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Generation and Management of Biomedical Waste in Police Hospital Jammu (J&K)

KEYWORDS: Biomedical waste , infectious and non-infectious waste

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ABSTRACT *In present study attempt has been made to assess biomedical waste generation and management in Police Hospital Jammu. The study was carried out for 21 days which included four Mondays, four Tuesdays, four Wednesday, three Thursdays, three Fridays and three Saturdays. As a whole percentage of total average infectious and non-infectious waste per day was observed to be 44% and 56%, respectively*

INTRODUCTION

'Bio-medical waste' means any waste generated during diagnosis, treatment or immunization of human beings or animals. Management of healthcare waste is an integral part of infection control and hygiene programs in healthcare settings. These settings are a major contributor to community-acquired infection, as they produce large amounts of biomedical waste. Biomedical waste can be categorized based on the risk of causing injury and/or infection during handling and disposal. Wastes targeted for precautions during handling and disposal include sharps (needles or scalpel blades), pathological wastes (anatomical body parts, microbiology cultures and blood samples) and infectious wastes (items contaminated with body fluids and discharges such as dressing, catheters and I.V. lines). Other wastes generated in healthcare settings include radioactive wastes, mercury containing instruments and polyvinyl chloride (PVC) plastics which are among the most environmentally sensitive by-products of healthcare (Askarian et al., 2004).

WHO stated that 85% of hospital wastes actually happened to be non-hazardous, around 10% infectious and around 5% non-infectious but hazardous wastes? In the USA, about 15% of hospital waste is regulated as infectious waste. In India this could range from 15% to 35% depending on the total amount of waste generated (Glenn & Garwal, 1999; Anonymous, 1998; Chitnis et al., 2005)

The Biomedical Waste (Management and Handling) Rule, 1998, drafted by the Ministry of Environment and Forest, Government of India came into enforcement in July 28, 1998. This rule encompasses all who are involved in any step of biomedical waste generation and handling.

The improper management in bio-medical waste causes stern environmental problems related to air, water and land pollution. The pollutants that cause damage can be classified into biological, chemical and radioactive. There are several legislations and guidelines in India concerning environmental problems. The effects of pollution on air, radio activities, land, health and hazards have been studied (Sadhu and Singh 2003).

Daschner and Dettenkofer (1997) suggested that sustainable development within hospitals need to maintain a balance between effective infection control and a good ecological environment. Kishore et al. (1999) reported that improper handling and collection of hospital waste lead to spread of infection in human health care workers and they stressed upon proper segregation, handling and disposal. Basu (1998) highlighted the adverse effects of pollutants released during incineration of medical or hospital waste. Rampal et al.(2002)while studying generation and disposal of hospital waste of Jammu city stressed need for mass awareness campaign regarding hospital waste to overcome lack of civic sense among people. Simran and Ivan (1995) discussed various incineration methods of hospital waste management in India and reported that improper handling and collection of hospital waste lead to spread of infection in human care workers and stressed upon proper segregation, handling and disposal. Sumi(2010) revealed that in Delhi only 46% were aware of existence of legislations for Biomedical waste management. Mahmood et al.(2011) observed that the segregation and colour coding of Biomedical waste were 100% in one private and one pubic hospital at Lahore.

In present study attempt has been made to assess generation and management of biomedical waste in Police Hospital Jammu.

Material and Methods

The study of biomedical waste of Police Hospital, Jammu was done for 21 days which included four Mondays, four Tuesdays, four Wednesday, three Thursdays, three Fridays and three Saturdays. During each sampling waste generated during 24 hours in different blocks of hospital: ENT, Paediatrics, X-ray, Medicine, Surgery, Wards etc is segregated into Infectious and Non-infectious waste. After segregation each type of waste was weighed separately to assess qualitative and quantitative composition and all the data was compiled to represent the average values.

OBSERVATION AND DISCUSSION : (Table I)

Qualitative analysis of biomedical waste: The bio-medical waste generated in the hospital was observed to be infectious and non-infectious waste. Infectious waste was observed to consist of waste sharps which included syringes, glass slides and injection vials, Soiled waste consisted of cotton, bandages and plaster casts whereas solid waste included drip sets. Non-infectious waste included paper, other wrappers, bottles (water bottles, glucose bottles and juice bottles) and food residue.

Quantitative analysis of biomedical waste: The average

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Infectious waste per day generated on Monday was observed to be 3039±774.54 gm (comprising syringes = 213.75 ±24.95 gm, glass slides = 49.75 ±3.68 gm, injection vials = 39.25 ±7.88 gm, cotton = 1175 ±206.15 gm, bandages = 26.75 ±6.99 gm, plaster casts = 1500 ±1779.51 gm, drip-sets = 34.5 ±3.31 gm)On Tuesday average Infectious waste per day waste was observed to be 2720.75±1504.01 gm (comprising syringes =231.25 ±39.23 gm, glass slides = 48.75 ±6.99 gm, injection vials =40.5 ±8.42 gm, cotton = 1087.5±278.01 gm, bandages = 28.25 ±10.27 gm, plaster casts = 1250 ±1443.37 gm, drip-sets = 34.5 ±3.69 gm)

On Wednesday average Infectious waste per day waste was observed to be 3120 ±1787.12 gm, (comprising syringes =220.75 ±21.18 gm, glass slides = 48 ±7.65 gm, injection vials = 36.75 ±3.40 gm, cotton = 1300 ±294.39 gm, bandages = 29 ±4.96 gm, plaster casts = 1450 ±1900 gm, drip-sets = 35.5 ±0.5 gm)Average per day waste on Thursday was 1268.34±468.71 gm (comprising syringes =205.67 ±72.56 gm, glass slides = 36.34 ±22.94 gm, injection vials = 37 ±13.52 gm, cotton = 933.33±404.14 gm, bandages = 25 ±15 gm, plaster casts = 0 ±0 gm, drip-sets = 31 ±0.5 gm)

Average Infectious waste per day waste on Friday was observed to be 3649.35 ±1959.86 gm (comprising Syringes =210.34 ±0.57 gm, glass slides = 43.67 ±7.57 gm, injection vials = 35.67 ±1.15 gm, cotton = 1200 ±200 gm, bandages = 25.67 ±10.69 gm, plaster casts = 2100 ±1900 gm, drip-sets = 34.34 ±3.78 gm).On Saturday average per day waste was 2501±216.40 gm (comprising Syringes = 200 ±10 gm, glass slides = 43 ±8.18 gm, injection vials = 32.34 ±2.51 gm, cotton = 1166.66 ±57.73 gm, bandages = 25 ±9.53 gm, plaster casts = 1000 ±1732.05gm, drip-sets = 34 ±1 gm)

Table 1 : Average biomedical waste per day in study area

Type of waste	Average Solid Waste (g/day) on						Average/ day (g/day)
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Infectious Wastes							
Waste sharps							
Syringes	213.75±24.95	231.25±9.23	220.75±21.18	205.67±72.56	210.34±0.57	200±10	213.51±11.34
Glass slides	49.75±3.68	48.75±6.99	48±7.65	36.34±22.94	43.67±7.57	43±8.18	44.91±5.02
Injection vials	39.25±7.88	40.5±8.42	36.75±3.40	37±13.52	35.67±1.15	32.34±2.51	36.91±2.85
Soiled Waste							
Cotton	1175±206.15	1087.5±278.01	1300±294.39	933.33±404.14	1200±200	1166.66±57.73	1143.74±23.70
Bandages	26.75±6.99	28.25±10.27	29±4.96	25±15	25.67±10.69	25±9.53	26.61±1.70
plaster casts	1500±1779.51	1250±1443.37	1450±1900	0±0	2100±1900	1000±1732.05	1216.67±86.04
Solid waste							
Drip sets	34.5±3.31	34.5±3.69	35.5±0.5	31±0.55	34.34±3.78	34±1	33.91±1.34
Total	**3039±774.54**	**2720.75±1504.01**	**3120±1787.12**	**1268.34±468.71**	**3649.35 ±1959.86**	**2501±216.40**	**2716.40±810.01**
Non-Infectious waste							
Paper	600±115.47	662.5±8.84	725±165.83	526.67±290.91	683.34±70.72	533.34±57.73	621.80±81.78
Other wrappers	82±2.44	85±0	80.5±4.43	70±26.45	79.34±1.15	76.67±2.8	78.91±5.17
Bottles							
Water bottle	208.75±0.29	202.5±9.57	196.25±10.30	189.34±5.70	196±5.77	200±5	198.80±6.60
Glucose bottle	260±14.14	245±19.14	250±21.60	243.34±40.41	213.34±1.54	216.67±20.81	236.55±18.8
Juice bottles	101.25±13.14	100±4.08	99.5±4.20	82.67±30.35	99.34±2.30	102.34±7.50	97.51±7.36
Food residue	2950±100	2850±100	2150±1247.66	2533.34±896.28	3166.67±115.47	3100±200	2791.66±85.39
Total	**4202±197.17**	**4145±153.46**	**3501.25±102.02**	**3636.36±1242.46**	**4438 ±244.42**	**4229.02±226.19**	**4025.27±369.67**
Grand Total	7234	6959.25	7296.25	4913.7	8006.04	6726.69	6721.65

Among waste sharps, maximum waste of syringes (231.25 gm) and that of injection vials (40.5gm) were observed to be generated on Tuesday and minimum waste of syringes (200 gm) and that of injection vials (32.34 gm) on Saturday . Glass slides used were highest on Tuesday (48.75 gm) as no. of tests performed in laboratory was more on Tuesday, whereas least on Thursday (36.34 gm). Among the soiled waste cotton waste generation was observed to be more on Wednesday (1300gm) and least on Thursday (933.33 gm), bandages were observed to be highest on Wednesday (29 gm) followed by 25 gm on Thursday and Saturday whereas plaster casts were observed to be highest (2100 gm) on Friday and absent on Thursday. Solid waste consisted of drip sets, which were highest on Wednesday (35.5 gm) and least on Thursday (31 gm).

The average per day Non-infectious waste generated on Monday was 4202±197.17 gm (comprising paper = 600 ±115.47 gm, other wrappers = 82±2.44 gm, water bottles = 208.75 ±6.29 gm, glucose bottles = 260±14.14 gm, juice bottles = 101.25±13.14 gm, food residue = 2950 ±10 gm).On Tuesday average per day waste was observed to be 4145±153.46 gm (comprising paper = 662.5 ±188.74 gm, other wrappers = 85±0 gm, water bottles=202.5±9.57 gm, glucose bottles=245 ±19.14 gm, juice bottles=100 ±4.08 gm,food residue=2850 ±100 gm).

On Wednesday average per day waste was observed to be 3501.25±102.02 gm (comprising paper = 725 ±165.83 gm, other wrappers = 80.5 ±4.43 gm, water bottles = 196.25 ±10.30 gm, glucose bottles = 250 ±21.60 gm, juice bottles = 99.5 ±4.20 gm, food residue = 2150±1247.66 gm). Average per day waste on Thursday was 3636.36±1242.46 gm (comprising paper = 526.67±290.91 gm, other wrappers = 70 ±26.45 gm, water bottles = 189.34 ±35.79 gm, glucose bottles = 243.34 ±40.41 gm, juice bottles = 82.67 ±30.35 gm, food residue=2533.34±896.28 gm).

On Friday average per day waste was observed to be 4438 ±244.42 gm (comprising paper = 683.34±160.72 gm, other wrappers = 79.34 ±11.54 gm, water bottles = 196±5.77 gm, glucose bottles = 213.34±11.54 gm, juice bottles = 99.34±2.30 gm, food residue = 3166.67±115.47 gm) Average per day waste on Saturday was observed to be 4229.02±226.19 gm (paper=533.34±57.73 gm, other wrappers=76.67±2.8 gm, water bottles=200 ±5 gm, glucose bottles=216.67 ±20.81 gm, juice bottles=102.34±7.50 gm, food residue=3100 ±200 gm). Among the non-infectious waste generated during these days, paper waste generation was observed to be highest on Wednesday (725gm) and least on Thursday (526.67 gm), other wrappers shows highest average on Tuesday (85gm) and lowest on Thursday (70 gm). In bottles, water bottles shows highest on Monday (208.75gm) and lowest

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on Thursdays (189.34 gm) whereas glucose bottles were highest on Monday (260gm) and least on Saturday (216.67 gm), juice bottles were observed highest and lowest on Monday (102. 5gm) and Thursday (82.67 gm), respectively. The highest and lowest food residue was observed on Saturday (3100gm) and Thursday (2533.34gm), respectively.

The percentage of infectious and non infectious waste generated was observed to range from 26% - 46% and 54%- 74% respectively i.e. Monday infectious waste was 41% and non-infectious waste was 59%, whereas on Tuesday infectious waste was 40% and non-infectious waste was 60%, on Wednesday infectious waste and non-infectious waste was 43% and 57%, respectively. Infectious wasteand non-infectious on Thursday was 26% waste was 74% whereas on Friday infectious waste was 46% and non-infectious waste was 54% and on Saturday infectious waste and non-infectious waste was 42% and 58%, respectively. Overall compilation of data revealed that on an average (6.742 kg/day) of biomedical waste comprising (2.717 kg) infectious and (4.026 kg) non-infectious waste was used to be generated in study area, on this rate average biomedical waste per week is calculated to be 47.194 kg, per month is calculated to be 202.26 kg and per year 2427.12kg.

As a whole percentage of total average infectious and non-infectious waste was 44% and 56%, respectively. Some of the medical waste from the hospital is incinerated and rest is sent to CRPF Hospital Bantalab, after that they treat the waste. Becher et al.(2002) revealed that medical waste poses high risk to doctors, nurses, technicians, sweepers, hospital visitors and patients

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