

Research Article

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Assessment of Knowledge, Attitude and Practice of Biomedical Waste Management among Health Care Personnel at El-Mak Nimer University Hospital 2021

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Introduction: Medical waste is generated by healthcare facilities such as hospitals, clinics, blood banks, and laboratories, which may cause infection to any person coming into contact with it. therefore, medical waste can be considered as being of the greatest environmental concern since it can harbor potentially harmful microorganisms and carries the risk of transmission of infections from healthcare facilities to healthcare workers, patients, and general public.

Method: This cross sectional descriptive study was carried out in Almak Nimer University Hospitals - River Nile state -Sudan during the year 2021 with the aim to assess knowledge, attitudes and practices among the health care personnel towards medical waste management. Total 125 respondents were participated in the study; the study uses questionnaires, interviews and observations as tools for data collection. The collected data were analyzed by Software Package for Social Sciences (SPSS) and the result was presented in figures and tables.

Result: A total of 125 subjects participated in this study which included (34 doctors, 56 nurse, 18 lab technician, 17 class IV employees). The study revealed that (96.8%) of the respondents have good knowledge about hazardous waste. (94.4 %) of the respondents have good knowledge concerning waste transmitting diseases. (84.08%) have good attitudes towards BMW ,the study most of participant want to upgrade knowledge of BMW management. about practices (77.6%) wearing personal protective measure while handling BMW during the work .(96%) wash their hands after the work , but only (61%) use drugs for cleaning the hand if injured.

Conclusion: The study revealed that level of knowledge over all (73.5%), there is good knowledge among health worker except class IV which is found to be reasonable. There are reasonable level of knowledge by class IV regarding define color-coding system. The attitude support BMW management is a team work which is found to be good as well as attitude of upgrading knowledge is found to be good. Some of participant had not received vaccination , there is good practice toward handling of BMW as well as have good practice about using special container for disposal.

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Received: July 05, 2022; **Accepted:** July 13, 2022; **Published:** July 18, 2022**Introduction**

Medical waste is generated by healthcare facilities such as hospitals, clinics, blood banks, and laboratories, which may cause infection to any person coming into contact with it. This may consist wholly or partly of human or animal tissue, blood or other body fluids, excretions, drugs or pharmaceutical products, swabs or dressings, syringes, and needles or other sharp instruments. It is waste which unless rendered safe may prove hazardous to any person coming into contact with it [1].

Therefore, medical waste can be considered as being of the greatest environmental concern since it can harbor potentially harmful microorganisms and carries the risk of transmission of infections from healthcare facilities to healthcare workers, patients,

and general public. In order to prevent harmful consequences to the human health, the community, and the environment, proper medical waste management (MWM) is needed, which entails managing waste from their generation, through separation, collection, transport, and treatment, to their final disposal [2].

Biomedical waste if not managed properly can spread highly contagious diseases and damage the environment [3]. Of the total waste generated, 80-85% is general waste which is non-infectious and 15% is infectious and hazardous waste. This infectious and hazardous waste can be harmful for health workers, general public and environment [4]. On an average about 0.33 million tons of hospital waste is generated in India annually and the waste generation rate ranges from 0.5 to 2.0 kg/bed/day. [5]. The

growth of BMW is expected at around eight per cent annually [6]. Improper handling of BMW can spread many diseases but the most dangerous ones are Hepatitis B, Hepatitis C and AIDS and also a cause of water, air and soil pollution [7]. Various studies in the past have shown that health care workers in our country are still not fully aware about proper BMW handling and disposal. This is inspite of the fact that globally there is an increasing awareness about proper BMW handling and disposal [6]. With this background, present study was conducted to understand the level of awareness regarding BMW handling and disposal among health care professionals in our institution and to identify pitfalls in this practice.

Methodology

Study Design

Descriptive, cross sectional study, hospital based

Study Area

Elmak Nimer university hospital built in 2002 year and contains the following department, medicine, surgery, pediatrics, gynecology and obstetrics, urology, dermatology, psychiatrics, ophthalmic, ear nose throat,(ENT), dental unit, radiology, electrocardiography, (ECG), coronary care unit (CCU), intensive care units (ICU), renal dialysis center, and there is cardiac center under building. There are 158 beds in different department and 24 specialist doctors and 124 other staff of hospital including general practitioners, house officers, burses and laboratories, in addition to that they are 61 workers in different department [8-39].

Study period

The study conducted from 18th of September 2021 up to 19th of January 2022.

Study Population

All health care personnel who include doctors, nurses, laboratory technicians and Class IV employees (cleaning workers and supervisors) working in the hospital.

Exclusion criteria: the study exclude consultants because have no direct contact with BMW.

Sampling

Sample Type

Non probability, Convenience sample.

Sample Size

125 (34 doctors, 56 nurse, 18 lab technician, 17 class IV employees).

Sample Technique

Total coverage for target group during data collection duration.

Methods of Data Collection

- Individual interview to the participants.
- Observation method to the hospital.

Tools of Data Collection

Standardize questionnaire which develop base on the relevant literatures. the questionnaire consist of 25 questions in Arabic language including 4 sets of questions concerning the: (1) characteristics of the participants(gender, age, the occupation and length of work in the hospital), (2) knowledge, (3) attitude and (4) practice. Administrated questionnaire deliver by interview to cleaning workers because they were illiterate or had difficulty

reading. Summary sheet that is describe the environment of the hospital.

Data Management

Data was analysis using electronic management SPSS version (20) Data presentation by table and figure.

Ethical Consideration

The research approval has been taken from faculty of medicine, Shendi university, Technical Permission has been taken from hospital manager And Verbal consent has been taken from the study participants.

Reference Management

Manual reference management using Vancouver style.

Result

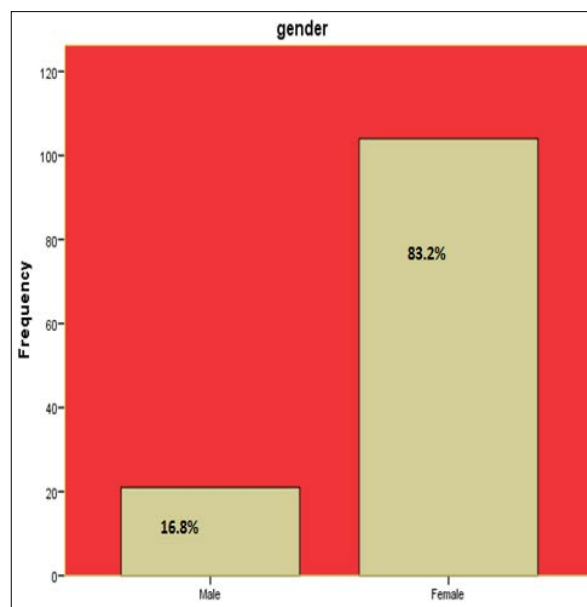


Figure 1: Describe The Gender Distribution of The Participants in The Study

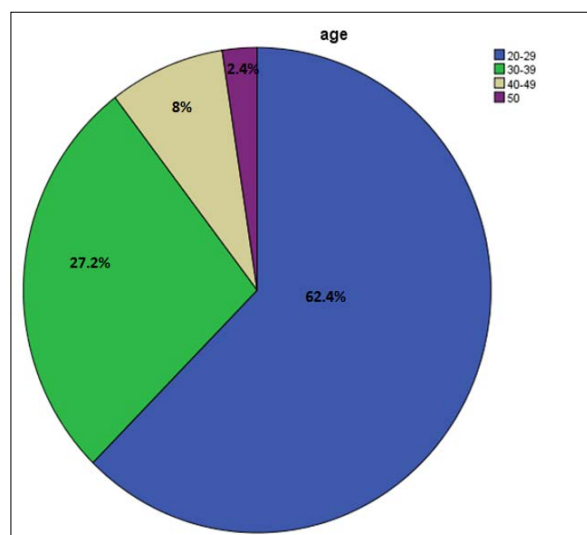


Figure 2: show Age groups distribution among study participants in the study

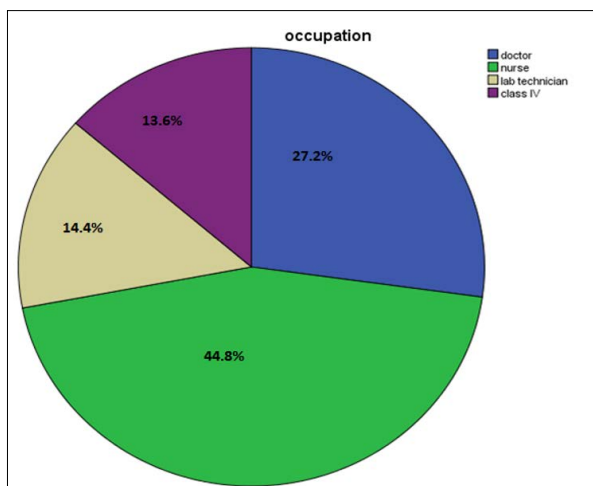


Figure 3: show Occupations distribution of the participants in the study

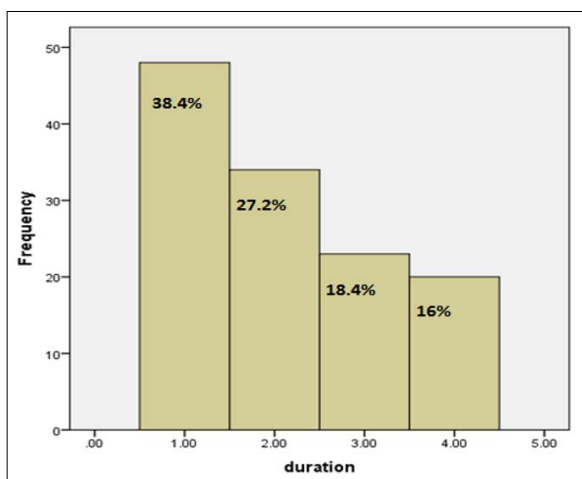


Figure 4: Describe work duration of the participants in the study

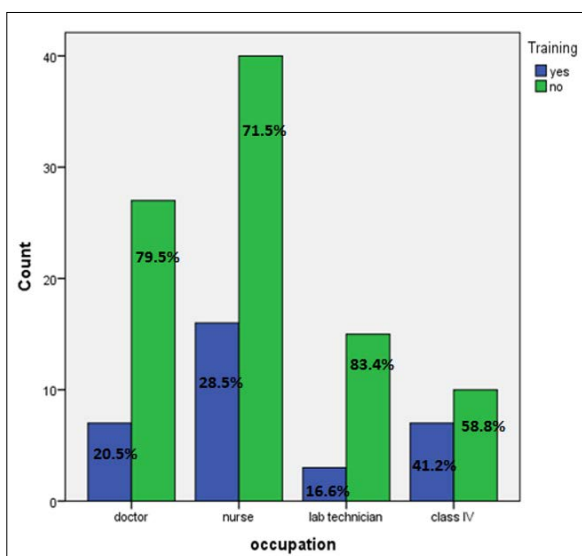


Figure 5: Show the participants whom received training about the BMW

Table 1: Describe Knowledge regarding non hazards BMW

Occupations	Non Hazards like foods and drinks			Total
	yes	no	Unknown	
	N	%		
Doctors	34	100	0	34
Nurses	48	85.7	8	56
Lab technicians	17	94.4	1	18
Class IV	8	44.4	7	17
Total	107	85.6	16	125

Table 2: Describe Knowledge regarding hazards BMW

Occupations	Hazards like blood and excreta of humans			Total
	yes	no	Unknown	
	N	%		
Doctors	34	100	0	34
Nurses	54	96.4	1	56
Lab technicians	18	100	0	18
Class IV	15	88.2	2	17
Total	121	96.8	3	125

Table 3: Show the Knowledge regarding drugs hazards from BMW

Occupations	Hazards like drugs			Total
	yes	no	Unknown	
	N	%		
Doctors	27	79.4	4	34
Nurses	46	82.1	4	56
Lab technicians	9	50	4	18
Class IV	10	58.8	3	17
Total	92	73.6	15	125

Table 4: Describe the Knowledge regarding needle hazards from the BMW

Occupations	Needle			Total
	yes	no	Unknown	
	N	%		
Doctors	34	100	0	34
Nurses	56	100	0	56
Lab technicians	18	100	0	18
Class IV	10	58.8	5	17
Total	118	94.4	5	125

Table 5: Describe the Knowledge regarding Human excreta hazards from BMW

Occupations	Human excreta				Total
	yes		no	Unknown	
	N	%			
Doctors	24	70.5	9	1	34
Nurses	35	62.5	19	2	56
Lab technicians	12	66.6	4	2	18
Class IV	2	11.7	11	4	17
Total	73	58.4	43	9	125

Table 6: Describe the Knowledge regarding food and drinks from BMW

Occupations	Foods and drinks				Total
	yes		no	Unknown	
	N	%			
Doctors	9	24	70.5	1	34
Nurses	10	46	82.1	0	56
Lab technicians	2	16	88.8	0	18
Class IV	8	7	41.1	2	17
Total	29	93	74.4	3	125

Table 7: Describe the Knowledge regarding ampoule of vaccination from BMW

Occupations	Ampoule of vaccination				Total
	yes		no	Unknown	
	N	%			
Doctors	31	91.1	1	2	34
Nurses	54	96.4	1	1	56
Lab technicians	16	88.8	0	2	18
Class IV	12	70.5	2	3	17
Total	113	90.4	4	8	125

Table 8: Describe the Knowledge regarding number of bags should be present in the wall

Occupations	Number of bags in each wall				Total
	1-2	2-3	more than 3		
	N	%	N	%	
Doctors	5	4	25	73.5	34
Nurses	4	8	44	78.5	56
Lab technicians	3	1	14	77.7	18
Class IV	7	8	2	11.7	17
Total	19	21	85	68	125

Table 9: Describe the knowledge about color coding system

Occupations	color of the container				Total
	color		colorless	Unknown	
	N	%			
Doctors	24	70.5	5	5	34
Nurses	37	66.07	10	9	56
Lab technicians	13	72.2	1	4	18
Class IV	10	58.8	5	2	17
Total	84	67.2	21	20	125

Table 10: Describe the knowledge regarding BMW bags

Occupations	Difference between bags of normal and biomedical waste				Total
	yes		no	Unknown	
	N	%			
Doctors	27	79.4	7	0	34
Nurses	50	89.2	5	1	56
Lab technicians	18	100	0	0	18
Class IV	11	64.7	6	0	17
Total	106	84.8	18	1	125

Table 11: Describe the Knowledge regarding if hepatitis caused by handling of BMW

Occupations	Hepatitis				Total
	yes		no	Unknown	
	N	%			
Doctors	34	100	0	0	34
Nurses	55	98.2	1	0	56
Lab technicians	18	100	0	0	18
Class IV	14	82.3	2	1	17
Total	121	96.8	3	1	125

Table 12: Describe the Knowledge regarding if HIV caused by handling of BMW

Occupations	Hepatitis				Total
	yes		no	Unknown	
	N	%			
Doctors	34	100	0		34
Nurses	56	100	0		56
Lab technicians	18	100	0		18
Class IV	15	88.2	2		17
Total	123	98.4	2		125

Table 13: Describe the Knowledge regarding if poisoning caused by handling of BMW

Occupations	Poisoning			Total
	yes	no	unknown	
	N	%		
Doctors	32	94.1	2	34
Nurses	50	89.2	6	56
Lab technicians	13	72.2	4	18
Class IV	15	88.2	2	17
Total	110	88	14	125

Table 14: Describe the Knowledge regarding if injury caused by handling of BMW

Occupations	Injury		Total
	yes	no	
	N	%	
Doctors	34	100	34
Nurses	55	98.2	56
Lab technicians	17	94.4	18
Class IV	15	88.2	17
Total	121	96.8	125

Table 15: Describe the Knowledge if BMW should storage on special place

Occupations	On special place			Total
	yes	no	unknown	
	N	%		
Doctors	27	79.4	6	34
Nurses	54	96.4	2	56
Lab technicians	15	83.3	1	18
Class IV	15	88.2	1	17
Total	111	88.8	10	125

Table 16: Describe the Knowledge if BMW should storage on open and closed to people

Occupations	Open and closed to people			Total
	yes	no	Unknown	
		N	%	
Doctors	8	25	73.5	34
Nurses	6	48	85.7	56
Lab technicians	6	11	61.1	18
Class IV	1	15	88.2	17
Total	21	99	79.2	125

Table 17: Describe the Knowledge regarding storage time of BMW

Occupations	Storage time				Total
	less than one	1-3	more than 3	Unknown	
	N	%			
Doctors	12	35.2	9	5	34
Nurses	24	42.8	10	18	56
Lab technicians	3	16.6	0	1	18
Class IV	6	35.2	10	1	17
Total	45	36	29	25	125

Table 18: Describe the Knowledge regarding burn disposal of BMW

Occupations	Disposal by burn			Total
	yes	no	unknown	
	N	%		
Doctors	25	73.5	3	34
Nurses	44	78.5	7	56
Lab technicians	8	44.4	2	18
Class IV	7	41.1	3	17
Total	84	67.2	15	125

Table 19: Describe the Knowledge regarding disposal of BMW by specialized company

Occupations	Disposal by specialized company			Total
	yes	no	unknown	
	N	%		
Doctors	23	67.6	7	34
Nurses	48	85.7	3	56
Lab technicians	4	22.2	1	18
Class IV	8	47.05	3	17
Total	83	66.4	14	125

Table 20: Describe the Knowledge regarding disposal of BMW by Radiation

Occupations	Disposal by radiation			Total
	yes	no	unknown	
	N	%		
Doctors	17	50	7	34
Nurses	29	51.7	13	56
Lab technicians	1	5.5	4	18
Class IV	2	11.7	6	17
Total	49	39.2	30	125

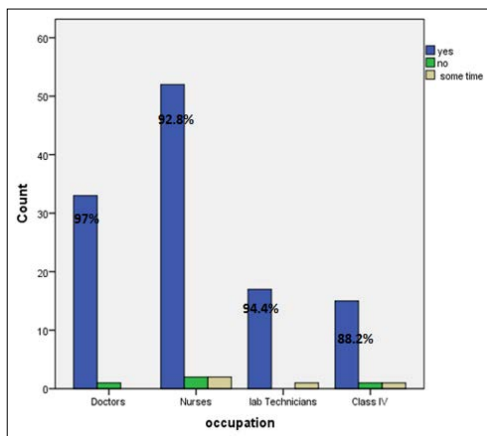


Figure 6: describe the Attitude regarding the importance of proper BMW management

Table 21: Describe the Attitude regarding BMW management is a team work

Occupations	BMW management is a team work			Total	
	yes	no	Some time		
	N	%			
Doctors	33	97.05	1	0	34
Nurses	54	96.4	0	2	56
Lab technicians	18	100	0	0	18
Class IV	16	94.1	1	0	17
Total	121	96.8	2	2	125

Table 22: Describe the Attitude regarding upgrade knowledge of BMW management

Occupations	Upgrade knowledge of BMW Management			Total	
	yes	no	Some time		
	N	%			
Doctors	33	97.05	0	1	34
Nurses	53	94.6	1	2	56
Lab technicians	18	100	0	0	18
Class IV	11	64.7	6	0	17
Total	115	92	7	3	125

Table 23: Describe the Attitude regarding BMW management adds extra burden

Occupations	Management of BMW adds extra burden		Total
	yes	no	
	N	%	
Doctors	19	44.1	34
Nurses	21	62.5	56
Lab technicians	12	33.3	18
Class IV	12	29.4	17
Total	64	48.8	125

Table 24: Describe the Attitude regarding effective BMW management is collective responsibility of each and every health care staff

Occupations	BMW management is collective responsibility		Total
	yes	no	
	N	%	
Doctors	31	91.1	34
Nurses	54	96.4	56
Lab technicians	15	83.3	18
Class IV	12	70.5	17
Total	112	89.6	125

Table 25: Describe the Practices regarding personal protective measure while handling BMW

Occupations	personal protective measure while handling BMW			Total	
	yes	no	Some time		
	N	%			
Doctors	25	73.5	4	5	34
Nurses	47	83.9	0	9	56
Lab technicians	15	83.3	0	3	18
Class IV	10	58.8	1	6	17
Total	97	77.6	5	23	125

Table 26: Describe the Practice regarding Wash the hands after disposal of BMW

Occupations	Washing the hands after disposal of BMW			Total	
	yes	no	Some time		
	N	%			
Doctors	32	94.1	0	2	34
Nurses	54	96.4	0	2	56
Lab technicians	17	94.4	1	0	18
Class IV	17	100	0	0	17
Total	120	96	1	4	125

Table 27: Describe the Practice regarding action following injury by BMW

Occupations	action following injury by BMW				Total	
	less than one	1-3	more than 3	Unknown		
	N	%				
Doctors	12	35.2	9	5	8	34
Nurses	24	42.8	10	18	4	56
Lab technicians	3	16.6	0	1	14	18
Class IV	6	35.2	10	1	0	17
Total	45	36	29	25	26	125

Table 28: Describe the practice regarding Vaccination against diseases caused by BMW

Occupations	Vaccination against diseases caused by BMW		Total	
	yes	no		
	N	%		
Doctors	26	74.4	8	34
Nurses	29	51.7	27	56
Lab technicians	13	72.2	5	18
Class IV	10	58.8	7	17
Total	78	62.4	47	125

Table 29: Describe the Practice regarding disposal of sharps in puncture proof container

Occupations	Disposal of sharps in puncture proof container			Total	
	yes	no	Some time		
	N	%			
Doctors	28	82.3	4	2	34
Nurses	50	89.2	4	2	56
Lab technicians	16	88.8	0	2	18
Class IV	11	64.7	6	0	17
Total	105	84	14	6	125

Table 30: Describe the practice regarding Disposal of sharps in puncture proof container

Occupations	Disposal of sharps in puncture proof container		Total	
	yes	no		
	N	%		
Doctors	10	24	70.5	34
Nurses	5	51	91.07	56
Lab technicians	2	16	88.8	18
Class IV	6	11	64.7	17
Total	23	102	81.6	125

Table 31: Describe the Practice regarding using special container for disposal of BMW

Occupations	Upgrade knowledge of BMW Management			Total	
	yes	no	Some time		
	N	%			
Doctors	30	88.2	1	3	34
Nurses	53	94.6	0	3	56
Lab technicians	13	72.2	0	5	18
Class IV	13	76.4	4	0	17
Total	109	87.2	5	11	125

Discussion

The level of knowledge, attitude and practice has been classified according to score of percentage of the true answer, if less than 33% consider poor, between 34% to 67% consider reasonable, more than 67% consider good.

The study was conducted to assess the knowledge, attitude and practice of biomedical waste management of health personnel. Knowledge level regarding BMW management among doctors, nurses and lab technicians was found to be good (75.1%) (78.8%) (70.3%) as compared to class IV employees (54.3%) in our study as show in table 5:1.

This finding was similar as reported in previous studies [40-42]. This reasonable of knowledge regarding BMW management among class IV employees may be due to the lack of formal training to them. Kapoor et al in their systematic review from dental teaching institutions in his country concluded that level of knowledge in study population regarding BMW was poor and continuous training programs were needed to enhance it [43].

(83%) doctors correctly answered about different BMW categories whereas in a study by Pandit et al none could answer it correctly [41]. Madhukumar et al reported only 3% of participants knew about different healthcare waste categories out of which 62.5% were technicians [44]. (56%) of the study population in a study by Basu et al knew about different BMW categories [45]. In a previous study 76% of study population (junior doctors) knew about different color coded containers for BMW disposal [45] (96%) of the study population in Madhukumar et al study knew about color coding. Deo et al found that only 20% of health staff knew about color coding [46]. In a study from Johannesburg hospital 96% of doctors and nurses knew about color coding but in our study we found (67.2) % of study participants knew about color of BMW bags as compared to (70.5%) of doctors, (66%), (72.2), (58.8%) nurses, lab technicians and class IV employees respectively as show on table 5:1 [47].

Knowledge about diseases transmitted by BMW was good (94.4%) among majority of doctors, nurses and lab technicians and class IV employees in our study as show on table 5:1. This finding was compatible with previous studies except in class IV employees which show poor level of knowledge in that study [40-49]. This exception in our study may be due to high incidence of occurrence in our community. Majority of participants in our study didn't know that BMW should be storage beyond 24 hours only (36%) of participants know that.

In this study all participants except class IV employees was knowledge about various methods of BMW disposal which was similar to the study by Yadavannavar et al [50]. Both Basu et al and Deo et al reported a poor knowledge of BMW disposal in their respective studies [42-46]. Knowledge regarding BMW disposal was found to be poor (33.3%) among class IV employees in the study which is pretty worrying as they are the people responsible for BMW disposal. Attitude of doctors, nurses and lab technicians and class IV employees towards BMW management was found to be good (84.08%) in the study. It was consistent with the findings of Tenglikar et al where they found that attitude of an individual towards any health behavior was directly proportional to knowledge level of that individual [51].

Similar findings were seen in study by Singh et al.[42] Majority of nursing staff (96.4%) realized that BMW management is a team work and it did not create extra burden on their work as seen in study by Malini et al.[45] this good attitude of nurses was also seen in study by Madhukumar et al [44].

What is encouraging to see is majority of health personnel (92%) in present study wanted to upgrade their knowledge on BMW

management seen also in a previous study practice of doctors, nurses and lab technicians and class IV employees towards BMW management was found to be good (81.4) in the study [42]. Two previous study reported that nursing staff practiced BMW management better according to the rules [43,44]. Malini et al similarly established that majority of qualified he Maximum number of health staff followed proper disposal of BMW in specific containers similar to a previous study [40]. Only (51.7%) of nurses and (58.8%) of class IV employees were vaccinated against diseases transmitted by BMW which is reasonable and was similar as reported by Kalia et al previously majority of qualified health professionals followed appropriate BMW management practices during observation noted that there is some defect in the practice of health worker in spite of good level of practices [52].

Table 5.1: Distribution of health care personnel on the basis of knowledge levels regarding bio-medical waste

Knowledge regarding BMW	Doctors N (34)		Nurses N (56)		Laboratory technician N (18)		Class IV Worker N (17)		Total	
	N	%	N	%	N	%	N	%	N	%
Knowledge regarding type of BMW	31	93	50	88	15	81.4	12	64.7	108	86.4
Knowledge regarding categories of BMW	28	83	48	85.2	15	86.1	9	45	100	80
Number of BMW bags in each wall	25	73.5	44	78.5	14	77.8	2	11.8	85	68
Character of BMW bags	24	70.5	37	66	13	72.2	10	58.8	84	67.2
Different between bags of normal waste and BMW	27	79.4	50	89.2	18	100	11	64.7	106	84.8
Diseases cause by BMW	33	98.5	54	96.4	16	91.6	15	86.7	118	94.4
Known the place where BMW storage	27	79.4	54	91	15	83.3	15	88.2	111	88.8
Storage time of BMW	12	35.2	24	42.8	3	16.7	6	35.2	45	36
Identified method of BMW management	20	63.7	40	72	4	24.2	6	33.3	70	56
Total		75.1		78.8		70.3		54.3		73.5

Percentage of knowledge of the participates regarding BMW = 73.5%

Table 5.2: Distribution of health care personnel on the basis of attitude towards bio-medical waste management

Knowledge regarding BMW	Doctors N (34)		Nurses N (56)		Laboratory technician N (18)		Class IV worker N (17)		Total	
	N	%	N	%	N	%	N	%	N	%
Management of BMW properly is an important issue	33	97	52	92.8	17	94.4	15	88.2	117	93.6
BMW management is a team work	33	97	54	96.4	18	100	16	94.4	121	96.8
Upgrade knowledge on BMW management	33	97	53	94.6	18	100	11	64.7	115	92
BMW management adds extra burden	15	44.1	35	62.5	6	33.3	5	29.4	61	48.4
Effective BMW management is collective responsibility of each and every health care staff	31	91.1	54	96.4	15	83.3	12	70.5	112	89.6
Total		85.3		88.5		82.2		69.4		84.08

Percentage of attitude of the participates regarding BMW = 84.08%

Table 5.3: Distribution of health care personnel on the basis of bio-medical waste management practices

BMW management practices	Doctors N (34)		Nurses N (56)		Laboratory technician N (18)		Class IV worker (17)		Total	
	N	%	N	%	N	%	N	%	N	%
Using personal protective measure while handling BMW	25	73.5	47	83.9	15	83.3	10	58.8	97	77.6
Wash the hands after disposal of BMW	32	94.1	54	94.4	17	94.4	17	100	120	96
Vaccination against diseases caused by BMW	26	76.4	29	51.7	13	72.2	10	58.8	78	62.4
Disposal of sharps in punctur proof container	28	82.3	50	89.2	16	88.9	11	64.7	105	84
Using special container for disposal of BMW	30	88.2	53	94.6	13	72.2	13	76.4	109	87.2
Total	82.9		82.8		82.2		72.3		81.4	

Percentage of practice of the participates regarding BMW = 81.4%

Conclusion

This study revealed that doctors(75.1%),nurses(78.8%) and lab technicians(70.3%) had good knowledge (73.5%) there were still some scope of improvement in BMW management which is found to be reasonable on class IV (56.%) knowledge regarding storage time place was poor (36%) among participants. Knowledge of class IV employees (54.3%) towards BMW management was reasonable. The study showed that there is reasonable level of knowledge by class IV toward identify health care waste categories (45%) There are reasonable level of knowledge by class IV regarding define color-coding system (58.8%). The attitude regarding Biomedical waste management it important issues as showed in the study which is good (93.6%) The attitude support BMW management is a team work by percentage (96.8%) which is found to be good as well as attitude of upgrading knowledge is found to be good (92%). Some of participant had not received vaccination only (62%) have vaccinated, there is good practice toward handling of BMW which is found to be (84%) as well as have good practice about using special container for disposal (87.2%). The assessment result show there is good knowledge level (73.5%), attitude level (84.08%), and practices level (81.4%).

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