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Hospital Waste Management Practices : Jabalpur City

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ABSTRACT

Hospital waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animal or in research activities pertaining there to or in the production or testing of biological and including all categories of waste. Hospital waste divides two categories hazardous and non hazardous waste. Pathological waste, infectious waste, sharps, pharmaceuticals, genotoxic, chemical and radioactive waste includes first category. It is risky for health so needs proper disposal. Hazardous waste makes 10% to 25% Total hospital waste and approximate 75% to 90 % hospital waste is non-hazardous. Developed countries are hospital waste generating rate in kg/bed/day more than developing countries. Hospital wastes may need more systems, since it includes parts of body, human and animal tissues, radioactive waste, gauze, cotton, plastics, infected liquid waste, blood and laboratory wastes. Jabalpur city is located at $23^0$3' to $23^0$16' North latitude and $79^0$51' to $80^0$6' East longitude. This study bases on primary and secondary data base. Schedule, interview and observation technique are applied for primary data collection, and secondary data collected from various survey report and available related literature. It is found that the maximum hospital waste is plastic material. Proper hospital waste disposal is not done by any of the agencies in Jabalpur city. It is found that the maximum hospital waste is plastic material. Proper hospital waste disposal is not done by any of agencies in Jabalpur city.

KEYWORDS - *Hospital waste management, Hospital waste generation rate, Hospital waste in Jabalpur.*

INTRODUCTION

Waste means materials that are discarded and are not intended to use further [1]. All waste arising from health care facilities is labeled as health care waste [3]. Any waste that is generated during diagnosis, treatment or immunization of human beings, animals or in research work relevant to or in production and testing of biological [4]. Hospital waste is a special category of waste, which is highly hazardous due to its infectious and/or toxic characteristics [16]. World Health Organization (WHO) classified the hospital solid wastes into 8 groups included ordinary waste, pathologic, radioactive, chemical, infection, sharp and needle, pharmaceutical and the dishes contain edaerosols. According to the bio-medical waste (Management and Handling) Rules (1998), "Bio-medical waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animal or in research activities pertaining thereto or in the production or testing of biological and including all categories of waste"[6]. United States Environmental Protection Agency (USEPA) also divided the infection wastes in 6 main groups and 4 optimal groups and it has also been expressed in clinical material of subdivision

medical groups [5]. Hospital waste management means using such procedures that will not let disease to spread [11]. Hospital waste comprises of hazardous and non hazardous waste. First category includes pathological waste, infectious waste, sharps, pharmaceuticals, genotoxic, chemical and radioactive waste [10]. This category makes 10 to 25% of total hospital waste and is risky for health so needs proper disposal [7]. About 75% to 90% is non hazardous general health care waste comparable to domestic waste [2]&[8].

Globally waste production of developed countries is 1 to 5 kg/bed/day while developing countries generate 1 to 2 kg/bed/day [1]. Hospital waste generation rate in U.S, U.K and Taiwan is approximately 7kg per bed per day, 1.67kg per bed per day and 2.5 kg per bed per day respectively [11]. The management of biomedical waste is still in its infancy stage all over the world. There is a lot of confusion among the generators, operators, decision- makers and the general community about the safe management of bio-medical waste. The reason may be due to the lack of awareness. Hence, resource material on bio-medical waste management for hospital staffs including nurses is the need of the hour [9].

METHODOLOGY

This research paper is based on primary and secondary data. Primary dada has been collected on the bases of field observation, interviews for finding the fact in the study area. The collected data and information were critically analyzed to assess exiting waste management, its limitation and impacts.

OBJECTIVE

The main objectives of this research paper are given as under :

(1) The quantity of hospital waste generated in Jabalpur city.
(2) To know that waste collection method in hospitals.
(3) To the study of the waste disposal process in Jabalpur city.

STUDY AREA

Jabalpur city is part of the Jabalpur congregation comprising of Municipal Corporation Jabalpur (MCJ) and Cantonment Board Jabalpur (CBJ). This ancient city (traditionally also known as "Sanskardhani") is located in central India, in the state of Madhya Pradesh. Geographically, the city is presently located at $23^0$3’ to $23^0$16’ North latitude and $79^0$51' to $80^0$6’ East longitude, at an altitude of 393 meters above mean sea level (MSL). Jabalpur lies on the banks of the Narmada River and sprawls over the plains of its tributaries Hiran, Gaur, Ken & Sone. The topography of Jabalpur is unique. The city is surrounded by low rocky and barren hillocks – Karia Pather hills on the northeast, Sita Pahad and Khandari hills towards the east, and Madan Mahal hills and rock outcrops towards the southwest (Map1).

The entire area of the city is hilly, with slopes differing in grade from 2 to 30 per cent. Minimum temperature recorded 9.80 C in December month maximum temperature 41.7 recorded in May in Jabalpur city. Average rainfall is 1386 mm. Total Population of Jabalpur is 1,054,336 (as per of

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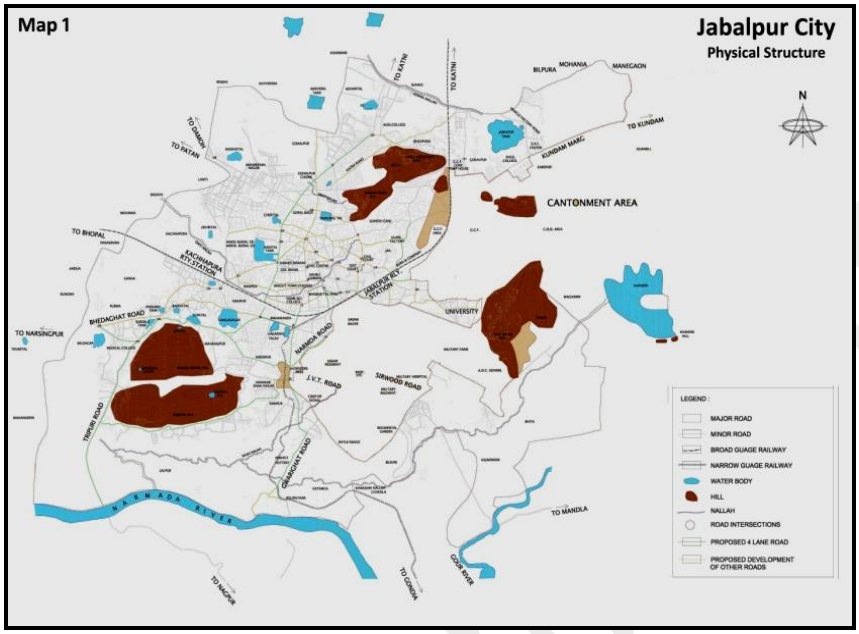
India 2011) Total area of Jabalpur City is 367 sq km. It is divided fifteen zone and 79 wards in the year 2015.



CLASSIFICATION OF HOSPITAL WASTE

A number of hospital waste areas available in the hospitals. On the list of its characteristic it is divided in to the seven categories. These categories are shown below -

(1) **General waste :** Largely composed of domestic or house hold type waste. It is nonhazardous to human beings, e.g. kitchen waste, packaging material, paper, wrappers, and plastics.

(2) **Pathological waste :** Consists of tissue, organ, body part, human fetuses, blood and body fluid. It is hazardous waste.

(3) **Infectious waste :** The wastes which contain pathogens in sufficient concentration or quantity that could cause diseases. It is hazardous e.g. culture and stocks of infectious agents from laboratories, waste from surgery, waste originating from infectious patients.

(4) **Sharps :** Waste materials which could cause the person handling it, a cut or puncture of skin e.g. needles, broken glass, saws, nail, blades, and scalpels.

(5) **Pharmaceutical waste :** This includes pharmaceutical products, drugs, and chemicals that have been returned from wards, have been spilled, are outdated, or contaminated.

(6) **Chemical waste :** This comprises discarded solid, liquid and gaseous chemicals e.g. cleaning, housekeeping, and disinfecting product.

(7) **Radioactive waste :** It includes solid, liquid, and gaseous waste that is contaminated with radio nuclides generated from invitro analysis of body tissues and fluid, in vivo body organ imaging and tumor localization and therapeutic procedures.

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Types of Hospital and Health Care Establishments Waste

This table shows hospital and health care waste mainly divided in to seven categories. They are - (1) Plastic (2) Glass (3) Textiles, (4) Paper and Cartons (5) Metals (6) Food waste and (7) other.

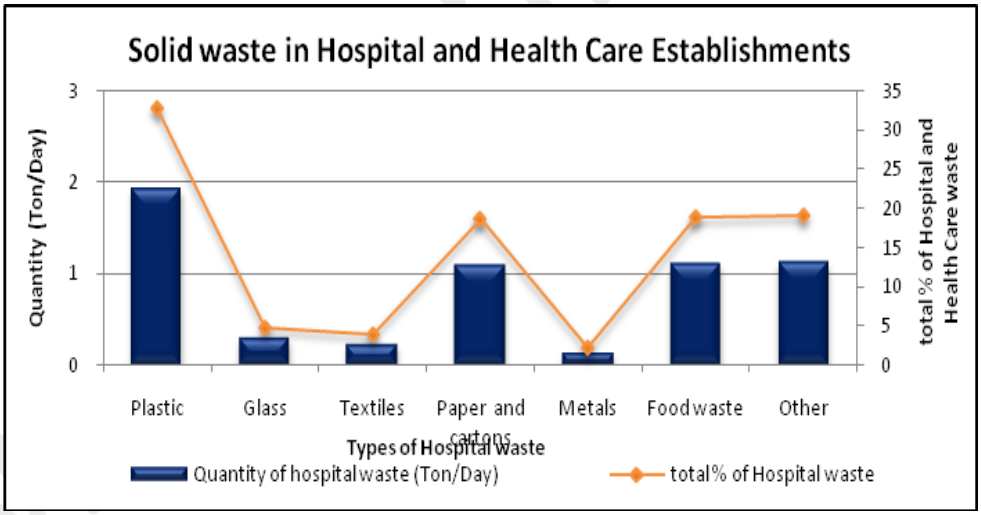
Table 1

Solid waste in Hospital and Health Care Establishments

S. No.	Types of Hospital waste	Quantity of Hospital waste (Ton/Day)	Total % of Hospital and Health Care
1.	Plastic	1.92	32.80
2.	Glass	0.28	4.80
3.	Textiles	0.22	3.80
4.	Paper and	1.09	18.60
5.	Metals	0.12	2.07
6.	Food waste	1.10	18.78
7.	Other	1.12	19.15
	Total	5.85	100.00

Source: Primary, 2015

Figure 1



Source: Primary, 2015

This table shows types of solid waste in hospital and other health care establishments. Total 5.85 ton per day solid waste is generated by hospital and health care establishments; it is the 1.18 percent of total waste. Plastic is generated 1.92 tons per day solid waste; it is the 32.8 percent of total hospital and other health care establishment's solid waste. Paper and cartons is generated 18.60 percent of total hospital waste and food waste is generated 1.10 ton/day, it is a 18.78 % of total hospital waste.

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Table 2

Hospital Surveyed in Jabalpur City

S. N.	Hospital	Category	No. of Beds	Occupancy of Beds	OPD
1.	Victoria	Government	257	257	973
2.	Elgin	Government	150	135	375
3.	GFC	Government	75	45	163
4.	OFK	Government	100	55	193
5.	Railway	Government	125	81	405
6.	Nataji Subhash Chandra Bosh Medical Collage (NSBMC)	Government	740	725	2325
7.	Jabalpur Hospital	Private	200	130	390
8.	Hindustan	Private	100	55	165
9.	Jaamdaar	Private	107	56	168
10.	Mannulal	Private	100	57	171
11.	Motilal Nehru	Private	44	21	65
12.	Samadhan	Private	46	27	81
13.	Pandey hospital	Private	50	28	84
14.	City Hospital no. 1	Private	75	48	144
15.	City hospital no. 2	Private	80	56	168
16.	Shalbi Hospital	Private	89	52	156

Source: Primary, 2015.

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In this above table is shown survey hospital in Jabalpur city. Total sixteen hospitals are surveyed in this study, eleven are Private and five are government. Maximum Number of 740 beds is available in Nataji Subhash Chandra Bosh Medical Collage (NSBMC). Victoria Hospital also show total no of 257 beds. 44 beds are available in Motilal Nehru Hospital; it is small hospital in all surveyed hospital. Government hospitals show is maximum occupancy of bed in Jabalpur city. Netaji Subhash Chandra Bose Medical College shows maximum 725 occupancy of beds in total available bed. Minimum occupancy of beds is in Motilalal Nehru hospital. There is only 21 beds occupancy of total 44 beds. Maximum OPD shows Medical College. There are average 2325 people per day come for treatment.

Table 3

Non-hazardous and Hazardous Hospital Waste Generated in Jabalpur City

S.N.	Hospital	Non-hazardous		Hazardous		Total Waste
		Wastes, kg/bed/day	% of total waste	Wastes, kg/bed/day	% of total waste	
1	Victoria	1.35	77.81	0.38	22.19	1.73
2	Elgin	1.43	78.57	0.39	21.43	1.82
3	GFC	1.37	89.26	0.17	10.74	1.54
4	OFK	0.63	72.23	0.24	27.77	0.87
5	Railway	0.49	74.21	0.17	25.79	0.66
6	NSB Medical Collage	1.46	74.05	0.51	25.95	1.97
7	Jabalpur Hospital	0.84	68.50	0.39	31.50	1.23
8	Hindustan	0.99	72.32	0.38	27.68	1.37
9	Jaamdaar	1.02	71.23	0.41	28.77	1.43
10	Mannulal	1.18	80.91	0.28	19.09	1.46
11	Motilal Nehru	1.19	78.57	0.32	21.43	1.51
12	Samadhan	0.82	72.32	0.31	27.68	1.13
13	Pandey hospital	0.43	74.13	0.15	25.87	0.58
14	City Hospital no. 1	0.80	81.27	0.18	18.73	0.98
15	City hospital no. 2	0.81	74.07	0.28	25.93	1.09
16	Shalbi Hospital	0.91	73.59	0.33	26.41	1.24
	Sub Total	15.71	76.23	4.90	23.77	20.61
	Average waste	0.98		0.31		1.29

Source: Primary, 2015.

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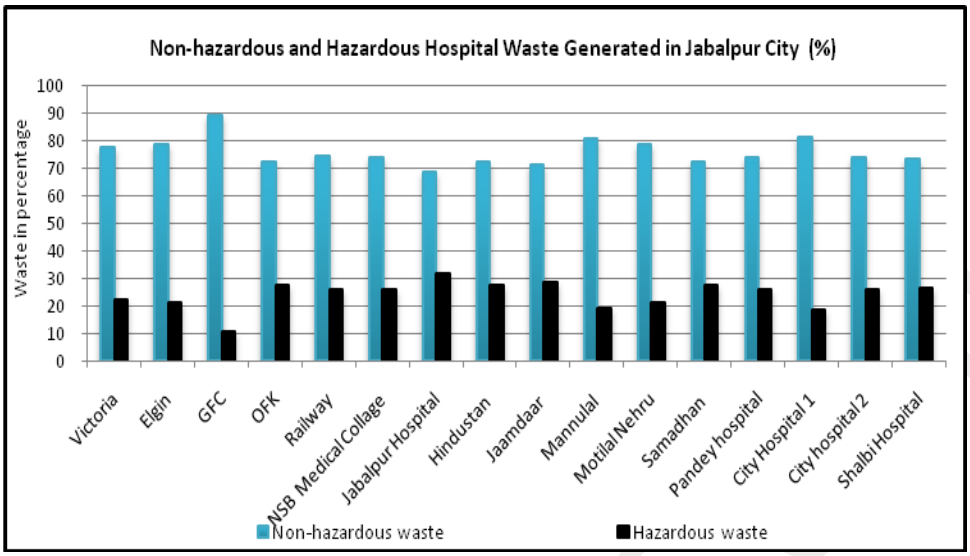
Figure 2



Source: Primary, 2015.

In this above table 3 is shows non-hazardous, hazardous waste and total hospital waste in kg per bed per day and percentage of total hospital waste. Total 1.29 kg per bed per day waste generate in Jabalpur, wherein 0.98 kg per bed per day non-hazardous and 0.31 kg per bed per day waste generate. Total 0.58 kg per bed per day waste generates in Pandey Hospital, non-hazardous waste is 74.13 percent of total waste and hazardous waste is 25.87 percent of total waste.NSB medical college generates total 1.97 kg per bed per day waste, there are 74.05 percent non-hazardous and 25.95 is hazardous waste. Elgin hospital is generated total 1.87 kg per bed per day, there are 78.57 percent of non-hazardous and 21.43 percents hazardous waste.

Table 4

Non-hazardous hazardous Hospitals Waste Generated in Jabalpur City

S. N.	Hospital	Non-hazardous (% of total waste)		Hazardous (% of total waste)	
		General	Reusable	Clinical	Sharp
1	Victoria	67.70	10.11	19.62	2.57
2	Elgin	68.60	9.97	17.83	3.60
3	GFC	78.24	11.02	6.85	3.89
4	OFK	61.81	10.42	4.97	22.80
5	Railway	61.30	12.91	17.59	8.20
6	NSB Medical Collage	53.13	20.92	18.13	7.82
7	Jabalpur Hospital	59.23	9.27	12.61	18.89
8	Hindustan	61.37	10.95	22.06	5.62
9	Jaamdaar	58.39	12.84	17.59	11.18
10	Mannulal	73.27	7.64	14.95	4.14

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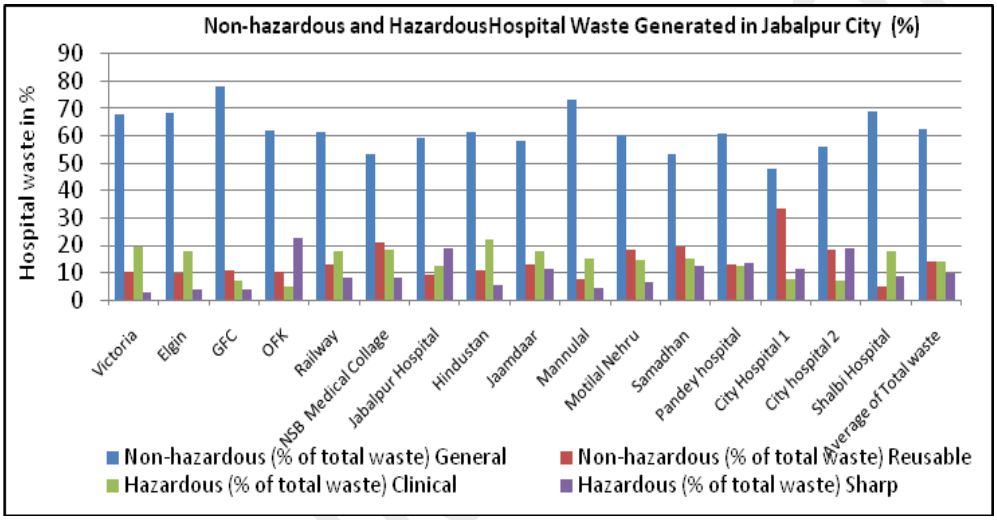
11	Motilal Nehru	60.11	18.46	14.74	6.69
12	Samadhan	53.17	19.15	15.14	12.54
13	Pandey hospital	61.00	13.13	12.49	13.38
14	City Hospital no. 1	47.92	33.35	7.64	11.09
15	City hospital no. 2	55.84	18.23	6.85	19.08
16	Shalbi Hospital	68.81	4.78	17.95	8.46
	Average of Total waste	62.32	13.91	14.26	9.51

Source: Primary, 2015.

Figure 3



Source: Primary, 2015.

This table is showing non hazardous and hazardous hospital waste generated in Jabalpur city. There is average 62.32 percent general waste and average approximate 14 percent waste reusable in non-hazardous hospital waste. Minimum 4.78 percent reusable hospital waste is generated by shalbi hospital and city hospital no. 1 generates maximum 33.35 percent reusable waste. GCF hospital generates maximum of 78.24 percent general waste. Average 14.26 percent clinical and 9.51 percent sharp wastes are generating in Jabalpur city. OFK hospital generates minimum 4.97 percent clinical waste and maximum of 18.13 percent of clinical waste is generated by NSB medical college. Victoria hospital generates minimum 2.57 percent of sharp waste and city hospital no. 2 generates maximum of 19.08 percent sharp waste.

Categorization of Hospital/Biomedical wastes

According to the Bio Medical Waste (Management and Handling) Rules, 1998, Hospital/Biomedical wastes are divided into ten categories. These categories are shown as under

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Table 5

Category of Hospital/Biomedical wastes

Category	Description of waste Category	Treatment and Disposal of BMW
Cat. 1	Human Anatomical waste (Human tissues, organs, body part)	Incineration/deep burial
Cat. 2	Animal waste : (Animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animal used in research, waste generated by Veterinary hospitals colleges, discharge from hospital and animal houses)	Incineration/deep burial
Cat. 3	Microbiology and biotechnology waste : (Waste from laboratory cultures, stocks of specimens of micro organism live of attenuated vaccines, human and animals cell culture used in research infectious agents from research and industrial laboratories, wastes from production of biological, toxins, dishes and devices used for transfer of cultures)	Autoclaving/microwaving/ incineration
Cat. 4	Waste Sharps: (needles, syringes, scalpel, blades, glass etc. that may cause puncture and cuts. This include both used and unused sharps)	Disinfection (chemical treatment/autoclaving/microwaving) and mutilation/shredding
Cat. 5	Discarded Medicines and Cyto-toxic Drugs: (wastes comprising of outdated contaminated and discarded medicines)	Incineration/destruction and drugs disposal in secured landfills
Cat. 6	Discarded Medicines and Cyto-toxic Drugs: (wastes comprising of outdated contaminated and discarded medicines)	Incineration/autoclaving / microwaving
Cat. 7	Solid Waste: (wastes generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets etc.)	Disinfection/autoclaving / microwaving and mutilation/shredding
Cat. 8	Liquid Waste: (waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities)	Disinfection/Discharge into drains
Cat. 9	Incineration Ash: (ash from incineration of any bio-medical waste)	Disposal secured landfill
Cat. 10	Chemical Waste: (chemical used in production of biological, chemicals used in disinfection, as insecticides etc.)	Chemical treatments and discharge into drain for liquids and secured land fill for solids.

Source- The Bio Medical Waste (Management and Handling) Rules, 1998.

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Waste Disposal Frequency in Jabalpur City

As per the survey conducted for primary data the categories wise waste disposal frequency in Jabalpur city is shown in the bellow given table.

Table 6

Categories Wise Waste Disposal Frequency in Jabalpur City

Categories of waste	Waste Production Number of Hospitals	Frequency of disposal			
		Daily	Once in 2-3 days	Once in weekend	Once in 15 days
Category 1st	5	4	1	-	-
Category 2nd	-	-	-	-	-
Category 3rd	3	2	1	-	-
Category 4th	16	1	14	1	-
Category 5th	16	-	10	5	1
Category 6th	15	-	6	8	2
Category 7th	16	13	3	-	-
Category 8th	12	12	-	-	-
Category 9th	10	8	2	-	-
Category 10th	12	12	-	-	-

Source: Primary Data, 2015.

In table 6 the different categories wise waste disposal frequency in Jabalpur city are shown. Category 1st waste is generated in five hospitals, four hospitals are disposing daily waste therefore one hospital is disposed waste at once in 2-3 days. Never hospital generates category 2nd waste. Category 3rd waste is producing three hospitals, two hospitals are daily disposed and one hospital is disposed waste once in 2-3 days. Category 4th waste produce all hospitals, fourteen hospitals disposed waste once in 2-3 days , one hospital daily and another one hospital is disposed waste once in weekend. Category 5th and 6th waste disposed once in 2-3 days in 14 and 10 hospitals. Category 7th waste is daily disposed by thirteen hospitals. Twelve hospitals are daily disposed 8th and 10th categories hospital waste. 9th category waste daily dispose eight hospitals and 2 hospitals dispose once in 2-3 days.

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Disposal Practice of Hospital waste in Jabalpur City

The biomedical waste has been grossly neglected in Jabalpur City. Large number of hospitals, nursing homes, health care centers has been identified by the Madhya Pradesh State Pollution Control Board in Jabalpur. Any measure for the safe disposal of the biomedical wastes has been adopted. The biomedical wastes get mixed up with the municipal solid waste and deposited at the common disposal site. Only few incinerators have been installed in Jabalpur. These institutions are located in Netaji Subhash Chandra Bosh Medical College, Jabalpur and Victoria Hospital. But often they are not managed and maintained properly and none of them is having the specifications. Most of the hospitals in the city are not having adequate facilities for the safe disposal of the biomedical waste. Wastes are either dumped in open space behind the hospital and occasionally burnt causing severe air pollution and land pollution. The contaminated syringes and needles are dumped along with other wastes, which are being collected by scavengers and illegally returned to the hospitals. The body parts often dumped along with the wastes is seen carried by birds and animals. The hospital authorities and staff are not fully aware of the seriousness of the problem created by the unscientific way of disposal of these wastes and hence give only very little attention to the disposal of these wastes.

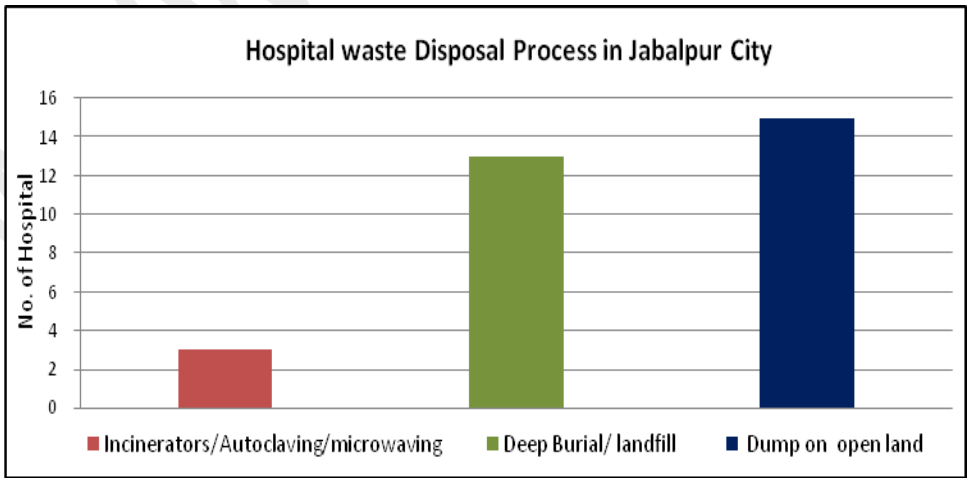
Table 7

Hospital waste Disposal Process in Jabalpur City

S.No.	Hospital waste Disposal Process	No. of Hospital
1.	Incinerators/Autoclaving/microwaving	3
2.	Deep Burial/ landfill	13
4.	Dump on open land	15

Source: Primary, 2015.

Figure 5



Source: Primary, 2015.

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Above table and Figure show hospital waste disposal process in Jabalpur City. Only three hospitals have incinerator for disposal to some part of their hospital waste. Thirteen hospitals dispose their hospital waste in deep Burial/ Landfill. Fifteen hospitals dump some part of their waste on open land. Presumably it can be said that maximum part of hospital waste in Jabalpur city is dumped on open land. Which is very much hazardous for environment.

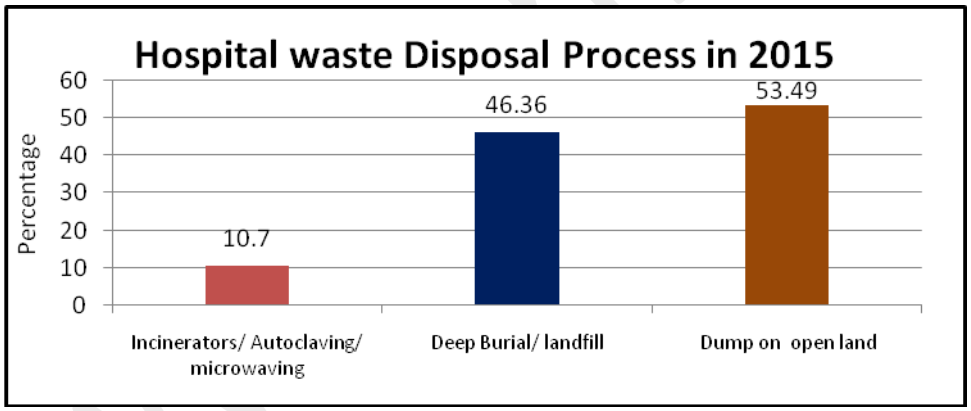
Table 8

Hospital waste Disposal Process in 2015

S.N.	Waste	Waste generated in the year 2015 (in Tons)	Percentage
1	**Hospital waste Generate (2015)**	**2135.25**	**100.00**
2	**Disposal**		
I	Incinerators/Autoclaving/microwaving	228.45	10.70
ii	Deep Burial/ landfill	989.95	46.36
iii	Dump on open land	1142.25	53.49

Source: Primary, 2015.

Figure 6



Source: Primary, 2015.

This table shows Hospital waste Disposal process in 2015. Jabalpur City generates total 2135.25 tons Hospital waste per year. There are three types method applies for waste disposal – (i) Incinerators/Autoclaving/microwaving, (ii) Deep Burial/ landfill and (iii) Dump on open land. 228.45 tons hospital waste is disposed through Incinerators/Autoclaving/microwaving, 989.95 tons hospital waste disposed in deep burial/ landfill and 1142.25 tons hospital waste dumped on open land Space. This figure shows percentage of hospital waste disposal process in Jabalpur City. 53.49 % hospital waste dump on open land in Jabalpur City. Category iii dump on open land is a maximum quantity of hospital waste disposal in Jabalpur City.

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CONCLUSION

Hospital and health care establishment generate total 5.85 ton per day solid waste. Plastic waste covers 32% of total hospital waste. Maximum numbers of indoor patients are admitted in Government hospital. Government hospitals have a maximum OPD and Beds occupancy. There are maximum 725 beds occupancy is found per day in Medical College. There are two type of hospital waste found in Jabalpur city like Non-hazardous and hazardous waste. Elgin hospital generates total 1.87 kg per bed per day, there were 78.57 percent of non-hazardous and 21.43 percents hazardous waste. There are Average 62.32 percent general waste and average approximate 14 percent waste reusable in non-hazardous waste. GCF hospital generates maximum 78.24 percent general waste. Average 14.26 percent clinical and 9.51 percent sharp waste is generating in Jabalpur city. Maximum 18.13 percent clinical waste is generated by Netaji Subhash Chandra Bose medical college. Large numbers of hospitals, nursing homes, health care centers do not take any measure for the safe disposal of the biomedical wastes. The biomedical wastes get mixed up with the municipal solid waste and deposited at the common disposal site. Presumably we can say that maximum part of hospital waste is disposed in landfill/deep burial and open space. This City generates total 2135.25 tons Hospital waste per year and 53.49 % hospital waste dump on open land.

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