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Original Article**DOI:****STUDY OF BIOMEDICAL WASTE MANAGEMENT IN DIFFERENT TYPES OF MEDICAL FACILITIES****Authors:**

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ABSTRACT

OBJECTIVE- To study disposal of different types of biomedical waste and to study the status of BMW management in different level of hospitals

METHOD-Medical facilities were divided into 4 groups. 10 facilities from each group were selected by simple random sampling. Facilities were visited by surveying groups and specific data about collection and disposal of waste were collected by asking management personnels of hospitals, doctors and staff.

RESULT- 90% of single speciality hospitals and 80% of multispeciality hospitals are following proper storage and segregations of BMW.90% of super speciality hospitals have transportation facilities.60% of super speciality hospitals , 30% of multispeciality and 20% of single speciality hospitals have incinerators. All super speciality hospitals have autoclave machines, while 70% of single and 50% of multispeciality hospitals have that. While only 2 out of 10 clinics have an autoclave machine.60% of both clinics and Superspeciality hospitals are using land disposal as a method of BMW management. 80% of small clinics and 70% of multispeciality hospitals are having dry and wet thermal management.

CONCLUSION- Superspeciality hospitals and Single specialty hospitals are using costly methods like incineration and autoclave also following guidelines for storage , segregation and transportation of BMW properly while amongst all most small clinics can't afford costly methods so uses cheaper techniques like chemical treatment and dry and wet thermal methods.

KEY WORDS: Sterilization, Storage and segregation, Disposal

INTRODUCTION

Hospitals have been recognised for treating sick people since the beginning, yet we are oblivious of the negative impacts of the rubbish and filth they generate on the mankind and the atmosphere. It is now well acknowledged that hospital waste puts the health of medical staff, the general public, and the nearby flora and animals at danger. After the Ministry of

Environment and Forests passed the legislation in 1986, the Bio Medical Waste (Management and Handling) Rules were notified by the Ministry in July 1998. It is the responsibility of every person to follow these guidelines. i.e., a person who has responsibility over an institution and is responsible for ensuring that waste created is managed safely and without harming human health or the environment. Private firms have begun proper biological waste disposal as a result of competitive spirit, but there is still a large gap to be filled. Many research on the expertise of personnel in facilities such as hospitals, nursing homes, and home health care were conducted in Gujarat, India to discover about the awareness of doctors and paramedical staff regarding the biological waste issue⁽¹⁾. Despite the norms and regulations, it was discovered that many institutions were sorting waste incorrectly. Both hospital employees and the general public are exposed to hazardous material generated by the facility. Infectious and noninfectious wastes can be broadly classified.

LITERATURE REVIEW

The latest guidelines for segregation of bio-medical waste recommend the following color coding⁽²⁾-

COLOR OF BAG	WASTE MATERIAL
Red Bag	Syringes (without needles), Soiled gloves, Catheters, IV tubes
Yellow Bag	All dressing materials, Body fluids, Blood bags, Human anatomical waste, Body parts
Cardboard box with blue marking	Glass vials, ampules, other glassware
White translucent Puncture Proof Container (PPC)	Needles, sharps, blades
Black Bags	Non-bio-medical waste which includes stationary, vegetable and fruit peels, leftovers, packaging including that from medicines, disposable caps, disposable masks, disposable shoe-covers, disposable tea cups, cartons, sweeping dust, kitchen waste

Rule 1998 schedule II





Color coding	Type of container	Waste categories
Yellow 	Plastic bags	Cat 1 human anatomical waste Cat 2 Animal Waste Cat 3 Microbiological Waste Cat 6 Solid Waste
Red 	Disinfected container plastic bags	Cat 3 Microbiological Cat. 6 Soiled Dressing
Blue/white 	Plastic bags, puncture proof containers	Cat. 4 Waste sharp Cat.7 Plastic disposable
Black 	Do	Cat. 5 Discarded medicine Cat. 9 Incineration ash Cat 10 Chemical Waste

Figure 1.1: Disposal of Biomedical Waste

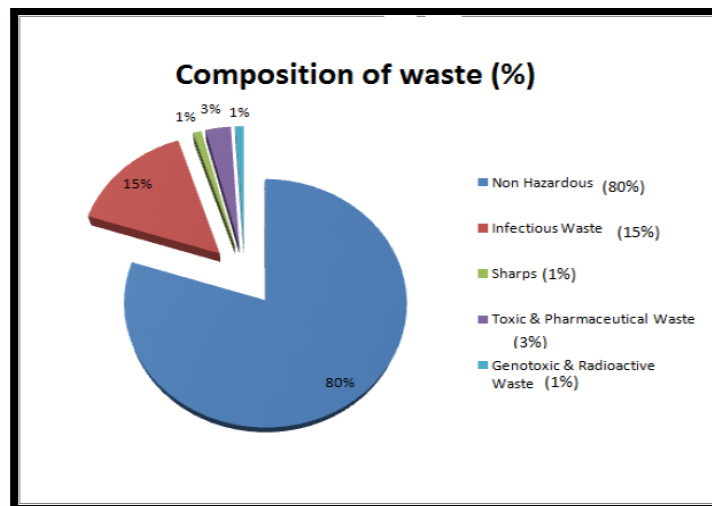


Figure 1.2: Composition of Biomedical waste⁽³⁾

DISPOSAL OF BIOMEDICAL WASTE(BMW)⁽⁴⁾

Deep burial: for Category 1 and 2

Autoclave and microwave treatment: for treatment of waste in Category 3, 4, 6 and 7 .

Shredding:

The plastics of the hospital including Intravenous bottles, transfusion sets, syringes, catheters, sharps including needles, blades, glass should be shredded after chemical treatment like microwaving or autoclaving.

Needle destroyers are used for disposal of needles without chemical treatment.

Land disposal:

- **Open dumps**

- **Secured/Sanitary landfill: it has advantages over open dumping**

The incinerator ash, expired medicines, toxic chemical waste should be subjected to Land disposal

Incineration

- A dry oxidation process at a high temperature which yields inorganic incombustible matter from reduction of organic and combustible waste
- Usually used for the waste that can not be repurposed, recycled or disposed of in landfill sites.
- Category 1, 2, 3, 5, and 6 can be subjected to incineration.

LIMITATIONS OF THE STUDY:

The study is conducted for a period of one month which is a limitation as the observation, if done, over a period of time will help in better analysis of the situation. Difficulty in collection of data from corporate hospitals as well as government hospitals due to heterogeneity.

SCOPE AND BENEFITS OF THE STUDY:

- Make sure all waste is gathered and handled in compliance with the rules specific to each form of waste; this creates opportunities for recycling.
- Steer clear of reusing drugs illegally.
- Make sure visitors, patients, and healthcare personnel are all safe.
- This study gives ideas about loopholes and areas of weak management to be improved for better waste management, hence helpful to improve law.
- Helps in minimizing solid waste.
- Outlines suggestions for choosing the best waste treatment technique and allocating priorities based on socioeconomic and financial considerations.

MATERIALS AND METHODS

Research methodology will be observational and exploratory research. The questionnaire will be structured.

Types of data

I. Primary data: It will be originally obtained through first hand investigation. It also includes information collected through interviewing management personnels of hospitals, doctors and staff.

II. Secondary data: It is research done in the past and widely available and obtained from another source like publications, journals and newspapers.

Sampling method: Sampling method will be simple random sampling.

Samples were divided in 4 groups.

- 1) Clinics
- 2) Single speciality hospitals
- 3) Multi speciality hospitals
- 4) Super speciality hospitals

Sample size

Sample size would be 10 hospitals/clinics from each group.

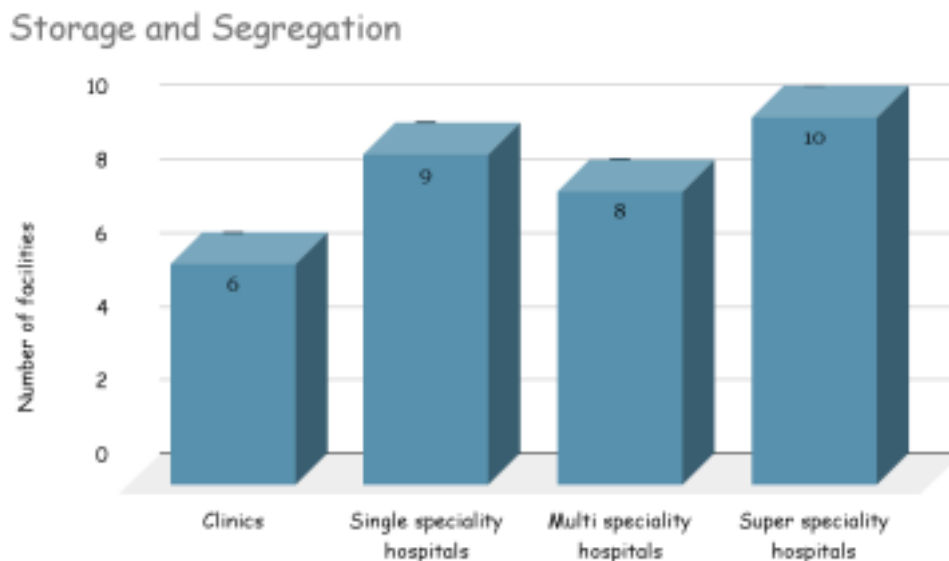
DATA COLLECTION:

Medical facilities were divided into 4 groups as described above. 10 facilities from each group were selected by simple random sampling. Facilities were visited by surveying groups and specific data about collection and disposal of waste were collected by asking management personnels of hospitals, doctors and staff. The following points were included in the questionnaire.

- 1) Storage and segregation of BMW
- 2) Transportation of BMW
- 3) Chemical treatment for sterilization of equipments
- 4) Incineration for solid combustible waste
- 5) Autoclave availability
- 6) Land Disposal of solid waste
- 7) Dry and wet thermal treatment for shredded infectious waste.

OBSERVATIONS AND RESULTS

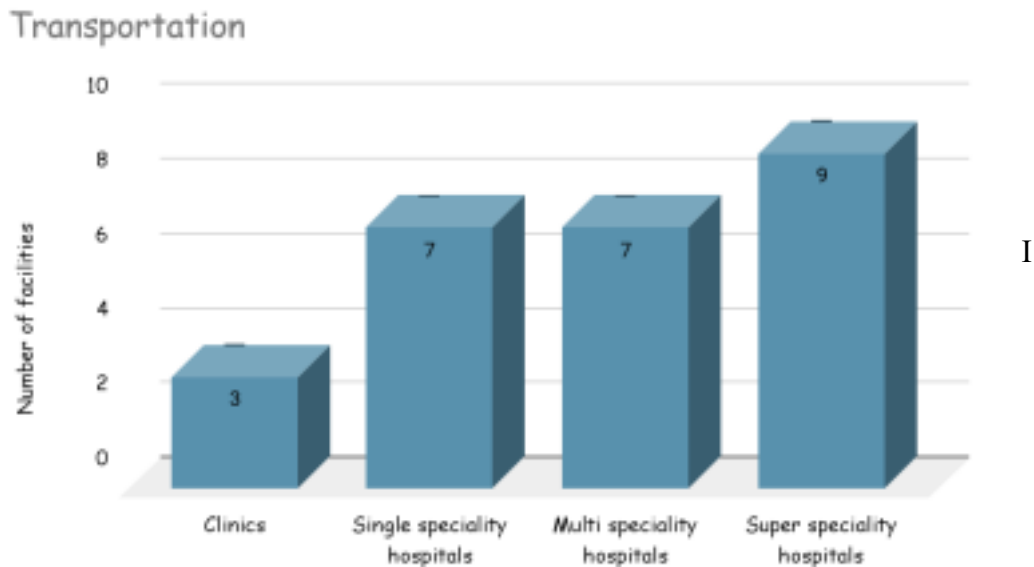
1) Availability of **storage and segregations** of BMW as per their categories mentioned in Biomedical Waste (Handling & Management Rules, 1998) amended in 2000.



Graph 1 Storage and Segregation

Interpretation: Above bar Graph 1 shows that the least number of clinics have availability of proper storage and segregations of BMW while all super speciality hospitals have it. while 90% of single speciality hospitals and 80% of multi speciality hospitals are following proper storage and segregations of BMW.

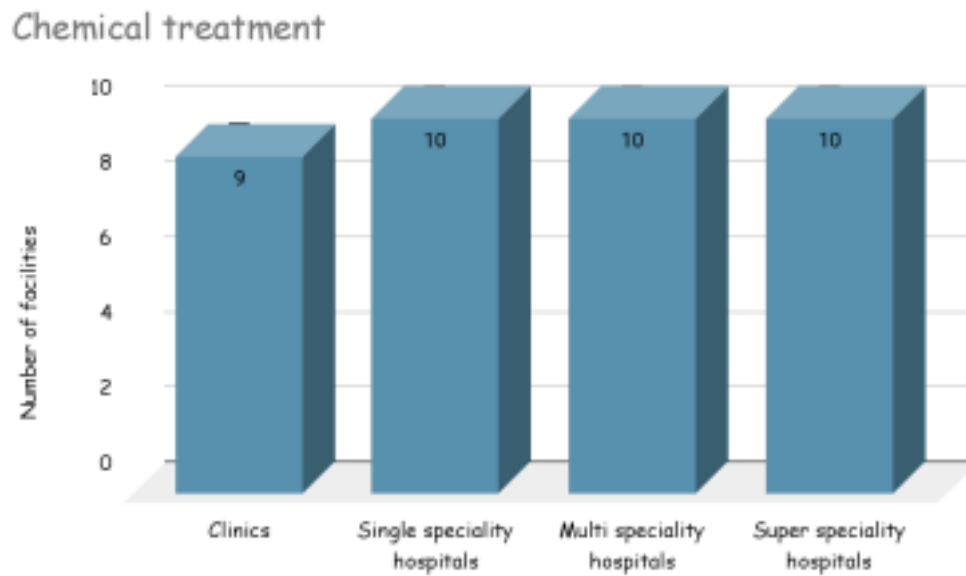
2) Availability of **transportation** of BMW



Graph 2 Transportation

Interpretation: Above bar Graph 2 shows that 30% of clinics do not have transportation facilities for BMW while 90% of super speciality hospitals have it. while 70% of single speciality hospitals and multi speciality hospitals are following transportation rules as per guidelines given by law.

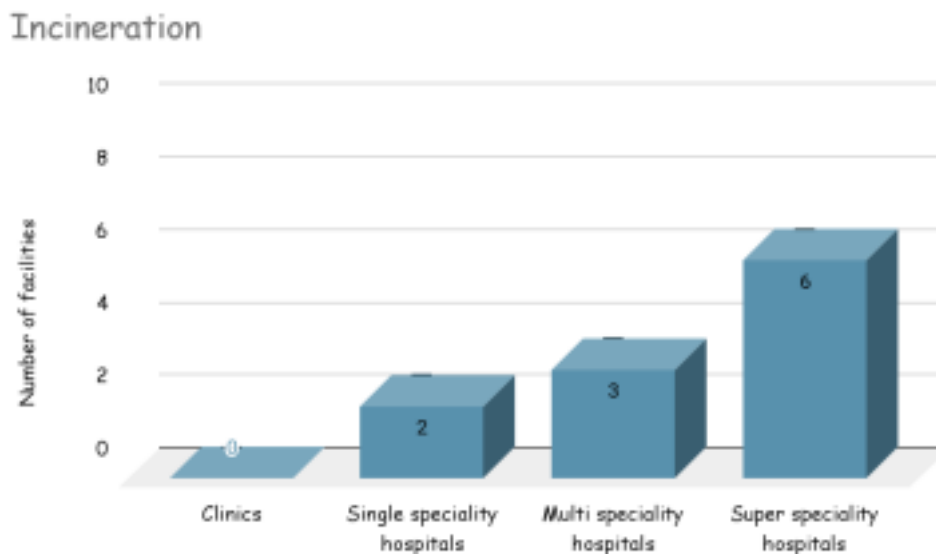
3) Availability of **Chemical treatment** for sterilization of equipments



Graph 3 Chemical treatment

Interpretation: Above bar Graph 3 shows that all single, multiple and super speciality hospitals have chemical sterilization techniques for equipment. 90% of clinics use this method as it is cheap and easily available and does not require special training.

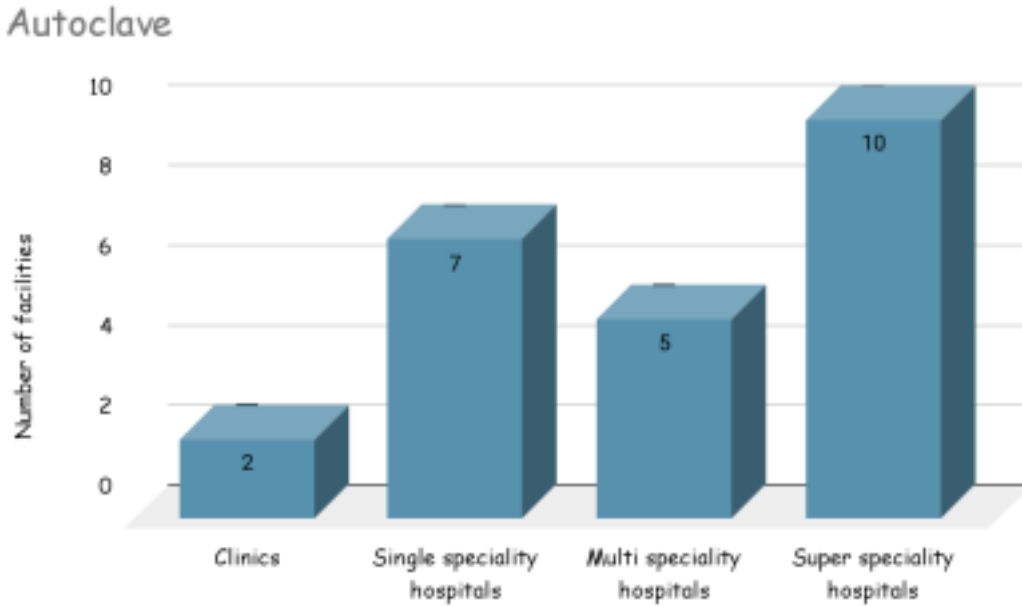
4) **Incineration** for solid combustible waste:



Graph 4 Incineration

Interpretation: Above bar Graph 4 shows that no clinics can afford incinerators for solid combustible waste as it is very costly and requires specialized training. 60% of super speciality hospitals, 30% of multi speciality and 20% of single speciality hospitals have incinerators. All over incinerators are not frequently available in small budget hospitals.

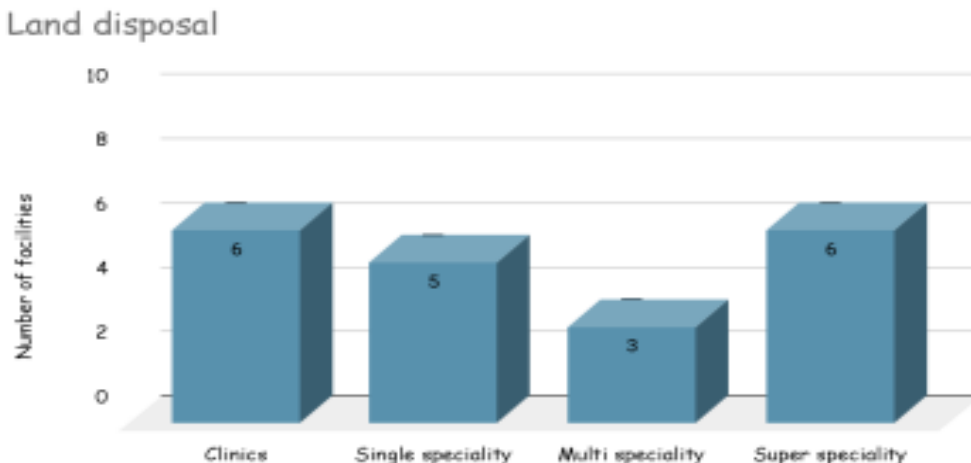
5) Availability of **autoclave**



Graph 5 Autoclave

Interpretation: Above bar Graph 5 shows that all super speciality hospitals have autoclave machines, while 70% of single and 50% of multi speciality hospitals have that. while only 2 out of 10 clinics have an autoclave machine.

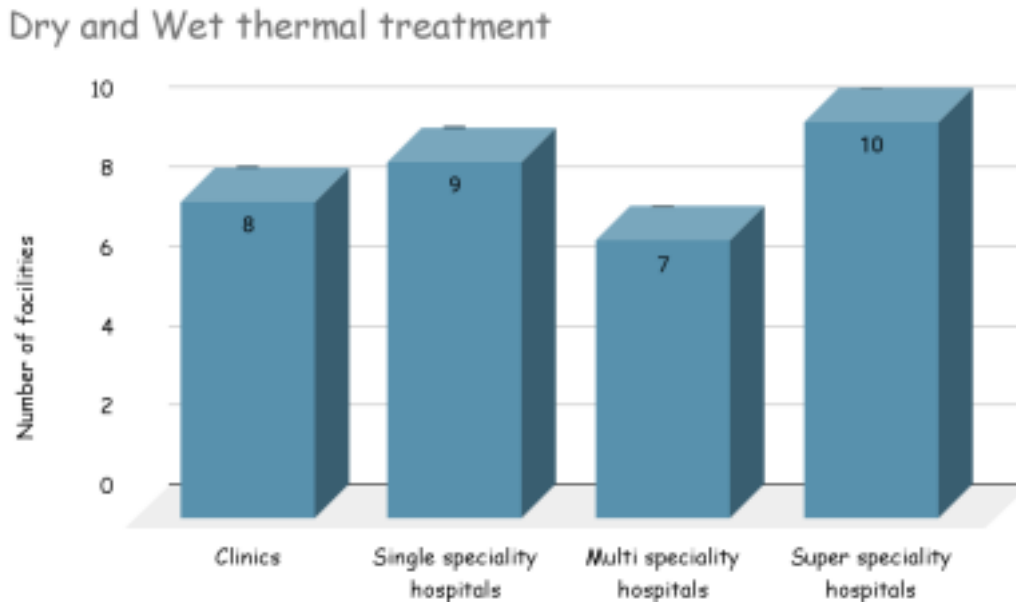
6) Using **land disposal**



Graph 6 Land Disposal

Interpretation: Above bar Graph 6 shows that 60% of both clinics and Super speciality hospitals are using land disposal and a method of BMW management. while only 30% of multi speciality and 50% of single speciality hospitals are using land disposal for a BMW management.

7) Dry and wet thermal treatment



Graph 7 Dry and Wet Thermal Treatment

Interpretation: Above bar Graph 7 shows that 80% of small clinics and 70% of multi speciality hospitals are having dry and wet thermal management while all 100% of super speciality and 90% of single speciality hospitals have this type of BMW management.

CONCLUSION OF DATA:

Facilities were visited by surveying groups and specific data about collection and disposal of waste were collected by asking management personnels of hospitals, doctors and staff and following data were collected are summarized as

- 1) As per graph, in super speciality hospitals storage and segregation of BMW is best managed as per guidelines and rules, while in small clinics it's least.
- 2) Proper transportation techniques are available in 90% of super speciality hospitals while only 30% of clinics have transportation facilities for bio medical waste. Similar 70% of single and multi speciality hospitals have transportation facilities.
- 3) Chemical treatment is available in all super speciality, multi speciality and single speciality hospitals. while 90% of clinics can afford it.
- 4) As per graph, No clinics are using incinerators while only 60% (highest) of super speciality hospitals are having incinerators. 20% of single speciality hospitals have

incinerators.

- 5) 100% of super speciality hospitals have autoclave machines, while at least, only 20% of clinics have it for BMW management.
- 6) As per graph, a similar percentage of clinics and super speciality (60%) are using land disposal techniques for solid waste disposal. while only 30% of multi speciality hospitals use land disposal techniques.
- 7) Dry and wet thermal treatment is used in all super speciality hospitals. This method is least used in multi speciality hospitals.
- 8) All over, Super speciality hospitals and Single specialty hospitals are using costly methods like incineration and autoclave also following guidelines for storage, segregation and transportation of BMW properly while amongst all most small clinics can't afford costly methods so uses cheaper techniques like chemical treatment and dry and wet thermal methods.

RECOMMENDATIONS:

The inappropriate disposal of biological waste causes numerous issues with the environment and human health. To reduce the pollution caused by biomedical waste, all stakeholders in the health sectors must make committed efforts. BMW must be transported, separated, and separated efficiently. It is important to implement an efficient communication plan, raise awareness, and educate healthcare professionals.

One of the causes of poor storage and segregation of biological waste is a lack of awareness and education among hospital staff concerning such waste. To prevent the negative impacts of the biological and hazardous elements of the waste, proper training is essential for biomedical waste segregation and disposal.

Needles used in hospitals need to be handled with extreme caution because there are 4 needlestick accidents per 100 beds, which is concerning in Asian nations, particularly India. Surprise inspections by regulatory officials should be carried out to ensure that healthcare facilities are following the rules for managing biomedical waste. Small clinics should refine their methods for transporting and storing BMWs.

CONCLUSION:

Healthcare facilities are becoming larger and more technologically advanced every day. The biomedical waste produced by these activities is the potentially harmful side of this advancement. There are constantly new diseases and viruses emerging. The risk to your health can be decreased with proper biomedical waste management and treatment. Medical establishments should abandon lax approaches to the regulations for managing hazardous waste. Since superspeciality hospitals are the best at managing biomedical waste (BMW), while small clinics are the least effective, there is a growing need for facilities for treating this waste and increased awareness among medical personnel. Compared to multispecialty hospitals, single specialty hospitals are superior at managing BMW. This study also indicated that medical college students' knowledge was lacking. Due to socioeconomic and budgetary constraints, it is difficult to choose the best waste treatment method and establish priorities, which is why small clinics lack expensive treatment options. The issue of biomedical waste can be mitigated with a strong communication strategy, awareness, and education programmes. The quantity of biomedical waste that would require special treatment would be relatively small if source isolation is effective. Periodically, the hospitals

and their treatment facilities are inspected by local pollution control authorities, who then make suggestions in light of their results. The suggestion of classification, segregation, and treatment facilities is made in conjunction with the state pollution control boards.

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