Col. S Rawat D Report

by Col. S Rawat

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ABBREVIATIONS

BMWM	:	Bio Medical Waste Management
AIDS	:	Acquired Immuno Deficiency Syndrome
OPD	:	Out Patient Department
OT	:	Operation Theatre
CT	:	Computed Tomography
USG	:	Ultra Sonography
HCF	:	Health Care Facilities
WHO	:	World Health Organization
HIV	:	Human Immunodeficiency Virus
NACO	:	National AIDS Control Organisation
pH	:	Potential Hydrogen
BOD	:	Biochemical Oxygen Demand
COD	:	Co-occuring Disorders
CBMWTF	:	Common Bio Medical Waste Treatment Facility
HBV	:	Hepatitis B Virus
HCV	:	Hepatitis C Virus

ABSTRACT

A descriptive cross-sectional study "Quality Assurance in Bio-Medical Waste Management in Medanta-The Medicity, Gurugram, Haryana" was conducted among approx. 1200 Nursing staff and 14 administrative staff supervisors for the period of three months i.e. 16 February 2019 to 16 May 2019. Objective was to assess "Quality Assurance in Bio-Medical Waste Management in Medanta - The Medicity, Gurugram, Haryana", it was conducted by ascertaining the existing knowledge, attitude and practices on BMW management among nursing and administrative staff, finding the extent to which this BMW management in the hospital is in compliance with BMW Management and Handling Rules 2016 and thereafter based on results recommendations were to be suggested for the improvement of BMW management in Medanta - The Medicity.

For the study sample size of 130 Nursing staff and 7 Administrative supervisors were observed. Non - Probability Convenient sampling method was used for sampling. The Data collection tool were the Structured Questionnaire and Checklist based on the BMW Management and Handling Rules 2016 and the Kayakalp guidelines were formulated. Data collection technique used was Questionnaire and Observation based. The staff was put through a series of 26 questions testing their Knowledge, Attitude and Practice questions including Multiple Answer questions. The analysis of answers was carried out to judge the staff's compatibility with BMW Management Rules. It was ascertained that 65% of them have good amount of knowledge and understanding on the aspects pertaining to the BMW management issues, around 87% respondents were observed practicing the guidelines in an appropriate manner and on attitude aspect 61% of the staff involved had displayed good results towards the issues related to BMW management in the hospital.

Based on the observational checklist it was found that barring few aspects hospital had been following the guidelines as issued on the subject by the government. As per the analysis based on Observation and Questionnaires, overall the Quality Assurance in BMW

Management in Medanta - The Medicity, Gurugram was found to be correct and being effectively implemented. However certain measures were communicated for improvement.

MEDANTA-THE MEDICITY, GURUGRAM

For the study sample size of 130 Nursing staff and 7 Administrative supervisors were observed. Non - Probability Convenient sampling method was used for sampling. The Data collection tool were the Structured Questionnaire and Checklist based on the BMW Management and Handling Rules 2016 and the Kayakalp guidelines were formulated. Data collection technique used was Questionnaire and Observation based. The staff was put through a series of 26 questions testing their Knowledge, Attitude and Practice questions including Multiple Answer questions. The analysis of answers was carried out to judge the staff's compatibility with BMW Management Rules. It was ascertained that 65% of them have good amount of knowledge and understanding on the aspects pertaining to the BMW management issues, around 87% respondents were observed practicing the guidelines in an appropriate manner and on attitude aspect 61% of the staff involved had displayed good results towards the issues related to BMW management in the hospital Medanta hospital's line-up of eminent doctors and assistant staff include some of the best in the industry, an

asset that very few medical institutions can claim. The hospital houses 6 Centres of Excellence including The Heart Institute, Institute of Neurosciences, Bone & Joint Institute, Kidney & Urology Institute, Cancer Institute and Division of Medical Oncology & Haematology. Each of these centres of excellence has been made to provide integrated health care through innovative programs using medical intelligentsia, state-of-the-art infrastructure & cutting-edge technology with a comprehensive and well incorporated information system.

Medanta-Mediclinic in Defence Colony of Delhi's main Ring Road is a multi-super specialty clinic and has daycare facility, it's an extension of their flagship hospital in Gurgaon. This clinic offers Diagnostic Testing, Wellness Programs, Outpatient Consultancy, Dialysis, Endoscopy and Day-care related Surgeries across all specialties. It serves as an alternative location for patients to access the consultancy and expertise of Medanta' s world renowned doctors.

The Medanta-Mediclinic, in partnership with DLF, at Building 10C in DLF Cybercity, Gurgaon, is the second Mediclinic in the Delhi NCR region. The multi-super speciality clinic and outpatient facility delivers healthcare services to working professionals at DLF Cybercity. The Mediclinic offers consultations with expert doctors across specialities, diagnostic services, executive health check-ups, speciality clinics and medical emergency response.

Its infrastructure aims to provide an Integrated medical treatment by physically integrating the entire hospital in one singular built mass, multiple options for treatment are offered to patients with varied medical requirements, the most appropriate are arrived at through a cross-function, cross-specialization committee.

Vision, Mission & Core values

Vision - Delivering world-class healthcare in India.

Mission - The sole mission is to deliver world-class, holistic & affordable healthcare and to build a dynamic institution that focuses on the development of people and new knowledge.

Core values

Leadership & excellence - Through exemplary action and behaviour deliver the best outcome in everything.

Compassion & service - Fostering a culture where everyone is committed to care for patients and their caregivers beyond duty.

Collaboration, learning & innovation - Promote teamwork and collaboration, welcome change and creativity to encourage innovation and seek better ways to achieve goals.

Specialities - It is primarily known for specializing in cardiology, but presently it has 32 institutions, departments, and divisions that provides services in over 20 specialties which includes

- Heart Institute
- Institute of Neurosciences
- Institute of Digestive and Hepatobiliary Sciences
- Institute of Critical Care and Anaesthesiology
- Cancer Institute
- Bone and Joint Institute
- Institute of Liver Transplantation and Regenerative Medicine
- Kidney and Urology Institute

Medical Technology

Da Vinci Surgical System - For minimally invasive surgery a System with 3D HD vision, a most advanced platform is available. Its a robotic surgery system designed ergonomically with breakthrough surgical capabilities combined with superior 3D visualization.

Cyber knife Robotic Radio surgery System - In one to five days the patients can complete treatment, unlike the conventional radiation therapy treatment, which generally takes weeks to complete. Thus system reduces both the treatment time as well as the side effects which are associated with radiotherapy.

Cataract suite - It comprises of an image guided system along with laser technologies in order to perform cataract surgery with accuracy and precision. It is designed to give high-end medical and surgical eye care.

Brain Suite And Others - it is designed to provide intra-operative MR imaging and MR guided surgery. High resolution MRIs during surgery enables surgeons to assess the degree of tumour removal thus avoiding damage to normal brain tissues. It also provides tumour luminescence i.e. guiding techniques that is to visualise tumour during the surgery.

Artis Zeego Endovascular Cath Lab - To fulfils the requirements for treating complex cases such as high-risk patients and structural heart disease a floor-mounted imaging system designed that provides advanced imaging. As it allows procedures to be contained in one room, thus facilitates in handling emergencies or complications immediately, thus reducing the risk to patients.

Facilities - Apart from the other basic facilities few important ones that needs to be highlighted are as under:

Air Ambulance - Medanta believes that all patients should have access to world-class care no matter where they live. To achieve this goal, Flying Doctors India was started, it's a dedicated team of specially trained doctors, nurses, pilots and

support staff, to help evacuate patients from even the most remote areas. Thus it eliminates geographic barriers to access Medanta's super specialised medical expertise and are available 24 hours a day, 365 days a year.

Emergency & Trauma Care- At Medanta, we are equipped to handle critically ill or injured patients with life threatening conditions

Critical Care Units - It constitutes a devoted team of anaesthesiology and surgical intensivists, critical care nurse practitioners, and respiratory therapists. All Intensive Care Units, High Dependency Units and Post-Operative Recovery rooms are well-equipped and closely supervised with stringent infection control and isolation protocols.

eCLINIC-Telemedicine Services- Under this program a cloud computing is undertaken, wherein group of doctors are accessible over the web throughout the globe over a desktop, laptop, mobile or tablet based system through video consultation. Patients charged for consultation via credit cards facility.

CHAPTER I

PROJECT REPORT

It is said that cleanliness is next to godliness. Bio medical waste management is the mainstay of hospital cleanliness, its hygiene and maintenance activities. Biomedical waste is extremely hazardous type of waste which poses serious health hazards.

Introduction

In ancient times when medical facilities were not prevalent easily and treatment were given by “Vaidyas," people asked the Maharshi Ved Vyas, as to why do people get sick. He replied that people get sick, if the colon organ of the body is not clean and all the diseases start occurring from there only. Therefore, one must keep the colon organ clean not to have diseases. It is evident that the origin of cleanliness for prevention of diseases is prevalent since ages.

The Origin of BMW in Foreign countries

The prime concern in waste management is one of the important factors in public health measures. The main focus of public health has been on cleanliness and sanitation. For prevention of epidemics, the provision of clean water; proper treatment of sewage and refuse were used. John Harrington (1561-1612) facilitated flushing away the human waste and helped dwelling units clean, but inside flow under the ground went into waterways and wells. During Roman times, clean and proper water supply and the sanitation system were of utmost importance when hygiene was given due importance. Public health remained the prime responsibility of the inhabitants in several areas of Europe, and laws were enforced for strict implementation.

At Harappa, in the Indian sub-continent, it was found out that the dead were buried in an extended posture with pottery and personal belongings, which indicated that proper regard to the departed souls were also given. It also suggests that proper cleanliness, hygiene and sanitation were followed by people.

Present Scenario

In the present scenario, when due to complex level of living and prevalence of dreaded disease like Hepatitis – B and AIDS, it is of main importance to cater for the infected and hazardous waste to save the population from peril. The HCF (Health Care Facilities) which are looking health aspects for the large population are generating great quantity of infected waste matters every day from their facilities. It is of prime importance that correct management of infected waste should be mandatory so that proper maintenance of hygiene, sanitation and cleanliness id carried out for the benefit of the population. The infected wastes should have correct collection, segregation, treatment and disposal in a safe manner so that the infection is not spread to the general population. Important rules and regulations should be promulgated and implemented so that various communicable diseases do not spread over to normal population.

The initiative by, the Prime Minister of India who introduced the Swachh Bharat Abhiyan on 2nd of October, 2014 to promote hygiene and cleanliness in public domain. For hospitals cleanliness and hygiene, it becomes a mandatory requirement. Hygiene and cleanliness prevents the spread of disease but also provides a positive experience to the patients and staff. On 15th of May, 2015 to promote cleanliness and enhance the quality of public health facilities Ministry of Health and Family Welfare, Government of India, has launched a nation wise initiative. The prime concern of this initiative is to recognize various measures for population to stay in a healthy and clean atmosphere. “Kayakalp” is the name of this initiative. Various Swachhta guidelines for health facilities have also been issued.

Objectives of Kayakalp

1. Health Care Facilities (HCF) to cater for promotion of cleanliness, hygiene and Infection Control Practices in public.

2. Standard protocols of cleanliness and infection control to be maintained and adhered to public HCF.

3. A culture to be inculcated and continuous assessment of performance to be carried out for cleanliness, hygiene and sanitation.

4. Public health facilities to adhere to sustainable practices related to improvement in cleanliness which would inculcate positive health outcomes.

Parameters in Kayakalp Checklist

The performance of the facility would be taken as under:

- Upkeep of Hospital / Facility.
- Adherence of sanitation and hygiene guidelines as formulated.
- Proper waste Management.
- Correct infection control.
- Good Support Services.
- Promotion of hygiene.

BMW management is one of the prime importance not only related to HCF but to the overall environment also. There are various reasons for generation of BMW wastes from HCF. The proper management of BMW has become a point of humanitarian concern all over the world with due importance being given by WHO. Improper management of BMW hascaused so many diseases in the population of the world especially in underdeveloped countries.

Hospital wastes occurring due to patient care have caused many harmful effects to the atmosphere. It can be a potential safety threat for hospital staff. Correct and proper disposal of hospital waste is of great concern.

CHAPTER II

BIOMEDICAL WASTE MANAGEMENT AND ITS LEGISLATIVE ASPECTS

BMW Management

In HCF, infected waste is produced which if not disposed correctly, causes risk to patients and general environment. The other names of BMW are clinical waste, medical waste and health-care waste as called in other parts of globe. According to **Biomedical Waste Management and Handling Rules, 2016 of India** any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps. BMW is mainly classified as biological and non-biological waste, some waste may infectious or non-infectious.

Hospital waste is an important hazardous waste which comes after Radio-active waste. Proper handling, treatment and disposal of BMW is essential as they may cause serious infectious diseases like Hepatitis, Tuberculosis and Human Immunodeficiency Virus(HIV)/AIDS. The use of disposable items has reduced the rate of infection but at the same time has increased the volume of the waste which needs to be disposed of properly.

Hospital Waste is 15-20 percentage of the general waste. The problem arises when that 15-20% gets mixed with the balance 80% and the whole thing becomes BMW. Proper hospital planning and designing should be carried out to ensure correct waste disposal, which would not affect the persons.

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At the point of generation only proper segregation of waste should be carried out in various categories. Pre-treatment of waste through disinfection/sterilization is to be carried out to prevent the possible microbial contamination.

Secondary stoppage of pilferage of recyclables or poor scattering or discharge by animals is to be prevented. This is to be ensured by direct disposal of the BMW from the health care facility to the common BMW treatment facility. Making people aware, by motivation and training and use of correct procedures in separation of waste separation will improve the correct waste management systems in the HCFs.

Implementation post the notification of the new and stringent rules, require an attitudinal change, greater levels of awareness & knowledge. New things have been added like phasing out of plastic bags, improvement in the emission levels by including Dioxins & Furans, which are carcinogens, reduction in the levels of suspended particulate matter from 150 mg/ Nm^3 to 50 mg/ Nm^3. These are major steps for a country like India but still not as stringent as some developed countries.

With the new clause of not having any BMW treatment facility within each HCF if a common BMW Treatment facility exists within 75 kms, is a good step. This would lead to lesser environmental degradation in the vicinity of residential areas as majority hospitals are located close to residential areas.

Legislative aspect in relation to BMW

In our country various central legislation related to BMW management are existing:

- The water (prevention and control of pollution) Act, 1974.
- The Air (prevention and control of pollution) Act, 1981.
- The Environment (Protection) Act, 1986.

- The hazardous waste (management and handling) rules, 1998.
- The BMW (management and handling) rules, 1998.
- Municipal Solid waste (management and handling) rules, 2000.
- The BMW (Management and Handling) Rules Amendment, 2000 and 2003.
- The BMW (Management and Handling) Rules, 2011 [Draft].
- The BMW (Management and Handling) Rules, 2016.
- The BMW (Management and Handling) Rules Amendment, 2018

The BMW (Management and Handling) Rules, 1998

Govt of India, Ministry of Environment and Forests published, The BMW (Management and Handling) Rules, 1998. These rules gave a regulation for management of BMW generated in HCF. It also tried to implement these rules more effectively and to improve the collection, segregation, processing, treatment and disposal of these BMW and to ensure reduction of BMW generation and its impact on the area.

Salient points of BMW Management and Handling Rules, 2016 (Att as Annexure I)

1. All types of healthcare camps like vaccination/blood donation/surgical camps and any other activities related with healthcare.
2. Phasing out of use of chlorinated plastic bags, gloves and blood bags within two years.
3. On-site disinfection or sterilization and pre-treatment of wastes of laboratory and microbiological to be carried out as per WHO or NACO guidelines.
4. Regular training to be imparted to all its health care workers as well as their immunization.
5. A Bar-Code System to be established for bags or containers containing Bio-medical waste for disposal.

6. Report major accidents.

7. Proper retention time in secondary chamber of incinerators to be achieved in two years.

8. From 10 categories it is reduced to 4 categories for improvement in the segregation of waste at source.

9. Procedure to get authorization has been simplified. Automatic authorization for bedded hospitals. For Non-bedded HCFs only one-time authorisation.

10. For reduction in emission of pollutants very stringent standards for incinerator has been introduced.

11. Dioxin and furans emissions limits is included.

12. State Govt to provide land for setting up a common BMW treatment and disposal facility.

13. If `common BMW treatment facility is available within a distance of 75 kilometres, there is no requirement by the occupier to establish on-site treatment and disposal facility.

14. Timely collection of BMW and disposal facility should be provided by the occupier. Conduct of the training to be carried out.

15. Hepatitis B and Tetanus immunization to be carried out for all the staff handling of BMW.

Category of BMW

The Govt of India Ministry of Environment, Forest and Climate has classified BMW into four categories under **BMW Management and Handling Rules, 2016**. These categories are further divided into sub categories under type of waste i.e. Yellow, Red, White and Blue.

Definition of BMW Management

BMW is defined as any solid or liquid waste which may present a threat of infection to humans. It includes various wastes from human bodies containing disease causing agents and discarded sharps. Also included are the following:

Used absorbent materials saturated with blood, blood products, body fluids or excretions or secretions contaminated with visible blood. The materials which are saturated with blood or blood products as also various devices which are contaminated with blood, body fluids or secretions or excretions contaminated with blood. The main producers of BMW include all the HCF. The protection of hospital staff who are frequently exposed to BMW due to occupational hazard should be strictly ensured.

The BMW (Management and Handling) Rules Amendment, 2018 (Att as Annexure II)

Problems relating to BMW Management

Air, water and land pollution would be more prevalent if proper BMW management is not carried out. The pollutants could be biological or chemical. For proper BMW management there are various legislations and guidelines in India. The risk of impact of air and land pollution on health is given as under:

Air Pollution: - Air pollution can be created both by indoors and outdoors environment. Due to air pollution two types of BMW can be generated, namely-Biological and Chemical.

In-door air pollution: - Pathogens in the waste or spores can enter air easily and remain in the air for a long period of time. It can cause diseases like Sick Building Syndrome. Preventive measures can be done by proper segregation of waste, pre-treatment at source, sterilizing the rooms, proper building design and well-maintained air conditioners.

Out-door air pollution: - If BMW waste is transported without a pre-treatment, or if it is left in open areas, then pathogens can easily enter into the atmosphere. Open burning and incinerators are two major causes of chemical pollutants, which can cause outdoor air pollution. Open burning of BMW is the most harmful practice. Respiratory diseases occur if it is inhaled. Dioxins and furans are organic gases which are carcinogenic. It can be prevented by following the prescribed way·

Water Pollution: — liquid waste is generated and when it is left into sewers without proper treatment can cause water pollution. Due to water pollution the parameters such as Potential Hydrogen(pH), Biochemical Oxygen Demand (BOD), Co-occurring Disorders (COD) could be changed.

Land Pollution: - Improper treatment of infectious waste, discarded medicine, chemicals if mixed with soil causes soil pollution. In the waste if heavy metals like cadmium, lead, mercury etc are present, then they will be absorbed by the plants and would enter human body by food chain. The other pollutants are nitrates and phosphates which are present in landfills.

CHAPTER III

RATIONALE OF THE STUDY

BMW management has been in focus in India since 1998. Prior to 1998, there was no separate formal notification of BMW Management rules in India. It was only in 1998 that the Union Ministry of Environment and Forests under the provision of Environment (Protection) Act, 1986 published the BMW (Management and Handling) rules.

The rationale for the study to be undertaken was warranted by the introduction of the Bio Medical Waste Management and Handling Rules, 2016, which has brought about significant change to the guidelines of handling and disposal of BMW in India.

The previous BMW (Management and Handling) rules, 1998 (as amended in 2011), was notified by the erstwhile Union Ministry of Environment & Forests. In 2014, the Union Ministry has been renamed to include Climate Change. The Ministry now actively monitors the factors polluting the Environment which adversely affects the climate and also undertakes remedial measures by means of passing strict legislation & its enforcement.

The Union Ministry of Environment, Forests & Climate Change has been highly proactive and in keeping in tune with WHO/International standards notified the BMW Management and Handling Rules 2016, which was very much required and is a step in the right direction.

Improper and incorrect management and handling of BMW would create a difficult public health consequence and a great effect on the environment. Environment pollution and emergence of vectors would occur due to incorrect segregation and improper method of waste disposal, which may take its toll on population by transmission of diseases like typhoid, cholera, hepatitis , etc. Poor infection control practices and improper waste management would lead to nosocomial infections in patients. There is risk of infection to persons outside hospital as well as common population living near the hospitals if proper BMW management is not carried out.

For ensuring the proper management and handling of the BMW, the Government of India has provided a regulatory framework as BMW Management and Handling Rules 2016.

This study of "**Quality Assurance in Bio-Medical Waste Management in Medanta-The Medicity** is an attempt to find out the gaps in the implementation of the BMW [Management and Handling) Rules, 2016 & its Amendment in 2018 in the Hospitals so that this study will provide valuable information and opportunity to improve current practices of BMW management.

Need of BMW Management in hospitals

To prevent infection to patients and staff of the hospitals there is great requirement of management of hospitals waste which are as under:

- Prevention of injuries from sharps which may lead to infection.
- To avoid nosocomial infections in patients.
- To prevent risk of infection outside hospital.
- To avoid risk associated with hazardous chemicals, drugs to persons handling wastes at all levels.
- Strict check on disposed off drugs being repacked and sold to buyers.
- Avoidance of risk by stricter measures due to defective incineration emissions and ash.

People at risk

The doctors, hospital staff, support and utility staff including house-keeping staff, disposal staff, patients and visitors as well as people staying nearby hospitals are the people under risk.

Impact of Infectious Agents on Human Health and Environment

The environment including human beings are badly affected due to improper disposal of BMW generated during the patient care. This waste is a very important health risk to the

hospital staff as well as other people. It is a matter of great concern that proper treatment and disposal of BMW should be carried out so that infections do not occur to common healthy people.

Impacts of infectious waste and sharps

Due care has to be taken to avoid disease occurring due to BMW. Out of 40 pathogens which transmit disease by BMW, the 3 main pathogens are Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV). It is pertinent that extreme care is exercised while handling and disposing it. Due to sharp injuries, in 2000, approximately 66000 hepatitis B (HBV), 16000 hepatitis C (HCV) and 200–5000 HIV infections occurred to hospital staff. It is estimated that every year, due to sharps more than two million hospital staff are exposed to percutaneous injuries.

Due to reuse of injection in 2009, 240 persons lost their lives who got hepatitis B in Gujarat. Black market was found out where used needles and syringes were repackaged and resold.

Impacts of chemical and pharmaceutical waste

Though there is no evidence of illnesses among the population due to chemical or pharmaceutical waste from hospitals. However, excreted pharmaceuticals from patients do find their way into waterways, which may contribute disease. The wildlife may be affected and it may create antibiotic resistance in bacteria.

BMW management has been emerged as a major issue of concern among hospital, health care workers and authorities. It is well understood fact that hospital waste can cause many adverse effects to environment and human due to waste generated during patient care. The problems related to disposal of waste in health care facilities is a risk and is a humanitarian topic worldwide.

CHAPTER IV

REVIEW OF LITERATURE

1. A case study to review compliance to BMW management rules in a tertiary care hospital by Dipika Shrestha*, Seema Bansode Gokhe, Anurag Dhoundiyal, Prashant Bothe published in International Journal of Community Medicine and Public Health | February 2017|Vol 4 | Issue 2

An observational study was carried out in an 1800 bedded Tertiary care hospital in a metropolitan city of Mumbai. Sampling method used was complete enumeration method to select the study sites. A total of 64 sites were observed for compliance to BMW handling and management rules with help of a validated checklist.

Hospital waste is an important hazardous waste which comes after Radio-active waste. Proper handling, treatment and disposal of BMW is essential as they may cause serious infectious diseases like Hepatitis, Tuberculosis and Human Immunodeficiency Virus(HIV)/AIDS. The use of disposable items has reduced the rate of infection but at the same time has increased the volume of the waste which needs to be disposed of properly.

Hospital Waste is 15-20 percentage of the general waste. The problem arises when that 15-20% gets mixed with the balance 80% and the whole thing becomes BMW. Proper hospital planning and designing should be carried out to ensure correct waste disposal, which would not affect the persons.

2. Biomedical waste management in India: Critical appraisal by Priya Datta, Gursimran Kaur Mohi, Jagdish Chander published in Journal of Laboratory Physicians - Volume 10, Issue 1, January-March 2018

One of the biggest challenges the government hospitals and small HCFs will face, during the implementation of BMW 2016 rules will be due to the lack of funds. To phase out chlorinated plastic bags, gloves, blood bags and to establish a bar code system for

bags/containers the cost will be high and time span for doing this i.e. two years is too short.

Currently, in India, there are 198 Common Bio Medical Waste Treatment Facility (CBMWTF) in operation and 28 are under construction. There is a great need for rapid development of many more CBMWTF to fulfil the need of treatment and disposal of all BMW generated in India. Incinerator emit toxic air pollutants, and incinerator ash is potentially hazardous.

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3. **Management of BMW Waste in Himachal Pradesh: A Case Study of Indira Gandhi Medical College and Hospital, Shimla,** HP, India by Ravinder ST published in. Environ Sci Ind J. 2017;13(4):146

The hospital wastes get segregated at source of production. These wastes undergo stages of waste management before final disposal. The procedure was in place as per BMW Management and Handling Rules 2016. Awareness of the staff in relation to waste handling policies can be enhanced.

Due to use of outstation staff who are changed regularly some mistakes were noticed while collection, segregation and packing of wastes. Wrong colour coded bins were used and non-infectious waste was mixed with infectious waste.

All the staff were in agreement of correct procedure of BMW guidelines. The instructions were followed carefully. There is a requirement of more allocation of resources for BMW management procedures.

4. **Assessment of knowledge and practice of BMW management among health care personnel in a rural tertiary care hospital of Darjeeling District, West Bengal, India** by Rishav Bakshi, Nilanjana Ghosh, Risheen Mukherjee, Sumanta Chakraborty published in Journal of Comprehensive Health, Volume 6, Issue 1, January 2018.BMW management remains an important but a neglected issue in few health sectors, especially if located in remote settings. Trainings were insufficient and they often lacked clarity regarding the segregation and waste categorization. The health care personnel were reluctant to follow the guidelines and were unaware of the occupational hazards and its toxic potential. The present study findings are in agreement with other study where huge gaps were identified regarding the knowledge of the colour coding of bags and bins and their skill in appropriate waste disposal. Waste segregation at source was lacking in most of the cases as reflected by present study as well. Reasons ascertained however varied as majority of health care personnel in other places cited that lack of designated people for BMW management at workplace led to the non-compliance of guidelines. Though monitoring officers were present and they had received training, fear of handling wastes and lack of proper handouts and charts in the wards led to inappropriate disposal. Workload was another issue as cited by our present study as well. Similar to present study, other studies revealed that emphasis on good quality training of health care personnel working in hospital at regular time interval would help in improvement of the situation further.

The study concludes that infrastructural support needed for appropriate BMW disposal is inadequate in North Bengal Medical College & Hospital. Knowledge & practice regarding concerning issues varies among different personnel depending on their working status and other factors. Inadequate practice and inability to comply with the guidelines occurs in few cases and the reasons elicited were increased workload, improper training, lack of com-

munication and other logistic constraints. Administrative support in the due matter, workshops and trainings organised on a regular basis, awareness generation, finding solutions for the identified gaps in BMW management may help the situation further.

5. **BMW Management In Different Hospitals of Guwahati And Its Effect On Environment** by Arabinda Changmai*, Tofiqul Islam, Dibarlan Nongsiang, Manoj Kumar Deka, Bhargab Jyoti Saharia, Ananta Choudhury, Biplab Kumar Dey A published in Journal of Applied Pharmaceutical Research Volume 6, Issue 1, Year of Publication 2018. Based on the survey, it was found that most of the hospitals store and segregate the BMW without using incinerator. Autoclave is done only by 46% of hospitals. As there is only segregation process and storage are done in most of the hospitals so there is a chance of causing infection from the waste if they are not properly stored or if the waste is kept for a longer period.

Mostly, the medical wastes are incinerated emitting toxic air pollutants & ash residues. This in turn gives rise to high level of dioxins in the environment. The toxic ash residues sent to landfills for disposal used to percolate to groundwater and thereby resulting in polluting it.

Though there are various laws, standards, rules and regulations prescribed for medical waste management but there is still a lack of compliance of medical waste management rules and regulations in the practical field.

As the segregation of waste at the time of generation is not done properly or efficiently this leads to the risk of infections to the patients as well as for the other people and staff in the hospital premises and environment also. The waste disposal bins are sometimes kept near to the waiting areas in the hospital due to which there is a high risk to the people who visited in the hospital or worked in the hospital of getting infected from diseases.

6. Hospital waste is an important hazardous waste which comes after Radio-active waste. Proper handling, treatment and disposal of BMW is essential as they may cause serious infectious diseases like Hepatitis, Tuberculosis and Human Immunodeficiency Vi-

rus(HIV)/AIDS. The use of disposable items has reduced the rate of infection but at the same time has increased the volume of the waste which needs to be disposed of properly. Hospital Waste is 15-20 percentage of the general waste. The problem arises when that 15-20% gets mixed with the balance 80% and the whole thing becomes BMW. Proper hospital planning and designing should be carried out to ensure correct waste disposal, which would not affect the persons.

8. **A study conducted on knowledge attitude and practices about biomedical waste management among nursing professionals in Srinagar revealed that** knowledge regarding biomedical waste, transmission of diseases was good (70%). Attitude of the nurses towards segregation of infections and non-infections waste was positive with 80% in favour of implementation. The practice of low reporting of injuries due to sharps was low possibly due to lack of awareness about formal system of injury reporting. The study recommended regular training and awareness generation activities among nursing staff needs to be held to increase knowledge, attitude and practices.

CHAPTER V

METHODOLOGY OF STUDY

Operational Definitions

Knowledge: In this study it refers to the ability of the nurses to respond correctly to the knowledge questionnaire and observation checklist regarding biomedical waste management.

Practice: In this study it refers to activity performed by nurses on biomedical waste management evaluated through an observation checklist.

Biomedical waste management: In this study it refers to systematic and scientific way of managing the health care waste through a step-by-step process such as collection, segregation, storage, transportation and disposal.

Nurses: The registered & certified nurses who have undergone a training of scheduled period prescribed by accrediting body.

Housekeeping staff : Housekeeping personnel's involved in Bio Medical Waste Management handling and disposal

Biomedical waste: Is any solid, liquid or fluid waste generated during diagnosis and treatment in the selected health care settings.

Statement of the Problem

A study of "Quality Assurance in Bio-Medical Waste Management in Medanta-The Medicity, Gurugram, Haryana".

Research Questions

1. What is the existing practices of BMW management among nursing and administrative staff in Medanta-The Medicity?
2. What is the level of compliance of BMW Management Rules 2016 in Medanta-The Medicity?
3. What should be the measures for the improvement of BMW management in Medanta-The Medicity?

Research Objective

General Objective

To assess "Quality Assurance in Bio-Medical Waste Management in Medanta, The Medicity, Gurugram, Haryana"

Specific Objectives

- To ascertain the existing knowledge, attitude and practices of BMW management among nursing and administrative staff in Medanta-The Medicity
- To find the extent to which this BMW management is in compliance with BMW Management and Handling Rules 2016.
- To suggest measures for the improvement of BMW management in Medanta-The Medicity.

Delimitations/other factors of the Study

(a) The sample size is restricted due to administrative constraints.

(b) The study is limited only to the nurses and housekeeping staff working at Medanta-The Medicity, Gurugram.

(c) The study limited to specific hospital limits the generalisation.

(d) During assessment phase the factors influencing knowledge and practice of nurses and administrative staff regarding BMW management was assessed as demographic variables such as age, sex, education and qualification, area of work, year of experience and the background knowledge and practice by them in BMW management were also assessed.

(e) Due content from the hospital HR wing as well as the nursing director Medanta-The Medicity hospital was obtained in order to carry out the study.

Methodology

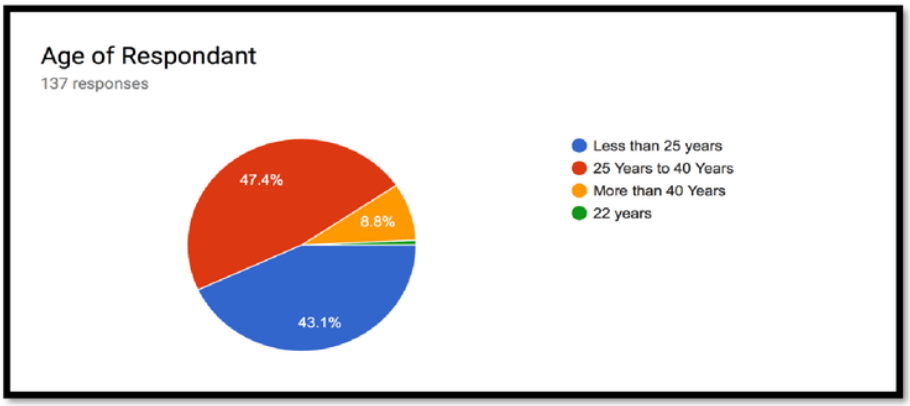
Study area	-	Medanta-The Medicity, Gurgaon
Study design	-	Cross Sectional and Descriptive study.
Study population	-	1200 Nursing staff & 14 Administrative staff supervisors.
Study sample	-	Total of 130 Nursing staff and 7 Administrative Supervisors were observed
Study sampling	-	Non probability Convenient Sampling.
Data collection tool	-	Structured Questionnaire and Checklist.**(Annexure III & IV)**
Data collection Technique	-	Interview and observation.
Type of data	-	Primary Data
Study period	-	Four months i.e. 16 Feb 2019 to 16 June 2019.

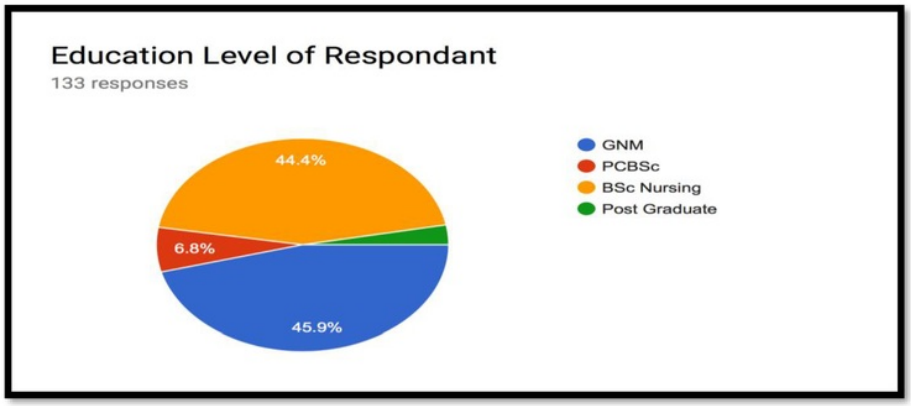
CHAPTER VI

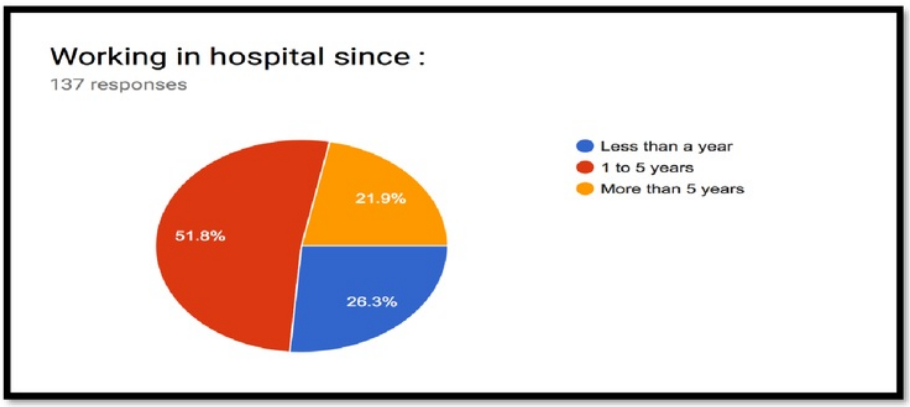
FINDINGS BY QUESTIONNAIRE: BMW MANAGEMENT IN MEDANTA-THE MEDICITY, GURUGRAM

The sampled staff was put through a series of 26 questions for testing their Knowledge, Attitude and Practice in all the aspects related to BMW Management. The analysis of answers is being carried out to judge the staff's compatibility with BMW Management Rules.

Section – I : It comprised Questions in order to collect the Socio demographic data under which the aspects ascertained were the age , education qualification and the working experience in the hospital. The response received is as under:-

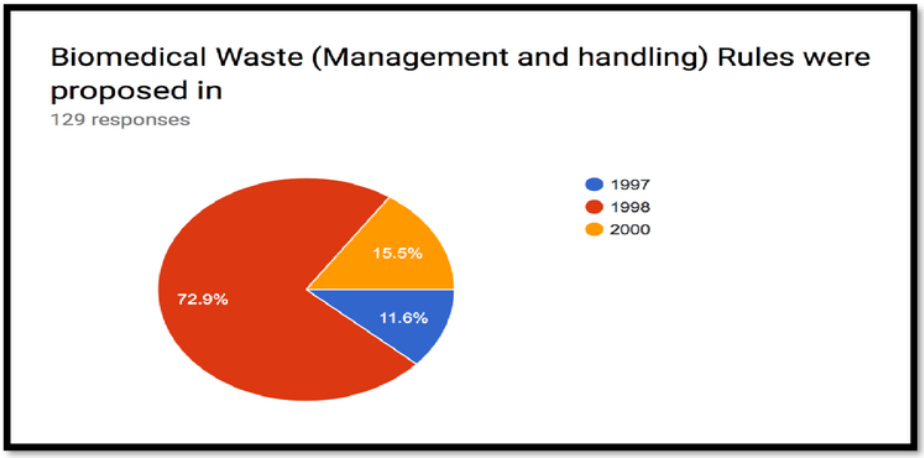


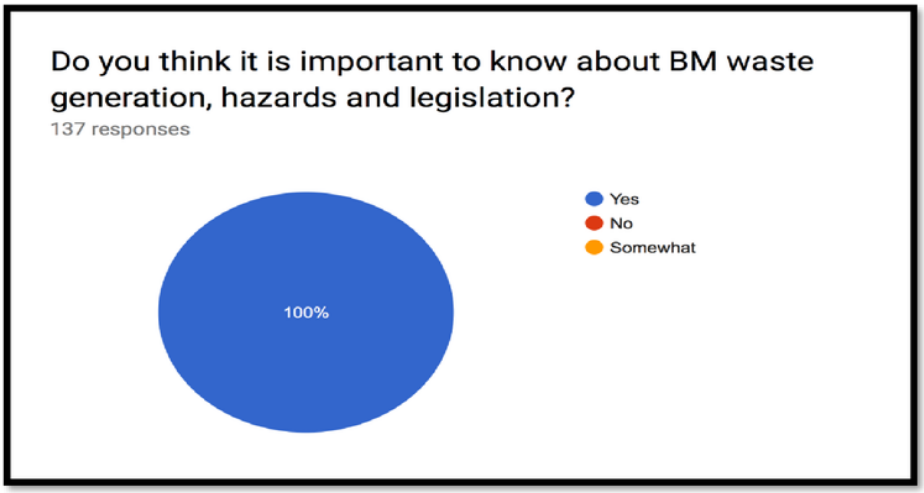


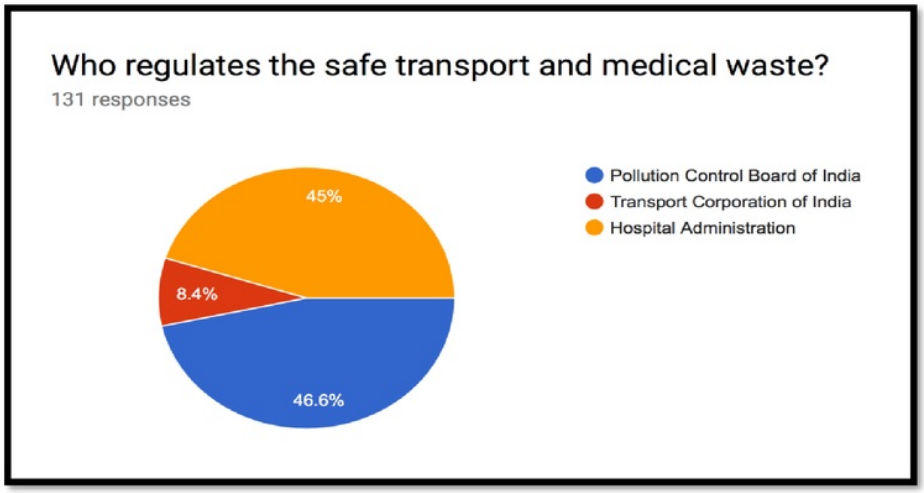


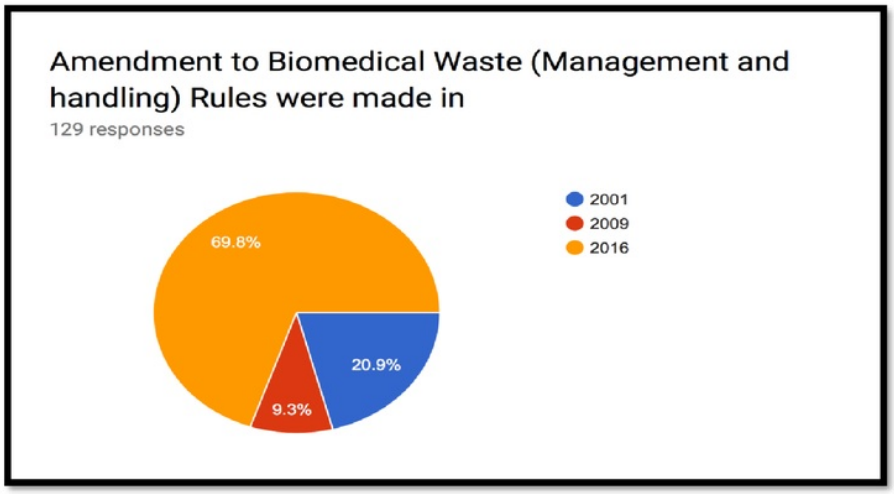
- From the above response it's clearly visible that the maximum age of respondent falls in the category of 25 to 40 years of age group i.e. 47% , it is followed by the 43% respondent from the age group category of below 25 years age.
- In the Level of education maximum nurses i.e. 46% were seen to with basic nursing Degree followed by 44% with BSc level of education.
- Work experience of 52% of the nursing and administrative supervisors is of less then 5 years but the point that merit attention is that that around 26% of the sample are with the experience of less than a year.

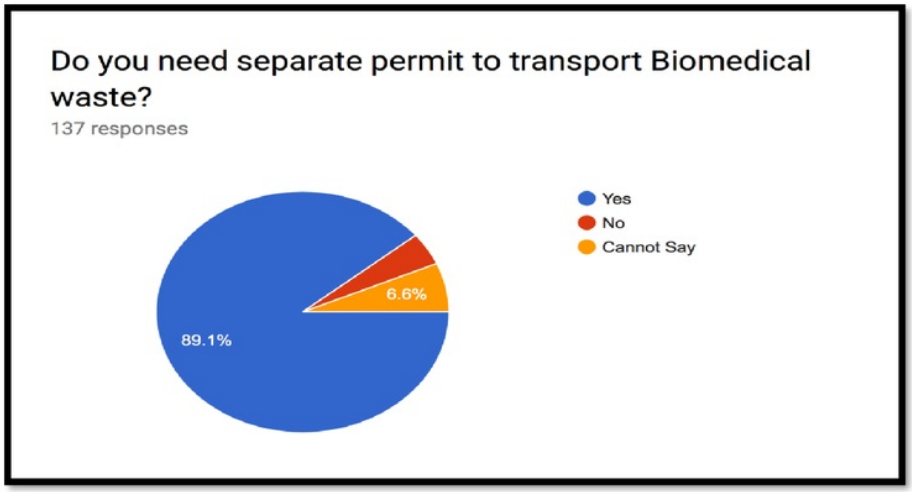
Section II: This was the section which was designed to assess the Knowledge on biomedical (BM) waste generation, hazards and legislation aspects. It comprised of total 08 questions and the details are as under:

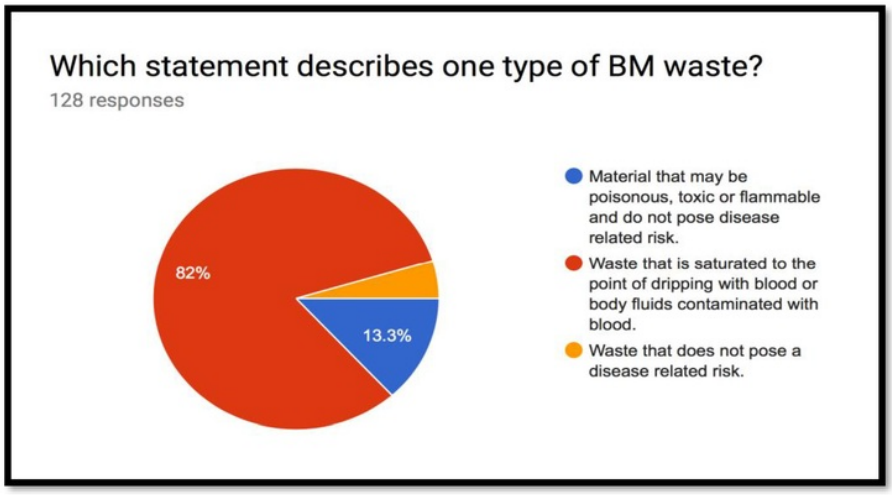


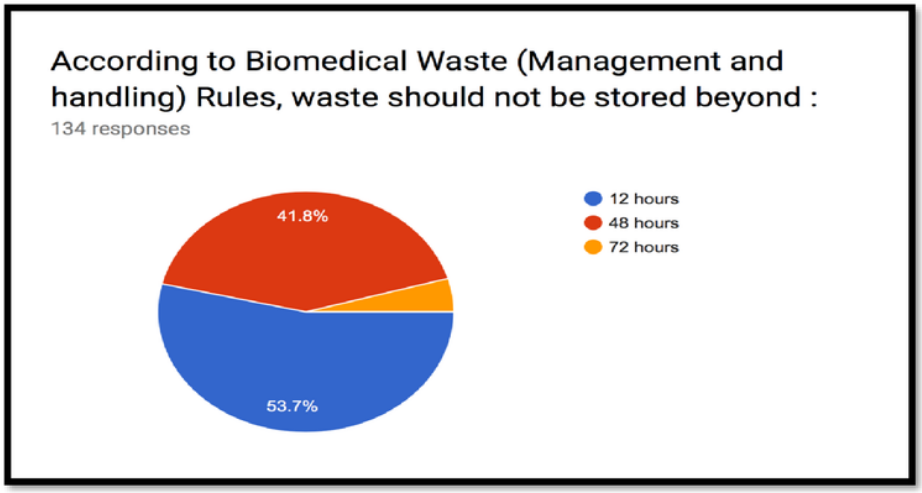



Who regulates the safe transport and medical waste?
131 responses
45%
8.4%
46.6%
Pollution Control Board of India
Transport Corporation of India
Hospital Administration


Amendment to Biomedical Waste (Management and handling) Rules were made in
129 responses
69.8%
20.9%
9.3%
2001
2009
2016

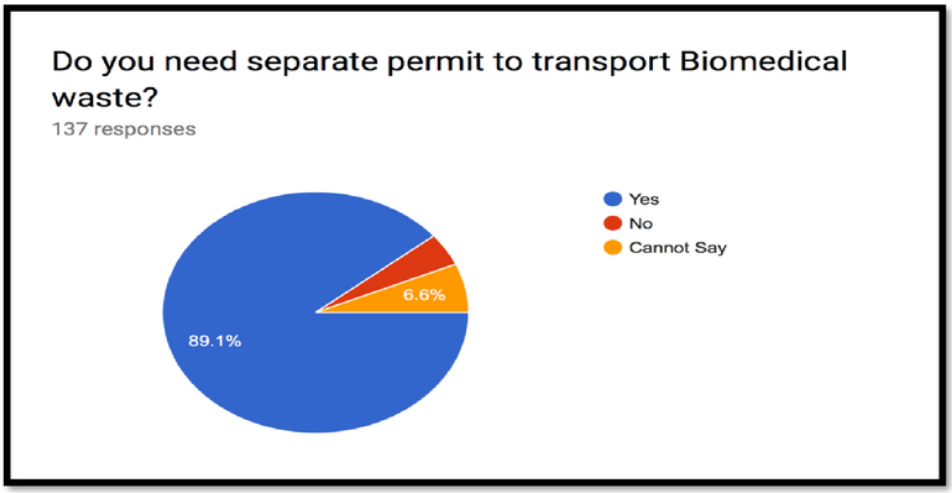

Do you need separate permit to transport Biomedical waste?
137 responses
Yes
No
Cannot Say
6.6%
89.1%

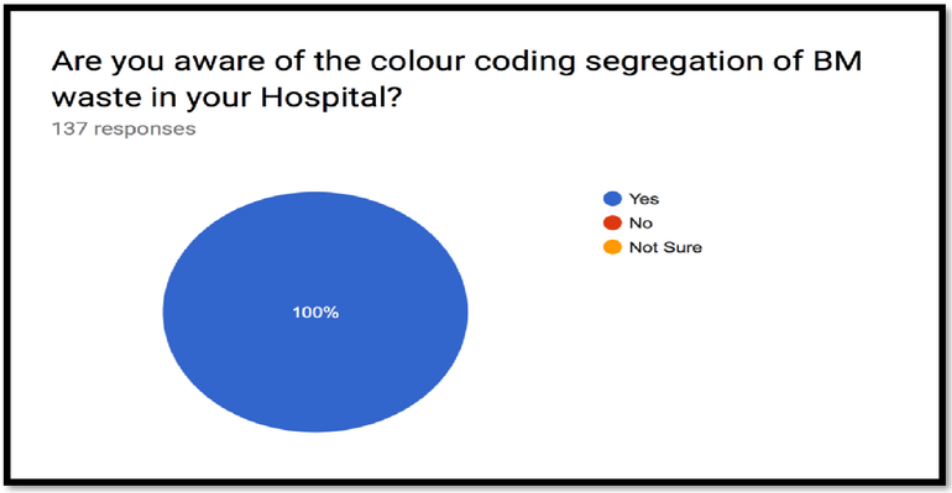

Which statement describes one type of BM waste?
128 responses
Material that may be poisonous, toxic or flammable and do not pose disease related risk.
Waste that is saturated to the point of dripping with blood or body fluids contaminated with blood.
Waste that does not pose a disease related risk.
82%
13.3%

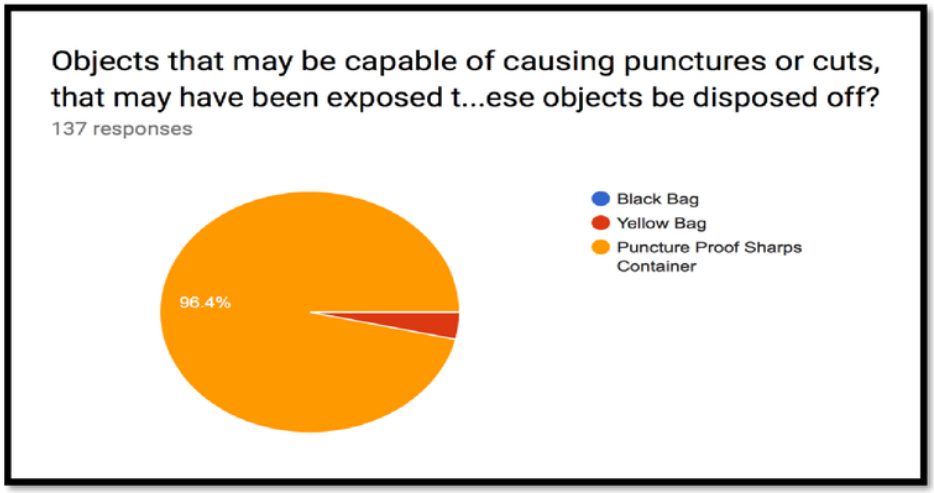


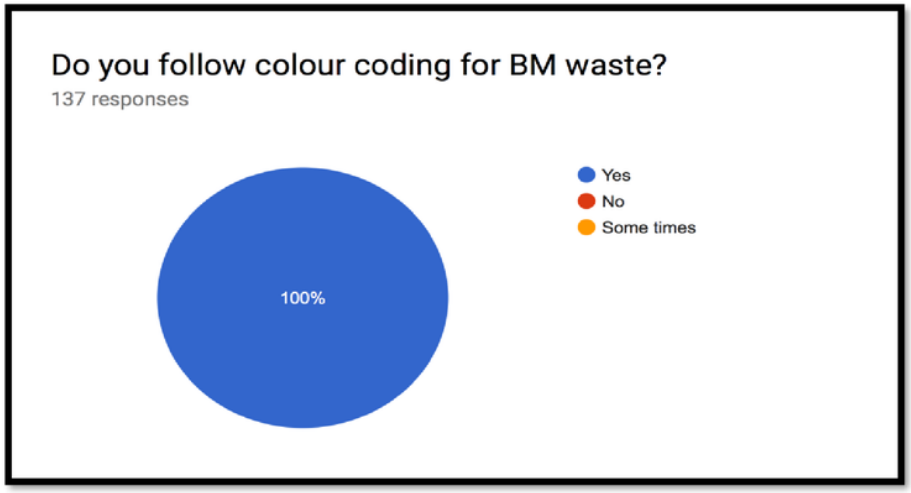
So based on the responses as received from the respondents on the knowledge aspects it can be ascertained that 65% of them have good amount of knowledge and understanding on the aspects pertaining to the BMW management issues..

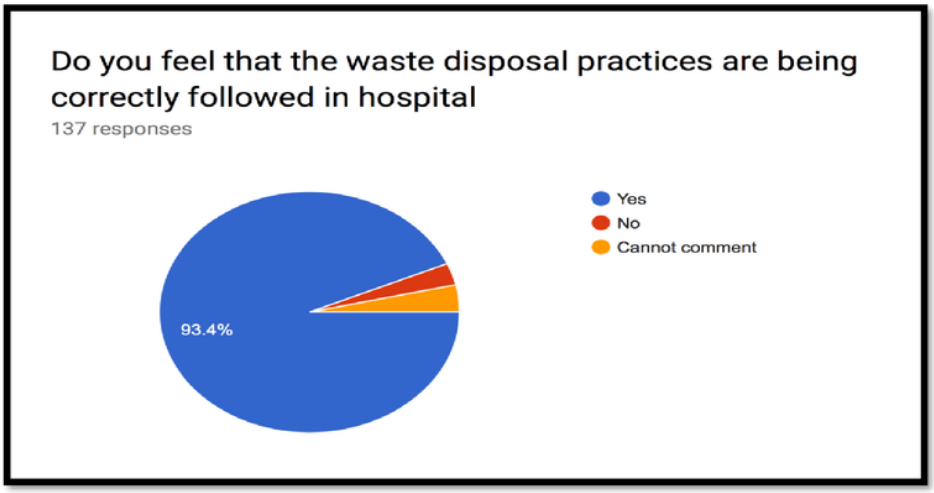
Section III: Total of 08 questions have been so as to assess the Level of awareness on biomedical waste management practice among the respondents.

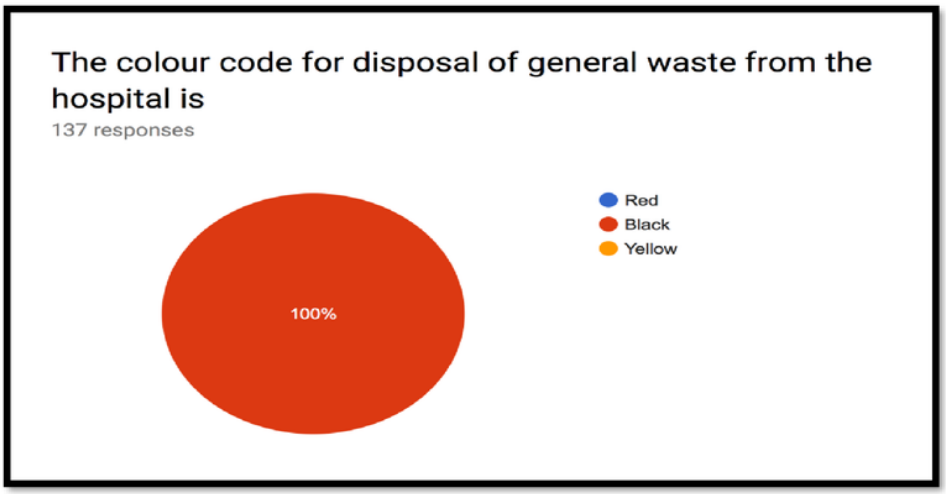


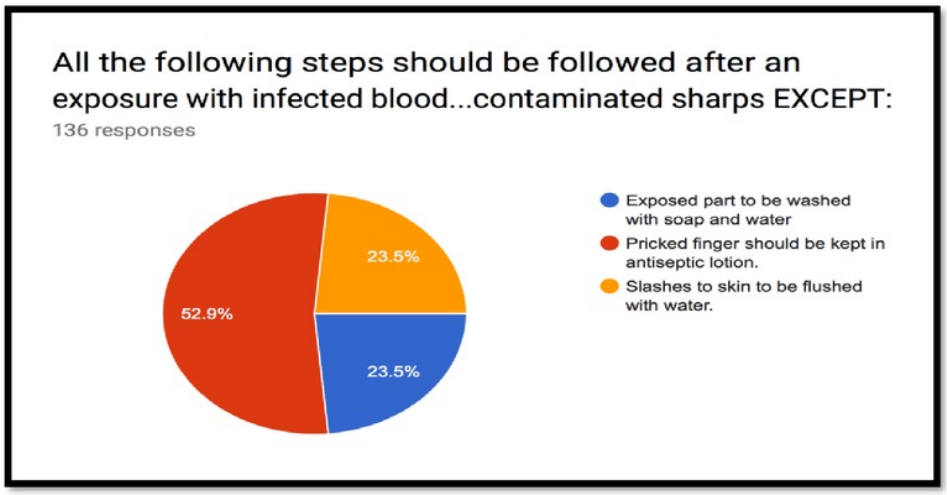


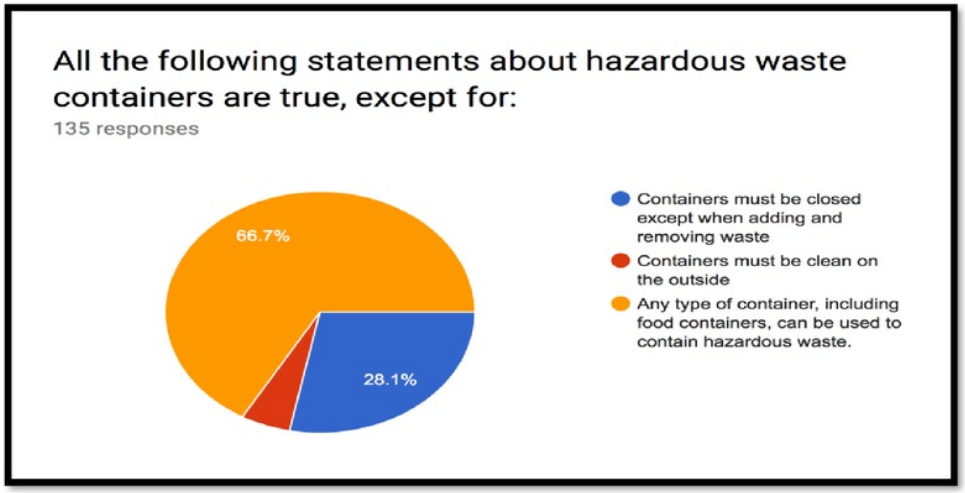

Objects that may be capable of causing punctures or cuts, that may have been exposed t...ese objects be disposed off?
137 responses
96.4%
Black Bag
Yellow Bag
Puncture Proof Sharps Container

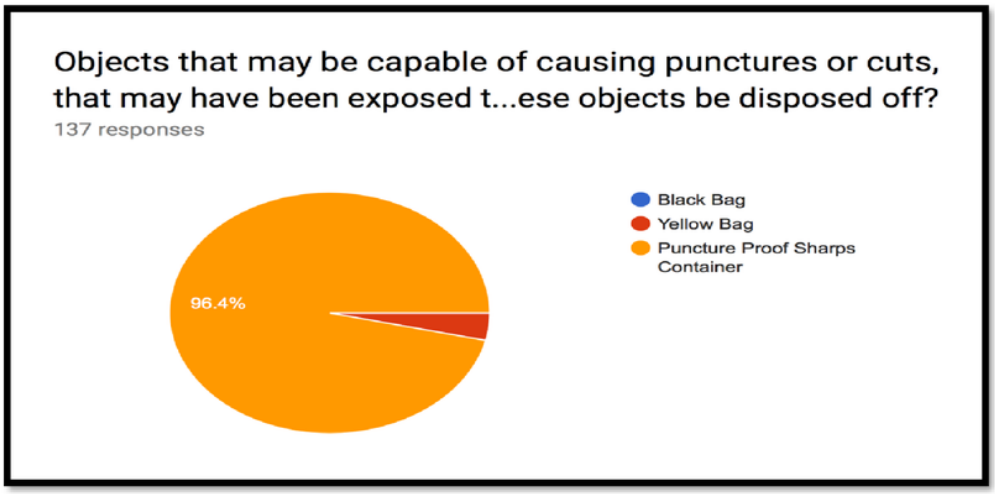

Do you follow colour coding for BM waste?
137 responses
100%
Yes
No
Some times


Do you feel that the waste disposal practices are being correctly followed in hospital
137 responses
93.4%
Yes
No
Cannot comment


The colour code for disposal of general waste from the hospital is
137 responses
100%
Red
Black
Yellow

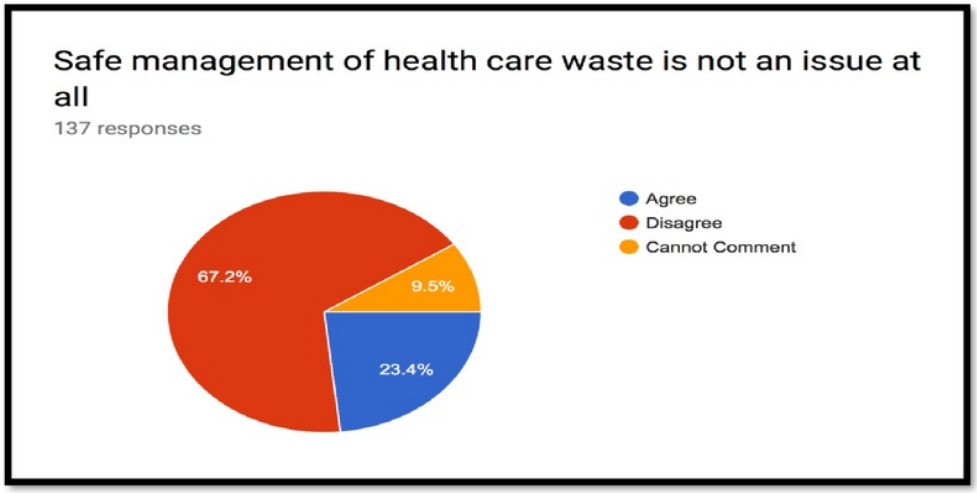

All the following steps should be followed after an exposure with infected blood...contaminated sharps EXCEPT:
136 responses
23.5%
52.9%
23.5%
Exposed part to be washed with soap and water
Pricked finger should be kept in antiseptic lotion.
Slashes to skin to be flushed with water.

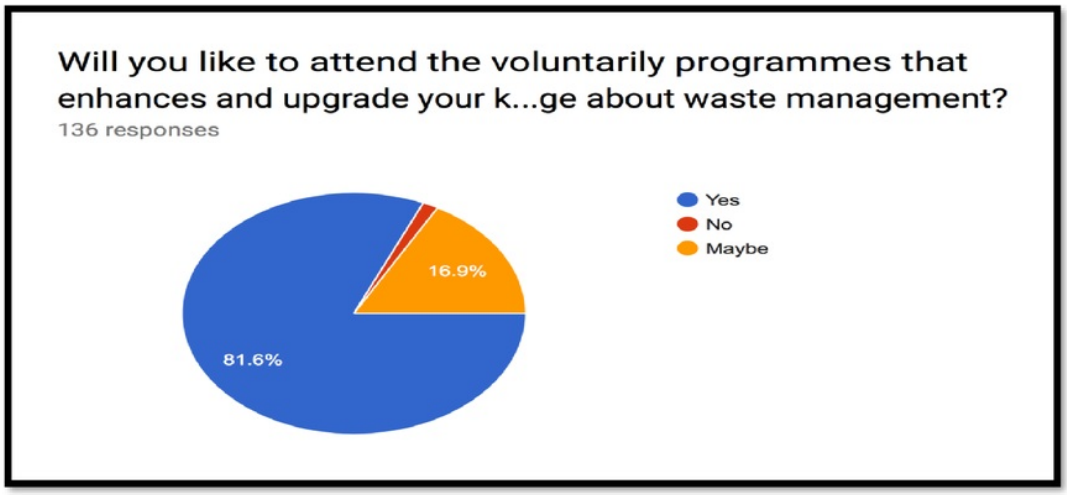

All the following statements about hazardous waste containers are true, except for:
135 responses
66.7%
28.1%
Containers must be closed except when adding and removing waste
Containers must be clean on the outside
Any type of container, including food containers, can be used to contain hazardous waste.

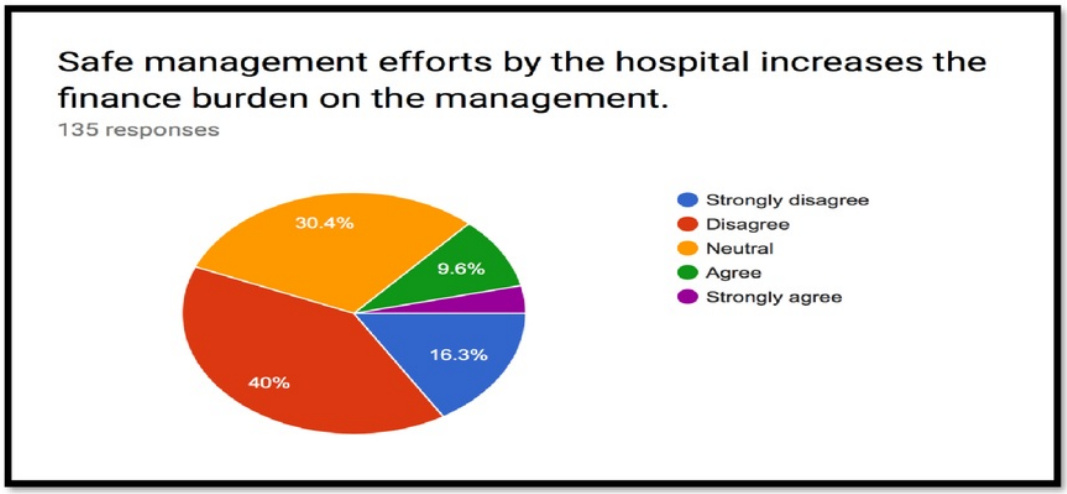


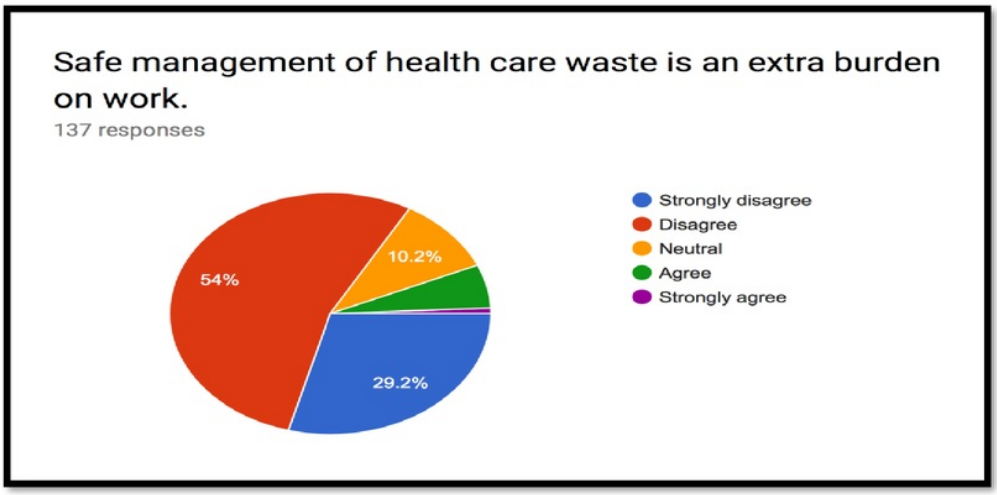
From the above responses as received from the respondents it can be made out that 87% of the staff follows the practices related to the BMW management in the hospital.

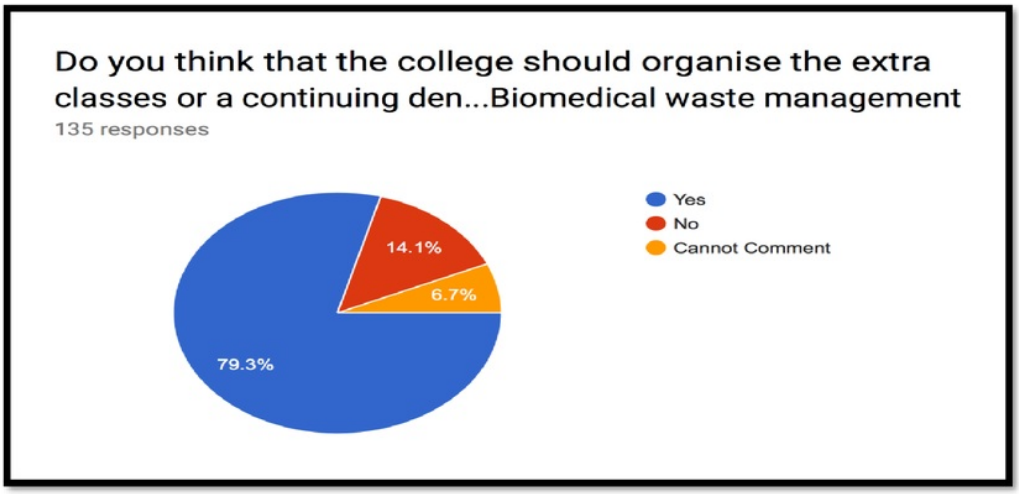
Section IV: The total of 07 questions were asked from the respondents in order to ascertain the Attitude/behaviour towards biomedical waste management.

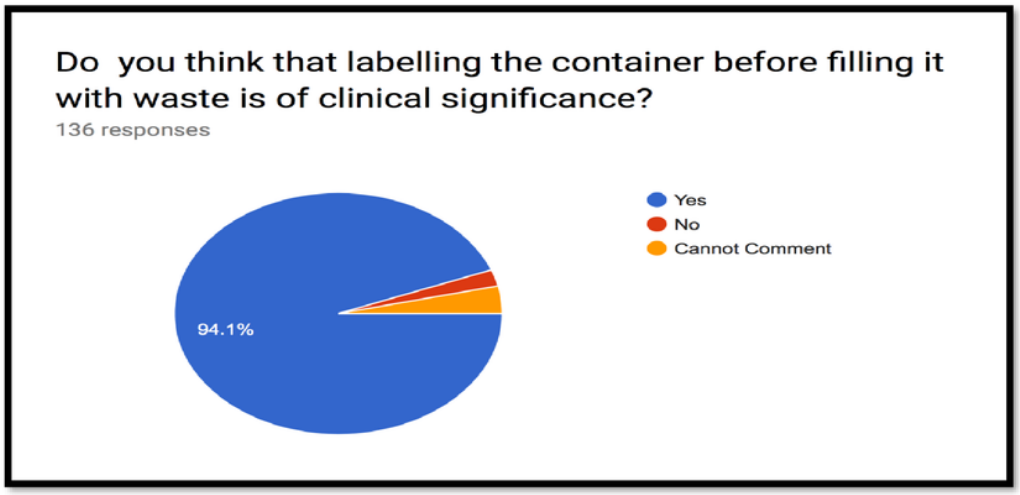


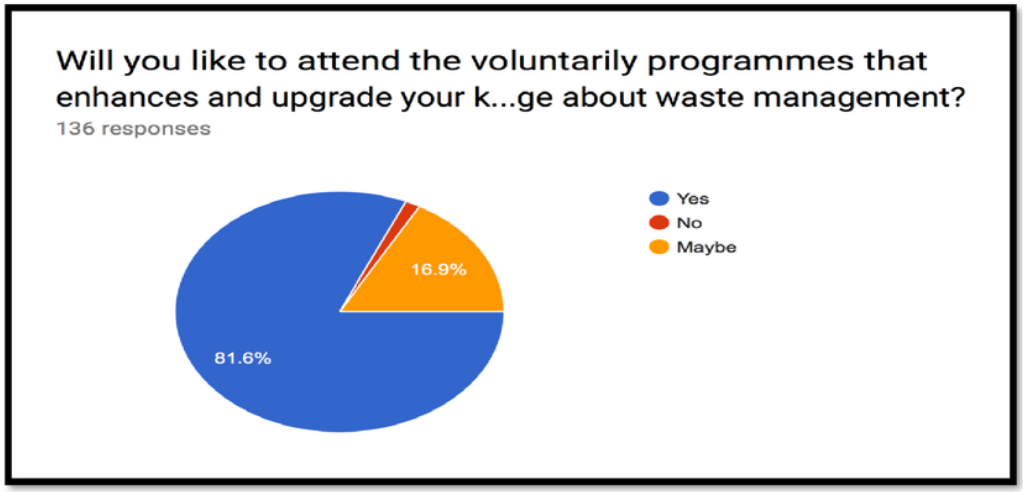

Will you like to attend the voluntarily programmes that enhances and upgrade your k...ge about waste management?
136 responses
Yes
No
Maybe
16.9%
81.6%


Safe management efforts by the hospital increases the finance burden on the management.
135 responses
Strongly disagree
Disagree
Neutral
Agree
Strongly agree
30.4%
9.6%
16.3%
40%


Safe management of health care waste is an extra burden on work.
137 responses
54%
10.2%
29.2%
Strongly disagree
Disagree
Neutral
Agree
Strongly agree


Do you think that the college should organise the extra classes or a continuing den...Biomedical waste management
135 responses
14.1%
6.7%
79.3%
Yes
No
Cannot Comment





From the 07 question's response it shows 61% of the staff involved has good attitude/awareness towards the issues related to BMW management in the hospital.

CHAPTER VII

FINDINGS BY OBSERVATION ON BMW MANAGEMENT IN MEDANTA - THE MEDICITY, GURUGRAM

As per the policy on BMW management Rules which was promulgated in the year 2016 various measures were asked to be incorporated in the management procedure in order to facilitate the correct disposal of the waste produced in the hospitals. In order to assess the compliance of BMW practices a checklist for the same was formed based on the guidelines provided in BMW Rules 2016 and the Kayakalp. Following were the observations made during the conduct of study:

(a) **Bio Medical Waste Management implementation** - Housekeeping department services, also called as Environmental Services is responsible for providing safe, clean, pleasant, orderly and functional environment for both the patients and the hospital personals. Therefore, it is very much important that the hospital waste are properly collected, segregated, stored, transported, treated and disposed of in safe manner to prevent hospital acquired infection. Therefore, in order to ensure the same Medanta has set the guidelines to handle Bio-medical waste. (**Attached as Annexure V**) in accordance with the BMW Management Rules, 2016.

The objectives of the policy are as under:

(i) Empowering of Staff members in BMW management through knowledge & training.

(ii) Defining various categories of waste being generated in the hospital

(iii) Segregation and collection of waste in separate containers.

(iv) Identifying and using proper treatment technology for waste treatment.

(v) Creating system where all categories of personnel are accountable for proper waste management

(vi) Proper transportation of BMW to central collection area health Care Facilities (HCFs) before such waste is collected by Common Bio-medical Waste Treatment Facility (CBWTF).

(b) **Segregation of general waste** 85% of the hospital waste belongs to this category and the same is collected in the light blue colour container. Patents and all the persons related to their relatives are briefed on the disposal aspect of general waste generated. It is handed over though the supply chain management to the contracted vendor every day and presently the contract has been given to Anand Enterprises for the same.

(c). **Segregation of bio medical waste.** - Segregation of the waste is responsibility of the generator i.e. doctors, nurses, technicians etc at all patient care activity area, diagnostic service area, operation theatre, treatment rooms and IPD and OPD areas , etc. For disposal or the different types of waste labeled colour coded plastic bags have been positioned in the premises of the hospital. It has been observed that the charts and material with respect to correct segregation of waste has been placed in the hospital. Chart and photos of Bins/Containers used is **Attached as Annexure VI**. The nursing staff are the key persons responsible for segregation of waste stick supervision is being maintained by the senior Nursing ward incharges.

(d). **Collection of bio medical waste**- Collection of the BMW is done by assigned housekeeping staff in colour coded blue/red/yellow bins and there are nearly 470 collection points established in the hospital for the same and the record for the area wise collection is maintained (**Attached as Annexure VII)** It is the responsibility of the Housekeeping staff to ensure the waste bags are tightly sealed when they are three quarters full. Sealed sharp containers are disposed separately in blue bags after dipping it in Sodium Chloride for half and hour before being given to the authorised contractor. Some salient points that are emphasised during collection and transportation are as under:

(i) Dedicated storage facility is available for BMW. It has to be ensured that storage facility is secured against pilferage, reach of animal/rodents and to be locked when not in use. Everyday waste storage place is cleaned and the record of the same is maintained(Photos and cleaning record documents **Attached as Annexure VIII**).

(ii) Separate trolley is used to collect Biomedical waste and it is ensured that it has no leakage or spillage while transporting.

(iii) Waste is collected three times daily from the collection points established in the hospital and thereafter moved to central storage site.

(iv) All bags are labeled with the details of their point of production and date.

(v) Bags and containers are replaced immediately with new once of same type. (**Photos att as Exhibit 1**)

(vi) Handling, collection and transportation is based on the guidelines issued by Haryana State Pollution Control Board.

(vii) Separate time slot for transportation of BMW and general waste is ensured to avoid mixing.

(viii) Biomedical waste is collected twice daily except on Independence Day, Republic day and on Holi when it is done once.

(ix) It is ensured that the contained are issued as well as stocked in sufficient quantity so as to ensure its availability.

(x) It is ensured that no waste to be kept for more than 48 hours.

(xi) The disposal of waste is outsourced to the company named Biotic Waste Solution, and the same is done as per BMW Management and Handling Rules 2016. Renewal of Agreement with Biotic Waste Solution is attached as (**Attached as Annexure IX**). Form III for Authorisation from Haryana Pollution Control Board is attached as (**Attached as Annexure X)**

(e) **Phase out chlorinated plastic bags**. Earlier the plastic bags used were of less than 40 microns but since 2017 non chlorinated plastic bags of more than 50 microns have been introduced.

(f) It has been observed that hospital do not have on-site treatment and disposal facility. In addition, no incineration is being done within the premises of the hospital.

(g) Pre-treatment of the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilization on-site in the manner as prescribed by WHO or NACO. Under this the proper record of autoclaving is being maintained.(**Attached as Annexure XI**) Laboratory samples, body fluids, secretions in suction apparatus, blood and other exudates in OT and Dressing room are treated with sodium hypochlorite solution before disposal into effluent treatment plant and then runoff is drained into the municipal drain.

(g) **Training to all health care workers and immunize all health workers regularly**.

The Managers are responsible to conduct weekly training for all the supervisors who interns conducts the classes of Facility staff every week so as to educate them on BMW aspects. (Attendance sheet and training program **Attached as Annexure XII**). Special emphasis is given on the Newly recruited staff for whom the induction training is organised by the mangers/supervisor initially and thereafter they are trained under the respective floor supervisor. In order to facilitate the written instructions are provided with respect to handling, storing and transportation of waste.

(h) I**mmunize all health workers** Its is ensured that all the administrative involved in segregation, transportation and storage are fully immunised and proper record of the same is maintained. (**Attached as Annexure XIII**) The yearly health checkup of housekeeping staff as well as the Nursing staff is closely monitored. It is ensured that the staff is fully immunized with Tetanus and Hepatitis B vaccination.

(h) **Establish a Bar-Code System and GPS** - The bar code system has been implemented in 2018 under which each bag can be tracked from its source to destination and in-between and it also facilitates to identify each bag uniquely, its current location, date/time of movement, facility where treated and so-forth. However, the hospital also maintains record for all types of waste generated and the quantity handed over to the contractor (**Attached as Annexure XIV**) . the details of the waste handed over is also loaded on the hospital website on the monthly basis. The responsibility for installation of GPS is of the contractor and the same has been installed in all the vehicles.

(j) **Use of Personal Protective Equipment** - It has been issued to all the persons responsible for handling the waste. Details of the kit being provided is **Attached as Annexure XV**. All staff members are aware of Biomedical waste related injuries and post-exposure prophylaxis kits are available in the hospital for any eventuality.

(k) **Review and monitoring activity related to BMD** - It is carried out on daily basis to ensure that the orders pertaining to BMW are complied with. (Audit checklist for the CWCP is **Attached as Annexure XVI)**. In addition to it, review and monitoring is also carried out by the infection control team of the hospital.

(l) **BMW activities on Hospital website**- Medanta has the website since 2017, in which all the details pertaining to the BMW that has been handed over to the contractor is published on the monthly basis.

(m) **Recycle waste records-No** recycle waste policy exists as all the waste is contracted with and it's the responsibility of contractor to dispose/recycle the material based on the guidelines issued by Haryana pollution Control Board.

(n) **Mercury waste / spills** - A typical healthcare facility may use mercury-containing objects in its day-to-day operations and exposure to it may lead to mercury poisoning, which can result in several diseases. Medanta has very clear guidelines and it believes in mercury free environment in the hospital.

As per the analysis of Observation and Questionnaires, overall the Quality Assurance in BMW Management in Medanta - The Medicity, Gurugram was found to be correct and was effectively implemented. All the procedures of BMW management were followed correctly by the staff and proper guidance were being given to the patients also, so that once they are discharged from the hospital, they keep it in mind that cleanliness is going to be beneficial not only to them but for the entire society as such. However certain measures which if implemented would make the BMW management in the hospital more effective.

RECOMMENDATIONS

My recommendations to the owner of the Medanta-The Medicity would be the following:

1. Needle stick / sharp injuries has been the main cause of concern therefore they system of segregation till its disposal needs to be closely monitored.

2. Focus on continues training on the BMW aspects in order to increase the knowledge and awareness level.

3. As all the staff involved with BMW management aspect is being motivated to report to all injuries, therefore the efforts on the same to be continued.

4. Effort is order to recycle the waste needs to be undertaken.

5. Website only gives out the monthly details of different types of BMW handed over to the contractor. Efforts be made to make the website more informative on BMW management aspects.

6. It has been observed that the details of the members as well as the timing for their daily round to check for BMW practice is known to all the staff involved in it. Therefore, they portray the best infant of the team thus not giving the correct picture of the practices being undertaken. Therefore, there is a need to organise the surprise checkup by changing the team members on regular basis.

7. Clinical's who have a very major role in BMW should form part of all the activities related to BMW management such as training, conclaves etc.

8. Last but not the least, Bio-Medical Waste Management programme cannot successfully be implemented without the willingness, devotion, self-motivation, cooperation and participation of all the staff of the hospital. Therefore, the aspect needs to be closely monitored.

CONCLUSION

For implementation of various clauses of the BMW Management and Handling Rules, 2016, with few amendment issued on it in the year 2018, a time period from one to two years, has been notified by the Government for implementation like creating own website, bar coded bags/containers procured , disposal of chlorinated bags etc as well as few aspects of reports and returns. Seeing this, the HCFs should not wait for the deadlines to expire but take forthwith proactive steps to save the environment from hastened degradation.

Passing of notification/legislation is one thing but implementation on ground is another. The gap between the implementation and monitoring needs to be narrowed.

Biomedical waste management programme cannot be successfully implemented without the willingness, devotion, motivation, cooperation and participation of all sections of employees of any health care establishment and responsible citizens in general. Therefore, it becomes the responsibility of each and every individual to segregate and manage the waste in such a way, that it is no longer a hazard for them, the public and the environment. The most imperative component of the waste management plan is to develop a system and culture through education, training and persistent motivation of the healthcare staff.

Waste management has to be of prime concern to everyone right from doctor up to all the support staff. Waste Management is so precious that it has to be given due importance. All out efforts should be made to make the HCF area and environment clean, healthy and free from infection.

REFERENCES

1. The BMW (Management and Handling) Rules, 1998

2. The BMW (Management and Handling) Rules, 2016 and its amendment 2018.

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