Assessment of Biomedical Waste in West, Central, North Zones of Hyderabad

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Abstract: *Waste disposal is especially important when it comes to medical supplies, as some waste can be contaminated with diseases and dangerous pathogens. Not all biomedical waste is treated the same way and different disposal companies use different methods such as autoclaving, incineration, chemicals and microwaves. Improper disposal of medical waste causes environmental pollution, unpleasant odours, the growth and reproduction of insects, rodents and nematodes, and injuries from blood-contaminated sharp objects, typhoid fever, cholera, hepatitis, etc. can lead to disease transmission. Thisstudy will reveal the current processes and environmental impacts of biomedical waste management by examining the quantity and quality of biomedical waste (BMW) generated by pharmacies, laboratories and multiple speciality hospitals.*

Keywords: Biomedical waste, health care waste, Clinical waste

I. INTRODUCTION

1.1 Biomedical Waste

"Biomedical Waste" means waste generated during human or animal diagnosis, treatment, or vaccination. Medical waste disposal is an integral part of healthcare infection control and hygiene programs. These environments are a major source of community-acquired infections because they generate large amounts of biomedical waste. Biomedical waste can be classified based on the risk of injury and/or infection during handling and disposal. Waste intended for precaution during handling and disposal includes sharps (needles or scalpel blades), pathological waste (anatomical body parts, microbial cultures and blood samples), and infectious waste. (Includes items contaminated with bodily fluids and excretions such as bandages, catheters, and infusion tubes). Other medical waste includes radioactive waste, mercury-containing instruments, and polyvinyl chloride (PVC) plastic.

Approximately 85% of the total waste generated from medical activities is a general non-hazardous waste.The remaining 15% are considered potentially infectious, toxic or radioactive hazards. The sources of Biomedical waste are Major Source(Hospitals, Laboratories, blood bank) and Minor Source(Clinics, Dental clinic,Homecare). BMW is categories and classified as per WHO standards. BMW is categories form 1-10, and Classified into Human waste, Animal waste, Microbiology and biotechnology waste, waste sharp, Discarded medicine, Soiled waste, solid waste, liquid waste, Incineration ash, chemical waste.Biomedical waste is colour coded for the segregation. Yellow coloured waste (Human anatomical waste, Animal waste, Microbiology and Biotechnology waste, soiled waste), Red coloured waste(Solied waste). Blue coloured waste (Waste Sharp), White (Discarded medicine and Cytotoxic drugs, Liquid waste, Incineration ash, Chemical waste).

Disposal method used for Biomedical waste are Incineration Technology, Non-Incineration Technology, Microwave Irradiation, Autoclave, Chemical waste, Plasma Pyrolysis.

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II. OBJECTIVE

2.1 The Main Objective of this Project

- To collect information on BMW sources in Hyderabad.
- To collect data about BMW generation rate of various sources in Hyderabad.
- To identify the collection, processing, and disposal method adopted at sources.
- Periodical assessment of BMW characteristics and its impacts.
- Impact assessment during collection, transport, and disposal, of BMW on environment and humans.

III. MATERIALS AND METHODS

3.1 Detail information on hospitals in Hyderabad:

Hyderabad's healthcare system consists of reputable public hospitals, state-of-the-art private hospitals, private clinics, nursing homes and advanced diagnostic centres, providing excellent services 24 hours a day.Hyderabad's healthcare sector is highly standardized and cheaper than other cities in the country. Individual hospitals offer ambulance services, fully stocked pharmacies, 24-hour emergency and trauma centres, and well-equipped pathology laboratoriesHyderabad City is well connected to other cities and states by road, rail and air, making it easy for patients to reach their destinations.

3.2 Description of the study area:

Hyderabad City, Telangana State, South Central India. It is the largest and most populous city in Telangana and the most important urban centre for all of South-Central India. .Hyderabad has developed into a commercial hub and an international information technology (IT) hub. Pharmaceuticals, tobacco, textiles, etc. are manufactured here. Service activities, especially those related to IT, have expanded dramatically and now constitute a large part of the urban economy. Hyderabad City is divided into 6 zones. Shown in Fig 1.(Charminar, L.B. Nagar. Khairtabad. Secunderabad. Serilingampally. Kukatpally).Each zone is further divided into a total of 30 circles. In addition, the circle will be divided into 150 stations. in 2020, each district will have 40,000-50,000 people.
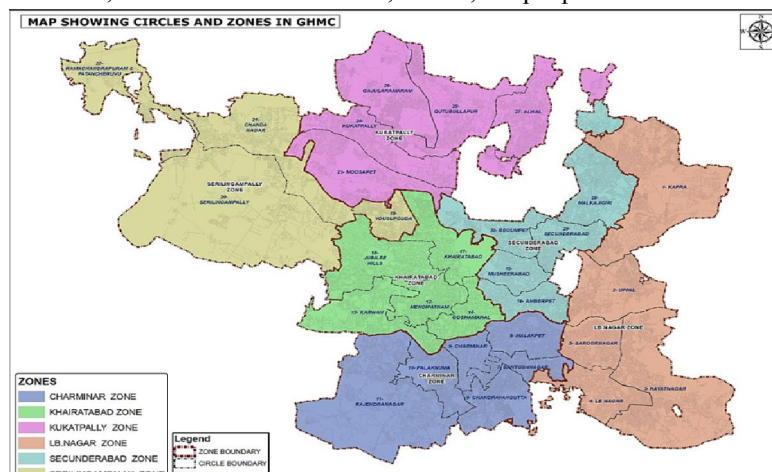

Fig. 1: Hyderabad map showing circles and zones in GHMC

3.3 Description of West Zone (Kukatpally zone and Serilingampally zone)

Kukatpally zone consists of areas such as Kukatpally, Moosapet, Alwal, Qutubullapur, and Gajularamaram. The Kukatpally zone comes belongs to the West zone of Hyderabad.Serilingampally zone consists of area such as Serilingampally, and Chandanagar. The Serilingampally zone belongs to the West zone in Hyderabad.

Table No.1: Locations of Hospitals in West zone.

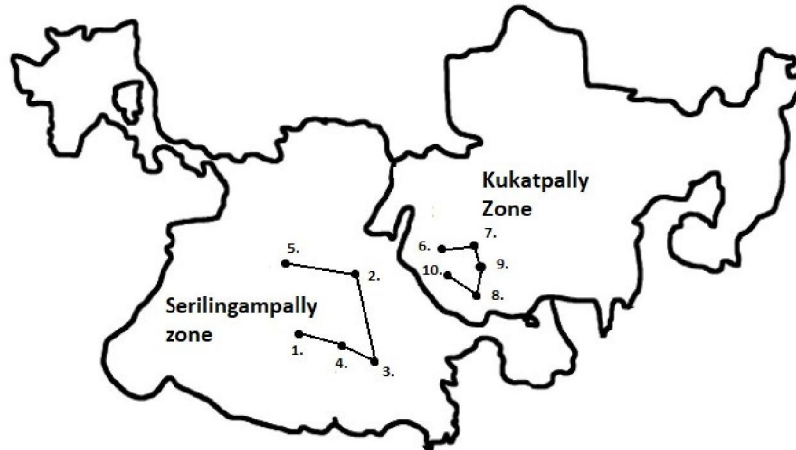| S.No	Name of the zone	Type of source	No of hospital	Location of the Hospitals
1.	West zone (Kukatpally zone)	Major source	2	1, 5.
		Minor Source	3	2, 3, 4.
2.	West zone (Serilingampally zone)	Major Source	2	8, 9.
		Minor Source	3	6, 7, 10.

Fig. 2: Location of hospitals in West zone

3.4 Description of Central Zone (Khairthabad zone) and North zone (Secunderabad zone).

Khairthabad zone consists of areas such as Jubilee Hills, khairthabad, Mehdipatnam, Karwan, and Goshamahal, The Khairthabad zone comes belongs to the Central zone of Hyderabad.Secunderabad zone consists of area such as Secunderabad, Malkajgiri, Begumpet, Musheerabad, Amberpet. The Secunderabad zone belongs to the North zone in Hyderabad.

Table No.2: Locations of Hospitals in Central zone & North zone.

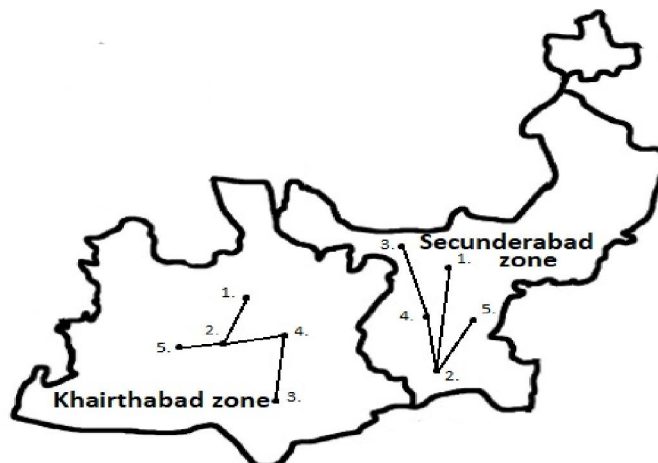| S. No	Name of the zone	Type of source	No of hospital	Location of the Hospitals
1.	Central zone (Khairathabad zone)	Major source	3	1, 2, 4.
		Minor Source	2	3, 5.
2.	North zone (Secunderabad zone)	Major Source	3	6, 8, 9.
		Minor Source	2	7, 10.

Fig. 3: Location of hospitals in Central zone and North zone

3.5 Collection of BMW generation rate data West zone (Kukatpally zone and Serilingampally zone) :

The data includes the various types of BMW generated at major and minor sources. Major sources are 4 and minor sources are 6. The data collected is from December-2022 to February-2023. The hospitals are located in the Kukatpally zone and Serilingampally zone.The data is tabulated in table 3.

Table No.3: BMW waste Generation Rate in the months of December, January and February(2022-2023).

S.No	Name of Hospital	Location	BMW Generation rate in the Month of December-2022 in Kgs					BMW Generation Rate in the Month of January-2023 in Kgs					BMW Generation Rate in the Month of February-2023 in Kgs				
			Yellow	Red	Blue	White	Total	Yellow	Red	Blue	White	Total	Yellow	Red	Blue	White	Total
1.	Care hospital	Gachibowli	1904	824	148	84	2960	1914	841	158	89	3002	1904	824	148	84	2960
2.	Healthfirst Diagnostics	Miyapur	11	9	5	3	28	12	10	4	3	29	11	9	5	3	28
3.	Novartis Health care Pvt Ltd.	Raidurg	10	8	5	4	27	9	8	5	3	25	10	8	5	4	27
4.	Oasis centre	Gachibowli	11	9	6	3	29	10	9	6	3	28	11	9	6	3	29
5.	Vasan health care Pvt Ltd	Chanda nagar	17	10	6	6	39	16	9	6	4	35	17	10	6	6	39
6.	Aditya diagnostics	Kukatpally	18	10	6	5	39	20	8	6	4	38	18	10	6	5	39
7.	Iswarya Fertility Service Pvt Ltd.	KPHB colony	11	8	5	3	27	10	6	3	2	21	11	8	5	3	27
8.	Parveen Maternity & Nursing home	Moti nagar	38	22	9	6	75	34	21	8	5	68	38	22	9	6	75
9.	Rainbow children's medicare	Hydernagar	517	175	83	39	814	520	186	84	35	825	517	175	83	39	814
10.	Esi dispensaries	Kukatpally	13	8	5	3	29	13	8	5	3	29	13	8	5	3	29

3.6 Collection of BMW generation rate data Central zone (Khairthabad zone) and North zone (Secunderabad zone):

The data includes the various types of BMW generated at major and minor sources. Major sources are 6 and minor sources are 4. The data collected is from December-2022 to February-2023. The hospitals are located in the Khairthabad zone and Secunderabad zone.The data is tabulated in table 4.

Table No.4: BMW waste Generation Rate in the months of December, January and February(2022-2023).

S.No	Name of Hospital	Location	BMW Generation rate in the Month of December-2022 in Kgs					BMW Generation Rate in the Month of January-2023 in Kgs					BMW Generation Rate in the Month of February-2023 in Kgs				
			Yellow	Red	Blue	White	Total	Yellow	Red	Blue	White	Total	Yellow	Red	Blue	White	Total
1.	Ankura Hospital	Banjara hills	396	181	96	44	717	395	178	89	44	706	384	174	87	46	691
2.	Ankura Hospital	Mehdipatnam	416	152	85	51	704	436	184	93	54	767	421	182	91	52	746
3.	Esi Dispensaries	Goshamahal	10	5	3	3	21	5	3	3	1	13	5	3	3	1	13
4.	Curewell hospital	Khairthabad	68	29	11	6	114	68	29	11	6	114	71	36	14	8	129
5.	Dr Agarwal health care	Mehdipatnam	14	8	5	3	30	14	8	5	3	30	14	8	5	3	30
6.	Apollo Hospital	Secunderabad	1012	845	101	84	2042	1052	847	101	89	2089	1012	826	98	81	2017
7.	Sree Krishna hospital	Malkajgiri	36	14	6	5	61	36	14	6	5	61	38	16	7	4	65
8.	Akshara Medical & Research centre	Begumpet	362	154	54	44	614	362	171	57	44	634	371	174	54	42	641
9.	Gurunanak care hospital	Musheerabad	1074	658	91	71	1894	1065	745	91	78	1979	1071	726	96	74	1967
10.	Sri Sai Subash Dental Surgery	Baghamberpet	9	5	2	2	18	9	5	2	2	18	10	7	2	2	21

IV. RESULTS AND DISCUSSIONS

For our second phase of the research. A questionnaire was prepared and used for data collection during this project. The questionnaire contains 11 questions regarding general information, handling, segregation, disposal and a health hazard of biomedical waste was prepared. Questionnaires were distributed amongst the 20 randomly selected authorities of government and private hospitals in Hyderabad(Kukatpally zone, serilingampally zone, khairthabad zone and Secunderabad zone). Questionnaires were collected after completion and interaction regarding biomedical waste was carried out. Responses to the questionnaire were coded and entered into Excel Sheet. Later data were tabulated and analysed by various statistical methods as per need. To study the existing storage, collection, transportation, processing and disposal facilities. We identified a common biomedical waste management facility at Hyderabad which was run by "GJ Multiclave Pvt Ltd". We have collected information related to storage collection, transportation, processing and disposal was collected in addition to this the information related to working of plant, costing, details of hospitals, etc were collected. Analysis of the questionnaires was done to produce comments, figures and tables. Later data was tabulated.

4.1 Data Analysis (West Zone)

The data from the table 3,have been compared and analysed in Table 9. There are a total of 15 hospitals, Major-4, and Minor-6, which are located in the Kukatpally zone (West zone) and Serilingampally zone (West zone).The data was collected over a period of three months December-2022 to February-2023.

TABLE 5: Comparison of the Table No.3from November (2022) – January (2023).

| S.no	Name of hospital	Location	beds	Total waste generated in the months		
				November	December	January
1.	Health care hospital	Rajendra nagar	10	61	61	59
2.	Healthfirst Diagnostics	Miyapur	0	29	29	28
3.	Novartis Health care Pvt Ltd.	Raidurg	0	25	25	27
4.	Oasis centre	Gachibowli	0	28	28	29
5.	Vasan health care Pvt Ltd	Chanda nagar	10	35	35	39
6.	Aditya diagnostics	Kukatpally	0	41	38	39
7.	Iswarya Fertility Service Pvt Ltd.	KPHB colony	0	21	21	27
8.	Parveen Maternity & Nursing home	Moti nagar	8	68	68	75
9.	Rainbow children's medicare	Hydernagar	50	810	825	814
10.	Esi dispensaries	Kukatpally	0	29	29	29
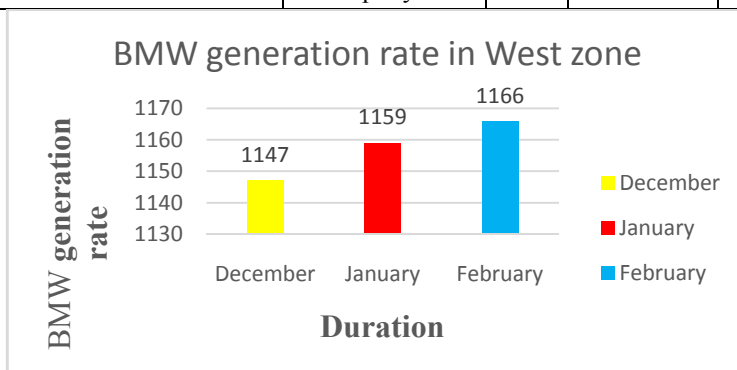
Fig. 4: BMW Generation Rate in West zone.

From our study, from Table 5, It was observed that West zone and West zone (Kukatpally zone and Serilingampally zone) Total BMW waste generation rate in the month of December is 1147 kgs, Maximum BMW generation rate is 810 kgs and minimum 25 kgs during November-2022. In the month of January Total BMW generation rate was 1159 kgs,

Maximum BMW generation rate is 825 kgs and minimum is 25 kgs. In the month of February Total BMW generation rate was 1166 kgs, Maximum BMW generation rate is 814 kgs and minimum is 27 kgs.

4.2 Data analysis (Central zone and North zone):

The data from Tables 4, have been compared and analysed in table 6. There are a total of 10 hospitals, Major-6, and Minor-4, which are located in the Khairthabad zone (Central zone) and Secunderabad zone (North zone).The data was collected over a period of three months December-2022 to February-2023.

TABLE 6: Comparison of the Table No.4 from November (2022) – January (2023).

| S.no	Name of hospital	Location	beds	Total waste generated in the months		
				November	December	January
1.	Ankura Hospital	Banjara hills	50	717	706	691
2.	Ankura Hospital	Mehdipatnam	50	704	767	746
3.	Esi Dispensaries	Goshamahal	0	21	13	13
4.	Curewell hospital	Khairthabad	10	114	114	129
5.	Dr Agarwal health care	Mehdipatnam	0	30	30	30
6.	Apollo Hospital	Secunderabad	150	2042	2089	2017
7.	Sree Krishna hospital	Malkajgiri	10	61	61	65
8.	Akshara Medical & Research centre	Begumpet	50	614	634	641
9.	Gurunanak care hospital	Musheerabad	100	1894	1979	1967
10.	Sri Sai Subash Dental Surgery	Baghamberpet	0	18	18	21
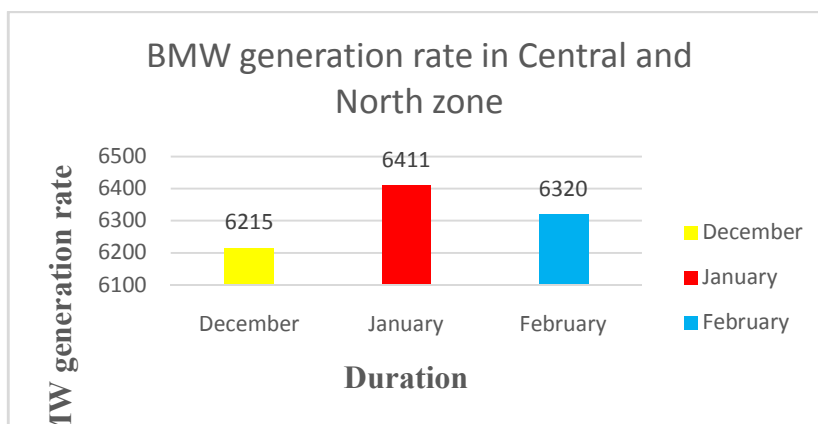
Fig. 5: BMW Generation Rate in Central zone and North zone.

From our study, from Table 6, It was observed that Central zone and North zone (Khairthabad zone and Secunderabad zone) Total BMW waste generation rate in the month of December is 6215 kgs, Maximum BMW generation rate is 2042 kgs and minimum 18 kgs during November-2022. In the month of January Total BMW generation rate was 6411 kgs, Maximum BMW generation rate is 2089 kgs and minimum is 13 kgs. In the month of February Total BMW generation rate was 6320 kgs, Maximum BMW generation rate is 2017 kgs and minimum is 13 kgs.

V. CONCLUSION

We have Gained knowledge about quantity of BMW (Biomedical waste) generation rate at six zones in Hyderabad. For our study we have selected 35 hospitals spread across six zones. The quantity and quality of BMW shows variations in yellow coloured (Human anatomical waste, animal waste) waste and red coloured (Soiled waste) waste is harmful for the Humans and Environment if it is disposed improperly. The waste generated from hospitals around Hyderabad is collected and disposed through a common waste disposal facility and through the various disposal process used in the

disposal facility. There are various challenges we face during the collection of data of BMW (Biomedical waste). Some small hospital and clinics do not follow the BMW Rules and dispose the BMW in dump fill. 75 percent of waste is collected and dispose properly at disposal facility and the remaining 25 percent is disposal improperly and the waste end up in landfill. The improper disposal of BMW (Biomedical waste) causes various impacts on humans like transmission of diseases such as typhoid fever, cholera, hepatitis and AIDS through injuries from contaminated syringes and needles. And various impacts on environment such as environment pollution, unpleasant odours, Growth and reproduction of vectors such as insects, rodents and nematodes and it can lead to transmission of diseases to humans.

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