



Gap between Knowledge and Practice in Bio-Medical Waste Management in a Tertiary Care Centre

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ABSTRACT

Background: Health-care waste contains potentially harmful microorganisms which can infect hospital patients, health workers and the general public. Training and capacity building of health-care staff are essential in the efforts to minimize the transmission of secondary infections. Before beginning the process of creating awareness, it is first necessary to assess the knowledge and practices regarding biomedical waste management among nursing staff and its association with socio-demographic variables.

Methods: This is an interview based cross sectional study involving 301 nursing staff working in tertiary care hospitals.

Results: Analysis of data showed that among 301 participants 91% were females and 9% were males, among the participants with good knowledge of biomedical waste disposal 93% were females and it is statistically significant with p value 0.005. Age and experience has impact on the proper biomedical waste disposal which is statistically significant with p value 0.019 and 0.013 respectively.

Conclusions: Female staff nurse with more experience had better knowledge of health hazards of biomedical waste and proper disposal of waste and universal precautions. Health-care waste workers should be trained before starting work handling waste, and then on a routine basis (e.g. annually) to update their knowledge of prevention and control measures.

Keywords: Health care waste; Biomedical waste; Knowledge; Nursing staff.

INTRODUCTION

Bio-medical waste means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or from research activities. Hospitals and laboratories generate various kinds of wastes which include bandages, cotton, soiled linen, body parts, sharps (needle, syringes etc), medicines (discarded or expired), culture media, slides, samples from patients which carry infection should be properly collected, segregated, stored, transported, treated and disposed to prevent contamination and nosocomial infection. Of the total amount of waste generated by health-care activities, about 85% is general, non-hazardous waste which includes papers, covers,

food etc and the remaining 15% is considered hazardous material that may be infectious, toxic or radioactive.

On average, high-income countries generate up to 0.5 kg of hazardous waste per bed per day; while low-income countries generate 0.2 kg.¹ However, health-care waste is often not separated at source and disposed properly in low income countries which increases the burden. According to the Ministry of Environment and Forests (MoEF) gross generation of Bio-Medical Waste (BMW) in India is 4,05,702 kg/day of which almost 28% of the wastes is left untreated and not disposed finding its way in dumps or water bodies and re-enters our system.² In terms of quantum of waste generated from

the states, Karnataka tops the chart with 62,241 kg/day of BMW.²

Health-care waste contains potentially harmful drug resistant microorganisms which can infect hospital patients, health workers and the general public. Sharp waste like needles and syringes if not disposed of safely, creates a risk of injury and infection and opportunities for reuse. Despite this progress, in 2010, unsafe injections were responsible for as many as 33,800 new HIV infections, 1.7 million hepatitis B infections and 315,000 hepatitis C infections.³ 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.¹

Knowledgeable staff can also help patients and visitors to understand their role in maintaining good hygiene, and to become more responsible for the wastes they produce. This can be achieved by training and capacity building of health-care staff. Before beginning the process of creating awareness in any given community, it is first necessary to assess the population in which awareness creation will take place. KAP Study tells us about knowledge possessed by a community and the ways in which they demonstrate their knowledge and attitude through their actions. The purpose of this study is to assess the knowledge and practices regarding biomedical waste management among nursing staff and its association with sociodemographic variables.

METHODS

This is a cross sectional study conducted among nursing staffs (301) working at K.R Hospital and Cheluvamba Hospital. Cheluvamba Hospital and Krishna Rajendra Hospital (K R Hospital) are both Tertiary Referral Centers and Teaching Hospitals attached to the Mysore Medical College. K R Hospital has a total bed capacity of around 1330 beds and Cheluvamba Hospital has a total bed capacity of around 410 beds. It also has a designated Neonatal ward and a Diarrhoeal Diseases Unit. The average waste generation per capita per month was observed to be 2700 kg/month and average waste per capita per day in the health center was observed to be 0.3 kg. Permission was taken from the medical superintendent of the hospitals and list of all the nurses working in various departments in different shifts was taken. After obtaining ethical committee approval study was done for period of 5 days; night shift nurses were approached in the morning before they left the hospitals. Data was collected by Direct interview method using a predefined and structured questionnaire after obtaining written informed consent. Questionnaire included 20 ques-

tions apart from questions related to basic information, of which 10 were related to knowledge regarding health hazards, color coding, personal protection and 10 were related to practice including universal precautions and segregation.

Data was analyzed using SPSS software 20 version. Pearson's chi-square test was done to find the association between the categorical variables. Probability value less than 5% was considered as statistically significant.

RESULTS

Analysis of data showed that among 301 participants 91% were females and 9% were males, majority (33%) belonging to the age group of 41-50 with median age of 43 years. Around 95% were staff nurses and 51% had qualification of diploma in general nursing and midwifery. 35% had work experience of less than 10 years, median of experience was 15 years.

Those who have answered correctly for $\geq 80\%$ questions were considered to have good knowledge and practice for the purpose of analysis. 294 participants (98%) had good knowledge of blood borne infections but only 205 of them (68%) took necessary precautions. 246 participants (82%) had taken Tetanus vaccine and 236 participants (78%) had taken Hepatitis B vaccine. 256 participants (85%) had good knowledge regarding colour coding and segregation of biomedical waste, but only 194 (65%) practiced it. Among the participants with good knowledge of BMW management 93% were females and it is statistically significant with p value 0.005. Table 1.

Age and experience has impact on the proper biomedical waste disposal which is statistically significant with p value 0.019 and 0.013 respectively. As age and experience increased waste management was better indicating better actions with increased practice. Staff nurse's knowledge and practice of universal precaution was statistically significant compared to junior health assistants and nursing superintendent with p value 0.009 and 0.039 respectively. Table 2.

DISCUSSION

Among nursing staff's majority were females which is common in most of the health care centres. There are many studies indicating female nurses are better in caring than male nurses.⁴ The results of this study suggest that they have better awareness compared to males but no such difference found in the practice. Therefore, female nurses can train the juniors with their knowledge and they need motivation for better practices.

Table-1:-Association between socio-demographic variables and the knowledge of biomedical waste

Socio demographic variables	Knowledge			p value
	Good (n=256) (%)	Not good (n=45) (%)	Total (n=301) (%)	
Age				
21 – 30	63 (78.7)	17 (21.2)	80 (26.5)	0.072
31 – 40	46 (95.8)	2 (4.1)	48 (15.9)	
41 – 50	84 (85.7)	14 (14.2)	98 (32.5)	
51+	63 (84.0)	12 (16.0)	75 (24.9)	
Gender				
Female	238 (86.8)	36 (13.1)	274 (91.0)	0.005*
Male	18 (66.6)	9 (33.3)	27 (8.9)	
Education				
SSLC/ PUC	48 (82.7)	10 (17.2)	58 (19.2)	0.528
Dip in GNM	128 (83.6)	25 (16.3)	153 (50.8)	
Dip Nursing	66 (90.4)	7 (9.5)	73 (24.2)	
BSc Nursing	14 (82.3)	3 (17.6)	17 (5.6)	
Experience (years)				
<= 10	88 (83.0)	18 (16.9)	106 (35.2)	0.581
11 – 20	86 (83.4)	17 (16.5)	103 (34.2)	
21 – 30	56 (90.3)	6 (9.6)	62 (20.5)	
31+	26 (86.6)	4 (13.3)	30 (9.9)	
Designation				
Staff Nurse	242 (84.9)	43 (15.0)	285 (94.6)	0.615
Junior Health Assistant	9 (81.8)	2 (18.1)	11 (3.6)	
Nursing Superintendent	5 (100.0)	0	5 (1.6)	

*: Indicates significance

Table-2: Association between socio-demographic variables and biomedical waste management practice

Socio demographic variables	Practice			p value
	Good (n=194) (%)	Not good (n=107) (%)	Total (n=301) (%)	
Age				
21 – 30	41 (51.2)	39 (48.7)	80(26.5)	0.019*
31 – 40	33 (68.7)	15 (31.2)	48(15.9)	
41 – 50	64 (65.3)	34 (34.6)	98(32.5)	
51+	56 (74.6)	19 (25.3)	75(24.9)	
Gender				
Female	181 (66.0)	93 (33.9)	274 (91.0)	0.064
Male	13 (48.1)	14 (51.8)	27 (8.9)	
Education				
SSLC/ PUC	39 (67.2)	19 (32.7)	58 (19.2)	0.837
Dip in GNM	96 (62.7)	57 (37.2)	153 (50.8)	
Dip Nursing	49 (67.1)	24 (32.8)	73 (24.2)	
BSc Nursing	10 (58.8)	7 (41.1)	17 (5.6)	
Experience (years)				
<= 10	60 (56.6)	46 (43.3)	106 (35.2)	0.013*
11 – 20	64 (62.1)	39 (37.8)	103 (34.2)	
21 – 30	44 (70.9)	18 (29.0)	62 (20.5)	
31+	26 (86.6)	4 (13.3)	30 (9.9)	
Designation				
Staff Nurse	182 (63.8)	103 (36.1)	285 (94.6)	0.638
Junior Health Assistant	8 (72.7)	3 (27.2)	11 (3.6)	
Nursing Superintendent	4 (80.0)	1 (20.0)	5 (1.6)	

*: Indicates significance

Knowledge without action is of no use in biomedical waste management. A study by Rafiq MM et al among nursing staff showed overall knowledge regarding BMW was 80% but only 70% practiced better waste handling similar to this study which showed a wide gap between knowledge and practice with 85% having good awareness and only

64% with healthy practices.⁵ Reasons for this are workload, ignorance, non-availability of all colour bins, no strict actions against those who do not follow the rules, taking nurses on contract basis which leads to lack of commitment to the work.

It was also found that with increase in age and experience there is better handling of BMW which is

similar to the study done in private hospitals at Udupi.⁶ Practice makes man perfect, this is true in waste management. As age and experience increases commitment and responsibility also increases leading to better practices. Nursing staff with diploma in nursing had significantly better knowledge than the nursing staffs with other educational qualification in the above study but such association was not found in the present study. Almost all (98%) had awareness of health hazards caused by BMW but only 68% took proper measures. There again exists a wide gap between knowledge and practice. Staff nurses had better awareness regarding health hazards compared to others and they took better precautions. 70% of them always wore aprons, 30% used gloves and only 10% used masks. 22% of study respondents were not vaccinated for the Hepatitis-B virus similar to the other study. Tetanus vaccination was better (86%) compared to hepatitis-b, similar results were found in a study done by Ismail IM et al.⁷

A cross-sectional study among health care personnel working in different departments of various hospitals in Allahabad showed doctors, nurses, and laboratory technicians have better knowledge than sanitary staff regarding biomedical waste management.⁸ Knowledge regarding the colour coding and waste segregation at source was found to be better among nurses and laboratory staff similar to this study. Regarding practices related to biomedical waste management, sanitary staff were ignorant due to lack of knowledge. The study of health functionaries in all the health centers whether govt. or private (including veterinary centers) of a block showed that segregation of waste, availability of hub cutter/ needle destroyer, disinfection and overall bio medical waste management was better in government centers than private centers.⁹ Among the government centers, this study observed that 69.2% staff nurses were disposing BMW in specified color coded containers which is in common with this study.

Nursing staffs working in Khaja Banda Nawaz Institute of Medical Sciences, Hospital Kalburgi were studied regarding hospital waste management.¹⁰ Results showed majority (78%) had knowledge regarding colour coding, sources of bio-medical waste, steps in its management and diseases transmitted through it, which is better compared to this study and 91% had positive attitude towards biomedical waste management. Among practices 90% are using needle hub cutter for needles and syringes and 84% segregation of bio-medical waste and 81% following personal protective measures at their work place which is also better than this study results. Awareness of undergraduate medical and nursing students about biomedical waste, its hazards and management was assessed and

found that MBBS students had a fairly better awareness regarding the subject than nursing students.¹¹ Almost all study participants were aware about colour coding in segregation of biomedical waste. But only half of them gave correct response about which waste is to be put in which bag.

Another study done by Shafee M et.al showed nurses had better knowledge than the technical and housekeeping staff about categories, segregation and various methods of disposal.¹² The nurses had a better attitude toward implementation of rules, cooperation in programs and practice of separation of wastes and proper disposal compared to technical and housekeeping staff. Similar results were found in another study conducted by Rajput A et al on paramedical staff working in different hospitals of Ujjain city.¹³ Overall knowledge about BMW was found to be better among female nurses in a tertiary care hospital of Gujarat, which is similar to this study.¹⁴ Majority nurses who had attended sessions on BMW management used personal protection equipment.

Awareness and existing practices regarding biomedical waste and its management were assessed in a district of Madhya Pradesh by Bansal M et.al. and analysis showed that almost all the doctors and majority of the paramedical workers were quite aware about hazards, prevention of hazards and handling of biomedical waste while it was least among non-medical workers.¹⁵ Knowledge about color coding and segregation was more among para-medical than medical staff. Many researchers and health care leaders want to measure nurse staffing according to the workload of each nurse, although "workload" does not have an agreed-upon definition. However, many health care leaders prefer to conceptualize workload as a nurse-to-patient ratio, such as "one nurse for every five patients."¹⁶ This is not followed in many health care centres which will lead to increased workload on nursing staff compromising their work. This is also a reason for improper waste management and measures should be taken to reduce the same.

CONCLUSION

Health-care waste workers should be trained before starting work handling waste, and then on a routine basis (e.g. annually) to update their knowledge of prevention and control measures. Training should include awareness rising about the potential hazards from waste, the purpose of immunization, safe waste-handling procedures, reporting of exposures and injuries, preventing infection following an exposure with PEP, and the use of PPE. Lack of awareness about the health hazards related

to health-care waste, inadequate training in proper waste management, absence of waste management and disposal systems, insufficient financial and human resources and the low priority given to the topic are the most common problems connected with health-care waste. Many countries either do not have appropriate regulations, or do not enforce them.

IMPLICATION

Understanding the levels of Knowledge, Attitude and Practice will enable a more efficient process of awareness creation as it will allow the program to be tailored more appropriately to the needs of the community. Following the study, a sensitization program for paramedical staff was conducted in series from the Department of Community Medicine and Hospital Infection committee. Regular teaching and training of medical students, medical and paramedical staffs on biomedical waste management will keep them updated and motivated. The management of health-care waste requires increased attention and diligence to avoid the substantial disease burden associated with poor practice, including exposure to infectious agents and toxic substances.

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