

Study on Assessment of Knowledge, Attitude and Practices of Hospital Staff About Biomedical Waste Management

By

Puja Kumari

*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

Academic year, 2016-2018



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TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr. Puja kumari** of MBA Hospital and Health Management from the IIHMR University, Jaipur has undergone internship training at **Thumbay New Life hospital, Hyderabad** from **5th Feb 2018 to 5th May 2018**.

The Candidate has successfully carried out the study ^{assigned} ~~designated~~ to her during internship training and her approach to the study has been sincere, scientific and analytical.

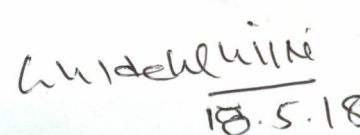
The Internship is in fulfillment of the course requirements.

I wish her all success in all her future endeavors.


Dr (Col) Ashok Kaushik

Dean, Academics and Student Affairs

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Dr. D.K. Mangal

Dean Research

The IIHMR University, Jaipur



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The Certificate is awarded to

DR. PUJA KUMARI

In recognition of having successfully completed her
Dissertation in the department of

OPERATIONS MANAGEMENT

And has successfully completed her Project on

**A STUDY ON ASSESSMENT OF KNOWLEDGE, ATTITUDE
AND PRACTICES OF HOSPITAL STAFF TOWARDS
BIOMEDICAL WASTE MANAGEMENT**

From 05/02/2018 to 09/05/2018

At **THUMBAY HOSPITAL** India Pvt. Ltd

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

We wish her all the best for future endeavors

Dr. Saurabh Patle

(Operations Head)

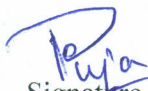
Dr. Shyam Sunder Tipparaju

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THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled “A study on assessment of knowledge of hospital staff about biomedical waste management” and submitted by Dr. Puja Kumari Enrollment No, IIHMR-U/01/2016-2018/0476 under the supervision of Dr. D.K Mangal for award of MBA in Hospital and Health Management carried out during the period from 5th Feb 2018 to 5th May 2018, embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.


Signature

THE IIMMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that all the ethical issues have been considered while collecting data for my dissertation titled-A Study on Assessment of Knowledge , Attitude and Practices of Hospital Staff towards Biomedical Waste Management.



SIGNATURE

1.1 ABSTRACT

STUDY TITLE: A study on Assessment of Knowledge, Attitude and Practices of hospital staff about biomedical waste management.

AUTHOR: Dr. Puja Kumari

BACKGROUND: Hospital generated waste is a special category of waste, which needs to be handled appropriately with precautions as it carries a higher potential for infection and injury than any other type of waste. Adequate awareness and practices among the hospital staff regarding the biomedical waste management are crucial to prevent these hazards.

OBJECTIVES:

1. To assess the Knowledge among hospital personnel regarding bio-medical waste and its management.
2. To assess the attitudes of health care workers towards biomedical waste management
3. To observe the existing practices of biomedical waste management in the health facilities of Thumbay hospital by observational checklist.

METHODOLOGY: The present study was conducted in Thumbay New Life Hospital, Hyderabad. Observation checklist and Questionnaire were used to conduct the study. A total of 120 staff members including doctors, nurses, lab technician and housekeeping staff were included in the study. Data were collected from Feb to April 2018. MS Excel was used to analyse the results.

RESULTS: The obtained data was tabulated and the results were interpreted. The knowledge on healthcare waste was found satisfactory among all the study groups. The study also found that more training is needed for the housekeeping staff to improve their practices.

CONCLUSION: The present study revealed that the knowledge, attitude among the housekeeping staff is low around 50% which is significantly lower compared to other study groups. Training classes for all the study groups are required and training on practices is to be imparted to all the housekeeping staff.

1.2 ACKNOWLEDGEMENT

"It is not possible to prepare a project report without the assistance & encouragement of other people. This one is certainly no exception."

At the very onset, I would like to extend my gratitude to the esteemed THUMBAY NEW LIFE HOSPITAL, HYDERABAD, and all management who helped me.

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My deep and warm thanks and regards to **DR. SAURABH PATLE (OPERATIONS HEAD)** for continuously guiding me in all my work and guiding me through thick and thin.

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Regards to **IIHMR UNIVERSITY, JAIPUR** for providing me a platform for such an exposure and knowledge.

I also acknowledge my gratitude, love and thanks to my father, mother and family who stood by me every time emotionally and economically.

Last but not the least not to forget the friends without whom this project would not have been a successful venture.

Thanking You

DR PUJA KUMARI

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1.5 Abbreviations:

- BMW: Biomedical waste management.
- CPCB: Central Pollution Control Board
- ICU: Intensive Care Unit
- SICU: Surgical Intensive Care Unit
- PICU: Pediatric Intensive Care Unit
- IPD: Inpatient Department
- LAB: Laboratory
- MOEF: Ministry of Environment and Forest
- OPD: Out Patient Department
- OT: Operation Theatre
- PPE: Personal Protective Equipment
- WHO: World Health Organisation
- PTS: Persistent Toxic Substance
- HEPA: High Energy Pressure Air Filter

2. DISSERTATION

2.1 INTRODUCTION

Biomedical waste is any solid, fluid or liquid waste, including container and any intermediate product, generated during diagnosis and treatment in the hospitals. Hospital waste is generated and discarded and is not intended for further use in a hospital. It is of paramount importance that there are significant voids that need to be addressed including efficient segregation, use of coded and colored bags, better handling and transfer means which need adequate training and awareness programmes for the medical and paramedical personnel. As per the reports from developed countries approximately 1-5 kgs of waste is generated per bed per day, whereas 1-2 kgs / bed / day is the figure from developing countries. In India it is estimated to be 2.0 kgs /bed/day. Improper handling of solid waste in the hospital may increase the airborne pathogenic micro-organisms, which could adversely effect the hospital environment and the community as well.

Biomedical waste management has recently emerged as an issue of major concern not only to hospitals, nursing home authorities but also to the environment. the bio-medical wastes generated from health care units depend upon a number of factors such as waste management methods, type of health care units, occupancy of healthcare units, specialization of healthcare units, ratio of reusable items in use, availability of infrastructure and resources etc

.The proper management of biomedical waste has become a worldwide humanitarian topic today. Although hazards of poor management of biomedical waste have aroused the concern world over, especially in the light of its far-reaching effects on human, health and the environment.

Now it is a well-established fact that there are many adverse and harmful effects to the environment including human beings which are caused by the “Hospital waste” generated during the patient care. Hospital waste is a potential health hazard to the health care workers, public and flora and fauna of the area. The problems of the waste disposal in the hospitals and other health-care institutions have become issues of increasing concern.

Thus health care waste, if not managed properly will be a cause in ushering of “disasters in making” by causing air, water, soil pollutions and helping in emergence of antibiotic resistant strains of microbial ingress of pollutants in the food chain and thus becoming a part of human

consumption. As such, there is an urgent need to demonstrate and promote best practices and techniques for health care waste management in countries that have not yet fully operationalized, and to facilitate operationalization by developing appropriate and affordable infectious waste treatment technologies that avoid formation and release of persistent organic pollutants (POPs) where none are yet available.

There is also growing concern about the spread of HIV, Hepatitis and other infectious disease that can be caused by needle-stick injuries and other forms of contagion that can result from the improper management of biomedical wastes by hospitals and other health care institutions. As health systems are strengthened and health care coverage expanded in developing countries through efforts to meet the Millennium Development Goals, the releases of persistent organic pollutants (POPs) and other persistent toxic substances (PTS) to the environment can increase substantially. This is often an unintended consequence of choices in materials and processes that seek to improve health outcomes.

India already has biomedical waste management regulations including a ban on the incineration of biomedical waste with the exception of human and animal waste at the Union level, but their implementation and enforcement throughout the country has been inconsistent.

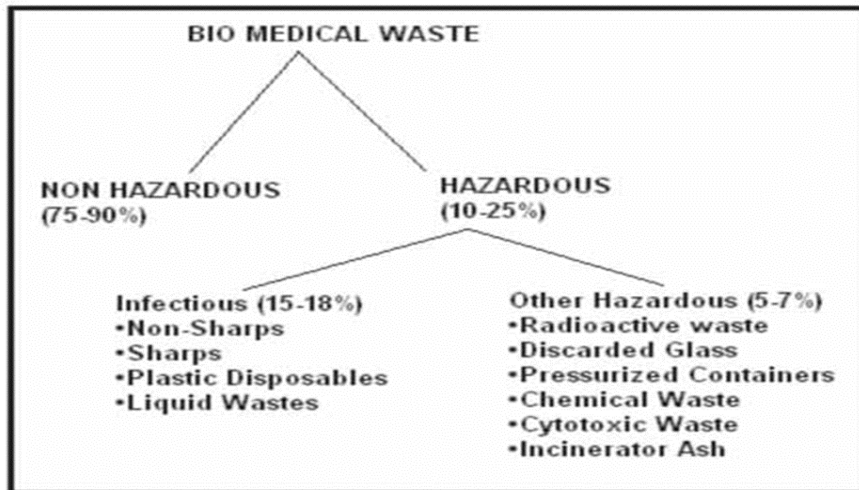
In recent years, there has been a growing awareness of the need for safe management of hospital waste for effective health service delivery. Nosocomial or Hospital-Associated Infections (HAI) are estimated to affect approximately 5% of hospitalized patients. Hospitals are reservoirs for strains of bacteria that are multi drug resistant strains. There are however effective interventions for reducing the occurrence of HAIs. Studies have demonstrated that these infections are a reason of prolonged hospitalization .

CLASSIFICATION OF BIOMEDICAL WASTE:

The World Health Organization (WHO) has classified medical waste into eight categories:

1. General Waste
2. Pathological
3. Radioactive

4. Chemical
5. Infectious to potentially infectious waste
6. Sharps Pharmaceuticals, Pressurized containers



2.2 LITERATURE REVIEW

There are many studies on the management of biomedical waste in hospitals. Some of the studies are discussed below:

- According to a study, Management of waste generated in any health-care facility is a critical issue as it poses a direct threat to human health as well as to the environment. The biomedical waste generated in the dental scenario includes sharps, used disposable items, infectious waste (blood-soaked cotton, gauze, etc.), hazardous waste (mercury, lead), and chemical waste (such as spent film developers, fixers, and disinfectants). A major concern in our field is management and disposal of mercury. Result was that many dentists have knowledge about the waste management but they lack in the attitude and practice. There is need for education regarding hazards associated with improper waste disposal at all levels of dental personnel. It is imperative that waste should be segregated and disposed off in a safe manner to protect the environment as well as human health.(1)
- According to another study, biomedical waste management becomes an issue, especially when the country is listed among one of the most polluted countries in the world. 183 male and 317 female students, representing more than 40 approved and recognized dental institutes were randomly selected and were asked to fill the questionnaire Results show that a large percentage of the students were not aware of the process of biomedical waste management (89%) whereas about half of the subjects were moderate to slightly aware about the recycling/reusing of dental materials .(2)
- Another study reveals that the medical waste management processes include handling, segregation, mutilation, disinfection, storage, transportation and final disposal. These are vital steps for safe and scientific management of medical waste in any establishment (3)
- .Another study reveals that the management of medical waste is of great importance due to its potential environmental hazards and public health risks. In the past medical waste was often mixed with municipal solid waste and disposed of in residential waste landfills or improper treatment facilities (eg inadequately controlled incinerators) in Korea. In recent years, many efforts have been

made by environmental regulatory agencies and waste generators to better manage the waste from healthcare facilities (5)

- Bio-medical waste has a higher potential of infection and injury to the healthcare worker, patient and the surrounding community. Awareness programmes on their proper handling and management to healthcare workers can prevent the spread of infectious diseases and epidemics. strict supervision, daily surveillance, audits inspections, involvement of hospital administrators and regular appraisals are essential to optimise the segregation of biomedical waste .(6)
- All disposable plastic should be subjected to shredding before disposing off to vendor. Final treatment of medical waste can be done by technologies like incineration, autoclave, hydrolase or microwave (7)
- According to another study, the key to minimization and effective management of medical waste is segregation (separation) and identification of the waste. They recommend that the most appropriate way of identifying the categories of medical waste is by sorting the waste into colour coded plastic bags or containers (8)
- According to World Health Organization (WHO) estimates 85% of Bio medical waste is non-hazardous and around 10% is infectious while the remaining 5% is non-infectious but consists of hazardous chemicals like methyl chloride and formaldehyde (9)
- Johannessen et al (2000) opine that proper management of medical waste can minimize the risk both within and outside healthcare facilities. The first priority is to segregate wastes, preferable at the point of generation into reusable and non-reusable, hazardous and nonhazardous components. (10)

Need of biomedical waste management in hospital

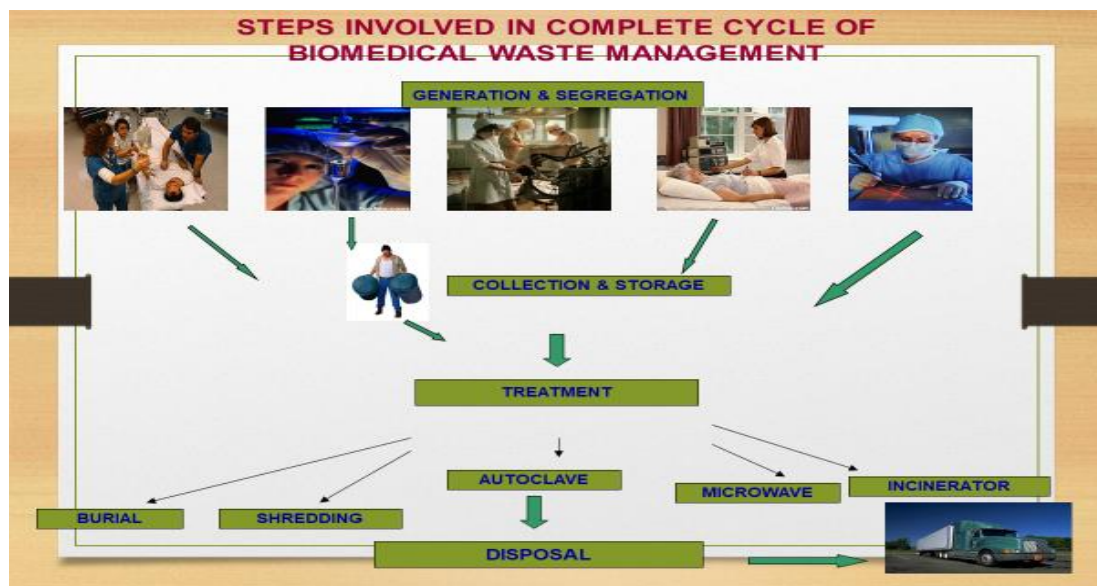
The reasons due to which there is great need of management of hospitals waste such as:

1. Injuries from sharps leading to infection to all categories of hospital personnel and waste handler.
2. Nosocomial infections in patients from poor infection control practices and poor waste management.

3. Risk of infection outside hospital for waste handlers and scavengers and at time general public living in the vicinity of hospitals.
4. Risk associated with hazardous chemicals, drugs to persons handling wastes at all levels.
5. “Disposable” being repacked and sold by unscrupulous elements without even being washed.
6. Drugs which have been disposed of, being repacked and sold off to unsuspecting buyers.
7. Risk of air, water and soil pollution directly due to waste, or due to defective incineration emissions and ash.

Biomedical Waste Management Process

There is a big network of Health Care Institutions in India. The hospital waste like body parts, organs, tissues, blood and body fluids along with soiled linen, cotton, bandage and plaster casts from infected and contaminated areas are very essential to be properly collected, segregated, stored, transported, treated and disposed of in safe manner to prevent nosocomial or hospital acquired infection.



1. Waste collection
2. Segregation
3. Transportation and storage
4. Treatment & Disposal
5. Transport to final disposal site
6. Final disposal.

EFFECTS OF BIOMEDICAL WASTE ON HEALTH

Sharps: The reuse of syringes: Worldwide, an estimated 10 to 20 million infections of Hepatitis B and C and HIV occur annually from the reuse of discarded syringe needles without prior sterilization.

Accidental Contacts: This happens through contaminated air, water or food, by accidental contact with soiled dressings or by injury from sharps.

Infections and diseases:

Serious diseases may develop in healthcare personnel, waste handlers, patients and the general public. In any healthcare establishment, nurses and house-keeping personnel are the main groups at risk of injuries, annual injury rates are 1020 per 1000 workers. Highest rates of occupational injury among all workers who may be exposed to health-care waste are reported by cleaning personnel and waste handlers, the annual rate in USA is 180 per 1000. There are reported cases of staphylococcal bacteraemia and endocarditis among housekeeping staff after a needle injury. Risk of infection of hepatitis B after needle stick injury-chances of susceptible health care workers (HCWs) is 6-30% after single needle stick exposure. In USA, in June, 1994, 39 cases of HIV infection were recognized by the centers for disease control and prevention as occupational infections with the following pathways of transmission: 32 from hypodermic needle injuries. • 1 from blade injury, • 1 from glass injury (broken glass from a tube containing infected blood) • 1 from contact with non-sharp infectious item, • 4 from exposure of skin or mucous membranes to infected blood.

By June 1996 the cumulative recognized cases of occupational HIV infection had risen to 51. All cases were nurses, medical doctors, or laboratory assistants. HCWs who are immunized are not at risk. Post exposure prophylaxis (PEP) with HB Ig and HB vaccine is 90% effective. However, Pre-exposure prophylaxis with HB vaccine is essential.

THE BIOHAZARD SYMBOL:

**Schedule-III
LABEL FOR BIO-MEDICAL WASTE CONTAINERS/BAGS**

BIOHAZARD SYMBOL	CYTOTOXIC HAZARD SYMBOL
 BIOHAZARD	 CYTOTOXIC
HANDLE WITH CARE	

TYPES OF BIOMEDICAL WASTE:

Types of Bio-Medical Waste Rules: 2016			
Cat.	Type of Bag/ Container used	TYPE OF WASTE	Treatment /Disposal options
Yellow 	non-chlorinated plastic bags Separate collection system leading to effluent treatment system ←	a) Human Anatomical Waste b) Animal Anatomical Waste c) Soiled Waste d) Expired or Discarded Medicines e) Chemical Waste f) Micro, Bio-t and other clinical lab waste g) Chemical Liquid Waste	Incineration or Plasma Pyrolysis or deep burial*
Red 	non-chlorinated plastic bags or containers	Contaminated Waste (Recyclable) tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles) and gloves.	Auto/ Micro/Hydro and then sent for recycling. not be sent to landfill
White 	(Translucent) Puncture, Leak, tamper proof containers	Waste sharps including Metals	Auto or Dry Heat Sterilization followed by shredding or mutilation or encapsulation
Blue 	Cardboard boxes with blue colored marking	Glassware	Disinfection or auto/ Micro/hydro and then sent for recycling.

PRESCRIBED AUTHORITIES AND CORRESPONDING DUTIES:

1. Ministry of Environment, Forest and Climate Change, Government of India
2. Central or State Ministry of Health and Family Welfare, Central Ministry for Animal Husbandry and Veterinary or State Department of Animal Husbandry and Veterinary.
3. Ministry of Defence
4. Central Pollution Control Board
5. State Government of Health or Union Territory Government or Administration
6. State Pollution Control Boards or Pollution Control Committee.

2.3 AIM OF THE STUDY:

To assess the knowledge of hospital staff about Biomedical waste Management.

OBJECTIVES OF THE STUDY:

4. To assess the Knowledge and awareness in hospital personnel regarding bio-medical waste and its management.
5. To assess the attitudes of health care workers about biomedical waste management
6. To observe the existing practices of biomedical waste management in the health facilities of Thumbay hospital by observational checklist.

2.4 RATIONALE OF THE STUDY:

A major issue related to current Bio-Medical waste management in any hospital is that the implementation of Bio-Waste regulation is unsatisfactory as some hospital staff are disposing the waste in a haphazard, improper and indiscriminate manner. Lack of segregation practices, results in mixing of hospital wastes with general waste making the whole waste stream hazardous. Inappropriate segregation ultimately results in an incorrect method of waste disposal. Inadequate Bio-Medical waste management thus will cause environmental pollution, unpleasant smell, may lead to the transmission of diseases like typhoid, cholera, hepatitis and AIDS through injuries from syringes and needles contaminated with human.

RESEARCH QUESTION:

What are the knowledge and Awareness among the hospital staff about biomedical waste management?

2.5 METHODOLOGY:

STUDY SITE: The study is carried out at Thumbay hospital, Hyderabad.

STUDY POPULATION: The study is conducted among healthcare professionals including doctors, nurses, lab technician and housekeeping staffs of the hospital to assess the level of awareness regarding biomedical waste management through the structured questionnaire which consisted of following parameters:

- ❖ Knowledge of the hospital staff regarding BMW management.
- ❖ Level of awareness about the biomedical waste management.
- ❖ Attitude of the staff about BMW management and Knowledge/ awareness about needle stick injury.

The checklist was used for qualitative assessment of biomedical waste disposal and practice by observation, for this, a total of seven wards (general surgery, general medicine, postnatal, gynecology, pediatrics, labor room, and casualty), procedure rooms in outpatient department, and four laboratories (central lab, microbiology, and pathology) .

Total questions asked were 10 questions for knowledge, 12 questions for awareness, 9 questions for attitude and 8 questions for knowledge/awareness of needle stick injury.

Knowledge: Low, medium, and high (score <50%, 50–70%, >70%, respectively).

Awareness: Low, medium, and high (score <50%, 50–75%, >70%, respectively)

Attitude: poor ≤4, Average: <7, Satisfactory: >8

Needle stick injury knowledge and practice: Poor: ≤4 practices according to guidelines

Average: < 7 practices according to guidelines

Satisfactory: >8 practices according to guidelines

Those who had good practices were assumed to be managing the waste in the proper manner and were able to protect themselves and environment from the negative impact of waste. After completion of data collection, data were coded and analyzed using Microsoft Excel.

TIME PERIOD: 3months

TECHNIQUE: Convenient sampling was done for the selection of respondent.

SAMPLE SIZE: The sample size taken is 120 including doctors, nurses, lab technician and housekeeping staff.

TOOLS: Quantitative

DATA COLLECTIO METHOD: Both primary and secondary data were used. Primary data was collected using questionnaires,

Primary data was generated using questionnaires, informal interviews and observation checklist.

1. Direct observation technique of various departments generating the BMW.
2. Interview with staff using structured questionnaire.

Secondary data: Secondary data was obtained from the hospitals' documents that were available mainly on the notice boards of various departments guiding the employees

PARAMETERS OF THE STUDY:

1. Knowledge of biomedical waste generation, legislation and handling rules(2016).
2. Level of Awareness on biomedical waste management among the hospital staff,
3. Attitude, behavior assessment towards biomedical waste management practices.
- 4.Knowledge and practices about needle stick injury.
5. General observation of biomedical waste disposal and different parts of the hospital.

2.6 ANALYSIS & RESULT

KNOWLEDGE OF BIOMEDICAL WASTE GENERATION, HAZARDS AND LEGISLATION

S.NO	KNOWLEDGE ASSESED	DOCTORS	NURSES	LAB TECHNICIAN	HOUSEKEEPING
1	What agency regulates wastes generated at healthcare facilities?	30.00%	50%	45%	32.14%
2	Do you think it is important to know about BM waste generation, hazards and legislation?	96.60%	97.50%	86%	89.29%
3	Biomedical waste (management and handling) rules were first proposed in?	43.33%	47.50%	36%	39.29%
4	Are you aware of the guidelines provided by biomedical waste management and handling rules 2016?	70%	90%	32%	64.29%
5	Which statement describes one type of biomedical waste?	80%	72.50%	73%	53.57%
6	According to biomedical waste (management and handling) rules, waste should not be stored beyond?	50%	47.50%	32%	17.86%
7	Who regulates the safe transport of medical waste?	53.33%	40%	23%	39.29%
8	Which disease can be transmitted if hospital waste is not managed properly?	80%	70%	68%	64.29%

9	Does the hospital has biomedical waste audit?	76%	90%	95%	82.14%
10	How do you look at biomedical waste disposal?	89.65%	85%	100%	75%

Table 1.3.1

FINDINGS:

- Most of the study groups are not aware about the agency that regulates the healthcare waste , doctors are less aware than the nurses regarding this.
- More than 85% of the staffs look at the biomedical waste disposal as individual responsibility.
- The knowledge about the waste should not be stored beyond 48 hours is very less among the housekeeping staff which is around 17%.
- Biomedical waste rules 1998 is known among very few of the study groups
- More than 70% of hospital staff are aware about the biomedical waste and its legislation and the disease caused by the improper handling of waste.

PERCENTAGE DISTRIBUTION OF STAFF ON THE BASIS OF HIGH MEDIUM AND LOW KNOWLEDGE.

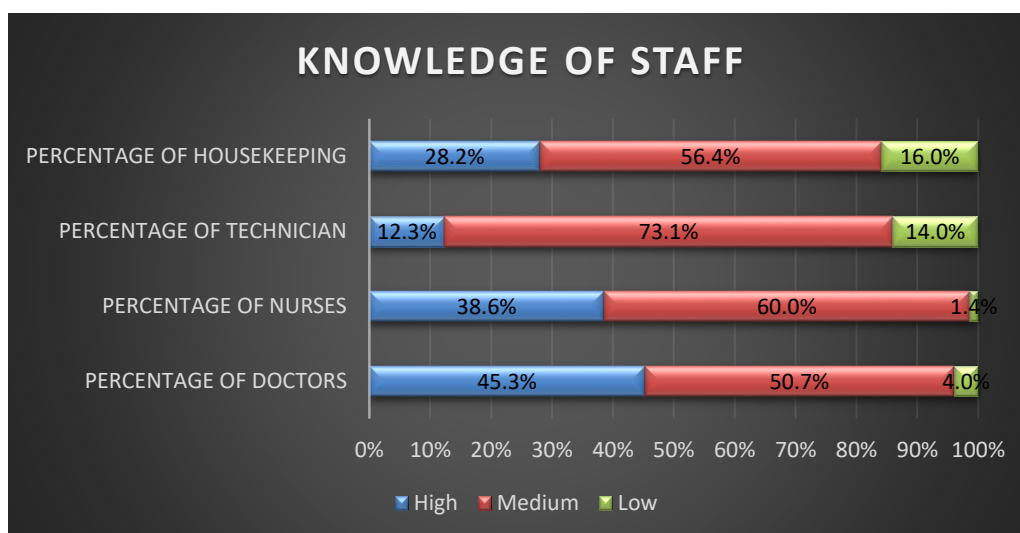


Figure 1.4.1

FINDINGS:

- Amongst all the staff 45% of doctors are having high knowledge for BMW disposal, whereas 50.7% have medium and 4.09% have low knowledge.
- 38.6% of the nurses have high knowledge about BMW disposal, 60.0% have medium knowledge and 1.4% are categorized as low knowledge.
- Only 12.3% of technicians are ranked having high knowledge and 73.1% and 14% of them are ranked as medium and low respectively.
- 28.2% of housekeeping staff are having high knowledge, 56.7% of them are having medium knowledge and 16% of them are having low knowledge.

OVERALL COMPARISON OF STUDY GROUPS TOWARDS BIOMEDICAL WASTE MANAGEMENT:

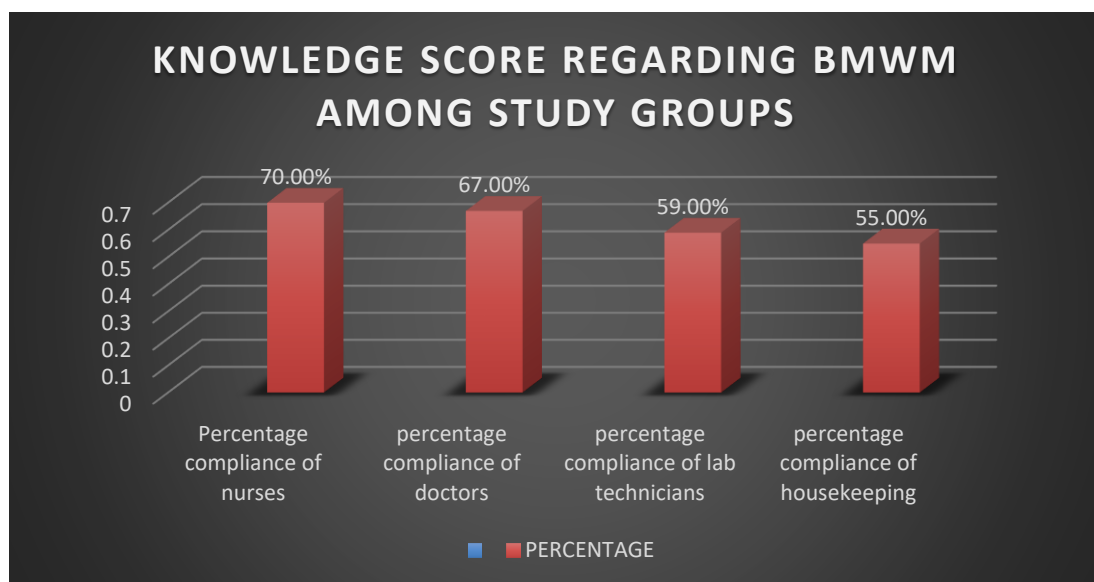


Figure 1.4.2

FINDINGS:

On Assessing the overall score, the knowledge regarding the biomedical waste is highest among the nurses (70%) and their percentage compliance is more than the knowledge among the doctors which is 67%. They were conscious of the measures for safe collection and final disposal of BMWM.

Percentage compliance of lab technician is average around 59%.

While the lowest knowledge about the biomedical waste management is among the housekeeping staff to be around 55%.

About 80% of the staff agreed to the fact that hospital waste is hazardous to health while only 20% thought that there is not so much difference between the normal waste and general waste.

Many of them were also unaware about the biohazard symbol. This shows that the people with higher education have more awareness about the environmental issues, national and International activities on biomedical waste management and the rules prescribed there in.

LEVEL OF AWARENESS ON BIOMEDICAL WASTE MANAGEMENT PRACTICE

S.NO	LEVEL OF AWARENESS ASSESED	DOCTORS	NURSES	LAB TECHNICIAN	HOUSEKEEPING
1	Do you know about colour coding segregation of BM Waste?	76.7%	97.5%	77.3%	57.1%
2	Does the hospital has a written policy , objectives and responsibility on biomedical wasre management?	80%	87.50%	81.80%	78.60%
3	Is the waste disposal practice correct in your hospital?	93.30%	57.50%	54.50%	42.90%
4	Objects that may b capable of causing punctures or cuts, that may have been exposed to blood including scalpels , needles , glass , ampules are considered BMW. How should these objects be disposed of?	43.30%	85%	68.20%	57.10%
5	The colour code for BM waste to be autoclaved , disinfected is?	30%	40%	72.70%	17.90%
6	The approximate proportion of infectious waste among total waste generated from a healthcare facility is?	36.70%	17%	13.60%	25%
7	The colour code for disposal of normal waste from the hospital is?	83.30%	92.50%	90.90%	85.70%

8	Do you know what sodium hypochlorite solution is and when it is used?	70%	95.50%	81.80%	78.60%
9	Are you aware of the disinfectants and antiseptics used in your hospital?	73.30%	97.50%	50%	57.10%
10	All of the following statements about hazardous waste containers are true, except for?	66.70%	40.00%	59.10%	32.10%

Table 1.3.2

FINDINGS:

- More than 70% staff among the doctors, nurses and lab technician were aware about the colour coding but about 43% of housekeeping staff were unaware about the colour coding.
- Very few study groups around half of the doctors agreed that they did not followed the colour coding including the lab technician and the housekeeping staff.
- More than 70% agreed that the hospital had written policy for biomedical waste management.
- Only doctors strongly agreed to the fact that waste disposal is correctly followed in the hospital while half of the nurses, lab technician and the housekeeping staff were of the fact that waste disposal is not correctly followed.
- Universal precaution (PPE) usage was strongly agreed by only doctors while the other nursing staff (40%) lab technician and housekeeping agreed that PPE usage is less.
- Awareness about the puncture proof containers (white bins) is very less among the doctors, followed by the lab technician and the housekeeping staff. Only nursing staff (more than 80%) were aware about the puncture proof container.
- The awareness about the colour code of which hospital waste which is disinfected is highest among the lab technician followed by the nurses and doctors but is the least among the housekeeping staff.

- The awareness about the approximate proportion of infectious waste among total waste is highest among the doctors followed by the nurses and the least among the lab technician.
- Almost most of the staff are aware about the general waste and about the disinfectants and its usage, only few of the housekeeping staff are unaware about the same.

PERCENTAGE DISTRIBUTION OF STAFF ON THE BASIS OF HIGH MEDIUM AND LOW AWARENESS.

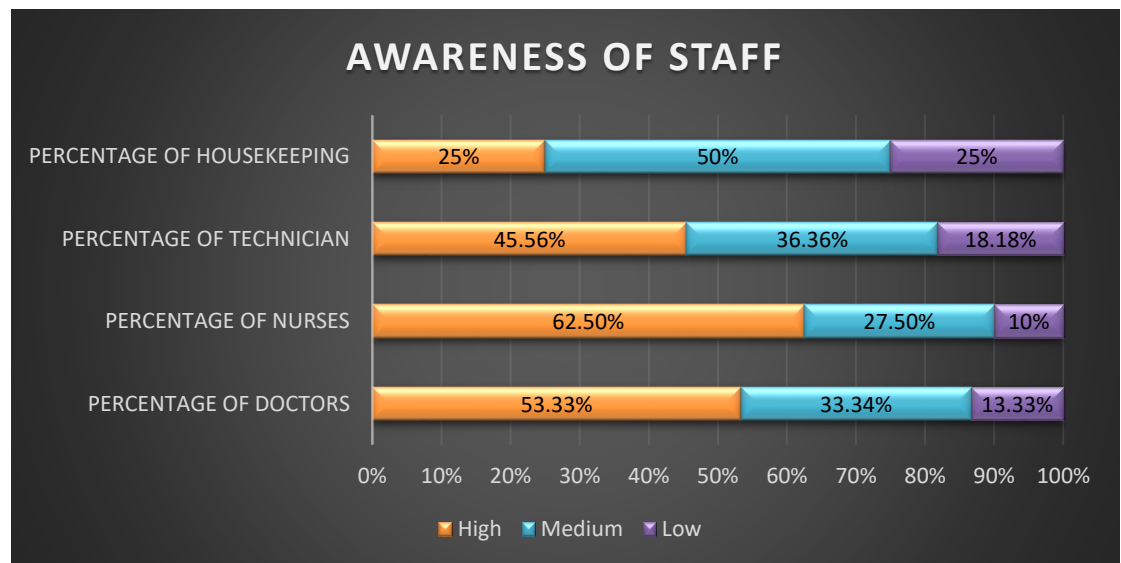


Figure 1.4.3

FINDINGS:

- Amongst all the staff 53.3% of doctors are having high awareness for BMW disposal, whereas 33.34% have medium and 13.33% have low awareness.
- 62.5% of the nurses have high awareness about BMW disposal, 62.50% have medium awareness and 1.4% are categorized as low awareness.
- 45.56% of technicians are ranked having high awareness and 36.36% and 18.18% of them are ranked as medium and low respectively.
- 25% of housekeeping staff are having high awareness, 50% of them are having medium awareness and 25% of them are having low awareness.

OVERALL COMPARISON OF STUDY GROUPS TOWARDS BIOMEDICAL WASTE MANAGEMENT:

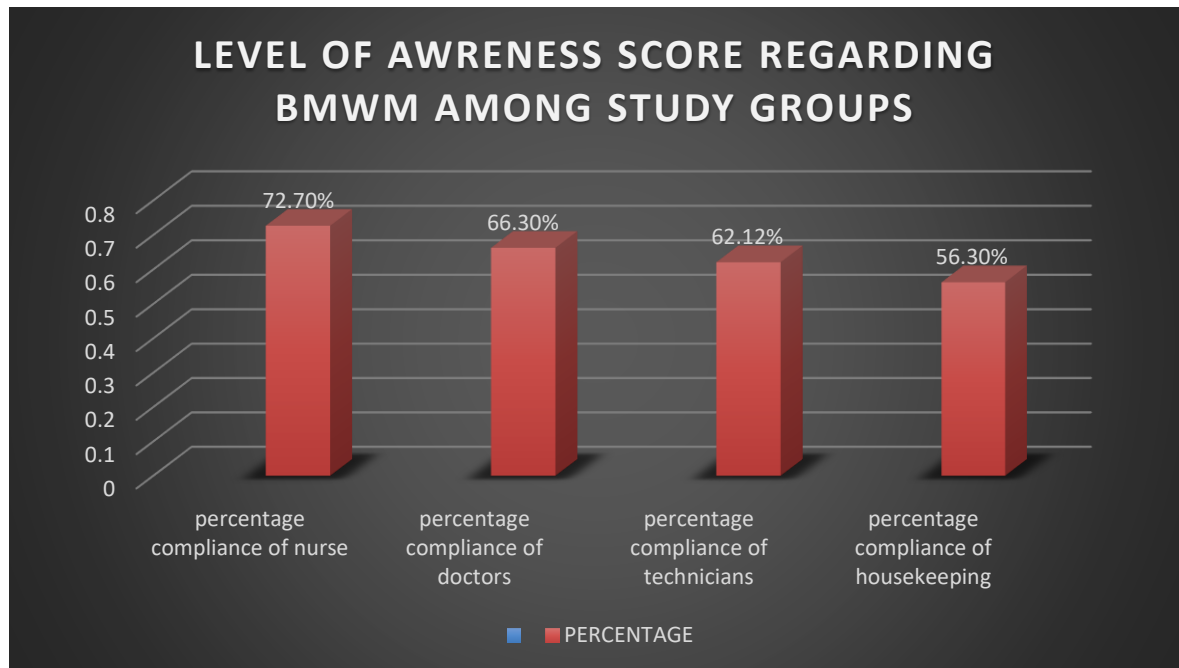


Figure 1.4.4

FINDINGS:

On Assessing the overall score, the level of awareness is highest among the nurses (72.70%) which is followed by the percentage compliance of doctors which is around 66.3%..

The percentage compliance of lab technician for the level of awareness is around 62%.

The least percentage of compliance is found among the housekeeping staff with around 56.30%.

Correct waste disposal practice is not being done and the usage of universal precaution is not followed.

ATTITUDE/BEHAVIOUR ASSESMENT TOWARDS BIOMEDICAL WASTE

S.NO	ATTITUDE OF RESPONDENTS	DOCTORS	NURSES	LAB TECHNICIAN	HOUSEKEEPING
1	Waste management is team work/ no single class of people is responsible for safe management?	86.7%	77.5%	86.4%	100.0%
2	Management of health care waste is an extra burden on work and increases the financial burden on management	60.0%	55.0%	45.5%	28.6%
3	Segregation of waste at source increases the risk of injury to waste handlers	30.0%	42.5%	63.6%	7.1%
4	Infectious waste should be put in yellow coloured plastic bag with bio hazard symbol	93.3%	85.0%	59.1%	42.9%
5	Use of colour code for segregation of waste is a must	100.0%	95.0%	90.9%	100.0%
6	Reporting of needle stick injury is an extra burden on work	46.7%	77.5%	68.2%	28.6%
7	What can be done if someone makes a mistake by putting a wrong waste in wrong bag?	53.3%	42.5%	31.8%	17.9%
8	Do you think that the hospital should organise separate classes on continuing the biomedical waste	93.3%	95.0%	100.0%	92.9%

	management programme to upgrade existing knowledge about biomedical waste management?				
9	Do you think that infectious waste should be sterilized from infections by autoclaving before shredding and disposal?	93.3%	45.0%	63.6%	75.0%

Table 1.3.3

FINDINGS:

- More than 70% of the hospital staff agreed to the fact that waste management is a team work.
- Most of the housekeeping staff think that the management of healthcare waste is an extra burden on work and increases the financial burden.
- Most of the staff are of the view that segregation of waste at source increases the risk of injury to waste handlers. Almost 90% of the staff are of the thought that there should be separate classes for biomedical waste management and segregation.
- 70% of the housekeeping staff thinks that reporting for needle stick injury is an extra burden on work. Less than 50% of the study groups thinks that gloves should be used if wrong waste is put on wrong bag rather than using chitel Forcep.

PERCENTAGE DISTRIBUTION OF STAFF ON THE BASIS OF SATISFACTORY, AVERAGE AND POOR ATTITUDE

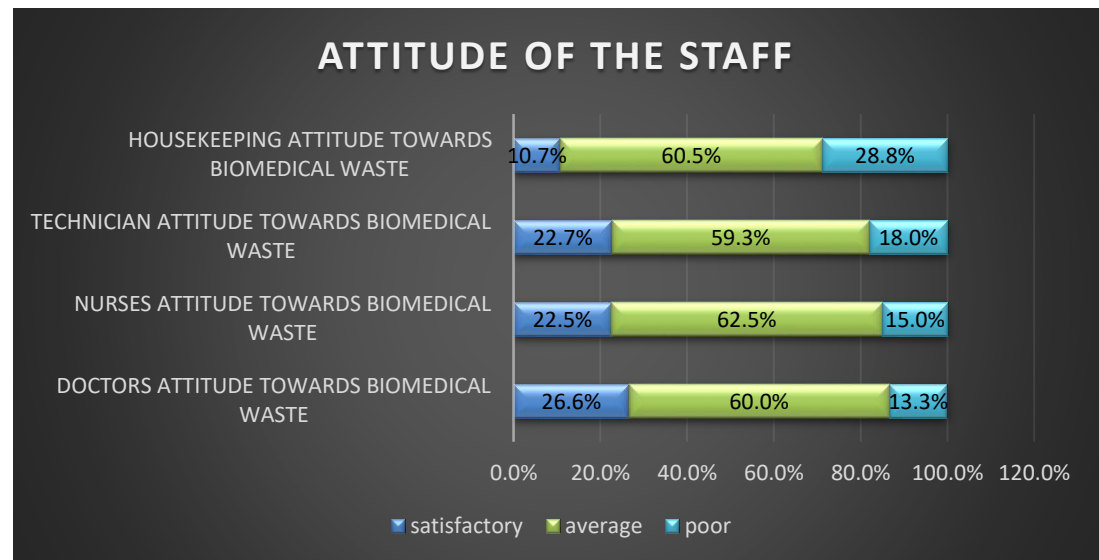


Figure 1.4.5

FINDINGS:

- Amongst all the staff 26.6% of doctors are having satisfactory attitude for BMW disposal, whereas 60% have average and 13.3% have poor attitude.
- 22.5% of the nurses have satisfactory attitude about BMW disposal, 62.5% have average attitude and 15.0% are categorized as having poor attitude.
- 22.75% of technicians are ranked having satisfactory attitude and 59.3% and 18% of them are ranked having average and poor attitude.
- Only 10.7% of housekeeping staff are having satisfactory attitude, 50% of them are having average attitude and 25% of them are having poor attitude.

OVERALL COMPARISON OF STUDY GROUPS TOWARDS BIOMEDICAL WASTE MANAGEMENT

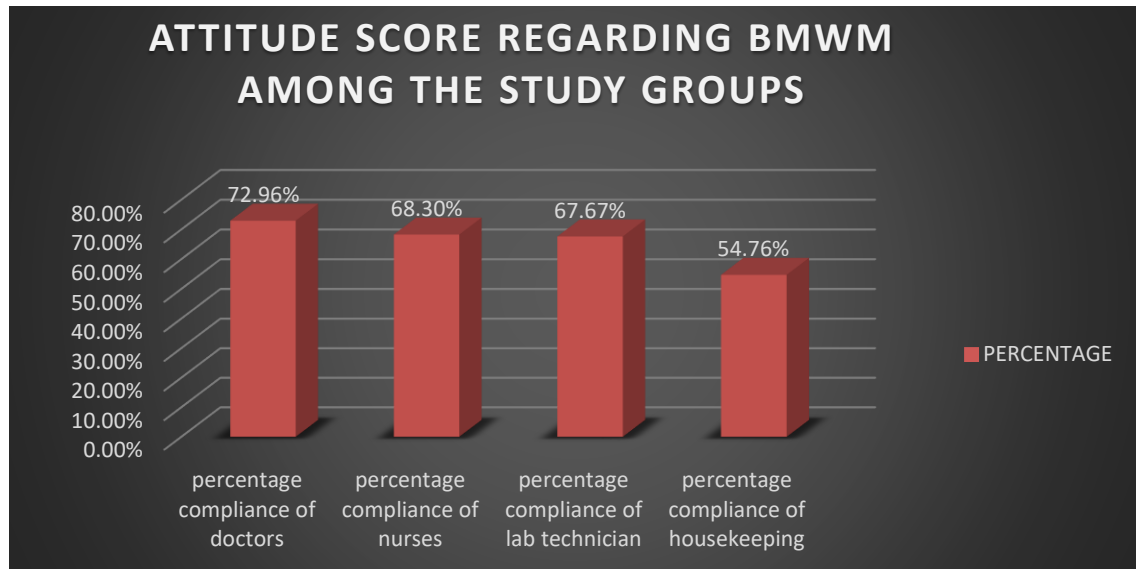


Figure 1.4.6

INTERPRETATION:

On Assessing the overall score, the positive attitude regarding the biomedical waste management is the highest among the doctors (72.96%) followed by the attitude of the nurses (68.30%)

Nurses are followed by lab technician with the percentage compliance of 67.67%.

The least compliance for the positive attitude and behaviour is found among the housekeeping staff with around (54.76%)

Segregation of waste should be done at source and all the infectious waste should be sterilized before shredding and disposal.

Almost whole of the staff (Doctors and Nurses) showed a positive attitude towards the need for measures for safe collection and final disposal of BMW and supported the ongoing effort

LEVEL OF KNOWLEDGE AND PRACTICES ON NEEDLE STICK INJURIES

S.NO	ASSESSMENT ON KNOWLEDGE AND PRACTICE ON NEEDLE STICK INJURY	DOCTORS	NURSES	LAB TECHNICIAN	HOUSEKEEPING
1	Is needle stick injury a concern?	97.0%	95.0%	86.4%	100.0%
2	Do you recap the used needle?	70.0%	42.5%	36.4%	17.9%
3	Do you discard the used needle immediately?	100.0%	95.0%	86.4%	85.7%
4	Are you aware of consequences of needle stick injury?	93.3%	97.5%	86.4%	67.9%
5	Have you sustained a needle stick injury during the last 12months	63.3%	70.0%	68.2%	42.9%
6	How did the most recent incident happen?	63.3%	72.5%	36.4%	57.1%
7	To whom did you report the injury?	86.7%	97.5%	81.8%	71.4%

8	Did you fill the incident report?	76.7%	72.5%	63.6%	53.6%
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Table 1.3.4

FINDINGS:

- More than 90% of the study groups were of the opinion that needle stick injury is a concern.
- Recapping of the used needle is done very less among the housekeeping staff followed by the technician, nurses and the doctors.
- Most of the staff discarded the used needle immediately.
- Almost all the doctors and nurses are aware about the consequences of needle stick injury. Only the housekeeping staff are not aware of the consequences as such which is harmful for them .
- Most of the housekeeping staff has not filled the incident report if they had needle stick injury.

PERCENTAGE DISTRIBUTION OF HOSPITAL STAFF ON THE BASIS OF SATISFACTORY, AVERAGE AND POOR KNOWLEDGE AND PRACTICE ABOUT BIOMEDICAL WASTE MANAGEMENT.

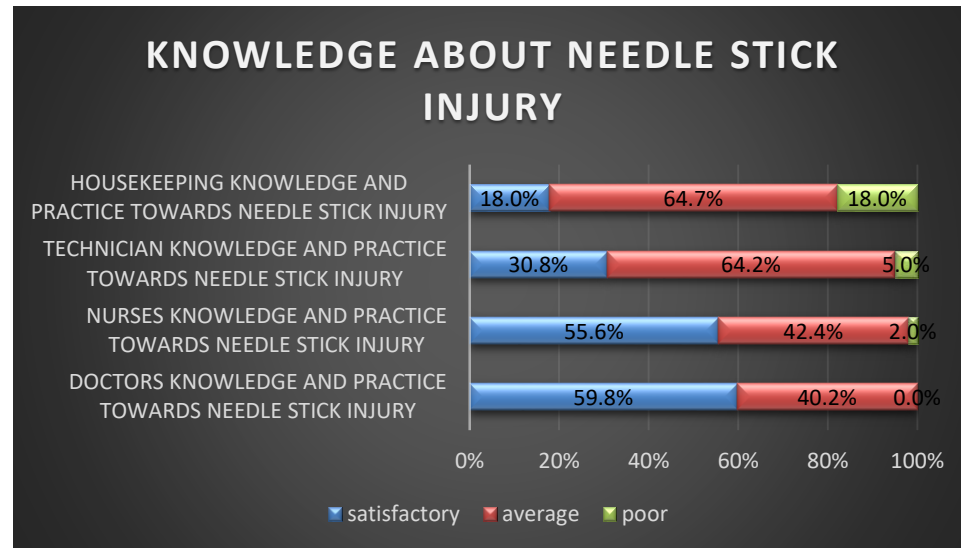


Figure 1.4.7

FINDINGS:

- Amongst all the staff 59.8% of doctors are having satisfactory knowledge about needle stick injury for BMW disposal, whereas 40.2% have average knowledge about needle stick injury
- 55.6% of the nurses have satisfactory knowledge about needle stick injury about BMW disposal, 42.4% have average and 2% are categorized as having poor knowledge about needle stick injury .
- 30.8% of technicians are ranked having satisfactory knowledge about needle stick injury 62.4% and 5% of them are ranked having average and poor knowledge about needle stick injury .
- Only 18% of housekeeping staff are having satisfactory knowledge about needle stick injury , 64.7% of them are having average and 18% are having poor knowledge about needle stick injury .

OVERALL COMPARISON OF STUDY GROUPS TOWARDS BIOMEDICAL WASTE MANAGEMENT

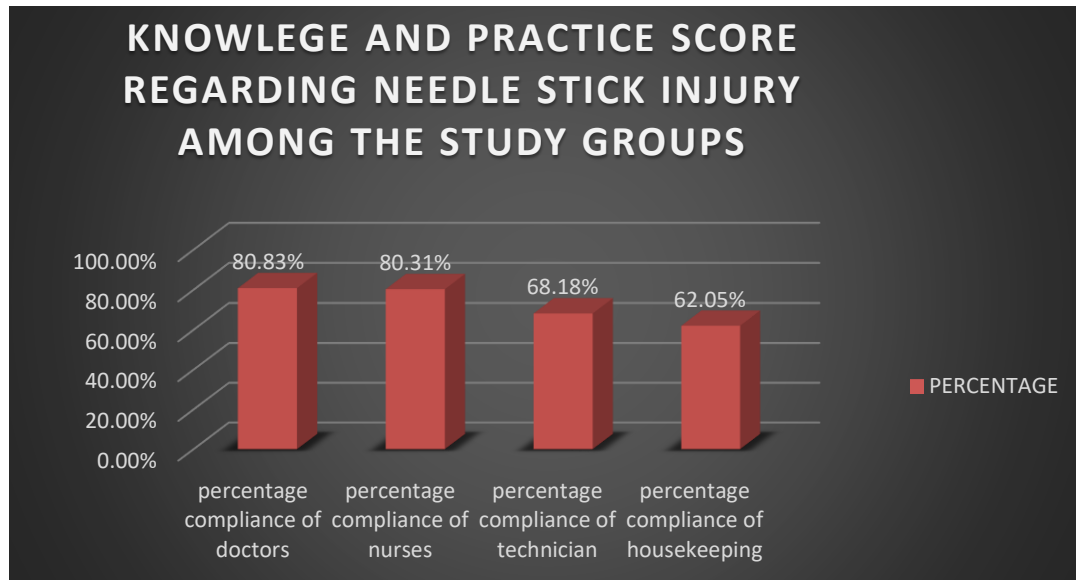


Figure 1.4.8

FINDINGS:

On assessing the overall score , the percentage compliance of doctors (80%) and the percentage compliance of the nurses(80%) is the same regarding the concern about the needle stick injury and its practices.

Percentage compliance of lab technician and the housekeeping staff is almost average at around 60% and above regarding the needle stick injury.

If such kind of incidence happens then the infection control nurse should be informed and the incident report should be compulsarily filled.

The entire waste management practices should be a part of total hygiene practice of the society rather than confining to hospital and health facility.

OBSERVATION OF BIOMEDICAL WASTE DISPOSAL AT DIFFERENT PARTS OF HOSPITAL

The following departments were observed in the main generating sites for BMW:

Laboratory

OPD

Wards

ICU

Operation Theatre

Observations are made on the following points:

1. The waste generating source and area
2. The segregation technique
3. The working technical staff as well as the housekeeping staff in the department.
4. The store room inside and outside the department
5. Condition of dustbins and sharp containers
6. Mode of transportation

Hence, different areas of the hospital are observed for proper biomedical waste management and disposal practices in hospital.

COLOURED BAGS		GEN WARD	CUBICLE	SHARING	MICU	CCU	PRIVATE BLOCK	CATH LAB	DIALYSIS	EMERGENCY	SICU	PICU	PROCEDURE ROOM
YELLOW	HUMAN AND ANIMAL ANATOMICAL WASTE, SOILED WASTE, EXPIRED MEDICINE, CHEMICAL WASTE, MICRO AND CHEMICAL LIQUID WASTE	no	yes	yes	yes	yes	no	yes	no	no	yes	yes	yes
RED	CONTAMINATED WASTE, TUBINGS, BOTTLE, INTRAVENOUS TUBES AND SETS CATHETERS, URINE BAGS, SYRINGES AND GLOVES	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no	no
GREEN	NORMAL WASTE	no	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes
BLUE	GLASSWARE	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes
WHITE	WASTE SHARPS INCLUDING METALS	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no

Table 1.3.5

General Observation:

The following departments were observed in the main generating sites for BMW:

- On Observation at different parts of the hospital , it was observed that there was improper waste disposal practiced in general ward.

GENERAL WARD:

Types of waste:

- Sharps: needles
- Plastics: syringes
- Human waste: blood, urine , soiled cotton

The department was clean and tidy.

Dustbins are not clean and overflowing.

Improper waste disposal in yellow and green coloured bins. Soiled cotton was found thrown in the normal waste bin.

Proper universal precaution is not being used.

The house keeping staff should mandatorily wear PPE while managing biomedical waste.

CUBICLE:

- In cubicle it was observed that the sharp container do not have sodium hypochlorite solution.
- There was spillage of waste outside the dustbin and the PPC container was not well maintained.

SHARING:

- Improper waste disposal practice was observed in the sharing area.
- Soiled cotton was found in the nursing station area of the sharing rooms.
- The waste from the wards are collected and then transfered in the particular coloured bags.
- Improper waste disposal in the coloured bins is observed.

MICU AND CCU:

- The department was clean and tidy.
- There was no spillage of waste outside the dustbin
- Biomedical waste management 2016 guidelines are correctly followed in MICU and CCU.

PRIVATE B BLOCK

- Improper waste disposal in yellow coloured bin is observed.
- PPC container is proper with sodium hypochlorite solution.

CATH LAB:

- Improper waste disposal is observed in green as well as yellow coloured bins.
- The cath lab staff are observed to follow proper PPE.

DIALYSIS:

- The waste disposal segregation is not properly followed in dialysis.
- All the disposals are seen thrown in red.
- No proper protocol is followed.

EMERGENCY:

- Improper waste disposal is seen in coloured bins of emergency and procedure room.
- The housekeeping staff and nurses are observed not wearing PPE.
- All the waste are disposed in the bedside bins irrespective of the 2016 guidelines.

SICU AND PICU

- The department is clean and tidy.
- The dustbins and the sharp containers are also having the proper disposal and filled with sodium hypochlorite solution.

OT:

Types of waste in operation theatre are:

- Sharps: needles and broken glass
- Plastic: syringes, tubing's and canulas
- Human waste: blood, urine, body parts after surgery.

Very few coloured plastic bags are used as directed by the standards.

- The biomedical waste is collected and removed from the area every 12hours.
- The waste is not immediately removed after some surgeries.
- The dirty utility room was not clean and stinking.
- The housekeeping staff is not well versed with the special precautions to be taken for maintaining the cleanliness of the OT area.

OPD AREA

Types of waste:

- Sharps: needles, broken glass
- Plastic: Syringes
- Human tissue: blood, pus

Segregation Technique: A common bucket or dustbin was present there and everything was disposed in that only.

Dustbins were clean and not overflowing.

2.7 DISCUSSION

- Knowledge, attitude and level of awareness about biomedical waste management and disposal is more amongst the nurses and doctors but least among the housekeeping staff. .
- Most of the staff including nurses and housekeeping staff are seen not using the PPE regularly which should be made mandatory because that is essential for their own safety.
- Although having knowledge the hospital staff is not following the proper waste disposal protocol. In spite of having knowledge they don't follow.
- Proper bins are not present according to 2016 guidelines and the colour coding.

2.8 RECOMMENDATION

1. Basic knowledge about bmwm should be communicated to all staff using training programmes. Training should be given regarding:

- Training regarding colour coding, only 43% of the housekeeping staff were aware about the biomedical waste management.
- Training regarding the storage time duration
- Training regarding proper PPE protocols by the management.
- Training and imparting knowledge about the usage of puncture proof containers

2. There is a need for motivation to doctors, technician and housekeeping staff to follow the bmw methods by giving rewards to the staff following the proper protocol about biomedical waste management. (table).

3. Special training regarding importance of segregation of waste at the source is important.

4. A protocol should be set for the proper recording of the needle stick injury and also improve its reporting on the staff behalf.

5. There is a need of strict implementation of guidelines of biomedical waste management and regular supervision and monitoring by a separate committee, exclusively formed for the implementation of rules related to the safe management and handling of hospital waste.

6. Proper blue bins should be made available according to the biomedical waste management guidelines 2016.

7. There should be a strict policy for the correct waste disposal in general ward, sharing rooms and cubicles.. Floor supervisors should be made available on each floor for checking the waste disposal practice.

8 ..Hepatitis B vaccine should be provided to all the staff working in the hospital.

SPECIFIC SUGGESTIONS:

Regarding staff:

1. The housekeeping staff must be regularly rotates so that everyone must be well acquainted with all the aspects of job.
2. Regular small test of 10 to 15 min duration should be conducted by the housekeeping supervisor.
3. One of the housekeeping supervisor should be chosen every week and shall be asked to address the colleagues regarding BMW management.
4. The usage of personal protective equipment must be made mandatory among all the hospital staff.
5. And also awareness program should be conducted for all the staffs including doctors nurses and lab technician so that they should get updated with the waste handling rules.

Regarding Dustbins and Poly bags:

1. The sharp containers must contain the sodium hypochlorite solution.
2. Stickers should be made available on each of the colour bags with the name of the housekeeping staff shift wise with the ward number and the shift number.
3. Stickers with instructions in local language should be made available so as it becomes easy for the housekeeping staff to understand.
4. A day before only the inventory should be checked for the stock outs so that it is made available the very next day.

Regarding the garbage area:

1. Good quality of disinfectant should be provided in the dirty utility rooms.
2. Plastic aprons must be provided to the boys who are entering the garbage area.
3. It must be ensured that the containers are dry from outside.

Regarding the segregation and collection of waste:

1. Needles and syringes should be destroyed before with the cutter at the point of generation.
2. Frequency of collection and transportation should be increased.
3. Sharps should be collected in puncture proof containers.
4. On site collection requires the staff to close the waste bags when they are full.

There is a need for intensive training programs at regular time interval to repeatedly train and re-train all the staff with special importance to the new comers and to periodically acquaint them with updated BMW management.

2.9 CONCLUSION

- . Knowledge regarding color coding and risks of handling biomedical waste was not adequate among the participant.
- Nursing protocol should be made for handling infectious and noninfectious waste should be displayed at all nursing stations
- Awareness regarding biomedical waste management was satisfactory in medical personnel while poor in non-medical workers. As these workers are regularly engaged in the process of biomedical waste management and handling, therefore there is an urgent need for orientation.
- The nursing incharges were found to have good knowledge about certain aspects of Biomedical waste management especially regarding legislation such as Biomedical waste management and handling rule 2016 and waste segregation of needles and blades in blue container.
- On the other hand laboratory technicians had better knowledge regarding personal protective equipments and categories of waste than nurses.
- The hospital generates different waste categories and they are to some extent mismanaged within acceptable standards as all the wastes are not getting segregated at source of production, and go through different stages of waste management prior to final disposal.
- Everyone amongst the staff felt that there was a great need of a new or additional waste management team and training programme for the employees.
- Lack of proper and complete knowledge about bio-medical waste management impacts practices of appropriate waste disposal.

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Annexure 1

Assessment of Biomedical Waste

: Your position:

Doctor ☐

Housekeeping ☐

Nurse ☐

Lab technician ☐

Section 1: Knowledge of biomedical (BM) waste generation, hazards and legislation

1. What agency(ies) regulate(s) wastes generated at health care facilities?

State ☐

Private ☐

Do not know ☐

2. Do you think it is important to know about BM waste generation, hazards and legislation?

Yes ☐

No ☐

Somewhat ☐

3. Biomedical Waste (Management & Handling) Rules were first proposed in:

1997 ☐

☐

1998 ☐

1999 ☐

4. Are you aware of the guidelines provided by the biomedical waste management and handling rules 2016.

Yes ☐

No ☐

Not sure ☐

5. Which statement describes one type of BM waste:

Materials 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. ☐

6. According to the Biomedical Waste (Management & Handling) Rules, waste should not be stored beyond:

12 hours ☐

48 hours ☐

72 hours ☐

96 hours ☐

7. Who regulates the safe transport of medical waste?

☐ Pollution Control Board of India.

☐ Transport Corporation of India.

☐ Administration.

8. Which diseases can be transmitted if hospital waste is not managed properly?

(a) HIV and AIDS ☐

(C) Jaundice ☐

(B) Hep.B ☐

(D) Others ☐

9. Does the hospital has biomedical waste audit?

Yes ☐

No ☐

10. How do you look at biomedical waste disposal?

Individual Responsibility ☐ people ☐

Administrative Responsibility ☐ Others ☐

Section 2: Level of awareness on biomedical waste management practice

11 Do you know about colour-coding segregation of BM waste?

Yes ☐

No ☐

Not sure ☐

12. Do you follow colour-coding for BM waste?

Yes ☐

No ☐

Sometimes ☐

13..Does the hospital has a written policy , objectives and responsibility on biomedical waste management?

Yes ☐

No ☐

14. Is the waste disposal practice correct in your hospital?

Yes ☐

No ☐

15. Do you follow universal precautions in the hospital? Yes ☐ No ☐

16. Objects that may be capable of causing punctures or cuts, that may have been exposed to blood or bodyfluids including scalpels, needles, glass ampoules, test tubes and slides, are considered biomedical waste.

How should these objects be disposed of?

white bags ☐

Yellow bags ☐

Red bags ☐

blue bags ☐

17..The colour code for the BM waste to be autoclaved, disinfected is:

Red ☐

white ☐

Yellow ☐

Blue ☐

18 The approximate proportion of infectious waste among total waste generated from a health care facility is:

10- ☐

20% 30- ☐

40%

50- ☐

60%

80-90% ☐

19 The colour code for disposal of normal waste from the hospital is:

Red ☐

green ☐

Yellow ☐

Blue ☐

20. Do you know what sodium hypochlorite solution is and when it is used?

Yes ☐

No ☐

21. Are you aware of the disinfectants and antiseptics used in your hospital?

Yes ☐

No ☐

22. All of the following statements about hazardous waste containers are true, except for:

Containers must be closed except when removing or adding waste. ☐

Containers must be clean on the outside. ☐

9 Contents must be compatible with the type of waste containers. ☐

Any type of container, including food containers, can be used to contain hazardous waste. ☐

Section 3: Attitude/ behaviour assessment towards biomedical waste

23. Waste management is team work/no single class of people is responsible for safe management.

Agree ☐

Disagree ☐

Cannot comment ☐

24 Management of health care waste is an extra burden on work and increases the financial burden on management.

- Agree ☐ Disagree ☐ Cannot comment ☐
- 25..Segregation of waste at source increases the risk of injury to waste handlers
- Agree ☐ Disagree ☐ Cannot comment ☐
- 26.Infectious Waste should be put in yellow coloured plastic bag with bio hazard symbol
- Agree ☐ Disagree ☐ Cannot comment ☐
- 27.Use of colour code for segregation of waste is a must
- Agree ☐ Disagree ☐ Cannot comment ☐
- 28.Reporting of needle stick injury is an extra burden on work
- Agree ☐ Disagree ☐ Cannot comment ☐
- 29.What can be done if someone makes a mistake by putting a wrong waste in wrong bag?
- a. Pick it up with bare hands to put in right bag ☐
- b. Use gloves to pick up ☐
- c. Use a chital forceps ☐
- d. Others ☐
- 30.Do you think that the hospital should organise separate classes or a continuing the biomedical waste management programme to upgrade existing knowledge about biomedical waste management?
- Yes ☐ No ☐ Cannot comment ☐
- 31.Do you think that infectious waste should be sterilized from infections by autoclaving before shredding and disposal?
- Yes ☐ No ☐ Cannot comment ☐

Section 4: Level of knowledge among nurses, doctors, attendants, lab technicians on needle-stick injuries

- 32.Is needle-stick injury a concern?
- Yes ☐ No ☐ Do not know ☐
- 33Do you re-cap the used needle?
- Yes ☐ No ☐ Do not bother ☐
- 34.Do you discard the used needle immediately?
- Yes ☐ No ☐ Have not noticed ☐
- 35Are you aware of consequences of needle-stick injury?
- Yes ☐ No ☐ Not concerned ☐
- 36Have you sustained a needle-stick injury during the last 12 months?
- Yes ☐ No ☐ Do not remember ☐

If yes, how many injuries?

37.How did the most recent incident happen?

Poor disposal of needle ☐ Individual carelessness/acid ☐
 Cannot remember ☐ Other (specify) ☐

38.To whom did you report the injury?

Line manager ☐ Occupational health ☐
 Infection control ☐ Nobody ☐
 Cannot remember ☐ Other (specify) ☐

39..Did you fill in an incident report?

Yes ☐ No ☐ Cannot remember ☐

Annexure 2

COLOURED BAGS		GEN WARD	CUBICLE	SHARING	MICU	CCU	PRIVATE BLOCK	CATH LAB	OT	EMERGENCY	SICU	PICU	PROCEDURE ROOM
YELLOW	HUMAN AND ANIMAL ANATOMICAL WASTE, SOILED WASTE, EXPIRED MEDICINE, CHEMICAL WASTE, MICRO AND CHEMICAL LIQUID WASTE												
RED	CONTAMINATED WASTE, TUBINGS, BOTTLE, INTRAVENOUS TUBES AND SETS CATHETERS, URINE BAGS, SYRINGES AND GLOVES												
GREEN	NORMAL WASTE												
BLUE	GLASSWARE												
WHITE	WASTE SHARPS INCLUDING METALS												

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