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"EFFECT OF WEBINAR REGARDING IMPACT OF BIOMEDICAL WASTE ON ENVIRONMENT AND IT'S PREVENTION AMONG NOVICE NURSING STUDENTS OF SELECTED COLLEGES OF ODISHA"

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ABSTRACT

Biomedical waste, sometimes known as hospital trash, is created during the treatment of people as well as during biologicals research, that contains potentially contagious materials and affect the environment due to improper disposal of waste. As nurses are backbone of the health care delivery system though they are working 24 hours a day. Novice nursing students have less knowledge on impact of biomedical waste on environment & its prevention. The current Pre-experimental one group pre-test post-test research study conducted in 3 nursing colleges of Odisha with 500 first year nursing students who are selected randomly by using convenience sampling technique. The result of the current study revealed that, majority of nursing students in Post-test (77.33%) are having good knowledge than Pre-test knowledge (3.33%). There was a significant mean difference (7.1) exists between pre-post test knowledge score and 0.1 SD difference exists between the pre and post-test. The present study revealed that, there is lack of adequate knowledge among nursing students regarding management of biomedical waste in view of its impact on the different aspects of the environment. The management of biomedical waste should be assessed as soon as possible in order to raise awareness for proper collection, segregation and disposal to prevent contamination of waste towards environment among future nursing officers at their training courses.

KEYWORDS - EFFECT, WEBINAR, IMPACT, BIOMEDICAL, NOVICE

INTRODUCTION

Hospitals, healthcare facilities, and laboratories produce a lot of waste that is highly hazardous for the environment. Improper disposal of waste contained pathogens could negatively impact the ecosystem. Organic and inorganic waste are both included in medical waste. One kilogramme of biological waste is produced daily on an average by a hospital bed, of which 10% to 15% is infectious, 5% is dangerous, and the remainder is general garbage. One of the most significant industries in the world is health care, and it is growing quickly in India. This expansion has been mostly attributed to longer life expectancies, better health consciousness, and an increase in the prevalence of lifestyle diseases. The term biomedical waste has been defined as “any waste that is generated during the diagnosis, treatment or immunization of human being or animals or in research activities”. Knowledge about how to segregate, collect, storage, treatment and disposal of hospital waste is very essential for all nursing students and nursing officers. Knowledge of nursing officers and student nurses regarding environmental impact due to Biomedical waste and its prevention is essential on health care and they can educate patients and visitors about their need to practice good hygiene, develop healthy habits, and take responsibility for the waste they generate. A direct or indirect connection exists between the waste produced in various hospitals and these ultimately affect the environment. The integrity of the environment may be harmed if waste is not collected and disposed of according to the rules. Calis and Arkan (2014) conducted a study among nursing students' understanding the effects caused by medical waste to the environment and human health. The majority of nursing students believed that medical waste posed a danger to both persons and the environment.[1]

A general practitioner's clinic produces 600 g of garbage per bed per day, whereas hospitals in India produce 1-2 kilograms per bed per day, according to a report published in June 2016 by the Indian Society of Hospital garbage Management.[2]

The World Health Organisation reported that the pandemic's medical waste accumulation increased plastic pollution in the waters by a factor of 10. Already, an estimated 8 million metric tonnes of plastic have been added to the ocean each year. The current pandemic has changed the dynamics of waste generation, that's causing problems for policymakers and sanitation staff. The danger of infections and injuries in waste produced by healthcare facilities is increased. It is crucial to have safe and dependable means of segregating and disposing of hospital waste if one is to lessen health issues and remove serious threats to people's health. [3]

A study about the Biomedical Waste Management among the Undergraduate Medical and Nursing Students in Vizianagaram, Andhra Pradesh revealed that MBBS students were somewhat more knowledgeable about the subject than nursing students, according to a study conducted by UJwala Ukey, Ramasankaram Kambatla. Many survey participants were aware of the use of colour coding to separate biological waste. However, only around half of them gave the right answer when asked which waste should go in which bag.[4]

Negligence in the management of biological waste results in resource depletion, and illness in humans and animals, including harm to the environment. Poor management of a BMW poses a health risk to the community, municipal staff members, hospital staff, and rag-pickers. Healthcare facilities may unavoidably produce hazardous biological wastes (BMW) that could endanger people or the environment during the delivery of healthcare. General (non-hazardous) and hazardous waste categories can be created for these wastes. General waste makes up 85% of all rubbish, and hazardous waste makes up the remaining 15%. Nowadays, terminology used to describe garbage generated by healthcare facilities includes the terms clinical waste, healthcare waste, infectious waste, medical waste, and biological waste. Biomedical waste is created during diagnosis, treatment, or immunization procedures.[5]

BMW production and disposal have become into a global issue. It now poses a serious threat to the environment and healthcare services. The World Health Organisation research estimates that 10 to 25% of the BMW is hazardous, with hazardous waste

proportions varying from 20% to 75% depending on the country. It can be considered that the methods of managing the biomedical waste is still in its infancy, but it has recently gained attention as a result of growing knowledge of the human immunodeficiency virus, hepatitis B and C viruses, and other potentially contagious diseases. More than 30 potentially deadly bloodborne infections can be spread via biomedical waste..[6]

The emissions from the healthcare industry and possible harm to the general public were calculated by Eckelman and Sherman in 2016. Air pollutants (9%), stratospheric ozone depletion (1%), acid rain (12%), green house(GHG)emissions (10%), smog formation (10%), and carcinogenic and non-carcinogenic air toxics (1-2%) all have a detrimental effect on public health globally over the past ten years, according to the economic input-output model from National Health Expenditure (NHE).[7]

Impact of biomedical waste on water

Due to the possibility of different chemicals from waste disposal sites seeping into the groundwater, improper biomedical waste disposal may have a detrimental impact on the water quality. Al Raisi et al. (2014) reported that the amounts of heavy metals in leachate were greater than those in drinking water. Surface and ground water become contaminated as a result of greater heavy metal concentrations.

According to Heera and Rajor (2014), Because biomedical waste has a high content of heavy metals and polycyclic aromatic hydrocarbons (PAHs), burning it releases unwanted amounts of toxic substances that could contaminate surface and groundwater. Because of this, it is essential to lessen the toxicity of ash before it is dumped in landfills or used once more. The recommendations for drinking water from the World Health Organization (WHO) and Environment Protection Agency (EPA) specify the acceptable limits for hardness (1320 mg/L) and chloride content (8500 mg/L) in leachate. Increased hardness (1320 mg/L) and chloride concentration (8500 mg/L) in leachate were found during investigation of BMW ash.[8]

Impact of Biomedical waste on soil quality

Adama et al. (2016) in their study reported that Bottom of incineration ash and soil samples taken from municipal landfills both are loaded with heavy metals. In soil samples collected from different locations in two landfills, Agamuthu and Fauziah (2010) found environmental heavy metal concentrations. As per the result it has been found that all heavy metals were below the Dutch intervention standard for soil remediation.

Unusual and unhygienic disposal of biomedical waste can change the soil composition near landfills. Changes in the chemistry and biology of a soil ecosystem can result from the interaction of various pollutants with the soil. Abidemi and Theresa (2015) in their study have focused on five heavy metals (Chromium ,nickel ,Zinc ,Lead and copper) and their concentrations in soil. According to the study it reveals that the heavy metals found were Zinc(1133 ± 897 mg/kg) , Nickle (26.3 ± 51.1 mg/kg),copper (110 ± 90 mg/kg) , Lead (137 ± 64 mg/kg) and chromium (3.632 ± 2.46 mg/kg). on the ground metal concentrations were higher in various sample sites in background countries . [9]

Nazir et al. (2015) has found that the concentrations of the heavy metals like cadmium, Zinc, copper, Nickel ,chromium and led in plants, water and soil. The concentration of some heavy metals, with the exception of zinc and copper, exceeded the limits allowed by the WHO. Their study claims that nickel levels were found in water samples taken near the hospitals waste point .

Impact of Biomedical wastes on Quality of the air:

The Biomedical waste burning could harm the environment by mixing of various chemicals to harmful levels for human health. According to Karthikeyan, Balasubramanian, and Iouri (2016), municipal solid waste dumping sites pose a difficult problem in terms of greenhouse gas and particle emissions. The ecology and public health are seriously endangered by the burning of hospital trash at these locations. When dangerous pollutants are released, locals may experience several kinds of respiratory issues. Their research

showed that the main sources of air pollution include dust, black carbon, ammonia, sulphate, and nitrate. According to Ephraim et al. (2013), various acute outbreaks, including the severe acute respiratory syndrome (SARS), are caused by inappropriate treatment of biological waste. majority of the hospital garbage.[10]

More than any other member of the medical staff, nurses and doctors spend the majority of their time with patients in the ward, increasing their exposure to the hazards of the hospital environment, particularly biomedical waste. In order to safeguard their own health, they must be well-versed in the newest knowledge, abilities, and management techniques for dealing with this waste. Additionally, they are in charge of minimising the harm that waste poses to other members of the health team and the general public.

This study concentrated on two areas by taking into account the value of nursing officers and students in the healthcare system. Examining the awareness of nursing students about the effects of biomedical waste on the environment was one component, which truly revealed how well this crucial topic had been taught. The effectiveness of a webinar on managing biomedical waste among nursing students was the second part of this study that was concerned with managing biomedical waste effectively.

OBJECTIVES

- To evaluate the effects of webinar regarding impact of biomedical waste on environment and its prevention among nursing students.

MATERIAL AND METHODS

A pre-experimental one group pre-test post-test research design adopted in this study. Total 500 participants (1st year nursing students) were selected from three different nursing colleges of Khordha districts of Odisha. The participants were randomly selected by using convenience sampling technique. Prior to investigation informed consent was obtained from each participant. After extensive review of literature, WHO guidelines content was prepared and structured questionnaire were developed which was again validated by different experts. This tool contains 2 parts like section-A and section-B. In section-A, the socio-demographic data of the students like age, gender and present place of clinical posting are included. In section-B, a self-structured questionnaire with 15 questions which carries one mark each based on the impact of biomedical waste on environment and its prevention. To measure the effect of webinar, the pre and post test was conducted through Google Form and the link was provided before and after the webinar. The participants were instructed to submit the form within 15 minutes. The scoring process of knowledge score was categorized into 3 that is poor, average and good. It was analysed by using inferential statistics. After pre-test the planned educational program (webinar) was conducted for the participants. A post-test was done to evaluate the effectiveness of webinar. Data was analysed with the help of statistical software, STATA (version 11.0).

RESULTS AND DISCUSSION

In this pre-experimental study, we evaluated the effect of webinar regarding environmental impact due to biomedical waste and its prevention. The socio-demographic data of the students were age, gender and present place of clinical posting. The result of the study clearly depicted that, the post-test knowledge of the nursing students were significantly higher than the pre-test knowledge. In the view of assessing the level of knowledge among nursing students the total obtainable score (15) of the questionnaire was divided into 3 descriptive levels like poor, average and good which was presented in the following tables.

Table I: Assessment of Pre-test knowledge score

n=500	Level of Knowledge categories	Range of Score	Frequency	Percentage
	Poor	1-5	367	73.33%
	Average	6-10	116	23.33%
	Good	11-15	17	3.33%

From the present study it was revealed that, in the pre-test, about 73.33% of students are having poor knowledge, 23.33% of students are having average knowledge and about 3.33% of nursing students are having good knowledge regarding environmental impact due to biomedical waste and it's prevention.

Table II: Assessment of Post-test knowledge score

n=500

Level of Knowledge	Range of Score	Frequency	Percentage
Poor	1-5	27	5.33%
Average	6-10	87	17.33%
Good	11-15	386	77.33%

But in the post-test assessment, it was revealed that, about 5.33% of students are having poor knowledge, 17.33% of students are having average knowledge and about 77.33% of nursing students are having good knowledge regarding environmental impact due to biomedical waste and it's prevention.

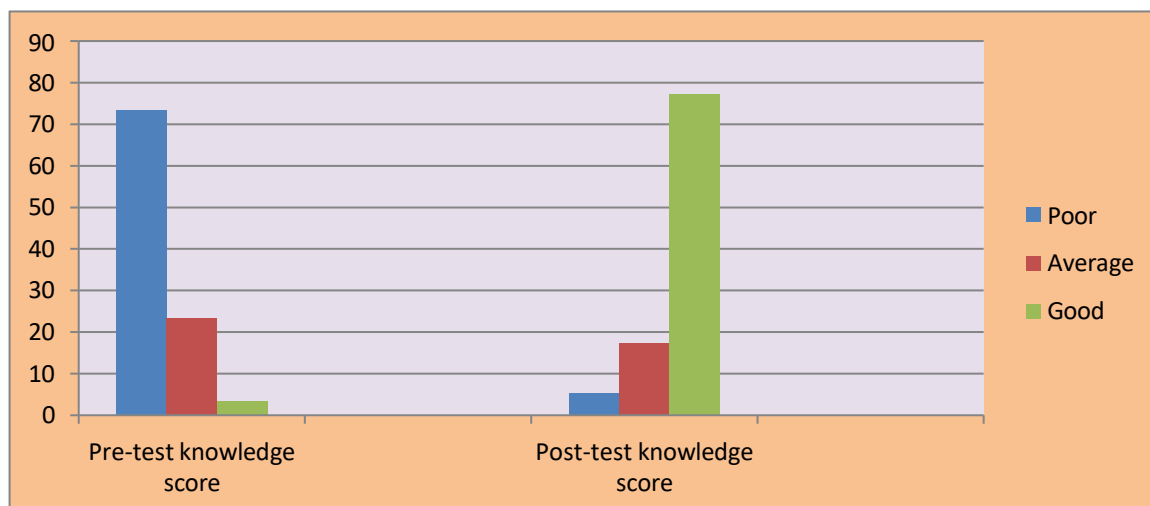


Figure I: Graphical presentation on comparison of pre-test and post-test knowledge score

Table III: Comparison of pre-test and post-test knowledge score in the form of mean and standard deviation

n=500

Knowledge score	Mean	Standard deviation
Pre-test knowledge score	4.5	2.62
Post-test knowledge score	11.6	2.72

Table IV: Effectiveness of webinar with mean, SD of pre. and postknowledge score of Nursing students .

n=500

Maximum possible score	Correct Responses		
	Pre-test (X)	Post-test(Y)	Effectiveness(Y-X)

	Mean	SD	Mean	SD	Mean	SD
15	4.5	2.62	11.6	2.77	7.1	0.11

From the above table it was clear that, the knowledge score of nursing students increases up to 7.1 in mean and SD 0.11. Overall results showed that the mean knowledge score after the test was higher than the mean knowledge score before the test. As a result, it was revealed that webinar was effective for novice nursing students.

DISCUSSION

Hospitals, clinics, and other healthcare facilities have a "duty of care" towards the environment and general welfare. Hospitals utilise a wide range of medications, including radioactive materials, cytotoxic, caustic, and antibiotics, which finally end up in hospital trash.

The proper management of medical waste is crucial for maintaining a healthy environment. According to reports, between the years of 1996 and 2004, 2140 people in the UK were exposed to blood-borne viruses at work. According to research, 21% of accidents happened during the disposal process. A research conducted in Mexico City, 34% (13) of the 69 garbage handlers who were interviewed claimed having sustained 22 needle sticks between them in the previous 12 months, and 96% had observed needles and syringes among the waste.

By the end of 2020, every city above the prefecture-level must build at least one centralized medical waste disposal facility, and by 2022, every county must build a medical waste system that includes the collecting, transfer, and disposal components, according to the Chinese government's Work Plan for Comprehensive Treatment of Waste in Medical Institutions (SCPRC, 2020).(MEE, 2020). [11]

The data analysis showed that nursing students had very little prior knowledge, but their knowledge score increased after receiving the specified instruction program. Since nursing students will be the foundation of the future health care system, the current study was done to evaluate their awareness of the impact of biomedical waste on the environment.

According to the current study conducted regarding the impact of BMW on environment depicted that, among 500 nursing students, 73.33% (n=367) of nursing students are having poor knowledge, 23.33% (n=116) of nursing students are having average knowledge and 3.33% (n=17) of nursing students are having good knowledge in pre-test knowledge score. But in post-test knowledge score, it was clear that about 5.33% (n=27) of nursing students are having poor knowledge score, 17.33%(n=87) of nursing students are having average knowledge whereas about 77.33% (n=386) of nursing students are having good knowledge score.

From this data analysis it revealed that, the previous knowledge of nursing students were very low whereas after webinar, their knowledge score was increased.

The current study was backed by a study carried out by Ms. Amandeep Kaur and Mrs. Pardeep Kaur, in which they used a self-Instructional Module on biomedical waste management among the staff Nurses of the selected Hospitals in Ludhiana, Punjab .The mean Post-test knowledge scores of the subjects (50 staff nurses) were found to be significantly (P0.01) higher than their mean pre-test knowledge score (17.52), demonstrating that the administration of the self-Instructional Module on Biomedical Waste Management was very effective on staff Nurses .

So, there is a lot to be desired to increase the knowledge of the nursing students regarding the impact of biomedical waste on environment and it's management as they are the future backbone of the health care system. As they are having some theoretical knowledge regarding biomedical waste management but practices are also important in the health care system. So this gap between

knowledge and practices can be bridged by giving them training by organizing different types of workshops or seminars or formal training on biomedical waste management for the safety of patients, themselves and also for the safety of environments.

STRENGTHS AND LIMITATIONS

Our study has several strengths and limitations. The main strengths are the adequate sample size and representative study population (novice nursing students) who have less knowledge on impact of BMW on environment and its prevention. Additionally this study gives emphasis on the improvement of knowledge by giving proper training to the new budding nurses. Furthermore the findings of the study provide specific information on a wide spectrum of data regarding the effectiveness of webinar. However it will be more effective if it will cover wide range of nursing students.

CONCLUSION

At the chosen nursing colleges, this study highlights the nursing students' present grasp of the impacts of biological waste on the environment. Because workplace safety is of the utmost significance, this study emphasizes the crucial need for training nursing students about biological waste management. The research claims that additional education is needed to increase nursing students' awareness of biological waste and its environmental impacts.

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