Original Research Article

Knowledge, attitude and practice regarding biomedical waste management amongst healthcare workers in a teaching hospital from a north eastern state of India

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ABSTRACT

Background: Bio-medical waste (BMW) means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities or in the production or testing of biological or in any health camp activities. Proper management of BMW ensures protection of public health and environment against any adverse effect associated with such waste materials. Several studies have reported that health care workers lack adequate level of awareness and right attitude regarding proper BMW management which ultimately reflects as incorrect practice of handling and disposal of bio medical waste. This study aimed to assess the knowledge, attitude and practices of healthcare workers regarding bio-medical waste management.
Methods: This study was conducted at Tomo Riba Institute of Health and Medical Sciences (TRIHMS), Arunachal Pradesh, India. Hospital based cross sectional study was conducted and questionnaire were administered to 313 healthcare workers of TRIHMS who consented to participate in the study. A predesigned questionnaire for knowledge, attitude and practice study was used for data collection. Data was analysed using Microsoft Excel and STATA 13.
Results: Study results show that the average knowledge score was highest amongst nurses (10±2.6) and least in class IV staffs (7.2±1.9). Amongst all participants laboratory technicians were mostly average or poor on the attitude score. Overall only 23 percent (n=73) of the healthcare workers were found to be performing good BMW management practice.
Conclusions: Our study revealed that there is significant variation in knowledge, attitude, and practice regarding biomedical waste management among healthcare workers.

Keywords: Attitude, Biomedical waste, Knowledge, North eastern state, Practice, Teaching hospital

INTRODUCTION

Bio-medical waste (BMW) has been defined as any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities or in the production or testing of biological or in any health camp activities. Thus the term bio medical waste is an umbrella term that includes several categories of waste as mentioned in schedule I of the government of India's biomedical waste rules 1998.[1]

The proper management of biomedical waste is necessary to avoid its adverse effect on health and environment. Management of bio medical waste is often a properly laid

down process in hospitals and large clinics. And it basically includes several steps which are required to protect health and environment against any adverse effect while handling such waste materials. As health care activities continuously generate bio medical waste, it has been estimated that out of the total amount of waste generated by various health care activities; nearly about 15% waste is hazardous. Due to the unique nature of the composition of such waste, mismanagement of bio medical waste materials pose high risk not only to the hospital staffs but also to the surrounding community.[2] Hospitals and large clinics in high income countries generate on average up to 0.5 kg hazardous waste per bed per day, while in low income countries waste generation is on an average approximately 0.2 kg waste per bed per day. However, in low income countries actual quantity of bio medical waste generated is much higher than estimated due to improper segregation of hazardous and non-hazardous waste materials.[3] Similarly in India, it has been estimated that annually about 0.33 million tons of bio medical waste is generated with an average of 0.5 kg to 2 kg per bed per day.[4]

As bio medical waste is hazardous and its by products contain potentially harmful microorganisms that can lead to hospital born infection to patients, infect health workers and also the general population staying nearby, the importance of proper management of BMW cannot be underestimated. It has also been documented that due to mishandling of such hazardous waste instances of spread of drug resistant microorganisms, contamination of drinking water source, releasing of toxic metals and gases from health care facility to surrounding environment have been reported. As lack of awareness among health workers, inadequate training, ignorant attitude towards standard operating procedure, human resource crisis, lack of fund, poor control of hospital management are some critical factors which have been shown to be related to the failure of the bio medical waste management.[5]

Bio Medical Waste management is a shared teamwork wherein both healthcare workers and health care facility need to follow good BMW management practices. Even though several legal provisions exits in India for the proper disposal and management of BMW but they are yet to be fully implemented.[6] Several studies from different states of India have reported that health workers lack adequate level of awareness and right attitude regarding proper bio medical waste management which ultimately reflect as incorrect/inappropriate practice of handling and disposal of the same.[7-12] Even though there are studies from large states of India, there is lack of information from the tertiary care hospitals in the north eastern states of India regarding awareness and management of daily generated different category of bio medical waste.

A tertiary care teaching hospital has a critical role in the health care set up of a state. The Tomo Riba Institute of Health and Medical Sciences (TRIHMS) situated at Naharlagun, Papum Pare district of Arunachal Pradesh, India, is the first medical college of Arunachal Pradesh. The hospital is equipped with all modern healthcare facilities along with 500 beds. Being the largest tertiary care hospital, it caters to large number of patients from all over the state and generates substantial amount of bio-medical waste.

With this background the present study was conducted in order to assess the knowledge, attitude and practices of healthcare personnel regarding bio-medical waste management in the Tomo Riba Institute of Health and Medical Sciences (TRIHMS), Arunachal Pradesh, India.

METHODS

Study area, design and setting

This was a hospital based cross sectional study conducted at Tomo Riba Institute of Health and Medical Sciences (TRIHMS) at Naharlagun, Papum Pare district of Arunachal Pradesh, India. The TRIHMS, Naharlagun is located at Papum Pare district which has a total population of 176,573 out of 1,382,611 total population of Arunachal Pradesh as per census 2011, of which male and female are 89,182 and 87,391 respectively (Figure 1).[13]
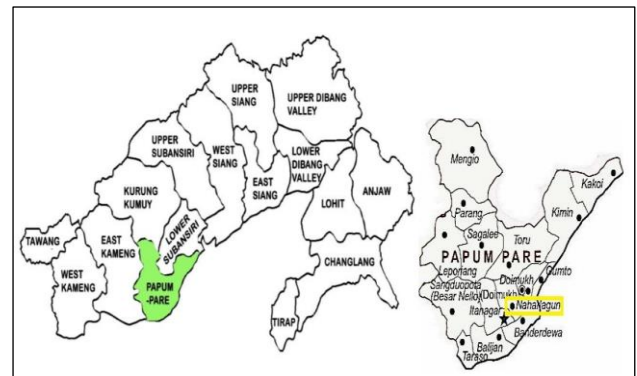
Figure 1: Map showing location of study district and TRIMHS.

Study duration and sampling

Study was conducted from December 2017 to March 2018. Convenience sampling technique was used and study population comprised of health personnel including doctors, nurses, laboratory technicians and grade IV staff. A total of 313 health care personnel were included in this study and a minimum of 80% participants from each category were covered.

Inclusion criteria included health care personnel working in the hospital that volunteered to participate and gave their consent. Staffs on leave and any personnel who did not give their consent and administrative staffs (clerical) of the hospital were excluded from the study.

Study tool comprised of pre-piloted structured questionnaire. The validated questions and the checklist were prepared according to the Indian Public Health Standards (IPHS) Guidelines for District Hospitals (101 to 500 Bedded).

The questionnaire was divided into two parts. The first part consisted of questions on personal and professional data including age, gender, qualification, experience, and other details. The second part consisted of questions on assessment of knowledge, attitude, and practice (KAP) regarding biomedical waste management. The questionnaire included closed-ended questions to capture background characteristics of the participants and knowledge-attitude-practice regarding biomedical waste management.

Correct answer to the knowledge/attitude/practice related question was scored as "1" and incorrect as "0" which were then combined to calculate the knowledge/attitude/practice score. Based on the score attained by giving assertive responses to attitude and practice questions participants were categorized as poor (score less than 6), moderate (score 6-7) and good (score more than 7). A descriptive analysis was performed using Microsoft excel and STATA 13.

RESULTS

A total of 313 hospital staff took part in this study. The study population comprised of 85 doctors, 120 nurses, 18 laboratory technicians and 90 class IV staff. A breakdown of the study population by their profession is shown in Figure 2.
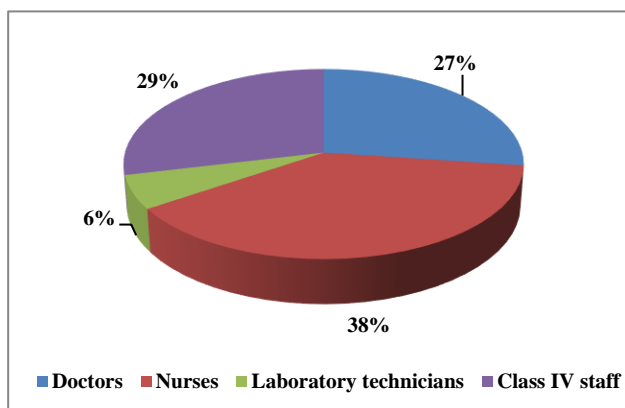
Figure 2: Percentage distribution of study participants by their professions.

More than half of the study participants (59%) belonged to the age group of 20-39 years. Nearly 63% of the participants were females. In terms of training for bio medical waste management, it was found that 56% of participants reported not undergoing any such training. Table 1 describes the background characteristics of the study participants.

Table 1: The background characteristics of the participants.

Characteristics	N=313	Percentage
Age groups (in years)		
20-39	183	59
40-49	88	28
50-60	42	13
Gender		
Male	117	37
Female	196	63
Profession		
Doctor	85	27
Nurse	120	38
Lab technician	18	6
Class IV	90	29
BMW management training		
Received	138	44
Not received	175	56
≤ 5 years of service	74	24
≥5 years of service	239	76

Assessment of knowledge in our study showed that approximately 75% doctors, 81% nurses, 90% lab technicians and 50% class IV staff could recognize bio hazard symbols. Further we found that 60% of doctors, 48% nurse and 45% lab technicians were aware about the latest bio-medical waste management rules.

But only 5% of class IV staff had any knowledge about bio medical waste management rules. The average knowledge score was found to be highest in nurses (10 ± 2.6) and least in class IV staffs (7.2 ± 1.9). Table 2 describes the frequency distribution of participants to major knowledge related questions and average knowledge scores of study participants.

The attitude of the participants regarding biomedical waste management was assessed by covering topics like waste management being a teamwork or not, decontamination and infection chances, segregation at the origin, the risk to waste handlers, the inclusion of bio medical waste management in the undergraduate medical course curriculum and whether biomedical waste management is a financial burden or not.

Most of the study participants showed good attitude towards bio medical waste management and majority of them agreed to the fact that bio medical waste management is a team work. While doctors, nurses and class IV staff had mostly good attitude scores, the laboratory technicians were mostly average and poor on the attitude score (Table 3).

When practice of the participants was assessed, we found that out of 313 total participants, only 23% (n=73) were found to be performing good bio medical waste management practice. The average practice score was highest among the nurses followed by class IV and lab technicians and least in doctors (Table 4).

Table 2: Distribution of participants according to positive response to major knowledge questions and average knowledge score among the participants.

Knowledge question	Doctors n=85		Nurse n=120		Lab technicians n=18		Class IV n=90	
	N	(%)	N	(%)	N	(%)	N	(%)
Recognize Bio Hazard Symbol	64	(75)	97	(81)	16	(90)	45	(50)
Aware of BMW Rule, 2016	51	(60)	57	(48)	08	(44)	04	(05)
Know how to properly discard syringes	30	(36)	99	(83)	04	(22)	66	(73)
Aware of IMAGE	06	(07)	27	(23)	02	(11)	00	00
Number of Categories in BMWM	20	(24)	45	(38)	03	(13)	07	(08)
Maximum time limit for BMW storage	07	(09)	13	(11)	01	(06)	37	(41)
Knowledge score (mean ± SD)	8.8±2.3		10±2.6		9.5±1.6		7.2±1.9	

Table 3: Distribution of participants according to positive response to attitude statement and attitude score.

Attitude statement	Doctors (n=85)		Nurse (n=185)		Lab Technician (n=18)		Class IV (n=90)	
	N	(%)	N	(%)	N	(%)	N	(%)
Biomedical waste management is a teamwork	79	(93)	117	(98)	17	(95)	85	(95)
Decontamination reduces chances of Infection	83	(98)	111	(93)	17	(95)	90	(100)
Segregation at the point of origin required	82	(97)	110	(92)	17	(95)	90	(100)
Biomedical waste risk to waste handler	46	(54)	53	(44)	10	(56)	21	(23)
Should BMW be segregated into different categories	80	(94)	114	(95)	18	(100)	85	(95)
BMWM to be included as a part of the undergraduate curriculum	81	(95)	92	(77)	14	(78)	85	(95)
BMWM not a Financial Burden	45	(53)	81	(68)	07	(39)	49	(55)
Attitude score								
Score more than 07 (Good)	67	(79)	77	(64)	05	(31)	57	(63)
Score 06 to 07 (Average)	14	(16)	34	(28)	10	(63)	33	(37)
Score less than 06 (Poor)	04	(05)	09	(08)	03	(19)	0	0

Table 4: Distribution of participants as per practice score.

Practical score	Doctors N=85		Nurse N=120		Lab tech N=16		Class IV N=90		Total staff N=313	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
<6 (Poor)	53	(62)	30	(25)	11	(61)	43	(48)	137	(48)
6-7 (Average)	26	(31)	46	(38)	02	(11)	29	(32)	103	(32)
> 7 (Good)	06	(07)	44	(37)	05	(28)	18	(20)	73	(23)
Practice score (mean±SD)	4.9±1.7		6.7±1.7		5.72±2.27		5.75±1.73		5.9±1.9	

Upon inspection as a part of practice of bio medical waste management in TRIHMS, it was observed that colour-coded bins were present at the point of waste generation as per guidelines. Color-coded plastic bags were available and properly put in some of the colour-coded bins but in some places, the only black plastic bag was found to be used in every bin.

Display of work instructions for segregation and handling of biomedical waste was also done and they were present near the bin area. Mixing of infectious and general waste was not done but, in some areas of the hospital where public access was more, such mixing was found. Post-exposure prophylaxis was available and it was found that bins were never overfilled, and only sometimes

disinfection of liquid waste was done before disposal. And it was also observed during the inspection that transportation of biomedical waste is done in closed containers.

DISCUSSION

This study assessed the knowledge, attitude and practice regarding biomedical waste management in a study population of 313 health professionals working in Tomo Riba Institute of Health and Medical Sciences at Naharlagun, Papum Pare district of Arunachal Pradesh, India. As stated by the BMW management and handling rules of 2016, safe disposal is to be practiced by all healthcare institutions.

The result of the study conducted at TRIHMS, highlighted the lack of knowledge and awareness about bio medical waste generation hazards, legislation and management among doctors, nurses, lab technicians and Class IV staffs. This study revealed that among various health professionals, nurses are having highest level of knowledge in terms of bio medical waste management. When compared between various categories of staffs, the average knowledge score among the class IV staffs was found to be lowest. Our finding is in accordance with the findings of other studies.[6,8-11] Such low level of knowledge among the class IV staffs may be due to lack of formal education.

The results of our study were in accordance also result of these previous studies. With majority of the participants being aware of the segregation of wastes in colour coded containers, nurses and class IV staffs topped the scores in the subject of storage and disposal of the biomedical wastes as a result of their practical and first hand approach towards waste management. [9-11]

In this study majority (more than 90%) participants agreed that bio-medical waste management is a team work, decontamination reduces chances of infection and segregation in different categories is needed to be done. Majority of the participants (66%) showed good attitude towards BMW management. This finding is in accordance with the findings of Anand P et al and Madhukumar et al.[14,15]

Our study also found that, 48% of all participants showed poor practice of bio medical waste management which is a serious concern. Average practice score of nurses was highest among all other categories of health personnel. Study by Tenglikar PV et al also reported highest practice score among nurses.[2] Such higher practice score among the nurses in this study may be due to higher sense of responsibility and organized monitoring by the senior nursing personnel. However, the overall good practice by the lesser number of participants (23%) revealed that there is a huge gap between the knowledge-attitude and actual practice of biomedical waste management.

Limitations of this study include its convenience sampling technique and small sample size because of which the study findings cannot be generalized. Further the study was conducted in one tertiary care hospital and thus covered only a limited area.

CONCLUSION

Our study conducted at Tomo Riba Institute of Health and Medical Sciences, a premier tertiary care and teaching institute in India, revealed that there is significant variation in knowledge, attitude, and practice regarding biomedical waste management among healthcare professional including doctors, nurses, lab-technician, and class-IV staffs. Knowledge regarding the collection, segregation rules, and disposal of biomedical waste management is more among nursing staff as compared to other health care professionals. Hence this study highlights the importance of improving knowledge and practice of biomedical waste management through training, proper monitoring and supportive supervision.

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