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Original Research Article

Knowledge, attitude and practices towards biomedical waste management among health care professionals, private practitioners and post graduate students in Davangere City, Karnataka, India

Ipshita Potlia*, P G Naveen Kumar, Prashant G M, Sushanth V H, Mohamed Imranulla, Rubel M and Swati Mallick

Department of Public Health Dentistry, College of Dental Sciences, Davangere, India

QR Code



***Correspondence Info:**

Dr. Ipshita Potlia,
Department of Public Health Dentistry,
College of Dental Sciences, Davangere, India

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Abstract

Introduction: Hospitals are the centers of cure and also of infectious waste generation. Improper waste management can be a threat to public health and environment. Staff that provide healthcare ought to be aware of the proper handling and the system of management.

Aim: The aim of the study was to determine knowledge, attitude and practices towards BioMedical Waste (BMW) management among health care professionals, private practitioners and post graduate students in Davangere, Karnataka.

Method: A cross-sectional study was conducted using a questionnaire with closed-ended questions. It was distributed to 458 health care workers including dental and medical post graduates, staff and private practitioners. The questionnaire was used to assess their knowledge of biomedical waste disposal. The results were expressed as a number and percentage of respondents for each question. Descriptive tests and Chi square tests were used to perform the statistical analysis.

Results: Around 540 questionnaires were distributed of which 458 were returned and analyzed. It was seen that though 91.70% of the participants were aware of the BMW generation and legislation however over 60% still unaware regarding the correct color coding system. About 13.6% of participants were not vaccinated for HBV infection and only 65.9% of the study subjects were correctly able to identify the symbol for biohazard.

Conclusion: It can be concluded from the present study that proper training and education regarding the BMW management is a must and needs to start at a much earlier level during the graduation of the healthcare workers so that it can be put into practice at the earliest.

Keywords: Biomedical waste, dental practitioners, post- graduates, davangere.

1. Introduction

Biomedical waste is defined as the waste generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining hereto or in production or testing of biological, and including categories mentioned in schedule I of Biomedical Waste (management and handling) (second amendment) Rules 2000, by Ministry of Environment and Forests notification. This was not the topic for concern until 1980s following the exposure to human immunodeficiency virus (HIV) and hepatitis B viruses (HBV) when it became an important issue for the medical fraternity.

The last century witnessed a boom in the development of hospitals, medical and dental colleges both in the private as well as the public sector owing to the exponential rise in the population, making the handling of the large amounts of waste produced by these facilities an important issue to deal with. This is because this waste carries a high potential for infection and injury than any other type of waste.[1] Biomedical waste generated in the hospital falls under two major categories [2]:

1.1 Non hazardous

1.2 Biohazardous

A study conducted by Glenn et al states that 85% of hospital wastes are actually non-hazardous, whereas 10% are infectious and 5% are non-infectious but they are included in hazardous wastes. About 15% to 35% of Hospital waste is regulated as infectious waste. This range is dependent on the total amount of waste generated.[3] So it is estimated that 10-25% of health care waste is hazardous, with the potential for creating a variety of health problems.[4]

The objectives of biomedical waste management involve mainly prevention of disease transmission from one patient to another; to health workers from patients and vice versa; prevention of injury to the workers in health care units as well as workers involved in support services.[5,6]

The waste management programme in hospitals are in accordance to these guidelines and aim to minimize cross infection, improve the general hygiene in hospitals and minimize environmental pollution through proper treatment and disposal of waste.[7] For waste management to be effective, the waste should be managed at every step, from generation to disposal.[8]

With this background, the study was conducted to assess the knowledge, attitude and practices towards biomedical waste management among health care professionals, private practitioners and post graduate students in Davangere, Karnataka.

2. Methodology

2.1 Study design and population: A cross-sectional questionnaire based survey was conducted in May 2015. The target population included all the healthcare workers including the private practitioners and postgraduate students in the two dental and medical institutes of the city. All the students who were willing, gave verbal consent and were present on the day of the survey were included in the study which resulted in a total of 458 participants.

2.2 Pre-testing of the questionnaire: A pretested questionnaire (Cronbach's $\alpha=0.81$) was given to all the participants. It was divided into two parts. The first part consisted of questions on personal and professional data including age, gender, qualification, experience and type of practice. The second part contained 14 questions on assessment of knowledge, attitude and practice regarding biomedical waste management. All questions were closed-ended and were written in English.

2.3 Ethical clearance: Ethical approval was obtained from the institutional ethical committee of College of Dental Sciences, Davangere. Prior permissions were obtained from the concerned authorities of respective colleges to conduct the survey.

2.4 Administration of Questionnaire: Participants were visited by a single investigator and all those available and willing were given the questionnaire on the day of visit. Participants were asked to respond to each item in the questionnaire by choosing the most appropriate alternative. Confidentiality and anonymity of the respondents were assured. The questionnaires were distributed by a single examiner and participants were immediately asked to fill up and return the questionnaire.

2.5 Statistical Analysis

The data was compiled and tabulated in Microsoft excel spread sheet and was subjected to frequency distribution analysis using SPSS version 22.0 (SPSS Pvt Ltd Chicago, IL, USA). Chi-square test was used to test associations between the responses among the age, genders, qualification, type of practice and years of expression. Multiple logistic regression models were fitted to the data to calculate Odds Ratios (OR) and Confidence Interval (CI) for the responses among the genders. $P \leq 0.05$ was considered to be statistically significant.

3. Results

A total of 540 questionnaires were distributed of which 458 were obtained back (Response Rate =84.81%). The details of participants according to the age, gender, qualification, years of experience and type of practice has been given in table 1.

Majority of the participants in this study were females (56.76%) and most of the subjects fell under the age group of 26-30 years (57.20%). It was seen that most of the individuals were either undergoing their masters in dental surgery or were holders of the same degree (62.88%).





Another important observation made was that most of the subjects had less than 5 years of working experience (84.71%) and that about 93.44 % of the participants were seen to be working attached to an institution.

Table 2 describes the chi square results for the significant responses with respect to age, gender, qualification, years of experience and type of practice.

Table 1: Distribution of the study subjects according to age, gender, qualification, years of experience and type of practice

Characteristic	Number (%)	
Age	Below 30	380 (82.9)
	Above 30	78 (17.1)
Gender	Male	198 (43.23)
	Female	260 (56.77)
Qualification	BDS	24 (5.25)
	MDS	288 (62.88)
	MBBS	64 (13.97)
	MD/MS	82 (17.90)
Years of Experience	Less than 5	388 (84.71)
	More than 5	70 (15.29)
Type of Practice	Private	30 (6.55)
	Institutional	428 (93.45)

Table 2: Chi square test analysis of response to knowledge, attitude & practice based questions

Question	Response	N (%)	Significance
Are you aware about biomedical waste generation and legislation?	Yes No	420(91.71) 38 (8.29)	0.005** (gender)
Where do you dispose pharmaceutical waste?	Red plastic bag Yellow plastic bag General garbage Blue plastic bag Don't know	76 (16.6) 162 (35.4) 22 (4.8) 166 (36.2) 32 (7.0)	0.002** (gender) 0.010** (type of practice)
Should the waste storage room be locked to prevent entry of unauthorized person?	Yes No	430 (93.9) 28 (6.1)	0.001** (age) 0.001** (years of experience) 0.001** (type of practice)
Are the hazardous chemical, pharmaceutical and radioactive wastes segregated from infectious and general non risk wastes?	Yes No	400 (87.3) 58 (12.7)	0.000** (type of practice) 0.000** (qualification)
Are the used needles destroyed before being collected?	Yes No	358 (78.2) 100 (21.8)	0.000** (type of practice) 0.019* (qualification)
Which is the universally accepted symbol for biohazard?	   	80 (17.5) 302 (65.9) 76 (16.6) 0 (0)	0.006** (gender) 0.017* (type of practice)
Are you aware about color coding segregation of Biomedical Waste?	Yes No	450 (98.3) 8 (1.7)	p > 0.05
Is the waste handler using any protective clothing equipment while collecting waste?	Yes No	364 (79.5) 94 (20.5)	p > 0.05
Can a normal plastic bag be used for waste disposal?	Yes No	62 (13.5) 396 (86.5)	p > 0.05
Do you think following proper waste management protocol is of financial burden to your institute/ college/ clinic?	Agree Disagree	84 (18.3) 374 (81.7)	p > 0.05
Water waste should be treated before being released/ or water waste should be connected to a sanitary sewer linked to a water waste treatment plant.	Agree Disagree Cannot Comment	422(92.14) 8 (1.75) 28 (6.11)	p > 0.05

*p>0.05 not significant, p<0.05 significant, ** p<0.01 highly significant

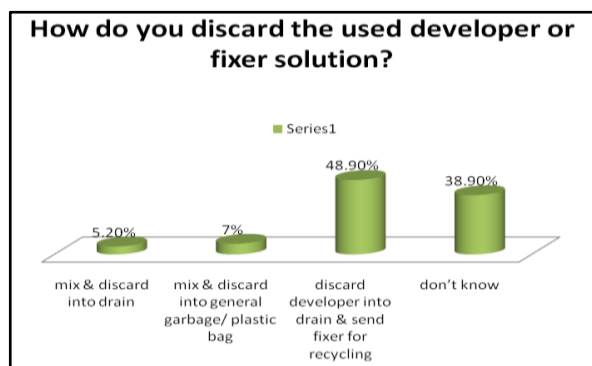


Figure 1: Distribution of methods used to discard fixer and developer solution

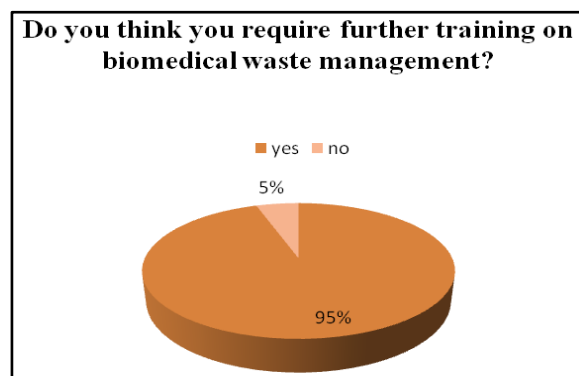


Figure 3: Healthcare workers opinion regarding further training in biomedical waste management

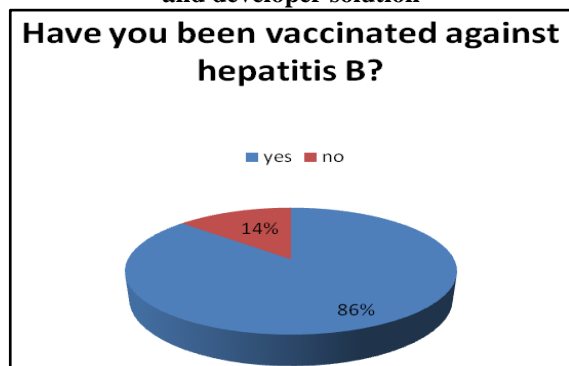


Figure 2: Pie chart showing number of health care workers vaccinated for hepatitis B

4. Discussion

Health care is a profession dedicated to promote and enhance the well-being of the masses. While accomplishing this, the health care workers from various branches (medical, dental, auxiliary staff and other health care helpers) are likely to be exposed to various biological health hazards.[2]

Of the majority of the waste generated in a hospital, infectious waste accounts for only a small fraction (10-15%). However, this small fraction is of biggest concern as it poses direct threat to the health and hygiene of

the human beings by transmitting viral, bacterial, fungal and parasitic disease.[2] Thus, right knowledge, a positive attitude and a good practice are imperative to guide and serve the patients.[9,10]

In the present study it was seen that 13.6% of participants were still not vaccinated for HBV infection (Fig 2) which is an alarming find as dentists and other healthcare workers are at a greater risk to these conditions and should be vaccinated as soon as they are enrolled in their respective courses.

The general awareness regarding hospital waste in the present study was similar to other studies [11,12] but the awareness about the components of color coded containers was lesser in the participants. It was also astonishing to see that though 98.3% of the participants agreed that they were aware of the color coding segregation of BMW, 63.75% of the participants still did not know the proper method of disposal of pharmaceutical waste and only 36.2% of them were correctly disposing pharmaceutical waste into the blue bag (Table 2). This could be because of the limited exposure to more recent advances into the BMW rules and regulations.

In India, to protect the environment and community health from hazards of infected waste, the BMW rules were promulgated in 1998 by the Ministry of Environment and Forest, Government of India, under Environment Protection Act 1986.[13-15,17] For effective implementation of these rules in health care settings, the health care professionals and auxiliary staff should possess adequate knowledge with respect to the source of BMW and its appropriate disposal.[16,17]

Surprisingly only 65.9% of the study subjects were correctly able to identify the symbol for biohazard. And about 18.3% of the participants felt that proper waste management protocol is a financial burden (Table 2).

It was reassuring to note that in the present study about 91.70% of the participants were aware about biomedical waste generation and legislation (Table 2), whereas in a previous study, conducted in a teaching hospital in New Delhi some 12 years ago, only 35.9% of respondents were aware regarding the same.[18]

The findings from the present study revealed that despite being aware of the BMW management protocols, majority (62.88%) of participants did not know about the proper color coding used for waste disposal (Table 2). It was noticed that most of the practicing dentists (51.1%) in the city still did not know the proper method of disposal of developer and fixer solution and were dumping it into the drain which adversely damages the environment figure 1.

The results of the study also helped us in understanding that there is a keen interest of the participants (95%) in obtaining further formal training figure 3. This

will address the need to progress from the concept of “waste management” to one of sustainable decision making regarding resource use, including methods of waste minimization at source and recycling.[19]

The problem regarding BMW management does not only limit itself to India, Lack of awareness, appropriate policy and laws, and willingness have been responsible for the improper management of medical waste in Dhaka City.[20] A Turkish study also reported inappropriate handling of BM waste at the institutions concerned and that there was no systematic program for the transportation of the health care waste to the final disposal sites.[21] A study of medical waste management in the south of Brazil also yielded similar results.[22]

Thus, it can be said that for proper disposal of BM waste, the introduction of laws alone is insufficient, the awareness of these laws amongst the public, as well as development of policies and enforcement with respect to those laws, is essential.[23,24]

The present study was conducted among a small group of subjects and in one of the many healthcare institutions in the country. Therefore it is recommended that similar studies should be performed and more subjects should be included. The need for more research and accurate data to provide an evidence-base for future decision-making is highlighted.

5. Conclusion

The results of this study has demonstrated that despite having knowledge, there is still a lack in the day to day practice of BM Waste, this could be because of the no formal training regarding the subject or could be because of no strict laws regarding the same. It is hereby required that awareness regarding BMW should be increased and BMW collection and segregation should be taught and implemented at an early level so as to bring about noticeable positive change.

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