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Assessment of bio-medical waste management in three apex Government hospitals of Agra

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Abstract: *Waste management practices in three apex government hospitals of Agra viz., Sarojini Naidu Medical College, Lady Lyall Maternity Hospital and District Hospital were studied during January, 2004-January, 2005. Data were collected with the help of (i) personal observations of the waste treatment and disposal practices and (ii) assessment of knowledge, attitude and practices of working personnel with the help of questionnaires. The results obtained indicated lack of knowledge and awareness regarding legislations on bio-medical waste management even among qualified hospital personnel. None of these hospitals were equipped with higher technological options e.g. incinerator, autoclave, microwave and had no facilities to treat the liquid waste generated inside the hospital. It is concluded that generation and implementation of a waste management policy, institutional/organizational set up, training and motivation must be given paramount importance to meet the current needs and standards of bio-medical waste management in these hospitals.*

Key words: *Biomedical waste, Incinerator, Autoclave, Microwave*
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Introduction

In pursuing their aims of reducing health problems and eliminating potential risks to people's health, health care services inexorably create enormous amount of biomedical waste, which creates a high potential for infection and injury. Inadequate and inappropriate treatment of this waste may have serious public health consequences and a noteworthy brunt on environment.

Health care workers have an important opportunity to manage the environmental effects of their practice (McVeigh, 1993; Nandalal and Somashekar, 2007). To ensure that medical waste is handled and treated in most cost effective manner and with least health risk to employee and the community, hospital administrator must carry out a comprehensive appraisal of the activities associated with generation, handling and disposal processes (Studnicki, 1992). The management of biomedical waste has become a worldwide humanitarian topic today. Although hazards of poor management of biomedical waste have aroused the concern world over, especially in the light of its far-reaching effects on human, health and the environment. In India many health care services are not giving adequate thought to the proper treatment and disposal of waste. This presents occupational risks to those who generate and are exposed to it, but all the citizens at large.

On an average, most health care facilities are doing petite than they should have in the areas of biomedical waste management. Previous research on bio-medical waste management reported inadequate handling, treatment and disposal of biomedical waste at many health care facilities (Sharma *et al.*, 1993; Gould, 1994; Weltman *et al.*, 1995; Gould *et al.*, 1996; Cisse *et al.*, 2000; Greco *et al.*, 2000; Richard *et al.*, 2001; Hatcher, 2002; Abdul *et al.*, 2003). In the present study, the existing system of biomedical waste management in three apex Government hospitals of Agra *i.e.* Sarojini Naidu Medical College, Lady Lyall Maternity Hospital and District Hospital have been undertaken.

Materials and Methods

During present study an amalgamation of two procedures was used for collecting the data. They are (i) Personal observations of the waste treatment and disposal practices (Henry *et al.*, 1994; Llorente *et al.*, 1997; Chauhan and Malviya, 2002) and (ii) Assessment of knowledge, attitude and practices of working personnel with the help of questionnaires (Linde, 1993; Sharma *et al.*, 1993; Al-Zahrani *et al.*, 2000; Cisse *et al.*, 2000; Dilly and Shanklin, 2000; Kishore *et al.*, 2000). A questionnaire was prepared that included questions regarding number of inpatients/day, outpatients/day, number of beds (total), awareness about biomedical waste (management and handling) rules, 1998, categories of biomedical waste produced and estimated quantity (kg/day), waste segregation, collection, labeling, transport and disposal, financial and personal resources. The views and suggestions of working personnel over existing conditions/methods of biomedical waste management in the hospitals were also recorded. The information obtained was later confirmed by means of direct observations. These data were collected during January, 2004-January, 2005 with a response rate of 46.37%.

Results and Discussion

The data in the present study were collected with the help of questionnaires that were formatted to understand the acquaintance, attitude and practices of employees involved in direct patient care regarding bio-medical waste management methods and by personal observations of the waste management practices. The methodology of the data collection was in harmony with the studies performed by Cisse *et al.* (2000) in regional hospitals of Senegal. At Sarojini Naidu

Table - 1: Total number of staff and number of persons responded to questionnaires at Sarojini Naidu Medical College, Lady Lyall Maternity Hospital and District Hospital

Sr. No.	Designation	SNMC, Agra			LLMH, Agra			DH, Agra		
		In position	Resp. No.	%	In position	Resp. No.	%	In position	Resp. No.	%
1	Doctor (Specialist)	86	45	52.33	38	18	47.37	40	25	62.50
2	Doctor (Resident)	292	100	34.25	-	-	-	-	-	-
3	GDMO	18	9	50.00	8	3	-	11	6	54.55
4	Nurse	137	53	38.69	55	30	54.55	21	10	47.62
5	Technician	53	29	54.72	2	2	100.00	4	2	50.00
6	Pharmacist	17	12	70.59	12	5	41.67	11	5	45.45
7	Ward boy	81	31	38.27	5	4	80.00	16	9	56.25
8	Peon	41	25	60.98	3	1	33.33	2	1	50.00
9	Aaya	24	16	66.67	25	10	40.00	3	2	66.67
10	Sweeper	110	54	49.09	24	10	41.67	11	6	54.55
11	Clerk and other staff	34	29	85.29	7	3	42.86	36	14	38.89
	Total	**893**	**403**	**45.13**	**179**	**86**	**48.04**	**155**	**80**	**51.61**

SNMC = Sarojini Naidu Medical College, LLMH = Lady Lyall Maternity Hospital, DH = District Hospital

Table - 2: Awareness regarding bio-medical waste (Management and Handling) rules, 1998 among the staff at Sarojini Naidu Medical College, Lady Lyall Maternity Hospital and District Hospital

Sr. No.	Designation	SNMC, Agra			LLMH, Agra			DH, Agra		
		In position	Resp. No.	%	In position	Resp. No.	%	In position	Resp. No.	%
1	Doctor (Specialist)	45	35	77.78	18	15	83.33	25	16	64.00
2	Doctor (Resident)	100	55	55.00	-	-	-	-	-	-
3	GDMO	9	5	55.56	3	2	66.67	6	2	33.33
4	Nurse	53	15	28.30	30	18	60.00	10	4	40.00
5	Technician	29	5	17.24	2	1	50.00	2	1	50.00
6	Pharmacist	12	2	16.67	5	1	20.00	5	1	20.00
7	Ward boy	31	0	0.00	4	2	50.00	9	0	0.00
8	Peon	25	0	0.00	1	0	0.00	1	0	0.00
9	Aaya	16	0	0.00	10	0	0.00	2	0	0.00
10	Sweeper	54	0	0.00	10	4	40.00	6	0	0.00
11	Clerk and other staff	29	2	6.90	3	1	33.33	14	2	14.29
	Total	**403**	**119**	**29.53**	**86**	**44**	**51.16**	**80**	**26**	**32.50**

SNMC= Sarojini Naidu Medical College, LLMH = Lady Lyall Maternity Hospital, DH = District Hospital

Medical College, Agra, total number of persons in position was 893, of which 403 (45.13%) responded to the questionnaire. At Lady Lyall Maternity Hospital, Agra, the total manpower in position was 179, of which 86 (48.04%) responded to the questionnaire. At District Hospital, Agra total staff in position was 155, out of which 80 (51.61%) responded to the questionnaire (Table 1).

A total of 569 (46.37%) persons responded to the questionnaire, of which 119 (29.53%) persons in Sarojini Naidu Medical College Agra, 44 (51.16%) persons in Lady Lyall Maternity Hospital Agra and 26 (32.50%) persons in District Hospital, Agra were aware of the bio-medical waste (Management and Handling) rules, 1998 (Table 2). Kishore *et al.* (2000), had tried to assess the knowledge and practices of bio-medical waste management and infection control among dentists of a teaching hospital and reported lack of awareness on bio-medical waste (Management and Handling) rules, 1998.

Out of total 54 waste handlers, which responded to the questionnaire at Sarojini Naidu Medical College, Agra, 17 (31.48%) reported that only gloves are available as personal protective clothing during waste handling while, the remaining 37 (68.52%) stated that they did not use any type of personal protective clothing (PPC). Out of 10 waste handlers, which responded to the questionnaire in Lady Lyall Maternity Hospital, Agra, 8 (80%) reported that they wore gloves during waste handling, only 1 (10%) reported to wore apron, 1 (10%) used long boots and 1 (10%) used mask while 2 (20%) stated that they did not use any type of personal protective clothing during waste handling. Out of 6 waste handlers, which responded to the questionnaire at District Hospital, Agra, 2 (33.33%) reported that

Table - 3: Types of personal protective clothing (PPC) worn by waste handlers/sweepers at Sarojini Naidu Medical College, Lady Lyall Maternity Hospital and District Hospital

Sr. No.	Personal protective clothing (PPC)	SNMC, Agra		LLMH, Agra		DH, Agra	
		No. of users	% (n=54)	No. of users	% (n=10)	No. of users	% (n=6)
1	Gloves	17	31.48	8	80.00	2	33.33
2	Apron	0	0.00	1	10.00	0	0.00
3	Long boot	0	0.00	1	10.00	0	0.00
4	Mask	0	0.00	1	10.00	0	0.00
5	Eye shield	0	0.00	0	0.00	0	0.00
6	None	37	68.52	2	20.00	4	66.67

SNMC= Sarojini Naidu Medical College, LLMH = Lady Lyall Maternity Hospital, DH = District Hospital

Table - 4: Training of waste handlers and particulars regarding risk involved in waste handling at Sarojini Naidu Medical College, Lady Lyall Maternity Hospital and District Hospital

Training and other particulars		SNMC, Agra		LLMH, Agra		DH, Agra	
		No.	% (n = 54)	No.	% (n=10)	No.	% (n=6)
1	Received special training in bio-medical waste handling	0	0.00	0	0.00	0	0.00
2	Aware of risk involved in BMW handling	20	37.04	7	70.00	2	33.33
3	Any injury/puncture/infection in the past 6 months	9	16.67	2	20.00	2	33.33
4	Accident reported to higher authority	0	0.00	0	0.00	0	0.00

SNMC = Sarojini Naidu Medical College, LLMH = Lady Lyall Maternity Hospital, DH = District Hospital

they wore gloves during waste handling while, the remaining 4 (66.67%) stated that they did not use any type of personal protective clothing (Table 3). The observation of the present investigation is in accordance with that of Henry *et al*. (1994) who performed a study at two privately owned community hospitals in two suburbs of Minneopolis and observed less than optimal levels of compliance of personal protective clothing among health care workers. Abdul *et al*. (2003) had also made similar observations when they evaluated infection control practices in 44 clinical laboratories of Karachi, Pakistan and found that gloves were used in 2 (4.54%) and protective gowns in 12 (27.27%) as personal protective clothing.

At Sarojini Naidu Medical College, Agra, although 20 (37.04%) waste handlers were aware of the risk involved in biomedical waste handling, none had received any special training on this aspect, while 9 (16.67%) waste handlers suffered with injury/puncture/infection in the past six months but no one reported it to higher authorities. At Lady Lyall Maternity Hospital, Agra, 7 (70%) waste handlers were aware of the risk involved in biomedical waste handling, while none had received any special training. Two (20%) waste handlers suffered with injury/puncture/infection in the past six months, but none of them reported to higher authorities. At District Hospital, Agra 2, (33.33%) waste handlers were aware of the risk involved in biomedical waste handling, however none had received any special training. 2 (33.33%) waste handlers suffered with injury/puncture/infection in the past six months but no one reported to higher authorities (Table 4).

A proper waste management team was missing in all the three hospitals. Matsumoto (2000) carried out a study in Central Laboratory, Social Insurance Tonan General Hospital. He emphasized on the establishment of a team/committee for the management of medical waste. Segregation practices were entirely absent at Sarojini Naidu Medical College, Agra and District Hospital, Agra. Waste was collected in plastic bins without color coding and appropriate labeling. However, waste was segregated and collected into different categories in different colored bins at Lady Lyall Maternity Hospital, Agra but segregation practices were not up to the mark. According to Duputie and Farrington (2002), proper waste segregation can reduce health care risk waste up to 40%. Similar observations were made by Klangsin and Harding (1998) in hospitals of Oregon, Washington and Idaho where they found that almost half of the hospitals were not segregating infectious waste from other medical waste. Internal transport of waste was performed by open handcarts in all the three hospitals and all the three hospitals lacked proper storage area where waste awaited its removal. At Sarojini Naidu Medical College, Agra and District Hospital, Agra the most frequently used technique for final disposal of waste was dumping of waste inside and outside the premises followed by open burning and throwing the waste into drains and municipal dumpers. However, at Lady Lyall Maternity Hospital, Agra, liquid waste was thrown in drains after treatment with bleaching powder while other categories of waste, after segregation and collection, were handed over to a common treatment plant (Dutt Enterprises Limited) for final treatment

and disposal. None of the hospitals was equipped with higher technological options for waste treatment and disposal.

In the present investigation it was observed that most of the authorities, administrators and other hospital staff were not concerned about the damage to society and the environment around them due to inappropriate handling and disposal of biomedical waste. Chauhan and Malviya (2002) analysed solid waste management practices in sixteen hospitals of Indore city and found that hospital authorities think that their basic responsibility is to take care of the health of the patients whereas the waste disposal in an environmentally compatible manner has been given a low priority. In the present study, many garbage dumps, in and around the health care facilities, which have been frequently visited by rag pickers, were observed. These rag pickers collect used needles, disposed drugs, syringes and PVC items from the garbage dumps. This practice not only encourages disposables being repacked and sold without proper disinfection but they also expose themselves to injuries with sharps and other infections. These findings are in agreement with those of Nema and Ganeshprasad (2002). They have observed that except for a few hospitals, waste is mostly dumped in the open space enabling rag pickers to collect syringes, cotton, plastics *etc*. In many hospitals, medical waste is burnt at dumpsites in an open environment.

Heads of various departments and other medical staff of all the three hospitals complained lack of finance as the major cause for not following the bio-medical waste (Management and Handling) rules, 1998. According to them waste budget was not getting the attention it requires. Similarly, Paul and Strout (1997) performed a study in USA and observed most healthcare facilities doing less than they should in the areas of solid waste management. One of the main reason they found for this was ever-tightening healthcare budgets.

Based on the data collected during the present course of study it was found that conditions of biomedical waste management in the Lady Lyall Maternity Hospital, Agra were better as compared to other two hospitals. Hospital personnel were trying to meet the current needs and standards. It was the only government hospital of Agra that was taking services from a common treatment plant (Dutt Enterprises Limited). Though segregation and collection practices of bio-medical waste still needed some improvement even at this hospital.

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