

**ASSESSMENT OF THE EXISTING PRACTICES IN BIOMEDICAL WASTE MANAGEMENT:
A GAP ANALYSIS APPROACH**

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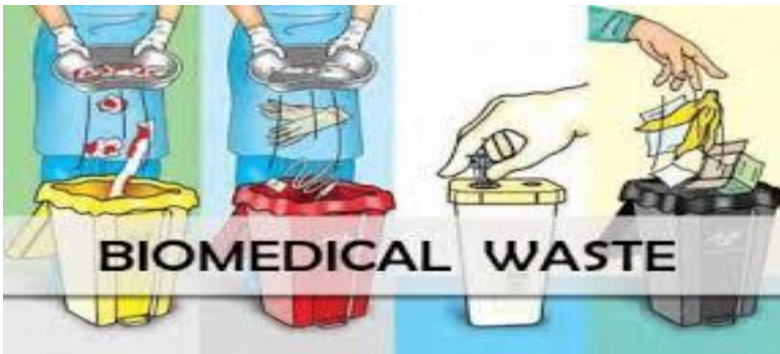
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INTRODUCTION



Biomedical waste is defined as “Any type of waste which is generated during the diagnosis, treatment or immunization of human beings or animals or during the research activities pertaining thereto or in the production or testing of biological (Preparation from organisms, micro-organisms/ Product of metabolism for diagnosis, treatment or research)”. The Government of India has made proper handling and disposal of this category of waste a statutory requirement with the publication of gazette notification no 460 dated 27th July, 1998 and the latest updated one on 28th March, 2016. The provisions are equally applicable to our service hospitals and hence there is a need for all the service medical, dental, nursing officers, other paramedical staff and safaiwalas to be well aware of the basic principles of handling, treatment and disposal of biomedical waste.

The composition of the biomedical waste is such that Non-hazardous waste comprises 85% of the waste and hazardous waste constitutes 15% of it. Of the 15% of the hazardous waste, 5% is hazardous but not infective and 10% is hazardous and infective. Biomedical waste is emerging as an issue of utmost concern, as the advancements taking place in the medical facilities have increased the waste generation per patient in the healthcare units worldwide.

In hospitals, the process of the biomedical waste is managed as follows:



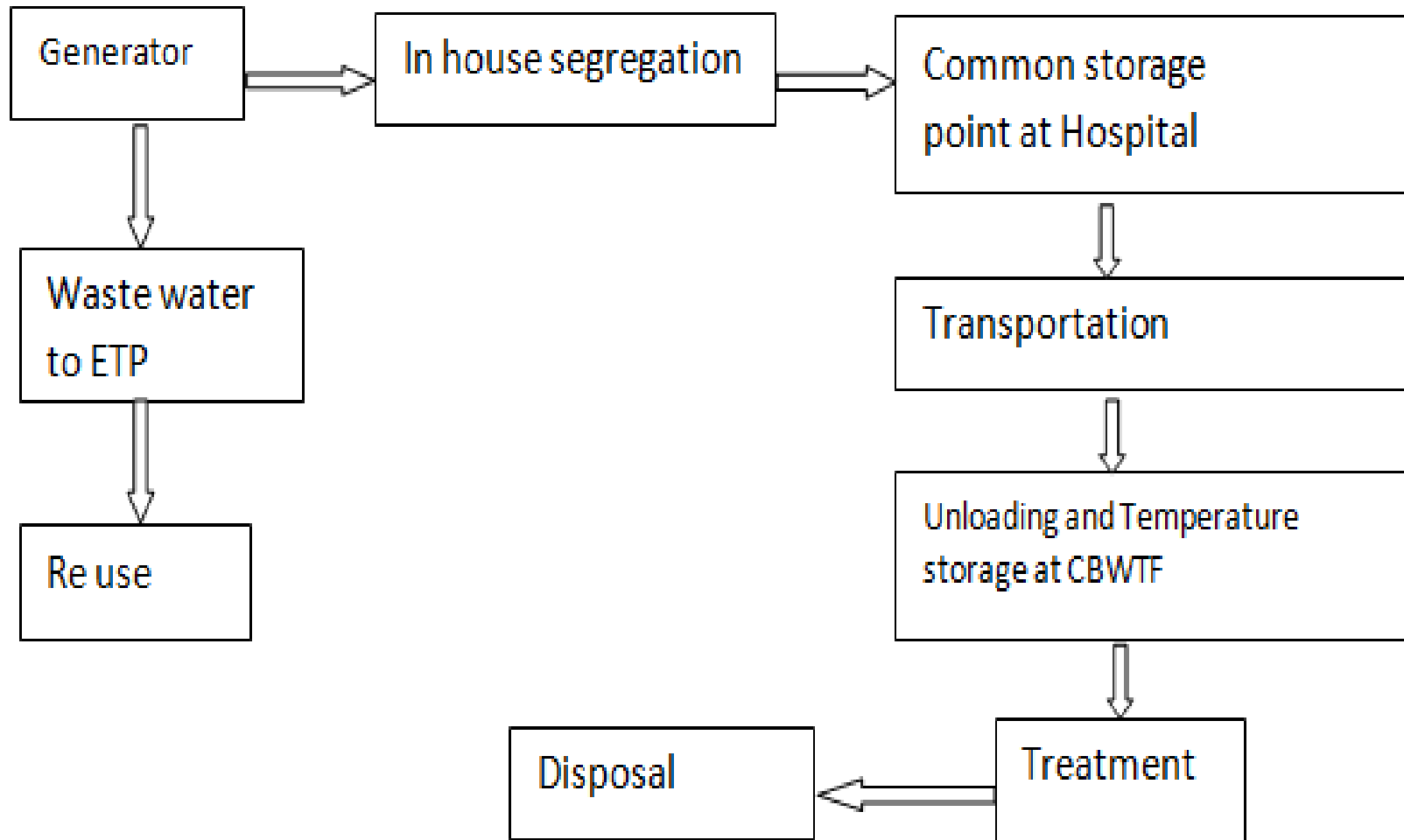


Fig . BMW management process: *The figure shows the 'As is' process of for the management of the biomedical waste in the hospitals.*

THE COLOUR CODING OF THE TYPES OF BIOMEDICAL WASTE ARE AS FOLLOWS:

WASTE CATEGORY	TYPE OF CONTAINER
Human anatomical waste	Non-chlorinated plastic bags
Animal anatomical waste	Non-chlorinated plastic bags
Soiled waste	Non-chlorinated plastic bags
Expired or discarded medicines	Non-chlorinated plastic bags or containers
Chemical waste	Non-chlorinated plastic bags or containers
Chemical liquid waste	Separate collection system leading to effluent treatment system
Discarded linen, mattresses, beddings, contaminated with blood or body fluid	Non-chlorinated plastic bag or suitable packing material
Microbiology, biotechnology and other clinical laboratory waste	Autoclave safe plastic bags or containers
Contaminated waste(recyclable)	Non-chlorinated plastic bags or containers
Waste sharps including metals	Puncture proof, leak proof, tamper proof containers
Glassware	Cardboard boxes
Metallic body implants	Cardboard boxes
General waste	Green coloured bins

Table . Colour coding of waste: *The table shows the colour coding of the waste into four colors as per the Biomedical waste management rules, 2016.*

The clinical solid waste is a very peculiar challenge in most of the healthcare facilities in the developing nations. poor handling practices and inappropriate disposal of hospital waste is an increasing health hazard in these countries. in developing countries, 1-2kg waste/bed/day is being produced and the waste produced is often not separated into hazardous and non-hazardous waste. further, there are various risks associated with the BMW management:

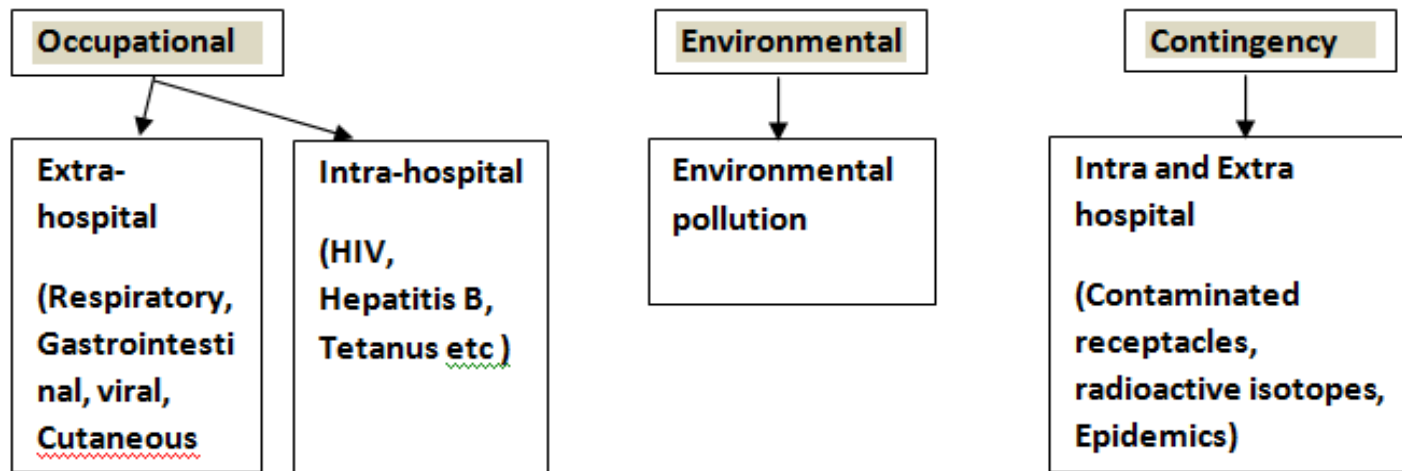


Fig . Risks associated with BMW: *The figure categorizes the risks associated with the biomedical waste as occupational, environmental and contingency.*

Therefore, there is an urgent need to divert attention towards the matter to streamline the process and to properly manage the Biomedical waste, so that infection control can be done.

OBJECTIVES

BIOHAZARD SYMBOL

जैविक परिसंकट चिन्ह



BIOHAZARD

जैविक परिसंकट



- 1. To map the current process flow in the biomedical waste management.**
- 2. To find the gaps present at different steps of process viz. waste generation, collection, storage and transportation.**
- 3. To identify the reasons for the gaps.**
- 4. To suggest value addition in the process.**



METHODOLOGY



Research Questions

- What is the current process flow for BMW management in the hospital?
- What are the gaps present in the process?
- What are the causes for the gaps present in the process?
- What value additions can be done to cover the gaps present in the process?

Study design and sampling

A descriptive study was conducted with non-probability convenient sampling.

Study area and location

The study was conducted at Civil hospital, Gandhinagar and covered Intensive Critical Care Unit, Wards(Medical wards, Surgical wards, Paediatric ward, ENT ward), Operation Theatre, Emergency, Laboratories (Cytology, Biochemistry, Pathology, Blood collection room), Storage room.

Study duration

The study was conducted for a period of 3 months from February,2018 to April,2018.

Data collection

The study was conducted by first mapping the process being followed for the biomedical waste management. A checklist was designed for keeping a record of the daily activities at different steps for the management of the biomedical waste viz waste generation->collection and storage->transportation.

The daily activities were kept a track of, through the checklist and an observational study was conducted at the above specified study area(Intensive Critical Care Unit, Wards, Operation Theatre, Laboratories, Storage room) to find the gaps, if present.

The gaps were identified through the observations and recorded in a pre designed template and fish bone analysis (Ishikawa diagram) was used to find the potential causes of the gaps found.

RESULTS



A. BIOMEDICAL WASTE MANAGEMENT

PROCESS FLOW:

i) Generation and Segregation:



Fig. Generation and segregation of waste process: *The generation and segregation of the waste is done in five colour coded bins- green, yellow, red, blue and white.*

ii) Collection and Storage:



Fig. Collection and storage of waste process: *The waste is collected in colour coded bags that are put in the same coloured bins in a separate collection room in each department and everyday at 8 o'clock the waste is taken to common storage facility located outside the hospital building, from where the waste is weighed using vernier calliper and transported to the outsourced facility.*

iii) Transportation:



Fig . Transportation of waste process: *The figure shows the transportation facility at the hospital. The waste from departments is transported in trolleys, where infectious and non-infectious waste is separated. And from the common storage room, a vehicle from the municipality collects it to the treatment facility.*



B. DURING THE STUDY, THERE WERE SOME GAPS OBSERVED IN THE MANAGEMENT OF THE BIOMEDICAL WASTE IN THE HOSPITAL, WHICH ARE SHOWN AS FOLLOWS:

i) Uncovered bins:



Fig .Uncovered bins: *The bins in the critical departments (ICCU, Emergency) are uncovered increasing the risk for infections.*

ii) Wrong coloured bag in the wrong bin:



Fig .Wrong coloured bag in the wrong bin: *There is a mismatch between the colour of the bin and the bag, which increases the chances of the mixing of the waste.*



iii) Wrong waste in wrong colour coding:



Fig . Wrong coloured waste in wrong colour coding (Blood collection room): *It was observed that waste was thrown in the wrong coloured bag.*

iv) Waste thrown outside the bin:



Fig . Waste thrown outside the bin: *There was spillage of the waste outside the bins and no proper supervision was maintained.*

v) The waste is being thrown on or outside the bag:



Fig. Waste thrown on or outside the bag: *The plastic bags were not placed properly in the bin and the waste was thrown outside the bag increasing chances of injuries to the personnel.*

vi) Waste hanging outside the bin:



Fig Waste hanging outside the bin: *The waste was not being properly disposed into the bin.*

vii) The bin filled more than 3/4th of the capacity:



Fig. The bin filled more than 3/4th of the capacity: *Regular collection of the waste is not being done at some places, leading to overfilling of the bins.*

viii) Waste kept on the shelf:



Fig. Waste kept on the shelf: *The waste is being kept at the shelf in various areas leading to poor infection control.*



ix) **Personal protective equipments not worn during handling of waste**

x) **The bags used for collection of waste are hung on the sides of the patient trolley:**



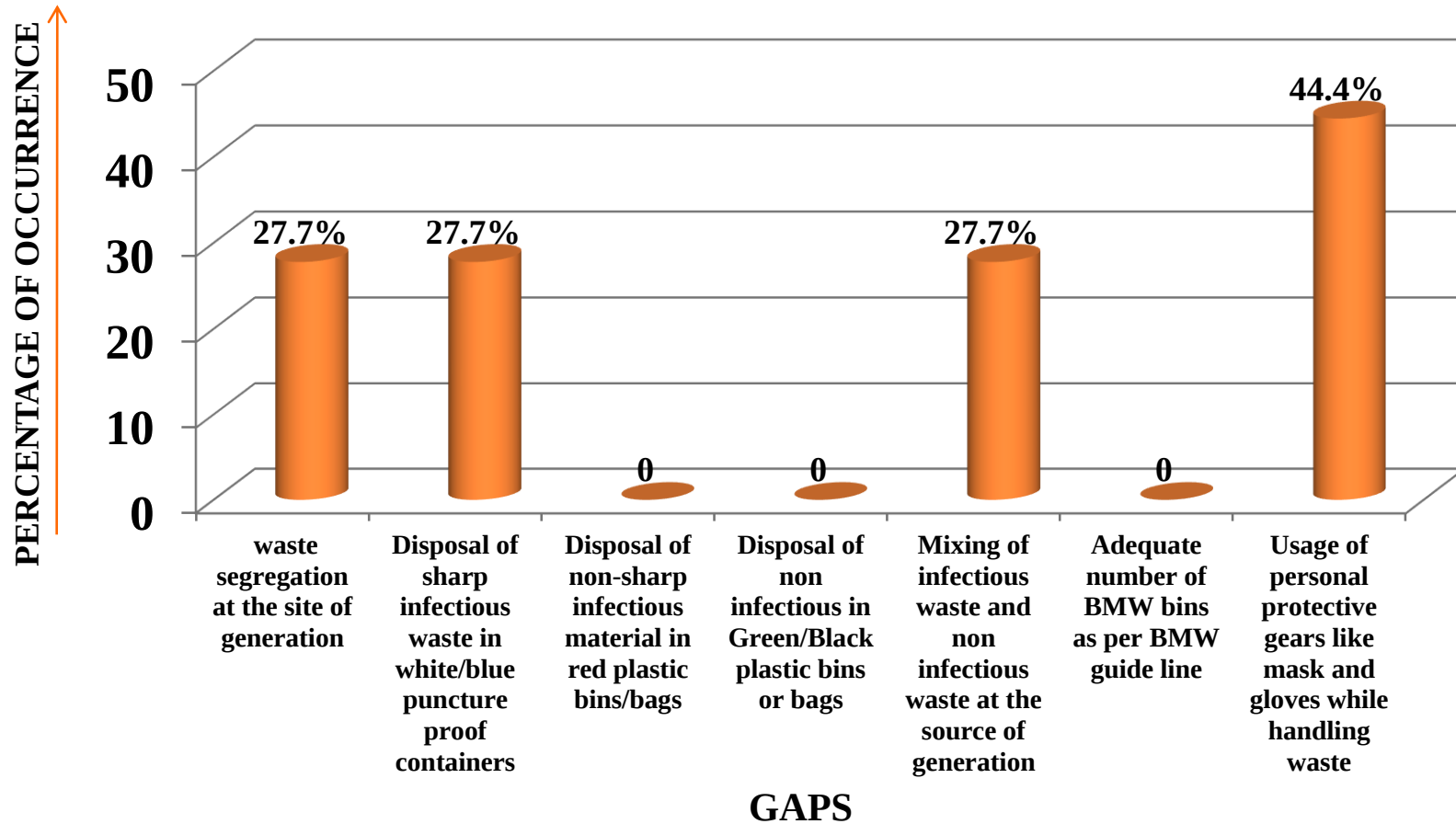
Fig. Plastic bags hung on the side of patient trolley: *Some departments are hanging the plastic bags on the sides of the patient trolley which can help in the spread of cross infection, due to exposure to the patient area.*

xi) **The bins are not cleaned regularly:**



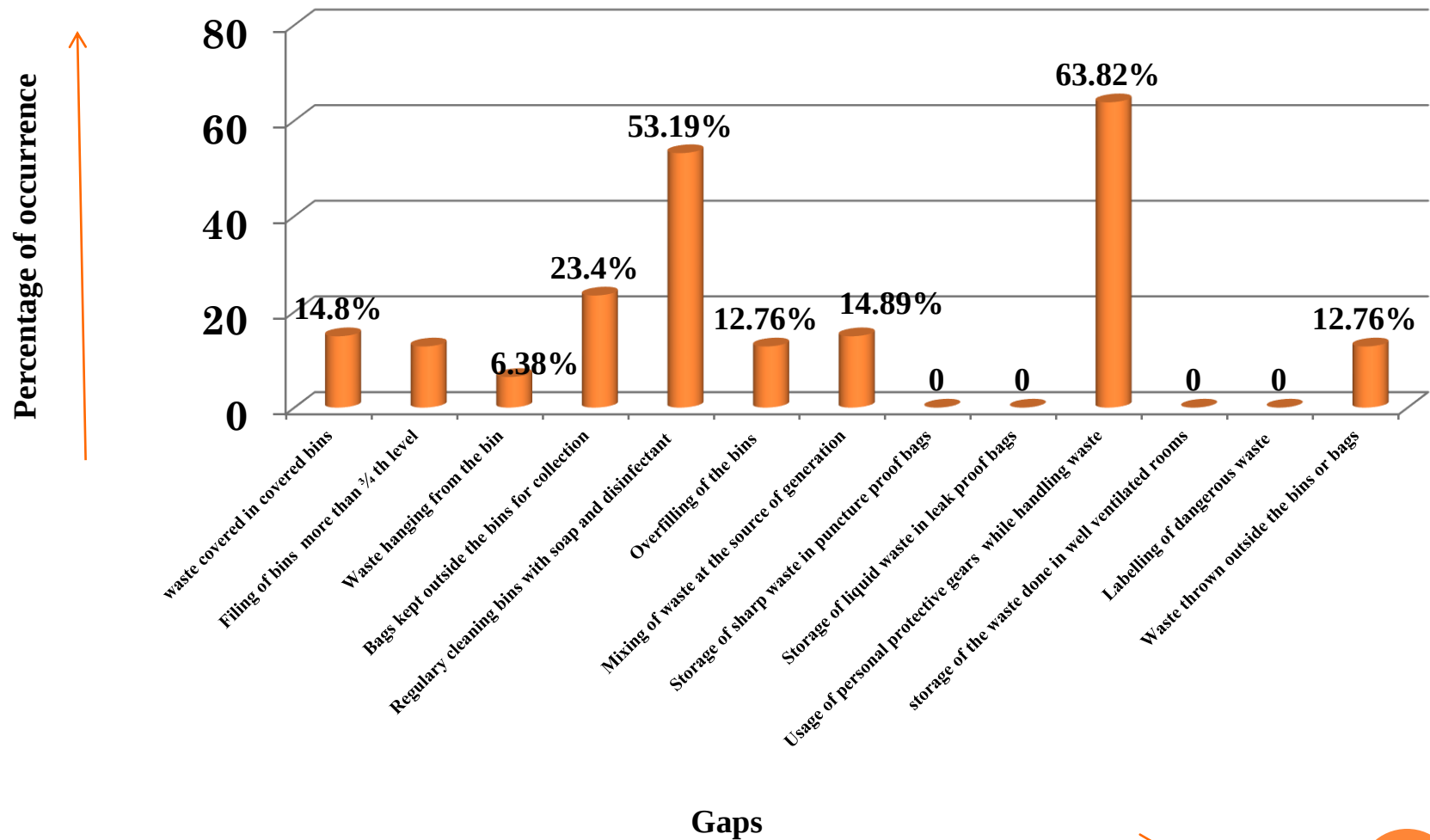
Fig. The bins are not cleaned regularly: *There is no proper cleaning of the bins in some departments.*

GAPS IN WASTE GENERATION AND SEGREGATION



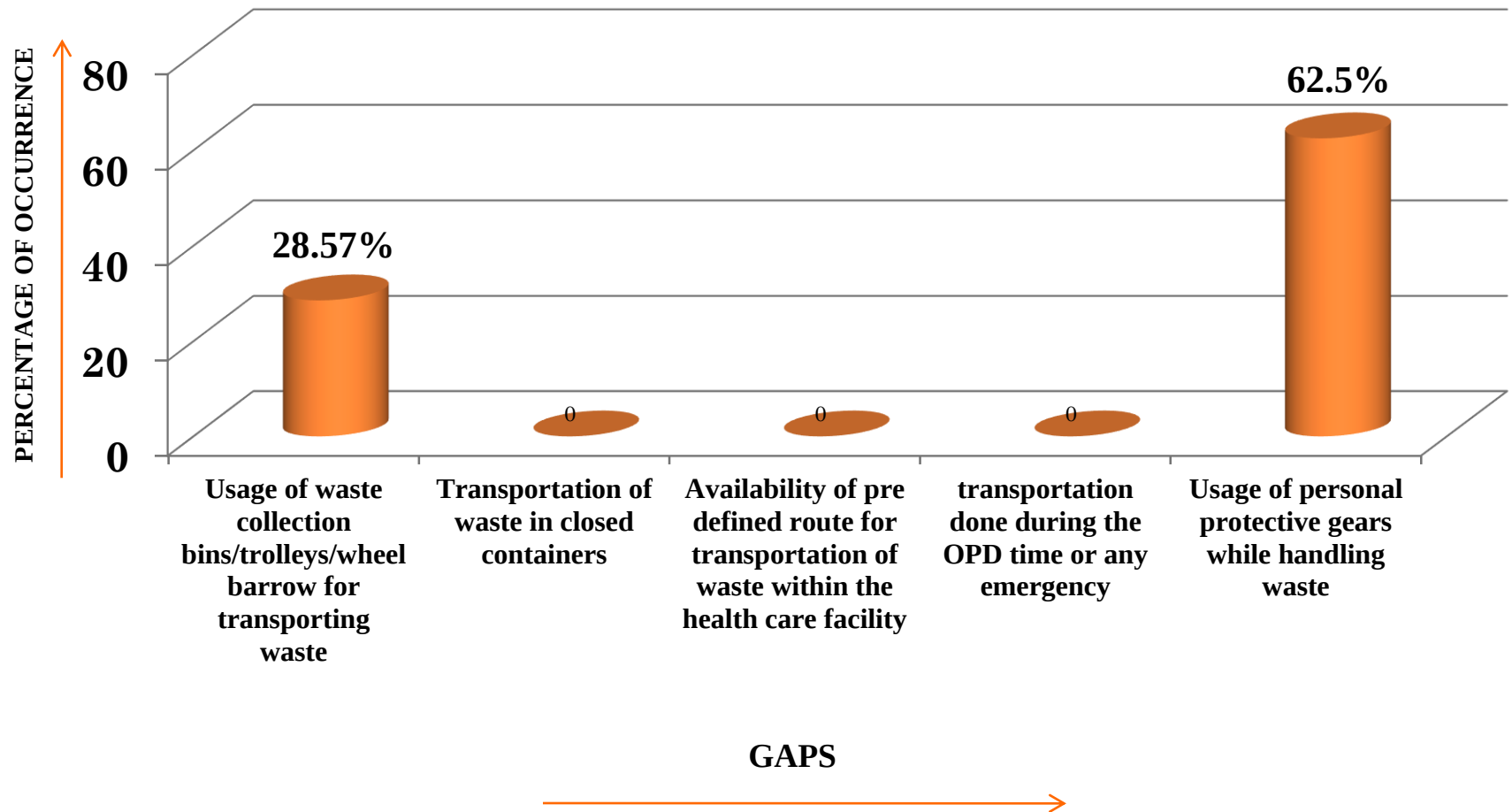
Graph. Gaps in waste generation and segregation: *The major gap found is in the use of PPE, which should be focused upon seriously. n=18(total frequency of occurrence of all the gaps).*

GAPS IN WASTE COLLECTION AND STORAGE



Graph. Gaps in waste collection and storage: *The major gap here also comes out to be breach in the use of PPE. And the next being irregular cleaning of the bins, which can lead to infection spread. (n = 47)*

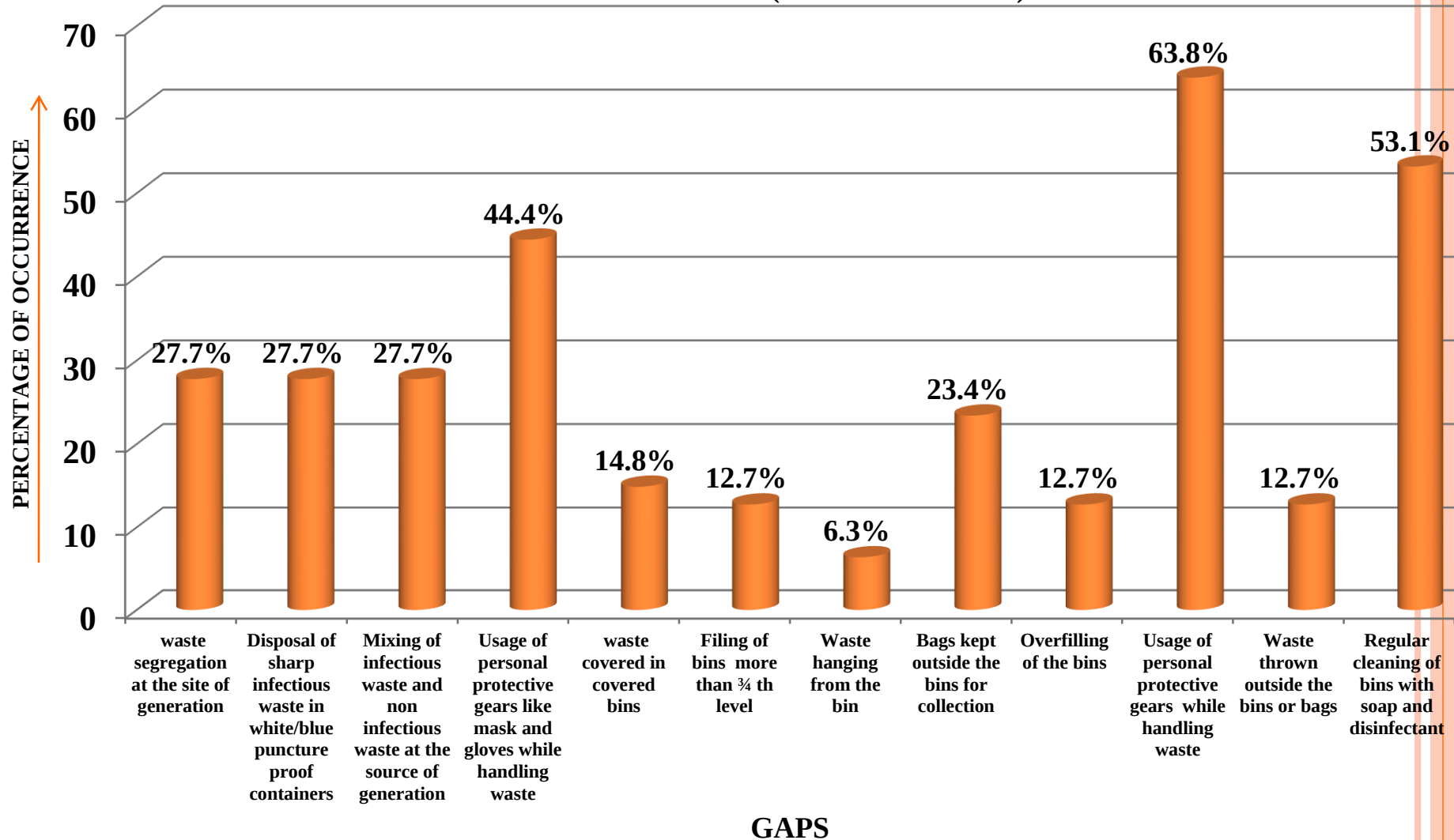
GAPS IN WASTE TRANSPORTATION



Graph. Gaps in waste transportation: *The graph depicts the major gap in the areas of use of PPE and underutilization of the trolley during transportation.. (n= 7)*

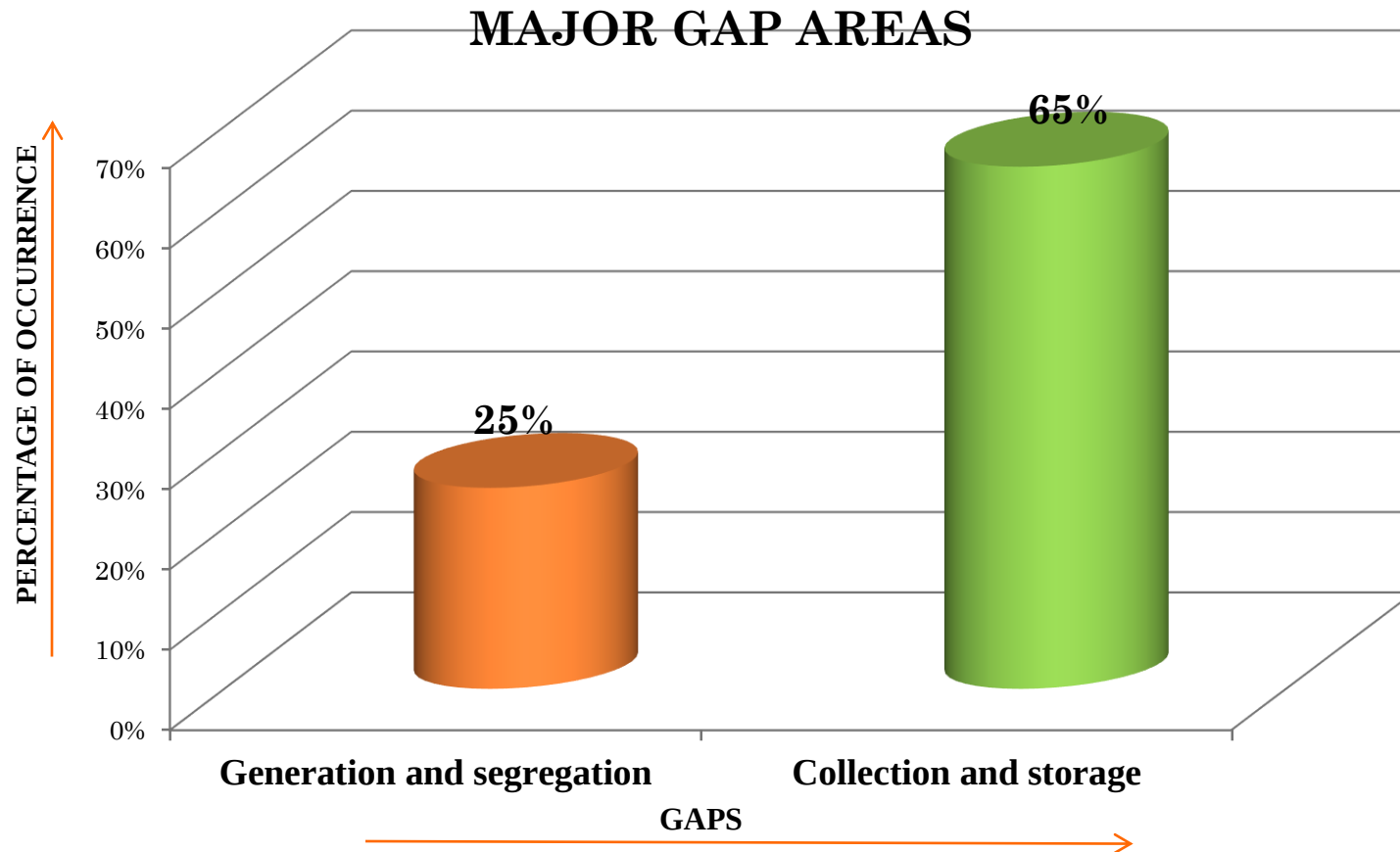


MAJOR GAPS (COMBINED)



Graph. Major gaps (combined): The graph shows the highest gaps in the utilization of PPE, irregular cleaning of the bins and least in the hanging of from the bin.

AND THE TWO MAIN AREAS WHERE THE GAPS ARE THE MOST ARE PRESENTED IN THE GRAPH BELOW:



Graph. Major Gap Areas : *The two major areas where the gaps are the highest is the collection(65%) followed by generation and segregation(25%).These areas are to be more focused upon.*



C. FISHBONE ANALYSIS (ISHIKAWA DIAGRAM):

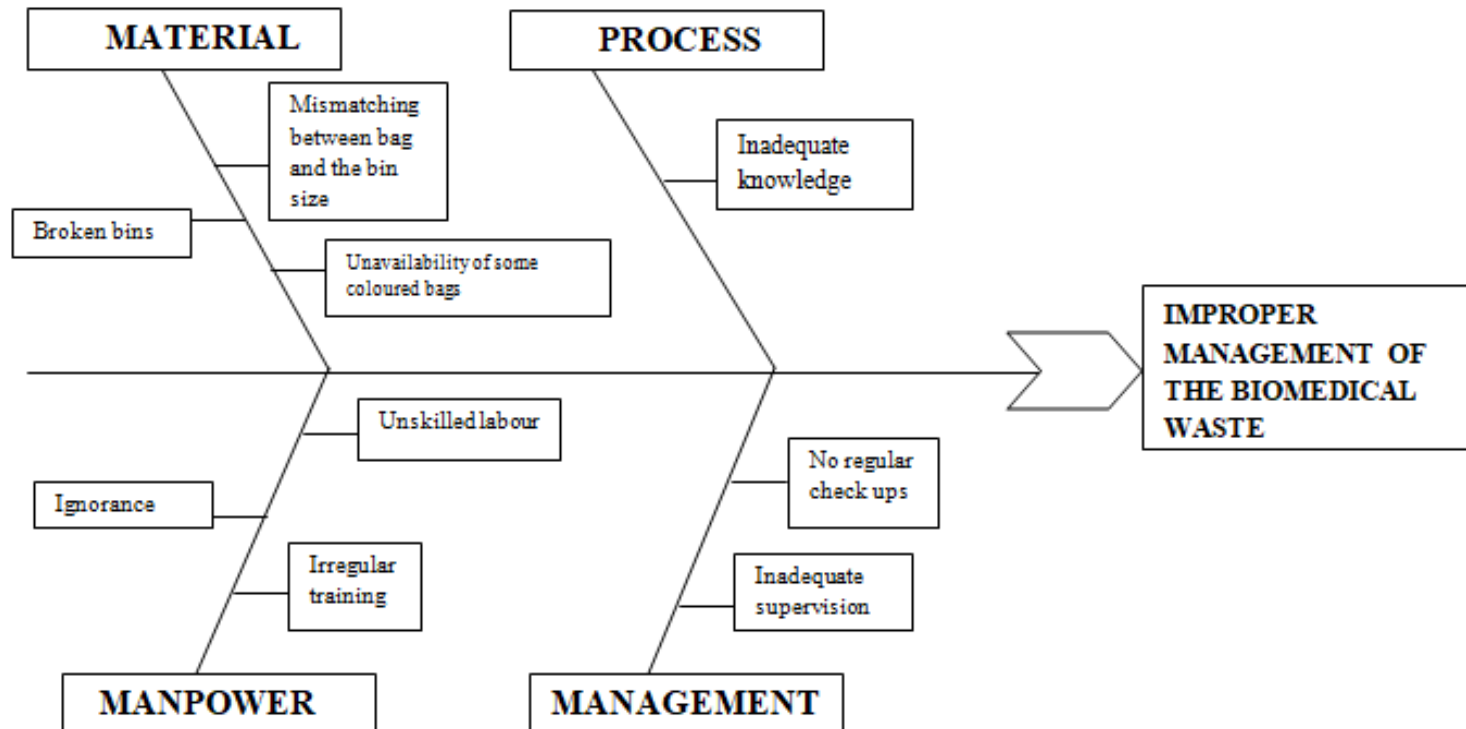


Fig . Fishbone diagram: *The fishbone analysis done identifies nine main causes of the gaps which are described above. These causes are based on observations and some on questions asked from the staff.*

CONCLUSION

An observational study on “Assessment of the existing practices in biomedical waste management: a gap analysis approach” was conducted at Civil hospital, Gandhinagar (Gujarat) from February, 2018 to April, 2018 to find the existing gaps in the management of the biomedical waste at the institution by first mapping the ‘As is’ process and then finding the gaps which are prevailing, by comparing the ideal with the existing, at the 3 levels of management:

- 1. Waste generation and segregation**
- 2. Waste collection and storage**
- 3. Waste transportation**

The study could find 11 major gaps in the biomedical waste management:

- 1. Uncovered bins**
- 2. Wrong coloured bag in the wrong bin**
- 3. Wrong waste in wrong colour coding**
- 4. Waste thrown outside the bin**
- 5. The waste is being thrown on or outside the bag**
- 6. The waste hanging outside the bin**
- 7. The bin filled more than 3/4th of the capacity**
- 8. Waste kept on the shelf**
- 9. Personal protective equipments not worn during handling of waste**
- 10. The bags used for collection of waste are hung on the sides of the patient trolley**
- 11. The bins are not cleaned regularly**



And a fish bone analysis was done for the above gaps and it was found that the major root causes for the above gaps can be:

- 1. Broken bins**
- 2. Unavailability of colored plastic bags**
- 3. Mismatched size of the bin and the plastic bag**
- 4. Inadequate knowledge of the staff for the biomedical waste management guidelines**
- 5. Unskilled labour**
- 6. Irregular trainings**
- 7. Ignorant attitude of the staff**
- 8. No regular checkups**
- 9. Inadequate supervision**

Further, some value additions are reported to the organization to consider.



VALUE ADDITION:

GAP ANALYSIS			
DATE OF GAP ANALYSIS: February, 2018 to April, 2018			
PROJECT NAME: Assessment of the existing practices in biomedical waste management: A gap analysis approach			
OBJECTIVES OF PROJECT:			
- To map the current process flow in the biomedical waste management. - To find the gaps present at different steps of process viz. waste generation, collection, storage and transportation. - To identify the reasons for the gaps. - To suggest value addition in the process.			
ACTIVITIES	GAPS IDENTIFIED	IMPLICATIONS	ACTIONS TO BE TAKEN
1.	Waste kept on the shelf	Infection spread	Regular review and proper training of the staff
2.	Personal protective equipments not worn during handling of waste	Infection spread	Proper training of the staff
3.	Wrong colour bag in the wrong bin	Mixing of waste leading to improper disposal	Proper training of the staff
4.	Wrong waste in wrong colour coding	Improper disposal	Proper segregation and proper training of the staff
5.	Uncovered bins	Infection spread	Proper covering of the bins
6.	Waste thrown outside the bin	Infection spread	Regular check to be kept and proper training of the staff
7.	The waste is being thrown on or outside the bag	Infection spread	Regular check to be kept and proper training of the staff and proper sized bags to be provided
8.	The waste hanging outside the bin	Infection spread	Regular check to be kept and proper training of the staff
9.	The bin filled more than 3/4 th of the capacity	Chances of overfilling of the bin	Regular checks
10.	The bags used for collection of waste are hung on the sides of the patient trolley	Infection spread	Regular review
11.	The bins are not cleaned regularly	Infection spread	Regular review and proper training of the staff

 During waste collection and storage

 During waste generation and segregation

Table.Value addition: *The table depicts some value additions, which can be done for removal of the gaps found.*

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APPENDIX

a. Gap analysis template

GAP ANALYSIS
DATE OF GAP ANALYSIS:
PROJECT NAME:
OBJECTIVES OF PROJECT:

ACTIVITIES	GAPS IDENTIFIED	IMPLICATIONS	ACTIONS TO BE TAKEN



b. Checklist

BIOMEDICAL WASTE CHECKLIST

GENERATION																
		ICU	O.T	WARD	EM	LAB	ICU	O.T	MED WAR	EM	LAB	ICU	O.T	SURWAR	EM	LAB
S.NO.	ACTIVITIES															
1	Is the waste segregated at the site of generation?															
2	Is the sharp infectious waste (needles, blades, broken glass etc) to be disposed in white/blue puncture proof containers?															
3	Is the non-sharp infectious material (infected plastics, syringe, dressing, gloves, masks, blood bags and urine bags) to be disposed in red plastic bins/bags?															
4	Is non infectious (General) waste eg. Packing materials, cartons syringe and needle wrappers, medicine covers to be disposed in Green/Black plastic bins or bags?															
5	Is the infectious waste and non infectious waste mixed at the source of generation?															
5	Adequate number of BMW bins as per BMW guide line?															

[illegible]

[illegible]

MANAGEMENT OF DIFFERENT WASTE STREAMS	ICU	O.T	WARD	EM	LAB	ICU	O.T	MED WAR	EM	LAB	ICU	O.T	SUR WAR	EM	LAB
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[illegible]



**LET THE WASTE OF THE “SICK”
NOT CONTAMINATE THE LIVES OF
“THE HEALTHY”**

THANK YOU