Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/15933
DOI URL: http://dx.doi.org/10.21474/IJAR01/15933

RESEARCH ARTICLE

AWARENESS ON BIOMEDICAL WASTE MANAGEMENT AMONG DENTAL STUDENTS -A CROSS SECTIONAL QUESTIONNAIRE SURVEY

Shaik Reshma[1], Shaik Arshiya[1], Eswar Prabhath K.[1], Potluri Raja Sekhar[2] and Sanga Ranganath[3]

1. Undergraduate Student, Care Dental College and Hospital, Guntur, Andhra Pradesh.
2. Assistant Professor, Department of Public Health Dentistry, Care Dental College and Hospital, Pothur, Guntur
3. Professor and Head, Department of Public Health Dentistry, Care Dental College and Hospital, Pothur, Guntur.

Manuscript Info

Manuscript History
Received: 25 October 2022
Final Accepted: 28 November 2022
Published: December 2022

Key words:-
Awareness, Biomedical Waste Management, Dental, Survey

Abstract

Introduction: It is known that many countries worldwide have been facing a common problem hazardous to both health and environment of their civilizations is health care waste. Healthcare services involved in serving people has been producing indiscriminate amount of these biomedical waste, which is not a neglecting fact as linked to our current state of the earth which is already facing many risks and disasters in the form of pollution, changes in biodiversity and climatic conditions of it inhabitants .

Objective: With this background in picture, present study was conducted with an objective to assess awareness on biomedical waste management through a knowledge, attitude, and practice questionnaire survey among dental undergraduate students and house surgeons.

Materials and Methods: A cross-sectional questionnaire survey was conducted among the study population in an institution located in Southern part of Andhra Pradesh state. A total of 120 study subjects participated in the survey with earlier consent.

Statistical Analysis: Collected data were tabulated, and interpreted in percentages of observations by using SPSS software version 20.0

Results: From the study, it isrevealed that the knowledge and awareness regarding BMW management was satisfactory among the third year dental students and house surgeons with few lapses observed in the overall training of the students regarding BWM.

Conclusion: The result clearly shows the need for a complete and constant educational programme regarding various medical hazards associated with improper waste management at all levels of the dental curriculum.

Introduction:-

Many industries and manufacturing facilities produce a radical number of wastes on a regular basis during their production process. The same applies to the medical and dental care facilities where a vast amount of material been used on daily basis, which leads to the generation of large amount of hazardous, and non-hazardous waste which may contain different compositions of plastic, glass, latex, metallic instruments, sharps, cotton, gauze and various

Corresponding Author:- Potluri Raja Sekhar
Address:- Assistant Professor, Department of Public Health Dentistry, Care Dental College and Hospital, Guntur, Andhra Pradesh, India -522006.

dental surgical waste containing extracted teeth and soft tissues which are contaminated with body fluids and infection causing microorganisms.

Various studies have shown that waste water produced from dental care facilities contains an elevated concentration of metals of mercury, silver, copper, tin, and zinc which mainly are sources from materials used in placement and removal of dental fillings (mercury, silver, copper, tin, and zinc) and radiological waste containing disposed X-ray fixer solution.[1]

This waste generation has quietly been escalated in the hospitals during the COVID-19 pandemic period which drawn a major attention towards management of the wastes produced from health care facilities, as it is considered to have direct and serious significant health and environmental impact.[2]It is our civic responsibility to address this issue as a public health concern.

As mentioned in the Bio-Medical Waste (Handling and Management) Rules 1998[3] by the Indian government, Biomedical waste (BMW) is defined as "the waste produced during diagnostic process, immunization or treatment of animals or humans or in research activities in the testing or production of biologicals"**.**All these rules and regulations set aside by the national and international regulatory bodies seem to be inappropriate and of no use, if their implementation or execution was not mandatory or appropriately supervised. According to a notification from the Government of India (1998)[4], BMW management is an element of a hospitalsanitation and maintenance duties, along with supervision of activities like collection, transportation, handling, or treatment of waste processing systems.

According to the World Health Organization, 85% of health care waste is basically harmless, 15% is considered infectious or hazardous waste, from which the major contributing sources were hospitals and health care facilities, laboratories, research centers, nursing homes, blood banks, etc. Those of which considerably posing a potential environmental impact. Few reasons assumed by WHO for the failure of waste management are lack of financial and human resources, lack of awareness and inadequate training of health care workers.[5,6]

Though the waste generated in dental setups is basically a subset of all the hazardous BMW, it is in a way producing a deleterious impact on environment. It seems important to know the knowledge and practicing abilities of students regarding biomedical waste management, so the present study was carried out with an objective to assess the knowledge, attitude and practice of biomedical waste management among dental students attending clinical placements in the institution.

Material and Methods:-

Study design and study population characteristics:

Present study was a cross-sectional study based on a self-administered questionnaire conducted among students in a teaching dental institution located in Andhra Pradesh region of India with about 125 study participants. The sample was obtained using convenience sampling technique which included participants those attending and been involved with clinical specialties comprising both undergraduate students and house surgeons. Study was conducted within a period from August 2022 to October 2022.

Inclusion and exclusion criteria:

Those attended the institution and willing to participate voluntarily are included in the study. Those not present during data collection and who were not willing to participate were excluded.

Questionnaire:

Present study questionnaire was adapted from a cross-sectional study conducted by Sanjeev et al[18] and Sharma et al[17] which was pretested for validity before data collection. It constitutes data related to participant's demographic information and three domains of questions pertaining to assess knowledge, attitude and practice of biomedical waste management. It is an open and close ended questionnaire comprising 45 questions under three domains

Data collection:

Upon explaining the purpose of the study, the questionnaire was administered among the study participants and their self-reported responses were collected. Along with that, the researchers noted the average time for each group to complete the questionnaire. The questionnaire was divided into four domains for the convenience, those were the

questions concerned with demographic information like gender, year of study, few questions on knowledge, attitude related and practice of BMW related, with each domain constituting around 10-15 questions. Most of the questions were close-ended with answers were chosen only from the given options like "yes", "no" and "don't know" and these answers were transformed into percentages.

Ethical Considerations
Ethical approval from the present study was obtained from the Institutional Ethics Committee (IEC). Along with that informed consent was acquired from all the study participants before the data collection.

Statistical Analysis:
Collected data was obtained and tabulated using Microsoft Excel Work Sheet and then statistically analyzed using IBM SPSS software version 20.0 (SPSS Inc., Illinois,USA). Descriptive and inferential statistics were performed and the results were expressed in frequencies and proportions. Pearson's Chi-square test was carried out to know the association between categorical variables. An obtained p-value of <0.05 was considered statistically significant.

Results:-

Of the total study sample (n=125), majority of the participants were female (82.4%) compared to males (17.6%) **(Figure.1)**. Detailed distribution of study participants based on their year of study in dentistry was given in **Figure 2,** where it can be seen that there were not much differences found in relation to the proportion of students in each study group.

When the comparisons were made in relation to the responses of the study participants regarding the knowledge on biomedical waste (BMW) management (**Table.1)**,it was observed that majority respondents in third year and house surgeons had excellent knowledge regarding proper management of BMW, which can be witnessed from the cumulative proportion of respondents giving correct/yes responses to the questions. Of total 125 respondents, 45 (36%) of the subjects agreed that all health care wastes were hazardous and majority participants (95%) felt that BMW applies for dentists. 77.4% participants reported that they didn't had any training in BMW management previously, which is highly statistically significant (P=0.000), this can be known by looking at the higher proportion of participants not knowing about the term 'IMAGE' (Indian Medical Association Goes Eco-friendly), which is a comprehensive scheme developed by Indian Medical Association to execute the biomedical waste disposal phenomenon. A higher proportion (89.6%, P=0.002)) of respondents knows the universally accepted biohazard symbol. Maximum participants didn't know about the agencies that regulate, monitor or authorize health care waste.

Table.2. describes the study year wise distribution relating to the correct attitude toward hospital waste management. The results obtained were in favor of biomedical waste management in all the three study groups and also were quite similar kind of responses in relation to majority of attitude related questions. There are differences only related to two questions, which is when the participants were asked about whether they have adequate knowledge on BMW, there is difference in the response between all three groups, mainly between third year and house surgeons groups.

When comparisons were made related to practice of BMW management **(Table. 3)** 84.8% subjects mentioned that they segregate waste into different color coded bins, which when they were asked about exact color coded bins as per regulations, then only few proportion of respondents answered correctly. Only 30.4% of them mentioned that they dispose collected waste sharps in heavy duty transparent plastic container. Response toward practices of BMW management has been illustrated in **Table 3**.

Discussion:-

Health care wastes have been the most concerning problem over the decades around the world in recent days, in which dental waste is also a subset of hazardous biomedical (BM) waste. It includes various materials like cotton, sharps, extracted teeth,which are usually contaminated with body fluids like blood and saliva and used x-ray solutions etc. These health care wastes were not only detrimental to the health of the people who comes in contact, but also have an impact on man's environment.[6]

Figure 1:- Distribution of study participants based on their gender

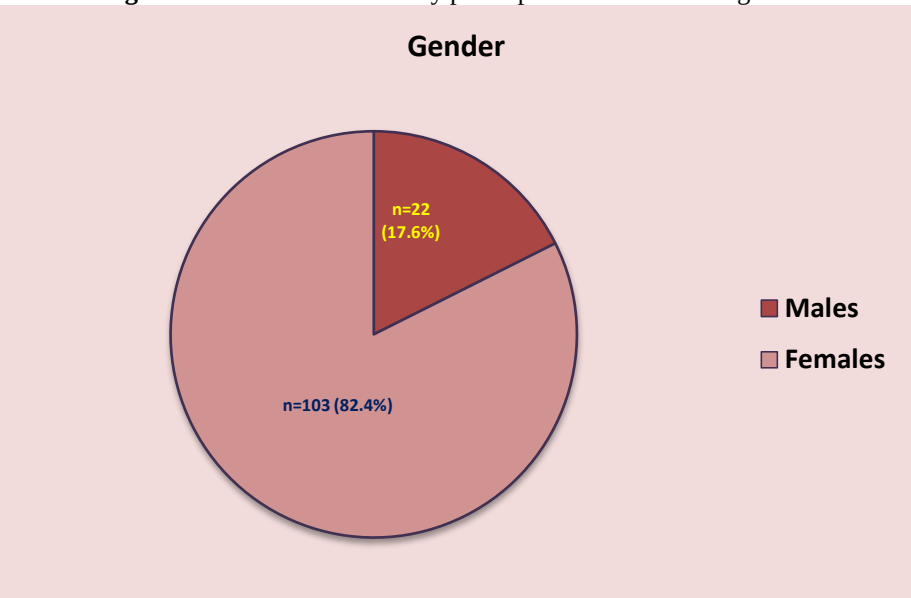
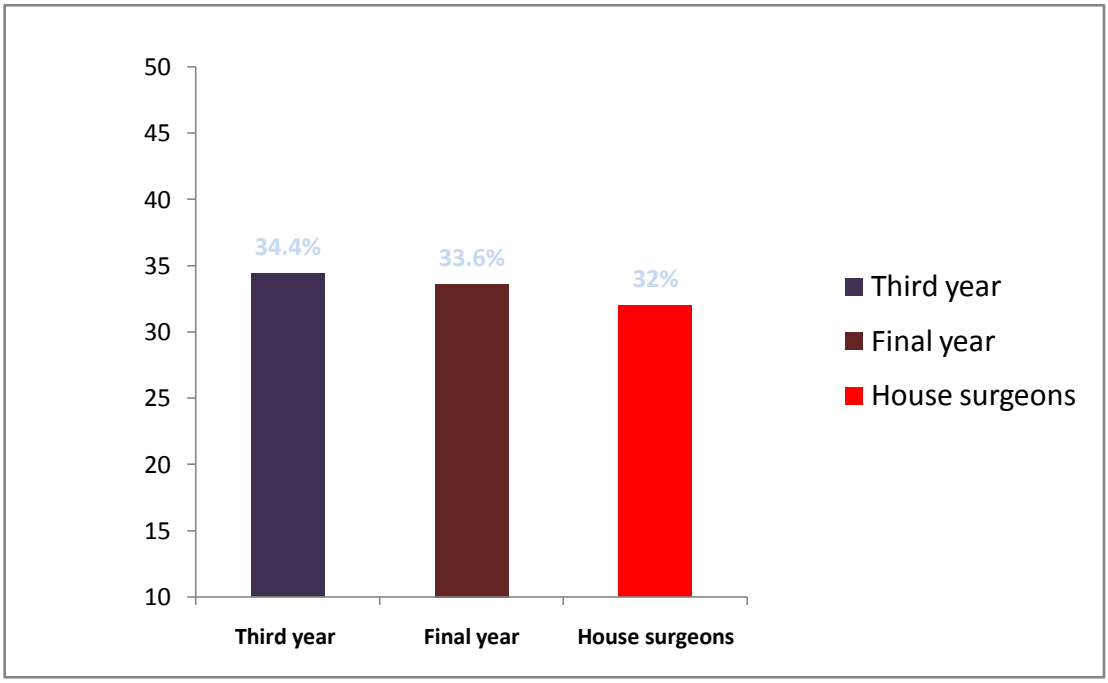


Figure 2:- Distribution of study participants based on their year of study.



In the present study where the participants were assessed for knowledge, attitude, and practice of BMW management, it isrevealed that the knowledge and awareness regarding BMW management was satisfactory among the third year dental students and house surgeons, whereas in a study conducted by H. G. Shah et al. (2015)[8], it wasfound that all the three groups of participants have good knowledge regarding BMW management, thus raising a question on why the final year students were not up to the standard compared to their counterparts. This result thereby necessitates the need for conducting CDE (continuing dental education) programs in order to provide a constant measure of imparting and creating awareness on BMW, as this programs proven helpfulin bringing about a change in the management of healthcare waste, as observed from the previous research by S Mahajan et al. (2020)[9] in which attendance of CDE programs resulted in increased awareness and better practice of waste disposal.

Table 1:- Comparison of Knowledge domain among the study groups (n=125).

S.No	Knowledge Questions	Response	3rd Year	4th Year	House surgeons	Total	P Value
1.	All health care wastes were hazardous	Yes	21	15	19	55	0.740
		No	21	25	19	65	
		Don't know	2	2	1	5	
2.	Biomedical waste management applies for dentists	Yes	41	42	36	119	0.200
		No	3	-	3	6	
		Don't know	-	-	-	-	
3.	plastic bag can be used for waste disposal	Yes	10	12	7	29	0.488
		No	34	29	32	95	
		Don't know	0	1	0	1	
4.	Have you had training in biomedical waste management?	Yes	4	3	17	24	0.000*
		No	39	37	22	98	
		Don't know	1	2	0	3	
5.	Are you aware of IMAGE?	Yes	9	2	18	29	0.000*
		No	29	29	20	78	
		Don't know	6	11	1	18	
6.	If yes, what does IMAGE stand for?	Correct	1	0	17	18	0.000*
		Incorrect	13	12	10	35	
		Don't know	30	30	12	72	
7.	According to national guidelines, what is the maximum time limit for which biomedical waste can be stored before disposal?	Correct	7	0	1	8	0.012*
		Incorrect	13	12	17	42	
		Don't know	24	30	21	75	
8.	Are you aware of amalgam separators?	Yes	33	32	26	91	0.240
		No	11	7	12	30	
		Don't know	0	3	1	4	
9.	Which one of this is universally accepted symbol of biomedical hazards?	Correct	33	42	37	112	0.002*
		Incorrect	9	0	2	11	
		Don't know	2	0	0	2	
10.	Do you know BM waste generation and disposal legislation?	Yes	22	11	17	50	0.074
		No	21	26	21	68	
		Don't know	1	5	1	7	
11.	Does any agency regulates wastes generated at health care facilities?	Yes	38	34	28	100	0.550
		No	2	3	3	8	
		Don't know	4	5	8	17	
12.	A separate permit is needed to transport BM waste?	Yes	39	37	33	109	0.540
		No	4	2	5	11	
		Don't know	1	3	1	5	
13.	Do you know who regulates safe transport of BM waste?	Yes	7	4	7	18	0.398
		No	36	34	31	101	
		Don't know	1	4	1	6	
14.	Are you aware of agencies authorized by the government to collect waste from health care facility?	Yes	21	16	17	54	0.377
		No	21	23	16	60	
		Don't know	2	3	6	11	

For the considerable management of hospitalwaste it is required that the health care personnel should hold positive attitudetowards the care of the environment, occupational health and safety. Hospital waste management and BMW management has major attitudinal and behavioral components[10], which is exactly matching with the present study where the responses obtained from the study participants related to the attitude domain were found in favor of the BMW management.

Findings from the present study shows that segregation of waste is an important step in the BMW management chain, where 84.8% study subjects mentioned that they do segregate the waste into different color coded bins. These findings were in accordance with a study conducted by Rajiv Saini et al. (2013)[11], where majority (94%)participants believed that segregation is a crucial step in waste management procedure.

Table 2:- Comparison of Attitude domain among the study groups (n=125).

S.No	Attitude questions	Responses	3rd year	4th year	House surgeons	P value
1.	Biomedical waste should be segregated in different categories?	Yes No Don't know	43 1 -	39 3 -	38 1 -	0.442
2.	Do you feel BMW should compulsorily be made part of dental curriculum?	Yes No Don't know	43 1 -	41 1 -	35 4 -	0.158
3.	Do you think you have adequate knowledge on biomedical waste management?	Yes No Don't know	21 23	9 33	25 14	0.000*
4.	Do you think it is necessary to know the BM waste generation, hazards and legislation?	Yes No Don't know	42 1	42 0	39 0	0.442
5.	Biomedical waste management increased the financial burden of the hospital	Yes No Don't know	15 28 1	12 29 1	9 29 1	0.874
6.	Self-management of health care waste is an extra work	Yes No Don't know	11 33 0	6 35 1	14 25 0	0.147
7.	Do you think your college should organize separate classes or a continuing dental education program through BM waste management?	Yes No Don't know	42 2 0	38 2 2	37 2 0	0.401
8.	Will you like to attend programs that enhance and upgrade your knowledge about waste management?	Yes No Don't know	33 11 0	36 3 3	28 11 0	0.019
9.	Do you think that infectious waste should be sterilised before disposal?	Yes No Don't know	35 7 2	21 20 0	27 5 7	0.000*
10.	Do you think treatment plant should be set up for treating contaminated water?	Yes No Don't know	37 6 1	36 3 3	37 0 2	0.151
11.	It is important to report to pollution control board about an institution which is not complying with waste management regulations?	Yes No Don't know	40 3 1	39 1 2	38 1 0	0.499
12.	Do you think labelling of a biomedical waste container necessary?	Yes No Don't know	42 2 0	40 1 1	36 0 3	0.218

Table 3:- Comparison of Practice domain among the study groups (n=125).

S.No	Practice Questions	Responses	3rd Year	4th Year	House surgeons	P Value
1.	Does your institute have tie up with any waste management companies?	Yes No Don't know	16 28 0	29 7 6	21 12 6	0.000*
2.	Do you dispose all kinds of waste into general garbage?	Yes No Don't know	17 27	2 40	14 25	0.000*
3.	Do you segregate biomedical waste?	Yes No Don't know	38 6 0	36 4 2	32 7 0	0.281
4.	Where do you dispose cotton, gauze and other items contaminated by blood?	Correct Incorrect Don't know	3 28 13	6 29 7	33 4 2	0.000*
5.	Where do you dispose pharmaceutical waste?	Correct Incorrect Don't know	15 19 10	7 20 15	9 22 8	0.233
6.	Where do you dispose waste sharps?	Correct Incorrect Don't know	4 27 13	7 20 15	27 8 4	0.000*

7.	**Where do you dispose excess mercury and mercury contaminated cotton?**	**Correct** **Incorrect** **Don't know**	**2** **17** **25**	**1** **19** **22**	**2** **11** **26**	**0.601**
8.	**How do you dispose hazardous liquid waste?**	**Correct** **Incorrect** **Don't know**	**3** **15** **26**	**1** **10** **31**	**6** **9** **24**	**0.172**
9.	**Do you follow colour coding for BM waste?**	**Yes** **No** **Don't know**	**33** **8** **3**	**35** **5** **2**	**36** **3** **0**	**0.282**
10.	**How do you discard used developer and fixer solution?**	**Correct** **Incorrect** **Don't know**	**9** **6** **29**	**2** **13** **27**	**18** **5** **16**	**0.000***

The present educational curriculum mainly focusing more on theoretical practices of the waste management, rather than the actual practice of waste disposal,[12] which is imperative and clinically relevant for the health care personnel to know its importance and act upon.

A study conducted by Priyaranjan et al. (2019)[13] showed that there was a very high difference between knowledge and practice of dental professionals regardingwaste management, whereas in the present study the responses state a better knowledge and practice of BMW management among the study participants.

A systematic review conducted by D Kapoor et al. (2014)[14], found that knowledge and awareness level of dental students was inadequate and there is considerable variation in practice and management regarding BMW as noticed from a vast number of research studies, as is the same outcomes were observed in the present study. While all the findings were a bit disappointing, there is one thing in the present study that can be compared to a tail drop in the sky is that, a phenomenally higher proportion (89.6%, P=0.002)) of respondents were aware of the universally accepted biohazard symbol, which is similar to a study conducted by Naidu et al. (2019).[15]

As reported in the study conducted by Manchanda K et al (2015)[16], that there were few limitations based on self-administered questionnaire that may present with over and under reporting along with occurrence of recall bias, present study did not face any such challenges and also no such limitations that affected the overall research process in any step along the way.

It is recommended that an effective and safe management of biomedical waste is not only a curricular or legal activity but should be implemented and continuously looked upon while paying attention to its role in environment and the sustenance of human life. Thus the present study recommends as mandatory that an effective training program to be provided to understand and act upon the existing gaps and shortagesin the health care personnel knowledge, attitude and practices toward hospital waste management.

Conclusion:-

As the present study focused mainly on the knowledge, attitudes and practices of the dental students about the biomedical waste management, the response obtained shows that overall there is inadequate training and practice of biomedical waste management among the study groups. This makes evident that there is a necessity in the dental curriculum to craft certain changes which give importance and provides regulations for proper education and practice of biomedical waste management in every year of their clinical attendance. This can be successfully achieved with the help of regulatory bodies, policy makers and the health care professionals.

References:-

1. Environmental Regulations and Best Management Practices. Available from: http://www.crd.bc.ca [Last accessed on 2022 Oct 11]
2. Farmer GM, Stankiewicz N, Michael B, et al. Audit of waste collected over one week from ten dental practices: A pilot study. Aust Dent J 1997;42(2):114–117
3. Government of India. Biomedical waste rules (The Gazette of India. Ministry of Environmental and Forest, 1988.
4. Government of India, Ministry of Environment and Forests. Bio-medical Waste (Management and Handling) Rules.Gazette of India; 1998. Available from: http://envfor.nic.in/legis/hsm/bio-med.html

5. World Health Organization- Health care waste. https://www.who.int/news-room/fact-sheets/detail/health-care-waste (Last accessed on 12 November 2022)
6. Indhulekha V, Ganapathy D, Jain AR. Knowledge and awareness on biomedical waste management among students of four dental colleges in Chennai, India. Drug Invention Today. 2018 Dec 1;10(12):32-41.
7. N. Ashikariswana et al. Knowledge and attitude in regards to dental care waste management amongst dental students-Questionnaire study. J. Pharm. Sci. & Res. Vol. 8(9), 2016, 1070-1072
8. Shah HG, Parikh M, Mehta I, Nair M, Desai P, Sodani V. Knowledge, attitude and practices of interns, graduates and postgraduate students at private dental colleges in Ahmedabad regarding bio medical waste management. J Adv Oral Res 2015;6(1):25-28.
9. Surabhi M, Shivakumar K.M, Vidya K. Knowledge, attitude and practices of biomedical waste management among dental practitioners in Karad City, Maharashtra, India. Indian Journal of Public Health Research & Development, January 2020, Vol. 11, No. 01
10. Rasheed S, Iqbal S, Baig LA, Mufti K. Hospital waste management in the teaching hospitals of Karachi. J Pak Med Assoc 2005;55:192-5.
11. Rajiv Saini et al. Knowledge of biomedical waste management among the students of rural dental college, Maharashtra, India. International Journal of Experimental Dental Science, January-June 2013;2(1):24-26.
12. Puri S, Smriti K, Pentapati KC, Singh R, Vineetha R, Tamrakar A. Assessment of awareness about various dental waste management practices among dental students and practicing clinicians. PesquisaBrasileiraemOdontopediatria e ClínicaIntegrada. 2020; 13;19.
13. Priyaranjan, Mago HS, Pandey S, Mishra A. Awareness of Dental Health Care Waste Management among Dentists- A Cross Sectional Study. J Adv Med Dent Scie Res 2019;7(10): 73-76.
14. Daljit Kapoor, AshutoshNirola, Vinod Kapoor, Ramandeep-Singh Gambhir. Knowledge and awareness regarding biomedical waste management in dental teaching institutions in India- A systematic review.JClinExp Dent. 2014;6(4):e419-24
15. Naidu SG, Reddy VC, Kumar RV, Sudhir KM, Srinivasulu G, Athuluru D. Dental health-care waste management among dentists of Nellore City - A cross-sectional study. J Indian Assoc Public Health Dent 2019;17:136-40.
16. Manchanda K, Fotedar S, Dahiya P, Vats A, Sarkar AD, Vats AS. Knowledge, attitude, and practices about biomedical waste management among dental healthcare personnel in dental colleges in Himachal Pradesh: A cross-sectional study. SRM J Res Dent Sci 2015;6:166-9.
17. Sharma A, Sharma V, Sharma S, Singh P, Awareness of biomedical waste management among health care personnel in Jaipur, India. Orla Health Dent Manag 2013;12:32-40.
18.Sanjeev R, Kuruvilla S, Subramaniam R, Prashath PS, Gopalakrishnan M. Kowledge,attitude, and practices about biomedical waste management among dental healthcare personnel in dental colleges in Kothamangalam: A cross-sectional study. HelathSci 2014;13:1-12.