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Research Article

A STUDY ON KNOWLEDGE, ATTITUDE AND PRACTICES REGARDING BIOMEDICAL WASTE MANAGEMNT AMONG NURSING STAFF IN PRIVATE HOPITALS IN UDUPI CITY, KARNATAKA, INDIA

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ABSTRACT
Hospital is the place, which is frequently accessed by the people irrespective of age, sex, race, religion, region and even nationality. The waste generated during entire healthcare activities has higher potential to produce health and environmental hazards than the wastes of other places. The knowledge of healthcare staffs has greater impact on proper biomedical waste management (BMW). A cross sectional study was carried out for duration of four months from October 2012 to January 2013 among nursing staff of private hospitals in Udupi city to assess the knowledge, attitude and practice regarding biomedical waste management. The study listed 17 hospitals as clusters and 4 hospitals were randomly selected for the study. A pre-structured questionnaire was used for data collection. Data were collected from 166 nursing staff of four selected hospitals after getting oral consent from hospital managing director and participants. The result revealed that the majority 160(96.4%) of participants were female and mean age of respondents were found to be 28.6 (±9.04) years. Majority 159(95.8%) of nursing staff had considered the biomedical waste as different from general wastes and 150(90.4%) of respondent were agreed for the segregation of BMW at point of generations. The study showed that 77.51% of study participants had knowledge about various diseases transmission through BMW. The overall knowledge 95.8% regarding BMW among nursing staff of hospital no.1 was significantly ($p<0.001$) higher than other hospitals. The study concluded that regular training and supervision is necessary for better healthcare waste management and implementation.

Key Words*: Healthcare Waste Management, BMW, Segregation*

INTRODUCTION
Hospital is the place, which is frequently accessed by the people irrespective of age, sex, caste, religion, region and even nationality. To take care of its aim of reducing health problems, eliminating potential risk, treating sick people; the healthcare service unavoidably produce waste which itself hazardous to health (Mathur *et al.*, 2009). The waste generated during entire course of healthcare activities is special in terms of its composition, quantity and their potential hazardous effect as compare to waste of other places, which require special attentiveness for its management (Tenglikar *et al.*, 2009). The improper management of biomedical waste poses significant hazardous risk to the patients, healthcare workers, the community and environments (WHO, 2007). The biomedical waste is defined as the waste 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 biological including categories mentioned in the schedule-I of Biomedical Waste(Management and Handling) Rules 1998,Government of India **(**Radha, 2012).
The inappropriate healthcare waste management caused 21 million hepatitis B virus (HBV) infections (32% of all new infections); 2 million hepatitis C virus (HCV) infections (40% of all new cases); 260,000 HIV infections (5% of all new cases) in 2000. Epidemiological studies indicate that a person who experiences one needle stick injury from a needle used on an infected source patient has risks of 30%, 1.8%, and 0.3% respectively of becoming infected with HBV, HCV and HIV (WHO, 2011).

The Biomedical Waste (management and handling) Rule, 1998, drafted by the Ministry of Environment and Forest, Government of India and came into enforcement in July 28, 1998. This rule encompasses all who involve in any step of biomedical waste generation and handling (Mausumi *et al.*, 2012).

The proper healthcare waste management include five steps namely segregation of biomedical waste at the point of generation, treatment, storage, transportation and final disposals. The segregation of biomedical waste at the source of generation is the first step, but crucial step in healthcare waste management because of specific methods needed for the treatment and disposal of different categories of wastes. The health personnel who involved in handling the biomedical waste at different point of generation in hospital include doctors, nurses, lab technicians, ward boy etc. Thus the knowledge regarding biomedical waste management among health care personnel have greater impact on health and environment.

This study aims to assess the knowledge, attitude and practices regarding biomedical waste management among nursing staff in Private Hospitals in Udupi City, Karnataka.

MATERIALS AND METHODS

A descriptive cross-sectional study was carried out for a period of 4 months from October 2012 to January 2013 to assess the knowledge, attitude and practices among nursing staff in private hospitals in Udupi City. One stage cluster sampling method was applied in the study. Total 17 private hospitals (capacity>50 beds) were listed as cluster in the city with average cluster size of 40 (nursing staff). To get calculated sample size of 144, four private hospitals were randomly selected for the study from the total listed hospitals. Oral consent was taken from the managing director of hospitals. The self administered questionnaire was used to gather information on socio-demographic characteristics, knowledge regarding color coding for segregation of BMW, diseases transmission through BMW, attitude towards BMW, practices like hand wash, protective measures, practice just after needle prick injury etc. The knowledge was assessed by 10 items questionnaire with maximum score 10. The higher score reflect greater knowledge regarding BMW. All nursing staff of these four selected hospitals, who gave oral consent was included in the study. The participants who were not present at the day of administration of questionnaire and not willing to participate were under exclusion criteria of the study. A total 166 nursing staff were participated during the study period. The collected data from 166 nursing staff were entered and analyzed by using SPSS 15.0. Frequency, proportions were calculated and reported. The association between different socio-demographic factors and the knowledge score regarding BMW were analyzed by independent t-test, ANOVA, Chi-square test at 5% level of significance.

RESULTS AND DISCUSSION

This study was conducted among nursing staff of four private hospitals in Udupi City. Total 166 nursing staffs were participated in the study. The majority (37.3%) of participants were from Hospital no.4 followed by Hospital No. 2 (24.7%), Hospital No. 1 (20.5%) and Hospital No. 3 (17.5%).

Table 1: Show Hospital wise distribution of Nursing Staff (N=166)

Name of Hospitals	Frequency	Percentage
Hospital No. 1	34	20.5
Hospital No. 2	41	24.7
Hospital No. 3	29	17.5
Hospital No. 4	62	37.3
Total	**166**	**100**

The data analysis revealed that 160 (96.4%) of respondents were female and rest 6(3.6%) were male. The mean age of participants were found to be 28.6 (±9.04) years. Most (72.9%) of the respondents were under the age of 30 years.

Table 2: Shows socio-demographic Profile of Nursing Staff (N=166)

Socio-demographic Variables		No. of Participants (n)	Percentage (%)
Gender			
	Male	6	3.6
	Female	160	96.4
Age			
	<30 years	121	72.9
	>30 years	45	27.1
Education			
	Diploma in Nursing	114	68.7
	ANM	30	18.1
	B.Sc. Nursing	9	5.4
	Others	13	7.8
Duty site			
	Ward	96	57.8
	Labour room or Operation theater	50	30.1
	Casualty	7	4.2
	Immunization Room	3	1.8
	Laboratory	4	2.4
	More than one	6	3.6
Jobs Experience			
	<3 Years	96	54.2
	>3 Years	76	45.8
Duration of Duty			
	<10 hours	129	77.7
	>10 hours	37	22.3
Training on BMW			
	Yes	122	73.5
	No	44	26.5
Vaccinated for Hepatitis-B			
	Yes	153	92.2
	No	13	7.8

Diploma in nursing was found to be basic qualification among most 114(68.7%) of study participants. The study included 96 (54.2%) subjects from wards followed by labour room/operation theaters 50 (30.1%), casualty 7 (4.2%), laboratory 4(2.4%), immunization room 3(1.8%) and more than one duty place 6(3.6%). The mean duration of job experience of respondents was 6.72 years and the mean length of duty hours was 9.69(±1.78) hours. This study showed that 26.5% of study respondents were not vaccinated for the Hepatitis-B virus. This study also observed that 92.2% of respondents had knowledge about the bio-hazard symbol. It is similar to the findings of a study done in Bhopal which stated that 81.8% of nurses were found to be aware about the symbol of biohazards (Bathma *et al.*, 2012). Majority 159(95.8%) of nursing staff had perception regarding BMW that it is different from general wastes and require special attention for its proper management. This is consistent with the findings of a study done among doctors and nurses on knowledge and practices regarding biomedical waste management at Johannesburg which showed that 90% of respondents treated biomedical wastes differently than general wastes **(**Ramokate and Basu, 2009). The study also revealed that 150(90.4%) of respondents were agreed on segregation of BMW at point of generations. This finding is also supported by the observation made in

the study done at Bangalore which stated that 87.5% of study subjects were in the favor of segregation of BMW at source of generation **(**Madhukumar and Ramesh, 2012**)**. The knowledge about the existence of BMW management & handling rules 1988 was found in 147(88.6%) of nursing staff. This is slightly higher from the result reported in the study conducted in Bhopal which showed that 54.5% of nurses were aware about the existence of BMW management and handling rules 1998 **(**Bathma *et al.,* 2012). Only 15(9.03%) of respondents were considered biomedical waste management as an unnecessary extra burden on them. It is consistent with the finding of study done at Bangalore which stated that 9.9% of study subjects felt biomedical waste management as unnecessary extra burden on healthcare staff (Madhu Kumar and Ramesh, 2012). Majority 142(85.5%) of nursing staff were felt that they need fresh training on BMW. Similar result were also observed in a study done on assessment of existing knowledge, attitude, and practices regarding biomedical waste management among the health care workers in a tertiary care rural hospital of B. G. Nagara which stated that 60% of nurses felt to go for training program on management of BMW (Radha, 2012). Most 101(60.8%) of participant were washed their hands after dealing with biomedical wastes.

Table 3: Shows the mean score of knowledge and practices regarding BMW management

Characteristics		**Mean Scores of knowledge regarding BMW Mean(SD)**	**p-value***
Hospital			
	Hospital No.1	5.79(1.79)	<0.001**
	Hospital No.2	6.93(1.94)	
	Hospital No.3	6.24(0.95)	
	Hospital No.4	9.58(0.93)***	<0.001***
Age			
	≤30 years	7.07(2.05)	<0.001**
	>30 years	8.89(1.84)	
Education level			
	B.Sc. Nursing	6.44(2.0)	<0.001**
	Diploma Nursing	8.06(2.02)***	
	ANM	5.97(1.97)***	
	Others	7.69(1.70)	<0.001***
Working hours			
	≤8 hours	9.45(1.17)	<0.001**
	>8 hours	6.38(1.74)	
Job Experience			
	≤3 years	7.01(2.0)	<0.001**
	>3 years	8.22(2.14)	
Training			
	Yes	7.52(2.27)	0.68**
	No	7.68(1.78)	

**independent t-test p-value in between age group, working hours, Job experience, training and ANOVA p-value in between hospitals, education levels at 0.05 level of significance.*
***p-value <0.05 shows significant difference at 0.05 level of significance*
****Post Hoc Games-Howell test applied in mean scores of knowledge of BMW and in between hospitals shows significant difference between hospital no.4 and rest of hospitals(p-value<0.001) at 0.05 level of significance. Post Hoc Tukey test applied in mean scores of knowledge of BMW and in between education level shows significant difference between diploma nursing and ANM(p-value <0.001) at 0.05 level of significance.*

The study observed that 48(28.9%) nurses had complete [scored 10 out of 10(100%)] knowledge regarding colour coding, different categories of BMW and proper segregation of BMW and only 9(5.4%) of respondents had less than 50% knowledge. An independent-samples t-test was conducted to compare the knowledge regarding BMW in nursing staff with age >30 years and age ≤30 years, working hours >8 hours and working hour ≤8 hours, and job experience >3 years and job experience ≤3 years. There was a significant difference in the BMW knowledge scores for age greater than 30 years (M=7.07, SD= 2.05) and less than 30 years (M=8.89, SD=1.84) of age; t(df)=-5.21 (164) ,p<0.001; for working hour ≤8 hours (M=9.45, SD=1.17) and >8 hours (M=6.38, SD=1.74) working hours; t(df)= 12.49 (164), p<0.001 and for job experience >3 years (M=8.22, SD=2.14) and ≤3 years (M=7.01, SD=2.00) job experience; t(df)= -3.77(164), p<0.001. These results suggest that with increase in age and experience there is significant increases in knowledge regarding BMW. After done with ANOVA test, significant knowledge score difference was observed in between different Hospitals (F= 68.25, p<0.001) but homogeneity of variance were not assumed (Levene Statistics=5.126, p=0.002), so Welch test was performed (value=110.59, p<0.001). This was followed by Post Hoc Games-Howell test, which revealed that there was significant difference of knowledge regarding BMW among nursing staff between hospital no.4 and other hospitals (p<0.001). This reflects that nursing staff of hospital no.4 had significantly higher knowledge regarding BMW than other hospitals. One Way ANOVA were also performed to detect the significant difference of knowledge of BMW between different categories of education level of nursing staff. Significant difference of knowledge of BMW was observed between different level of education (F=9.74, p<0.001), followed by Post Hoc Tukey test, which showed that there was significant difference of knowledge regarding BMW between diploma in nursing and other educational qualification (p<0.001). This reflects that nursing staff with diploma in nursing had significantly better knowledge than the nursing staffs with other educational qualification.

Table 4: Shows knowledge regarding health hazards of BMW

Health Hazards of BMW	**Participant Response (N=166) N (%)**		
	Yes	**No**	**Total Response**
HIV may transmit through BMW	130(78.3)	36(21.7)	166 (100)
Hepatitis-B may transmit through BMW	137(82.5)	28(16.9)	165 (99.4)
Hepatitis-C may transmit through BMW	119(71.7)	45(27.1)	164 (98.8)
Can't touch mercury by bare hand	160(96.4)	6(3.6)	166 (100)
BMW has hazardous effect on Environmental	141(84.9)	20(12.0)	161 (97.0)

The knowledge regarding infectious disease transmission due to improper BMW management among nurses was also assessed in the study. The majority 77.51% of study participants were having knowledge about various diseases transmission through BMW. But slightly smaller finding were observed in the study conducted to assess knowledge, attitude and practices regarding Biomedical waste among paramedical workers in Karimnagar town, Andhra Pradesh which stated that 48.8% nursing staffs had knowledge about various health problems caused by BMW (Shafee Mohd *et al.,* 2010). Out of 166 subject, 137(82.5%) were aware about Hepatitis-B transmission through BMW, followed by 130 (78.3%) HIV and 119 (71.7%) Hepatitis-C. Similar results were observed in the study conducted among doctors and nurses at Johensan which stated that 88% respondents agreed on the Hepatitis-B transmission through improper management of BMW followed about HIV (82%) and Hepatitis-C (76%) **(**Ramokate and Basu 2009). But current study findings are slightly higher than the result reported in a study done in Sabarkantha district of Gujarat which stated that 50% of nursing staffs were aware about the

HIV/Hepatitis B transmission through BMW [Pandit N B, Mehta H K, Kartha P K and Choudhary S K (2005)]. Among all participants, 160 (96.4%) were aware that mercury should not touch by bare hand. The majority of nursing staffs 141 (84.9%) were agreed on the statement that inappropriate disposal of BMW results in environmental degradation. Out of 166 participants, majority 151(91%) were experienced needle prick injury in their working life and among them 89 (53.6%) were got needle prick injury less than five times throughout their job duration but a significant number 62 (37.3%) were injured by needle prick more than five times. Only 19.9% of the needle prick injured respondents were not reported to hospital authority.

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