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RESEARCH ARTICLE

A STUDY ON BIOMEDICAL WASTE MANAGEMENT AT A TERTIARY CARE CENTRE IN REMOTE RURAL AREA OF MEWAT, HARYANA

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ABSTRACT

Introduction: The indiscriminate disposal of waste has resulted in a rise in deadly infections such as Human Immunodeficiency virus and Hepatitis B. Therefore, Biomedical Waste Management has recently emerged as an issue of major concern.

Objectives: To study the handling, segregation and collection practices of bio-medical solid waste in the hospital and its mandatory compliance with Regulatory Notifications for Bio-medical Waste (Management and Handling) Rules, 1998.

Materials and Methods: Primary data was collected from the interview basis of the staff and personal observation by visiting the sites of biomedical waste generation, segregation, temporary collection and transport. Secondary data was collected from the records of the department by the permission of the hospital administration team.

Results: Total 86 sites of biomedical waste generation were visited. Location of bags & dustbins at right place was found 100% correct in case of yellow, red & blue bags while it was correct in case of black bags 98.83% of location points. All the bags (100%) were leak-proof. Availability of black, red, yellow & blue bag was 88.37%, 95.38%, 91.86% & 97.67% respectively. Daily collection of BMW from black, red, yellow & blue bag was 96.51%, 96.51%, 98.83% & 97.67% respectively. Out of all visited sites needle destroyers were present at 97.67% places & were in working condition at 95.34% places. Syringes were not kept in different buckets for disinfection except 5.81% sites. Before transportation to temporary storage area BMW is being tagged only at 10.46% of total sites. Compliance with the rules was found to be 62%.

Conclusion: Biomedical waste management in hospital of SHKM GMC is in compliance with Biomedical Waste (management & handling) Rules. But, still there is a scope of further improvement in BMW management practices, so that proper follow up of mandatory rules can be ensured

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INTRODUCTION

A hospital is an establishment that provides medical care facilities to persons suffering or suspected to be suffering from any disease or injury. When patient care activities are carried out in a healthcare setting, certain waste is produced which has the potential to cause harm to human beings and environment. Increased population, expansion of health care facilities as well as the recent trend of using disposables has led to an unprecedented burden of health care related waste (Mohee, 2005). The term health-care waste includes all the waste generated within health-care facilities, research centres and laboratories related to medical procedures. In addition, it includes the same types of waste originating from minor and scattered sources, including waste produced in the course of health care undertaken in the home

(e.g. home dialysis, self-administration of insulin, recuperative care). (Rutala *et al.*, 2004) Between 75% and 90% of the waste produced by health-care providers is comparable to domestic waste and usually called "non-hazardous" or "general health-care waste". It comes mostly from the administrative, kitchen and housekeeping functions at health-care facilities and may also include packaging waste and waste generated during maintenance of health-care buildings. The remaining 10–25% of health-care waste is regarded as "hazardous" and may pose a variety of environmental and health risks. (Park, 2013) However, if the infectious component gets mixed with the general non-infectious waste, the entire bulk of hospital waste potentially becomes infectious. Biomedical waste has been defined under Indian Gazette of Bio-medical Waste (Management and Handling) Rules, 1998 as any waste which is generated during the diagnosis, treatment and immunization of human beings or animals in research activities pertaining thereto or in the production or testing of biological waste and

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includes categories mentioned in Schedule I of the rules. Biomedical waste generated from various health care institutions has created tremendous environmental and public health problems. The indiscriminate disposal of waste has resulted in a rise in deadly infections such as HIV/AIDS (Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome) and Hepatitis B. Different types of biomedical waste may be responsible of health hazards like psychological stress, infections & diseases (HIV/AIDS Hepatitis B&C, Hemorrhagic fever, Herpes, Measles, Shigellosis, Salmonellosis, Pneumonia, Septicemia, Bacteremia, Cholera, Tuberculosis, Anthrax, Helminthic infections, Candidiasis, Rabies and others), injuries, dermatitis, conjunctivitis, bronchitis, cancer, genetic mutation and poisonings. Therefore, Biomedical Waste Management has recently emerged as an issue of major concern not only to hospitals, nursing home authorities but to the environment and enforcement agencies, media and general public (Chaudhary, 2004). Beside infectivity concerns, it causes chemical and radiological hazards (Chamberland *et al.*, 1991). All individuals coming into close proximity with hazardous health-care waste are potentially at risk from exposure to a hazard, including those working within health-care facilities who generate hazardous waste, and those who either handle such waste or are exposed to it as a consequence of careless actions.

The collection of disposable medical items (particularly syringes), its resale and potential re-use without sterilization can also cause a serious disease burden (WHO, 2002). The seriousness of improper Bio-Medical Waste management was brought to the limelight during the “beach wash-ups” during summer 1998; which was investigated by the Environment Protection Agency (EPA) of USA; and it culminated in the passing of Medical Waste Tracking Act (Mwta) Nov. 1988. This made USA the pioneer as far as waste management is concerned (Mukesh, 2001). Proper management of medical waste is crucial to minimise health risks.

It is possible for improvements in waste management to begin in pioneering local health-care facilities. However, to have an impact more widely across a country usually requires active government intervention. The most common first step by a government ministry is to describe the changes needed in a national health-care waste-management policy. A policy can be viewed as a blueprint that drives decision making at a political level and should mobilize government effort and resources to create the conditions to make changes in health-care facilities. (WHO HANDBOOK, NEW). It is essential to develop a national policy and implement a comprehensive action plan for HCWM (Health Care Waste Management) providing environmentally (Shinee *et al.*, 2008). Many countries lack documented government rules related to BMWM. India was one of the first countries to implement BMWM rules. (Gupta, 2009)

There are a number of legislations to enforce proper disposal of BMW in India, for example Biomedical Waste (Management & Handling) Rules 1998, and Solid waste (Management & Handling) Rules 2000, Hazardous Wastes (Management & Handling) Rules 1989.

These rules are applicable to every hospital and nursing home, veterinary institutions, animal houses or slaughterhouses, which generate biomedical waste. Penalties are specified in Environment (protection) Act, 1986. Whoever fails to comply with or contravenes these rules shall be punished under section 16 and 17 of Environment (protection) Act 1986 that is imprisonment for a term, which may extend upto 5 years with fine, which may extend to Rs. 100,000 or with both, and in case of failure to comply punishment may extend upto 7 years (Surjit S Katoch, 2007). Aim of biomedical waste management is proper segregation, collection, transport, handling and disposal in such a way that it is safe for environment as well as community.

Steps of Biomedical waste disposal



It has been found that no appropriate strategy regarding biomedical waste management exists in most of health care centres and there is an urgent need to increase awareness about rules, regulations and procedures regarding this vital issue. (INCLIN Program Evaluation Network (IPEN) study group, 2014). Hospitals are the institutions responsible for taking care of public health which encompasses both patient care as well as maintenance of a clean and healthy environment congenial to the good health and prosperity of all its working members. (Yadavannavar, 2010) Keeping this in view, the present study was conducted with the aim i) To explore the handling, segregation and collection practices of bio-medical solid waste in the hospital, ii) to note its mandatory compliance with Regulatory Notifications for Bio-medical Waste (Management and Handling) Rules, 1998 and iii) to identify its strengths and weaknesses & to suggest the corrective measures. The improvement of present waste management practices for SHKM, GMC, Mewat will have a significant long-term impact on minimising the spread of infectious diseases.

Profile of SHKM, GMC Hospital

Shaheed Hasan Khan Mewati Govt. Medical College (SHKM,GMC) is the only major Institution in the region of Mewat for Medical Education & Research and a tertiary care Centre for the provision of specialized Health care services not only to the people of the State of Haryana, but also to those from Rajasthan and western U.P. It is run under Pt. B. D. Sharma University of Health Sciences and Governed by Department of Medical Education and research, Haryana.

This 400 bedded hospital is committed to providing super-speciality medical care to all sections of the society at affordable cost, incorporating continual quality improvement in all functional aspects, to achieve the highest standards of patient care and satisfaction. Shaheed Hasan Khan Mewati Government Medical College (SHKM, GMC) is situated near Arawali Hills in District Mewat of Haryana. It is situated at a distance of 40 km from ultra-modern city Gurgaon and 50 km from IGI airport, New Delhi near State Highway 13 (Gurgaon to Alwar)¹. Along with providing medical education to

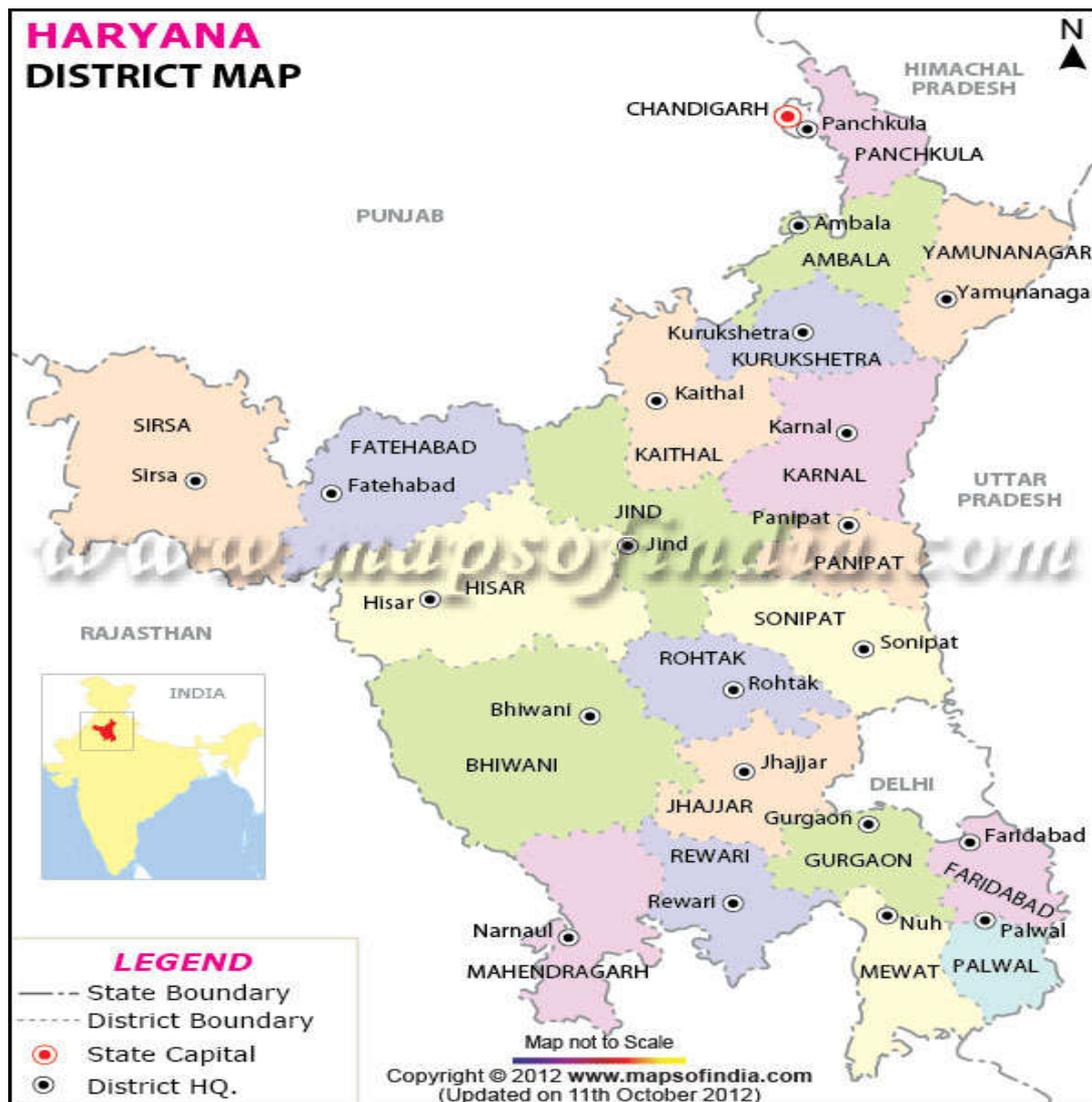
M.B.B.S. students, the Institute also serves as a tertiary care health centre with provision of specialized health care services. This tertiary care hospital offers all the basic facilities including Surgery, General Medicine, Ophthalmology, ENT, Orthopaedics, Radiology, Obstetrics & Gynaecology, Respiratory medicine, Anaesthesia, Psychiatry, Dermatology, Dentistry, Paediatrics. Hospital also has blood bank, casualty, physiotherapy unit. It offers wide range of laboratory services in Microbiology, Pathology, Biochemistry, Forensic & Toxicology, Pharmacology. Besides clinical and paraclinical branches, it also has basic sciences departments including Anatomy & Physiology. It also offers high-end diagnostic facilities like ultrasonography, X-rays, Mammography. It has a well equipped multispecialty hospital with 360 IPD beds and 40 emergency beds along with OPD services. During last year (2013) hospital served 229399 patients in OPD clinics and 13480 patients were admitted to Indoor services which are distributed into nineteen wards to provide adequate and satisfactory health care. The main catchment area is Mewat District and adjoining districts like Rewari, Faridabad, Gurgaon, Palwal and Alwar. According to 2011 census the population of Mewat district is 10, 89,406. Including adjoining area it is serving approx. 2 lakh people.

MATERIALS AND METHODS

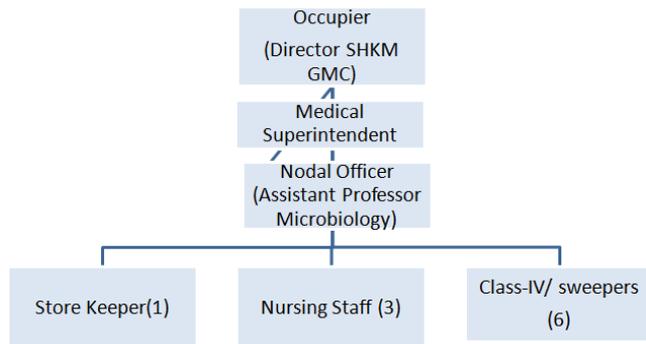
Permission was taken from the hospital authority for conducting the present study. Primary data was collected from the interview basis of the staff along with observation. It is a case study done with in a period of 2 months. Primary data was collected by using checklist-1 (segregation & collection) and checklist-2 (handling, transport & storage). Checklists were filled by observing the sites of biomedical waste generation, segregation, collection & primary storage area and by interviewing the staff like BMW management in charge, nursing superintendent, in charges of various IPDs & OPDs and sweepers. Secondary data was collected from Medical Record Department of the hospital. Strength and weaknesses were analysed on basis of data collected and noting its compliance with Biomedical Waste (Management and Handling) Rules, 1998. The policy and procedures were studied by observational study with in a period of 2 months.

Biomedical waste management staff

All the work done regarding biomedical waste management is taken care by nodal officer who is assistant professor in department of microbiology in SHKM GMC, who is supervised by Medical superintendent and is directly headed over by the occupier himself.



Hierarchical structure of Biomedical Waste Management in the Hospital



List of Equipments used in biomedical waste management process in hospital of SHKM GMC Mewat

| S.No. | Name of the Equipment | Quantity |
|-------|---|----------------|
| 1 | Wheeled Trolleys | 08 |
| 2 | Plastic Dustbins (yellow, red, blue & black) | 336 |
| 3 | Iron Dustbins with stand (yellow, red, blue & black) | 8 |
| 4 | Puncture proof container | 80 |
| 5 | Bags (yellow, red, blue & black) | Regular Supply |
| 6 | Personal Protective Equipments (safety helmet, goggles, face mask, gown, gloves, and gum boots) | Regular Supply |
| 7 | Needle Destroyer | 60 |
| 8 | Signage Boards A (displaying colour coding based segregation) | 300 |
| 9 | Signage Boards B (displaying category wise classification of biomedical waste) | 300 |
| 9 | Stickers (displaying BMW symbol) | 224 |
| 10 | Hypochlorite sol. | Regular Supply |

Observations

Generation of Waste

It was observed that the major sites of non-hazardous waste/general waste generation are office, kitchen, administration, stores, rest rooms etc. The hazardous (infectious & toxic) waste is generated mainly in wards, treatment rooms, operation theatres, intensive care unit, labour room, laboratory, dental department, emergency unit and blood bank.

Segregation

Segregation means "separation of different types of wastes by sorting or the systematic separation of Bio-Medical Waste into designated categories. [Biomedical waste (Management & Handling) rules, 1998]. In this hospital, the segregation is done at the point of generation of waste. For this purpose proper signage boards have been displayed at all the points of generation of bio-medical waste along with coloured bins. This is being followed in all running Out-doors (which include Orthopaedics, Ophthalmology, ENT, Obstetrics & Gynaecology, Medicine, Skin, Paediatrics, TB & chest, Surgery, Psychiatry, Dental), Casualty/ Emergency, Radiology department, In-doors (Medicine wards, Surgery wards, Labour ward, ICU, PICU, Paediatrics ward, Gynae ward, Ortho ward, Eye/ENT/Dental ward), Operation theatres (Main OTs, Minor

OTs, Emergency OT) and Laboratories (Pathology, Microbiology, Biochemistry, Emergency).

Process of Segregation in the Hospital

Segregation is done in the hospital using four colour coded bins i.e. Yellow, Red, Blue & Black.

Yellow Dustbins & Bags

Waste category no. 1, 2, 3 & 6 are collected in yellow dustbins and bags. It includes,

From OT

Amputated Limbs, Placenta, Intestine, Uterus, Ovary & other human anatomical wastes.

From Laboratories

Infected Samples and cultures, live or attenuated vaccine, Culture Plates, Wastes from production of Biologicals, Toxins. Soiled Cotton, Swabs, Gauge Pieces, Dressings, Bandages, bed sheets and plaster casts soiled with blood, pus, vomit, sputum, & other body fluids. The biomedical waste in yellow bags is disposed off by incineration or deep burial method.

Red Dustbins & Bags

Waste category no. 3,6,7 are collected in red dustbins and bags. It includes Tubing, Catheter, gloves, I.V. set, venflon, urine bag, blood bag, Ryle's tube, drainage tube & bags, Plastic bottles, Plastic culture plates & tubes. The biomedical waste collected in red bags is treated by Autoclaving/Microwaving and chemical treatment.

Blue Dustbins & Bags

The waste category no. 4 & 7 is collected in it, which includes Needles, Scalpels, Blades, Glass ampoules and Syringes etc. that may cause puncture and cuts. This includes both used and unused sharps. The biomedical waste collected in blue dustbins is treated by Chemical-treatment/autoclaving/Micro-waving, Mutilation/shredding methods.

Black Dustbins & Bags

Waste category no. 5, 6 & 9 are collected in black bags and bins, it includes Wastes comprising of out dated, contaminated and discarded medicines, solid chemicals used for disinfection in Laboratories & Hospitals eg. Insecticides, wrappers kitchen waste etc. The waste collected in these bins is finally disposed off by local municipality.

TREATMENT & DISPOSAL OF BMW

The hospital has outsourced its BMW for its final treatment & disposal. The BMW after being stored in temporary storage room of the hospital is taken by Vulcan waste management Co.

Ltd. for treatment & disposal. This company is also authorized by HSPCB for the same.



Data Analysis

Data was analysed by using appropriate statistical method i.e. percentage.

RESULTS

Total 86 sites of biomedical waste generation were visited to fill the check list -1 for hospital waste management (segregation & collection). Bags and dustbins were found at all the sites visited (100%). Location of bags & dustbins at right place was found 100% correct in case of yellow, red & blue bags while it was correct in case of black bags 98.83% of location points. All the bags (100%) used for BMW collection and segregation were leak-proof. Availability of black, red, yellow & blue bag was 88.37%, 95.38%, 91.86% & 97.67% respectively. Daily collection of BMW from black, red, yellow & blue bag was 96.51%, 96.51%, 98.83% & 97.67% respectively. Out of all visited sites needle destroyers were present at 97.67% places & were in working condition at 95.34% places. Syringes were not kept in different buckets for disinfection except 5.81% sites. Availability of gloves in appropriate sizes was 100% while their disposal in bleaching powder was no where to be seen i.e. 0%. Before transportation to temporary storage area BMW is being tagged (generating department name, waste category no. etc.) only at 10.46% of total sites. Compliance with BMW (management & handling) rules regarding handling, storage & transportation was found to be 62%.

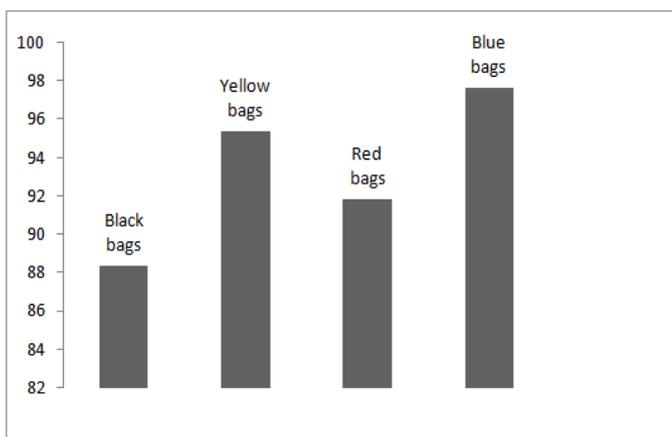


Fig. 10. Graphical presentation of availability of bags for BMW segregation & collection in SHKM GMC

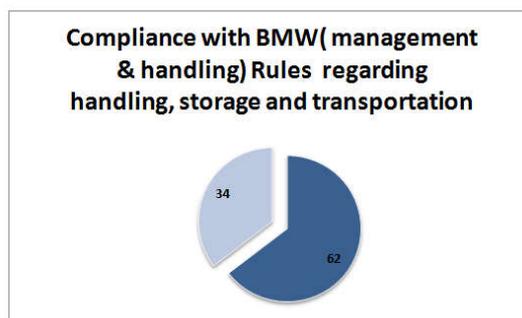


Fig. 11. Compliance with BMW Management (handling) Rules regarding, storage and transportation

DISCUSSION

This is a case study done in SHKM GMC to study the management process and practices in the hospital. The results of the study show that Bio medical Waste (Management & Handling) Rules are being followed in this hospital properly with few lacunas only. Almost all the bags were in their respective coloured dustbins and were found at their assigned places in the hospital. All the bags in use were found leak-proof. Along with good availability of signages boards, bags and gloves, the collection of BMW is being done on daily basis. All these findings indicate that the hospital authorities & staff have good knowledge and awareness regarding BMW management & handling practices. The results are supported by the fact that all the doctors, nursing staff and class – 4 (sweepers & ward boys) have been sensitized through power point presentations (PPTs) and training sessions regarding bio medical waste management.

Also the results are in compliance with the fact that the hospital has recently cleared all the objections from Haryana State Pollution Control Board (HSPCB) which were raised earlier. The results are consistent with the findings of study done by IPEN study group (2014) in which it was found that BMW is managed in a better way at tertiary level hospitals (Mukesh, Yada 2001).

The major flaws were found in disposal of syringes and gloves which indicate further need of continuing training sessions and making a BMW management committee for better control over practices. Compliance with BMW (management & handling) rules regarding handling and storage was up to mark but, not so in case of transportation practices. Possible reason for the situation can be lack of separate dedicated department and shortage of staff for BMW management.

The hospital is in its budding phase and proper guidelines and standard operating procedures are being developed, therefore, a better picture regarding management can be expected in future. Establishment of Biomedical Waste Committee will also be helpful in improving compliance with the Biomedical Waste (management & handling) Rules regarding handling, transport and storage practices. The number of personnel involved in BMW management seems to be less according to patient load & bed strength of the hospital. Therefore, more staff should be recruited who can help in ensuring the proper supply of equipments and a better implication of biomedical rules in the hospital or the hospital may have a separate

dedicated department to deal biomedical waste management in the hospital.

Strengths

Strong points in BMW management in SHKM GMC are:

Good knowledge & awareness of staff regarding biomedical waste management rules. Proper display of signage boards throughout the hospital area. Good BMW segregation, storage and handling practices. Sufficient availability of equipments along with personal protective equipments for BMW workers.

Weaknesses

- Lack of Biomedical Waste Management Committee.
- Lack of proper labelling of Biomedical Waste during transport.
- Improper immunisation status of Biomedical Waste management workers.

Recommendations

There is a need:

- To establish Biomedical Waste Management Committee
- To establish a proper Biomedical Waste Management Department
- To organize regular training sessions for doctors, nursing staff, sweepers and ward boys.
- To organize Biomedical Waste management audits at institutional level.
- To arrange for proper immunisation of Biomedical waste management workers.

Conclusion

This study concludes that biomedical waste management in hospital of SHKM GMC are in compliance with Biomedical Waste (management & handling) Rules which are under Environment Protection Act. But, still there is a scope of further improvement in BMW management practices, so that proper follow up of mandatory rules can be ensured.

Significance of this study

This study has enlightened the strengths and weaknesses and problem areas in biomedical waste management in hospital of SHKM GMC. The results of study clearly indicate the points which need more attention. Further the recommendations can be used for improving biomedical waste management in this institute.

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