DOI: https://doi.org/10.53350/pjmhs22163323

**ORIGINAL ARTICLE**

# Effect of World Health Organization Based Guidelines on Biomedical Waste Management Knowledge and Practices among Nurses in a Tertiary Care Hospital

WAJIHA HAMEED[1], ADNAN YAQOOB[2], HAJRA SARWAR[3], SADIA KHAN[4]
[1]*MS Nursing Student, Lahore School of Nursing, The University of Lahore.*
[2]*Assistant Professor, Lahore School of Nursing, The University of Lahore*
[3]*Assistant Professor, Lahore School of Nursing, The University of Lahore*
[4]*Senior Lecturer, Faculty of Allied Health Sciences, The University of Lahore*
*Correspondence to: Wajiha Hameed, Email: Wajiha.hameed786@gmail.com, Cell# 03077743300*

## ABSTRACT

**Introduction:** Biomedical waste is the consisting of human tissues or organs, microbiology waste, broken glasses, sharp needles and syringes, drips, cytotoxic drugs, dressings, drips, blood strain items, chemical waste, fluids, urine catheters, and tubes. These wastes are not only harmful to the patients but lead to infections among health care provider and very hazardous for environment.

**Objectives:**To assess the effect of world health organization based guidelines on biomedical waste management Knowledge and practices among nurses in a Tertiary Care Hospital.

**Methodology:** A Quasi-experimental (pre-post) study was carried out at Bahawal Victoria Hospital, Bahawalpur. Overall, 150 nurses were recruited into the study. Data was collected by using an adopted knowledge and practice questionnaire. A total 16 weeks of interventions were organized for the nurses into groups regarding to knowledge and practices of the biomedical waste management. The study was approved by the University of Lahore's Ethical Review Board. Permission was also granted from the hospital administration. Data were analyzed by using SPSS version 24.

**Results:** The mean age of the participants were 33.01 years with a SD of 5.4. The majority (62.7%) of the participants were nursing diploma holders. 66% of the participants were having < 5 years of working experience. Overall, 132(88%) and 100(100%) of participants had poor pre-interventional knowledge and unsatisfactory practices regarding to biomedical waste management. After interventions, 148(99%) and 142(95%) of participants reported good knowledge and safe practices. There was a significant (P= 0.000) enhancement in means of knowledge (2.88 to 12.95) and practices (3.70 to 13.93) scores.

**Conclusion:** The findings of the study reported as poor knowledge and unsafe practices between the nurses regarding to the biomedical waste management. Educational interventions of WHO guidelines proved significant improvement into the knowledge and practices of the nurses regarding to biomedical waste management.

**Keywords:** World Health Organization, Knowledge, Practice, Biomedical waste management

## INTRODUCTION

Hospitals are health care centers that provide hazard-free health care facilities to the patients in the form of treatment, interventions, and facilitation[1]. In the last few decades, globally the burden on health care centers has been increasing due to the increasing population. Instead of providing care to the unhealthy population certain health care setups health hazards for the patients, community, and health care workers due to improper biomedical waste management[2]. Till the last few decades, biomedical waste was not considered a health issue for the patients, community, and health care professionals[3].

Biomedical waste of the hospital is consisting of human tissues or organs, microbiology waste, broken glasses, sharp needles and syringes, drips, cytotoxic drugs, dressings, drips, blood strain items, chemical waste, fluids, urine catheters, and tubes[4,5]. The huge prevalence of infections and potential risk of various infections risks raise questions on the biomedical waste management in the health care sectors[6]. Eventually, hospital waste becomes the most concerning aspect of the health care sector due to its hazardous consequences for the patients, health care workers, and community[7].

All these health care centers provide care to a huge number of patients and address the health-related problems of the population[8]. The health sector produces a large amount of biological waste in the course of treating health problems, which can be hazardous to anyone who comes into touch with it.[9]. Approximately, 10 to 25% of the waste produced in the hospital is hazardous[10]. Not all the waste generated in the health care sector is infectious or hazardous. Approximately, 75-90% of the waste produced in the hospital is not infectious and may not be risky for the health care professionals, patients, and community[11].

Body fluids, human tissues, excreta of the patients such as urine, blades, sharp glasses, contaminated bandages, blood, and clothes are infectious waste. The waste generated from laboratory work, surgery, empty bottles, paper boxes, papers, and outdated drugs are non-infectious waste[12]. In Pakistan, approximately 250000 tons of biomedical waste is produced per year. This waste is consisting of 0.667kg, 0.497kg, and 0.17 kg bed-day. This biomedical waste comprises of plastic (71%), paper (3.85, glass (13.9%), infected dressing (5.7%), gloves, masks, sheets (0.3%), operation theater machines produced waste (2%), diapers (0.4%) and blades (0.1%)[13,14].

Improper management of hospital waste can cause severe health-related problems such as, human immunodeficiency virus (HIV), severe infections, hepatitis B virus, and other injuries to the whole hospital staff. Nurses are 10 times more prone to infections than other health care providers[15,16]. Similarly, improper management of hospital waste products may impact the health care staff, patients, and the environment which indirectly impacts the population[17].

Nurses are considered to be the backbone of the health care system. Their role in the management of biomedical waste is very important[18]. According to research studies, nurses reported poor, average, and good knowledge and practices regarding hospital waste management[19,20]. Continuous and evidence bases education is an important aspect of nursing professional development. Similarly, educational programs play a very significant role in improving the nurse's knowledge and practices regarding to biomedical waste management[21,22]. Studies conducted in different health care sectors of Pakistan reported inconsistency in the effective management of biomedical waste as per WHO guidelines. With the above background, this study is intended to address the gap by applying the effect of World Health organization Based Guidelines on the Biomedical Waste Management Practice among Nurses in a Tertiary Care Hospital.

## METHODS AND MATERIALS

A Quasi-experimental (pre-post) study was carried out at Bahawal Victoria Hospital, Bahawalpur. The study participants were 150 registered nurses having aged 22-40 years and at least with one year of experience were included in this study. Nurses working on the management level were excluded from study.

Initially, the data was collected by using a validated questionnaire adapted by the World Health Organization (WHO) to assess knowledge and practice of the nurses regarding to biomedical waste management. The Cronbach alpha is 0.92. The questionnaire is divided into three sections. In the section, “A” socio-demographic variables of the participants were asked. Section “B” is consisting of 14 questions about to the knowledge of nurses regarding to biomedical waste management. The knowledge were assessed as poor,average and good knowledge. Section “C” is consisting of 15 questions about to practice of the nurses regarding to biomedical waste management. The biomedical waste management practices were assessed as safe and unsafe practices. 16 weeks interventions were arranged for the nurses in groups and post-interventional data were collected by using the same questionnaire.

The study was approved by the University of Lahore's Ethical Review Board. Permission was also granted from the hospital administration. The participation of the participants was voluntary bases. Consents were granted from the participants before recruiting into the study. Data will be analyzed using SPSS version 24.

## RESULTS

Overall, 150 participants were involved into the study. All the participants were female. The mean age of the participants were 33.01 years with a SD of 5.4. The minimum age of the participants were 22 years while the maximum age were 45 years. The majority (62.7%) of the participants were nursing diploma holders, 20.7% of participants were holding Post RN

nursing degrees while 16.7% of participants were holding BSN Nursing degrees. The majority (58%) of the participants were from the 25- 35 years age group , 32% participants were from the 36 - 45 years age group, while 10% of participants were having aged less than 25 years. Besides, the majority (66%) of the participants was having less than 5 years of working experience, 20% were having 5 to 10 years, 6% of participants were 10 to 15 years and 8% of participants were having working experience of more than 15 years. 27.3% of participants were recruited from each Surgical and medical unit respectively, 13.3% participants were selected from the neurology unit, 6.7% participants each were selected from urology, orthopedic, and dialysis respectively. 6% of participants were included from CCU, 2.7% were from ICU and 3.3% were from the gastroenterology unit (Table 1).

The majority 132(88%) of the participants had poor pre-interventional knowledge regarding to biomedical waste management,while only 18(12%) of the participants had Average knowledge regarding to biomedical waste management.Similarly, all the nurses reported Unsafe Pre-Interventional practices regarding biomedical waste management.16-week interventions were applied and post-interventional knowledge was assessed using the same questionnaire. Almost all 148(99%) of the participants were reported as Good Knowledge related to bio-medical waste management and only 2(1%) of participants reported Average knowledge. Similarly, the majority 142(95%) of the participants were reported Safe practices while only8(5%) of the participants were reported Unsafe practices (Table2,3).

Table 1: Socio-Demographic profile of the study participants, n=150

| | Frequency( *f* ) | Percent(%) |
|---|---|---|
| Gender | | |
| Female | 150 | 100.0 |
| Educational Status of Participants | | |
| Diploma in Nursing | 94 | 62.7 |
| BSN Nursing | 25 | 16.7 |
| Post RN Nursing | 31 | 20.7 |
| Total | 150 | 100.0 |
| Age of the participants | | |
| Less than 25 years | 15 | 10.0 |
| 25 to 35 years | 87 | 58.0 |
| 36 to 45 Years | 48 | 32.0 |
| Total | 150 | 100.0 |
| Experience of the participants | | |
| Less than 5 Years | 99 | 66.0 |
| 5 to 10 Years | 30 | 20.0 |
| 10 to 15 Years | 9 | 6.0 |
| More than 15 Years | 12 | 8.0 |
| Total | 150 | 100.0 |
| Working Unit | | |
| CCU | 9 | 6.0 |
| Urology | 10 | 6.7 |
| Gastroenterology | 5 | 3.3 |
| ICU | 4 | 2.7 |
| Orthopedic | 10 | 6.7 |
| Neurosurgery | 20 | 13.3 |
| Dialysis | 10 | 6.7 |
| Surgical Ward | 41 | 27.3 |
| Medical Ward | 41 | 27.3 |
| Total | 150 | 100.0 |

Table 2:Pre post knowledge categorical scores regarding biomedical waste management,n=150

| | Pre intervention | Post intervention |
|---|---|---|
| Knowledge Categories | *f* (%) | *f* (%) |
| Poor | 132 (88) | 0(0) |
| Average | 18 (12) | 2 (1) |
| Good | 0 (0) | 148 (99) |

Table 3: Pre post practices categorical scores regarding biomedical waste management,n=150

| | Pre intervention | Post intervention |
|---|---|---|
| Practices Categories | *f* (%) | *f* (%) |
| Unsafe practices | 100(100) | 8(5) |
| Safe practices | 0(0) | 142(95) |

Table 4: Pre and Post-intervention knowledge and practices means score regarding biomedical waste management, n=150

| | N | Mean | Std. Deviation |
|---|---|---|---|
| Pre-interventional mean knowledge | 150 | 3.88 | 2.343 |
| Post-interventional mean knowledge | 150 | 12.95 | 0.982 |
| Total | 150 | 16.82 | 3.32 |
| Post-Interventional Practices | 150 | 3.7067 | 1.55242 |
| Post-Interventional Practices | 150 | 13.93 | 1.254 |
| Total | 150 | 17.63 | 2.80 |

The overall mean of pre-interventional knowledge score regarding to biomedical waste management was 3.88 with SD of 2.343, while the mean of post-interventional knowledge score of participants regarding biomedical waste management was reported to be 12.95 with a SD of 0.982. The overall mean of pre-interventional practice score regarding to biomedical waste management was 3.70 with a SD of 1.55, while mean of post-interventional practice score of the participants regarding biomedical waste management was reported to be 13.93 with a SD of 1.254 (Table 4).

Wilcoxon Signed Rank Test was applied to the pre and the post-interventional knowledge and practices. There was a significant difference of mean (P=0.000) between pre-interventional and post-interventional knowledge of nurses regarding Bio-medical waste management. Similarly, a significant difference of mean (P=0.000) between pre-interventional and post-interventional practices of nurses regarding Bio-medical waste management (Table 5,6).

Table 5: Test Statistics of Wilcoxon Sign Rank Test (Comparison of the means knowledge score)

| Test Statistics | |
|---|---|
| Post_ interventional Knowledge score - Pre_ interventional Knowledge score | |
| Z | -10.654[b] |
| Asymp. Sig. (2-tailed) | 0.000 |
| a. Wilcoxon Signed Ranks Test | |
| b. Based on negative ranks. | |

Table 6 : Test Statistics Wilcoxon Sign Rank Test (Comparison of the mean Practices score)

| Test Statistics | |
|---|---|
| | Post-Interventional practice score - Pre-Interventional practice |
| Z | -10.660[b] |
| Asymp. Sig. (2-tailed) | 0.000 |
| a. Wilcoxon Signed Ranks Test | |
| b. Based on negative ranks. | |

## DISCUSSION

The basic aim of this study was to assess the effect of World Health Organization Based Guidelines on biomedical waste management practice among nurses in a tertiary care hospital. Overall, 150 participants were involved into the study. In this study, majority of the (88%) of participants had poor knowledge related to biomedical waste management, while only 12% of participants had average knowledge regarding to the biomedical waste management. Overall, all the participants reported unsafe practices regarding to the Biomedical waste management.

Supporting the current findings, a cross sectional study conducted in India, reported majority of the (75%) nurses had inadequate knowledge, while 25% of nurses had moderate knowledge related to the bio-medical waste management (23). Similarly, another cross-sectional study also reported similar findings and revealed poor knowledge among the nurses regarding biomedical waste management (24). Additionally, a study provided different results in comparison to the current findings a study reported that nurses had average knowledge of biomedical waste management (25). Despite, poor knowledge of the nurses another study reported a better understanding of the nurses regarding biomedical waste management (26).

In a similar context, a study in Pakistan reported different findings and revealed that 61.39% and 89.69% of the nurses had good knowledge, and practice regarding biomedical waste management (27). There are variations in the current findings and literature. These variations maybe as a result of the study's inclusion and exclusion criteria. In our study, only those nurses were included in the study that hasn't attained any training session or workshop about biomedical waste management.

In the current study, 16-week interventions were applied and post-interventional knowledge and practices were assessed using the same questionnaire. Almost all (99%) of the participants were reported as Good Knowledge of the bio-medical waste management while only 1% of participants reported Average knowledge. Similarly, the majority (95%) of the participants were reported Safe practices while only 5% of the participants were reported Unsafe practices towards bio-medical waste management. There was a significant (P=0.000) difference among pre and the post-knowledge and practice. The mean knowledge score before interventions was 3.88 which increased to 12.95. Similarly, the overall mean pre-interventional practice score regarding biomedical waste management was 3.70 which was improved to 13.93.

Supporting the current findings, an interventional study reported significant improvement in mean knowledge score (9.6% to 97.3%) and practiced score (80% to 92.1%) after interventions (28). In the same context, another study also reported significant improvement in the nurses knowledge and practices towards the biomedical waste management. Good knowledge among 17% of the nurses improved to the 58% (29). The findings of an interventional study reported, a significant improvement in the nurses's knowledge from a mean value of 16 to 19 after educational

interventions (30) and from low to good knowledge and from unsatisfactory to satisfactory practices (31).

Additionally, another interventional study in India also provided similar findings as to the current study and reported a significant (P=0.001) improvement in knowledge mean score. The mean pre interventional knowledge's score of the nurses was 34.5 which improved to 84 after interventions (32). Thus, the above studies proved that interventions (training) regarding to the biomedical waste management is very important for the improvement of nurses' knowledge regarding to the biomedical waste management. Likewise, other studies in the current study also emphasize to the importance of the educational interventions regarding to the biomedical waste management and the nurses's knowledge improved from poor knowledge to good knowledge, and practices from unsatisfactory level to a satisfactory level.

## CONCLUSION

The findings of the study reported as poor knowledge and unsafe practices between the nurses regarding to the biomedical waste management. Educational interventions of WHO guidelines proved significant improvement in the knowledge and practices of the nurses regarding to biomedical waste management. Continuous nursing education and educating the nurses about WHO guidelines are essential for the nurses to improvement of the knowledge and practices towards the biomedical waste management.

## REFERENCES


1. Maassen SM, Van Oostveen C, Vermeulen H, Weggelaar AM. Defining a positive work environment for hospital healthcare professionals: A Delphi study. PLoS One [Internet]. 2021;16(2 February):1–14. Available from: http://dx.doi.org/10.1371/journal.pone.0247530
2. Kwikiriza S, Stewart AG, Mutahunga B, Dobson AE, Wilkinson E. A whole systems approach to hospital waste management in rural Uganda. Front Public Heal. 2019;7(JUN):1–9.
3. Gizalew Snr E, Girma Snr M, Haftu Snr D, Churko C, Girma Snr Z. Health-care Waste Management and Risk Factors Among Health Professionals in Public Health Facilities of South Omo Zone, South West Ethiopia, 2018. J Healthc Leadersh [Internet]. 2021 May 3;13:119–28. Available from: https://pubmed.ncbi.nlm.nih.gov/33976580
4. Aguora SO. Assessment of Knowledge of Essential Supply Chain Functions among HIV/AIDS Supply Chain Workforce in Nigeria. Texila Int J Acad Res. 2020;7(2):103–11.
5. Singh T, Ghimire TR, Agrawal SK . Awareness of Biomedical Waste Management in Dental Students in Different Dental Colleges in Nepal. Biomed Res Int. 2018;22(1):33–9.
6. Wyżgowski P, Rosiek A, Grzela T, Leksowski K. Occupational HIV risk for health care workers: risk factor and the risk of infection in the course of professional activities. Ther Clin Risk Manag [Internet]. 2016 Jun 14;12:989–94. Available from: https://pubmed.ncbi.nlm.nih.gov/27366077
7. Karki S, Niraula SR, Karki S. Perceived risk and associated factors of healthcare waste in selected hospitals of Kathmandu, Nepal. PLoS One. 2020;15(7):e0235982.
8. Kurji Z, Premani ZS, Mithani Y. Analysis Of The Health Care System Of Pakistan: Lessons Learnt And Way Forward. J Ayub Med Coll Abbottabad. 2016;28(3):601–4.
9. Kieft RAMM, de Brouwer BBJM, Francke AL, Delnoij DMJ. How nurses and their work environment affect patient experiences of the quality of care: a qualitative study. BMC Health Serv Res [Internet]. 2017;14(1):249–56. Available from: https://doi.org/10.1186/1472-6963-14-249
10. Rao D, Dhakshaini MR, Kurthukoti A, Doddawad VG. Biomedical waste management: A study on assessment of knowledge, attitude and practices among health care professionals in a tertiary care teaching hospital. Biomed Pharmacol J. 2018;11(3):1737–43.
11. Kuchibanda K, Mayo AW. Public health risks from mismanagement of healthcare wastes in Shinyanga municipality health facilities, Tanzania. Sci World J. 2015;34(2):1–11.
12. Novi F, Enri D, Indah RSS, Venny UB, Yati S. Generation and Proportion Assessment of Hospitals Infectious Waste in Bandung Region Indonesia. E3S Web Conf. 2018;73(2):56–62.
13. Sobia M, Batool SA, Chaudhry MN. Characterization of hospital waste in Lahore, Pakistan. Chin Med J (Engl). 2014;127(9):1732–6.
14. Ali M, Wang W, Chaudhry N. Management of wastes from hospitals: A case study in Pakistan. Waste Manag Res J Int Solid Wastes Public Clean Assoc ISWA. 2016 Jan;34(1):87–90.
15. Awodele O, Adewoye AA, Oparah AC. Assessment of medical waste management in seven hospitals in Lagos, Nigeria. BMC Public Health. 2016;16(1):1–11.
16. Umegbolu EI, Ozoejike IN. Management of solid healthcare wastes in some government healthcare facilities in Enugu state, Southeast Nigeria: a cross-sectional study. Int J Community Med Public Heal. 2017;4(11):4031.
17. Sherani SH. Hospital Waste Management for the Protection of Human Health and Environment : A Review. Heal Syst Policy Res. 2020;7(1):1–5.
18. Pandey A, Ahuja S, Madan M, Asthana AK. Bio-medical waste managment in a tertiary care hospital: An overview. J Clin Diagnostic Res. 2016;10(11):DC01–3.
19. Anand P, Jain R, Dhyani A. Knowledge, attitude and practice of biomedical waste management among health care personnel in a teaching institution in Haryana, India. Int J Res Med Sci. 2016;4(10):4246–50.
20. Pal J, Biswas M, Nandi S, Biswas AK. Assessment of knowledge and practices of biomedical waste management and infection control among health assistants in a rural block of Nadia district, West Bengal. Int J Community Med Public Heal. 2019;6(10):4462.
21. Sciences M, El-sayed SH, Zakaria AM, Gheith NA. Sahar Hamdy El-Sayed, 2,3 Abeer Mohamed Zakaria and 2 Nervana Abdel-Rahman Gheith. Res J Med Med Sci. 2012;7(1):25–37.
22. Elnour AM, Moussa MMR, El-Borgy MD. Impacts of Health Education on Knowledge and Practice of Hospital Staff with Regard to Healthcare Waste Management at White Nile State Main Hospitals , Sudan. Int J Health Sci (Qassim). 2015;9(3):311–25.
23. Scientific A, Sciences M. A Study to Access the Knowledge Level on Bio-Medical Waste Management among the Nurses in Tamilnadu. Acta Sci Med Sci. 2019;3(1):78–87.
24. Mohammad Nasir Uddin, Mohammad Rashedul Islam and KY. Knowledge on Hospital Waste Management among Senior Staff Nurses Working in a Selected Medical College Hospital of Bangladesh. J waste Manag. 2014;14(4):995–1002.
25. Srivastava J. Knowledge Regarding Biomedical Waste Management among the Staff Nurses. Int J Sci Res. 2016;5(7):1714–7.
26. Balamurugan SS, Justin PSPR, Sonai RP. A Descriptive Study on Knowledge Regarding Biomedical Waste Management Among Health Care Personnel in a Tertiary Care Hospital Authors : Natl J Res community Med. 2014;3(2):186–91.
27. Ali R, Sadiq A, Hussain T, Rehman A. Knowledge and practices about biomedical waste management among healthcare personnel in Tertiary Care Hospital, Rawalpindi. J Rawalpindi Med Coll. 2019;23(S-2):72–5.
28. Hosny G, Samir S, El-Sharkawy R. An intervention significantly improve medical waste handling and management: A consequence of raising knowledge and practical skills of health care workers. Int J Health Sci (Qassim). 2018;12(4):56–66.
29. Elnour AM, Moussa MMR, El-Borgy MD. Impacts of Health Education on Knowledge and Practice of Hospital Staff with Regard to Healthcare Waste Management at White Nile State Main Hospitals , Sudan. Int J Health Sci (Qassim). 2016;9(3):311–25.
30. Jadhav J, Thangaraj S, Dsouza L, Rao A. Assessment of educational intervention on biomedical waste management among Government Nursing College students, Bengaluru. Int J Med Sci Public Heal. 2015;4(5):726.
31. Kotasthane DS, Kotasthane VD, K S, A A. Impact of intervention on awareness of biomedical waste disposal among nurses. Ann Pathol Lab Med. 2017;4(2):A195–202.
32. Mannapur, Dorle, Ghattargi S. Impact of Educational Intervention on the Knowledge of Bio - Medical Waste Management Among Health Care Workers in a Tertiary Care Hospital At Bagalkot City. J Evol Med Dent Sci. 2014;3(19):5076–82.