



DON'T DUMP THAT

**AN OVERVIEW OF BIOMEDICAL WASTE
MANAGEMENT IN GUJARAT**

About Toxics Link

Toxics Link is an Indian environmental research and advocacy organization set up in 1996, engaged in disseminating information to help strengthen the campaign against toxics pollution, provide cleaner alternatives and bring together groups and people affected by this problem. Toxics Link's Mission Statement - "Working together for environmental justice and freedom from toxics. We have taken upon ourselves to collect and share both information about the sources and the dangers of poisons in our environment and bodies, and information about clean and sustainable alternatives for India and the rest of the world." Toxics Link has unique expertise in areas of hazardous, medical and municipal wastes, international waste trade, and the emerging issues of pesticides, Persistent Organic Pollutants (POPs), hazardous heavy metal contamination etc. from the environment and public health point of view. We have successfully implemented various best practices and have brought in policy changes in the aforementioned areas apart from creating awareness among several stakeholder groups.

Acknowledgement

We would like to thank Mr. Ravi Agarwal, Director, Toxics Link for his continued guidance and encouragement. We are grateful to Mr. Satish Sinha, Associate Director, Toxics Link who guided us through the entire research process and helped us in shaping the study.

Our sincere thanks is due to all team members of Toxics Link for their valuable inputs and suggestions.

Research Team

Study Supervisor: Priti Mahesh, Chief Programme Coordinator, Toxics Link

Report by: Dr. Aakanksha Mehrotra, Programme Coordinator, Kopal Dixit, Programme Officer

Field inputs: Paryavaran Mitra (Ahmedabad)



Toxics Link
for a toxics-free world

Copyright © Toxics Link, 2021

All rights reserved

For further information:

Toxics Link

H2 (Ground Floor), Jungpura Extension

New Delhi - 110014, India

Phone: 91-11-24328006, 24320711

Fax: 91-11-24321747

www.toxicslink.org

DON'T DUMP THAT

**AN OVERVIEW OF BIOMEDICAL WASTE
MANAGEMENT IN GUJARAT**

A REPORT BY **TOXICS LINK**



Contents

1. Introduction	1
Breathe in a bit of Gujarat	4
<hr/>	
2. Rationale and Objective	6
Methodology	6
Secondary Research	6
Primary Survey & Analysis	6
Limitations of the Study	7
<hr/>	
3. Status of BMW Management in Gujarat	7
Biomedical Waste Quantities	8
Health Care Facilities: Practices	8
Storage and Treatment	13
Pre-Treatment	15
Medical Clinics: Findings of the Survey	15
Violation by the CBWTF	20
<hr/>	
4. Discussion & Recommendations	21

BIO-MEDICAL
WASTE



NO
ENTRANCE

Abbreviations

GPCB	Gujarat Pollution Control Board
PPE	Personal Protection Equipment
CBWTF	Common Biomedical Waste Treatment Facility
PHC	Primary Health Centre
CHC	Community Health Centre
SDH	Sub District Hospital
DH	District Hospital
HCF	Healthcare Facility
BMW	Biomedical Waste
WHO	World Health Organization
WWTP	Waste Water Treatment Plant
MSW	Municipal Solid Waste
ETP	Effluent Treatment Plant
STP	Sewage Treatment Plant
TSDF	Treatment, Storage and Disposal Facility

Waste generated from **HEALTHCARE FACILITIES**



10-25%

belongs
to the
hazardous
category

75-90%

belongs to
the non-
hazardous
category



*Waste must be
segregated, if not,*

100%
will become
infectious

- By WHO



Introduction

Healthcare facilities are the cornerstone of our society. They are responsible for the health & wellness of the community in the form of providing preventive therapies, diagnosis of ailments and treatment modalities ranging from prescribing medicines to complex surgical procedures. During these processes, healthcare facilities also generate a lot of waste and such waste is known as “Hospital waste”, “Healthcare waste” or more formally as “Biomedical Waste” in India.

Biomedical waste thus simply put, is waste generated during any healthcare-related procedure. It may be generated during examination of a patient and may also be generated while performing a veterinary surgery. Thus, biomedical waste is not just restricted to healthcare facilities treating human beings. Waste created during research activities, treatment of wildlife, and laboratory procedures also forms part of the biomedical waste stream. The major sources of healthcare waste across the world are hospitals, laboratories and research centers, mortuary and autopsy centers, animal research and testing laboratories, blood banks and collection services.

Biomedical waste garners a lot of attention globally owing to its potentially harmful nature. Such waste contains components like blood, body fluids along with pathogens as a result of patient contact which can act as a potential source of infection. Over the years, biomedical waste has become a major source of hospital-acquired infection globally. Improperly handled waste can lead to life-threatening infections and introduce toxins into the environment. Illegal trading of such waste leading to its reuse can have catastrophic effects impacting the lives of millions of people and starting a chain reaction of infections.



Majority of the HCFs in West Bengal, Bihar, Jharkhand, Uttarakhand, Rajasthan and Karnataka either partially segregated their waste (18%) or did not segregate their waste at all (72%)





WHO reports that out of all the biomedical waste generated 85% is general, and non-hazardous. The remaining 15% is considered hazardous material that may be infectious, toxic or radioactive. If the healthcare waste is not segregated properly, the general waste which is harmless in nature gets infected too and adds to the total amount of the infectious biomedical waste. This could contain potentially harmful microorganisms that can infect hospital patients, health workers and the general public. Drug-resistant microorganisms can also spread from health facilities into the environment.

Thus, during the late years of the 20th century, rules on scientifically managing biomedical waste were beginning to be adopted by countries throughout the world. India, realizing the dangers associated with mismanagement of such waste, was among the first countries in the South Asian region to notify its own set of rules which came to be known as Biomedical Waste (Management & Handling Rules), 1998. These rules were introduced by the Ministry of Environment & Forest, to streamline the process of biomedical waste handling from the point of generation to the point of disposal.

These rules [Bio-Medical Waste (Management and Handling) Rules, 1998] were based on the principles of source segregation of different categories of BMW in different color-coded bins for easy identification of the type of waste, followed by collection, transportation, treatment, and disposal. Even way back in 1998, India had introduced the concept of treatment of biomedical waste via Common Biomedical Waste Treatment Facility (CBWTF) which was responsible for timely collection of waste from HCFs and their environmentally sound management treatment using available technologies, thus avoiding any adverse effect to health & environment. In 2016, the Ministry of Environment, Forest & Climate Change, Government of India published the Biomedical Waste Management Rules in suppression of the 1998 Rules. The 2016 rules aimed to further improve segregation, collection, processing, treatment and disposal of BMW in a comprehensive and clarified way. It not only simplified the color-coded segregation, it also extended the need for authorization to non-bedded facilities along with clearly specifying the duties and responsibilities of both the bedded and non-bedded healthcare facilities as well as the CBWTFs.

Biomedical waste in India as per the definition provided in BMW 2016 means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals, and including categories mentioned in Schedule I.

TABLE 1: BIOMEDICAL WASTE SEGREGATION SCHEDULE 1

Category	Type of bag/container used	Type of waste	Treatment/Disposal options
	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, Plasma Pyrolysis or deep burial
	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 to be sent to landfill
	(Translucent) Puncture, Leak, tamper proof containers	Waste sharps including metals	Auto or Dry heat sterilization followed by shredding or mutilation or encapsulation
	Cardboard boxes with blue-colored marking	Glassware	Disinfection or auto/ Micro/ hydro and then sent for recycling

In addition, over the years, various guidelines have been issued by CPCB (the apex body for regulation of biomedical waste management in India) along with amendments, to bring more clarity in the application of the said rules. Provisions have been also made to ensure there is no pilferage of recyclable items, no secondary handling or inadvertent scattering or spillage by animals during transport from the HCFs to the CBWTFs. The effort is to improve the collection, segregation, transport and disposal of such waste. Standards for incinerators have also been made more stringent, along with introducing steps for emission, control of dioxins and furans, in a bid to control the environmental damage being caused by the CBWTF.

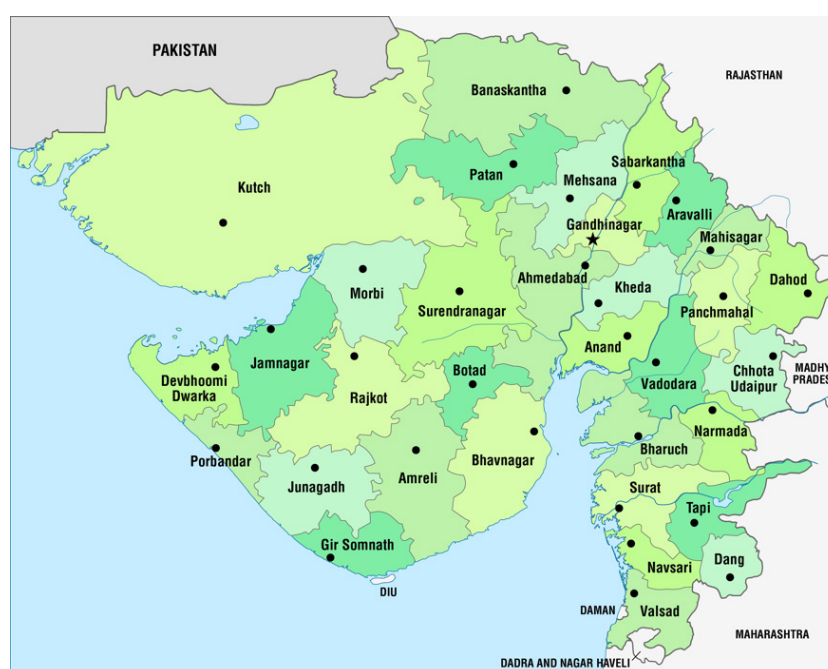
As the population of the country is increasing, the healthcare facilities catering to the rising population are also booming. Thus, the role of the notification of the BMW rules in the development of a regulatory framework and infrastructure to scientifically manage the rising volume of waste cannot be denied. The present waste management profile of India is depicted below.

TABLE 2: CURRENT BIOMEDICAL WASTE PROFILE IN THE COUNTRY 1

No of HCFs	319907	Bedded-106643
		Non-bedded-215336
No. of beds	2486823	
No of HCFs granted authorization	155103	
Quantity of Biomedical waste generated	615 tons/day	
Quantity of Biomedical waste treated	541 tons/day	
Number of CBWTFs	202+36 (under construction)	
Number of HCFs violating BMW Rules	28,816	
No. of showcause notices issued	17,196	

A WHO study² conducted in the four states of West Bengal, Bihar, Jharkhand, Uttarakhand, Rajasthan and Karnataka to assess the status of biomedical waste management found that only 10% of healthcare facilities in these regions comply with proper segregation protocol as per the BMW Rules, 2016. Majority of the HCFs in these states either partially segregated their waste (18%) or did not segregate their waste at all (72%). The study further stated that 26% of the hospitals were not connected to any CBWTF. 56% of the hospitals were dumping their waste illegally while 32% of the healthcare facilities resorted to open burning as a means of disposal. Similar findings have been observed in other studies conducted to assess the present situation of biomedical waste management in the country. These findings highlight that in spite of the regulations being in force since 1998, 23 years later the implementation of these rules at the ground level has not been achieved according to what was expected.

FIGURE 1 MAP OF GUJARAT HIGHLIGHTING ALL DISTRICTS



1 [https://greentribunal.gov.in/sites/default/files/news_updates/Report%20by%20CPCB%20in%20O.A.%20No.%20710%20of%202017%20\(Shailish%20Singh%20Vs.%20Sheela%20Hospital%20&%20Trauma%20Centre,%20Shahjahanpur%20&%20Ors.\).pdf](https://greentribunal.gov.in/sites/default/files/news_updates/Report%20by%20CPCB%20in%20O.A.%20No.%20710%20of%202017%20(Shailish%20Singh%20Vs.%20Sheela%20Hospital%20&%20Trauma%20Centre,%20Shahjahanpur%20&%20Ors.).pdf)

2 World Health Organization (WHO). 2017. Report on health-care waste management status in countries of the South-East Asia Region. New Delhi: World Health Organization, Regional Office for South-East Asia

Thus, there is still a need to understand the gaps and improve systems on ground. The current assessment of biomedical waste management in Gujarat is an initiative of Toxics Link from its state level assessment series to check the realities at the ground level and bring in a countrywide sound and sustainable biomedical waste management system.

BREATHE IN A BIT OF GUJARAT

Gujarat is a state in the western coast of India, most of which lies on the Kathiawar peninsula and has a population of 60.4 million which makes it the tenth largest state in India in terms of population. Gujarat is bordered by Rajasthan to the northeast, Dadra and Nagar Haveli and Daman and Diu to the south, Maharashtra to the southeast, Madhya Pradesh to the east and Pakistan's province of Sindh to the west. Its capital city is Gandhinagar while its largest city is Ahmedabad.

Gujarat has a literacy rate of 78.03% against the national average of 77%. It also contributes to about 7.69% of India's total GDP making it the 5th richest state in India. Even being a strong state in terms of financial wealth, the healthcare profile of the state falls short in terms of required personnel and infrastructure needed to cater to the current population. Gujarat has 3.2 number of beds per thousand people.³

BIOMEDICAL WASTE MANAGEMENT AND TREATMENT PROFILE OF GUJARAT (As per published CBCB & GPCB reports)

The current status of biomedical waste management and related infrastructure of the state has been reviewed by compiling the information available in the public domain via the published reports of CBCB & GPCB (Gujarat Pollution Control Board). The GPCB is the organization responsible in the state for inventorisation of occupiers and data on biomedical waste generation, treatment and disposal. They monitor for compliance of various provisions, conditions of authorizations and take actions against HCFs or CBWTFs for violations.

According to the information available in the public domain, a total of 33706 kg/ day of biomedical waste is generated in the state which constitutes roughly 5% of the entire BMW generation of the country. Gujarat has a total of 33 districts out of which 32 districts are covered by treatment facilities. Currently 20 CBWTFs are operational in the state and treating all the waste generated there.

TABLE 3: BIOMEDICAL WASTE PROFILE OF STATE OF GUJARAT⁴⁵

Biomedical Waste Generated	33706 kg/day					
Number of CBWTFs	20					
Total HCFs	Number	28960			Bedded- 10882	
					Non-Bedded - 18840	
	Beds	193599				
Government Hospitals	Number	2236	PHC 1770	CHC 385	SDH 44	DH 37
	Beds	41129	Urban - 20565			Rural – 11715

3 https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/AR_BMWM_2018.pdf

4 https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/AR_BMWM_2018.pdf

5 <https://pib.gov.in/PressReleasePage.aspx?PRID=1539877>

TABLE 4: STATUS OF CBWTFs IN THE STATE OF GUJARAT⁶⁷

Total Number of HCFs Covered by CBWTF	26828
Total Number of Beds Covered by CBWTF	142315
Total number of treatment equipments	
Incinerator	22
Autoclave	22
Shredder	29
Total treatment capacity (kg/day)	
Incinerator	68600
Autoclave	28672
Shredder	33220

The report claims that 100% of this waste is disposed of through the CBWTFs. Though this report suggests a perfect picture, GPCB's inspection report of one of the CBWTF's in the state, Rhythm Biocare suggests the complete opposite. The CBWTF facility has been issued a showcause notice twice for non-compliance of the rules by not adopting the bar code system and not providing an online monitoring system for parameter O₂ as per the BMW Rules, 2016. This amounts to a violation of the provision of BMW Rules, 2016 which is an offense punishable under section 15 of The Environment (Protection) Act, 1986. No action plan was submitted by the CBWTF in this regard.

There has also been a complaint filed against the same CBWTF in the National Human Rights Commission due to its close proximity to five villages and two schools, where the residents have been facing issues like breathing problems and skin allergies from the past few years. Sewage water has been released into the lake present in the area causing environmental pollution endangering the life of the flora and fauna. Moreover, the facility has also been alleged to employ an untrained local population as biomedical waste handlers. In spite of all these pending complaints and show cause notices, the validity of the authorization of Rhythm Bio care is up to 2022.

Other discrepancies have also been seen in reports both at the GPCB & CPCB level.

Grey areas identified in information published by the CPCB & GPCB

- The only source of information to obtain any data on biomedical waste in Gujarat at the state level is the GPCB Annual report. The data available on the GPCB website on CBWTFs and HCFs catered to dates back to 2009.
- GPCB claims that 100% of its biomedical waste is disposed by CBWTFs, whereas the number of beds catered by CBWTFs (142315) in their status report of 2017 does not seem to match the number of beds in Gujarat mentioned by CPCB (193599) in the annual report 2018. Also, as per the latest reports⁸ complete inventorization of all the HCFs has not been achieved in the state.
- As per CPCB's annual report 2018-2019, Gujarat has not completed its inventorisation of its HCFs and thus concrete estimation of the amount of waste generated in the state cannot be done.

Thus, there appears to be a discrepancy regarding the actual state of biomedical waste management in the state, thereby suggesting the need to examine the on-ground prevailing practices of biomedical waste management four years after the new biomedical waste management rules came into effect.

6 https://gpcb.gujarat.gov.in/uploads/AR_2018_19_ENGLISH.pdf.

7 https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/AR_BMWM_2018.pdf

8 [https://greentribunal.gov.in/sites/default/files/news_updates/Report%20by%20CPCB%20in%20O.A.%20No.%20710%20of%202017%20\(Shailesh%20Singh%20Vs.%20Sheela%20Hospital%20&%20Trauma%20Centre,%20Shahjahanpur%20&%20Ors.\).pdf](https://greentribunal.gov.in/sites/default/files/news_updates/Report%20by%20CPCB%20in%20O.A.%20No.%20710%20of%202017%20(Shailesh%20Singh%20Vs.%20Sheela%20Hospital%20&%20Trauma%20Centre,%20Shahjahanpur%20&%20Ors.).pdf)

Rationale and Objective

The gaps identified by comparing information in the public domain suggested that the actual state of biomedical waste management in Gujarat is probably different from what was being reported. It created a doubt on the validity of information especially on 100% scientific disposal of biomedical waste via the CBWTFs. The need was, therefore, felt to conduct a primary research in Gujarat to identify the current practices and gaps in biomedical waste management.

The objectives of this study are as follows:

- To understand the overall scenario of biomedical waste in the state of Gujarat
- To assess the knowledge, attitude and practices of healthcare facilities in the state regarding BMW management
- To advocate for better regulatory planning, implementation and monitoring of biomedical waste management in the state

METHODOLOGY

The study was done by Toxics Link in collaboration with Paryavaran Mitra in Ahmedabad, Gujarat and includes primary as well as secondary research components.

SECONDARY RESEARCH

The secondary research is a compilation of relevant data sourced from information available in the public domain in the form of annual reports, research papers and other publications in order to get an account on the status of BMW management in the state and the roles played by various stakeholders. This helped us in identifying the gaps and strengthening the context of the report and also to highlight the need to conduct a primary study to analyze the ongoing ground situation.

PRIMARY SURVEY & ANALYSIS

- The primary study was carried out in four major districts of Gujarat, namely, **Ahmedabad, Gandhinagar, Rajkot and Sabarkantha (Himmatnagar)** to understand a broad representation on the status of BMW management in the state. These four districts represent 24.55% of the population in proportion to the Gujarat population.

TABLE 5 PROFILE OF THE FOUR DISTRICTS ASSESSED TO UNDERSTAND A BROAD REPRESENTATION ON THE STATUS OF BMW MANAGEMENT IN THE STATE⁹.

District	Population	Male	Female	Population Growth	Area km ²	Density/km ²
Ahmedabad	7214225	3788051	3426174	24.01%	8107	890
Rajkot	3804558	1974445	1830113	20.20%	11198	340
Sabarkantha	2428589	1244231	1184358	16.62%	7394	328
Gandhinagar	1391753	723864	667889	4.29%	2140	650

⁹ <https://www.census2011.co.in/census/state/districtlist/gujarat.html>

To understand the BMW management situation at various tiers of the healthcare system, different categories of the healthcare facilities were investigated in these cities, viz., Referral Hospital (Govt. medical college), Govt. district/bedded hospitals, Govt. Community Health Centers (CHC), Govt. Primary Health Centers (PHCs) both in urban and rural locations, Private Hospitals (Multispecialty>100-bedded), Private Hospitals (Multispecialty>20-bedded).

- A total number of **145 HCFs** were visited from the state. The investigations were carried out through physical visits to the HCFs, interacting with concerned staff (administrator or medical officer, staff dealing with waste, nurses, etc.) and visual observations in the facilities.
- A **structured questionnaire-based survey** was developed for conducting the investigation to understand waste generation, waste disposal practices and infrastructure (segregation, collection, storage, transport) by the HCFs, occupational safety, awareness levels, compliance with the rules, etc. A thorough photo documentation (wherever feasible) was carried out for the observations during the investigations.
- Data analysis & reporting- The data gathered from all the investigated HCFs was tabulated and analyzed graphically using Microsoft Excel. The observations were also documented against almost each parameter. Graphical representation of the data was done under two categories, - the information provided by the HCFs as a part of the interaction and survey is labelled as Reported, while the data collected through observation is labelled as Observation.
- Investigation for illegal dumping or sale: An observation-based survey with snowball sampling was conducted by visiting the municipal dumping sites or landfills and local markets to figure out mixing of BMW with Municipal Solid Waste (MSW) and illegal sale of the waste, if any.

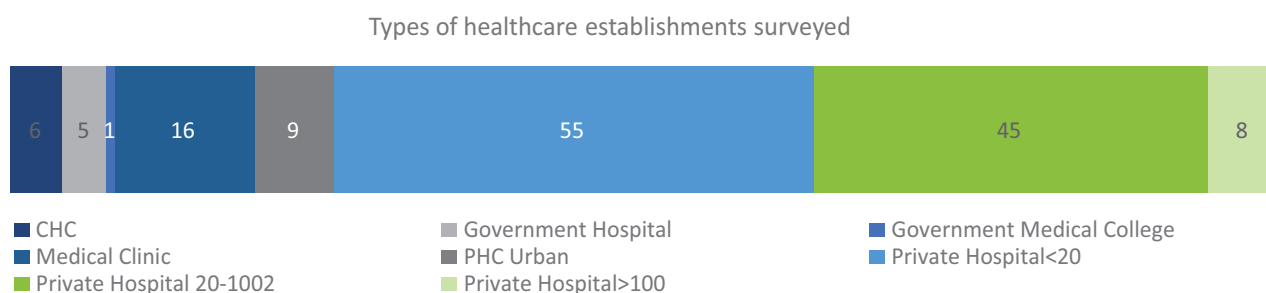
LIMITATIONS OF THE STUDY

- Limited number of HCFs in the state were visited, due to limitation of resources and restricted time frame.
- The biomedical waste generated and disposed could not be physically measured and data available in records of the HCFs visited were relied upon, as the healthcare facilities did not provide us full access.
- Only one CBWTF in the state could be visited, as most CBWTFs deny entry in their premises, thus practices from various CBWTFs could not be compared.

STATUS OF BMW MANAGEMENT IN GUJARAT

The study to assess knowledge, attitude & practice regarding biomedical waste management was conducted among 145 healthcare facilities (including non-bedded facilities). Biomedical waste generation data was also obtained for these HCFs from the CBWTFs serving these areas. These facilities were spread across four major districts of the state namely Ahmedabad, Rajkot, Gandhinagar and Sabarkantha. The collective bed strength as per GPCB's annual report of these districts amounts to 7421, which forms 25.6% share of the total bed strength in the state. A wide array of establishments in these 4 districts were surveyed for the purpose of this study as indicated in the graph below.

FIGURE 2: TYPES OF ESTABLISHMENT SURVEYED IN GUJARAT



BIOMEDICAL WASTE QUANTITIES

The data for biomedical waste was obtained from two waste management agencies namely the Distromed Bio clean Pvt Ltd and E. coli waste management company, both based in Gujarat. In depth analysis of the data clearly suggests that waste segregation is not being carried out well in most of the HCFs. In a recent study, the average hospital waste generation per patient per bed for developing countries is estimated to be 1-2 kgs¹⁰, though it does differ depending on the bed strength and also its specialty. Some studies have also put it to around 300 gms to 1.5 kgs¹¹. In some hospitals in Gujarat (mostly private multispecialty hospitals), it was reported that the daily waste generation was between 3-4 kgs per patient per bed, which is too high and gives an indication that general waste is being mixed with biomedical waste, leading to huge quantum of biomedical waste in these facilities. In complete contrast, there was an extremely low amount of average per bed waste (around 150-200 grams) being reported from certain HCFs (mostly private under 100-bedded hospitals), which points out improper waste management and also probably improper waste record-keeping. This was clearly evident in some cases, for example a PHC in Sabarkantha district with a bed strength of <10 was generating between 15-20 kgs of biomedical waste per day, while on the other hand some 100 bedded private hospitals in the same district were generating 5-8 kgs of biomedical waste per day. A similar pattern was also seen when comparing per day generation of biomedical waste from PHCs and CHCs in the same district, CHCs being a higher referral center, catering to a larger population was generating much less biomedical waste per day compared to PHCs which again appears as a deviation from the normal pattern.

To further confirm, when the websites of these facilities were visited mostly all of them either lacked a website of their own or no records (annual reports/waste records) were found on them, clearly highlighting the gap in management of such facilities, when it is mandated by law for HCFs > 10 beds to have their own website and the annual biomedical waste report to be uploaded on it. Another big discrepancy was visible in few of the hospitals which were disposing of their waste only in the yellow category, with red waste and white waste (sharp waste) reported as zero. This is weird, since these specialties are listed as bedded facilities and thus, zero generation of red, white and blue category waste doesn't appear to be true. It was also seen in some hospitals that the red category waste was being reported more than yellow category waste, which does not conform to the normal pattern of biomedical waste stream distribution, indicating that either wrong segregation was carried out or incorrect waste reporting was being done.

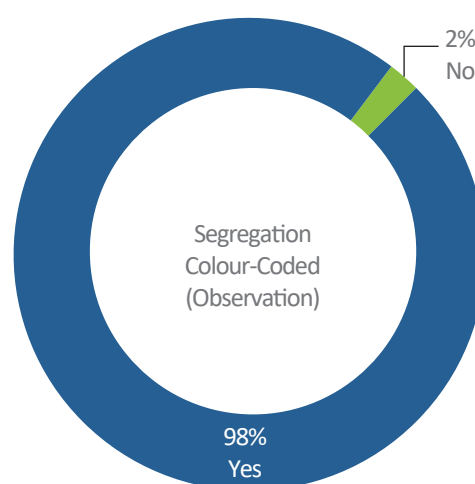
HEALTHCARE FACILITIES: PRACTICES

The study was conducted through a mix of a standard questionnaires and observations noted during the visit and the evaluation included various parameters. The graphical representation marked "Reported" are based on responses collected via the survey while the ones marked "observation" are based on information collected via observing the functioning of the HCFs when they were physically visited. The findings of the study are listed category wise for ease of representation and better understanding.

SEGREGATION

Segregation at source forms the core of biomedical waste management rules. As per the observations made during the survey, 98% of the healthcare facilities visited were segregating their waste in the color-coded bins. Two

FIGURE 3: COLOR-CODED SEGREGATION OF BIOMEDICAL WASTE



10 https://www.vivis.de/wp-content/uploads/WM9/2019_WM_351-358_Zafar.pdf

11 <https://www.ctdt.co.in/doi/CTDT/pdf/10.5005/jp-journals-10055-0064>

facilities in Gandhinagar district were not segregating the waste at source in color-coded bins. Color-coded segregation forms the core of efficient biomedical waste management; hence such facilities are not only flouting the norms but also contributing to increasing the quantum of biomedical waste as a result of mixing of general waste with BMW. Though the records do mention that the segregation is happening, as mentioned above waste quantities indicate improper segregation.

INFRASTRUCTURE

Infrastructure for managing biomedical waste is equally important, as they help in maintaining safety and minimizing contact with waste, thus safeguarding health of the waste handlers and other healthcare staff. The major infrastructure required for handling biomedical waste are bins, trolleys, bags and storage rooms.

Bins

As per their responses in the survey, 88.4% of the facilities reported having bins. It was observed during the visit, that among these facilities, 6.3% did not have color-coded bins, while 3.9% were open bins. Most of these hospitals, which were lacking in bins, were private facilities with less than 20 beds. Also, the lack of bins was more common in Gandhinagar district. When color-coded and closed bins are mandated in the biomedical waste rules, 2016, the inability to follow these basic infrastructure guidelines can lead to waste mixing, waste spilling and pilferage of waste.

FIGURE 4: INFRASTRUCTURE AVAILABLE FOR MANAGEMENT OF BIOMEDICAL WASTE AS REPORTED BY HEALTHCARE STAFF

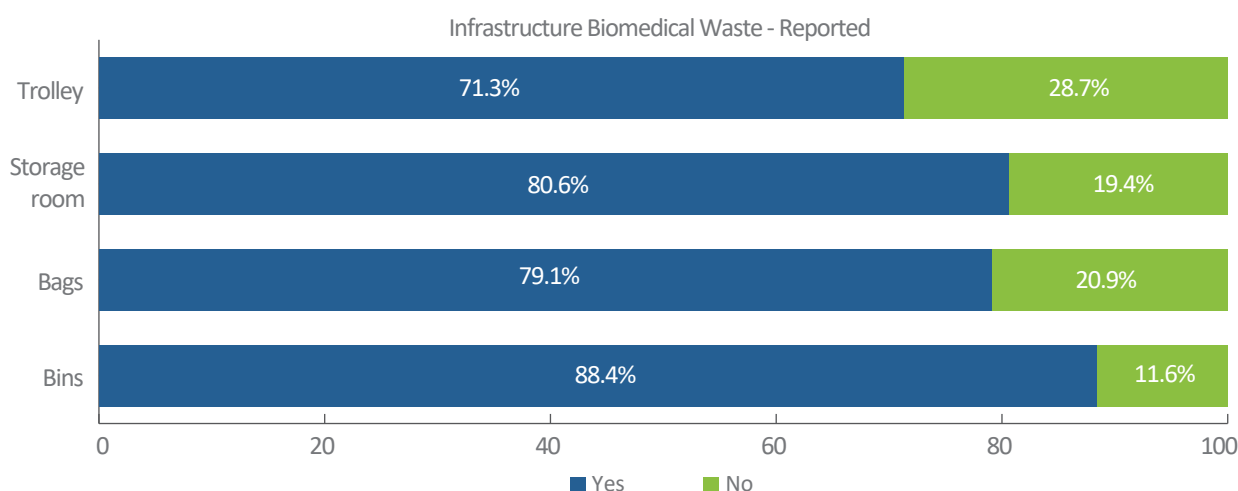
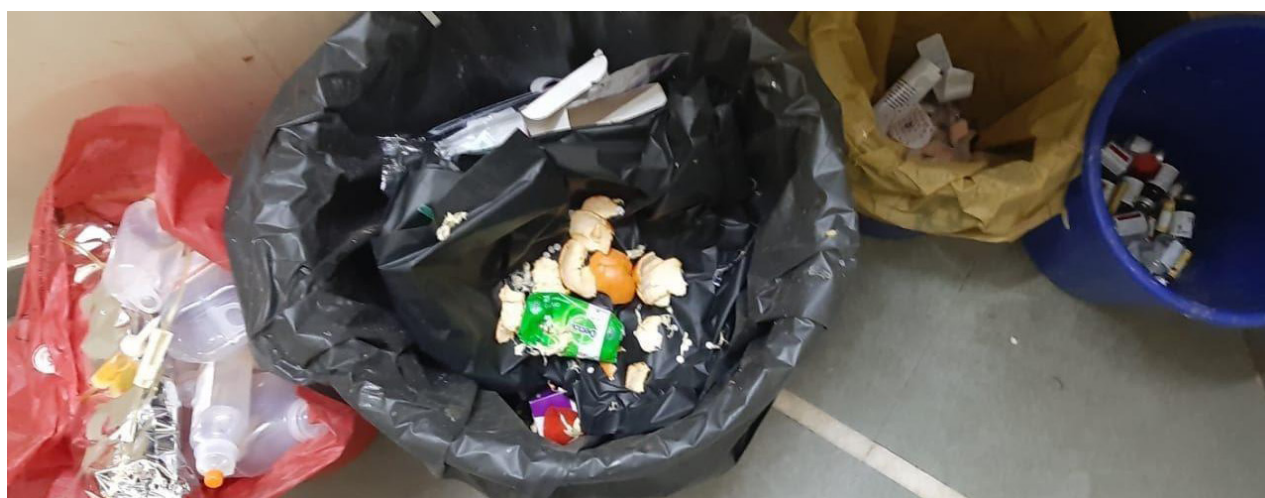
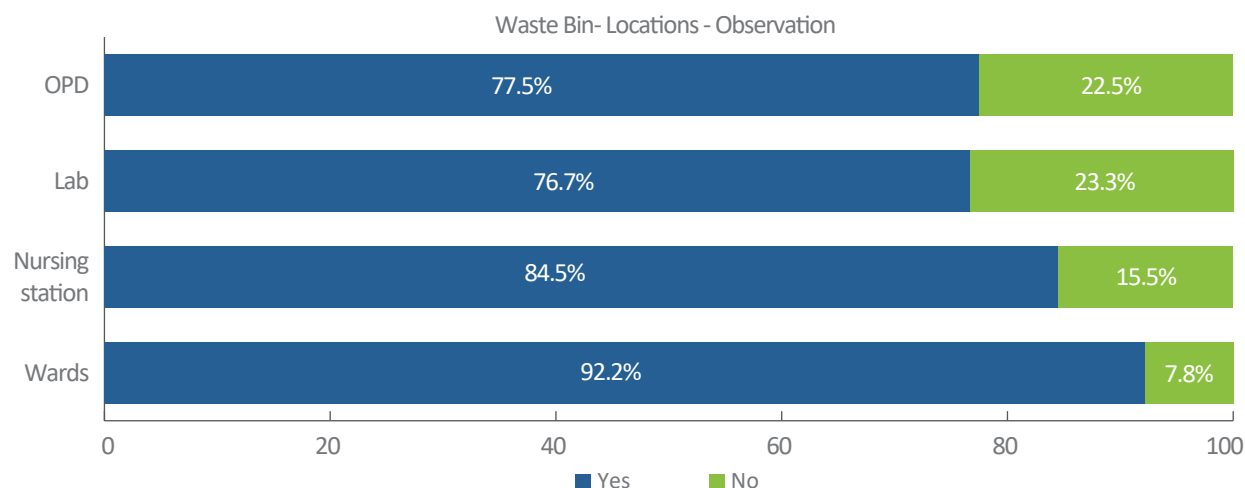


FIGURE 5: OPEN NON COLOR-CODED BIN PRESENT IN A HCF (AHMEDABAD DISTRICT)



It was also observed that color-coded bins were missing from strategic locations in various healthcare facilities. 22.5% of the facilities did not have proper bins in the OPD while 23.3% labs did not have color-coded bins. This is shocking, as 98% hospitals reported following segregation as per rules, whereas the observation clearly showed the absence of bins from high waste generation points like labs and OPDs.

FIGURE 6: OBSERVED WASTE BINS LOCATION THROUGHOUT THE FACILITY



Trolleys

71.3% of HCFs had reported the presence of trolleys for collection of biomedical waste in their premises. During our observation, it was noted that out of these 48.8% of the trolleys were not clean while 7.8% of them were open trolleys. The infrastructure required to collect biomedical waste if not closed properly and cleaned on a daily basis, may become a source of infection for people handling and managing such waste, and may also attract insects and rodents.

FIGURE 7: OBSERVATION OF TROLLEYS AVAILABLE IN THE FACILITIES

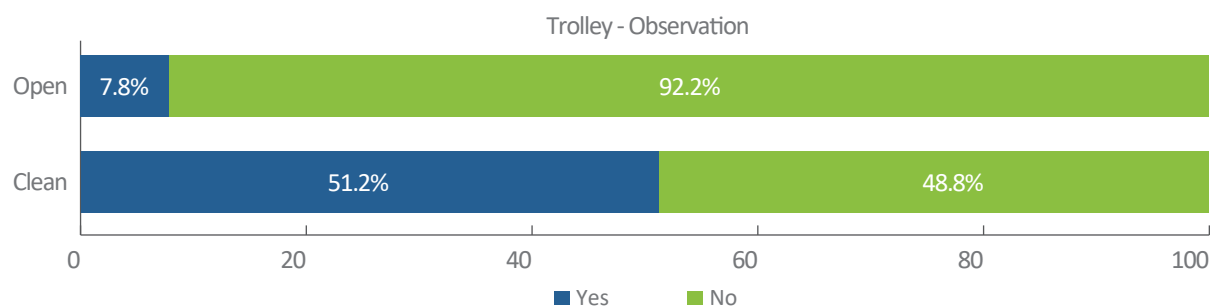
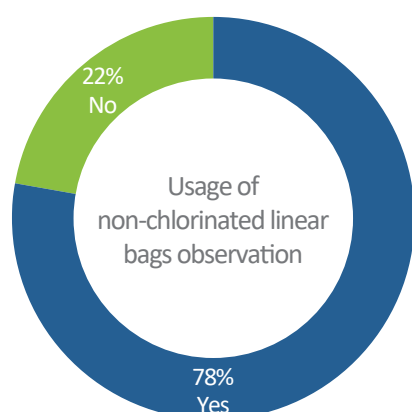


FIGURE 8: OBSERVATION ON USAGE OF NON-CHLORINATED LINEAR BAGS



Bags

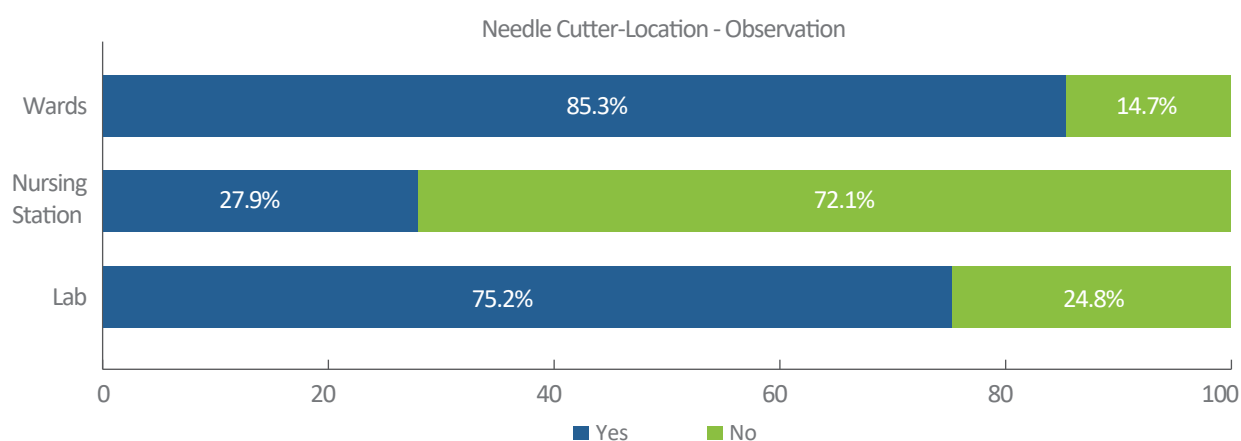
As per the Biomedical Waste Rules 2016, color-coded bags may be used for collection of biomedical waste. As responded during the survey, 20.9% of the healthcare setups are still not using bags for waste collection. While earlier, chlorinated linear bags were used for waste collection, an amendment in BMW rules was done in 2018, to phase out the use of chlorinated plastic bags for BMW. Two years since the amendment was issued, 22% of the facilities have still not switched to non-chlorinated bags for biomedical waste collection.

NEEDLE CUTTER & SHARP CONTAINERS

Needle stick injury is one of the most common occupational risks associated with healthcare facilities. Thus, keeping in mind, the rules mandated the provision of discarding needle by first breaking them via a needle cutter to prevent reuse and then discarding them in a transparent/white puncture-proof container. It was observed that 99.2% of the HCFs had a needle cutter present, where 81.9% had an electric needle cutter while the rest had a manual needle cutter. However, it was also seen that though needle cutters were available in almost all the HCFs, they were not present in all locations where syringes were used. 72.1% of the nursing stations, 24.8% of labs and 14.7% wards did not have a needle cutter present. This is a serious gap and could lead to discarding of the syringes along with the needle at such points, leading to its reuse and becoming a transmitter of infections like HIV& Hepatitis -B. 93% of the facilities visited had a sharp container present but only 89.1% of were puncture-proof.

Thus, an overview of the infrastructure facilities gives us an idea that while basic infrastructure is present in facilities, issues like improper placement of bins, non-color-coded bins, use of chlorinated plastic bags act as a major roadblock in complete implementation of the BMW, 2016 rules at the ground level.

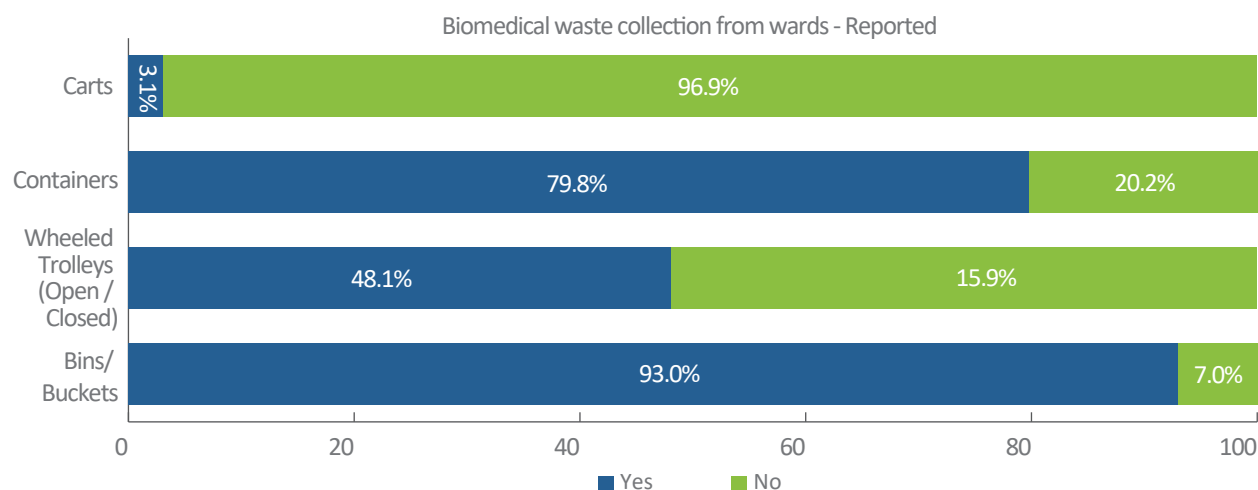
FIGURE 9: OBSERVATION OF NEEDLE CUTTER PLACEMENT ACROSS ALL FACILITIES



COLLECTION AND TRANSPORTATION- INTRAMURAL

The waste collected from bins and trolleys placed at various locations across the HCFs is transported to a storage location present inside the hospital premises. This transportation of waste is known as Intramural waste transportation.

FIGURE 10: REPORTED MODE OF COLLECTION OF BIOMEDICAL WASTE FROM WARDS



Most commonly used mode of intramural transportation as reported by the facilities was bins/ buckets followed by containers. It was also reported that 51% facilities had their waste collected once a day, while 48% of them got their waste collected every alternate day. Majority of the facilities in Ahmedabad district and Gandhinagar district had intramural waste collection on alternate days, while in Sabarkantha & Rajkot, intramural waste was collected almost on a daily basis. Those in Gandhinagar were all small hospitals with a bed strength of less than 30. All CHCs & PHCs in Ahmedabad district had their waste collected on alternate days. Only 1% of total facilities got their waste collected twice a day. 99% of the facilities had hired contractual agencies for intramural waste collection and management. The intramural waste is handled by waste handling staff in 88% of the facilities, while in 12% facilities ward boys were handling this waste. Roughly in 50% of the facilities visited in Gandhinagar, ward boys were employed in intramural collection & transportation of waste; rest all the other districts employed separate waste handling staff.

FIGURE 11: PERSONNEL RESPONSIBLE FOR HANDLING BIOMEDICAL WASTE

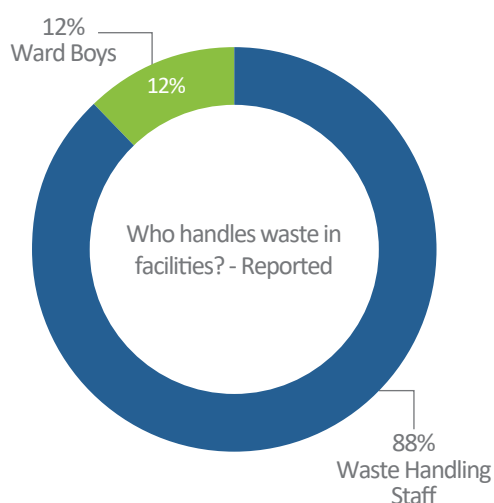


FIGURE 12: FREQUENCY OF INTRAMURAL BIOMEDICAL WASTE COLLECTION

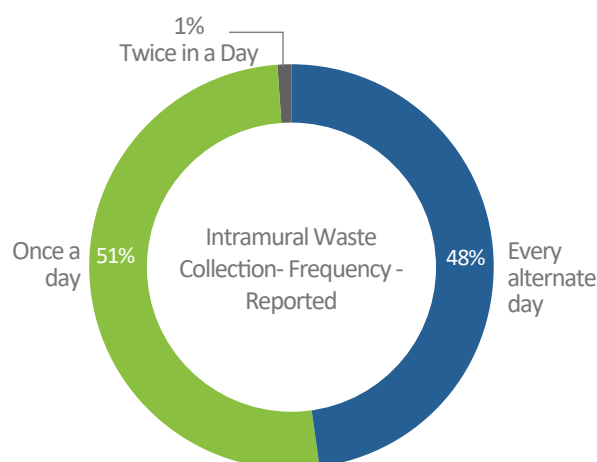


FIGURE 13: BIOMEDICAL WASTE BEING TRANSPORTED IN WHEELED TROLLEY IN A HCF IN RAJKOT, GUJARAT



Collection - Extramural & Cytotoxic Waste

As per the responses collected via the survey, only 87% of the facilities were linked to a CBWTF, Majority of these hospitals which are not connected were in the Gandhinagar district, which are not connected, and were mostly less than 20-bedded facilities. This is complete defiance of the law as all the HCFs

(only hilly terrains & areas of difficulty to reach are exempted) should tie up with a CBWTF for scientific management of biomedical waste which is responsible for the extramural waste collection. It is done by the CBWTF personnel on a daily basis in 50% of the HCFs, on alternate days in 48% of the HCFs and once a week in 2% of HCFs. This is not in accordance with the rules which state that it is the duty of the CBWTFs to collect waste daily from the tied-up facilities, even on holidays. The hospitals should inform the concerned authority if the waste is not being collected on a daily basis.

STORAGE AND TREATMENT

STORAGE AREA INFRASTRUCTURE

As per the responses collected during the survey, 96.1% HCFs informed of having a BMW storage area present but when these facilities were visited, it was observed that the infrastructure of the storage area and techniques being followed are not up to the mark. 48.8% of the facilities did not have an adjacent water supply which is needed to clean the storage area. Moreover, 98.4% of the facilities did not even have a slope & drain route to ETP. While 74.4% did not even have fire-extinguishers present near the storage area, 96.1% facilities were not animal/rodent-proof. Thus, the absence of basic infrastructure in the storage facility is an accident waiting to happen.

9% of the facilities were not storing cytotoxic waste separately, most of these facilities were in Ahmedabad & Gandhinagar district. Cytotoxic waste when not dealt with extreme caution can cause serious health issues not only to the waste handlers but also to the CBWTF personnel when they come to collect regular biomedical waste. It was also noted that in some HCFs, waste collected from the ward was found lying abandoned in the hospital premises. Whether it was general waste or biomedical waste could not be ascertained.

FIGURE 14: OBSERVATION OF INFRASTRUCTURE PRESENT IN STORAGE FACILITY

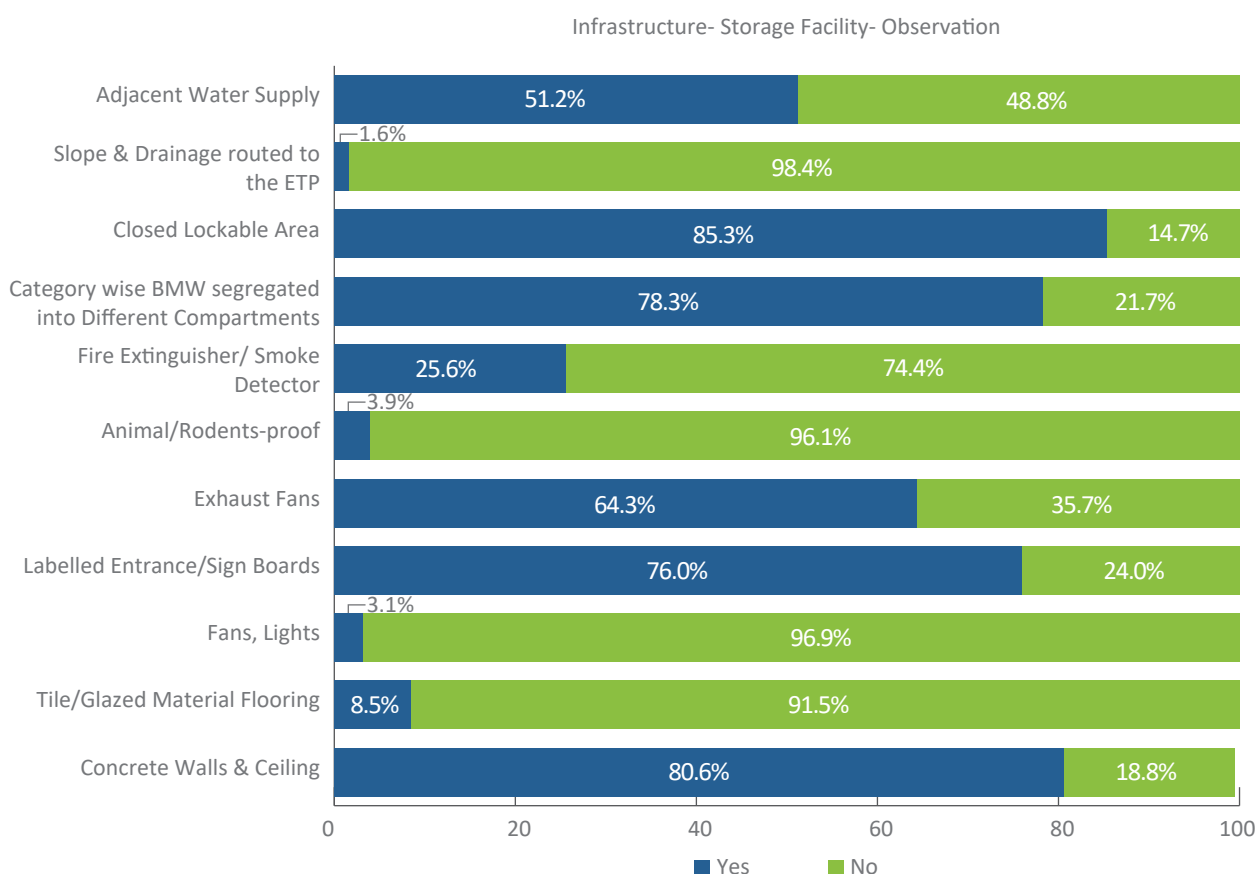


FIGURE 15: HOSPITAL WASTE FOUND LYING ABANDONED IN THE PREMISES IN A HCF IN SABARKANTHA, GUJARAT



FIGURE 16 WASTE FROM HCF IN SABARKANTHA, LYING IN THE OPEN OUTSIDE PREMISES



PRE-TREATMENT

As per the BMW 2016 rules, all the laboratory waste, microbiological waste, blood samples and blood bags should be pre-treated before disposing. 19% of the HCFs visited as a part of the study did not have any pre-treatment facility available in their premises. The usage of equipments like microwave, shredder, and autoclave was down to a bare minimum. Most facilities just used sodium hypochlorite solution as a means to pre-treat their waste. ETP (Effluent Treatment Plant) is compulsory in all facilities generating biomedical waste where the bed strength is more than 10 to ensure that chemical waste is not directly discharged into the sewer. None of the hospitals visited as a part of the survey had installed an ETP, even when 45 out of 145 hospitals were more than 30 bedded. 1.4% facilities were directly discharging their chemical waste in municipal sewage without even pre-treating it, contaminating the entire system. In terms of solid waste, 27% facilities were disposing some amount of municipal solid waste along with biomedical waste. Most of these facilities (25%) were in the Sabarkantha district, while all the PHCs visited in the Ahmedabad district were doing the same.

FIGURE 17: AVAILABILITY OF A PRE-TREATMENT FACILITY AS REPORTED BY STAFF

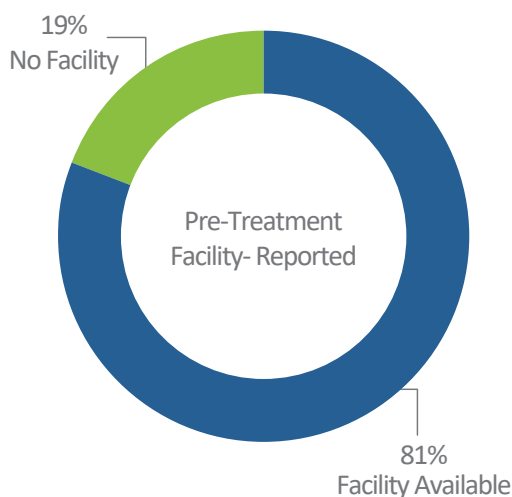


FIGURE 19: MSW BEING DISPOSED OF WITH BMW

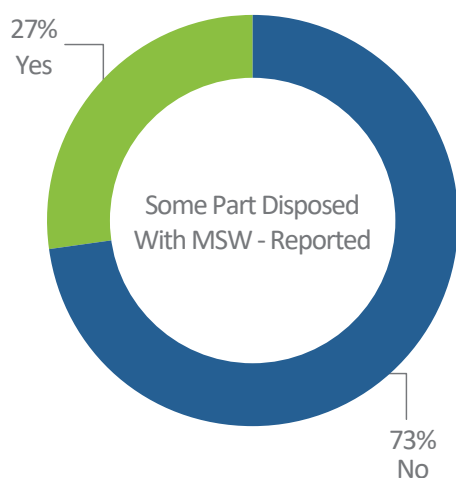


FIGURE 18: METHODS OF PRE-TREATMENT AVAILABLE

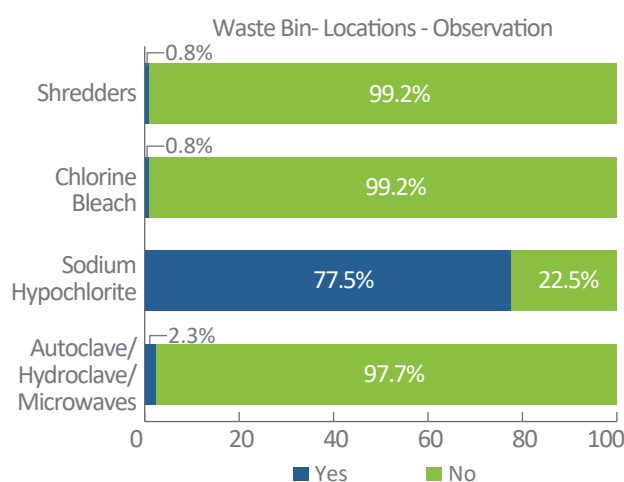
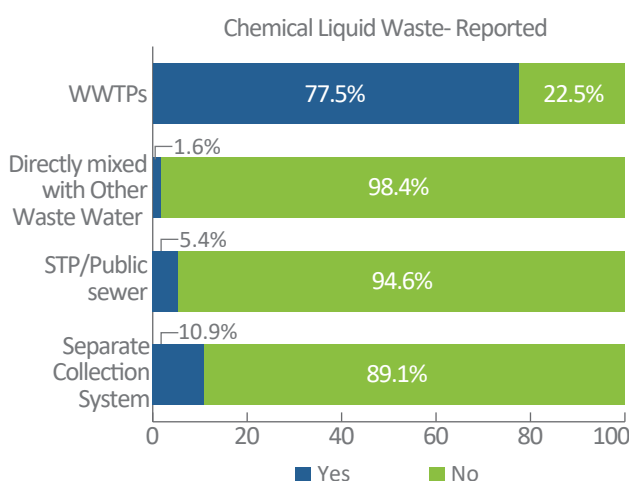
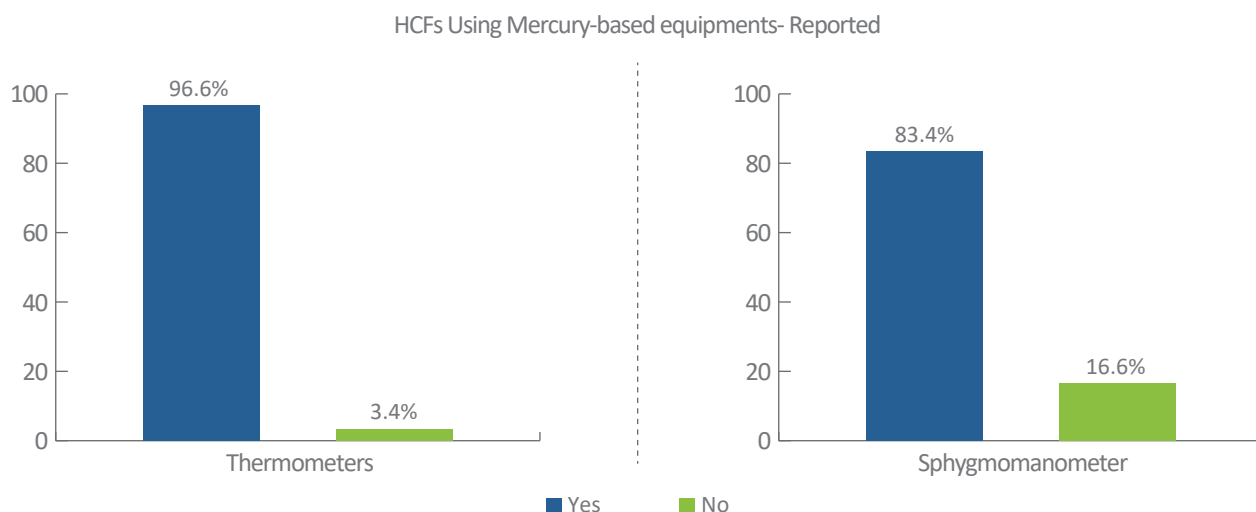


FIGURE 20: METHODS OF TREATMENT OF CHEMICAL LIQUID WASTE



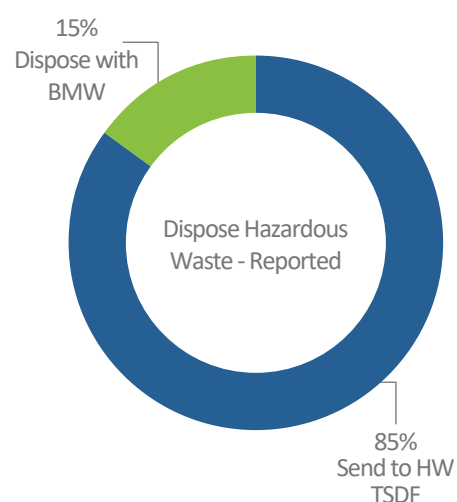
Mercury, Chemicals & Other Hazardous Waste

FIGURE 21: USAGE OF MERCURY-CONTAINING EQUIPMENT IN HCFS



Healthcare equipment containing hazardous components like mercury are still being used in a lot of facilities. Mercury-based thermometers are being used in 96.6% of the facilities while mercury-based sphygmomanometers are being used in 83.4% facilities. When asked about the disposal of hazardous components, 85% facilities reported that they are sending this waste to TSDF. The remaining 15% facilities are mixing the hazardous waste with regular biomedical waste. All the facilities visited in Ahmedabad, Sabarkantha & Rajkot were using mercury-containing equipment, but majority were disposing them through TSDF. Gandhinagar district on the other hand had majority of hospitals who were disposing their hazardous waste along with biomedical waste. Hazardous waste like mercury waste is highly toxic in nature and acts as a potent neurotoxin, thus mixing of this waste with other biomedical waste causes cross-contamination which negatively impacts the health safety of the workers and the environment.

FIGURE 22: DISPOSAL METHOD OF HAZARDOUS WASTE



Occupational Health & Safety

87% of the facilities reported recapping of the needles after using them. Almost all the facilities visited in Ahmedabad, Rajkot & Sabarkantha were recapping the needles post usage. Gandhinagar fared a little better in this regard where roughly half of the hospitals visited were not recapping needles. In spite of having various regulations in place and awareness being generated on the ill-effects of improper handling of used needles which can cause infectious diseases like HIV & Hepatitis-B, this issue is further aggravated by the fact that 85% of the healthcare facilities have no system for reporting needlestick injury. 90% of facilities did not have a policy in place for Post Exposure Prophylaxis (PEP), i.e., they don't have antiretroviral therapy available as a preventive measure against HIV, for potential exposure against people who got needle stick injury, though 90.3% facilities immunized their workers against Tetanus and 86.7% facilities immunized their workforce against Hepatitis B.

FIGURE 23: EXISTENCE OF A NEEDLE STICK INJURY REPORTING SYSTEM

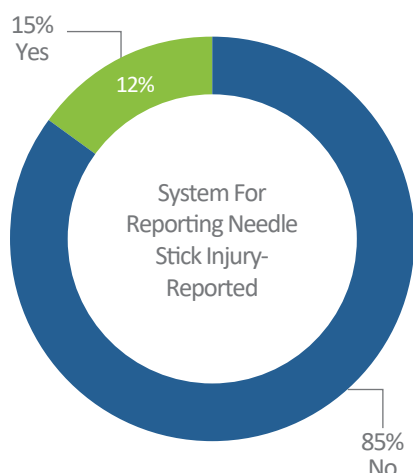
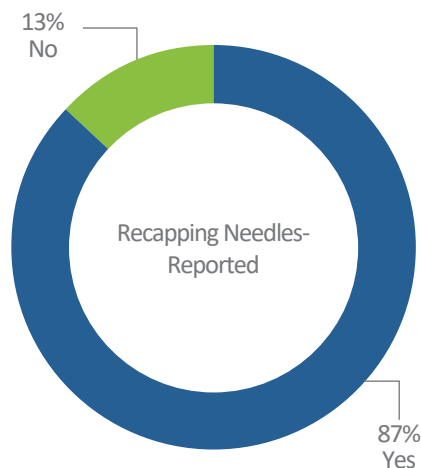
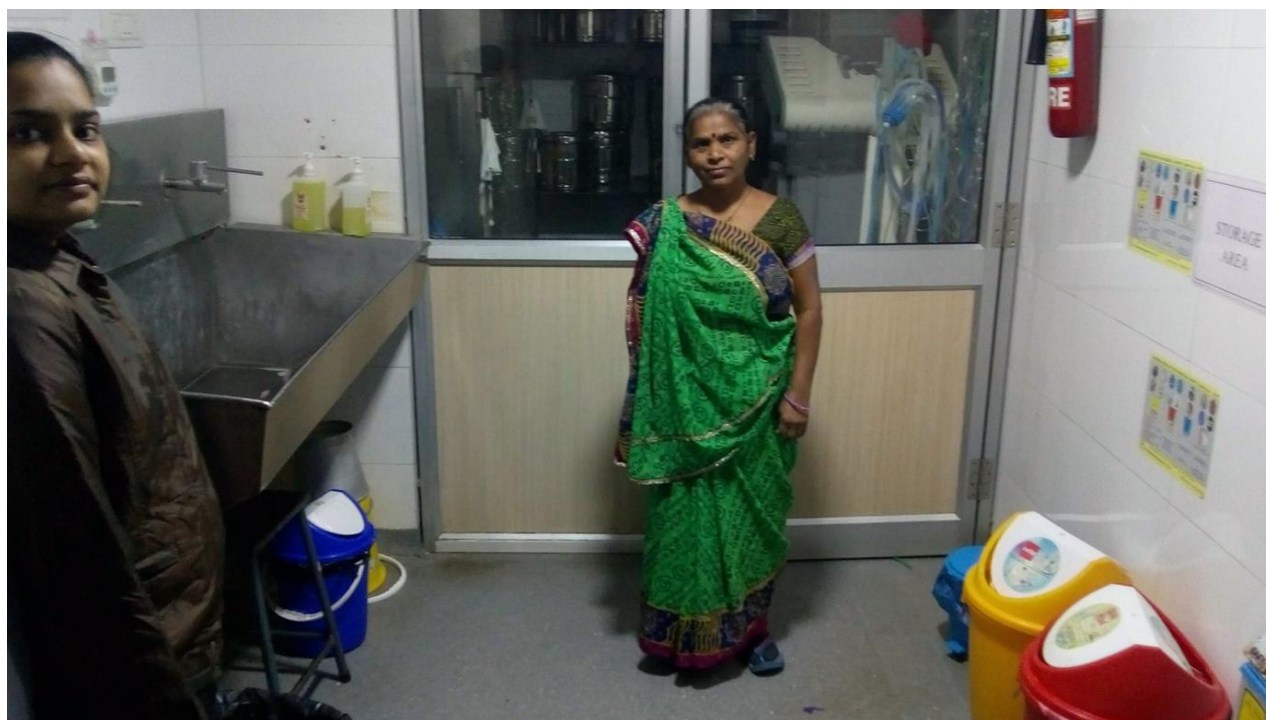


FIGURE 24: RECAPPING OF NEEDLES AS REPORTED BY HEALTHCARE STAFF



The complete occupational safety attire to be donned by people handling biomedical waste comprises of masks, gloves, aprons, boots and head cap. While masks and gloves were seen predominately on most health care workers, aprons and head caps were not worn by many. Exposure of body parts while handling infectious biomedical waste may increase the risk of infection along with increasing the chances of accidents. It was also noted that some healthcare workers were not wearing any PPE during our visit at one of the HCFs.

FIGURE 25 HEALTHCARE STAFF IN STORAGE AREA WITHOUT PPE



Policy Awareness, Capacity Building and Record Maintenance

For efficient management of biomedical waste in a healthcare facility, a biomedical waste committee should be set up or a person should be designated for the task. The biomedical waste management committee is responsible for creating awareness on the subject, organizing training for staff members, including trainings at the time of induction and refresher training to build capacity along with maintaining records pertaining to biomedical waste management. 77% of the facilities had a BMW management committee,

FIGURE 26: BIOMEDICAL WASTE MONITORING COMMITTEE

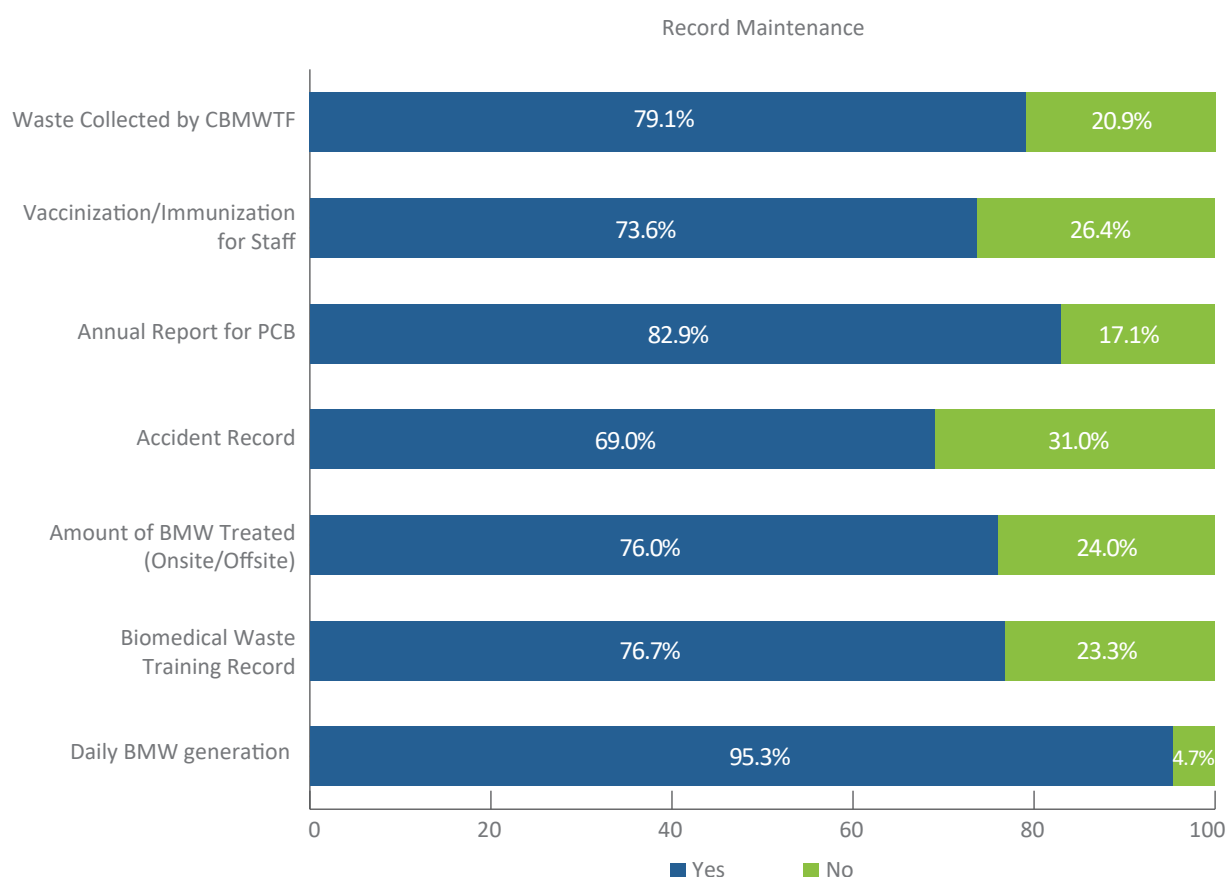
BMW Management Committee

Role	Percentage
BMW Management Committee	77%
Nodal Person for BMW Management	13%
None	10%

FIGURE 27: IEC MATERIAL ON BMW DISPLAYED IN A HEALTHCARE FACILITY



FIGURE 28: RECORD MAINTENANCE OF DIFFERENT ACTIVITIES PERTAINING TO BIOMEDICAL WASTE MANAGEMENT IN A HCF



A 48-bedded facility in the capital city of Ahmedabad was seen flouting majority of the Biomedical waste management norms. The facility did not have any colour-coded bins present. There were no puncture-proof sharp containers present as well. There was no daily record-keeping for biomedical waste generation. It was also endangering the health of its employees but not providing immunization and adequate PPE.

MEDICAL CLINICS: FINDINGS OF THE SURVEY

16 clinics were visited across all four districts as part of the study to assess the current knowledge, attitude and practices among non-bedded healthcare facilities in the state. This was done particularly because, even though the biomedical waste management rules in 2016 required non-bedded facilities also to register with the state pollution control boards (as they were also generating biomedical medical waste in small quantities), most of these facilities all across the country are neither registered with the prescribed authorities nor are they practicing segregation and disposal of the waste as per the rules.

When compared to healthcare facilities, medical clinics generated less waste, have smaller premises and lesser staff, but they also come under the ambit of the rules, as biomedical waste even in small proportions has the capacity to infect the entire waste stream if such waste is being disposed of along with general waste. This in particular not only creates trouble in disposing of the increased amount of infectious waste but also causes health risk to the waste handlers, and rag pickers, who have no training or personal protection equipment to deal with such waste.

94% of the medical clinics visited as a part of our survey, were using bags which were using non-color coded bags, though some of them were using color-coded bins. It was also seen, that needle stick injuries were taken

casually. 100% of the medical clinics visited were not only recapping the needles, 93% of those clinics neither had a policy for reporting such injuries nor any post exposure prophylaxis measures in place.

VIOLATION BY THE CBWTF

CBWTF is an important component in the process concerning sound management of biomedical waste. They are the ones responsible for timely collection of the biomedical waste from the facilities and disposing it using latest available technologies which are sustainable and do not negatively impact human health and the environment. Various media outlets from time to time have reported malpractices of the CBWTFs which have endangered both health and the environment. During the course of our BMW assessment in Gujarat, our team got the opportunity to interview Mr. Hidayatulla Khan Parmar, a resident of Ahmedabad, who had filed a complaint against E.Coli, a CBWTF operating in the area. According to him, the facility was improperly disposing the biomedical waste. The waste was being disposed of at an open site behind Dev Hotel near Narol, Ahmedabad. The officers of Municipal Corporation (Solid Waste Department) investigated the alleged location. Upon investigation, the facility was found guilty and it was found that 11 laborers were involved in disposing the waste in the said area where they were also segregating it. As a result, of these findings, the department imposed a fine amounting to Rs. 40,000 on the CBWTF.

KEY FINDINGS OF THE STUDY

- Lack of inventorization of healthcare facilities in the state of Gujarat
- Most HCFs do not have their own websites, which is mandatory under the new Rules
- Most HCFs have not uploaded their annual report on their website, mandatory under the new Rules.
- Biomedical waste generation records highlight improper reporting and mixing of general waste with biomedical waste.
- Poor infrastructure in the storage areas, basic requirements not met.
- 13% facilities visited under the study not connected to CBWTFs
- 27% facilities disposing municipal solid waste along with biomedical waste
- 15% facilities disposing hazardous waste along with biomedical waste
- Filled waste bags lying unattended in the hospital premises
- 19% facilities not pre-treating their microbiological waste/lab waste
- Most facilities lack pre-treatment equipments like microwave/ autoclave
- None of the hospitals have installed effluent treatment plants
- Recapping of needle, a frequent activity seen in 87% HCFs, and in 100% clinics
- Lack of policy for Post Exposure Prophylaxis
- IEC material not placed at strategic locations
- Case study and existing reports show appalling conditions of CBWTFs



Discussion & Recommendations

There was complete lack of inventorization of the healthcare facilities in the state and little records available in the public domain to extract information. Keeping this in mind, our study focused on the on-ground situation of biomedical waste management in the state. The survey conducted across 145 HCFs in the four districts of Gujarat painted a picture which differed greatly from the existing records in various reports. It was observed that while color-coded segregation was seen in almost all of the healthcare facilities, there was lack of bins/bags being placed at strategic locations. Important waste generation spots like nursing stations lacked color-coded bins in some facilities. Complete waste segregation can only be achieved if waste is segregated at “source of generation”. It was also noted that at various HCFs, these bins were not cleaned, at regular intervals thus becoming a potent site of infection. The latest amendments to the rules mandate phasing out of chlorinated bags while, it was seen that 22% of these facilities were still using chlorinated plastic bags which can be very harmful, once these bags go for incineration in the CBWTF facility. Sharps need to be handled very carefully as sharp- related injury is one of the leading causes of hospital-related accidents, and thus should be dealt with extreme caution. However, in case of HCFs in Gujarat, it was noted that while there was a lack of needle cutters in places like nursing stations and microbiological labs, the sharp container used to store this waste was not puncture-proof in 10% of the facilities.

13% of the HCFs were not linked to a CBWTF, which is totally against the law, as all of these facilities have a access to an operational CBWTF near their area. Even among those facilities which have access to a CBWTF, only 50% of them have their waste being collected daily. This waste if not collected daily has to be stored safely in a storage facility with a good infrastructure, but sadly, this was also not up to the mark. Most storage areas in the HCFs were ill-equipped to deal with fire hazards, were not rodent-proof and did not have an adjacent water supply required for periodic cleaning of the storage area. Cytotoxic waste which has to be handled and stored separately was being stored along with biomedical waste in 9% of the facilities. Pre-treatment of microbiological and lab waste is required to neutralize them as per law, but not only were 19% of the facilities bereft of any pre-treatment method, but some of them were also disposing their municipal waste along with biomedical waste, rendering all efforts of color-coded segregation and separate storage futile. Even after the introduction of electronic health equipments in the Indian health market, mostly all HCFs visited in Gujarat are still using traditional equipment containing hazardous materials. About 15% of the facilities are infecting the biomedical stream by disposing their hazardous waste (e.g., Mercury) along with biomedical waste introducing toxic chemicals in treatment plants which are not equipped to treat and dispose them in a sustainable manner. The state of Gujarat has performed poorly in terms of providing a safe working environment to its health workforce. While 87% of the facilities reported recapping of needles, there was also no policy for post-exposure prophylaxis in place for most of them. Complete PPE kits were also not donned by the staff handling biomedical waste. IEC material, which helps in enforcing the rules by providing a visual aid, was lacking in prominent waste generation areas like nursing stations and labs in more than 80% of the facilities. 10% HCFs visited in Gujarat did not even have a BMW management committee, and thus lacked any proper monitoring mechanisms. The lack of proper record maintenance of activities like vaccinations, injuries etc. also sends an incomplete picture to the state and central regulatory authorities, hindering policy development at various levels.

The medical clinics visited as a part of the survey also are in no better state than the HCFs. Mostly escaping the grips of the SPCBs, this category of waste generators though falling under the ambit of the rules are not following them as per protocol.

The findings of the study give a clear illustration that while, there isn't a lack of infrastructure at most of the places, the shortfalls are mostly management-based. Lack of thorough monitoring, incomplete utilization of the available resources and half-hearted implementation of rules, have led to gross errors which if not rectified may negatively impact the health of not only the healthcare workforce but also may be harmful for the environment. Thus, certain recommendations if adopted by the HCFs in Gujarat, may help in improving the working conditions, ensuring improved health & safety.

RECOMMENDATIONS

- A detailed list of healthcare facilities in Gujarat including bedded and non-bedded facilities (hospitals, nursing homes, clinics, path labs, vet hospitals) needs to be done by GPCB. This will help in identifying the defaulters and people who have not tied up with CBWTFs.
- Inventorization for HCFs is required in the state, bedded and non-bedded facilities along with proper records for waste generation.
- Most hospitals in Gujarat do not have ETP/STP in place and are discharging their waste without meeting the required standards. Monitoring systems need to ensure that the technical capacities of HCFs are being built in order to ensure compliance.
- Most hospitals in Gujarat do not even have pre-treatment equipment like autoclave, microwave etc., and majority of them solely rely on sodium hypochlorite, upgradation in technical capacities is an immediate requirement of the state.
- Stringent monitoring by GPCB would help improve compliance on all fronts, lack of the same would lead to biomedical waste mismanagement by HCFs in the form of mixing of hazardous waste and general waste with biomedical waste.
- District level monitoring committees have to be made more active in monitoring BMW management at the local level who can also be involved in capacity building for all healthcare and CBWTF staff. More focus needs to be laid on ensuring the occupational health & safety of the healthcare staff
- Capacity building of stakeholders is required at all levels including regulatory authorities, local authorities, occupiers, healthcare professionals, waste handling staff for maintaining holistic biomedical waste management in the state involving regular training and refresher trainings





H2 (Ground Floor),
Jungpura Extension,
New Delhi - 110014
India
Tel: 91-11-24328006, 24320711
Fax: 91-11-24321747

 https://www.instagram.com/toxics_link/
 <https://www.facebook.com/toxicslink>
 <https://twitter.com/toxicslink>
 <https://www.youtube.com/user/toxicslink2012>
 www.toxicslink.org