"CASE STUDY ON BIO-MEDICAL WASTE MANAGEMENT OF BIDAR GOVT. HOSPITAL BEFORE AND AFTER COVID-19"

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ABSTRACT

Advances in medical facilities with the introduction of sophisticated instruments have increased the waste generation per patient in health care units. It is the waste that is generated during the diagnosis, treatment or immunization of human beings or animals or in the production or testing of biological components. According to the Government of India as contemplated under section 6,8 and 25 of the Environment (Protection)Act,1986,has made the Biomedical Waste (Management & Handling) Rules,1998 applicable to every institution generating biomedical waste which includes hospitals, nursing homes, clinic, dispensary, veterinary institutions, animal houses, pathological lab, blood bank ,the rules are applicable to even handlers. The process of handling biomedical waste includes segregation, transportation with suitable treatment method as incineration, deep burial, autoclaving, microwave treatment. The preference of which pertains to the category and characteristics of Bio medical waste. Although Bio medical waste includes a percent of hazardous waste, there exists an equal competent method of treatment. During the study, it was observed that: (i) the process of segregation, collection, transport, storage and final disposal of infectious waste was done in compliance with the Standard Procedures, (ii) the final disposal was by incineration in accordance to EPA Rules 1998, This hospital also extends its facility to the neighboring clinics and hospitals by collecting their produced waste for various treatment.

1. Introduction

Everything is made for a defined purpose "anything which is not intended for further use is termed as waste". In the scientific and industrial era combined with increasing population and their demand, the turnover of products has gone very solid waste. With increasing need of Health Care in fast changing society the role of hospitals/nursing homes comes to the forefront. "Hospital is a residential establishment which provides short term and long term medical care consisting of observational, diagnostic, therapeutic and rehabilitative services for a person suffering

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or suspected to be suffering from disease or injury and for parturient. It may or may not also provide services for ambulatory patients on an outpatient basis". In Delhi there are about 72 hospitals under Govt. Sector, 550 registered nursing homes and 936 dispensaries. In addition to this there are about 1560 unregistered establishments with different names like Nursing Homes, Medical Centers, Dental Hospitals, etc. About 40000 hospital beds are available in the public and private sector in Delhi. With increasing number of hospitals and nursing homes in Delhi, this number may go up even higher. Tough the percentage of bio waste production in India is less (0.5 to 1 kg of waste/person/day) compare to western countries (1 to 105 kg of waste per bed per day). However, Karnataka State is also taking lead in the bio medical waste production, estimated to be 1.0 kg/day in diagnostic laboratory, 0.25 kg/day in veterinary clinics, 1.5 kg/day in blood bank, and 0.2 kg/day in small clinics. Segregation of biomedical waste at the source of generation is the first and essential step in biomedical waste management & it continues to be the key message and central theme of the BMW, 2016. The present study tries to find out the real state of quantification of waste generation, segregation, awareness, and management of bio-medical waste in government hospitals of Bidar district Karnataka, India.

During the pandemic period, the demand for medical equipment, more specifica l y personal protective equipment's (PPEs), drastically increased.

This increase could be an inevitable consequence of disease spread, calling for special consideration to this equipment's network in their lifecycle (Rowan and Laffey, 2020). According to various directives and measures to protect public health, a significant increase in the volume of waste resulting from the enhanced use of PPEs has been docu- mented, including; face masks, hand gloves, rubber shoes, gowns, hand sanitizers and other medically used gears for instance - test sets/ kits, syringes, plastic vessels, tissue papers, bandages, etc. (Czigány and Ronkay, 2020; UNICEF, 2020). Most of the COVID-19 related waste comes under medical waste (referred to as "waste" in the following discussion), which is defined as a solid waste generated from diag- nosis, treatment and vaccination of human beings and animals, which covers research activities, testing and production of biological products (Nzediegwu and Chang, 2020; Windfeld and Brooks, 2015).

Waste generated during the COVID-19 pandemic is specifica l y ca led COVID-19 medical waste (CMW). A huge volume of waste has been produced and is still growing due to the prevailing pandemic situ- ation with unique characteristics, such as lower density than regular medical waste, requiring special attention to be treated before disposal (Purnomo et al., 2021; Chen et al., 2021). The CMW includes PPEs, such as face shields, face masks, gloves, goggles, coverall suits, in addition to other related waste such as disinfectant containers and hand sanitizer (Vanapalli et al., 2021). There is an obligation to use standard PPEs by the health workers (nurses, doctors, and caregivers), patients and healthy people who have close contact with the infected patients. Pres- ently, all the citizens in most countries worldwide are obliged to wear face masks during all outdoor activities (Siddique et al., 2021; Dzekashu et al., 2017). As an inevitable outcome, many disposable PPEs are made available and used, leading to a massive increase in po- tentially infectious waste, posing further health and environmental threats. It was found that on surfaces of the material, including plastic, steel and glass, the COVID-19 virus can last for several days (Wang et al., 2020; Hantoko et al., 2021). The risks of these threats are increas- ing in developing countries with an inadequate medical waste manage- ment system, which is a threat to humanity (Kampf et al., 2020).

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Since its inception, the waste is increasing every day by introducing new ac- tivities like vaccination, and it needs to be handled properly. Before it is dealt with or processed, quantification is of utmost required for effi- cient and effective planning. Various statistical models, such as STIRPAT (environmental pressure model) and Autoregressive Inte- grated Moving Average (ARIMA) model (time seriesmodel) have been applied to estimate trend in medical waste which seems to be promising (Wei et al.,

1.1 Colour Coding And Type Of Container

Colour Coding	Type of Container	Waste Category	Treatment options
Yellow	Plastic bag	Cat.1,Cat.2, Cat.3and Cat.6	Incineration/ deep burial
Red	Disinfected container/plastic bag	Cat.3, Cat.6, and Cat.7	Autoclaving/Micro waving/ Chemical treatment
Blue/ White Translucent	Plastic bag/puncture proof container	Cat.4 andCat.7	Autoclaving/Micro waving/Chemical treatment and destruction/shredding
Black	Plastic bag	Cat.5, Cat.9, andCat.10 (solid)	Disposal in secured landfill

Fig 1.1: Coloured Dust Bins For Bmw Disposal

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1.2: Historical Background

Hospital Waste or Health care waste should include any type of material generated in Health Care Establishments including aqueous and other liquid waste. Hospital waste means "Any solid, fluid or liquid waste material including its container and any other intermediate product which is generated during short term and long term care consisting observational, diagnostic, therapeutic and rehabilitative services for a person suffering or suspected to be suffering from disease or injury and for parturient or during research pertaining to production and testing of biological during immunization of human beings. Hospital waste includes garbage, refuse, rubbish and Bio Medical Waste".

1.3: Present Scenario

Waste management is one of the important public health measures. If we go into the historical background, before discovery of bacteria as cause of disease, the principle focus of preventive medicine and public health has been on sanitation. The provision of potable water, disposal of odor

from sewage and refuse were considered the important Coming back to modern age, on the eve of 21st century with increased use of disposable material and the presence of dreaded disease like Hepatitis – B and AIDS, it is out most important to take care of the infected and hazardous waste to save the mankind from disaster. The Health care institutions or hospitals which are responsible for care of morbid population are emitting voluminous quantity of rubbish, garbage and Bio Medical Waste matter each day from wards, operation theatre and outpatient areas. Proper management of hospital waste is essential to maintain hygienic, aesthetics, cleanliness and control of environmental pollution. The recycling of disposable syringes, needles, IV sets and other article like glass bottles without proper sterilization may be responsible for Hepatitis, HIV, and other viral diseases. It becomes primary responsibility of Health administrators to manage hospital waste in most safe and eco-friendly manner.

1.4 : BIOMEDICAL WASTE RULES

The Government of India as contemplated under Section 6, 8 and 25 of the Environment (Protection) Act, 1986, has made the Biomedical Wastes (Management & Handling) Rules, 1998.

The rules are applicable to every institution generating biomedical waste which includes hospitals, nursing homes, clinic, dispensary, veterinary institutions, animal houses, pathological lab, blood bank; the rules are applicable to even handlers.

The Segregation, Packaging, Transportation and Storage shall be done as under:-

1. Bio-medical waste shall not be mixed with other wastes.

Bio-medical waste shall be segregated into containers/bags at the points of generation in accordance with Schedule II prior to its storage transportation, treatment and disposal. The containers shall be labeled according to Schedule III. Every

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The Segregation, Packaging, Transportation and Storage shall be done as under:-

2. Bio-medical waste shall not be mixed with other wastes.

3. Bio-medical waste shall be segregated into containers/bags at the points of generation in accordance with Schedule II prior to its storage transportation, treatment and disposal. The containers shall be labeled according to Schedule III. Every occupier of an institution generating, collecting,receiving, storing, transporting, treating and /or handling Biomedical Waste shall apply on Form 1 for Authorization to the Board.

1.5: SOURCES OF BIOMEDICAL WASTE

- Government/private hospitals
- Nursing homes
- Physician/dentist office or clinic
- Dispensaries
- Primary health care centers
- Medical research and training centers
- Animal./slaughter houses
- Labs/research organizations
- Vaccinating centers

1.6 : CATEGORIES OF WASTE

The biomedical wastes are categorized into ten according to its characteristics taking into account treatment and disposal. The different categories of waste as per the rule are given in

Table 1: Categories of Biomedical Waste

Waste Category	Type of waste	Treatment And Disposal Option
CategoryNo.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 and colleges, discharge from hospitals, animal houses)	Incineration/ deepburial
CategoryNo.3	Microbiology & Biotechnology Waste(Wastes from laboratory cultures, stocks or specimen of live micro organisms or attenuated vaccines, human and animal cell cultures used in research and infectious agents from research hand industrial laboratories, wastes from production of biological ,toxins and devices used for transfer of	Local autoclaving/ microwaving /incineration
CategoryNo.4	Waste Sharps (Needles, syringes, scalpels, blades, glass,	Disinfecting (chemical treatment / autoclaving / microwaving and mutilation/ shredding
CategoryNo.5	Discarded Medicine and Cytotoxic drugs(Wastes comprising of outdated, contaminated and discarded medicines)	Incineration/ destruction and drugs disposal in secured landfills

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1.7: SEGGREGATION OF BIO MEDICALWASTE

Creating a system for segregation of waste is the first step. Segregation at source of different types of biomedical wastes and their appropriate storage and/or disinfections sterilization, etc. Would ensure that infectious wastes do not get mixed with non-infectious wastes as this would infect the entire waste. Only a small fraction of waste generated by health care institutions is actually infectious or hazardous. It is estimated that 80-85 percent is non-infectious, 10 percent is infectious and 5 percent is hazardous. Segregation of waste into infected or contaminated waste and non-infected waste is mandatory and is a prerequisite for safe and hygienic waste management.

The Schedule1 of the Rules has laid down certain directions regarding segregation and storage to ensure safe and hygienic handling of infectious and non-infectious waste. The segregation of biomedical waste into various categories and storage in four different colored containers are taking into account the treatment and disposal facilities available(seeTable2).The Biomedical waste shall be segregated into containers/bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal. The containers shall be labeled according to Schedule III of the rule. Apart from the biomedical waste the general waste or the garbage generated in health care establishments such as office waste, food waste and garden waste is advisable to be stored in green colored containers. The local bodies are duty bound to collect such general waste stored in green colored containers.

The Rules recommend different color codes for waste containers in which different types of wastes needs to be stored. Clinical and general wastes should be segregated at source and placed in color coded plastic bags and containers of definite specifications prior to collection and disposal. The container should comprise of an inner plastic bag of varied color depending on the type of waste. It should be of a minimum gauge of 55 micron (if of low-density) or 25micron (if of high density), leak proof and puncture proof, and should match the chosen outer container.

The outer containers a plastic bin with handles and of a size which will depend on the amount of waste generated. The inner polythene bag should fit into the container with one-fourth of the polythene bag turned over the rim. Labeling has been recommended to indicate the type of waste, site of generation, name of generating hospital or facility.

This will allow the waste to be traced from the point of generation to the disposal area. The containers are then to be transported in closed trolleys or wheeled containers that should be designed for easy cleaning and draining. If for any reasons, it becomes necessary to store the waste beyond such period, permission from the prescribed authority (established by the government of every State and Union Territory) must be taken, and It must be ensure that it does

Fig 1.2: segregation

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not adversely affect human health and the

Once collection occurs, then biomedical waste is stored in a proper place. No untreated biomedical waste shall be stored beyond a period of 48hours. Segregated wastes of different categories need to be collected in identifiable containers. The duration of storage should not exceed for 8-10 hours in big hospitals and 24 hours in other health care institutions. Each containers may be clearly able to show the ward or room where it is kept .There as on for this labeling is that it may be necessary to trace the waste back to its source. Besides this, storage area should be marked with a caution sign.

2.1: Gayatri V. Patil and Kamala Pokhrel

To quantitatively estimate the amount of non-infectious and infectious waste generated in different wards/sections. The personnel working under to occupier (who has control over institution to take all steps to ensure biomedical waste is handled without any adverse effect to human health and environment) were trained to take adequate precautionary measures in handling these bio-hazardous waste materials.

2.2: N K Das, Sushant Prasad

Proper disposal of Hospital waste is of paramount importance because of its infectious andhazardous characteristics.

2.3: Biomedical Waste Management in a charitable Hospital

The study of non- infectious and infectious waste generated in different months was performed.

2.4: Zekieni R. Yelebe, Revelation J. Samuel

To characterize and quantify the waste, the study was carried out to ascertain the generation of biomedical waste from ten hospitals in Bayelsa state. The result reveled that all hospitals involved disposed their generated waste into municipal waste dumpsites without any form of treatment leading to unhealthy and hazardous environment around healthinstitutes

2.5: Shalini Sharma: Awareness about Bio-Medical Waste Management among Health Care Personnel of Some Important Medical Centers in Agra. Central Pollution Control Board laid down these guidelines to meet regulatory needs thrown up by new situations involving establishment of Common Treatment Facilities and Incinerators. For Common Bio-Medical Waste Treatment Facility (CBWTF) the guidelines have been provided regarding: Location, Land Requirement, Coverage Area, Treatment Equipment, Infrastructure, Record Keeping,

Collection and Transportation, Disposal of Treated BMW, Cost to be charged from the HCUs, Setting Up and Operation Checklist. For Incinerator guidelines have been provided regarding: General Applicability & Installation, Design, Air Pollution Control Device, Incinerator& Waste Storage Rooms, and Operator of Incinerator.

Category 1 & 2 shall be incinerated. All other waste shall be imparted non-incineration treatment. Incinerator shall be allowed only at Common Bio- Medical Waste Treatment Facility.

2.6: Ruta M. Sharma1, Murali Jadesh

"A Study on Bio-Medical Waste Generation and Management in Two Hospitals of Bidar City, Karnataka, India". This present study is focused on effectiveness of segregation practiced and awareness of bio-medical waste management which includes collection, storage, transportation and disposal of waste generated in various hospitals in and around of Bidar Dist.

2.7: Khadhija Al-omran

"Estimation of Covid-19 Generated Medical West in the Kindam of Bahrain" Bahrain is a member of

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GCC states with a total population of 1,701,575 and a total area of 760 km^2. . The Kingdom was selected for this study based on its highest population density among GCC member states. The control and handling of COVID-19 in Bahrain are much difficult and sensitive. The Kingdom pro- vides the best health facility to all citizens; several health centers were designated to treat COVID-19 related patients during the pandemic. As stated above, the data were collected from the website and were vali- dated for Bahrain.

3.1 Once the pit filled up to 3/4th capacity, it can be encapsulation with binding material like cement. Once encapsulated mass is dry, sharp pit is BIOMEDICAL WASTE TREATMENT SYSTEM

The Biomedical waste treatment and disposal are to be done very carefully, as it is infectious in nature. Considering the then level of information and knowledge, the Government of India has specifically laid down the treatment and disposal options. All health care institutions are required to follow this without fail. As per the Rule ,the biomedical waste has to be treated and disposed of in accordance with options suggested under Schedule I, and incompliance with the standards prescribed in Schedule V of the Rule. Any biomedical waste treatment system should comprise of segregation at source, storage in color- coded containers, systematic collection, transportation to treatment site, treatment considering the type of waste and disposal considering the type of waste. Segregation of biomedical waste is based on the category of waste. Storage and collection of waste in colour-coded containers is based on the treatment adopted.

The treatment options for biomedical waste as per the schedule I of the Rules are incineration, deep burial, autoclave, microwave, chemical treatment, destruction and shredding, and disposal in secured landfills. Disinfection refers to procedures, which reduce the number of microorganisms on an object or surface but not the completed instruction of all microorganisms or spores. Sterilization on the other hand, refers to procedures, which would remove all microorganisms, including spores, from an object. Sterilization is undertaken either by dry heat(for 2 hours at 170^0C in an electric oven-method of choice for glass ware and sharps)or by various forms of moist heat(i.e. Boiling in water for an effective contact time of 20 minutes or steam sterilization in an autoclave at 15lb/sq. in chat 121^0C for 20 minute).

BIOMEDICAL WASTE TREATMENT PLANT SITE LOCATION (GIS MAP)

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3.2: BMW TREATMENT FACILITIES

3.2.1: INCINERATION

Incineration uses high temperature combustion under controlled conditions to convert wastes containing infectious and pathological material to inert mineral residues and gases. The process of incineration results in a significant reduction in the weight and the volume of the waste combusted. Historically, incineration has been used for all forms of solid waste including municipal and hazardous wastes in addition to medical waste. Incineration technologies have evolved through the years as both a means of waste treatment and as a way to recover the energy value of solid wastes prior to its disposal.

During normal operations, the heating value of the waste placed into the incineration units should be sufficient to maintain combustion without the assistance of supplemental fuels. As a result, the heating value of any waste to be combusted is an extremely important element since the need for supplemental fuel has a significant effect on the overall costs of incineration.

Examples: Rotary kiln Incineration, Controlled air Incineration

Advantages

- Can accept the greatest variety of waste.
- Treated waste is unrecognizable and exists as ash.
- Significant volume reduction (80 to 90%).
- Waste totally sterilized.
- Energy recovery potential in larger systems.

Disadvantages

- Incinerators convert biological problem into potential air quality emission problems.
- Acid gases and heavy metals in air emissions.
- Heavy metals found in ash residues.
- Identified as a major source of dioxin and furan emissions.

3.2.2 AUTOCLAVING

It is a low-heat thermal process where steam is brought into direct contact with waste in a controlled manner and for sufficient duration to disinfect the wastes. For ease and safety in operation, the system should be horizontal type and exclusively designed for the treatment of bio-medical waste**.**

Advantages

- Tested and proven technology with extensive use.
- On-site or regional treatment of various sizes.
- Low capital operating cost.
- No hazardous emissions since combustion is not involved.
- Complies with current rules in most industrialized countries.
- Quality control procedures are well established through extensive use.
- Less manpower required.
- No pre- or post-treatment required

Disadvantages:

- Shredding may be required to make treated waste unrecognizable.
- Only 30 to 35% volume reduction.
- If autoclave does not have proper drying mechanism, foul odors can be emitted.
- Requires plastic liners or bags.
- Cannot treat all types of medical waste.

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- Disposal areas may have a concern about disinfection quality control

3.2.3: MICROWAVE TREATMENT

In microwaving, microbial inactivation occurs as a result of the thermal effect of electromagnetic radiation spectrum lying between the frequencies 300 and 300,000 MHz Microwave heating is an inter-molecular heating process. The heating occurs inside the waste material in the presence of steam.

Specification of microwave is as follow;

1. Microwave treatment shall not be used for cytotoxic (kind of drugs waste), hazardous or radioactive wastes, contaminated animal carcasses, body parts and large metal items.
2. The microwave should completely and consistently kill bacteria and other pathogenic organism that is ensured by the approved biological indicator at the maximum design capacity of each microwave unit.

- **Advantages**

- Hi-tech state-of-art technology.
- Shredding makes biomedical waste unrecognizable.
- On site treatment of varying capacities.
- No hazardous emission since combustion is not involved.
- Complies with current rules in most industrialized countries.
- Proven technology with world-wide installations including larger regionally-based systems.

• Disadvantages

- High capital cost.
- Pre-shredding and wetting of waste required.
- All waste cannot be processed.
- Highly skilled manpower required.
- High operating and maintenance cost

3.2.4: CHEMICAL TREATMENT

Chemical disinfection is commonly used to kill microorganisms on medical equipment and on floors and walls in health care facilities. In addition, technologies have been developed that utilize chemical disinfection as a means of treating medical waste. The intent of these systems is to simply provide a means by which a chemical disinfectant is placed in contact with the infectious waste to kill or inactivate contained pathogens. Chemical treatment involves the direct use of chemicals for disinfection. Common disinfectant chemicals include chlorine compounds, phenol compounds, iodine, alcohol, hexachlorophene, formaldehyde/alcohol combinations. Most chemicals are used as aqueous solutions.

It uses chemicals to destroy pathogenic organisms from any inanimate object.

- Sharps contaminated with blood and body fluids.
- Instruments, equipment that are used to cut, pierce or enter the natural orifices like needles, syringes and endoscopes.
- Contaminated floors, surfaces, clothes, beds, beddings, enamel, crockery and bed pans
- Wet mopping of intensive care units, operation theatres, wardsand patient waiting areas.1%hypochloritesolutioncanbeusedfor chemical disinfection.

• **Advantage:**

- Economical with low capital investment.

• **Disadvantages:**

- Only for surface contaminated or penetrable waste.
- Not suited for pathological waste.
- Shredding required for most medical waste.

Environmental risk to air and water associated with the chemical use

FINAL DISPOSAL IN SECURED LANDFILLS

4.1 LANDFILL

It is a site for the disposal of waste materials by burial and is the oldest form of waste treatment. Historically, landfills have been the most common methods of organized disposal and remain so in many places around the world. Some landfills are also used for waste management purposes, such as the temporary storage, consolidation and transfer, or processing of waste material (sorting, treatment, or recycling).

- It is another method of final disposal of BMW.
- If a municipality or medical authority genuinely lacks the means to treat the waste before disposal, sanitary landfill observing certain standards can be as an acceptable choice especially in developing countries.
- A pit or trench should be dug about 2 meters deep.
- It should be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.
- It must be ensured that animals do not have any access to burial site.
- On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes.

4.2: DEEP BURIAL

- Yellow (a), (b) and (c) wastes namely human anatomical, animal anatomical and soiled waste are permitted for deep burial only in rural or remote areas where there is no access to common bio-medical waste treatment facility after obtaining authorization from SPCB/PCCs.
- A pit or trench should be dug about two meters deep. It should be half filled with waste, and then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.
- It must be ensured that animals do not have any access to burial sites. Covers of galvanized iron or wire meshes may be used.
- On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes.
- Burial must be performed under close and dedicated supervision.
- The deep burial site should be relatively impermeable and no shallow well should be close to the site. The pits should be distant from habitation, and located so as to ensure that no contamination occurs to surface water or ground water. The area should not be prone to flooding or erosion.
- The location of the deep burial site shall be authorized by the prescribed authority i.e CPCB/ SPCB or District Pollution Control Board Office.
- The institution shall maintain a record of all pits used for deep burial.
- The ground water table level should be a minimum of six meters below the lower level of deep burial pit.

4.2 Suggested method for design of concrete pit for waste sharps.

If required, a sharp pit must be constructed within the hospital premise to dispose of the sharp waste generated from the facility. Prior to disposal in concrete pit, sharps waste should be disinfected and treated in

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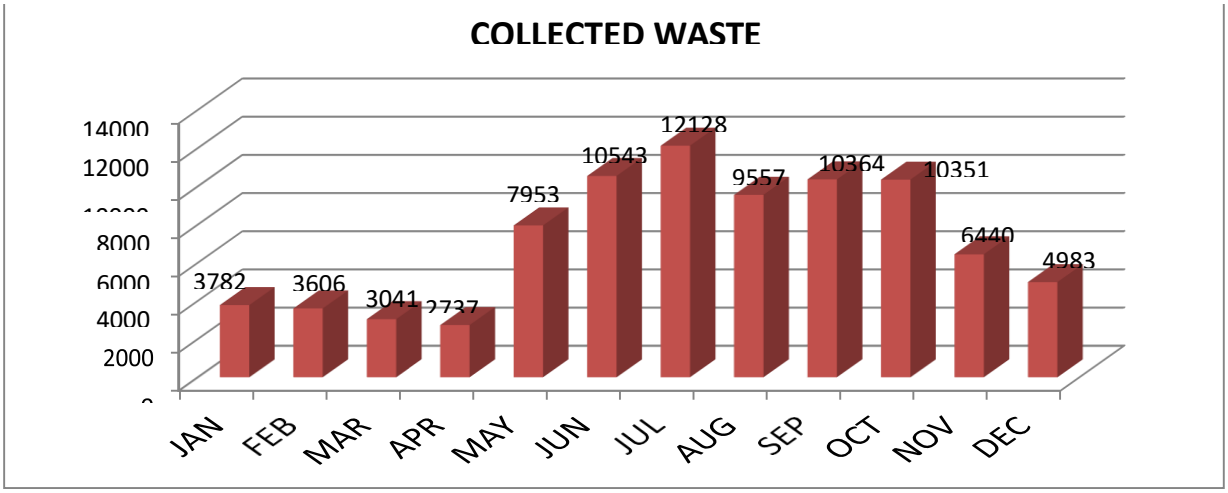
following methods;

- Autoclaving along with sharp containers followed by shredding or mutilation; or
- Combination of shredding cum autoclaving along with sharp containers
- Sharp pit must be a 1m ×1m×1m concrete lined circular or rectangular pit as shown in figure.
- Pit can be dug and lined with brick, masonry or concrete rings.
- The pit should be covered with a heavy concrete slab, in which a galvanized steel pipe of about 1.0m height and suitable diameter is fixed to feed the shredded or mutilated sharps waste.
- The top opening of the steel pipe shall have a provision of locking after the treated waste sharps has been disposed in.
- sealed and another sharp pit is created for further use.
- For high water table regions where water table is less than 6m beneath bottom of the pit, a tank with above mentioned arrangements shall be made above the ground.

PERCENTAGE OF WASTE GENERATED BEFOR COVID-19 (2019)

SL NO	MONTHE	COLLECTED WASTE	LOCATION
1	January	3782 kg	BIDAR
2	February	3606 kg	
3	March	3041 kg	
4	April	2737 kg	
5	May	7953 kg	
6	June	10543 kg	
7	July	12128 kg	
8	August	9557 kg	
9	September	10364 kg	
10	October	10351 kg	
11	November	6440 kg	
12	December	4983 kg	



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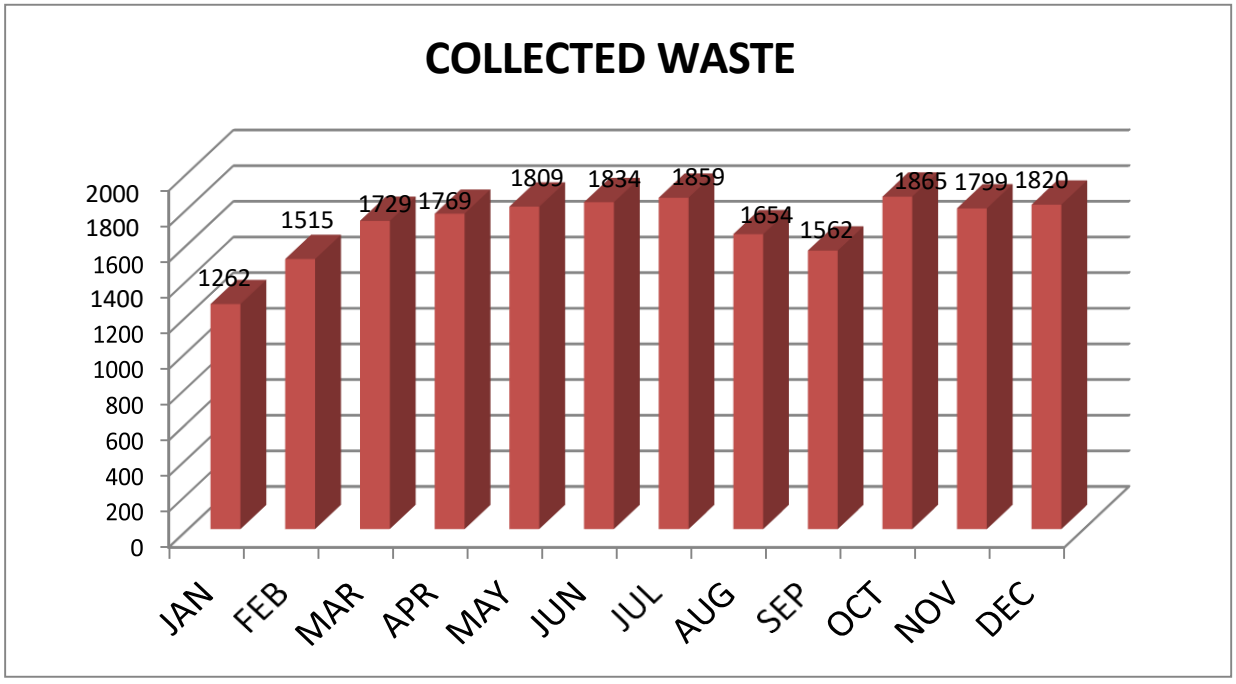
PERCENTAGE OF WASTE GENERATED BEFOR COVID-19 (2019)

SL NO	MONTHE	COLLECTED WASTE	LOCATION
1	January	1262 kg	BIDAR
2	February	1515 kg	
3	March	1729 kg	
4	April	1769 kg	
5	May	1809 kg	
6	June	1834 kg	
7	July	1859 kg	
8	August	1654 kg	
9	September	1562 kg	
10	October	1865 kg	
11	November	1799 kg	
12	December	1820 kg	



CONCLUSION

1. The absence of waste management, lack of awareness about the health hazards, insufficient financial and human resources and poor control of waste disposal are the most common problems connected with health-care wastes.
2. We need innovative and radical measures to clean up the distressing picture of lack of civic concern on the part of hospitals and slackness in government implementation of bare minimum of rules, as waste generation

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particularly biomedical waste imposes increasing direct and indirect costs on society.

3. The challenge before us, therefore, is to scientifically manage growing quantities of biomedical waste that go beyond past practices. If we want to protect our environment and health of community we must sensitize ourselves to this important issue not only in the interest of health managers but also in the interest of community.
4. In order to achieve aesthetic appeal for the entire process of waste management, the collection of the non-infectious and infectious waste should start at the patient/visitor area so that a less full trolley moves along these areas. It was advised that the infectious wastes should be collected separately from the Laboratory and Operation Theater and should go directly to the incinerator and should not be transported through the patient area.
5. Rather replacing the polyethylene bags in the respective bins (with periodic disinfections of the bins), the bins should be collected each time and replaced with clean bins with the polyethylene bags already in them. The collected bins should be carried in separate trolleys to minimize the possibility of spillage.
6. Periodic meetings should be conducted involving administrative and maintenance staff who are directly or indirectly involved with waste management in order to share and discuss the technical or practical difficulties and provide suggestions that may be specific to a particular hospital and region.
7. A compulsory inducting training program should be conducted for all new staff in the hospital to familiarize them with the operating procedures practiced in the hospital.

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