



## A prospective cross-sectional study on knowledge and practices of healthcare professionals on biomedical waste management from Nilgiris district, Tamilnadu

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### ABSTRACT

This study was conducted to ascertain the knowledge and practices related to biomedical waste management in secondary care hospitals in our region. The required information was obtained using a simple questionnaire which included 2 parts, namely, knowledge and practices with 16 and 20 questions respectively. Out of the 80 respondents, 75 % were females. Nurses constituted a major fraction of healthcare professionals (70%) in hospitals. About 47.5% of the respondents had a working experience of 0-5 years. Females had better knowledge and practices in the disposal of medical wastes (91.14% and 94.998%) as compared to males (88.125% and 89%). There was a significant association of age with the knowledge ( $p= 0.013$ ) and insignificant regarding practice ( $p= 0.998$ ) of healthcare professionals. The knowledge and practices of all healthcare professionals were overall good. There was a significant association between a professional category of healthcare professionals with knowledge ( $p= 0.00000181$ ) and practices ( $p= 0.003129$ ) of medical waste disposal. The results of the investigation uncovered that healthcare professionals had great learning about the disposal of biomedical waste. It was additionally discovered that healthcare professionals adhered to the strategies and the rules related to biomedical waste management.

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### INTRODUCTION

Healthcare is indispensable for our sustainability, yet the waste created from this sector speaks to a

genuine issue of living nature and the human world. Inappropriate waste administration in human services offices causes an immediate wellbeing sway on the living things and the earth. Along these lines, biomedical waste administration has as of late risen as an issue of real concern (Mathur *et al.*, 2012). According to Biomedical Waste (Management & Handling) Rules (1998) of India, 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 production or testing of biologicals" (Mathur *et al.*, 2012).

### Need of biomedical waste management in hospitals

1. Injuries from sharps leading to the infection to

all categories of hospital personnel and waste handler.

2. Nosocomial infections in patients from poor infection control practices and poor waste management.
3. Risk of infection outside the hospital for waste handlers and scavengers and at time general public living in the vicinity of hospitals.
4. Risk associated with hazardous chemicals, drugs to persons handling wastes at all levels.
5. "Disposable" being repacked and sold by adding unscrupulous elements without even being washed.
6. Drugs which have been disposed of, being repacked and sold off to unsuspecting buyers.
7. Risk of air, water and soil pollution directly due to waste, or due to defective incineration, emissions and ash

### Benefits of Biomedical Waste Management

1. Cleaner and healthier surroundings.
2. Reduction in the incidence of hospital-acquired and general infections.
3. Reduction in the cost of infection control within the hospital.
4. Reduction in the possibility of disease and death due to reuse and repackaging of
5. infectious disposables.
6. Low incidence of community and occupational health hazards.
7. Reduction in the cost of waste management and generation of revenue through appropriate treatment and disposal of waste.
8. Improved image of the healthcare establishment and increase the quality of life (Mathur *et al.*, 2012).

Ministry of Environment and Forests 1986 and (Biomedical Waste (Management & Handling) Rules, 1998): In accordance with these rules, "it is the duty of every occupier i.e.; A person who has the control over the institution or its premises, to take all steps to ensure that waste generated is handled without any adverse effect to human health and environment" (Biomedical Waste (Management & Handling) Rules, 1998).

Improper healthcare waste management is known to cause environmental pollution and infectious waste which could lead to the transmission of several pathogens. The quantum of such waste generated in India is estimated to be 1-2 kg per bed per day in a hospital (Rajput *et al.*, 2009).

Safe disposal and subsequent destruction of biomedical waste is a key step in the reduction of illness or injury through contact with such potentially hazardous material and in the prevention of environmental contamination.

Nilgiris, being a biosphere reserve in the Western Ghats region of India, waste disposal should be carefully handled and managed. Various rules and guidelines have been implemented by the government to enhance environmental safety.

Therefore, we performed this survey to assess the management of biomedical waste, to observe whether standards, protocols are complied with and to evaluate the level of awareness among healthcare professionals in secondary care hospitals of Nilgiris district, Tamilnadu, India.

### MATERIALS AND METHODS

The study was conducted at two secondary care hospitals in Nilgiris district viz Shiva Shakthi multispecialty center, which is a 22 bedded hospital and Vijaya hospital with an occupancy of 42 beds.

This study was planned from December 2018 to May 2019. The study design was prospective, cross-sectional and descriptive in nature.

#### Designing the questionnaire

The questionnaire was adapted from the study conducted by (Makhura *et al.*, 2016) after obtaining permission from the authors.

The questionnaire was translated to the local language for ease of accessibility and was validated by selected health care professionals regarding the clarity, content and flow of the questionnaire who are not part of the study carried out. Minor changes were made, and the questionnaire was finalized.

The questionnaire consisted of 2 parts, namely, knowledge and practices with 16 and 20 questions, respectively. Each question has a multiple-choice answer of three categories, including disagree, agree and neutral from which the person can choose one.

#### Data collection

The Health Care Professionals (HCPs) were given an orientation about the study and those who expressed consent were enrolled for participation.

**Table 1: Percentage distribution of sociodemographic variables and knowledge and practices of biomedical waste management among HCPs (N=80).**

Variables	N %
<b>Gender</b>	
Male	25%
Female	75%
<b>Age</b>	Mean =29.166 ±2.9107
21-25	25%
26-30	30%
31-35	15%
>35	30%
<b>Professional category</b>	
Doctor	11.25%
Dentist	1.25%
Nurse	70%
Allied health worker	17.5%
<b>Knowledge of HCPs</b>	
Adequate knowledge	89.63%
Not sure	4.72%
Inadequate knowledge	5.65%
<b>Practice of HCPs</b>	
Adequate knowledge	91.99%
Not sure	4.95%
Inadequate knowledge	3.041%
<b>Experience</b>	Mean = 8 ±5.196
0-5	47.5%
6-10	16.25%
11-15	21.25%
16-20	3.75%
>20	11.25%

Ethical committee approval was not obtained for the conduct of this study as it does not involve a therapeutic intervention and offers no risk to the study participants.

However, oral consent was obtained from all participants beforehand. Purposive sampling was employed in this study as the healthcare workers are available on a shift basis, and recruitment will be affected by fixing a sample size.

The printed questionnaire was given to the HCPs, and they were asked to fill up the given questions by marking a tick against the respective column for each question and marking demographic data compulsorily.

#### Data analysis

The questions were assigned scores based on the adequate/inadequate knowledge and practice among the HCPs, and the scoring was given as agree-2, disagree-1, and neutral-0. Each data was entered

in MS Excel worksheet along with scores. The data was then analyzed using descriptive statistics and Chi-square test by using the software SPSS version 21.0.P -value < 0.05 was considered statistically significant

#### RESULTS AND DISCUSSION

A total of 80 responses were obtained through a self-administered questionnaire from the HCPs of two secondary care hospitals in the Nilgiris district.

By carefully examining the data in Table 1, it is found that the response rate for the study sample was 100% (80/80\*100). Most respondents were Female (60; 75%), and minority were males (20; 25%); a large proportion of them were nurses. Mean age of the respondents was 29.166 ± 2.9107 years, with age of 20-35 years. Nearly half of the respondents had 0-5 years of experience (47.5%).

**Table 2: Socio-demographic variables in relation to the knowledge and practices of biomedical waste disposal among HPCs (N=80).**

Variable	N %	p value
<b>Gender and knowledge regarding disposal of medical waste</b>		0.006165
<b>Male</b>		
Adequate knowledge	88.125%	
Not sure	0.937%	
Inadequate knowledge	10.937%	
<b>Female</b>		
Adequate knowledge	91.14%	
Not sure	2.81%	
Inadequate knowledge	6.037%	
<b>Gender and practice regarding the disposal of medical waste</b>		0.011
<b>Male</b>		
Adequate knowledge	89%	
Not sure	6.75%	
Inadequate knowledge	4.25%	
<b>Female</b>		
Adequate knowledge	94.998%	
Not sure	3.166%	
Inadequate knowledge	1.83%	
<b>Age and knowledge regarding the disposal of medical waste</b>		0.013
<b>21-25 years</b>		
Adequate knowledge	96.56%	
Not sure	0.625%	
Inadequate knowledge	2.81%	
<b>26-30 years</b>		
Adequate knowledge	87.49%	
Not sure	4.16%	
Inadequate knowledge	8.32%	
<b>31-35 years</b>		
Adequate knowledge	91.66%	
Not sure	1.04%	
Inadequate knowledge	7.29%	
<b>&gt;35 years</b>		
Adequate knowledge	95.567%	
Not sure	0.778%	
Inadequate knowledge	3.63%	
<b>Age and practice regarding the disposal of medical waste</b>		
<b>21-25 years</b>		

*Continued on next page*

Table 2 continued

Adequate knowledge	95%	
Not sure	2.25%	
Inadequate knowledge	2.75%	
<b>26-30 years</b>		0.998
Adequate knowledge	97.082%	
Not sure	0.416%	
Inadequate knowledge	2.495%	
<b>31-35 years</b>		
adequate knowledge	93.32%	
Not sure	4.165%	
Inadequate knowledge	2.499%	
<b>&gt;35 years</b>		
adequate knowledge	96.66%	
Not sure	0.83%	
Inadequate knowledge	2.49%	
<b>Professional category and knowledge regarding the disposal of medical waste</b>		0.00000181
<b>Doctor</b>		
Adequate knowledge	97.22%	
Not sure	0.694%	
Inadequate knowledge	2.08%	
<b>Dentist</b>		
Adequate knowledge	93.75%	
Not sure	0%	
Inadequate knowledge	6.25%	
<b>Nurse</b>		
Adequate knowledge	90.78%	
Not sure	2.739%	
Inadequate knowledge	6.466%	
<b>Allied health worker</b>		
Adequate knowledge	85.09%	
Not sure	2.4%	
Inadequate knowledge	12.97%	
<b>Professional category and practice regarding the disposal of medical waste</b>		0.003129
<b>Doctor</b>		
Adequate knowledge	97.22%	
Not sure	1.11%	
Inadequate knowledge	33.33%	
<b>Dentist</b>		
Adequate knowledge	95%	
Not sure	5%	
Inadequate knowledge	0%	
<b>Nurse</b>		
Adequate knowledge	94.12%	
Not sure	4.209%	
Inadequate knowledge	1.665%	
<b>Allied health worker</b>		

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Table 2 continued

Adequate knowledge	89.61%	
Not sure	6.15%	
Inadequate knowledge	4.23%	
<b>Years of experience and knowledge about the disposal of medical waste</b>		0.001264
<b>0-5 years</b>		
Adequate knowledge	93.05%	
Not sure	2.136%	
Inadequate knowledge	4.6%	
<b>6-10 years</b>		
Adequate knowledge	85.09%	
Not sure	3.845%	
Inadequate knowledge	11.05%	
<b>11-15 years</b>		
Adequate knowledge	87.86%	
Not sure	1.10%	
Inadequate knowledge	11.02%	
<b>16-20 years</b>		
Adequate knowledge	77.08%	
Not sure	8.33%	
Inadequate knowledge	8.33%	
<b>&gt;20 years</b>		
Adequate knowledge	92.36%	
Not sure	3.47%	
Inadequate knowledge	4.166%	
<b>Years of experience and practice about the disposal of medical waste</b>		0.01
<b>0-5 years</b>		
Adequate knowledge	95.128%	
Not sure	3.68%	
Inadequate knowledge	1.18%	
<b>6-10 years</b>		
Adequate knowledge	92.30%	
Not sure	4.229%	
Inadequate knowledge	3.46%	
<b>11-15 years</b>		
Adequate knowledge	89.7%	
Not sure	5.88%	
Inadequate knowledge	4.41%	
<b>16-20 years</b>		
Adequate knowledge	93.33%	
Not sure	4.99%	
Inadequate knowledge	1.66%	
<b>&gt;20 years</b>		
Adequate knowledge	94.99%	
Not sure	3.88%	
Inadequate knowledge	1.388%	

As shown in Table 2, female respondents have higher knowledge and better practices in the disposal of medical wastes (91.14% and 94.998%) as compared to male respondents (88.125% and 89%). There was a significant association of age with the knowledge ( $p= 0.013$ ) and insignificant regarding practice ( $p= 0.998$ ) of HCPs, respectively. The knowledge and practices of all healthcare professionals were by and large high. There was a significant association between the professional category of HCPs with knowledge ( $p= 0.00000181$ ) and practices ( $p= 0.003129$ ) of disposal of medical waste.

In our study, the majority of the respondents were females and based on occupation nurses constituted a large proportion. This is in accordance with the study conducted by other researchers (Hamajima, 2014; Makhura et al., 2016).

According to our study, there is a significant association between the socio-demographic variables such as gender, professional category and years of experience in relation to knowledge whereas in a similar study performed none of these variables were found to have significant association with knowledge and practices of biomedical waste disposal (Makhura et al., 2016).

A greater no. of the population belonged to the age group of 26-30 years and greater than 35 years. The mean age of our population was found to be 29.166 years  $\pm$  2.9107. Also, most of the people were found to have only 0-5 years of experience followed by the group having 11- 15 years of experience, which implies that most of them were freshers in this field. The mean years of experience was found to be 8 years  $\pm$  5.196.

Workplace health policies have to be enforced, and epidemiological studies have to be carried out to identify the hazards to the workforce (Ferdowski et al., 2010).

In the present study, doctors were having prominent knowledge and practices related to medical waste management in comparison to other HCPs. This is in contrast with a study conducted in Delhi, where nurses showcased better knowledge than doctors (Bhayana et al., 2016). Allied health care workers required more knowledge and disposal practices, which were like previous studies.

When compared to the other studies, where higher proportions of the population had inadequate knowledge and practices of the BMW management, this study denotes that most of the respondents had better and proper practices of disposal of medical wastes than the knowledge acquired (Bashaar et al., 2017; Kapoor et al., 2014; Kishore et al.,

2014). Strikingly, those studies were conducted in major cities, whereas our study was conducted in a remote small town with minimum facilities (Omar et al., 2012; Bokhoree et al., 2014). Despite the lack of urbanization, we found that the healthcare professionals of both hospitals had adequate knowledge and practices regarding the management of biomedical waste.

#### Assets of the study

1. The study was conducted in a small town in Nilgiris district, Tamil Nadu; no previous studies on biomedical waste management were undertaken in this region.
2. Even though the study population was small, the knowledge and practices of the HCPs were much better than previous studies.

#### Limitations of the study

1. Small sample size
2. Cross-sectional rather than interventional study, which would have made a better impact on results in terms of creating awareness.

#### CONCLUSIONS

This cross-sectional survey was conducted to gauge the knowledge and practices of disposal of biomedical wastes among the HCPs, from various secondary care hospitals in the Nilgiris district. The overall result of the study revealed that the HCPs were aware and had good knowledge about the safe disposal of medical wastes. It was also found that the HCPs strictly adhered to the policies and the guidelines framed by the government.

#### Future outlook

1. Current disposal practices in the secondary care hospitals of the rural areas need positive changes and awareness among the HCPs.
2. Reinforcement of existing guidelines are required, and proper education should be given for using protective measures among the biomedical waste collectors.
3. Proper training should be emphasized to the staffs regarding the segregation and safe disposal of biomedical waste.

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