively. The effect of these contaminants was considered as a surface and ground water contamination.
- Burning of biomedical waste may pollute the environment and dangerous to human health.

**VI. OWN INTERPRETATION**



**VII. DISCUSSION**

Biomedical wastes, generated from both hospitals and other health care facilities, poses a great danger to human health and the environment surrounding them. This threat to the environment can be minimized by promoting a sustainable approach. The key steps in this approach include:

1. Usage of reusable products instead of single-use products. For example, some of the containers and instruments can be disinfected and reused.



2. Small medical waste containers in patient rooms so that patients cannot use them as regular trash bins.
3. Limit the access of the waste containers only to the trained professionals.
4. Place instruction signs throughout the HCF to remind which type of waste should go into which container.
5. Implementation of waste audits to check if the rules are being followed.

This study faced some challenges due to the lack of documented information.

This study was based on data and information found on the internet. We faced some challenges due to that reason. These challenges can be overcome in the future by developing a legitimate database. Probable solutions are-

1. Every hospital and HCF should keep records of wastes generated every month.
2. These records should be categorized according to the various types of wastes.
3. These records should be uploaded to a central database under the supervision of a central governing body.
4. To maintain transparency, these records can be made public.

If these steps are taken with care and responsibility, further studies in this field will be much more intricate and fruitful.

Developing a new set of rules for BMWM is not enough. It has to be made sure, these rules are followed by the hospitals and HCFs. To ensure that, these steps might be helpful-

- Onsite inspection to a facility on a random basis. It would ensure the thoroughness of the waste management system.
- Hospitals and HCFs might be inspired by the governing body if they follow the protocol correctly. They can be granted free good publicity for their sense of responsibility to the environment and society.
- On the other hand, if some organizations do not follow the set of rules for a proper waste management system, they should be severely penalized.

## VIII. CONCLUSION

Through this study, we have analysed the present situation of biomedical waste management in Dhaka, Bangladesh. We also recommended the importance of developing and implementing a Biomedical Waste Management (BMWM) guideline which highlights the importance of sustainability. This strategy should also increase the awareness and professionalism of the personnel related to health care services. Additionally, we have recommended the usage of reusable products and waste conduction audits. The cooperation and coordination of various healthcare facilities and governing institutions are of paramount importance for a better and long-term solution. The government can organize year-long training programs for the hospitals, on a ward basis. Existing regulations should be updated and new ones should be added if necessary.

## IX. REFERENCES

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