Internship training

In

Gurukripa Nursing home, Raipur

On

A STUDY OF BIO-MEDICAL WASTE MANAGEMENT PRACTICE AND ITS QUALITY ASSURANCE

By

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(PG/18/086)

Under the Guidence of

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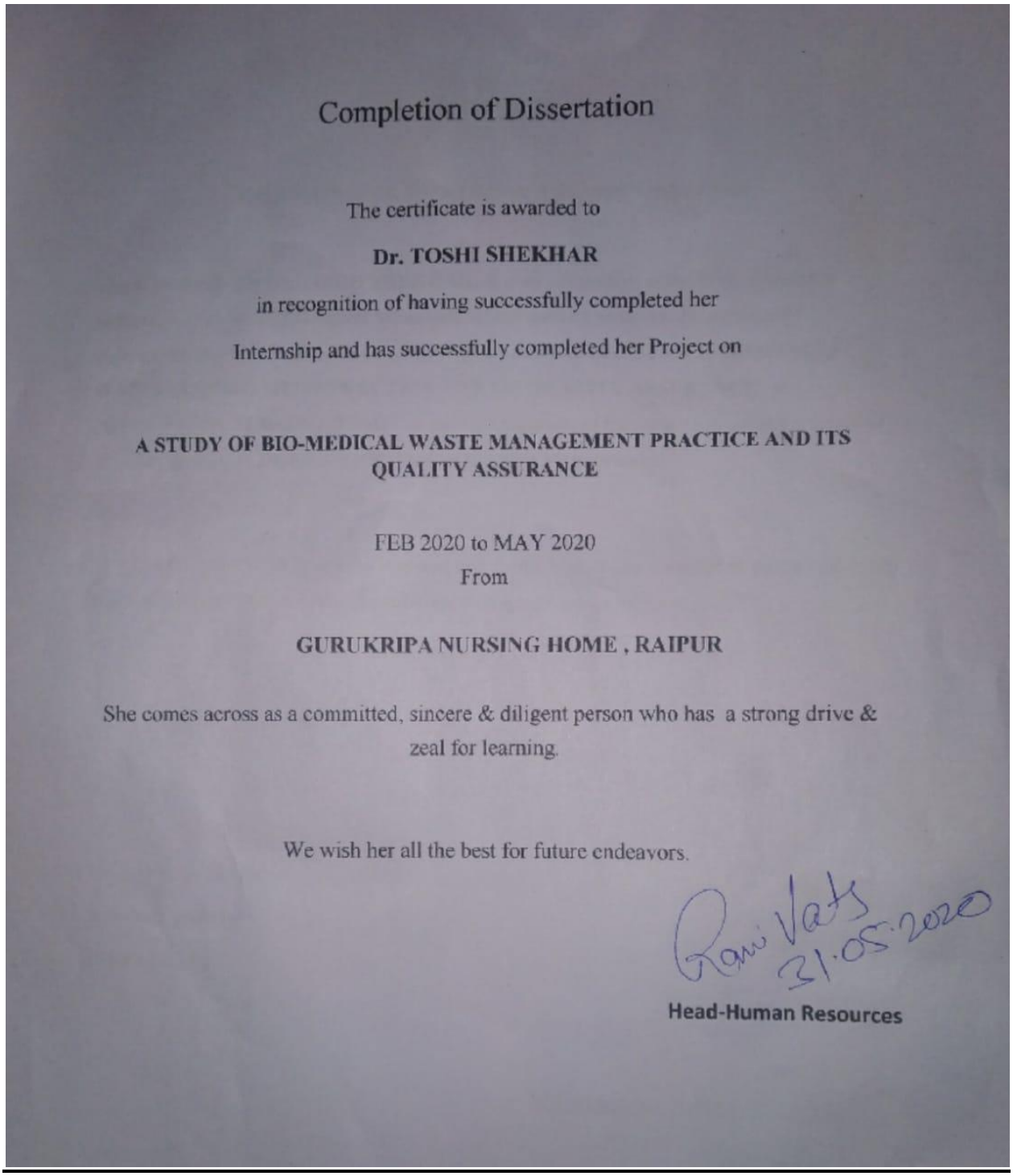
Post-graduate Diploma in Hospital and Health Management

2018-2020

International Institute of Health Management Research, New Delhi



Completion of Dissertation

The certificate is awarded to

Dr. TOSHI SHEKHAR

in recognition of having successfully completed her

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A STUDY OF BIO-MEDICAL WASTE MANAGEMENT PRACTICE AND ITS QUALITY ASSURANCE

FEB 2020 to MAY 2020

From

GURUKRIPA NURSING HOME , RAIPUR

She comes across as a committed, sincere & diligent person who has a strong drive & zeal for learning.

We wish her all the best for future endeavors.

Ravi Vats
31.05.2020

Head-Human Resources

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Dr. TOSHI SHEKHAR student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at GURUKRIPA NURSING HOME, RAIPUR from 15/02/2020 To 15/05/2020.

The Candidate has successfully carried out the study designated to him during internship training and his/her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish him all success in all his/her future endeavors.

Dr Pradeep K Panda
Dean, Academics and Student Affairs
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IIHMR, New Delhi

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. TOSHI SHEKHAR,** a graduate student of the **Post- Graduate Diploma in Health and Hospital Management** has worked under our guidance and supervision. He/ She is submitting this dissertation titled "**A STUDY OF BIO-MEDICAL WASTE MANAGEMENT PRACTICE AND ITS QUALITY ASSURANCE**" at "**GURUKRIPA NURSING HOME**" in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management.**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Dr. PANKAJ TALREJA

Associate professor

IIHMR DELHI

Ravi Vats
31.05.2020

(GURUKRIPA HURSING HOME)

Certificate of Approval

The following dissertation titled is "**A STUDY OF BIO-MEDICAL WASTE MANAGEMENT PRACTICE AND ITS QUALITY ASSURANCE**" at "**GURUKRIPA NURSING HOME**" hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.Dissertation Examination Committee for evaluation of dissertation.

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Dr. SUMESH KUMAR

ACKNOWLEDGEMENT

Words can never be enough to express my sincere thanks to **Dr. Rashmi vats**

for providing an opportunity to work at **Gurukripa Nursing home, Raipur**

I convey my gratitude and special thanks to my mentor and head **Dr. Ravi vats** who provided me with valuable insights to the subject.

I would like to thank **Prof. Shankar Das (Director IIHMR- Delhi) &Dr. Pradeep Panda (Dean – Academics)** for his continuous support and motivation.
I also express my thanks to my mentor **Dr. Pankaj Talreja (Assistant Professor, IIHMR- Delhi),** for extending his support. Most of all, I pay my sincere offering to the Almighty and my family without their grace I would not be able to add a new dimension to my life.

Last but not the least, I am thankful to all the colleagues and Teaching staff of IIHMR for their help and extended support.

ABBREBIATIONS

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-occurring Disorders

CBMWTF	:	Common Bio Medical Waste Treatment Facility
HBV	:	Hepatitis B Virus
HCV	:	Hepatitis C Virus

Gurukripa Nursing home, Raipur

1. **Hospital profile-**

It is a 50 bedded multi-specialty facility situated in an upscale locality of the Nation Raipur, Chhattisgarh. The hospital began its services in July 2009 and has already become a preferred healthcare service provider for the residents and corporate entities of Raipur. Gurukripa nursing home, offers a wide range of clinical services such as Obstetrics & Gynecology, Internal Medicine, General Surgery, Pediatrics, Ophthalmology, ENT, Urology, Dermatology, Orthopedics , Cardiology, Neuro &Spine Surgery, Pulmonology, Qualified and experienced medical personnel and technicians ensure healthcare delivery of the highest standards.

The hospital has standard infrastructure and follows a benchmarked standards of medical, nursing and operating protocols and is rapidly becoming the preferred healthcare destination for the patients.

1.3 Values

- **PATIENT CENTRICITY**

  Commit to 'best outcomes and experience' for our patients.
  Treat patients and their caregivers with compassion, care and understanding**.**
  Our patients' needs will come first.

- **OWNERSHIP**

Be responsible and take pride in our actions
Take initiatives and go beyond the call of duty.
Deliver commitment and agreement made.

- **INNOVATION**

Continuously improve and innovate to exceed expectations.
Adopt a 'can-do' attitude.
Challenge ourselves to do things differently.

- **INTEGRITY**

Be principled, open and honesty.
Model and live our 'Values'.
Demonstrate moral courage to speak up and do the right things.

- **TEAMWORK**

Proactively support each other and operate as a team.
Respect and value people at all levels with different opinion, experiences and backgrounds.
Put organization needs before department/ self-interest.

NON-CLINICAL-

- House- keeping services
- Laundry services
- Security services
- GDA services

CLINICAL SERVICES-

- Ambulance services
- CT scan
- Physiotherapy
- Laboratory services

SECTION -1

INTRODUCTION

All human activities produce waste. We all know that such waste may be dangerous and need safe disposal. Industrial waste and sewage and agricultural waste pollute water, soil and air which can also be dangerous to human beings and environment. Similarly, many hospitals and other health care facilities are generating lots of waste which can transmit infections, particularly HIV, Hepatitis B, Hepatitis C and Tetanus, to the people who handle it or come in contact with it.

According to the Bio-Medical Waste management guidelines of 2016, Biological means any preparation made from organisms, microorganisms or product or metabolism and biochemical reactions intended for use and diagnosis, immunization or treatment of human beings or animals or research activities pertaining there to.

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 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 caring for the large population are emitting 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.

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 **the Biomedical waste management and**

handling rules of 2016 any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities 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.

As per WHO, 85% of hospital wastes are non-hazardous, 10% are infectious and 5% are non-infectious. The global scenario of BMW management is shocking as it is reported 18 to 64 percent of health care settings have unsatisfactory BMW management system. The hospital waste has a high potential for 25 infection and risk of injuries putting in danger the healthcare workers, the patients, the community and the environment.

The burden of the problem varies for developed and developing countries. In developed countries the problem lies in the increasing volume of waste produced by increasing use of disposable items and in developing countries, where the supplies for waste disposal are limited, the problems are more related to segregation and disposal of the healthcare waste.

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 % 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.

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 150mg/ Nm^3 to 50mg/ 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

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 trainingto 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**.**

Category	Type of Waste	Type of bag/container to be used	Treatment and Disposal options
Yellow	**Human Anatomical Waste:** Human tissues, organs, body parts and fetus as per MTP act 1971	Yellow coloured non chlorinated plastic bags	Incineration or Plasma Pyrolysis or deep burial
	Animal Anatomical Waste: Experimental animal carcasses, body parts, organs, tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.		
	Soiled waste: items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components.		Incineration or Plasma Pyrolysis or deep burial* In absence of above facilities, autoclaving or micro-waving/hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery.
	Expired or Discarded Medicines: pharmaceutical waste like antibiotics, cytotoxic	Yellow coloured non	Expired `cytotoxic drugs and items contaminated with cytotoxic drugs to be returned

	drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.	chlorinated plastic bags or containers.	back to the manufacturer or supplier for incineration at temperature >1200 0C or to common bio-medical waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >12000C or Encapsulation or Plasma Pyrolysis at >12000C. All other discarded medicines shall be either sent back to manufacturer or disposed by incineration.
	Chemical Waste: chemicals used in production of biological and used or discarded disinfectants.	Yellow coloured containers or non-chlorinated plastic bags.	Disposed of by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility.
	Chemical Liquid Waste: liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, Silver X-ray film developing liquid, discarded Formalin, infected secretions, liquid from laboratories and floor washings, etc	Separate collection system leading to effluent treatment system.	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule III.
	Discarded linen, mattresses, beddings, contaminated with blood with blood or body fluids.	Non chlorinated yellow	Non- chlorinated chemical disinfection followed by incineration or Plazma Pyrolysis

		plastic bags or suitable packing material.	or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or Plazma Pyrolysis.
	Microbiology, Biotechnology and other clinical laboratory waste: blood bags, Laboratory cultures, stocks or specimens, live or attenuated vaccines, residual toxins, dishes and devices used for cultures.	Autoclave safe plastic bags or containers.	Pre-treat to sterilize with nonchlorinated chemicals on-site as per National AIDS Control Organisation or World Health Organisation guidelines thereafter for Incineration.
Red	Contaminated waste (Recyclable) : **Waste generated from disposable items** such as tubing, bottles, intravenous tubes and sets, syringes (without needles and *fixed needle syringes)* and vacutainers with their needles cut) and gloves.	Red coloured non-chlorinated plastic bags or containers.	Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites.
White (Translucent)	**Waste sharps including Metals:** Needles, syringes with fixed needles tip cutter or burner, scalpels, blades or any other contaminated sharp object that may cause puncture and cuts.	Puncture proof, Leak proof, tamper proof containers.	Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving;

	This includes both used, discarded and contaminated metal sharps.		and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.
Blue	**Glassware:** Broken or discarded glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.	Cardboard boxes with blue coloured marking.	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling.
	Metallic Body Implants	Cardboard boxes with blue colored marking	

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

Rule 4(c)

Original Provision - It shall be the duty of every occupier to pre-treat the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilisation on-site in the manner as prescribed by the World Health Organisation (WHO) **or National AIDs Control Organisation (NACO)** guidelines and then sent to the common bio-medical waste treatment facility for final disposal.

Amended Provision it shall be the duty of every occupier to pre-treat the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilisation on-site in the manner as prescribed by the World Health Organisation (WHO) **guidelines on Safe management of wastes from health care activities and WHO Blue Book, 2014** and then sent to the Common bio-medical waste treatment facility for final disposal.

Rule 4(d)

Original Provision - It shall be the duty of every occupier to phase out use of chlorinated plastic bags, gloves and blood bags within two years from the date of notification of these rules.

Amended Provision It shall be the duty of every occupier to phase out use of chlorinated plastic bags **(excluding blood bags)** and gloves **by the 27th March, 2019**.

Rule 4(i)

Original Provision - It shall be the duty of every occupier to establish a Bar- Code System for bags or containers containing bio-medical waste to be sent out of the premises or place for any purpose within one year from the date of the notification of these rules.

Amended Provision It shall be the duty of every occupier to establish a Bar- Code System for bags or containers containing bio-medical waste to be sent out of the premises **or for the further treatment and disposal in accordance with the guidelines issued by the Central Pollution Control Board by 27th March, 2019.**

Rule 4(p)

Original Provision - It shall be the duty of every occupier to make available the **annual report on its web-site** and all the health care facilities shall make own website within two years from the date of notification of these rules.

Amended Provision - It shall be the duty of all the health care facilities (any number of beds) shall make available the annual report on its web-site **within a period of two years from the date of publication of Bio-Medical Waste Management (Amendment) Rules, 2018**.

Rule 5(c)

Original Provision - It shall be the duty of every operator of a common bio-medical waste treatment and disposal facility to establish bar coding and global positioning system for handling of bio- medical waste within one year.

Amended Provision - It shall be the duty of every operator of a common bio-medical waste treatment and disposal facility to establish bar coding and global positioning system for handling of bio- medical waste in accordance with the guidelines issued by the Central Pollution Control Board **by 27th March, 2019.**

Rule 7(8)

Original Provision - Every occupier shall phase out use of non-chlorinated plastic bags within two years from the date of publication of these rules and after two years from such publication of these rules, the chlorinated plastic bags shall not be used for storing and transporting of bio-medical waste and the occupier or operator of a common bio-medical waste treatment facility shall not dispose of such plastics by incineration and the bags used for storing and transporting biomedical waste shall be in compliance with the Bureau of Indian Standards. Till the Standards are published, the carry bags shall be as per the Plastic Waste Management Rules, 2011.

Amended Provision- Every occupier shall phase out use of chlorinated plastic bags within two years from the date of publication of these rules and after two years from such publication of these rules, the chlorinated plastic bags shall not be used for storing and transporting of bio-medical waste and the occupier or operator of a common bio-medical waste treatment facility shall not dispose of such plastics by incineration and the bags used for storing and transporting biomedical waste shall be in compliance with the Bureau of Indian Standards. **Till the Standards are published, the carry bags shall be as per the Plastic Waste Management Rules, 2016.**

Rule 13(2)

Original Provision - The prescribed authority shall compile, review and analyse the information received and send this information to the Central Pollution Control Board **on or before the 31st July of every year.**

Amended Provision -The prescribed authority shall compile, review and analyse the information received and send this information to the Central Pollution Control Board **in Form IVA before the 31st July of every year.**

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.

Out of 64 wards that were observed for compliance to BMW handling and Management rule, 42.18% disinfected the biomedical waste bins daily. Mixing of contents in the red bag, yellow bag

and black bag was found to be 20.31%, 12.5% and 10.93% respectively. None of the wards observed cutting of gloves and saline bottles prior to disposal.

The tertiary care hospital where the study was carried out was compliant with most rules with respect to BMW management. Segregation, mutilation and disinfection practices were not performed strictly at all waste generating sites. Due to patient overload and lack of staffing mutilation and disinfection practices were overlooked at many sites. Day to day collection of waste from all sites was not carried out due to which record books were not properly maintained. False reporting was noted on records at various sites.

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.

The new rules are meant to improve the segregation, transportation, and disposal methods, to decrease environmental pollution so as to change the dynamic of BMW disposal and treatment in India. For effective disposal of BMW management, there should be a collective teamwork with

committed government support in terms of finance and infrastructure development, dedicated healthcare workers and healthcare facilities, continuous monitoring of BMW practices, tough legislature, and strong regulatory bodies.

The basic principle of BMW management is segregation at source and waste reduction. Besides, a lot of research and development need to be in the field of developing environmental friendly medical devices and BMW disposal systems for a greener and cleaner environment.

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 communication 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. An analytical study on medical waste management in selected hospitals located in Chennai city by Sutha Irin A, published in Environ Waste Management and Recycling 2018 Volume 1 Issue 1.

The present paper aims to study the Medical Waste Management assessment, the process of managing the medical waste to include its segregation, storage, and disposal in govt and corporate hospitals in Chennai.

The results reveal that the HCF in private and Govt hospitals still struggle with unsuitable BMW management which has not received enough concern. Training on waste management was not adequate.

Various improvements on BMW handling and treatment was suggested to cater for proper waste management system in HCF.

7. **A study conducted at Balrampur Hospital, Lucknow on waste management practices within the state** said that the hospital does not have any proper treatment facility for infectious waste. Laboratory waste materials are disposed off directly without proper disinfection into municipal sewerage. From the municipal bin and hospital premises disposable plastic items are segregated by the rag pickers, which led to infectious diseases following sharp injuries.

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 favor 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.

RATIONALE

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 Gurukripa Nursing home , Raipur** 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 Hospital so that this study will provide valuable information and opportunity to improve current practices of BMW management.

OBJECTIVES

General Objective:

A study to check the knowledge about Bio-Medical Waste Management practices and its quality assurance in the hospital

Specific Objectives:

1. To ascertain the existing knowledge, attitude and practices of BMW management among clinical as well as non clinical staffs
2. To find the extent to which this BMW management is followed w.r.t to BMW Management and Handling Rules 2016.
3. To suggest measures for the improvement of BMW practices in the hospital

METHODOLOGY

Study Population-The study was performed among the clinical as well as non clinical staffs of the hospital

Study Design- Descriptive cross-sectional study

Sampling Method - Purposive Sampling technique is used in this study

Sample Size - 30, All the current staffs were taken as sample in the study and information was collected based on their personal choice of the participation

Type of data -Primary Data

Tools - Statistical software used for data analysis MS excel and MS word.

Methods of Data Collection - A semi structured questionnaire in form of Google form was administered to all staffs both clinical as well as non clinical and a checklist provided by the hospital was used.

Data Collection Tool - The Google form consisted of 20 questions related to:

- Demographic details.
- Knowledge about BMW guidelines
- Attitude towards the BMW management
- Factors affecting the BMW Practice

SECTION- 3

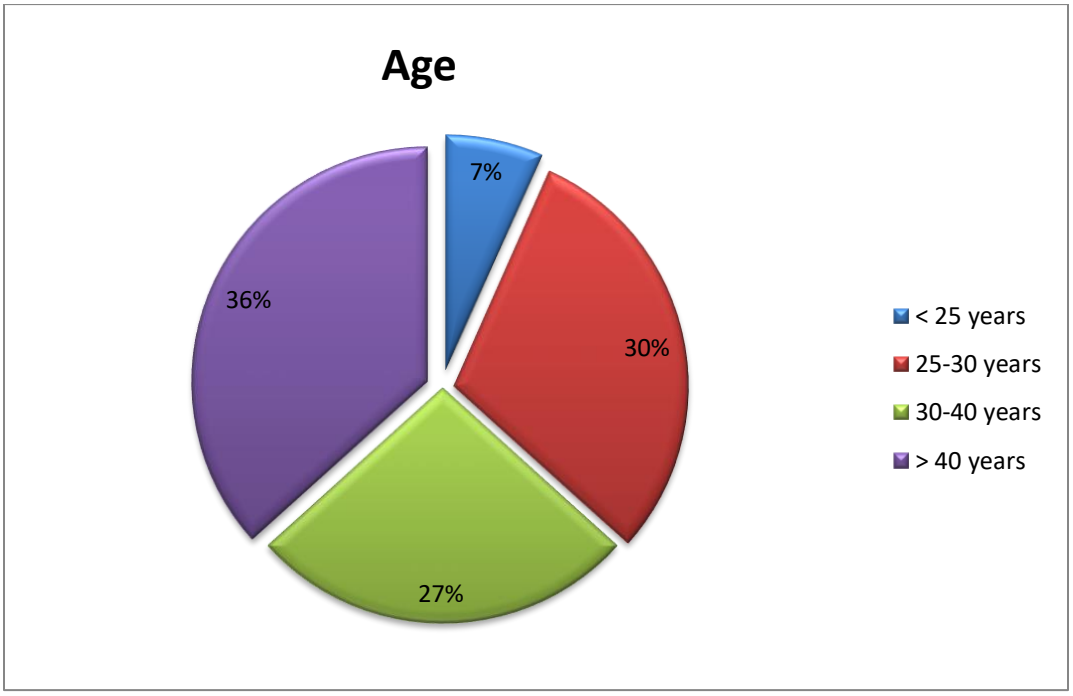
RESULTS AND DISCUSSION

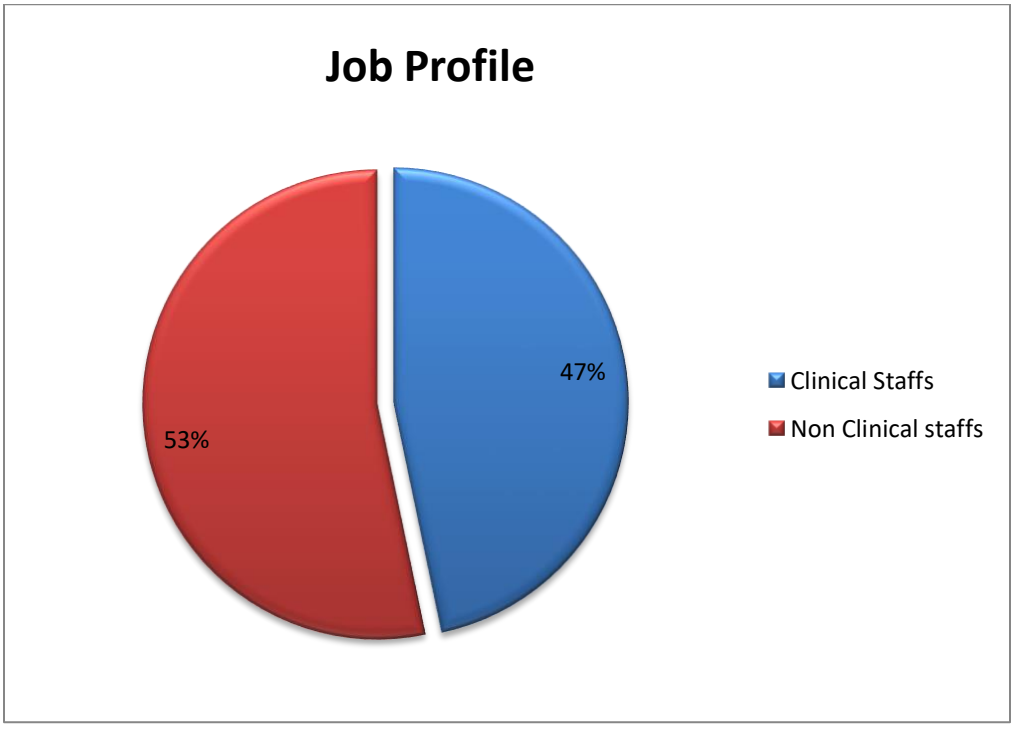
Data collected through the survey performed has been analyzed using Ms Excel.

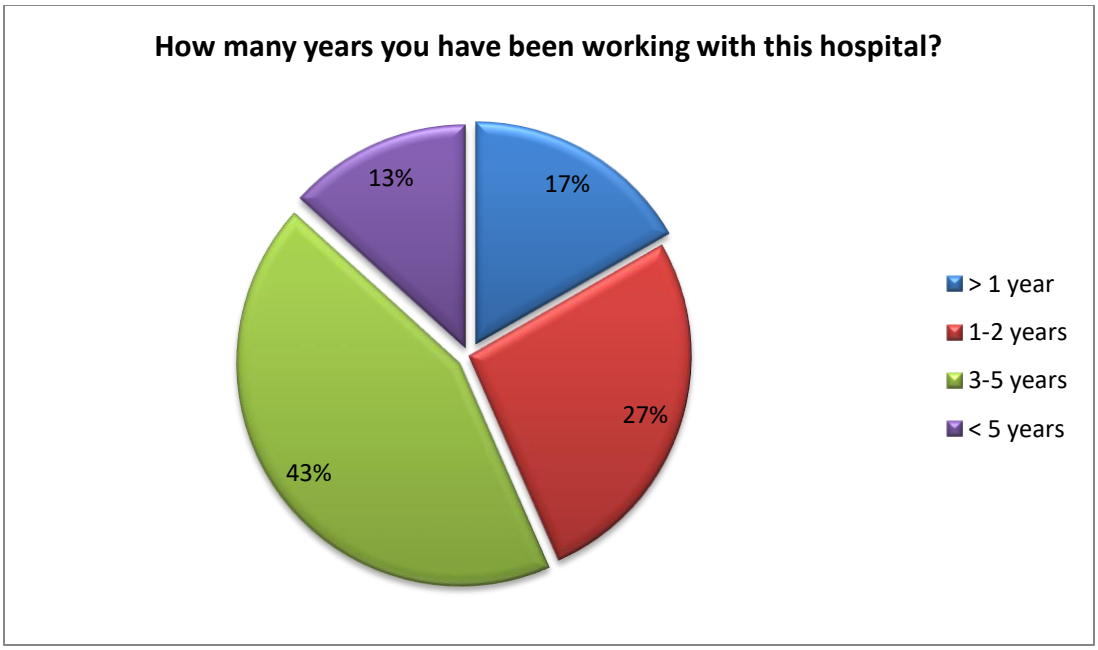
Key findings are discussed in this section

The sampled staff was put through a series of 20 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 , profiles and the working experience in the hospital. The response received is as under

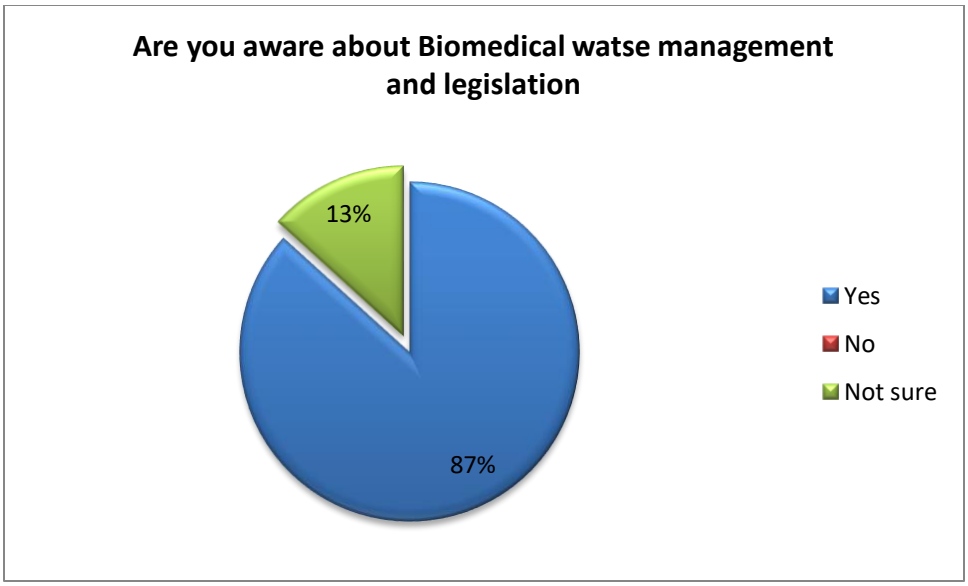




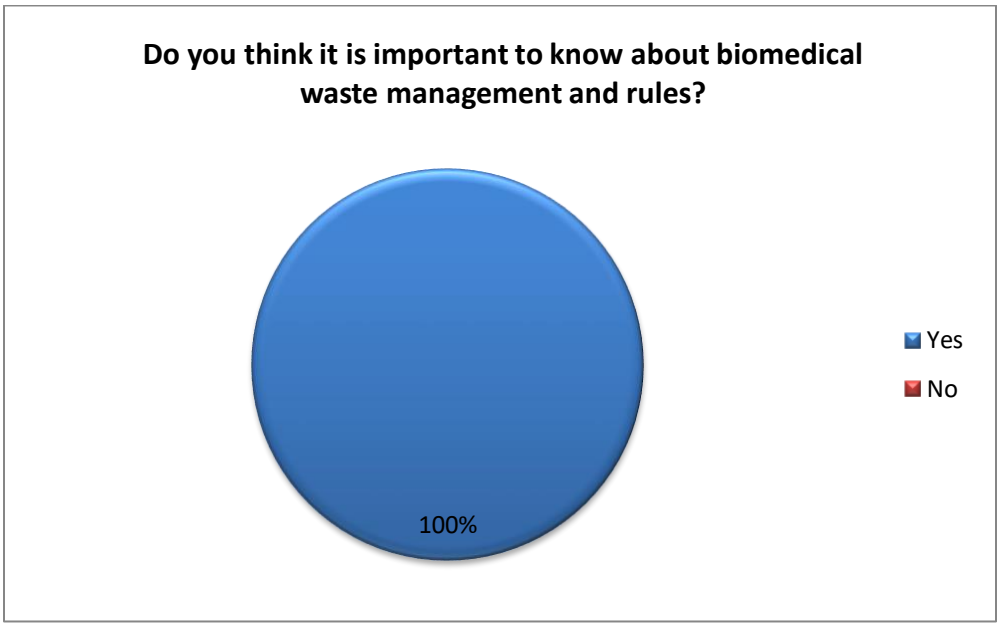


- From the above response it's clearly visible that the maximum age of respondent falls in the category of more than 40 years of age group i.e. 36% , it is followed by the 25-30 years of age i.e.30% then 30-40 years , 27% and the minimum respondent from the age group category of below 25 years age i.e. only 7%
- The maximum staffs who responded i.e. 53% are of clinical job profile, while 47% are of non clinical job profile
- Work experience of 43% are 3-5 years with the hospital followed by 27% has 1-2 years of work experience with the hospital , 17% has less than 1 years minimum being 13% of staffs has more than 5 years work experience.

Section II: This was the section which was designed to assess the Knowledge on biomedical (BM) waste generation, hazards and legislation aspects. A total of 06 questions was asked for the same.

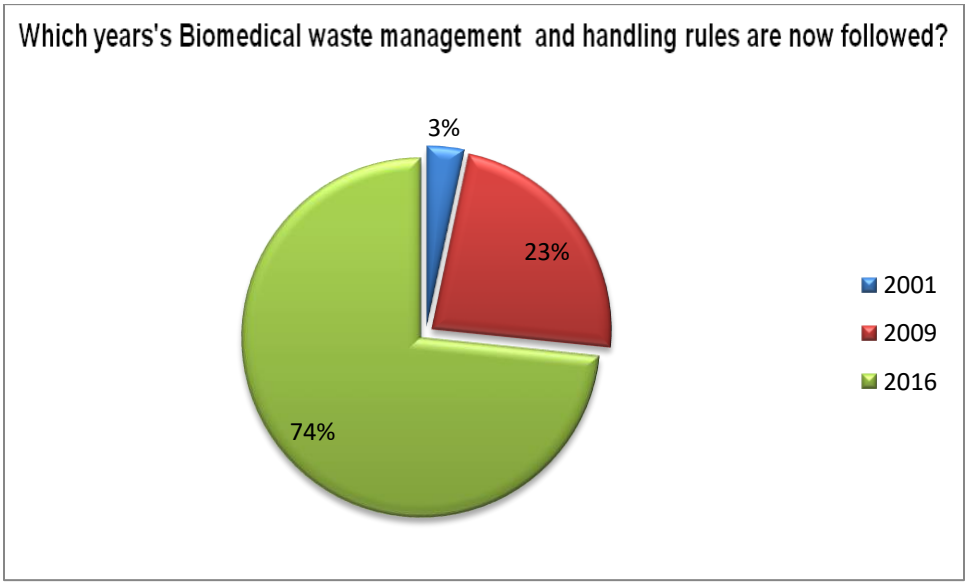


Out of the total respondents, 87% has a knowledge of biomedical waste management and legislation while 13% are not sure about the same.

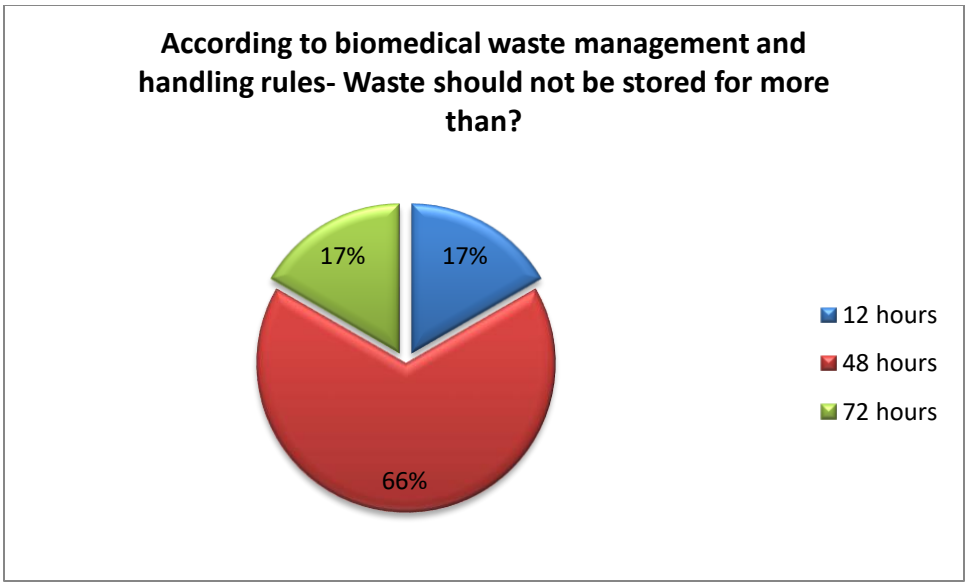


100% of the respondents thinks it is very important ro know about biomedical waste management

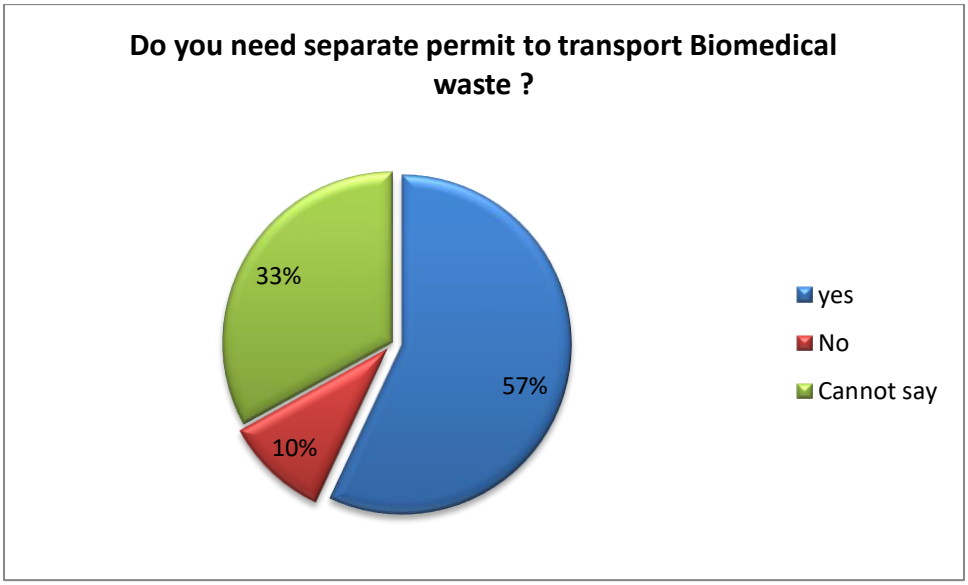
Out of the total respondents 80% has responded correctly for the above question, that means they have knowledge regarding the rules and management



Out of the total respondents 74% have responded correctly for the above question, that means they have knowledge regarding the rules and management



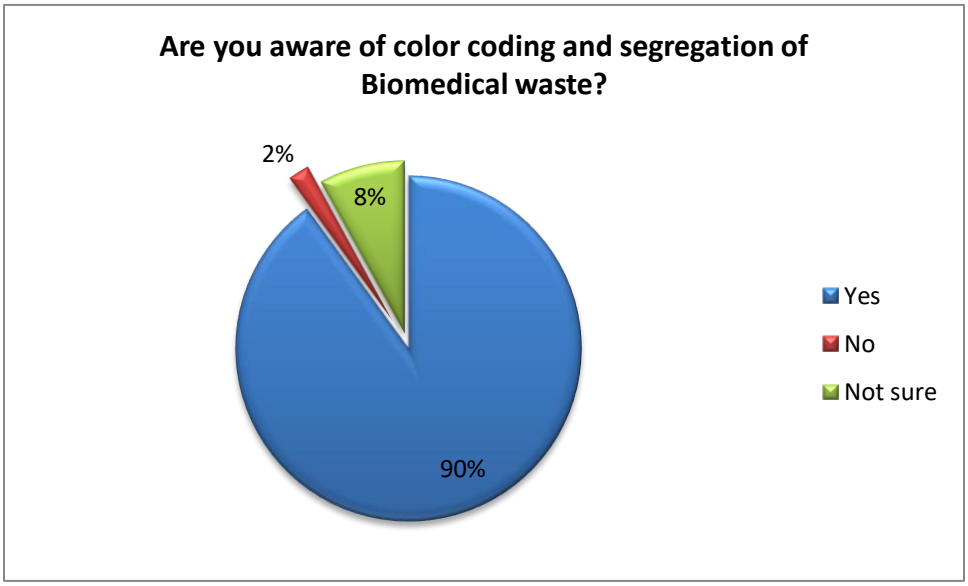
Out of the total respondents 67% has responded correctly for the above question, that means they have knowledge regarding handling of biomedical waste



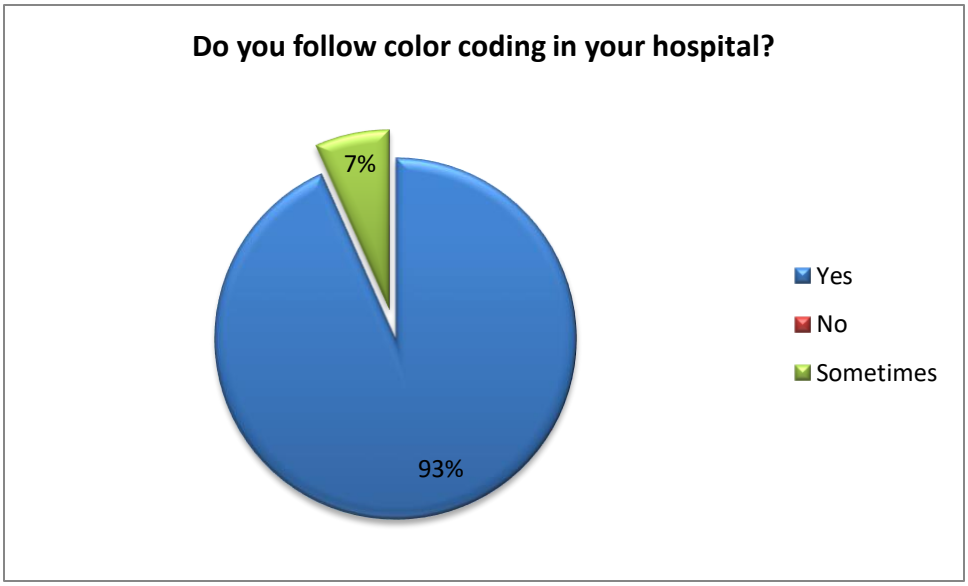
Out of the total respondents 57% has responded yes for the above question, that means they have knowledge regarding handling of biomedical waste, while 33% are still not sure regarding the same.

So based on the responses as received from the respondents on the knowledge aspects it can be ascertained that 69% of them have good amount of knowledge and understanding on the aspects pertaining to the BMW management issues..

Section III: Total of 05 questions has been so as to assess the Level of awareness on biomedical waste management practice among the respondents.

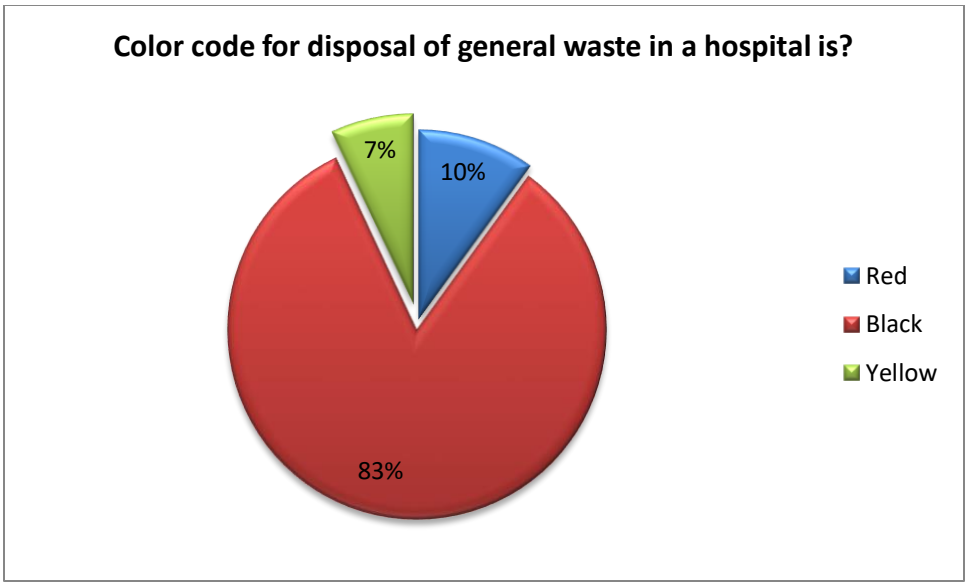


Out of the total respondents 90% are aware of the color coding and segregation of biomedical waste while 8% are not sure and 2% do have know about the same.

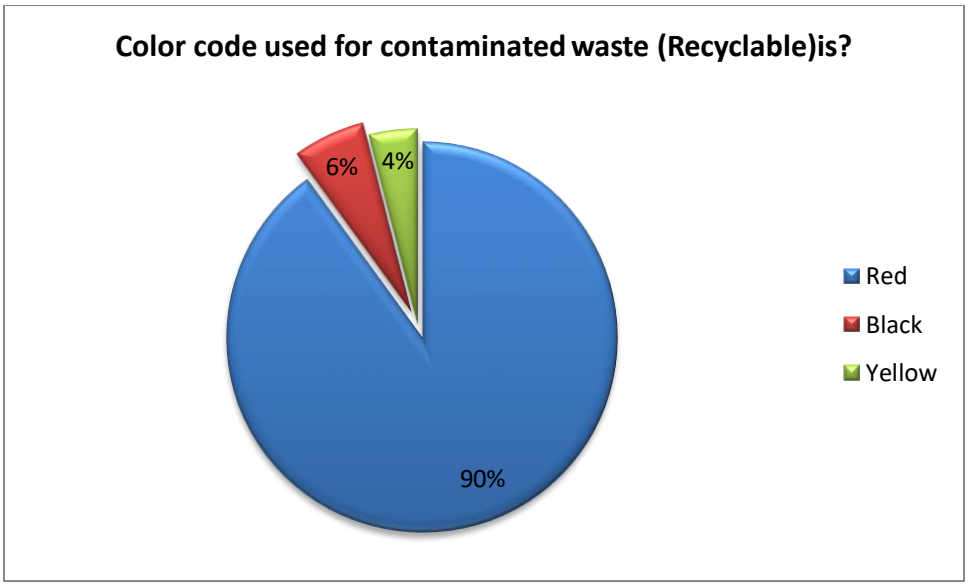


Out of the total respondents 93% thinks that they follow color coding of the Hospital while 7% sometimes follow the color coding in hospital.

90% of the respondents feel waste disposal activities are correctly followed in your Hospital, while 10% feels sometimes it is followed.



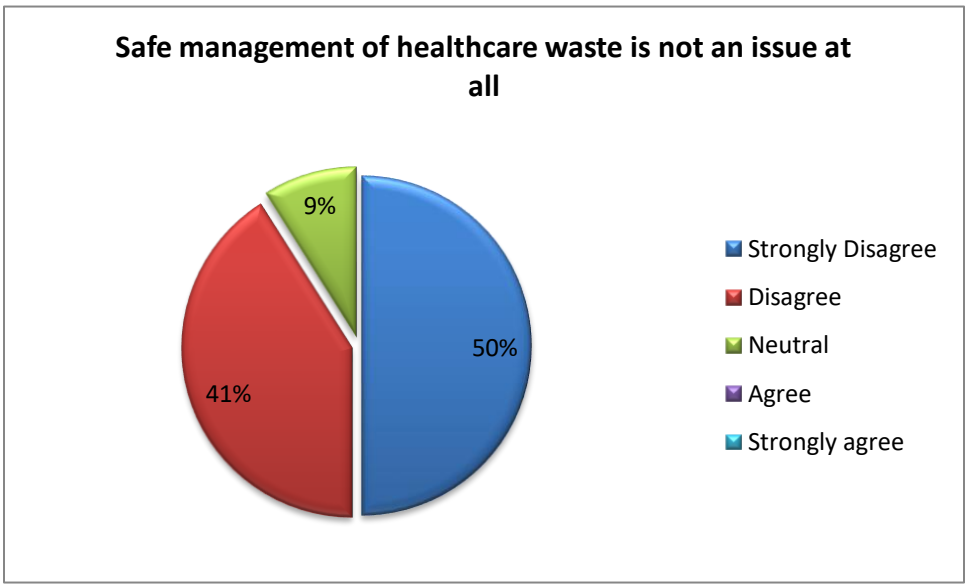
83% of the respondents correctly responded to the above question



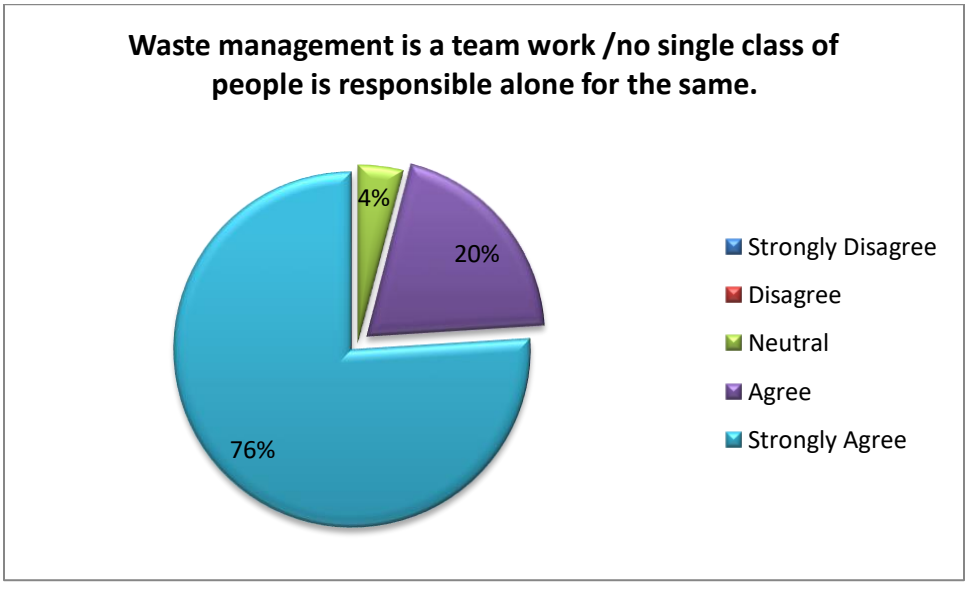
90% of the respondents correctly responded to the question.

From the above responses as received from the respondents it can be made out that 90% of the staff follows the practices related to the BMW management in the hospital.

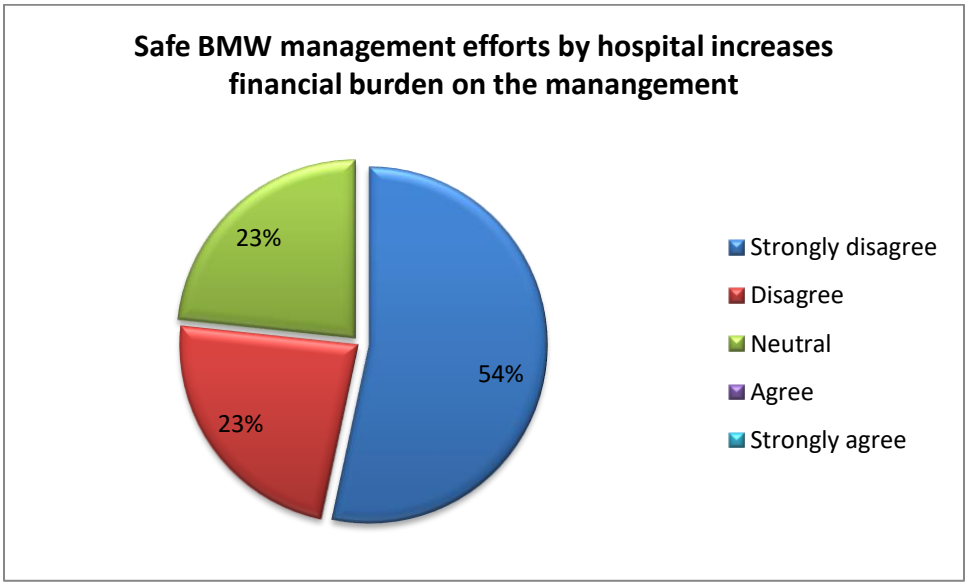
Section IV: The total of 07 questions was asked from the respondents in order to ascertain the Attitude/behavior towards biomedical waste management.



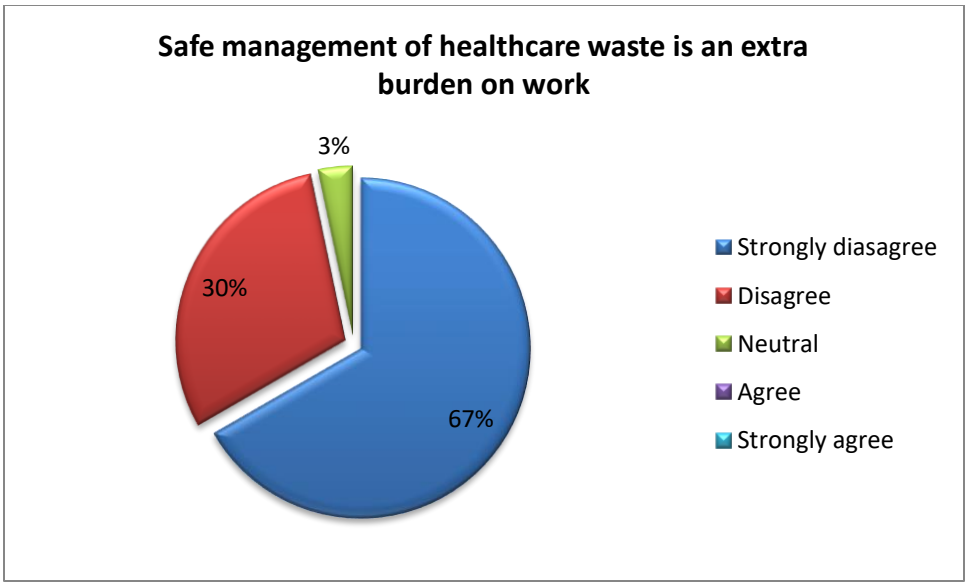
Out of the total respondents 50% strongly disagree with the statement that safe management Of healthcare waste is not an issue at all, 41% disagree while 9% is neutral with this statement.



Out of the total respondents 76% strongly agree with the statement that waste management is a team work , 20% agree while with the statement and 4% is neutral with this statement.

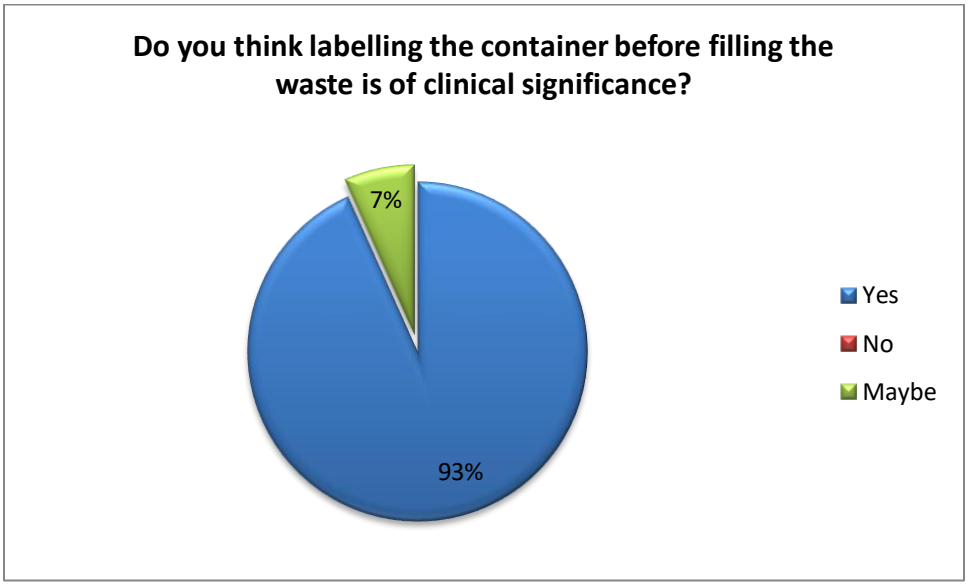


Out of the total respondents 54% strongly disagree and says that safe management Of healthcare waste do not increase financial burden on management , 23% disagree while with the statement and 23% is neutral with this statement.



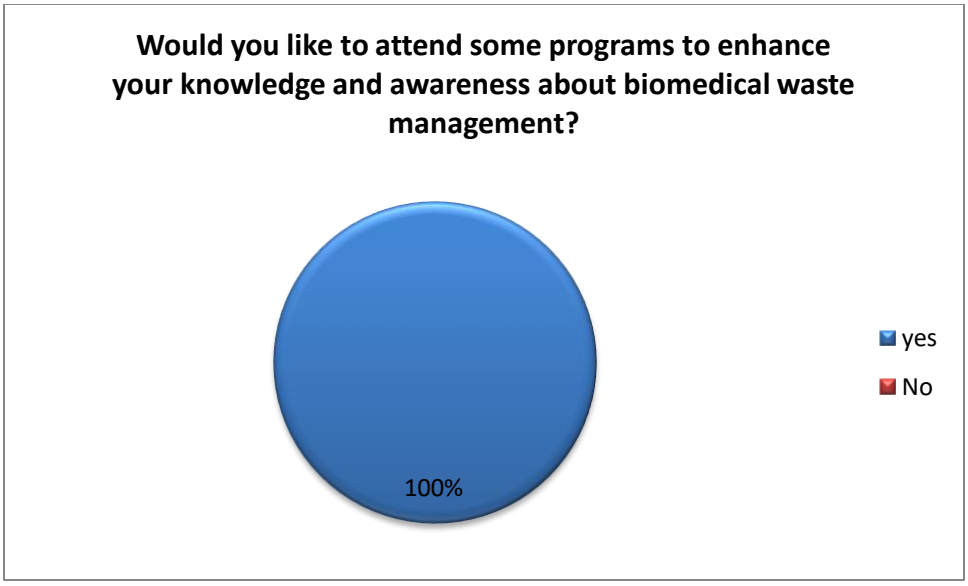
Out of the total respondents 67% strongly disagree and says that safe management

Of healthcare waste is not an extra burden on management, 30% disagrees while with the statement and 3% is neutral with this statement.



Out of the total respondents 93% says yes and while 7% says may be labeling of container is of clinical significance.

Of healthcare waste is not an extra burden on management, 30% disagrees while with the statement and 3% is neutral with this statement.



100% of the respondents would like to attend some programs to enhance your knowledge

And awareness about biomedical waste management.

From the 07 question's response it shows 72 % of the staff involved has good attitude/ awareness towards the issues related to BMW management in the hospital.

SECTION-4

FINDINGS BY OBSERVATION ON BMW MANAGEMENT

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. Following were the observations made during the conduct of study.

(a) **Bio Medical Waste Management implementation** - House keeping 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 personnel's. 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 hospital has set the guidelines to handle Bio-medical waste in accordance with the BMW Management Rules, 2016.

The objectives of the policy are as under:

(i) Empowering of staff in BMW management through knowledge and 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) 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). The hospital has a separate company contractor that takes away the collected waste i.e. SMS WATER GRACE INVIRO PROTECT PVT LIMTED

(b) **Segregation of general waste** - 85% of the hospital waste belongs to this category and the same is collected in container . Patients and all the persons related to the same are briefed on the disposal aspect of general waste which are generated.

(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. The nursing staff are the key persons responsible for segregation of waste strict supervision is being maintained by the senior Nursing ward in charges.

(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 collection points established in the hospital for the same. It is the responsibility of the Housekeeping staff to

ensure the waste bags are tightly sealed. Sealed sharp containers are disposed separately in blue bags after dipping it in Sodium Chloride for half and hour before being given to the authorized contractor. Some salient points that are emphasized 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.

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

(iii) Waste is collected 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.

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

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

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

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

(f) 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. 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.T**he 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. (Emphasis is given on the newly recruited staff for which the induction training is organized by the mangers/supervisors

(h) I**mmunize all health workers** Its is ensured that all the staffs involved in segregation, transportation and storage are fully immunized and proper record of the same is maintained. The yearly health check up of housekeeping staff as well as the Nursing staff is closely monitored.

(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 . 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.. 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. In addition to it , review and monitoring is also carried out by the infection control team of the hospital.

(l) **Recycle waste records**- No recycle waste policy exists as all the waste is contracted with and its the responsibility of contractor to dispose/ recycle the material based on the guidelines issued by Chhattisgarh 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. Hospital 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 the hospital 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

1. Focus on continues training on the BMW aspects in order to increase the knowledge and awareness level.
2. Double handling of the biomedical waste to be avoided.
3. All the staff involved with BMW management aspect must be motivated to report to all injuries rather than punishing or criticizing them.
4. Not only clinical staffs but non clinical and administrative staffs should also be trained regarding biomedical waste management.
5. Destruction of needles before disposal to be undertaken by the means like needle cutters etc as it prevents their reuse.
6. Efforts be made to make the website more informative on BMW management aspects.
7. There is a need to organize the surprise checkup by changing the team members on regular basis.
8. Last but not the least, Bio-Medical Waste Management programs cannot successfully be implemented without the willingness, devotion, self- motivation, cooperation and participation of all the staff of the hospital. Therefore every aspect need 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 programs 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 doctorate 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.

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