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AWARENESS OF BIOMEDICAL WASTE MANAGEMENT AMONG NURSES IN SHARIF MEDICAL CITY HOSPITAL LAHORE, PAKISTAN

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Keywords

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ABSTRACT

Background: *Biomedical waste management (BMWM) is a critical issue in healthcare settings. It refers to waste generated during the diagnosis, treatment, or immunization of humans or animals, as well as from related research activities. Improper handling and disposal of biomedical waste, especially in developing countries, increases the risk of hospital-acquired infections and epidemics. Appropriate disposal practices can significantly reduce morbidity and mortality.*

Objective: *To assess the awareness of biomedical waste management among nurses in Sharif Medical City Hospital, Lahore, Pakistan.*

Methods: *A descriptive cross-sectional study was conducted over six months (August 2022–January 2023). A total of 109 nurses, selected through a convenient sampling technique, participated. Data were collected using a structured, close-ended questionnaire assessing knowledge, awareness, and practices regarding biomedical waste management. Descriptive statistics were applied using SPSS version 20.*

Results: *Most participants (92.7%) were aware of the colorcoding system for biomedical waste segregation, while 5.5% lacked this knowledge. Regarding safe practices, 54.1% reported recapping used needles–a practice discouraged due to the risk of needle-stick injuries–while 44% did not recap, and 1.8% were indifferent. Although general knowledge of biomedical waste management was satisfactory, gaps were observed in practical implementation, particularly in safe sharps disposal.*

Conclusion: *The study found that nurses possessed adequate knowledge about biomedical waste segregation; however, unsafe practices such as needle recapping persisted. Regular training sessions, strict supervision, and hospital-wide awareness programs are recommended to improve compliance with biomedical waste management protocols and reduce occupational and environmental hazards.*

CHAPTER 1
INTRODUCTION

The waste that is produced during the diagnosis, treatment, or immunization of human beings or animals, or in the research activities related to or in the production or testing of biological and includes categories or classes mentioned in schedule I of the Biomedical Waste (Management and Handling) rules 1998 (Govt. of India, 1998). The rules for its handling were first notified in 1998and then were revised twice in 2000. This makes it mandatory for the health care institutions to segregate, disinfect, and dispose their waste in an eco-friendly way. (National guidelines on Hospital waste management, 1998).

While talking about biomedical waste management the following thing comes to light that some of the waste produced due to Health care activities is not more hazardous than regular household waste. But, some types of health-care waste signify a higher threat to human health. The indicated percentage of these includes infectious waste (15%–25% of total health-care waste), among which are sharps waste (1%), body part waste (1%), chemical or pharmaceutical waste (3%), and radioactive and cytotoxic waste or broken thermometers (less than 1%)." (Padmanabhan.K, & Bark, D. 2019).

Even mercury present in thermometer be, be deposited to a 20-acre lake from the atmosphere. This small amount, over time, will contaminate even the fish in the lake. (The Interstate Mercury Education, and Reduction Clearing house, 2004)

To ensure proper waste management, all of those concerned containers should be labeled clearly and placed in the same area. This is how no waste will be left behind, and the whole surrounding or environment can be saved from biomedical exposures. (BWS Inc. Regulated Waste Solution, 2018). For this, appropriate rules should be designed for each hospital and, nursing homes, veterinary institutes, animal houses or slaughter houses, which are actually responsible for biomedical waste.

The healthcare workers have a crucial obligation to properly segregate and be trained the staff in its disposal. Most common issues related with health care waste is lack of awareness or knowledge about the health hazards related to healthcare waste, insufficient training in proper waste management, absence of proper waste management and disposal systems, inadequate financial and human resources. (Sharma *et al.*, 2017)

Due to which nosocomial infections have become headache worldwide for both developed and developing countries. The percentage for these accounts 7% in developed and 10% in developing countries. As these infections occur during patients hospital stay, can cause several unwanted implications like prolonged hospital stay, disability, and economic liability. (Khan, H. A., Baig, F. K., & Mehboob, R. 2017).

In line with this, biomedical waste management now has also been categorized into four classes color code-type of waste and treatment choices. Additionally, it's also guided that untreated human and, animal anatomical waste, soiled waste, and biotechnology waste mustn't be stored beyond a period of 48 h. (Government of India Ministry of Environment, Forest and Climate Change, 2016).

Henceforth, adequate awareness, along with attitudes and, practices of health care staff of the health care institutions play a very noteworthy role in its disposal. (Rao, D., Dhakshaini, M. R., Kurthukoti, A., & Doddawad, V. G. (2018)

The study conducted in Pakistan about Practice and enforcement of national Hospital Waste Management 2005 rules shows that most of the hospitals lacked from waste management plans (70%), related job descriptions (80%), written procedures (80%), or records (90%). Many hospital settings neither had qualified hospital waste management supervisors (56%) nor did they consolidate formal hospital waste management trainings for new staff (40%). (Zeeshan *et al.*, 2018)

Another cross-sectional study conducted in tertiary care hospital of Pakistan assessing KAP of health personnel indicates that majority of the respondents of study almost 83% were of their opinion that their knowledge on the subject was not sufficient enough. In lieu 74% of the subjects said that they had never

attended training in biomedical waste management while 26% said they had given training. (Mattoo, A. M., Hameed, S., & Butt, A. M. 2019)

Moreover, another African study conducted in northwest Ethiopia shown that there was shortage of waste management gadgets and Personal protective (PPE) Supplies. The subjects had following of scores in knowledge (45.5%), attitude (78.2%), and practices (80%). Due to aforementioned concern, there was high almost (30.9%) prevalence of needle stick and sharps injuries leading to sever consequences. (Deress *et al.*, 2019)

SIGNIFICANCE

Health care is very important for our life and health, but health facilities generate waste also. Indiscriminate disposal of this large amount of potentially infectious and harmful waste facilities generate around the globe imposes severe threat to surroundings and to human health. .

Therefore, proper biomedical waste management plays a vital role in preventing any outbreak of infectious diseases and protecting the society from transmission of these diseases. And thus as a result, delivers not only hygienic and healthy environment in surroundings but also can cause, low incidence of occupational health and community hazards. Similarly, potential epidemics and pandemics can be prevented. This study assessed the awareness of health care staff regarding hospital created waste disposals among health care personnel's thus increasing life expectancy and reducing unwanted morbidity and mortalities.

OBJECTIVES

To assess the awareness of Biomedical Waste Management among nurses in Sharif medical city hospital Lahore.

RESEARCH QUESTIONS

Do the Nurses have enough knowledge of biomedical waste generation, hazards and legislation?

What is the level of awareness on biomedical waste management practice among nurses?

What is level of knowledge among Nurses regarding needle stick injuries?

HYPOTHESIS

Null Hypothesis

Health care personnel do not have awareness and regarding the biomedical waste management.

Alternative Hypothesis

Health care personnel do have awareness regarding the biomedical waste management.

Conceptual Definition

According to Dictionary (Webster, 2016).

Awareness: The state of being aware & understanding that something is happening or exists..

Operational Definition

Awareness: The study participants know about biomedical waste management (60 % of knowledge about BMW is sufficient).

CHAPTER 2

LITERATURE REVIEW

Compared to other types of trash, waste generated during medical procedures has a higher risk of infection and harm. If we can provide enough information and awareness about the appropriate handling of biomedical waste (BMW), we can strengthen health care system and prevent fatal diseases. Lack of information about how to properly handle medical waste can have negative effects on one's health and environment simultaneously. Research about knowledge and practices about BMW among health care workers has been carried out to evaluate the understanding, outlook, and practices of physicians, nurses, laboratory technicians, and sanitary staff about the handling of biomedical waste. This study was conducted using a predesigned and pretested questionnaire and a cross-sectional study design was chosen. Study participants included medical staff working in various departments of the hospital. A total of 283 health professionals consented to be

interviewed (93% response rate). Research results showed that nurses and laboratory staff were more knowledgeable about color coding and waste segregation at source than physicians. (Mathur, Dwivedi, Hassan, Misra, 2011).

A number of cross-sectional audits on the hospital's biomedical waste segregation and the HCWs' awareness of it had been done as part of the study. In hospitals, ordinary trash makes up 80% of waste generation, with infectious, hazardous, and radioactive waste making up the remaining 20%. This 20% of the waste is highly infectious and dangerous and could cause serious damage to the society and the environment when it is not properly segregated and disposed off. In September 2009, a staff awareness audit on biomedical waste segregation was done with the primary goal of determining the degree of knowledge among nurses, allied personnel, and healthcare professionals in this area. A pre-tested questionnaire with a response rate of 54% was given to 166 randomly chosen healthcare professionals as part of the audit. The study's drawback was that optimizing the segregation of biomedical waste requires targeted training, stringent oversight, daily observation, audits inspections, hospital administrator involvement, and regular evaluations. (Joseph, Paul, Premkumar, Paul, Michael, 2015)

Health care provider are constantly associated with disposal of biomedical waste. Biomedical waste, whether liquid or solid, is produced during medical procedures, diagnosis, and treatment. This study was conducted in tertiary care hospital. A cross-sectional study included 150 health care worker form five groups (postgraduates, interns, nurses, technicians and sanitary staff) each group comprising of 30 individuals and give response by questionnaire 30 questions (10 in each session) and give score good, average and poor. In our study postgraduates 81.33%, interns 86.7% and laboratory technicians 69.33%. Postgraduates and interns had better knowledge regarding biomedical waste management than nurses and sanitary staff. So, provide enough knowledge to nursing staff who work in the hospital ward. (Sekar, Swapna, Easow, 2018).

Inadequate management of biomedical waste cannot only cause a risk of infection such as hepatitis B and C but also a risk of water, air and environment pollution that cause a significant impact of patients and human health. Therefore, the Ministry of health and family welfare commissioned implementation of an infection management and environment plan (IMEP) in health care facilities. Hence, this study was conducted to assess the knowledge, attitude and practices of biomedical waste management at primary health care facilities. A cross- sectional study was conducted among the primary health care center of Hassan district. Detail of knowledge, attitude and practices of biomedical waste management were collected through observation, interview of staff and predesigned questionnaire. A score of 0, 1 and 2 give that show good score >70, average 50 to 70 and poor <50. The main efficacy score was 63%. Knowledge was good with score of 74, attitude was average with score of 63 and practices was showing poor score of 54. There is a need of retraining of all staff nurses to improve practices with supportive supervision of the authorities. (Gonibeedu et al. 2021)

The biomedical waste, if not manage properly can cause high risk for staff health, patients, patient families, public health and environment. Especially in those lower range settings where system of managing of biomedical waste not followed. This study show the perception of staff of Indian rural tertiary care teaching hospital on hospital waste management. A qualitative study was conducted by using 10 Focus group discussion (FGD'S) for different professional group cleaning staff, nurses, medical students, doctors and administration. The focus group guide for following topics. Role of health care waste management (HCWM) in prevention of health care associated infection and perception of improvements.

This focus group discussion was recorded and translated to English when conducted in other language. The gap between knowledge and actual practices regarding health care waste management (HCWM) in perception of staff nurses. The suggestion that

organizational changes and proper training of nursing staff to fill the gap. (Joshi et al. 2015).

The study was conducted in private sector hospital in Pakistan to check the level of awareness mindset and perception regarding biomedical waste management among health care professionals. A descriptive cross – sectional study was conducted in which sample was collected by multistage random sampling. Among all participants studied mean age was (29.56 to 7.59). After statistical analysis majority of respondents had good knowledge 64.7% OT department had good knowledge26% while knowledge of nurses was 33%. The attitude of respondent 53%, respondent from OT department the confident attitude 28% while nurses had confident attitude 39%. overall good practices of respondent were 65%, OT department had 30 % whereas nursing staff also had good practice 41% .it was concluded that healthcare professional knowledge and practices were found to be satisfactory but their attitude was somehow low. On the other hand, nurses have high score of satisfactory knowledge, attitude and practices. This may lead to increased interest in biomedical waste management in hospital settings. (Hassan, Zia, Khawaja, 2020).

THEORETICAL FRAMEWORK

The Health Promotion Model was given by Nola J. Pender "this model describes that health is a positive dynamic state rather than simply absence of disease". It is directed towards providing awareness to individual to raises his/her well-being level. This model explains the complex nature of persons as they intermingle within their surroundings or environment to chase better health.

This study is used to understand the people awareness, behavior, attitude and knowledge about health promotion and prevention.

This study is also related because it increase the awareness of health care staff by provide them necessary knowledge about biomedical waste management and their rules by trainings to modify their practices towards proper handling of waste which would promote their overall well-being.

CHAPTER 3

MATERIAL AND METHOD

3.1.1. Study Design

The Design of the study was cross sectional.

3.1.2. Study Duration

Six Months. (August 2022 to January 2023).

3.1.3. Study Area

Sharif medical city hospital

3.1.4. Study Population

The study will be conducted among BS Generic Nursing, Post RN, General Nursing, and Nursing Assistants

Inclusive Criteria

All the relevant nursing professionals of Sharif medical city hospital, Lahore were included in the research. These were BS Generic Nursing, Post RN, General Nursing, and Nursing Assistants.

Exclusive Criteria:

Nursing Students and those who do not give consent.

Data collection methods:

The modified close ended questionnaire was used to assess the Awareness of the population. It captured the following information: socio-demographic characteristics, knowledge about the bio-medical waste characterization and management and bio-medical waste management practice.

Study variables:

Dependent variable: Awareness of Biomedical Waste Management Among Nurses

Independent Variable: Knowledge/Education of Nurses Regarding Biomedical Waste Management.

Sample Size & sampling technique:

A standardized sample was considered. A convenient sampling technique was used for this study.

Sample Size

$n = N/1+N e^2$

$n = 150/1+150(0.05)^2$

$n = 150/ 1.375$

n= 109
Where, N is Total Population & e^2 is level of significance

ETHICAL CONSIDERATION

A written application mentioning the purpose of the project will be given to the "Review Board of Sharif city hospital" and its approval will be taken for conducting research here. Additionally, written consents will also be attached with questionnaire to ensure permission of respondents and all respondents will sign before data collection.

RESEARCH TOOL

The modified close ended questionnaire was used to assess the Awareness of 109 Nurses.

DATA GATHERING PLAN

All questionnaires were completed and data was collected from Sharif medical city hospital, Lahore. A pilot study was done to check the validity of the questionnaire and some questions are added.

DATA ANALYSIS

The data was analyzed by using statistical package for social science (SPSS) version 20. Descriptive Statistics was applied. The results were presented in the form Tables, Bar charts or Histograms.

CHAPTER 4

RESULTS

Total 109 subjects participated in this research where people from different age groups included. However, more females and people with Single Marital status participated in research. The results of the study mentioned in Table 1, Table 2, and Table 3. This also included Figure 1 and Figure 2 which shows major findings of the research.

Table 1: Demographic Data

Questions	Percentages
1. Age:	
15 – 28	83.5
29 – 39	13.8
40 above	2.8
2. Gender:	
Male	31.2
Female	68.8
3. Marital Status:	
Single	80.7
Married	19.3
4. Your position:	
Doctor / Dentist	18.3
Nurse	65.1
Nursing Assistant	4.6
Lab technician	2.8

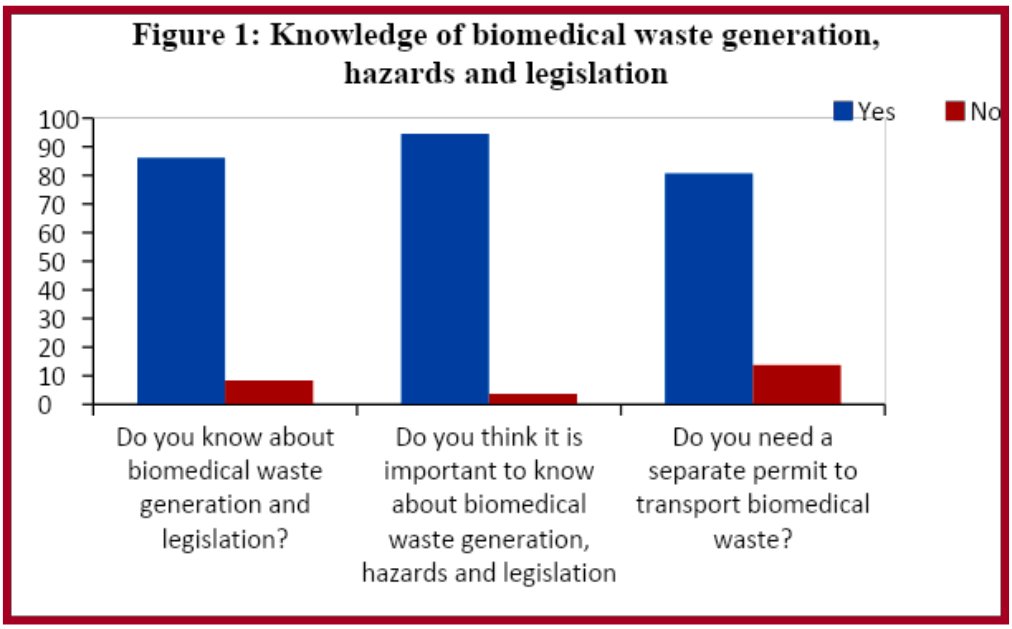
Figure 1: Knowledge of biomedical waste generation, hazards and legislation
Yes
No
100
90
80
70
60
50
40
30
20
10
0
Do you know about biomedical waste generation and legislation?
Do you think it is important to know about biomedical waste generation, hazards and legislation
Do you need a separate permit to transport biomedical waste?

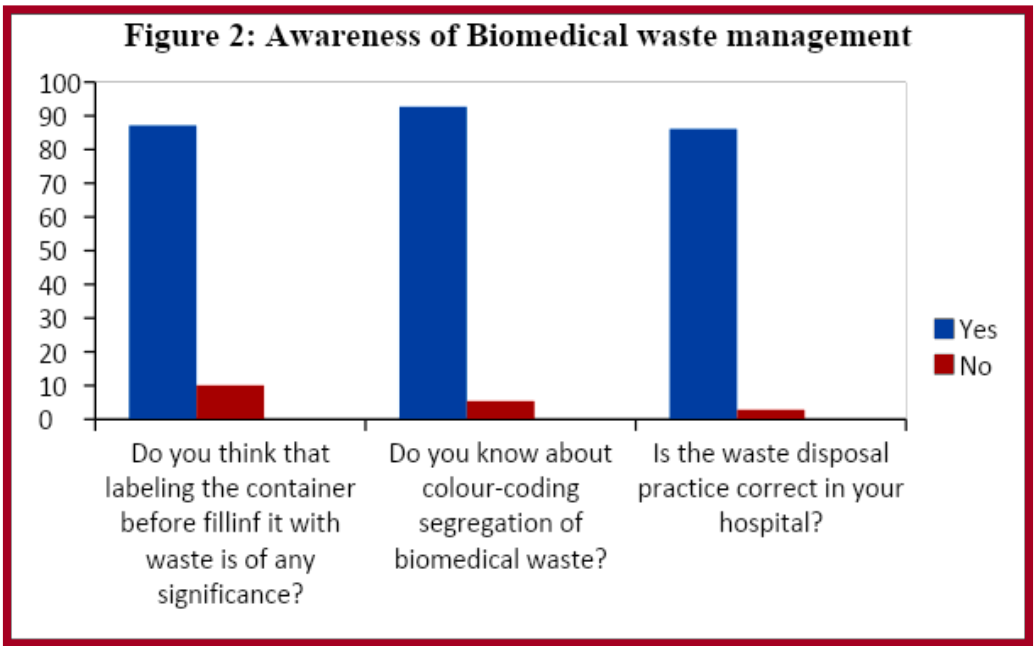
Figure 2: Awareness of Biomedical waste management
100
90
80
70
60
50
40
30
20
10
0
Yes
No
Do you think that labeling the container before fillinf it with waste is of any significance?
Do you know about colour-coding segregation of biomedical waste?
Is the waste disposal practice correct in your hospital?

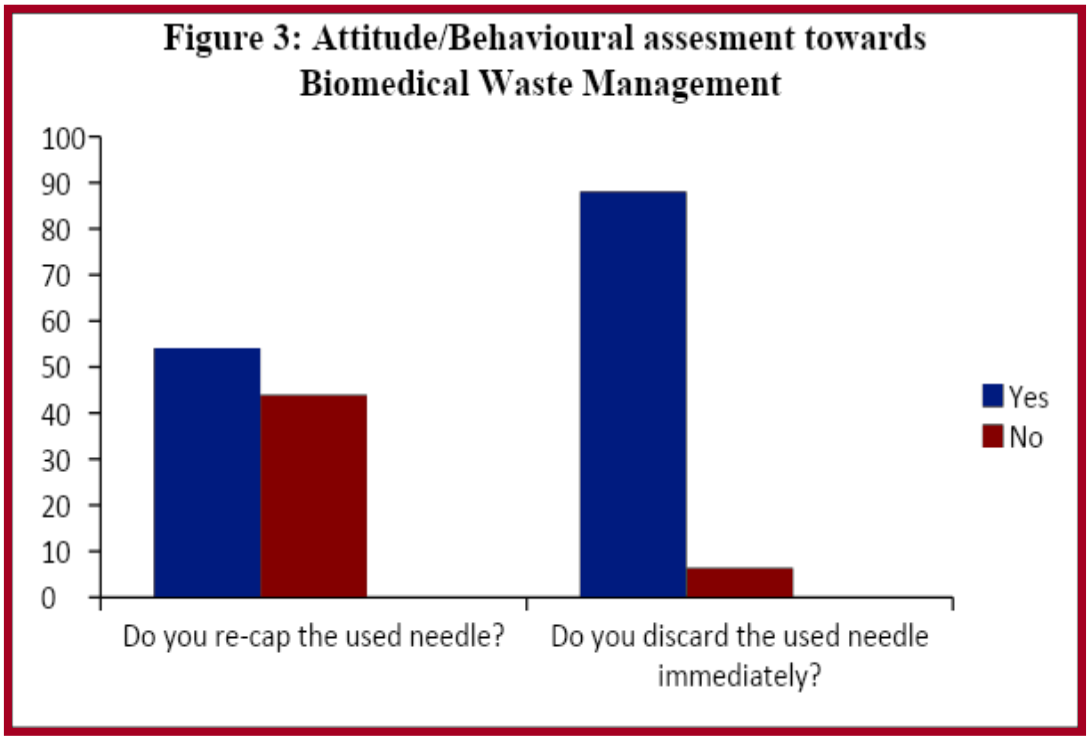

Table 2: Section 1: Knowledge of biomedical waste generation, hazards and legislation

Questions	Percentages
7. When Biomedical Waste (Management & Handling) Rules were first proposed?	
1997	19.3
1998	45.9
1999	17.4
2000	17.4
8. When the Amendments to the Biomedical Waste (Management& Handling) Rules were made?	40.4
2000	34.9
2001	11.0
2003	13.8
2004	
9. Which statement describes one type of biomedical waste?	
Materials that may be poisonous, toxic, or flammable and do not pose disease-related risk.	38.5
Waste that is saturated to the point of dripping with blood or body fluids contaminated with blood.	55.0
Waste that does not pose a disease-related risk.	6.4
10. At how many hours waste should not be stored beyond, according to the Biomedical Waste (Management & Handling) Rules?	
12 hours	53.2
48 hours	43.1
72 hours	4

Table 3: Section 2: Level of awareness on biomedical waste management practice

Questions	Percentages
12. Do you follow color-coding for biomedical waste?	
Yes	92.7
No	4.6
Sometimes	2.8
13. Objects that may be capable of causing punctures or cuts that may have been exposed to blood or body fluids including scalpels, needles, glass ampoules, test tubes and slides, are considered biomedical waste. How should these objects be disposed of?	
Black bags	8.3
Yellow bags	23.9
Clear bags	1.8
Sharps container	66.1
14. Are documents with confidential patient information to be disposed of into the paper recycling bins?	
Yes	45.9
No	37.6
Do not know	16.5
15. What is the color code for the biomedical waste to be autoclaved disinfected?	
Red	22.9
Black	30.3
Yellow	33.0
Blue/white	13.8
16. What is the color code for disposal of normal waste from the college?	
Red	8.3
Black	28.4
Yellow	18.3
Blue	45.0
17. Except which all of the following steps should be followed after an exposure with infected blood/body fluid and contaminated sharps?	
Exposed parts to be washed with soap and water.	38.5
Pricked finger should be kept in antiseptic lotion.	22.0
Splashes to eyes should be irrigated with sterile irritants.	20.2
Splashes to skin to be flushed with water.	19.3

Table 4: Section 3: Attitude/behavior assessment towards biomedical waste

Questions	Percentages
18. Is safe management of health care waste not an issue at all?	
Agree	31.2
Disagree	64.2
Cannot comment	4.6
19. Does waste management is team work/no single class of people is responsible for safe management?	
Agree	78.0
Disagree	17.
Cannot comment	4.6
20. Does safe management efforts by the hospital increase the financial burden on	

management?	
Agree	56.9
Disagree	37.66
Cannot comment	5.5
21. Is safe management of health care waste an extra burden on work?	
Agree	
Disagree	24.8
Cannot comment	63.3
	11.9
22. Do you think that the college should organize separate classes or a continuing dental education program to upgrade existing knowledge about biomedical waste management?	
Yes	91
No	13
Cannot comment	5
23. Will you like to attend voluntarily programs that enhance and upgrade your knowledge about waste management?	
Yes	85.3
No	10.1
Cannot comment	4.6
24. Do you think that infectious waste should be sterilized from infections by autoclaving before shredding and disposal?	
Yes	55.0
No	35.8
Cannot comment	9.2
25. Do you think that an effluent treatment plant for disinfection of infected water should be set up in medical colleges?	
Yes	82.6
No	11.9
Cannot comment	5.5

Table 5: Section 4: Attitude/behavior assessment towards biomedical waste

Questions	Percentages
26. Are you aware of consequences of needle-stick injury?	
Yes	92.7
No	6.4
Not concerned	0.9
27. Did you fill in an incident report?	
Yes	43.1
No	53.2
Cannot remember	3.7

CHAPTER 5

DISCUSSION

In our study, data were collected from 109 participants, of which 94 (86.2%) knew about biomedical waste generation and legislation 9 (8.3%) of them didn't know about it and 6(5.5%) of them were not sure about that. A similar study was conducted in associated hospital of government medical college Kathua which shows similarity in results with current study where maximum participants know about biomedical waste management nearly 58.6% know about biomedical waste generation and legislation, 14.1% of them had no awareness regarding it and 27.3% were not sure. (Dolma et al., 2020)

Furthermore, in our study 103 (94.5%) of participants said that it is important to know about biomedical waste generation, hazards and legislation, 4(3.7%) of them said that it's not important and 2 (1.8%) of them said somewhat. A similar study conducted in associated hospital of government medical college Kathua shows coinciding results with current study in which 76.3% of them thought that it is important to know about biomedical waste generation, hazards and legislation, 23% of them said no it's not important. (Dolma *et al.*, 2020)

The result related to awareness of biomedical waste management of our study shows in which 101 (92.7%) answered yes, they know about the color-coding segregation of biomedical waste, 6 (5.5%) said didn't know color coding and 2 (1.8%) answered that not sure about that. Surprisingly similar study conducted in India showed alike results with the current study in which 93% of them know about the color-coding segregation of biomedical waste and 1.7% didn't know color coding. (Potlia& Code, 2017)

When comes to following this color coding in our study 101 (92.7%) said that they follow color coding, 5 (4.6%) answered no and 3 (2.8) answered sometimes. Similarly, study conducted in Pune, India which indicates related results with the current study where maximum subjects 206 were total participants from which 127 (61.6%) answered Yes, they follow color coding and 79 (38.4%) said no.(Khatri*et al.*, 2014)

While the most important regarding practices to safe needle stick injury shows contradiction to study performed in Ethiopia, Africa about Knowledge and practice of health workers about standard precautions where our study indicates where 59(54.1%) answered yes they re-cap the used needle, 48(44.0%) answered no and 2(1.8%) said that they do not bother. While in African study said No (79.1%) and 20.9 % said no respectively. This result in comparison ensures more safe practice in Ethiopia. (Alemayehu, T., Worku, A., & Assefa, N. 2018)

CONCLUSION

The study was conducted in order to evaluate awareness of biomedical waste management among nurses which can prevent many nosocomial infections, injuries and hazards. In this study, very large number of participants was aware of some basic rules of biomedical waste management. But their practices and attitudes regarding proper needle disposal were not satisfactory the hospitals should conduct awareness programs and set protocols regarding biomedical waste management to create safe environment which would ensure well-being of lives.

LIMITATION

The findings of this study are relatively limited because of the use of a descriptive design and convenient sampling technique.

Due to resource shortage this study was conducted in only one tertiary care hospital

There is no participatory observations were performed to evaluate the segregation practices. Hence, external validity of the findings is questionable.

One of the main difficulties during research is that we are novice in research.

RECOMMENDATION

The study sample should be collected through random sampling method and Participatory observation should be performed to evaluate the segregation practices which can minimizes biasness. The sample should be collected from different Tertiary care hospital to raise its external validity. The health department should take effective initiative to extend awareness and

practices of biomedical waste management and handling within the hospitals through different ways such as mass media, college awareness programs, discussions and seminar to increase the awareness about handling and disposing of Biomedical waste & its management.

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