Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/15656
DOI URL: http://dx.doi.org/10.21474/IJAR01/15656

RESEARCH ARTICLE

EXISTING KNOWLEDGE, AWARENESS AND PRACTICES REGARDING BIOMEDICAL WASTE MANAGEMENT AMONG HEALTH CARE WORKERS WITH ITS EFFECT AT RANI DURGAVATI MEDICAL COLLEGE BANDA (UP) INDIA

(Formerly Government Allopathic Medical College / GAMC Banda (UP) India.)

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Manuscript Info

Manuscript History
Received: 05 September 2022
Final Accepted: 09 October 2022
Published: November 2022

Key words:-
Knowledge, Awareness, Practice, Biomedical Waste Management

Abstract

The Central Government framed certain rules to protect the Environment, namely Bio-Medical Waste Management (BMWM) Rules, 2016, and (Amendment) Rules, 2018. These were an update and simplification of prior existing rules not only for human health and also for safety of environment for the current and future generations. Effective BMWM is not only a legal necessity but also a social responsibility. Common Bio-medical Waste Treatment and Disposal Facility (CBWTF) is a set up where biomedical waste generated from member health care facilities has imparted necessary treatment to reduce adverse effects that this waste may pose on human health and environment. The study was conducted to assess / judge existing knowledge, awareness and practices regarding BMWM among Health care workers at Rani Durgavati Medical College Banda, India. A pre-tested questionnaire based on cross-sectional survey was circulated among various Health care workers / Participants using the questionnaire of BMWM for health care workers of 400 bedded tertiary care teaching Hospital Rani Durgavati Medical College. This questionnaire was distributed among 146 participants/HCWs over a period of one month i.e. from 11th January to 15th February, 2021.

Each questionnaire was composed of four sections/tables:

1. Section A / Table-1 comprised of demographic profile of the subjects
2. Section B / Table-2 comprised of questions to test the Knowledge / Awareness
3. Section C / Table-3 was about the Attitudes and
4. Section D / Table-4 about the practices of BMWM.

The study showed that:

1. The participants scored high on attitude and knowledge about the waste management practices while their scores on the implementation part were comparatively low.

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2. There was a significant difference in relation to educational qualification of respondent in knowledge and practice score.
3. Rani Durgavati Medical College / GAMC Banda lead yearly in proper segregation, treatment and disposal. Our treatment of BMWM increased as gross generation of BMWM decreased significantly in the years2020 and 2021.

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Introduction:-

According to the Bio-medical Waste Management Rules, "Bio-medical waste treatment and disposal facility" means any facility wherein treatment, disposal of Bio-medical waste or processes incidental to such treatment and disposal is carried out and includes common Bio-medical waste treatment facilities. This subject should be taken up at a top priority in view of modern times pandemic e.g., Covid -19 a higher potential Hazardous, infections and injuries. http://www.moef.nic.in/legis/hsm/biomed.html
http://www.healthcarewaste.org/basics/definitions.

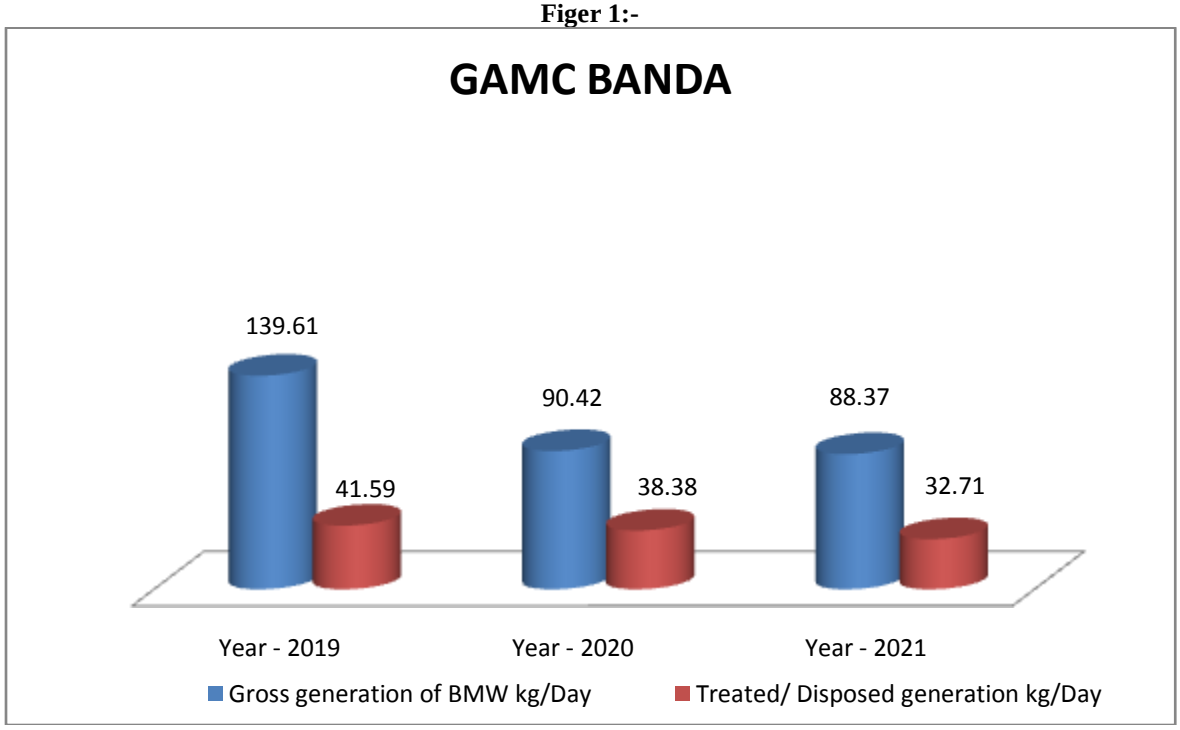
BMW was segregated as per the Schedule-I & II to common BMWT facility for treatment, processing and final disposal and ensuring treatment and disposal of generated bio-medical waste through a CBWTF, located within a distance of 75 KM. http://www.moef.nic.in/legis/hsm/biomed.html & http://www.healthcarewaste.org/basics/definitions.

It is not only the liability of WHO to contain the present pandemic and to prevent any occurrence of such incidence in future, which can affect global health again but also the combined responsibility of all the countries and communities to be vigilant against such recurrence of pandemic or epidemics.

Table 1:- Geographical distribution of BMW Incidence at different Time duration.

Geographic location	**Gross generation of BMW**	**Treated / disposed**	**Year**	**Study**
in India	4,05,702 kg/day	only 2,91,983 kg/day	2011	Centre for Science and Environment. Bio Medical Waste Rules made stringent. Available from: http:/www.cseindia.org/node/3702
Delhi	70 tons/day	10.7 tons/day	In 2013	Delhi Green Blog. Biomedical Waste Management in Delhi: Need of the Hour. Available from: http://delhigreens.com/2013/08/15/biomedical-waste-management-in-delhi-need-of-the-hour
Rani Durgavati Medical College (Formerly GAMC) Banda	139.61 kg/Day	41.59 kg/Day	2019	Star Enterprises Lucknow.
	90.42 kg/Day	38.38 kg/Day	2020	
	88.37 kg/Day	32.71 kg/Day	2021	

Figer 1:-



Study shows that at Rani Durgavati Medical College / GAMC Banda lead yearly in proper segregation, treatment and disposal. Our treatment of BMWM increased as gross generation of BMWM decreased significantly in the years 2020 and 2021 as Health care workers follow the guidelines of segregation, proper treatment and disposal.

Materials and Method:-

A pre-tested questionnaire based cross-sectional survey was done among various Health care workers / Participants of 400 bedded tertiary care teaching Hospital Rani Durgavati Medical College Banda, India. Over a period of one month (from 11th January to 15thFebruary, 2021) through self-distributed pre-tested questionnaire based and randomly distributed to HCWs /Participants which were 146 in number present on the day of data collection were included in the study.

Each questionnaire was composed of four sections / Tables. Section A / Table-1 comprised of demographic profile of the subjects while Section B / Table-2 comprised of questions to test the Knowledge / Awareness, Section C / Table-3 regarding Attitudes and Section D / Table-4 practices of BMWM. The overall response of the participants was graded based on correct responses as: Satisfactory (more than 80%), Intermediate (50–80%) and Unsatisfactory (less than 50%).

Result:-

Response rate was 72.27 (146 of 202). The 146 respondents comprised students of MBBS 2ndYear (62%), and MBBS 3rdYear (82.35%) year. Study showed moderate knowledge about biomedical waste management practice among the health care workers that mean knowledge and attitude score was higher as compared to practices. Significant differences exist in relation to educational qualification of respondent in knowledge and practice score. The study also shows that Rani Durgavati Medical College / GAMC Banda lead yearly in proper segregation, treatment and disposal. Our treatment of BMWM increased as gross generation of BMWM decreased significantly in the years 2020 and 2021.

Section: A / Table-1

GENERAL CHARACTERISTICS OF PARTICIPANTS / RESPONDENTS			
Sr. No.	Parameter	Batch / HCW	
		3rdYear MBBS	2ndYear MBBS

1.	No. of Students in the Batch		Nos. 84/102		Nos. 62/100	
	Participants, No's (%)		84(%)		62(62%)	
			Nos.	%	Nos.	%
2.	Gender	Male	49	58.33	39	62.90
		Female	35	41.66	23	37.09
3.	Age profile	Under 19 yrs.	02	2.38	04	6.45
		19-20 yrs.	18	21.42	12	19.35
		21-22 yrs.	17	20.23	22	35.48
		Above 23 yrs.	47	55.95	24	38.70
4.	Qualification	Intermediate	69	82.14	57	91.93
		Graduation	15	17.85	05	8.06
		Post Graduation	0	0	0	0
5.	Resident	Urban	29	34.52	25	40.32
		Rural	21	25	14	22.58
		Semi- urban	34	40.47	23	37.09

Section A / Table-1;

Section Comprised of demographic profile of the subjects. In all 146 respondents in the study, Ages of the students were in between 18-26 years. Percentage of male participants was 58.33 & 62.90 % for 3rd and 2nd year respectively (Table1). Basic qualification of participants was Intermediate, 82.14% & 91.93%.Participantsof in 3rdyear were from semi-urban background, whereas in 2nd year majority 40.32 were from urban background.

Section: B / Table-2

KNOWLEDGE / AWARENESSBASED QUESTION ON BIOMEDICAL WASTE MANAGEMENT				
S. No.	**Question**	**Response**		**Percentage (%)**
1	Are all healthcare wastes hazardous?	YES	103	70.54
		NO	43	29.45
2	Are you aware that biomedical waste management rules modified in 2016	YES	89	60.95
		NO	57	39.04
3	Can any plastic bag be used for waste disposal?	YES	51	34.93
		NO	95	65.06
4	Have you had any training in biomedical waste management?	YES	86	58.90
		NO	60	41.09
5	Are you aware of IMAGE?	YES	90	61.64
		NO	56	38.35
6	If yes, what does IMAGE stand for?			
	a) Indian Medical Association for Greener Environment.	25		17.12
	b) Indian Medical Association for Go Green Eco friendly	35		23.97
	c) Indian Medical Association Goes Eco friendly	58		39.72
	d) Don't know	28		19.17
7	a) According to the national guidelines, what is the maximum time limit for which biomedical waste can be stored?			
		46		31.50
	b) 24 hours	17		11.64
	c) 72 hours	68		46.57
	d) 48 hours	15		10.27
	e) Don't know			
8	Which of the following is the universally accepted symbol for biohazard?		38	26.02
			108	73.97
9	Do you feel that biomedical waste management should compulsory be		94	64.38

	made part of undergraduate curriculum?		52	35.61

Section: B/ Table-2;

About (70.54%) of the respondents (n=103) considered all health care wastes hazardous. 39.04% of the respondents (n=57) were not aware of the fact that BMW Management rules were modified in 2016. Only 34.93% of the respondents opinioned that any plastic bag can be used for waste disposal, around 59% had received training on BMW management. Only 61.64 % were aware of the IMAGE and of them 39.72 % knew the correct abbreviation of IMAGE. Only 46.57% knew the maximum storage period for biomedical waste according to national guidelines is 48 hours. Around 74% respondents correctly recognized the symbol of biohazard. Around 64% respondents felt that BMW management should compulsory be made part of undergraduate curriculum. In majority of the knowledge related questions significant differences in responses were observed in relation to educational qualification.

Section: C / Table-3

RESPONSE TO ATTITUDE BASED QUESTION ON BIOMEDICAL WASTE MANAGEMENT

S. No.	QUESTION	Response		Percentage(%)
10	Do you agree that biomedical wastes should be segregated into different categories?	YES	126	86.30
		NO	20	13.69
11	Do you think your knowledge regarding biomedical waste management is adequate?	YES	96	65.75
		NO	50	34.24
12	Do you think you require any further training on biomedical waste management?	YES	87	59.58
		NO	59	40.41

Section: C / Table 3;

Contains the responses to attitude-based questions on BMW management. The response showed a favorable positive attitude towards the topic of discussion. No significant differences in response were observed in relation to different groups assessed in this aspect.

Section: D / Table-4

RESPONSE TO PRACTICE BASED ON QUESTION ON BIOMEDICAL WASTE MANAGEMENT

	Question	Response		Percentage(%)
13	Does your institute have tie up with waste management companies?	YES	132	90.41
		NO	14	9.58
14	**Does your institute have incinerator for treatment of biomedical waste management?**	YES	126	86.30
		NO	20	13.69
15	**Do you dispose all kind of waste into general garbage**	YES	26	17.80
		NO	120	82.19
16	**Do you segregate the biomedical waste according to different categories?**	YES	134	91.78
		NO	12	8.21
17	**Where do you dispose cotton, guaze and other items contaminated by blood?**			
	a. Red Plastic Bag	27		18.49
	b. Yellow Plastic Bag	98		67.12
	c. General waste	07		4.79
	d. White container	14		9.58
18	**Where do you dispose pharmaceutical waste?**			
	a. Black Plastic Bag	11		7.53
	b. Red Plastic Bag	22		15.06
	c. Yellow plastic Bag	98		67.12
	d. White container	15		10.27
19	**Where do you dispose waste sharps?**			
	a. Black Plastic Bag	23		15.75
	b. Red Plastic Bag	11		7.53
	c. White container	103		70.54

	d. Yellow Plastic Bag	09	6.16
20	**Where do you dispose excess mercury and mercury contaminated cotton?**		
	a. Drain	34	23.28
	b. General garbage	13	8.90
	c. Plastic Bag	21	14.38
	d. Yellow plastic Bag	78	53.42
21	**How do you dispose the hazardous liquid waste?**		
	a. Drain	13	8.90
	b. General garbage	15	10.27
	c. Chemical treatment and drain discharge	118	80.82
22	**According to modified biomedical waste management 2016, Can biomedical waste cross border for its treatment?**	18	12.32
		128	87.67
23	**Incineration is safe method for treatment of**		
	a. Anatomical waste, animal carcasses & amputated limbs	93	63.69
	b. Microbiological waste	34	23.28
	c. Infected metallic implants	19	13.01
24	**Where do you dispose contaminated glassware & medicine vials**		
	a. Yellow Bag	21	14.38
	b. Red Bag	08	5.47
	c. White container with biohazard label	21	14.38
	d. Blue card board box	96	65.75
25	**Which bag to be used for disposal of gloves?**		
	a. Red Bag	105	71.91
	b. Yellow Bag	27	18.49
	c. Either of two	13	8.90
	d. None	01	0.68
26	**Proper method for needle disposal**		
	a. Recapping	13	8.90
	b. Burning and cutting	89	60.95
	c. Disinfection in sodium hypochlorite	42	28.76
	d. All	02	1.36
27	**Various steps in waste management, reduction Segregation storage transportations and treatment**	CORRECT ANSWER	87%
28	**Inertisation is a process of mixing waste with Cement before disposal of toxic substances**	CORRECT ANSWER	34%
29	**Biomedical waste is treated at 850-2000°C in incinerator**	CORRECT ANSWER	76%
30	**In Indian condition about 1.5-2 kg of waste per bed per day is generated.**	CORRECT ANSWER	65%

Section: D / Table-4;
Section has responses to practice based questions on BMW management. About 90% agreed that the institute in which they are working had a tie up with waste management companies.

Around 14% of the respondents (n=20) were not aware of the fact that **institute has incinerator for treatment of BMW management.** Only 17.8% disposed all waste in general garbage. Only 8.21% were not **segregating the biomedical waste according to different categories.** Majority of the respondents (67%) disposed blood soaked cotton gauze etc. in blue bags, about (67%) disposed pharmaceutical wastes in yellow bags, and 70% disposed sharps in white translucent puncture proof container. About 53% stored the excess mercury & mercury contaminated cotton in glycerin, 81% treated the liquid waste with chemical before discharging into drains. Majority of the respondents (88%) knew that according to modified BMW 2016 rules, hospital waste cannot cross the state border for treatment.

About 64% respondents knew that **Incineration is safe method for treatment of Anatomical waste, animal carcasses & amputated limbs.**

About 66% respondents disposed contaminated glassware & medicine vials in blue card board boxes. Around 72% disposed used gloves in red bags and around61% were aware about the proper method for needle disposal.

87% respondents knew various steps of BMW management according to new Rules. Only 34% were aware how toxic substances are disposed off. 76% knew that **biomedical waste is treated at 850-2000°C in incinerator.**65% respondents had knowledge that in Indian conditions about 2 kg of waste per bed per day is generated. Study showed moderate knowledge about biomedical waste management practices among the health care workers that mean knowledge, attitude scores were higher as compared to practices. Significant differences exist in relation to educational qualification of respondent in knowledge and practice score.

Discussion:-

Healthcareworker's knowledge, practices and skills are essential for reducing healthcare associated infections. It is important to instill adequate knowledge, positive attitudes and good practices at the time of primary care training of the respondents. The study was done to judge basic knowledge, identify gaps in knowledge, attitudes, skills and practices among the respondents. Knowledge being a basic criterion that allows one to earmark between the right and wrong. Attitude accredits to thinking towards a proper situation. Practice means contemplation of rules and knowledge that lead to action. Thus right knowledge, positive attitude and good practices are imperative to guide and serve the patients, Jain M et al. (2010), Sanjeev R et al. (2013).

Environment and Public health knowledge directly or indirectly affect hospitals waste management as well as disposal of a wide variety of drugs such as antibiotics, cytotoxics, corrosive chemicals, radioactive substances. Significant differences exist in relation to educational qualification of respondent in knowledge and practice score.

Study shows that participants have only the basic knowledge on various aspects and skills at health care facility and need further improvement. This can be done by reinforcing training, through observation and by improving the skills. Improper BMWM causes many ills such as inappropriate recycling, unauthorized and illegal re-use.

This will go a long way in preventing noso-comial infections. Biomedical Waste Management (BMWM) is a public health problem. Every hospital generating BMW needs to set up requisite BMW treatment facilities on site or ensure requisite treatment of waste at common treatment facility.

India visualised the need of environmental protection through act (1986) before United Kingdom & United state of America. The Central Government enacted BMW Management Rules 2016, and (Amendment) Rules, 2018, were an update and simplification of BMW Rules not only to human health and safety but also to the environment for the current and future generations. Effective BMWM is not only a legal necessity but also a social responsibility. This article reviews the current perspectives on BMWM rules, conventions and the treatment technologies used worldwide. Furthermore, developing models for the monitoring of hospital health-care waste practices and research into non-burn eco-friendly sustainable technologies, recycling and polyvinyl chloride-free devices will go in long way for safe carbon environment. Globally, greater research in BMWM is warranted to understand its growing field of public health importance.

In this study it is an important observation that about 70.54% (n=103) of the respondents considered all healthcare wastes to be hazardous. It was relatively same in other studies (88.3%), and (60%) conducted in Himachal Pradesh and Delhi respectively. This awareness is the better than the result conducted among other studies in Delhi by Sood et al. (2011).

Only 87% of the respondents were aware of the fact that the Biomedical Waste Management and Handling rules were applicable to them. However studies conducted by Sood et al. (2011) in Delhi, Aradhya Abrol et al. (2019) in Himachal Pradesh, Narang RS (2012) in Amritsar, and Sanjeev R et al. (2014) in Kathamangalam' revealed that the awareness in this regard was72%, 80%, and 70% and 75% respectively.

Only about 34.93of the respondents opinioned that any plastic bag can be used for waste segregation. Other studies e.g. Sood et al. (2011), Aradhya Abrol et al. (2019), Charania Z K et al. (2011), and Sudhir KM (2006) shows 17%, 34%, 28% and 27% respectively.

Current study shows only 41% of the respondents agreed that they have not received any training in biomedical waste management in contrast with the study conducted in Himachal Pradeshwas 20% by Aradhya Abroletal. (2019).

IMAGE is the scheme of Indian medical association Kerala for scientific disposal of biomedical waste. Image provide comprehensive service by providing training to hospital staff for segregation of biomedical waste in color coded bags, collection of it from hospital, transportation in specially designed covered vehicles, scientific treatment and final disposal in the common facility by Sudhir KM (2006).

Current study shows only 62% of the respondents agreed that they have not received any training in biomedical waste management in contrast with the study conducted in Himachal Pradeshwas 20% by Aradhya Abrol et al. (2019).

About 62% were aware about IMAGE However only 40% (n=58) could answer the expansion of the abbreviation IMAGE as Indian Medical Association Goes Ecofriendly. Other study in Himachal Pradesh37% were aware about IMAGE However only 25% (n=30) could answer the expansion of the abbreviation IMAGE as Indian Medical Association Goes Ecofriendly, Aradhya Abrol et al. (2019).

Regarding the maximum time limit for storage of biomedical waste according to national guidelines about 10% not aware of the time limit and about 47% were aware of the fact that it was 48 hours, AradhyaAbrol etal described about 16% participants were not aware of the time limit and 33% were aware of the fact that it was 48 hours, Aradhya Abrol et al. (2019).

In Present study 73.97% participants were aware about the symbol of Biohazards, About 83% of respondents were aware about the symbol of biohazards which is similar to the findings of Madhu Kumar et al. (2006) and Aradhya Abrol et al. (2019).

Regarding Section: C / Table-3 or attitude related questions almost 86% of the respondents opinioned that the biomedical wastes should be segregated into different categories. Only 93% respondents opinioned that the biomedical wastes should be segregated into different categories by Sood et al. (2011) in Delhi, Aradhya Abrol et al. (2019) in Himachal Pradeshand Sanjeev et al (2014) in Kathamangalam.

A very positive attitude towards healthcare waste management is highlighted by the observation that about 66% of the respondent felt that they have knowledge regarding biomedical waste; still 60% of the respondents were interested in receiving further training on the same. This study shows very favorable attitude with no significant relation to educational qualification. About 83% & 75% respectively in Himachal Pradesh, Aradhya Abrol et al. (2019).

Section: D / Table-4 or practice related questions presented a very different picture about 10% respondents were unaware of their institutional tie up with waste management companies. 82% of the respondents disposed all kind of waste into general garbage. This result was in contrast with other study conducted by Aradhya Abrol et al. in Himachal Pradesh where the corresponding figure was 8.3%, 4 %.

More than 67% of the respondents disposed blood soaked cotton gauze and pharmaceutical wastes in yellow plastic bag. This result was in contrast with a study conducted by Aradhya Abrol et al. (2019).in Himachal Pradesh where the corresponding figure was 75%.

About 71% of respondents disposed waste sharps in white container which is 75%, and86% in study conducted by Aradhya Abrol et al. (2019) and G. Bhagawati et al. respectively (2015)

It is an important finding that about 10% of the respondents disposed mercury in general garbage which is 8.3% in study conducted by Aradhya Abrol et al. (2019)

On the other hand about 81% of the respondents were aware of proper disposal of liquid waste and 87% respondents not knew the biomedical waste can't cross the state border which is 54.2% and 87% in study conducted by Aradhya Abrol et al. (2019)

Regarding proper disposal of gloves and needle disposal score was 72% and about 61% respectively. Very few i.e. only 34% of respondents knew about the process of Inertisation which is 70% and 66% in study conducted by Aradhya Abrol et al. (2019)

Conclusions:-

The present study revealed that knowledge and attitude regarding biomedical waste management among healthcare workers / students of the institute was higher as compared to the practice. Biomedical waste management amongst participants can be achieved by conducting awareness programs to reduce the gap of the knowledge, attitude and practice. After following the guidelines of segregation, proper treatment and disposal by Health care workers / study shows that Rani Durgavati Medical College (Formerly GAMC Banda), lead to proper segregation, treatment and disposal.

Our study revealed that although the attitude about biomedical waste management was high among the healthcare workers, but the practice was comparatively low. Although students had satisfactory scores / moderate knowledge, attitude and skills in tertiary care Hospital. The study indicated that there is a need to give structured inputs based on WHO guidelines, to reinforce and subsequently evaluate for creating more awareness among healthcare workers regarding biomedical waste management. To overcome this critical problem this topic should be made a mandatory part of the undergraduate curriculum and also repeated training should be imparted on biomedical waste management.

Present study also shows that proper knowledge and awareness about the BMW rules should be imparted not only to the people who produce the waste but also to the healthcare workers who handle it. There is an urgent need for raising awareness on BMWM among the hospital staff in all health-care setups.

References:-

1. Bio-Medical Waste (Handling and Management) Rules 1998. Available from: http://www.moef.nic.in/legis/hsm/biomed.html
2. Healthcare Waste Management Types of HCW. Proportions and Hazards. Available from: http://www.healthcarewaste.org/basics/definitions
3. Jain M, Sawla L, Mathur A, Nihlani T, Ayair U, Prabu D, Kulkarni S. Knowledge, attitude and practice towards droplet and airborne isolation precautions among dental health care professionals in India. Med Oral Patol Oral Cir Bucal2010; 15:e957-961.
4. Sanjeev R, Suneesh K, Subramaniam R. Knowledge, attitude and practices towards droplet and airborne isolation precautions among dental health care personnel in a dental college in Kothamangalam: A cross sectional study. J Odontol Res2013; 1:30-36.
5. Sood AG, Sood A. Dental perspective on biomedical waste and mercury management: A knowledge, attitude and practice survey. Ind J Dent Res2011; 22:371-375.
6. Aradhya Abrol, Savita Mahajan, Madhu Chauhan, Narender Kumar Awareness and practices regarding biomedical waste management among health care workers in a tertiary care hospital in Himachal Pradesh Indian Journal of Microbiology Research, January March, 2019; i6(l)'-92-96
7. Narang RS, Manchanda A, Singh S, Verma N, Padda S. Awareness of biomedical waste management among dental professionals and auxiliary staff in Amritsar, India. Oral Health Dent Manag 2012; 11: 162-169.
8. Sanjeev R, Suneesh Kuruvilla, Subramaniam R, Prashant PS, Meera Gopalkrishnan. Knowledge, attitude and practices about biomedical waste management among dental healthcare personnel in dental college in Kothamangalam; a cross sectional study. Health Sci 2014; 1(3):JS001I.
9. Charania ZK, Ingle NA. Awareness and practices of dental care waste management among dental practitioners in Chennai City. J Contemp Dental 2011; 1:1.
10. Sudhir KM. Awareness and practices about dental health care waste management among dentists of Davangere City, Karnataka. J of Indian Assoc Public Health Dent2006; 8:44- 50.
11. Bhagawati G, Nandwani S, Singhal. Awareness and practices regarding biomedical waste management among health care workers in a tertiary care hospital. Indian J Med Microbiology 2015; 33(4):580-582.