

The Bio-Medical Waste Management in M.K.C.G. Medical College & Hospital, Berhampur, Odisha and its Legal Aspects Implemented by Indian Panel.

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ABSTRACT

Hospital waste management has been brought into focus in India recently, particularly with the notification of the BMW (Management and Handling) Rules, 1998. Proper handling, treatment and disposal of biomedical wastes are important elements of health care office infection control programme. The M.K.C.G Medical College & Hospital having 881 beds, 22 main departments and having medical waste treatment plant inside the MKCG Campus. The plant was inaugurated on dated 7th Sept 2005 and plant opened from 9 am to 5 pm and there have 4 machines installed i.e. Incinerator, Microwave and two shredder having capacity 100 kg/hr, 100 ltr/hr and 100 kg/hr respectively. The health care workers are collected medical waste from all department of M.K.C.G & private hospital, Laboratory & Clinic etc. at the morning time with in 12 'o' clock. The biomedical waste generated in Berhampur town is 1500 kg. (Considering 1 kg/ patient /day). The highest waste generated 42 % in Dressing Room and lowest waste generated 4 % in Pharmacy Department. At the time of collecting the medical waste they are not maintaining the color coding methods for that the segregation staffs are facing more and more difficulty to separate all wastes safely. Waste sharps and other plastic items were separated from the healthcare waste collected, shredded and disinfected along with the remaining waste by steam sterilisation in an autoclave. After autoclaving, the wastes were incinerated at 800°C for a period of three hours. During treatment, the incinerator door was periodically opened and the waste material turned for complete incineration. The ash generated was collected from the incineration unit, placed into a rectangular trench of 10 feet, sieved, packed and transported to the facility for deep burial. The process of incineration was always carried out between 9 am to 5 pm so that there will be public nuisance occurs in the locality of biomedical treatment plant. Minimizing biomedical waste is the first step in managing wastes safely, responsibly and in a cost effective manner. This management step makes use of reducing, reusing and recycling principles. There are many possible means to minimize the amount of both general waste and biomedical wastes within the health care or related facility. Hazardous wastes must be segregated from general wastes at the source. This is a regulatory requirement of the Occupational Health and Safety Regulations.

Key Words: MKCG Medical College & Hospital, Biomedical Waste, handling, disposal, treatment, and Management, Incinerator, Microwave

INTRODUCTION

Hospital waste refers to all waste, biologic or non biologic that is discarded and not intended for further use. Medical waste is a subset of hospital waste; it refers to the material generated as a result of diagnosis, treatment or immunization of patients and associated biomedical research. Biomedical waste (BMW) is generated in hospitals, research institutions, health care teaching institutes, clinics, laboratories, blood banks, animal houses and veterinary institutes. Although very little disease transmission from medical waste has been documented, both the American Dental Association (ADA) and Center for Disease Control recommend that medical waste disposal must be carried out in accordance with regulation. Hospital waste management has been brought into focus in India recently, particularly with the notification of the BMW (Management and Handling) Rules, 1998. The rule makes it mandatory for the health care establishments to segregate, disinfect and dispose their waste in an eco-friendly manner. The rules also envisage that common facility or any other facilities can be used for waste treatment. However it is incumbent on the occupier to ensure that the waste is treated within a period of 48 hours. Patro, (2007).

Thereafter, other hospitals also sought to contract out the cleaning services in their institutions. Since funds were a constraint, this could not be done, at once, in a large number of hospitals. However, in September 1998, further contracts were signed with Sulabh International for the cleaning of one ward of the SCB Medical College, Cuttack, and 6 wards of the MKCG Medical College, Berhampur. Subsequently, this was extended to 4 district hospitals. Presently, contracting out is being carried out on an experimental basis in some districts. In addition to this, security services in Capital Hospital, Bhubaneswar and other such larger hospitals have also been contracted out. In contracting out of cleaning and sanitation of hospital, the selection of the contractor is made through a tender procedure. Experiences in hospital cleaning and sanitation, solvency of the contractor, availability of assets, location of contractor's office, tax clearance certification, registration number, etc are taken into consideration by the tender committee. This committee is headed by the District Collector (Chairman) and the CDMO or Addl. CDMO or ADMO (PH) as members. Tender notices are published in the newspapers and the Collector of the State is the final authority in selecting the contractor. Following a recent State Government decision, the costs of cleaning and sanitation are to be made out of the user charges generated through the ZSS. In case of disputes and controversies in selection of the contractors, the matter is to be referred to State Director and Government for final decision. The hospital cleaning and sanitation is supervised by the Hospital superintendent and the payments are passed through the ZSS. It is proposed that catering and laundry services are also contracted out.

Proper handling, treatment and disposal of biomedical wastes are important elements of health care office infection control programme. Correct procedure will help protect health care workers, patients and the local community. If properly designed and applied, waste management can be a relatively effective and an efficient compliance-related practice. This review article discusses about the various types of waste, its management and the hazards of indiscriminate disposal of hospital waste management.

The management of healthcare waste is of great importance due to its potential environmental hazards and public health risks. Until fairly recently, medical waste management was not generally considered an issue. In the 1980s and 1990s, concerns about exposure to human immunodeficiency virus (HIV) and hepatitis B virus (HBV) led to questions about potential risks inherent in medical waste. Thus hospital waste generation has become a prime concern due to its multidimensional ramifications as a risk factor to the health of patients, hospital staff and extending beyond the boundaries of the medical establishment to the general population Maharana, (2010)



Risk to healthcare workers and waste handlers:

Waste Handler workers of M.K.C.G. Medical College & Hospital, Berhampur, Ganjam

In personal discussion with waste handlers of MKCG Medical College & Hospital staff they are working with proper dress up like mask, apron, glove and full shoes etc. and taking vaccination quarterly in a year. Improperly contained contaminated sharps pose greatest infectious risk associated with hospital waste. There is also theoretical health risk to medical waste handlers from pathogens that may be aerosolized during the compacting, grinding or shredding process that is associated with certain medical waste management or treatment practices. Physical (injury) and health hazards are also associated with the high operating temperatures of incinerators and steam sterilizers and with toxic gases vented into the atmosphere after waste treatment.

Risk to the public:

Public impacts are confined to esthetic degradation of the environment from careless disposal and the environmental impact of improperly operated incinerators or other medical waste treatment equipment. There may be increased risk of nosocomial infections in patients due to poor waste management. Improper waste management can lead to change in microbial ecology and spread of antibiotic resistance. Near to the biomedical waste treatment centre of MKCG, Berhampur residential houses are not present within 200m surrounding it.

Handling:

Staff was handling the waste with appropriate health and safety measures by using impervious gloves and mouth masks but was not aware of the potential hazards of the material they were handling as prescribed in the Biomedical Wastes Management and Handling Rules 1998. The standard of the quality of the protective equipment used in handling the healthcare waste was poor. One reason for the poor standard of the equipment was the repeated use of what should have been single use gloves. This was despite the fact that staff was often exposed to potential infections as a result of producing items of clinical waste due to split or improperly packed waste sacks. Some of the waste carts were observed to be soiled with biological fluids and blood which could potentially be hazardous on contact.

Segregation:

Generally, waste items were segregated according to the respective colour coded bags as prescribed in the Biomedical Wastes Management and Handling Rules 1998. One exception to the general rule was laboratories where rather than being segregated; all of the waste was mixed and placed into a single



bag. All of the various types of wastes, including anatomical waste, pathological waste and laboratory cultures were collected in yellow coloured bag. Intravenous sets, sharps, plastic bottles and other disposables were disposed of in red coloured bag, and all the general waste is placed in a black bag. The general waste collected from each department was dumped along with municipal solid waste for further treatment and disposal. Collected healthcare waste was taken to a common storage area using waste carts. Each waste bag used for collection of the infectious waste was labeled as bio-hazardous material. As per the discussion with the segregation staffs of MKCG they are always collecting the biomedical waste not in proper channel and they are not maintaining the instructed color coding process.

Segregation of Biomedical Waste at M.K.C.G., Medical College ,& Hospital, Berhampur

Colour Coding	Types of waste material collected
Red	Used for all the plastic items such as intravenous sets, Blood Bags, Syringes, tubing contaminated with blood and fluids.
Yellow	Used for human anatomical wastes, laborator cultures, dressings, attenuated vaccines, plaster contaminated with blood.

Storage:

Storage of the segregated healthcare waste was away from the patients and nursing stations. In MKCG, Berhampur solid waste dump site is nearly 50m from the hospital however, the storage area did not have secured bins to eliminate the possibility of access to the waste by flies, rodents and dogs. On the other side there was no appropriate designated place for the storage and they were observed to be dumped haphazardly. The healthcare waste was not stored for more than 24 hours on-site.



Final Treatment and Disposal at M.K.C.G., Biomedical Plant:

Waste sharps and other plastic items were separated from the healthcare waste collected, shredded and disinfected along with the remaining waste by steam sterilisation in an autoclave. After autoclaving, the wastes were incinerated at 800°C for a period of three hours. During treatment, the incinerator door was periodically opened and the waste material turned for complete incineration. The ash generated was collected from the incineration unit, placed into a rectangular trench of 10 feet, sieved, packed and transported to the facility for deep burial. The process of incineration was always carried out between 9 am to 5 pm so that there will be public nuisance occurs in the locality of biomedical treatment plant.

The biomedical waste treatment facility M.K.C.G., Medical College & Hospital. The incinerator was installed with a stack of Sustainable Solid Waste Management. To provide further filtering of the particulate matter and other poisonous gases the incinerator was equipped with a smoke filter and a scrubber. The effluent from the scrubber which was concentrated with high particulate matter was treated in an aeration tank subsequently by sand filters. The treated effluent was allowed to settle for a week and the sludge dried and incinerated. The supernatant liquid was released and the 'back wash' waters from sand filters returned to the aeration tank to complete the cycle of treatment.

Literature on English healthcare waste management reveals that the safe disposal of clinical waste has received much attention recent years. The standards of performance in healthcare waste management .

Sustainable Solid Waste Management in MKCG_Medical College & Hospital of Berhampur

The M.K.C.G. Medical College & Hospital, Berhampur require extensive awareness and training for the staff with regards of their perception towards the healthcare waste and also in the implications involved in its incorrect handling. This gap is mainly due to the attitude towards and limited knowledge towards sustainable waste management practices. Unless there are greater measures put in place and start acting accordingly as recommended in this study the rise in the quantities of healthcare waste and its mishandling will continue unabated and may be of a big concern in future.



*Biomedical Waste Microwave at MKCG,
Berhampur waste treatment plant*



*Biomedical Waste Incinerator at M.K.C.G.
Berhampur waste treatment plant*



*Biomedical Waste shredder at MKCG,
Medical waste treatment plant*



MKCG Medicine Department

MATERIAL AND METHODS

The Methods of waste disposal in Berhampur city is open dump and the waste processing is open dump and the waste processing is Land filling types. Presently the garbage are dumped in open place near Chandania Hill site located in South point of Berhampur Town 7 k.m away from town south direction. In 10.31 acres of land area is provided for dumping the solid wastes and biodegradable waste – 9 acres for Solid waste and 1.31 acres for Biomedical Waste (Bisoyi. L.K.- 2006). The biomedical waste generated in Berhampur town is 1500 kg. (Considering 1 kg/ patient /day). There are 2 Govt. Hospital, 2 Govt. dispensary, Railway Hospital and 2 private hospital and 34 private nursing homes and clinic in the city.

- Govt Hospital MKCG Medical College & Hospital, Private Hospital & Clinic of Berhampur City 881 beds.
- Govt hospital (service hospital) 1047 beds Keeping in view the infrastructural requirement for BMW management and adherence to BMW Rules 1998, total cost in terms of capital cost as well as operational cost (per month) was worked out for BMW management.

Methods of storage and segregation at ward / department level, internal transportation, storage, external transportation and on site final disposal / off site disposal were studied for all 5 hospitals by direct observation and infrastructure for the same was studied. Informal discussion with various hospital functionaries was carried out. Common regional facility for final disposal of infectious waste was also studied.

The sample comprised of 96 randomly selected employees from 22 main departments (namely, General Medicine, General Surgery, Orthopedics, ENT, Obstetrics & Gynecology, Ophthalmology, Pediatrics and Psychiatry. In addition, this hospital offers super-specialties including Cardiology, Cardiovascular and Thoracic Surgery, Urology, Nephrology, Neurology, Neuro-Surgery, Pediatric Surgery, Neonatology and Gastroenterology.) of M.K.C.G. Berhampur. It mainly included personnel who are involved in healthcare waste management. The majority of the employees sampled were support staff in the age range of 18 – 52 years.

RESULT & DISCUSSION

Waste quantification was undertaken during the period of April and May 2015 to determine the waste management practices of the support staff. A representative sample of 3 bags was randomly chosen from different units of MKCG Medical College & Hospital for waste quantification analysis. Each bag was weighed using a weighing machine and the relative quantities of waste generated in kg/day, for different units of MKCG Medical College & Hospital was taken. The biomedical waste generated in Berhampur town is 1500 kg. (Considering 1 kg/ patient /day). The highest waste generated 42 % in Dressing Room and lowest waste generated 4 % in Pharmacy Department. There are 2 Govt. Hospital, 2 Govt. dispensary, Railway Hospital and 2 private hospital and 34 private nursing homes and clinic in the city. From the data obtained, percentage quantities of healthcare waste are calculated.(Table-1 and fig.1 &2)

Table-1. Percentage Quantities of healthcare waste generated in selective Departments

Departments	O.P.	O.T.	Patient Wards.	Laboratories.	Blood Bank	Dressing Room.	Pharmacy
% of waste	10	20	42	8	8	8	4

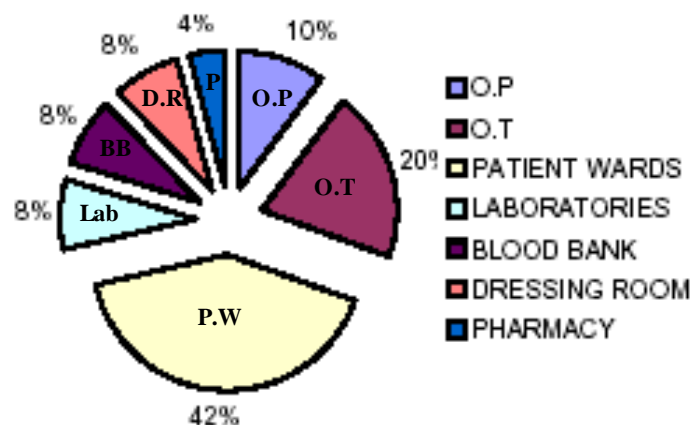
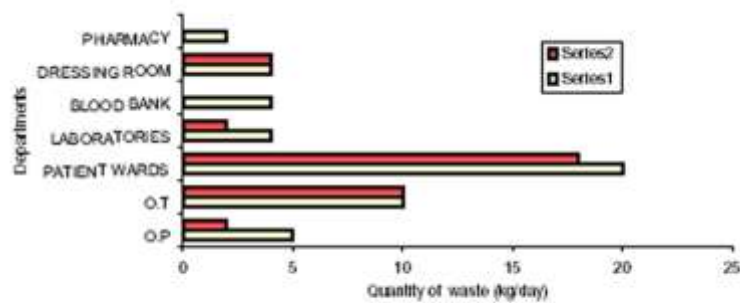


Fig. 1 Percentage Quantities of Healthcare Waste Generated in Selected Departments



Relative Quantities of Waste Generated in Kg/Day, Collected in Selected Departments in Red and Yellow Bags

Figure 2

Review of the segregation, handling, collection, storage practices, at various units of the MKCG was carried out to support and supplement the information gathered by the questionnaires. At least five fortnightly site visits were conducted during the period of study. All the site visits were uninformed and were very helpful in obtaining information about common practices in the management of the wastes. Data pertaining to the treatment and disposal processes at the private company (Life Line Pharma, Berhampur) responsible for collection and disposal of medical wastes and from health officials was also collected. The facility is located in side the M.K.C.G. Campus. It is a common treatment facility for each of the three surrounding coastal districts namely Ganjam, Gajapati, and Rayagada. The facility processes 7-8 tonnes/day of medical waste collected from 80 hospitals including government, private owned hospitals, private clinic and pathology. An onsite visit of the biomedical waste treatment facility was undertaken to study the processes Sustainable Solid Waste Management involved in treatment and disposal activities at the facility and their compliance with the Biomedical Wastes Management and Handling Rules 1998.

Minimizing biomedical waste is the first step in managing wastes safely, responsibly and in a cost effective manner. This management step makes use of reducing, reusing and recycling principles. There are many possible means to minimize the amount of both general waste and biomedical wastes within the health care or related facility. Hazardous wastes must be segregated from general wastes at the source. This is a regulatory requirement of The Occupational Health and Safety Regulations.

Segregation minimizes the amount of waste requiring special handling and disposal procedures and reduces the overall costs of disposal. Considerable cost offsets can be achieved if the entire waste stream does not have to be treated as biomedical waste. Only a small proportion of the wastes generated at a health care or similar facility are actually biomedical waste. Further segregation of biomedical waste into the following types allows for cost effective disposal:

- Animal Biomedical Wastes;
- Cytotoxic Chemical Wastes;
- Human Anatomical Wastes;
- Human Blood and Body Fluids Wastes;
- Microbiology Laboratory Wastes;
- Sharps Wastes; and
- Special Precaution Wastes.
- Product Substitution/Process
- Product substitution is another means to reduce the amount of wastes generated by a health care or related facility. Some suggestions include:
- Consider and periodically re-evaluate the potential for substitution of single use/disposable medical and surgical supplies with reusable items. Factors such as patient and worker health protection considerations, cost, convenience, labour, available space and worker acceptance should be a part of the evaluation;

- Consider using products with reduced packaging;
- Consider using suppliers/companies that have a policy of receiving/recycling used goods;
- Encourage the use of products that contain recycled materials and initiate recycling of appropriate general wastes wherever possible;
- Employ containers composed of non-halogenated plastics where incineration of the waste is necessary; and
- Encourage suppliers and manufacturers to develop or use products made from non-halogenated plastics or recycled materials.
- Saskatchewan Biomedical Waste Management Guidelines February 2008

Observations:

- ❖ The segregation of waste in almost all hospital is not satisfactory.
- ❖ Colour coding for various categories of waste is not followed.
- ❖ The storage of bio-medical waste is not in isolated area and proper hygiene is not maintained.
- ❖ Personal protective equipment and accessories are not provided.
- ❖ Most of the hospitals do not have proper waste treatment and disposal facilities. In the cities where common treatment facilities have come up, many medical establishments are yet to join the common facility.
- ❖ Emission monitoring of two incinerators indicated that they do not meet the emission norms.
- ❖ Most of the incinerators are not properly operated and maintained, resulting in poor performance.
- ❖ Sometimes plastics are also incinerated leading to possible emission of harmful gases.
- ❖ Several hospitals have not applied to State Pollution Control Board for authorization under the rules.
- ❖ General awareness among the hospital staff regarding bio-medical waste is lacking.

Recommendations and Follow-up:

- ❖ All health care facilities generating Bio-medical waste shall strictly ensure segregation, colour coding and other provisions of Bio-medical waste (Management & Handling) rules, 1998 and amendments thereof.
- ❖ Hospitals should apply to state Pollution Control Board for authorization to handle and treat the waste.
- ❖ Incinerators, which do not conform the design & emission norms as per rules, must be modified and air pollution control system may be retrofitted to minimize the emission level.
- ❖ The operator should ensure proper O&M of incinerator through attainment of required temperature in both the chambers, regular operation of the incinerator, proper maintenance of the logbook and storage of the waste in isolated area, plastic incineration should not be undertaken.
- ❖ Proper training and personal safety equipment / accessories should be provided to waste handling staff.
- ❖ Records of waste generation, treatment and disposal should be maintained by the hospital.
- ❖ Steps should be taken to set up common bio waste treatment facility in each city/town with strict monitoring of these facilities by regulatory agency and individual facilities should be discouraged. This is on account of the fact that improper operation may lead to increase in air pollution problem. Better siting, management and monitoring is possible in common facilities only.
- ❖ The amounts chargeable for the waste in most of the common facilities are for below the minimum O&M cost. This needs to be rationalized else it may lead to non-operation of facilities.
- ❖ Various regulatory agencies, Hospitals, Medical Association & Municipal Corporation should work together for proper management of Bio-medical waste in the cities/towns.

Action has been initiated against Govt. medical colleges of Berhampur for having bed capacities more than 1000 but do not manage the bio-medical waste as per rules. Steps are also being taken against other hospitals, which do not follow the rules and operate the incinerators, to meet the emission norms.

Orissa High Court issued show cause notices to superintendents of Govt. Medical Colleges & Hospitals.

The Orissa High Court issued show cause notices to the superintendents of the three Government medical college and hospitals in the state, the Srirama Chandra Bhanja Medical College and Hospital of Cuttack, Veera Surendra Sai Medical College and Hospital at Burla and Maharaja Krushna Chandra Gajapati Medical College and Hospital at Berhampur along with the Directors of the private institutions Hi-Tech Hospital, Kalinga Institute of Medical Sciences and LV Prasad Eye Institute for violating the Bio-Medical Waste (Management and handling) Rules (Maharana B.K.-2010)



The bench comprising Justices L. Mohapatra and I. Mohanty took into consideration the affidavit filed by the Orissa State Pollution Control Board stating that the health institutions were not following proper biomedical waste management practices.

The petitioner City-based Maitree Sansad alleged that the private nursing homes in the twin cities indulged in management practices that violated the rules. Waste was indiscriminately released to the river, the petitioner stated.

The High Court-appointed amicus curiae Pravat Das said that it was obligatory on the part of the civic authorities to ensure that there was no violation of the rules to which Advocate-General Ashok Mohanty said that the Commissioners of Bhubaneswar Municipal Corporation and Cuttack Municipal Corporation would constitute Committees to monitor the situation. The next date of hearing has been fixed on July 21.

Another bench of the High Court, comprising Justices BP Das and MM Das, issued notice to the Secretary of Health and Family Welfare, the Secretary of Housing and Urban Development and the Secretary of Works Department to file affidavits in response to the report of the Advocates' Committee on the implementation of the internal sanitation and sewerage system of the SCB Medical College and Hospital, Cuttack.

Biomedical Waste (Rules 1998):

These Rules are applicable to all those persons who generate, collect, receive, store, transport, treat, dispose, or handle bio-medical waste in any form. Bio-medical waste has been defined as 'any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of Biological and including or in research activities pertaining thereto or in the production or testing of Biological and including categories mentioned in Schedule I. Schedule I has mentioned 10 categories of bio-medical wastes which include human anatomical waste, animal waste, microbiology & biotechnology waste. Waste sharps, discarded medicines and Cytotoxic drugs, solid waste, liquid waste, chemical waste, incineration ash'.

Rule 4 makes a duty of every occupier of an institution generating biomedical waste which includes a hospital, nursing home, Clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank, to take all steps to ensure that such waste is handled without any adverse effect on human, health and the environment.

Schedule I provides various methods for disposal of such wastes according to their nature. Such methods include – Incineration, Deep burial, Local autoclaving, Micro waving, Mutilation, Disposal in landfills, Disinfection, Chemical treatment. According to the nature of the category provided in the schedule.

Rules 6 provides for segregation of wastes in different colored plastic bags and labeled as per Schedule III thus they be packed safely. Such waste shall be transported only in authorized vehicles.

Further, no untreated bio-medical waste shall be kept beyond a period of 48 hours without the permission of the competent authority in this regard.

Proper records regarding the generation, collection, reception, storage, transportation, treatment and disposal of bio-medical wastes is to be maintained by the institution (Rule 11). The institution is also under an obligation to report an accident at a site where bio-medical waste is handled or during transportation to the authority prescribed for the purpose.

There are 13 rules in all and 6 schedules attached to them. It is a welcome venture to deal with noxious hazardous wastes produced in cities.

CONCLUSION

In MKCG Medical College & Hospital, Berhampur needed proper segregation of waste and they should follow the color coding procedure for various categories of waste. They should properly maintain hygiene and storage of bio-medical waste in isolated area. Medical provide the personal protective equipment and accessories to the biomedical treatment plant staffs. MKCG hospitals do not have proper waste treatment and disposal facilities they should carefully maintain and follow the Biomedical Waste Rules 1998. In the cities where common treatment facilities have come up, many medical establishments are yet to join the common facility. Emission monitoring of incinerators indicated that they do not meet the emission norms.

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