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Knowledge, Attitude and Practice Based Survey Study on Biomedical Waste Management

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ABSTRACT: Introduction: On a daily basis, the biomedical waste that is generated is immense and contains infectious & hazardous materials. Inadequate and inappropriate knowledge of handling and disposal of biomedical waste may lead to serious health complications.
Aim and Objectives: The aim of this questionnaire based survey study is to assess the awareness among undergraduates, postgraduates and faculties of a dental college in Moradabad (U.P) on the basis of knowledge, attitude and practice regarding the biomedical waste management.
Materials and Method: A Self-administered questionnaire, composed of 23 questions was designed. The study population comprises of 249 randomly selected participants BDS-3rd Year Students(69), BDS-Final Year Students(40), Interns(40), Postgraduates(55), Faculties(45) of a Dental College in Moradabad (U.P)
Result: It was revealed on the basis of knowledge, attitude and practice that the awareness was more desirable among the Faculties when compared to undergraduate and postgraduate students (Faculties < Postgraduates <Interns <BDS Final Year < BDS 3rd Year)
Conclusion: Even though Faculties, Postgraduates and Undergraduates have knowledge about the waste management but there exists a lacuna in practice and attitude, therefore workshops and trainings related to biomedical waste management would be a step forward towards attaining a healthy environment for the future.
Keywords: Biomedical Waste, Dental professionals, Knowledge, Practice

I. INTRODUCTION

According to WHO, The term biomedical waste(BMW) is a waste generated during diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining thereto, or in the production and testing of biologicals. Dental waste is a subset of hazardous biomedical waste. Dental practices generate a large amount of plastics, sharps, infected plaster of paris/stone casts, extracted teeth and much of which may be contaminated with body fluids. India was one of the first country to implement Biomedical waste (management and handling) rules in 1998 (amended as draft in 2003, 2011) under Environment Protection Act (EPA), 1986.[1]The Ministry of Environment Forests and Climate Change, Government of India, notified the Biomedical waste (management and handling) Rules, 2016 on 28th March 2016, under the provisions of EPA, 1986.[3] These rules are intended to fill up the gaps in the old rules to regulate the disposal of various categories of Biomedical waste. However, only the introduction of these laws are not sufficient until there is proper implementation and awareness.[2] Hospitals, clinics, healthcare institutes, laboratories, blood banks, veterinary hospital and institutes are all capable of generating biomedical waste.

Medical care plays an important part of life and health, but the wastes that are generated from it can pose a serious threat to the environment as well as the public in general. It requires specific treatment and management prior to its safe disposal. The severity of the threat is further compounded by high prevalence of diseases such as HIV and Hepatitis. The healthcare workers, community and environment will be directly impacted if the biomedical wastes are not correctly disposed. It is important that health care units take utmost care in handling, treating, and disposing of biomedical waste.[4] The biomedical waste should not be mixed with other waste hence, segregation of waste plays a predominant role. 'The color coded segregation system should be positioned in the point of generation and BMW should be segregated at the point of generation."Though, there has been an increased global awareness among health professionals about the various hazards and adequate management techniques, but due to lack of implementation the final outcome has been unsatisfactory. It has also been observed

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that in various teaching institutes, the bio medical waste management is not being implemented strictly. Looking into the existing scenario across various teaching institutes in the country, it was thought of to conduct a survey study to assess the awareness among undergraduates, postgraduates and faculties of a Dental College in Moradabad (U.P) on the basis of knowledge, attitude and practice regarding biomedical waste management.

II. MATERIALS AND METHOD

A predesigned, self-administered questionnaire was distributed among the students and faculties in a dental college. The survey had a total of 23 questions based on knowledge, attitude and practice towards biomedical waste management. A total of 204 students and 45 of faculty participated in the survey. The confidentiality of all the participants was maintained. The Likhert Scale was used for scoring the questions and the percentage response was obtained and the data was calculated.

III. RESULT

All the survey sheet answers were tabulated and statistically analyzed by frequency distribution test. The frequency distribution test was analyzed for knowledge, attitude and practice with respect to all the categories and the following results were obtained. A total of 32.53% of boys and 67.46% of girls had participated.The percentage of undergraduate students were 60% and the postgraduates were 22% and faculty were 18% participated in the study. The demographic analysis showed that the study population was between the ages of 20-50years.

a)KNOWLEDGE BASED

On the basis of knowledge69.81% of 3rd years, 74.17% of final years, 78.75% of interns, 80% of postgraduates & 87.04% of the faculty were aware of when the biomedical waste (Handling & Management) rules were first proposed and whether there any guidelines laid down by government of India. The same amount of percentagewas also aware of the bio-hazard symbol andif the waste needs to besegregated. The order of awareness in percentage regarding knowledge based was Faculties firstfollowed bypostgraduate students,then by Interns followed by BDS Final Year and finally the BDS 3rd Year as shown in Table-1

Knowledge based										
Categories	Total number of individuals	Questions						Total number of correct answers	Total number of questions asked	Percentage of correct answers
		Q-5	Q-6	Q-7	Q-8	Q-9	Q-12			
BDS 3rd years	69	67	49	45	30	63	35	289	414	69.81
BDS Final Year	40	35	29	26	18	40	30	178	240	74.17
Interns	40	40	30	24	24	40	31	189	240	78.75
Postgraduates	55	52	46	50	34	54	28	264	330	80
Faculty	45	40	30	43	34	45	43	235	270	87.04

TABLE-1 Participants knowledge regarding biomedical waste management

b) PRACTICE BASED

When it comes to the practice, only 42.6 of BDS 3rdyears, 49% of BDS final year, 40.5% of interns, 56% of postgraduates and 75.43% of faculty were aware that waste should not be stored beyond 48 hours, and if there is any waste disposal policy in their hospital. It was also observed that the same amount of percentage which was not very encouraging among both undergraduate and postgraduate students knewabout the correct disposal of the type of waste in their respective color-coded bags. In the practice based evaluation it was observed that the Faculties were aware followed by Postgraduate students, then by BDS Final Year students, followed by Interns and finally the BDS 3rd Year as seen in Table-2

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 449-456 www.ijdmsrjournal.com ISSN: 2582-6018

TABLE-2Participants practice regarding biomedical waste management

Practise based														
Categories	Total number of individuals	Questions										Total number of correct answers	Total number of questions asked	Percentage of correct answers
		Q-10	Q-11	Q-13	Q-14	Q-15	Q-16	Q-17	Q-18	Q-19	Q-20			
BDS 3rd years	69	37	62	64	20	24	5	34	6	2	40	294	690	42.61
BDS Final Year	40	20	39	40	8	14	7	26	1	13	28	196	400	49
Interns	40	22	40	40	3	8	1	24	0	5	19	162	400	40.5
Postgraduates	55	38	45	51	26	15	22	38	10	20	43	308	550	56
Faculty	45	34	45	45	34	37	31	34	7	33	41	341	450	75.78

TABLE-2Participants practice regarding biomedical waste management

c) ATTITUDE BASED

When it came to the general attitude60.39% of BDS 3rd Year, 71.67% of BDS final year, 73.33% of interns, 73.94% of postgraduate, 92.59% of faculty knew that how often should there be collection of biomedical waste from the hospital.The participants also agreed that segregation of waste is not an extra burdenand also a large number of participants agreed that there should be more regular educational programs on biomedical waste management. In general attitude towards waste management the results showed that faculties had the right attitude followed bypostgraduate students, then by interns and BDS 3rd Year students and finally BDS final year students as shown in Table-3

Attitude based							
Categories	Total number of individuals	Questions			Total number of correct answers	Total number of questions asked	Percentage of correct answers
		Q-21	Q-22	Q-23			
BDS 3rd years	69	17	56	52	125	207	60.39
BDS Final Year	40	13	35	38	86	120	71.67
Interns	40	16	35	37	88	120	73.33
Postgraduates	55	27	46	49	122	165	73.94
Faculty	45	35	45	45	125	135	92.59

TABLE-3 Participants attitude regarding biomedical waste management

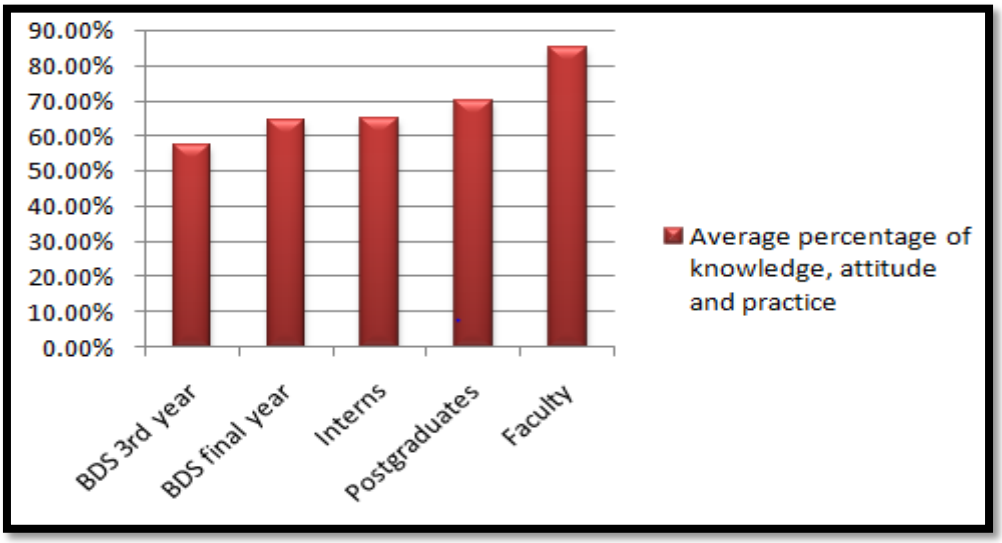
OVERALL ANALYSIS

Overall Survey Analysis					
Categories	Total number of individuals (N)	Knowledge based (%)	Practise based (%)	Attitude based (%)	Overall percentage (%)
BDS 3rd years	69	69.81	42.61	60.39	57.60%
BDS Final Year	40	74.17	49	71.67	64.19%
Interns	40	78.75	40.5	73.33	64.94%
Postgraduates	55	80	56	73.94	69.98%
Faculty	45	87.04	75.78	92.59	85.13%

TABLE 4- Overall Analysis

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 449-456 www.ijdmsrjournal.com ISSN: 2582-6018

Analysis of data revealed that the study participants had knowledge regarding the waste management but they lacked in practice and attitude towards waste management. When mean average was derived for the various categories it was observed that the BDS 3rd Year had an overall analysis of only 57.6% which was the least among all the categories. The interns and final year overall analysis were 64.9% and 64.1 % respectivelyand it was not significantly different. The postgraduate students had an overall analysis of 69 % which was mildly higher when compared to final BDS students and interns but still not very significant. The postgraduate overall percentage when compared to BDS 3rd Year was significantly different. The faculty had an overall percentage of 85% which was much higher when compared to both the postgraduate and undergraduate students. The overall percentage of the faculty was significantly higher when compared to all the other categories as observed in Table-4,Graph-1.

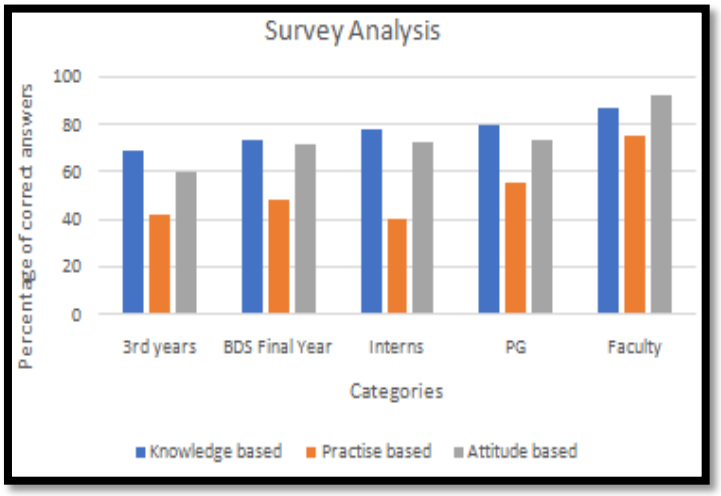


GRAPH 1- Average percentage on the basis of knowledge, attitude and practice

IV. DISCUSSION

The questionnaire study was choosen as it allows to collect the information and data from a large number of respondents rather quickly. The participants were choosen randomly from the dental college in Moradabad(U.P),India. Result showed that there was a decent level of knowledge and awareness among Undergraduates, Postgraduates and Faculty but when it came to practice based analysis the percentage among the undergraduate and postgraduate students were not satisfactory(Graph-2).A good number of the study population were aware that there is a biomedical waste disposal policy in their hospital, but when it came to the issue who segregates the waste 67% of the respondents were accurate in saying that it's the duty of every personnel who generates the biomedical waste to do the appropriate segregation.So when compared to a study conducted by Nirmal Raj et al which aimed to assess knowledge, attitude, and practices of medical staff and students regarding biomedical waste management it was found that 65% of the respondents were accurate in saying that it's the duty of every personnel to do the appropriate segregation of biomedical waste which was closely similar to the present study.[4]

International Journal Dental and Medical Sciences Research
Volume 3, Issue 1, Jan-Feb 2021 pp 449-456 www.ijdmsrjournal.com ISSN: 2582-6018



GRAPH 2- Overall Analysis

Rao D et al conducted a study to assess the level and gaps in knowledge, attitude and practice among health care workers in different departments of tertiary care teaching hospital and concluded that knowledge component was found to be low in the housekeeping staff and more desirable among doctors when compared to the different cadres of the health care workers regarding the biomedical waste management.[7]Similar study was conducted by Vanesh et al to assess the knowledge, attitude and practice among doctors, nurses,& sanitary staff and concluded that doctors, nurses have better knowledge regarding the color coding and waste segregation whereas sanitary staff were found ignorant on all the counts.[5]Even in the present study,results were found to be similar that doctors or faculty had the most desirable knowledge of handling biomedical waste management.

Sharma et al aimed to determine the awareness regarding the biomedical waste policy & practices and the awareness regarding the needle stick injury and its prevalence among different healthcare providers and concluded that there were poor levels of knowledge and awareness about Biomedical waste generation hazards, legislation and management among health care personnel. However, regular monitoring and training is a terrible need.[10]

According to World Health Organization, biomedical waste in the hospitals can be categorized as non-hazardous waste(80-85%) and hazardous waste(15-20%).The hazardous waste can be infectious like sharps, or non-infectious that include chemical and pharmaceutical waste as seen in figure-1.

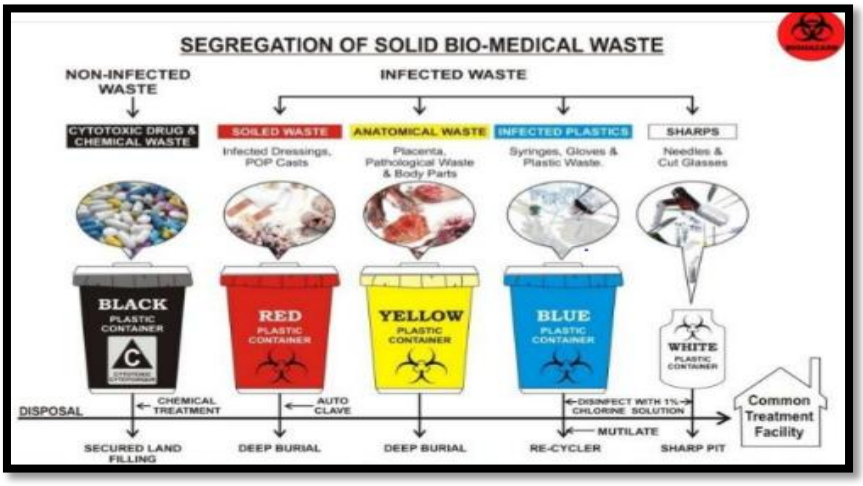


FIGURE-1 Color-coded bags for disposal of biomedical waste (Courtsey: Internet)

International Journal Dental and Medical Sciences Research
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Biomedical Waste Management Rules, 2016 (Ministry of Environment and Forests)

Under the new regime, the scope of rules has been expanded to include blood donation camps, vaccination camps, forensic laboratories, first aid room in schools, household biomedical waste, and other camps/programmes apart from that all other health care facilities have been included. The duties of occupier, common biomedical waste management(CBMW) disposal facilities and authorities are delineated better. The biomedical rules, 2016 mandates the pretreatment of laboratory waste, microbiological waste, blood samples and blood bags through disinfection and sterilization in place. For traceability of the biomedical waste, they introduced the bar code and GPS system. All major accidents including accidents caused by fire hazards, blasts, during handling of biomedical waste and the remedial action taken by the prescribed authority have also been reported.[3,6] The salient differences between Biomedical Waste Management Rules 1998 and Biomedical Waste Management Rules 2016 are depicted in the respective Table-5.

TABLE 5- Difference between biomedical waste rules between 1998 and 2016

POINTS	BIOMEDICAL WASTE MANAGEMENT RULE, 1998	BIOMEDICAL WASTE MANAGEMENT RULE, 2016
Duties of occupier	Duties of occupier are not enhanced No pretreatment of waste on place Chlorinated plastic bags, gloves, blood bags are recommended Details of records are not mandatory Effluent treatment plant is not mandatory Annual report need not to be posted on website Here biomedical waste management committee not compulsory and also records are not compulsory to maintain	Duties of occupier are enhanced Pretreatment by disinfection and sterilization on site of infectious lab waste, blood bags as per WHO guidelines Occupier ensures non-chlorinated plastic bags, gloves,blood bags within 2 years of notification Occupier ensures to maintain biomedical waste management daily and on website monthly It mandates the liquid waste to be segregated at source by pretreatment and effluent treatment plant Annual report should be made available on website within 2years Occupier establishes biomedical waste management committee and records of equipments,training,health checkup and immunization is compulsary
Duties of common biomedical waste management treatment facility(CBWMTF)	Duties are not delineated better Bar coding and GPS not documented Vaccinations for healthcare workers not documented	Duties are delineated better Occupier has to establish Bar coding system and GPS by first year and they ensure occupational safety for healthcare workers by Tetanus and HBV infection
Schedule I	Categories of waste	Color code and type of waste with treatment and disposal
Deep burial	Deep burial allowed in villages and towns with less than 5 lakhs population	Deep burial is an option for remote and rural areas
Chemical treatment	Chemical treatment by 1% hypochlorite	Chemical treatment by 10% hypochlorite solution
Drugs	All drugs to be discarded in black bag	Antibiotics, other drugs and

	For cytotoxic drug destruction and drug disposal in secured landfills	soiled chemical waste suggested for incineration Cytotoxic drugs: incineration upto 1200C and return back to supplier
Microbiology and biotechnological waste Infected plastics, sharp and glass	Pretreatment not mandatory Infected plastics, metal sharps, glass go in blue container with disinfectant and local autoclaving/microwaving/incineration is recommended	Pretreatment of infectious waste is mandatory as per WHO guidelines Infected plastics and sharps after mutilation go in for red bag and white container respectively and are sent to authorized recyclers Glass articles are discarded in cardboard box with blue markings
Recycling	Recycling of plastics, glass to authorized recyclers not mentioned	Focus on recycling of plastics, sharp and glass to authorized recyclers

According to Biomedical wastemanagement and handling rules, biomedical waste should not be kept beyond 48 hours. Next important concern is the type of plastic bags for the collection of biomedical waste. Special non-chlorinated plastic bags must be used, which can be incinerated instead of normal plastic bags which release dioxins & can further pollute the environment.

Pharmaceutical waste or non infectious hazardous waste that includes expired medicines should be disposed off properly, either should be returned to manufacturer & given to waste collection company, where they are either buried in deep landfills or incinerated. One major issue of concern in the dental office is the improperly handled sharp waste (needles, scalpel blades) that may lead to needle stick and puncture wound injuries with resulting infections, so they need maximium precautions and care. The mutilated sharps should be placed in puncture proof container containing 1% NaoCl for disinfection which further sent for shredding , encapsulation, and disposal in landfills by common treatment facility. Another hazardous waste is chemicals like disinfecting agents. For sterilization and disinfection of dental operatories, a variety of chemicals that may contain active chemical ingredients such as formaldehyde which is classified as hazardous are used. Local municipality should be consulted, before discharging chemicals into the sewer system, as it contains higher concentration of formaldehyde or ignitable substances likealcohols, etherandacetone. Sewage treatment is the process of removing contaminants from municipal waste water, containing mainly household sewage plus some industrial wastewater. Physical, chemical, and biological processes are used to remove contaminants and produce treated waste water that is safe enough to release into the environment. Therefore, it should be remembered that waste water eventually is reused as local drinking water hence it should be treated before drainage.[8]

Although majority of the doctors were aware of segregation and color coding used for disposal of different types of waste it is yet to be ascertained if they are following the same protocols in their own private practice. Hence, strict prosecution laws should be imposed under biomedical waste management act for the doctors so that they adhere to the policy protocols strictly in their daily practice. On the other hand, in rural areas, the waste management policy is still not being followed. So, we still have quite a distance to reach as far as biomedical waste management is concerned[10]

Such facets require and necessitate more awareness and training in infection control and Biomedical waste management for both dental and non-dental personnel. There is an ominous need to include waste management programmes in curriculum of undergraduate dental academic program. It should also be made mandatory for dental hygienist, dental technicians and dental operating room assistant to be trained with regards to biomedical waste management and its disposal. The biomedical lawsapply for all those people who are generating, collecting, receiving, storing, transporting, treating, disposing and handling the biomedical waste. Occupational safety should be a prime consideration for any system of waste management.[9]

V. CONCLUSION

A modest attempt was made through this survey basedstudy to evaluate the awareness regarding biomedical waste management on the basis of knowledge, attitude and practice and it was concluded that though the study participants have knowledge about the waste management but they lack in practice and attitude. Henceneed ofthe hour is to instill awareness amongst all the dental and nondental personnel by conducting vigorous and continuous training programs regarding the handling, segregation and disposal of biomedical waste.

REFERENCES

[1]. Government of India, Ministry of Environment and Forests. Biomedical waste (Management and Handling) Rules. Gazette of India.1998 (27 July).

[2]. Government of India, Ministry of Health and Family Welfare (MoHFW). National guidelines on hospital waste management based upon the biomedical waste (management and handling) Rules, 1998. New Delhi: MoHFW; 2002.

[3]. Capoor MR, Bhowmik KT. Current perspectives on biomedical waste management: Rules, conventions and treatment technologies. Indian J Med Microbiol 2017;35:157-64

[4]. A.P Raj Nirmal , Thomas Mathew, UthappaRoshan, Isaac Lijo, Reddy Naveen. Bio-Medical Waste Management-A Survey.RUJODS Ranchi University, Vol-2 No-1 June 2013

[5]. MathurVanesh, Dwivedi S, Hassan MA, Misra RP. Knowledge, Attitude & Practices about biomedical waste management among health care personnel: A Cross-Sectional Study. Indian J Community Med.2011 Apr-Jun;36(2) :143-145.

[6]. DattaPriya, MohikaurGursimran, ChanderJagdish.Biomedical waste management in India: Critical Appraisal. J Lab Physicians.2018 Jan-Mar; 10(1):6-14.

[7]. Rao D, DhakshainiM.R, Kurthukoti A, DoddawadV.G.Biomedical Waste Management: A study on assessment of knowledge, attitude & practice among health care professionals in a tertiary care teaching hospital. Biomed Pharmacol J 2018;11(3)

[8]. Sood AG, Sood A. Dental perspective on biomedical waste and mercury management:A knowledge, attitude and practice survey. Indian J Dent Res 2011;22:371-5

[9]. Sharma Alok, SharmaVarsha, Sharma Swati, Singh Prabhat. Awareness of biomedical waste management among health care personnel in Jaipur, India. Oral health and dental management March 2013;12(1):32-40.

[10]. Naidu SG, Reddy V C, Kumar R V, Sudhir K M, Srinivasulu G, Athuluru D. Dental health-care waste management among dentists of Nellore City-A crosss-sectional study. J Indian Assoc Public Health Dent 2019;17:136-40