

An Overview of the Biomedical Waste Generation on Per Bed Basis in Some Hospitals of Punjab State of India

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ABSTRACT

Introduction: The biomedical waste management is an important issue and it also a challenging one. The present study was designed to assess the quantum of biomedical waste generated for some hospitals in Punjab. The study also intends to seek possible explanations for the different values obtained for different institutes.

Materials and methods: Ten hospitals with a bed capacity of 200 or more were selected for the study. The biomedical waste generated from these institutions for the months of September, October, and November 2018 was scrutinized. The biomedical waste generated per bed (assuming 100% bed occupancy and actual bed occupancy) was determined. The results were sent to the administrative officers of these institutes and possible explanations sought for the similarity/difference amongst institutes.

Results: From the results, it is evident that hospitals with larger bed strength are not necessarily generating more biomedical waste per bed. Rather, a careful observational analysis reveals that private institutes in general are generating more biomedical waste per bed occupied *vis-a-vis* the government institutes. This could in part be attributable to more disposables being used in these institutions and good practices of biomedical waste management followed in these institutes. The extent of biomedical waste generated by an institute also depends upon the number and type of patients admitted in departments. It is also influenced by the bed strength allocated to different departments. Still, the institutes with lesser biomedical waste generation should ensure that biomedical waste practices are strictly being followed and the record keeping is referable and meticulous.

Conclusion: The quantity of biomedical waste is increasing in its amount and type due to advances in scientific knowledge and this has an impact on human lives. So, it is imperative that efforts are continuously made in the right direction so that biomedical waste disposal goals are achieved to highest possible pinnacle.

Keywords: Bed occupancy, Biomedical waste generated, Biomedical waste practices.

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INTRODUCTION

Biomedical waste is defined as 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 manufacturing or scrutinization of biological materials.¹ The biomedical waste management is an important issue and it also a challenging one.^{2,3} The awareness regarding biomedical waste management is continuously increasing amongst health personnel and due credit should be given to the continuous efforts being undertaken by the Punjab Pollution Control Board.

There are around 8,126 healthcare facilities (HCFs) which have made agreement with the common biomedical waste treatment facilities (CBWTFs) of the state. The bed capacity of these 8,126 HCFs is around 70,000 beds. Out of these 8,126 HCFs, 6,857 HCFs have bed capacity less than equal to 10 beds and 8 HCFs are having medical college facility. To understand the trends of any system put in place, it is very important to have normative data with which future and past comparisons can be made to have. These trends allow assessment of the scenario and pave way for guidelines to be formulated which could accentuate achieving of the desired outcome.

An overview of the literature indicates that the average hospital waste generated per bed per day in developing nations should be 1–2 kg.⁴ The present study was designed to assess the values for the state of Punjab. The study also intended to seek possible explanations for the different values if any obtained from different institutes.

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MATERIALS AND METHODS

The present study was conducted in medical hospitals in Punjab. Ten hospitals with a bed capacity of 200 or more were selected for the study. The biomedical waste generated from these institutions for the months of September, October, and November 2018 was scrutinized. The data were obtained from the records submitted by the institutions to Punjab Pollution Control Board. Hence, Ethical Approval from the Institutional Ethical Committee was not required for this study.

The biomedical waste generated per bed (assuming 100% bed occupancy) per day was determined for each of these institutes. To eliminate bias of variable occupancy rates in these

institutes, a reality check was done to ascertain actual waste generated per bed occupied in these institutes. The results were sent to some of the administrative officers of these institutes and possible explanations sought for the similarity/difference amongst institutes.

RESULTS

Tables 1 and 2 demarcate the biomedical waste values in big and small set-ups. However, the data presented in these tables have restricted value due to the fact that it does not take into account the actual bed occupancy in these institutes for the period. A clearer picture emerges when we consider the actual bed occupancies

and consider the biomedical waste generated per bed occupied in institutes.

From Table 3, it emerges that it is not necessary that hospitals with larger bed strength will account for more biomedical waste generated per bed. Rather, a careful observational analysis of Tables 1 to 3 reveals that private institutes in general are generating more biomedical waste per bed occupied *vis-a-vis* the government institutes. This could in part be attributable to more disposables being used in these institutions but still there are aspects in biomedical waste generated per bed occupied which cannot be explained on use of disposables alone. So, an opinion was sought from the administrators in these institutes regarding the variability in data obtained from different institutions.

Table 1: Biomedical waste generated per bed (assuming 100% bed occupancy) per day by hospitals with bed strength more than 400 in Punjab during a 3-months period

Hospital (bed capacity)	Month	Blue*	Red*	Yellow*	White*	Others*	Total in kg/bed/day
DMCH, Ludhiana (1625)	September	8316.36	19816.09	22992.93	239.89	0	1.054
	October	8316.36	19816.09	22992.93	239.89	0	0.997
	November	8316.36	19816.09	22992.93	239.89	0	1.102
RH Patiala (1287)	September	1000.01	904.21	1434.52	37.59	0	0.09
	October	1056.14	1158.74	1606.71	42.13	0	0.10
	November	857.25	954.71	1445.42	48.43	0	0.09
GNDH, Amritsar (951)	September	1222.64	796.88	1550.09	22.97	0	0.13
	October	743.02	1012.02	1045.67	17.36	0	0.10
	November	595.43	713.38	891.91	17.81	2.04	0.08
CMCH, Ludhiana (700)	September	1425.97	3563.01	2864.43	26.68	157.49	0.38
	October	1885.01	3749.13	2967.2	51.18	101.25	0.40
	November	1851.22	3639.53	2777.82	40.39	72.69	0.40
CH, Jalandhar (470)	September	840.1	488.9	1007.86	95.12	0	0.17
	October	571.07	468	1035.45	81.94	0	0.15
	November	609.73	514.28	609.73	73.42	0	0.15

*Per month values in kg

Table 2: Biomedical waste generated per bed (assuming 100% bed occupancy) per day by hospitals with bed strength less than 400 in Punjab during a 3-months period

Hospital (bed capacity)	Month	Blue*	Red*	Yellow*	White*	Others	Total in kg/bed/day
Fortis Hospital, Mohali (350)	September	1963.2	8724.3	5562.11	438.17	196.23	1.61
	October	2361.81	11232.47	7102.95	411	204.39	1.96
	November	2072.8	9244.27	6018.685	370.64	184.2	1.70
SGL Jalandhar (350)	November	472.75	995.02	870.14	35.02	156.23	0.33
	September	723.31	1288.3	1458.17	29.81	0	0.34
	October	844.44	1305.69	1483.97	42.22	0	0.32
Civil Hospital, Ludhiana (250)	September	298.26	377.94	1063.82	33.07	0	0.24
	October	284.77	363.11	1194.07	33.75	0	0.24
	November	266.37	333.26	1093.05	20.91	0	0.23
M K Hospital Patiala (250)	September	124.37	293.22	1132.73	13.02	0	0.21
	October	102.19	246.66	925.53	11.75	0	0.17
	November	105.18	217.02	940.07	12.61	0	0.55
Fortis Hospital, Ludhiana (200)	September	343.95	953.88	752.4	30.11	178.78	0.38
	October	434.51	992.08	770.45	36.07	183.6	0.39
	November	472.75	995.02	870.14	35.02	156.23	0.42

*Per month values in kg

Table 3: Biomedical waste generated per day by hospitals in Punjab taking the actual bed occupancy into consideration during a 3-months period

Hospital	Month	Total in kg/day	Total in kg/bed/day (as per actual bed capacity)
DMCH, Ludhiana	September	1712.18	1.490
	October	1620.12	1.316
	November	1789.94	1.567
CMCH, Ludhiana	September	267.92	0.88
	October	282.38	0.86
	November	279.39	0.88
Fortis Hospital, Mohali	September	562.80	2.28
	October	687.50	2.62
	November	596.36	2.50
Fortis Hospital, Ludhiana	September	75.30	0.80
	October	78.11	0.75
	November	84.31	0.86
SGL, Jalandhar	September	116.65	0.66
	October	118.59	0.54
	November	112.14	0.55
Guru Nanak Dev Hospital, Amritsar	September	119.75	0.17
	October	90.91	0.13
	November	74.02	0.12
Rajindra Hospital, Patiala	September	112.54	0.10
	October	124.64	0.11
	November	110.19	0.10
Civil Hospital, Jalandhar	September	81.07	0.13
	October	69.56	0.11
	November	72.76	0.14
Civil Hospital, Ludhiana	September	59.10	0.25
	October	60.51	0.25
	November	57.12	0.24
Mata Kaushaliya, Patiala	September	52.11	0.23
	October	41.49	0.19
	November	137.48	0.79

From the assertions made out by some administrators, the following features can be ascertained regarding variability of biomedical waste generated per bed in different institutes.

- The extent of biomedical waste generated depends upon the number and type of patients admitted in departments. It also depends upon the bed strength allocated to different departments. It is expected that more biomedical waste would be generated from gynecology department compared to psychiatry department. Also, naturally there would be seasonal variation in the amount of biomedical waste generated in these institutes so instead of a 3-months analysis an annual analysis and estimate is expected to give a more comprehensive picture. Furthermore, it will be interesting to note if the same trend/result (biomedical waste more for private *vis-a-vis* government institutions) is seen for other states.
- The number of super speciality wards viz. cardiac, dialysis, and plastic surgery is more in private institutes because of availability

of super speciality doctors there. Super speciality doctors are virtually not there in government institutions.

- The possibility of pilferage, though remote cannot be ruled out. The managements of hospitals as well as agencies lifting the waste should be told in writing to maintain the strictest practices and referable records to prevent any possible pilferage.
- What ideally should be the amount of biomedical waste generated by an institute per bed the authors believe is not mentioned anywhere, and neither it should be advocated. What more important is that whatever the quantity of biomedical waste, there should be total segregation and disposal of the same as per rules.
- The hospitals with higher biomedical waste generated are NABH accredited. Due credit goes to them for biomedical waste management practices and other institutions should get inspired from them. There should be an in-house analysis to determine whether there is a lacuna in biomedical waste management practices or is there a problem with meticulous record keeping? The answers must be sought and it is imperative that efforts are made in the right direction so that biomedical waste disposal goals are achieved to highest possible pinnacle.

DMCH-Dayanand Medical College and Hospital; RH-Rajindra Hospital; GNDH-Guru Nanak Dev Hospital; CMCH-Christian Medical College and Hospital; CH-Civil Hospital.

SGL Hospital-Swami Gurbachan Lal Hospital; MK Hospital-Mata Kaushalya Hospital.

DISCUSSION

Proper management of biomedical waste generated in an HCF is one of the most important functions of a healthcare worker as its improper management poses risk to humanity and our ecosystem. Additionally, improper management could lead to initiation of legal proceedings against employees and administrative authorities of the hospital.⁵ Proper handling, treatment, and disposal of biomedical wastes are important elements of healthcare office infection control programme.⁶

The magnitude of biomedical waste generated per day per bed essentially depends upon variable factors like types of patients attending the health institution, the facilities provided for patient care, and of course the standards of biomedical waste management.⁷ It essentially fluctuates from 1 kg to 2 kg in developing countries like India up to 4.5 kg in more advanced countries like the United States of America.^{8,9} It has been observed that in developed countries, due to the advent of increased use of disposables, the waste generated is up to 5.24 kg per bed per day.

10% to 15% of the waste is infectious in developed countries.⁹ From Tables 1 to 3, it is evident that for Fortis Hospital, Mohali, the biomedical waste generated is the maximum. This can be attributed to increased use of biomedical disposables in more advanced institutes leading to a higher quantum of generated biomedical waste.¹⁰

A review of the literature by the authors reveals that in most medical hospitals the hospital waste generated in India is around 1–2 kg per bed per day. The quantum of waste generated in district hospital Kargil is 2.0 kg per bed per day. This is identical to studies conducted by various workers who have assessed the average quantity of hospital waste produced in India ranges from 1.5 to 2.2 kg per bed per day. Also a study conducted at AIIMS, New Delhi

(a tertiary care hospital), in 1988 revealed the quantum of waste generated as 2.2 kg per patient per day.^{11,12}

The hazardous nature of biomedical waste is due to its cytotoxic, chemical, infectious, and injurious properties.¹³ Biomedical waste is definitely a harmful hazard because it has the prerequisites which can spread infection both nosocomially within healthcare settings as well as to persons working outside HCFs, like waste handlers, scavenging staff, and also to the general public. It has been reported that 60% of all hospital staff sustain injuries from sharps during various procedures in various institutions providing much needed patient care.¹⁴

Medical care is vital for our life, health, and well-being. However, the waste generated from medical activities can be hazardous, toxic, and even lethal because of their high potential of diseases transmission. With the course of time, the waste is increasing in its amount and type due to advances in scientific knowledge and has an impact on human lives.^{15,16} So, it is imperative that efforts are continuously made in the right direction so that biomedical waste disposal goals are achieved to highest possible pinnacle.

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