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KNOWLEDGE, ATTITUDE AND PRACTICES OF BIOMEDICAL WASTE MANAGEMENT AMONG BUDDING EARLY DENTAL PRACTITIONERS.

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Abstract:

Background of the study: Management of Bio-medical waste (BMW) is one of the biggest challenges of the present day concerning community health. About 10-25% of biomedical waste generated by dental health care facilities are hazardous and it is essential for dental practitioners to be aware of biomedical waste management amendments and must follow the recommended guidelines strictly to prevent any potential health hazard.

Aim: To assess the knowledge, attitude and practices of biomedical waste management among dental practitioners in Tamilnadu, India.

Methodology: A cross sectional online-survey was conducted using self-administered questionnaires through Google Forms among dental practitioners between 1 to 5 years of clinical experience across the state of Tamil Nadu, India.

Results: Majority of the study participants feel it is important to know about bio medical waste generation, hazards and legislation and accepts improper handling of BMW leads to significant environment problems and potential hazardous disease transmission. Only 24% with 1-2years experience responded familiarity towards all color code segregation in contrast to 71.15% respondents with 3-5years experience. On the other hand 70% dentists with 1-2years have shown positive attitude towards attending programs, and recommend practical exercises on BMW management in their undergraduate curriculum.

Conclusion: Within the limitations of the study, it was observed that dental professionals with less clinical experience show inadequate knowledge, attitude, and awareness practice compared to professionals with more experiences towards biomedical waste management. Though dental professionals understood the importance of handling hazardous waste, there in a need for periodic evaluation, orientation based training programs and establishment of strict amendments to ensure safe disposal of hazardous dental waste.

Keywords: Body fluids, Dental Professionals, Health hazard, Microorganisms, Pathological tissue, Red coded bag.

Introduction:

Biomedical waste (BMW) creates a greater threat to ecosystem and all the living species including humans if not disposed or managed properly. Appropriate supervision and safe disposal prevents the spread of highly infectious microorganisms, potential pathogens and contagious diseases among healthcare personnel, patients, health care waste management workers (HCWMW) and general public, whereas poor handling methods carries a significant risk of transmission of nosocomial infections from healthcare facilities to all these levels [1, 2]. According to recent reports by World health organization (WHO) approximately 3million tons of health care waste are produced every year in India among which 10 to 35% are categorized under highly hazardous materials as infectious, toxic and radioactive [3-5]. In the recent years, an increase in number of hospitals and health care sectors with subsequent rise of medical waste generated during diagnosis, treatment or research activities on humans or animals, and production and testing of biological substances resulted in bioaccumulation of unprocessed biomedical waste products [6].

The management of unprocessed biomedical waste products is one of the biggest challenges of the present day concerning community health [7]. In order to effectively prevent bioaccumulation in the environment, spread of pathogens and contagious diseases, BMW Management (amendment) rules was established by Government of India to guide proper handling of biomedical wastes by health care professionals and health workers involved in production, storage, assortment, transport, waste treatment and discarding as per protocols [8, 9]. Among health professionals, dentists are more prone to acquire infections owing to their close proximity to the oral mucosa and associated structures. It is estimated that 10-25% of biomedical waste generated by dental health care facilities such as cotton soaked with body fluids, blood, saliva, soft tissue or pathological waste, chemical waste, dental material wastes from impression, restorations, extracted teeth, needle sharps, suction tubes and radiologic waste are hazardous and capable of inducing health related ailments [9, 11]. Studies have also shown higher concentration of silver, tin, mercury from amalgam restorations, fixer and developer solutions, substantially causes greater health risk [12, 13]. Therefore, it is essential for dental practitioners to be aware of these amendments and follow strictly to prevent any potential health hazard.

Literature studies have shown lack of attitude, understanding and awareness towards waste management among dental graduates despite numerous enforcement measures taken as a part of dental training [14-16]. Nonetheless several studies have similarly shown poor biomedical waste handling practices among dental professionals resulted in inappropriate mixture of hazardous and non-hazardous materials [17-19]. Hence the present study was aimed to assess the knowledge, attitude and practices of biomedical waste management among dental practitioners in Tamilnadu, India and emphasis the need for formulation of adequate dental waste management strategies in the near future.

Methodology:

A cross-sectional questionnaire survey was conducted amongst the dental practitioners between 1 to 5 years of clinical experience across the state of Tamilnadu, India to assess their knowledge, attitude and practice towards biomedical waste management. The study was conducted following the Helsinki declaration as revised in 2013. After obtaining the Ethical clearance, the required information was collected through published scientific articles pertaining to the study

and self-administered structured questionnaires, comprising of 15 questions in English language was prepared and evaluated. The questionnaire had both combination of selected response to the certain questions and also few close ended questions (Yes / No/ don't know).

A total of 152 randomly selected dental practitioners between 1 to 5 years of clinical experience across Tamilnadu participated in this survey. Since this study was conducted during COVID-19 Pandemic lockdown period, online Google forms were generated and distributed through social media platforms. The internal consistency of the questionnaire was adequate (Cronbach's alpha = 0.846). All the participants were briefed about the purpose of the study and an informed consent was obtained before the survey through Google forms and assured that their participation was purely voluntary.

Statistical Evaluation:

Non-probability, stratified sampling technique was employed that yielded information from 152 dental practitioners with 1-5 years of clinical experience were taken into this observational study having a cross-sectional design. Responses recorded among the selected population group were evaluated using SPSS software Version 22.0. In the final analysis, "yes" or correct responses were given a score of 1 and "no" or incorrect responses were given a score of 0; the scores were summed to obtain the overall scores among Dental practitioners under 5 year of experience.

Results:

On analysis of the given data the mean age of study population was observed as 26.29 ± 1.7025 years (mean ± S.D) with 0.272 at 95% confidence level comprising of 72 (47.36%) male and 80 (52.64%) female participants. On analysis of the given data it was observed 65.7% of the study participants were dental practitioners with 1-2 years of clinical experience (100 out of 152) followed by 34.3% (52 out of 152) dental practitioners with 3-5 years of clinical experience respectively. Chi-square test analysis to correlate interrelationship between the year-wise distribution of the study participant showed chi-square statistic of 124.27 with p value <.0001. The result is significant at $p < .05$.

Majority of the study participants were familiar that guidelines are imposed by Government of India for BMW management among which 96% feels it is important to know about bio medical waste generation, hazards and legislation and 92% - 95% accepts the fact that poor or improper biomedical waste handling can cause significant environment problems and disease transmission by potential pathogens respectively. More than half of the study participants feel that BMW should be a practical exercise in dental college however 70% participants with less than 2years experience had shown positive interest to voluntarily attend programs that enhance and upgrade your knowledge of biomedical waste management.

On evaluation of knowledge and practice towards storage of dental waste 48% practitioners with 3-5years experience and 40% with 1-2years experience suggest disposal room for temporary storage however practitioners with 1-2 years were uncertain about period of biomedical waste storage (48 hours) according to BMW (management and handling) guidelines ($p<.05$). On assessment of knowledge and practice towards BMW management protocols and color coding segregation only 24% with 1-2years experience responded that they are familiar with all color code segregation in

contrast to 71.15% respondents with 3-5years experience though nearly 2/3rd practitioners follow color code for BMW in their practice without familiarity.

Among disposal practices based on color coding dental professionals with 1-2years experience 39% use yellow for contaminated PPE, gloves and other infectious waste, 31% prefer Red for highly infectious, pathological waste, cotton, objects in contact with bodily fluids, 48% choose black/White for translucent, puncture proof, leak proof, temper proof bag/container for sharps including metals and 39% opted black for non-infected general health care waste slightly lower than respondent with 3-5years experiences (42.3%, 55.76% ($p<.05$*), 59.61%, 36.53% respectively). 53% practitioners with 1-2years, 46.15% with 3-5years recommend neutralization of developer and fixer solution for darkroom waste management. From the present study it was observed 72.3% (1-2years) and 80.83% (3-5years) dental professionals had adequate knowledge, attitude, and practice awareness towards biomedical waste management.

Tables and Figures:

Discussion:

Dental professionals are constantly exposed to higher risk of health hazards though the amount of hazardous waste produced is less than the total waste generated across the health care sectors. Dental waste can be broadly categorized as non-regulated general wastes, regulated and infectious contaminated waste, and toxic hazardous waste ranging from amalgam, restorative cements and rotary files to blood/saliva containing cotton swabs, needles and human anatomical waste. Suitable Biomedical waste management practice is vital to break/prevent the spread of infectious diseases from patient to patient and to health care professionals. Lack of knowledge towards biomedical waste recognition and segregation can largely affect the environment as well as health care personnel who come in contact with these waste materials, if not dealt with appropriate measures. Hence, this study was conducted to assess the knowledge, attitude, and practices of dental practitioners with 1-5 years of clinical experience regarding dental waste management across Tamilnadu.

In the present study 96% feels it is important to know about bio medical waste generation, hazards and legislation and 95% accepts the fact that poor or improper biomedical waste handling can cause significant environment problems and disease transmission by potential pathogens respectively and these result shows agreement with studies conducted by Khubchandani K et al [2], Ananthalekshmy et al [20], Lakshmikantha R et al [21], Jamkhande et al [22]. Majority of the study participants were aware that guidelines are imposed by Government of India for BMW management similar to studies by Gupta NK et al [6], Ananthalekshmy et al [20], Jamkhande et al [22], Reddy M et al [23], Anand P et al [24] and contrast to Khubchandani K et al [2], Manchanda et al [11], Kumar DM [25], and Khandewal V et al [26] who showed poor knowledge towards guidelines imposed. One of the likely reason for difference in findings could be attribute to clinical experience level where the professionals with 3-5years showed better practice and knowledge towards BMW disposal system and strict guidelines imposed in some parts of the country where government or non-government agencies collects wastes regularly on a daily basis, thereby increasing the probability of biomedical waste practices.

Nearly 70% of study participants with less than 2years experience had shown positive interest to voluntarily attend programs that enhance and upgrade your knowledge of biomedical waste management. Ananthalakshmey et al [20],

Jamkhande et al [22], and Narang et al [27] also demonstrated similar results and recommended discussions, technical talks, awareness programs, workshops, assessments and continuing dental education on dental waste management practices to all the dental practitioners irrespective of their clinical experiences. Periodic evaluation and orientation based training programs should be provided to all health care professionals and workers, so that both the knowledge as well as practice of bio-medical waste management can be promoted. Thus the study showed a positive attitude of dental practitioners towards following and upgrading themselves about proper dental waste management.

More than half of the study participants feel that BMW should be a practical exercise in dental college similar to observation by Khubchandani K et al [2], Ananthalekshmy et al [20], and Jamkhande et al [22]. From these findings, we observed that biomedical waste management though included in the dental curriculum, there is an essential need for better education with practical demonstration classes, assessment programs and internship training sessions to further improve their knowledge of waste disposal and management process. Although specialized waste transporter services, health care waste disposal agencies, government biomedical waste segregation systems are available in India, dental professionals during early days of clinical practice need to be made familiarized to the availability of these services.

On assessment of knowledge towards time limit for storage of BMW, an uncertainty was observed among 40% practitioners with less clinical experiences similar to observation by Khubchandani K et al [2] and Kulkarni et al [12]. Most of the participants were unaware that as per national guidelines, BMW cannot be stored for more than 24hours suggesting a significant difference. Recent studies by Ananthalekshmy et al [20], Jamkhande et al [22], Anand P et al [24], Pawar PA et al [28], and Sood A [29], showed 80% to 90% of dental professionals color coded the waste and segregate before disposal. In contrast, only 24% with 1-2years experience and nearly 2/3rd practitioners follow color code for BMW in their practice without familiarity was observed in this study. These results were in agreements with Singh RD et al [13], Lakshmikantha R et al [21], and Jamkhande et al [22]. Private practitioners were not disposing BMW as per guidelines in some places due to lack of authorized BMW recycler in their area or not aware of recycler in the locality. Dental professionals should ensure that segregating wastes are important, equally so is the labeling of containers with color coded systems as recommended into which they are separated.

Among disposal practices based on color coding dental professionals with 1-2years experience showed poor proper segregation of waste compared to professionals with more years of experience. Many studies have also reported similar poor results in color coding segregation. Pawar et al [28], Bansal et al [30] showed appropriate disposal of cotton, gauze, and other items contaminated by blood into yellow bags where Mazhar S et al [3], Singh RD et al [13], Jamkhande et al [22], and Kumar DM [25] observed all these infectious were placed into common bins. This difference may be due to lack of theoretical knowledge, regular supervision of BMW, non-availability of color coding containers, and improper enforcement of standard practice by health care statutory or local body. Hazardous medical waste is typically handled by incineration instead of going to a landfill, but nowadays, there are even more modern and practical ways to handle biomedical waste management on-site, like autoclaves, or integrated sterilizers and medical waste shredders. Apart from these reasons, dental professionals should be aware that color coding segregation reduced the quantity of biomedical wastes that require special treatment, prevent reusing or illegal use of materials and also protect the environment by safe disposal methods.

Only 48% properly dispose needles/sharps similar to Khubchandani K et al [2], Lakshmikantha R et al [21] studies. One should be aware that in dental clinic settings maximum care, precaution and proper disposal of waste sharps such as infected needles, chemical wastes to avoid health hazards, needle-stick injuries and acquiring infections such as hepatitis and HIV. There was a statistically significant difference between the groups with performing poor disposal systems compared to professionals with more experiences. Hence needles, which comprised of the bulk of sharps should be destroyed by needle destroyers and should be placed in puncture-proof container. There is a high risk of unintentional needle pricks for waste handlers/health care workers if disposed in red or yellow coded waste bags.

Limitations of a study should be taken into account when assessing these findings with the previous results. Generalizability of the results possibly will be one of the limitation of our study due to the different population group, smaller sample size, selection of the study participants which involves dental practitioners with 1-5 years of clinical experience. It is a fact that studies involving the use of questionnaires are susceptible to selection bias, social interest and confounding bias and this may also remain as another limitation.

Conclusion:

From the present study it was observed that dental professionals with less clinical experience show inadequate knowledge, attitude, awareness and practice compared to professionals with more experiences towards biomedical waste management. Though dental professionals understood the importance of handling hazardous waste, but the knowledge and practice still has possibility for improvement. A positive attitude was revealed by most of the participants who feels need for better education with practical demonstration classes, assessment programs and internship training sessions to further improve their knowledge of waste disposal and management process. Thus, periodic evaluation and orientation based training programs should be provided to all health care professionals and workers, so that both the knowledge as well as practice of bio-medical waste management can be promoted.

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