

Original article

Knowledge, attitude and practices regarding biomedical wastes among health care professionals in Sri Ganganagar city: A cross- sectional study

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Abstract

Introduction: Biomedical waste (BW) has become a serious health hazard in many countries, including India. Eighty percent of total BW generated by health care activities can be disposed of through regular municipal waste disposal methods. The remaining 20% is considered hazardous.

Materials and methodology: A self-administrated questionnaire study was conducted among health professionals. The sampling frame comprised of the medical, paramedical and dental practitioners of the Sri Ganganagar city registered with their respective state council. The final sample was 350 practitioners with a response rate of 89.5%. Questionnaire was designed in English language to record knowledge, attitude and practice of practitioners regarding biomedical waste management (BWM). The questionnaire was pretested on a group of forty different practitioners to check the feasibility of the study and to ensure face validity of the questionnaire. 6 out of 32 questions of the initial questionnaire were removed and appropriate modifications were made. The data was descriptively analysed and chi square tests and one way analysis of variance was applied using SPSS version 20.

Results: In the sample 58.29% were males and the rest were females (41.71%). The participants comprised medical (31.14%), dental (47.43%) and paramedical professionals (21.43%). Dental professionals had better knowledge about biomedical waste management (BWM) rules than medical and paramedical staff ($p < 0.0001$). Mean score of biomedical wastes knowledge, attitudes and practices was found greatest among dental professional's as compared to medical and paramedical professionals.

Conclusion: Training regarding BWM (Biomedical Waste Management) cannot be overemphasized as incomplete knowledge about BWM impacts practices of appropriate waste disposal.

Keywords: Biomedical waste; dental waste; hospital waste; waste management; health care professionals

Introduction

Biomedical waste (waste generated during the process of diagnosis, treatment or immunisation of humans or animals, or in research activities pertaining to any of these processes, or in the production or testing of biological material) has become a serious health hazard in many countries, including India. Biomedical waste (BW) is a potential health hazard to health care workers, the public, and the flora and fauna of the area.^[1] Eighty percent of total BM generated by health care activities can be disposed of through regular municipal waste disposal methods. The remaining 20% is considered hazardous.^[2, 3]

Health-care waste refers to all the waste generated by a health care establishment. It is estimated that annually about 0.33 million tonnes of hospital waste is generated in India and, the waste generation rate ranges from 0.5 to 2.0 kg per bed per day.^[4] The waste produced in the course of healthcare activities carries a higher potential for infection than any other type of wastes. Bio-medical waste collection and proper disposal has become a significant concern for both the medical and the general community. Dental offices generate a number of hazardous wastes that can be detrimental to the environment if not properly managed. This includes sharps, used disposable items, infectious wastes (blood-soaked cotton, gauze etc.), mercury containing waste (mercury, amalgam scrap), lead containing waste (lead foil packets, lead aprons) and chemical waste (such as spent film developers, fixers and disinfectants).^[5] The utmost important point is that careless and indiscriminate disposal of this waste by health care professionals (medical and dental doctors) contribute to the spread of serious diseases such as hepatitis and human immunodeficiency virus (HIV) among people who handle waste and also among the general public.^[6]

In developing countries, Biomedical waste management (BMW) has not received sufficient attention.^[7] In India, the *Biomedical Waste (Management and Handling) Rules 1998* (The Gazette of India, 1998)^[8], make it mandatory for hospitals, clinics, and other medical and veterinary institutes to dispose of BMW strictly according to the rules. The few studies on BMW management from India have established that hospitals did not manage BMW properly.^[9,10] Also, knowledge about the composition of BMW and its management is limited and unreliable though waste characterization is important to effectively control pollutants, such as acids, gases, heavy metals, and dioxins at dump sites.

BMW management has been entrusted with waste segregation at the source of generation into labelled colour-coded containers/bags that have been pre-assigned for the ten defined categories.^[11] Doctors need to have exemplary professional practice in this regard. Even, evidence from various parts of India suggests that, gaps in knowledge and lacunae in attitudes and practices are still prevalent to a worrying extent among the various categories of healthcare professionals. Presently, no publication is available

on the knowledge, attitudes and practices regarding BMW generation and management among health care professionals in this part of country. It was therefore decided to address this issue by undertaking the present study, so that training modules can be designed for safer and more effective delivery of health care.

Materials and methods

A cross-sectional study, using a self-administrated structured questionnaire was conducted among practitioners [medical, dental and paramedical (nursing, homeopathy and others)], to obtain information on the biomedical waste management related knowledge, attitudes and practice among practitioners from city during month of December-March 2015. The study was approved by the Ethical Committee of Surendera Dental College and Research Institute, Sriganaganagar. The sampling frame comprised of the medical, paramedical and dental practitioners of the Sriganaganagar city registered with their respective state associations. In this way a total of 391 practitioners were considered as the sample frame. Those who didn't give consent and failed to return the questionnaire or incomplete questionnaire were excluded from the study. The final sample was 350 practitioners with a response rate of 89.5%.

A self-structured questionnaire in English language was designed to record the knowledge, attitude and practice of practitioners regarding biomedical waste management. The questionnaire was pretested on a group of forty different practitioners to check the feasibility of the study and to ensure the face validity of the questionnaire. 6 out of 32 questions of the initial questionnaire were removed and appropriate modifications were made. The reliability of the questionnaire was evaluated by: (1) Cronbach's coefficient alpha to measure the internal consistency; (2) test-retest method to examine the stability of the questionnaire. The alpha coefficient of 0.76 was considered adequate. Test-retest reliability was measured by having the same set of respondents to complete a questionnaire at two different points of time within which there was no change of the constructs of interest. Intraclass correlation coefficient (ICC) with 95% confidence interval was used for assessing this reliability. ICC measures the strength of agreement between repeated measurements. The value of the ICC was 0.70. An ICC 0.4–0.75 was an indication of fair to good reliability. The questionnaire was viewed by three experts in dental public health to ensure its suitability for the present study. The questionnaire was personally administered and the professionals were explained regarding the motive of the study and how to complete the questionnaire. It was emphasized that the confidentiality of the responses made by them would be strictly maintained. The questionnaire included sections on demographic data and questions on knowledge, attitudes, awareness of biomedical waste management and willingness to

follow rule of biomedical waste management. Respondents were asked to indicate their level of agreement with statements addressing the three areas. For the sake of simplifying the analysis, the questions were divided into three areas: knowledge of biomedical waste management, attitude towards the role of practitioners in biomedical waste management control and practices regarding biomedical waste management control. All the questions responses was based on a Likert scale where the respondents were asked to indicate their agreement with the statement on a scale of 1-5, where 1 was strongly agree, 2 agree, 3 unsure, 4 disagree and 5 strongly disagree and for the remaining questions and for statistical analysis the answers were dichotomised.

All the data obtained was examined and the responses were coded. The data was then descriptively analysed and chi square tests and one way analysis of variance was applied using SPSS version 20. The chi square test of association was used to assess differences among HPs in all variables.

Results

Demographic data were listed in Table 1. In the whole population 58.29% were males and the rest were females (41.71%). The participants comprised of medical (31.14%), dental (47.43%) and paramedical professionals (21.43%). Most of the professionals, approximately 39.7% were in the age group of 20-29 years and 30.29% were in the age group of 30-39 years and 30% were above 40 years. 69.72%, 44.58% and 16% medical, dental and paramedical respectively had done post-graduation. More than 40% of the professionals had experience of more than 5 years in their respective fields (Table 1).

Table 1: Demographic characteristics of the sample

Characteristic	Whole sample (n= 350) n (%)	Medical (n= 109) n (%)	Dental (n= 166) n (%)	Paramedical (n= 75) N (%)
Gender				
Male	204 (58.29)	71 (65.14)	77 (46.39)	56 (74.67)
Female	146 (41.71)	38 (34.86)	89 (53.61)	19 (25.33)
Age (in years)				
20-29	139 (39.71)	43 (39.45)	61 (36.75)	35 (46.67)
30-39	106 (30.29)	54 (49.54)	32 (19.28)	20 (26.67)
>40	105 (30)	62 (56.88)	29 (17.47)	14 (18.67)
Qualification				
Graduate	188 (53.71)	33 (30.27)	92 (55.42)	63 (84)

Postgraduate	162 (46.29)	76 (69.72)	74 (44.58)	12 (16)
Experience				
≤5	197 (56.29)	55 (50.46)	98 (59.04)	44 (58.67)
>5-10	102 (29.14)	38 (34.86)	43 (25.90)	21 (28)
>10	51 (14.57)	16 (14.68)	25 (15.06)	10 (13.33)
Practice				
Public	112 (32)	48 (44.03)	24 (14.46)	40 (53.33)
Private	238 (68)	61 (55.96)	142 (85.54)	35 (46.67)

Dental professionals (88%) had better knowledge about BWM rules than medical (86.2%) and paramedical staff (62.7%) and this difference was statistically significant ($p < 0.0001$). A total of 58.7% and 61.5% medical and dental professional respectively had a view that biomedical wastes leads to disease transmission ($p < 0.05$). More than 2/3rd of the professionals believe that they require further training on biomedical waste management. Seventy one point six percent and 60% of medical and paramedical professionals dispose all kinds of waste into general garbage whereas in case of dental professionals only 32.5% dispose all kinds of waste into general garbage ($p < 0.05$). (Table 2)

Table 2: Practitioner knowledge, attitudes and practices regarding BWM

	Whole sample	Medical	Dental	Paramedical	p value
	n= 350	n= 109	n= 166	n= 75	
Knowledge	n (%)	n (%)	n (%)	n (%)	
Are all healthcare wastes hazardous	184 (52.6)	74 (67.9)	134 (80.7)	48 (64)	0.28
Are you aware about biomedical waste management rules	287 (82)	94 (86.2)	146 (88.0)	47 (62.7)	<0.0001
Can any plastic bag be used for waste disposal	245 (70)	80 (73.40)	99 (59.64)	66 (88)	0.84
As per Indian Biomedical waste 1998 rule, the Biomedical Waste is categorized in to	115 (32.9)	53 (48.6)	44 (26.5)	18 (24)	<0.0001
Segregation is a separation into different	227 (64.9)	58 (53.2)	128 (77.1)	41 (54.7)	0.19

categories					
Disease can be transmitted by biomedical waste	173 (49.4)	64 (58.7)	102 (61.5)	7 (9.3)	<0.0001
Maximum time limit for which biomedical waste can be stored	172 (49.1)	59 (54.1)	83 (50)	30 (40)	0.16
Universally accepted symbol for biohazard	151 (43.1)	43 (39.5)	92 (55.4)	16 (21.3)	<0.0001
Attitudes					
Biomedical wastes should be segregated into different categories	270 (77.1)	75 (68.8)	149 (89.8)	46 (61.3)	<0.0001
Require any further training on biomedical waste management	267 (76.3)	77 (70.6)	140 (84.3)	50 (66.7)	0.003
Dispose all kinds of waste into general garbage	192 (54.9)	78 (71.6)	54 (32.5)	60 (80)	<0.0001
Follow any guideline for color coding related to biomedical waste management in work area	239 (68.3)	82 (75.2)	131 (78.9)	26 (34.7)	<0.0001
Practices					
Color coded container / bag, you dispose cotton, gauze and other items contaminated by blood	156 (44.6)	44 (40.4)	86 (51.8)	26 (34.7)	0.03
Color coded container / bag, you dispose pharmaceutical waste	87 (24.9)	32 (29.4)	47 (28.3)	8 (10.7)	0.005
Color coded container / bag, you dispose waste sharps	137 (39.1)	36 (33.0)	77 (46.4)	24 (32)	0.03
Color coded container / bag, you dispose mercury contaminated cotton	104 (29.7)	23 (21.1)	73 (43.9)	8 (10.7)	<0.0001
Color coded container / bag, you discard the used developer or fixer solution	139 (39.7)	41 (37.6)	67 (40.4)	31 (41.3)	0.86
Color coded container / bag, you dispose the hazardous liquid waste	52 (14.9)	15 (13.8)	31 (18.7)	6 (8)	0.09
Color coded container / bag, you discard used rubber materials (gloves, catheter, other tubings)	207 (59.1)	77 (70.6)	91 (54.8)	39 (52)	0.01
Color coded container / bag, you discard general waste materials	215 (61.4)	83 (76.1)	113 (68.1)	19 (25.3)	<0.0001

p values derived from chi square test ($p < 0.05$ statistically significant, $p < 0.01$ highly statistically significant)

Mean score of biomedical wastes knowledge, attitudes and practices was found greatest among dental professional's ($7.64 \pm 1.33, 6.58 \pm 1.09, 7.55 \pm 1.04$) as compared to medical ($7.41 \pm 1.08, 6.41 \pm 0.99, 7.52 \pm 1.01$) and paramedical professionals ($6.71 \pm 0.92, 6.02 \pm 0.87, 6.32 \pm 0.98$) respectively and this difference was also found to be statistically significant ($p < 0.05$). (Table 3)

Table 3: Mean and standard deviations of knowledge, attitude and practice among medical, dental and paramedical staff

Group	Knowledge		Sig.	Attitude		Sig.	Practice		Sig.
	Mean	SD		Mean	SD		Mean	SD	
Medical	7.41	1.08	0.004	6.41	0.99	0.021	7.52	1.01	0.009
Dental	7.64	1.33		6.58	1.09		7.55	1.04	
Paramedical	6.71	0.92		6.02	0.87		6.32	0.98	

($p < 0.05$ statistically significant, $p < 0.01$ highly statistically significant)

Discussion

The study revealed several lacunae in the knowledge, attitudes and practices among the health professionals. Health professionals have an ethical responsibility towards the environment and themselves. Because of the nature of their profession, they must not forget that they are at risk for treating patients who may have infectious diseases. Dentists, dental assistants and patients may be exposed to pathogenic microorganisms localised in the oral cavity and respiratory tract, including cytomegalovirus (CMV), HBV, HCV, herpes simplex virus (HSV) type 1 and 2, HIV, Mycobacterium tuberculosis, staphylococci, streptococci and other viruses and bacteria.^[12] These microorganisms can be transmitted to dental health care professionals by direct contact with a patient's saliva, blood, skin or oral secretions, or by indirect contact through injuries caused by contaminated sharp instruments, or by droplet infection from aerosols or spatter.^[13]

Eighty six point two percent of the medical professionals were aware about BWM and its rules which is low as compared to the one reported by Chudasama^[4] et al (95.4%). Most of the dentists and medical professionals 84.3%, 70.6% respectively surveyed in the present study had shown interest in receiving such training. Survey results also showed that most respondents did not segregate waste at the point of generation in the clinic or hospital which is in agreement with study done by Singh BP et al^[6] and

Chudasama^[4] et al. They were also unaware of any legislation on hospital and clinic waste management or of any waste management guidelines. Medical professional (58.7%) in the present study believe that BW lead to transmission of disease while Chudasama^[4] et al reported 89% regarding the same in his study. Possible reasons for this include: that surveyed sample consider recommendations should be followed but are tedious; that practitioners consider it the responsibility of government to impose regulations, and that the imposition of regulations increases the financial and labour-associated burden on the dental practice.

Eighty point seven percent, 67.9% and 64% of the dentist, medical and paramedical professionals considers all health care waste to be hazardous. This concept is being believed by more dentist in the present study then compared to other similar study conducted by Sood^[14] and Sanjeev R^[5] et al. 59.64% of the dental professionals opted that any plastic bag can be used for waste segregation. The observation is in contrast with the results of studies done in Chennai^[15] and Davangere^[16], where the corresponding values were 28% and 27% respectively.

Regarding the maximum time limit for storage of biomedical waste according to national guidelines, about 50% of dentist admitted that they were not aware of the time limit while Sanjeev R^[5] et al reported 60% of the participating dentists from that study were not aware of such time limit. Regarding the attitude related questions, almost 89.8% of the dental respondents opted that the biomedical wastes should be segregated into different categories. The results are not in accordance with that of the study conducted by Sood^[14] et. al.

About 32.5% of the dental respondents disposed all kinds of waste into general garbage which is higher than the study done by Sanjeev R^[5] et al (18%) while lower than the study done by Sudhakar^[17] et al (47.6%). It is a surprising finding that only 51.8% of the dental respondents disposed blood soaked cotton, gauze in respective color coloured bag while corresponding figures in studies conducted at Amritsar^[18] and Delhi^[14] were 42% and 36%. It is an important observation that only 43.9 % of the respondents disposed mercury in respective color coded bag while in Chennai study^[15], the corresponding value was around 32% and in Bangalore study^[17], it was around 15% which is comparatively less.

The study thus throws a light on the existing knowledge, attitude and practice of the health care professionals in Sri Ganganagar city. This study indicates that there is an urgent need to train the health care professionals regarding the same. Occupational safety is a prime concern.

Conclusion

Based on the observation, our study revealed that the importance of training regarding bio medical waste management cannot be overemphasized, lack of proper and complete knowledge about bio medical waste management impacts practices of appropriate waste disposal. Safe and effective management of waste is not only a legal necessity but also a social responsibility. There is a need to cope up with this problem thorough proper planning and education programs.

Funding: Nil

Conflict of Interest: None declared

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