"EFFECTIVENESS OF TRAINING PROGRAM ON AWARENESS AMONG NURSING STAFF, LAB TECHNICIANS AND SANITARY WORKERS REGARDING BIO-MEDICAL WASTE MANAGEMENT IN A TERTIARY CARE HOSPITAL IN CENTRAL INDIA".

1] **Dr. Lokesh Mukut Vaishnav**
Junior Resident, Dept of Community Medicine, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi, Wardha.

2] **Dr. Ashok Mehendale**
Professor & Head, Dept of Community Medicine, Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi, Wardha.

Study Protocol
Conflict of Interest: None

Abstract

Background : A serious threat to both general and medical community is the proper collection and proper dumping of the Bio-medical Waste. In India, 1.87 lakh healthcare facilities with 17.01 lakh beds generates 519 tonnes of biomedical waste every day, Central Pollution Control Board (CPCB). There are Healthcare Facilities (HCF) that still handle and accumulate such wastes inappropriately without understanding its hazardous repercussions on environment and human society. Study is attributed to awareness and negligence related issues. It covers a wide spectrum of information required for Healthcare Facilities (HCF) in regards to modifications in Bio-Medical Waste Management Rules, 2016' (BMWM2016) from year 2016 till November 2019 and rules amended in view of the COVID-19 pandemic.

Aim : Effectiveness of Training Program on awareness among Nursing Staff, Lab Technicians and Sanitary Workers regarding Bio-medical Waste management at a Tertiary Care Hospital in Central India.

Methodology : Interventional Study will be implicated from September 2020 to December 2022 in Acharya Vinoba Bhave Rural Hospital (AVBRH) Tertiary Care Hospital, Sawangi, Wardha, Central India by the Post Graduate Student. Assessment of awareness will be

done by distributing a set of questionnaires and then training the Healthcare Personnel (HCP), regarding Bio-Medical Waste Management based upon direct observation in the workplace. A total of 422 Nurses, Lab Technicians and Sanitary Workers will be enrolled as study participants. The Study participants will be demonstrated regarding proper standards of Bio-Medical Waste management.

Expected Outcomes/Results and Conclusion : Data will be analyzed and appropriate statistical tests will contemplate the results of study.

Keywords : Bio-Medical Waste (BMW) Management, Healthcare Personnel (HCP), Awareness, Training Programme, Tertiary Care Hospital.

INTRODUCTION

"Anything which is not ought or intended for the further use is called Waste."
Bio-Medical Waste Management Rules, 2016 said to be "generated during - diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining thereto or in the production or testing of biological or in health camps". Health-care providers are producer of approximately 75% to 90% of waste which can be non – risk or common waste of healthcare, comparable to domiciliary wastes. Key function of health healthcare establishments are administration and house, should include waste created during the course of care in hospital premises. Other 10% - 25% of health waste is known to be harmful and can pose a number of health risks.(1, 2)

By the rules of Biomedical waste management (2016) and its amendment in 2018 and 2019 with inclusion of the Central Pollution Control Board (CPCB) guidelines for handling, treatment and disposal of wastes' generated during treatment/ diagnosis/ quarantine of COVID – 19 patients -:

A) Main points to remember –
1) To keep hospital clean and make it a safer place by recognizing the dangers and risks of waste.
2) When rules are obeyed it protects are our health and society.
3) Always do best to manage or handle the biomedical wastes as per the rules.
4) If followed well Segregation is easy.
5) Always segregate the waste in correct liners or bins for suitable treatment.
6) For proper treatment and disposal of the wastes never mix waste during collection and transportation.
7) Spillage of chemicals can be harmful so manage it accordingly and consciously.
8) Safety is of utmost importance so wear the protective gears provided to Healthcare Workers.
9) Biomedical waste if not treated well leads to risk to environment and human health.
10) Segregation of general waste from infectious is necessary to prevent the spread of infections and epidemics.
11) In case of COVID – 19, strict measures to be followed in hospital wards, laboratories and sample collection centres.

12) Safety is the topmost priority while handling, treatment and disposal of wastes' at the sites generating them by the guidelines.

B) Treatment and Transportation Standards as per "Schedule II of BMWM Rules, 2016" –
   1) For Vacuum autoclave
   2) For Gravity Flow Autoclave:
   3) For Microwave
   4) For Incineration
   5) For Transportation Of Bio-Medical Waste
   6) For Spillage Management

C) Five categories of Biomedical wastes for segregation –

   1) Yellow – Anatomical (Human and animal) wastes, chemical wastes, solid wastes, chemotherapy wastes, discarded linen and medicines and laboratory wastes. Others like liquid wastes, infectious wastes, discarded medicines, discarded linens, etc.
   2) Red – Contaminated recyclable waste - Disposable items such as tubing, plastic bottles, intravenous tubes and catheters, cannulas, syringes without needles and gloves.
   3) Blue – Glass waste and metallic implants except cytotoxic wastes.

   4) White (Translucent) - Metal sharps – needles and blades in a puncture proof containers.

   5) Black – Hazardous and other wastes – used containers of disinfectants and pesticides, used batteries, etc. (3)

In actual fact, 85 percent is non – hazardous as a whole, while 10 percent is infectious and 5 percent are non-infectious and is considered as harmful or hazardous waste, says World Health Organization. Roughly 15 percent to 35 percent waste is controlled as infectious waste. (4)

Countries with high incomes produces average of 0.5 kg per day per hospital bed of hazardous waste, while those with low revenue produce average of 0.2kg of waste.(5)

Biomedical waste management aims to decrease the effect of waste on the community and the environment, the decrease in the chance of infections and accidental injury to the workers and decrease the cost of total treatment of waste and fixing of responsibility in Institutions for biomedical waste disposal.

Within the like color-coded bags, coloured templates displaying bio-medical waste segregation are shown in the hospital waste segregation site for the convenience of the health worker for color-coded waste. Hospital's waste segregation site features identical colour coded bags and coloured posters displaying the BMW segregation and this help the Healthcare Personnel.

"Segregation" of Bio-Medical Waste Management is most significant step. If Bio-Medical Waste is improperly managed then it has a substantial risk factor for the Health Care

Personnel (HCP).(6) As stated by Bio-medical Waste Management Rules (2016), amendments for categories (colour coded) for distinct waste segregation were implemented by Government of India, Ministry of the Atmosphere, Forest and Climate Change and aimed to enhance coherence with rules in 2018.

However, adequate segregation, manipulation and disposal of health facilities in India remains a serious concern with annual growth of 7%, with a projected annual growth of up to 775,5 tonnes a day by 2022.

Amidst COVID -19 pandemic, it would also be worthwhile to point the Novel Severe Acute Respiratory Syndrome Coronavirus 2 (Novel SARS CoV-2) with fomite-borne transmission and it's presently unknown period of viability on the fomites, the improper Bio-Medical Wastes' in the garbage facilitates easy entrance in to the huge susceptible.(7)

RATIONALE

Bio-medical Waste Management 1998 rules were revised in years - 2000, 2003, 2011, 2016 also new amendments were made in 2018, 2019. So, we can understand the functioning of the workforce in the hospital which works continuously with all these wastes repeatedly will be able to notify the ongoing practices in the tertiary care hospital as new rules. Hence, it is important to find out the awareness and concerns on the Bio-Medical Waste Management.

Staff Nurses, Sanitary workers and lab technicians are directly related with the handling or managing of the biomedical waste. They are the most important people who could speak about their knowledge, perception and practices on biomedical waste. If there are any knowledge gaps in these forementioned cadres can help us to determine the strategy how to guide or inform about the waste disposition.

AIM

Effectiveness of Training Program on awareness among Nursing Staff, Lab -Technicians and Sanitary Workers regarding Bio-medical Waste Management in the Tertiary Care Hospital in Central India.

OBJECTIVE

1. To study the baseline awareness of Staff Nurses, House Keeping Staff and lab technicians regarding bio-medical waste (BMW).
2. To determine the association between Tests (Pre and Post) format of awareness scores with selected socio - demographic variables.
3. To evaluate the pre-planned training programme efficacy on Bio-medical waste management among Healthcare Personnel.
4. To figure out the process carried out regarding management of Bio-medical Waste Management by the healthcare personnel in the Tertiary Centre and provide recommendations as needed.

METHODOLOGY AND MATERIAL -:

Study Settings :
Study will be executed to assess quality of Bio-Medical Waste management in 1500-bedded Acharya Vinoba Bhave Rural Hospital (AVBRH) Tertiary Care Hospital, Sawangi, Wardha, Central India.

Research design : Present study will be an Interventional Study.

Study Participants:
The data will be collected from Nursing Staff, Lab Technicians and Sanitary Workers who are in the act of dealing the biomedical waste in the Tertiary - Care Hospital.

Sample size :
As stated by the Krejcie and Morgan formula (1970) – 'determining the sample size for research activities'. (7) The sample size is estimated as follows :-

$$n = \frac{X^{2*}N*P(1-P)}{c^2(N-1)+X^2P(1-P)}$$

Where,
Total population of all cadres = 930
N =   Population size
X^2=   Chi-square value for 1 degree of freedom at some desired probability level. This is 3.84 at 5% level of significance
P=   50% proportion = 0.05
c=   Confidence   Level   of   one   choice   =   0.05

$$n = \frac{930(3.84)(0.5)(0.5)}{(0.05)^2(930-1)+(3.84)(0.5)(0.5)}$$

= 422.

Hence rounding up, the proposed sample size of each including population of respective population with the above formula will be 422
This sample is proposed to be covered from identified total population size.

This sample size was further distributed as per available approximate population of each staffs and students using the Krejcie and Morgan formula (1970) reported by survey conducted in the tertiary care hospital as -

Sr. Nos.	Cadres	Population (n)	Sample size to survey
3	Nurse staffs	650	242
4	Lab technicians	30	28
6	Housekeeping Staffs	250	152
7	Total	930	422

Sampling procedure -:

Data collection tools and procedure -:

- Tool consists of a structured interview questionnaire which will be pre-tested, semi-structured close ended and will contain questions, will be in English and local (Marathi/Hindi) language to evaluate the awareness of Healthcare Personnel regarding bio-medical waste management with proper consent from the concerned hospital authority.
- **1. Section A:** Questionnaire related to Demographic Profile
- **2. Section B:** Questionnaires to assess the awareness of the Nursing Staffs, Lab Technicians and Sanitary Workers regarding Bio - medical waste management include – attributes related to the colour coding and their implications, identification of bio-medical hazards symbol, waste categories and hospital policies.
- **3.** Questions to evaluate the existing attitude of Health - care Personnel regarding Bio - medical waste management.
- **4. Checklist:** Judging - practice of Health - care Personnel regarding bio-medical waste management include – safe practicing with the infected sharps, received any training.

Step 1 – Pre - test data collection –

Prior to intervention data, semi-structured questionnaire administered will be collected for the assessment of the participants' baseline awareness of biomedical waste management.

Step 2 – Training programme on biomedical waste –

Training programme regarding biomedical waste management 2016 rules and its amendment in 2018, 2019 and also including Central Pollution Control Board Guidelines 2020 will be organized for two consecutive days in the form of traditional or video lectures as per the COVID 19 pandemic situation.

Step 3 – Post – test data collection –

The post-intervention, the data will be obtained using the same self-managed properly - structured questionnaire to get the efficacy of the programme.

Inclusion criteria:
Health - Care Workers who are available during the study with the valid written consent given by the study participants.

Exclusion Criteria:
Health Care Workers who are not present in 3 visits at the time of surveys. No hospital authorities included and cadres who have not given written valid consent.

Analysis plan:
Data will be recorded in MS excel and audited by Statistical Product and Service Solutions (SPSS) 24.0 version statistical software. Various proportionate frequencies of staffs and students were calculated. Data were analyzed using appropriate statistical methods (X^2 test for categorical data analysis).

Ethics committee approval :

The study protocol will be submitted to the Institutional Ethics Committee of DMIMS (DU) for approval. Permissions for the study will be obtained from the appropriate officials of concerned hospital. The study will not require compulsory participation and will not interfere with any regular activities of the hospital. Confidentiality will be maintained.

Informed written consent will be acquired from the study participants after clarifying the purpose, nature and procedure of the study in prescribed Performa just before data collection.

Expected Outcome/Results:

After study investigator will be able to know - gaps in the awareness of Nursing Staffs, Lab Technicians and Sanitary Workers regarding biomedical waste management on new rules of 2016 and its amendments in 2018 and 2019 with Covid 19 pandemic rules and regulations.

DISCUSSION:

Annapurna Parida et al (2019) concluded - education aspect of waste management in health care should be improved in order to ensure diligent and standardised implementation of new, emerging and future regulations. Periodic assessment and review should become standard to enforce compliance. The BMWM rules are dynamic in spirit, which is strengthened by the fact that the BMWM rules of 2019 were already twice completed in 2019 when we finalised our study.(8)

Savithri Kanganda Bopaiah et al (2020) concluded - health care professionals having good knowledge must be motivated and to be given practical tutoring. All hospital personnel are strongly encouraged to require rigorous training programmes for Biomedical Management. The necessity for the all hospital staff are highly recommended for systematic training programmes on the management of BMW. Strict oversight and control of hospital management operations should be practiced day by day.(9)

Maneesh Bhatt et al (2020) found - KAP regarding BMW management is poor in majority of health care providers. Hence, it is recommended that regular training and retraining of health care providers should be undertaken on a continuous basis including onsite BMW handling to ensure appropriate BMW management and disposal to minimize the effects of BMW hazards.(10)

Purav G Patel et al (2020) showed - majority of them had knowledge regarding basics of BMW, they failed to address some important points on BMW management. Also some of them had not exposed to training of new BMW guidelines 2016. It shows that training on BMW should be integral part of induction program for all new joined staff as well as this training should be conducted at regular intervals as part of continuous medical education at each healthcare facility.(11)

Sharma P et al (2016) – recommended that there should be mandatory training programs for Healthcare workers regularly and BMWM should be in the curriculum of Medical and Nursing faculties(12).
Needs for such type of programmes and trainings are evident from the GBD studies (13-17). Few of the related studies were reported(18-19).

Limitations -:

Study is bounded to only selected Tertiary - care Hospital.

Conclusion-:

Conclusion will be derived based on the data analysis.

REFERENCES –

[1]   Y, Chartier. Safe Management of Wastes From Health-care Activities. Second Edition. World Health Organization; 2014.

[2]   K Park. Textbook of Preventive and Social Medicine, 25th ed. Jabalpur: Bhanot Publishers; 2011. p849.

[3]   https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/Pictorial_guide_covid.pdf

[4]   Health-care waste [Internet]. [cited 2020 Oct 27]. Available from: https://www.who.int/news-room/fact-sheets/detail/health-care-waste.

[5]   Pandey A, Ahuja S, Madan M, Asthana AK. Bio-medical waste management in a Tertiary Care Hospital: An overview. Journal of clinical and diagnostic research: JCDR. 2016 Nov;10(11):DC01.

[6]   Das A, Garg R, Ojha B, Banerjee T. Biomedical Waste Management: The Challenge amidst COVID-19 Pandemic. Journal of Laboratory Physicians. 2020 Aug;12(2):161.

[7]   Krejcie RV, Morgan DW. Determining sample size for research activities. Educational and psychological measurement. 1970 Sep;30(3):607-10.

[8]   Parida A, Capoor MR, Bhowmik KT. Knowledge, attitude, and practices of Bio-medical Waste Management rules, 2016; Bio-medical Waste Management (amendment) rules,

2018; and Solid Waste Rules, 2016, among health-care workers in a tertiary care setup. Journal of laboratory physicians. 2019 Oct;11(4):292.

[9] Bopaiah SK, Suga S, Myneni S, Ravikumar D, Sivagananam P, Kumar MR, Krishnan M, Balu P, Sundharesan N, James KM, Kumaravel K. Assessment of the knowledge and attitudes regarding biomedical waste management among the health care professionals in a tertiary care teaching hospital in Chennai. Journal of Critical Reviews. 2020;7(9):578-86.

[10] Bhatt M, Maroof M, Awasthi S, Bahuguna SC, Kanubhai TH, Pamei G. Knowledge, Attitude and Practice of Biomedical Waste (BMW) Management among Health Care Providers in a Tertiary Care Hospital: A Cross Sectional Study from Haldwani, Uttarakhand. Indian Journal of Preventive & Social Medicine. 2020 Mar 30;51(1):7-.

[11] Patel PG, Raval P. Assessment of level of knowledge regarding biomedical waste management among healthcare workers in tertiary care hospital in Western India.

[12] Sharma P, Jais M, Gupta P, Ansari S, Lall H, Debbarma M, Kaur R. Awareness regarding biomedical waste management among health care workers in a tertiary care hospital in New Delhi, India. Indian J Dent Res. 2016 Jul;6(7):8739-41.

[13] Murray, Christopher J L, Aleksandr Y Aravkin, Peng Zheng, Cristiana Abbafati, Kaja M Abbas, Mohsen Abbasi-Kangevari, Foad Abd-Allah, et al. "Global Burden of 87 Risk Factors in 204 Countries and Territories, 1990–2019: A Systematic Analysis for the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1223–49. https://doi.org/10.1016/S0140-6736(20)30752-2.

[14] Vos, Theo, Stephen S Lim, Cristiana Abbafati, Kaja M Abbas, Mohammad Abbasi, Mitra Abbasifard, Mohsen Abbasi-Kangevari, et al. "Global Burden of 369 Diseases and Injuries in 204 Countries and Territories, 1990–2019: A Systematic Analysis for the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1204–22. https://doi.org/10.1016/S0140-6736(20)30925-9.

[15] Wang, Haidong, Kaja M Abbas, Mitra Abbasifard, Mohsen Abbasi-Kangevari, Hedayat Abbastabar, Foad Abd-Allah, Ahmed Abdelalim, et al. "Global Age-Sex-Specific Fertility, Mortality, Healthy Life Expectancy (HALE), and Population Estimates in 204 Countries and Territories, 1950–2019: A Comprehensive Demographic Analysis for the Global Burden of Disease Study 2019." *The Lancet* 396, no. 10258 (October 2020): 1160–1203. https://doi.org/10.1016/S0140-6736(20)30977-6.

[16] Kinyoki DK, Ross JM, Lazzar-Atwood A, Munro SB, Schaeffer LE, Abbasalizad-Farhangi M, et al. Mapping local patterns of childhood overweight and wasting in low- and middle-income countries between 2000 and 2017. Nat Med 2020;26(5):750-759.

[17] Lozano R, Fullman N, Mumford JE, Knight M, Barthelemy CM, Abbafati C, et al. Measuring universal health coverage based on an index of effective coverage of health services in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet 2020.

[18] Khanam, N., V. Wagh, A.M. Gaidhane, and S.Z. Quazi. "Knowledge, Attitude and Practice on Uses of Plastic Products, Their Disposal and Environmental Pollution: A Study among School-Going Adolescents." *Journal of Datta Meghe Institute of Medical Sciences University* 14, no. 2 (2019): 57–60. https://doi.org/10.4103/jdmimsu.jdmimsu_27_19.

[19] Palsodkar, P., P. Palsodkar, P. Dakhole, and M. Patil. "Smart Waste Management(Swm) Systems for Offices and Educational Institutes." *Journal of Advanced Research in Dynamical and Control Systems* 12, no. 6 Special Issue (2020): 58–63. https://doi.org/10.5373/JARDCS/V12SP6/SP20201007.