

Midwives Compliance to W.H.O Guidelines of Maternity Waste Management Practice in Nnamdi Azikiwe University Teaching Hospital

Aralu, Joy Chioma

African Center for Public Health and Toxicological Research

University of Port Harcourt, Nigeria

DOI: 10.56201/ijhpr.v9.no5.2024.pg35.47

Abstract

The study evaluated the Nnamdi Azikiwe University Teaching Hospital's midwives' compliance with the W.H.O. Guidelines for maternity waste management practices. The study used a sample of seventy midwives and nurses. The study employed a descriptive research design. The study only employed one hypothesis and one research question. Data collection involved the use of a single research instrument. While the t-test was used to test the hypothesis, descriptive statistics such as percentage, mean, and charts were used to answer the research question. The findings showed that, of the 70 respondents, 55.7% were between the ages of 18 and 28, 25.71% were between the ages of 29 and 39, 18.6% were between the ages of 40 and 50, and none were 51 years of age or older. Of the respondents, 16% were men and 84% were women. Among the medical professions, 34% were doctors, 34% were nurses, 16% were waste handlers, and 16% were lab scientists. The study also showed that few respondents (21.4%) reported low compliance with HCW disposal, while the majority (78.6%) reported high compliance. Poor post-sign designation of HCW disposal and the absence of a well-constituted supervisory/monitoring nurses' group on HCW management are among the factors that work against proper waste disposal in Nnamdi Azikiwe University Teaching Hospital. According to the study's findings, midwives and nurses at Nnamdi Azikiwe University Teaching Hospital in Nnewi follow WHO guidelines when it comes to waste management practices. As a result, the study suggests that hospital administration develop thorough and ongoing training programs for midwives that concentrate on WHO guidelines for managing healthcare waste. Training ought to include handling, disposing, and properly classifying waste as well as how to use personal protective equipment.

INTRODUCTION

The dangerous nature of medical wastes means that waste management should give them more attention. Waste generated by various health care activities in laboratories, research facilities, and healthcare settings is referred to as healthcare waste. The remaining 75–80% of garbage is general and non-hazardous, whereas the remaining 10–25% of healthcare waste, sometimes referred to as biological waste, is dangerous. Biomedical waste is any waste generated during human or animal diagnosis, treatment, or immunization. It also includes garbage generated during relevant research operations or the development of biological testing, such as the production of human anatomical waste. Animal, microbiological, and biotechnological wastes, sharps waste, leftover medicine and

cytotoxic drugs, solid waste, liquid waste, incinerator ash, chemical waste, etc. are among the items included (Bhanot, 2015).

Guzder (2020) defines healthcare waste as any waste generated by hospitals, clinics, nursing homes, veterinary clinics, research institutes, and laboratories throughout the diagnostic, immunization, and treatment processes. Healthcare waste (HCW) is a special sort of waste since it may include dangerous materials. In developing countries, managing healthcare waste has become a critical concern. In order to assess the current dangers of healthcare waste to public health due to its infectious nature, a tertiary health institution (Teaching Hospital) in Nigeria undertook a cross-sectional descriptive study from May to April 2020. Because most healthcare facilities are located in cities, poorly managed medical waste may spread dangerous illnesses and put patients, staff, the general public, and the environment at risk (World Health Organization, 2017).

Ethiopia is now trailing behind in implementing the recommended healthcare waste segregation process, similar to many developing countries. In addition, safe healthcare waste management has received very less attention, and many institutions do not follow the basic standards required for correctly processing healthcare wastes. Pressurized containers, broken thermometers, spent batteries, radioactive or cytostatic waste, and 15% pathological and infectious waste are examples of trash that falls under the World Health Organization's threshold, which is 80% general healthcare waste. The percentage of healthcare waste creation is far greater than this threshold, as previous study has shown. For example, an analysis of six hospitals in Addis Ababa, Ethiopia, shows that between 29.5 and 53.12% of garbage is hazardous medical waste. At Menelik II Hospital in Ethiopia, the proportion of infectious waste was 53.73%. The percentages of hospital infectious waste in Ethiopia's north and south were 34.3 and 53%, respectively. These figures often exceed the recommended amount by the World Health Organization by three to four times. The differences in estimates of the percentage of general and hazardous materials in healthcare waste production are most likely the result of inadequate hospital waste stream segmentation. Moreover, the current situation might become worse due to a lack of public health regulations requiring the segregation of healthcare wastes (Andales, 2020). In addition to raising disposal costs, improper medical waste segregation poses a range of dangers to the environment and public health. Correctly sorting medical waste, however, should result in a clean solid waste stream that can be easily, safely, and economically managed via land filling, composting, and recycling. Careful item segregation may reduce waste in the healthcare waste stream as a whole by as much as 60%. In this way, understanding the root causes of healthcare waste segregation practices is necessary to develop solutions that improve the waste management system. Thus, the aim of this study was to determine if midwives and nurse midwives at Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi, in the state of Anambra, were following the guidelines set out by the World Health Organization for the management of medical waste.

It is not unexpected that healthcare waste management does not get the priority and attention it needs given that Nigeria is a developing country with limited resources (Amin, Gul & Mehrab, 2019). Thus, a major challenge in developing countries is the absence of institutional frameworks for healthcare waste management. In addition to increasing the danger of infectious disease outbreaks, the open dumping of clinical waste at the same landfill as municipal trash provides

community members with access to it (Ravitch, 2017). Healthcare waste management is a big worldwide challenge, while making up a relatively small fraction of the total rubbish in society. 15% of the garbage generated at healthcare institutions is hazardous, and in order to prevent the waste from becoming completely toxic, it must be properly divided at the moment of production, according to a 2017 World Health Organization research. According to WHO estimates, there will be 8–16 million new cases of hepatitis B, 2.3–4.7 million new cases of hepatitis C, and 80,000–160,000 new cases of HIV year. These figures are mostly the result of dangerous injection dumping practices and very deficient waste management systems.

Similar to other healthcare facilities, pharmaceutical companies, medical device manufacturers, radioactive materials, human tissue, diagnostic samples, blood chemicals, soiled dressings, used needles and syringes, and other hazardous materials are among the waste products produced by these facilities (ANON, 2016). The primary producers of these wastes are, among other locations, autopsies, mortuaries, blood banks, assisted living institutions, hospitals, and clinics (Charter et al, 2018).

Mishandling medical waste may result in food contamination, occupational health hazards, and a host of hospital-acquired illnesses. Furthermore, improper disposal of waste materials, such as blood-contaminated sharps, may disseminate viruses that cause AIDS, hepatitis B, hepatitis C, and other illnesses (Awodele et al, 2016). These infections may impact healthcare workers, patients, support staff, hospital visitors, waste handlers, scavengers, fetuses in wombs, and members of the general public. Healthcare waste (HCW) and its worldwide management are a growing concern for both practitioners and non-practitioners. If medical facilities are aware of the types and quantities of clinical waste they produce, they can budget and plan for the management of hazardous waste properly (Bongayi et al., 2020). Planning and material acquisition, construction, employee conduct and training, equipment use protocols, proper treatment and disposal of medical waste both within and outside of healthcare facilities, and process evaluation are all included in health care waste management. According to estimates from the World Health Organization (WHO), general healthcare waste—which includes non-hazardous materials including food preparation waste, cardboard, paper, and plastic packaging—accounted for between 75% and 90% of the garbage produced by healthcare facilities in 2017. Conversely, as much as 25% of medical waste is hazardous and dangerous to people and the environment. Inappropriate disposal of medical waste may lead to serious diseases in patients, medical personnel, and the general public. Conducting an analysis of midwives' waste management practices is crucial to ascertain compliance with World Health Organization guidelines for healthcare waste management. Globally, only radiation waste is thought to be more hazardous than medical waste. The serious effects that poor management may have on the environment and public health make healthcare waste management a top priority. Medical waste management requires the involvement of healthcare professionals. Midwives are essential healthcare providers who help with pregnancy, childbirth, and postpartum care. The risk associated with healthcare waste exists globally. Additionally, they are essential in making sure that waste generated during maternity care is properly managed (ANON, 2016).

A survey of midwives, nurse midwives, and intern nurse midwives was part of the study to find

out how well they understood and applied the criteria for managing healthcare waste. If healthcare facilities are aware of the types and quantities of clinical waste that are produced, they can budget and plan for the management of hazardous waste properly (Bongayi, 2018). Lack of a plan for managing waste in healthcare facilities eventually leads to inadequate separation of waste at the sites of use, collection, storage, and disposal. This inadequate waste disposal process puts the environment, healthcare professionals, and patients at danger of disease. Hospitals that have operational gaps, such as not having color-coded bags for medical waste segregation at the point of use or not providing medical personnel with guidelines on disposal and segregation, are considered to have poor healthcare waste management. When healthcare facilities improperly dispose of their waste, they put not just the health of their patients and staff at risk but also that of facility visitors and the local community by contaminating the land, water, and air. Instead of posing potential health risks to people, healthcare institutions should protect people's health in the surrounding areas.

Additionally, an increase in patient attendance has resulted in an increase in medical waste generation. Sunder et al. (2015) also discovered that an increase in healthcare facilities corresponds with population growth, which in turn drives up medical waste output. This increase is expected to lead to a greater emphasis on proper healthcare waste management at Nnamdi Azikiwe University Teaching Hospital (NAUTH), especially in the maternity department where wastes such as blood, bodily fluids, and sharps are continuously generated. The many problems that healthcare waste management still presents have made it a concern, especially given how rapidly the country's economic situation is deteriorating. Multiple studies have focused on healthcare waste management; however, the maternity department, which generates most blood, body fluids, and sharps, has gotten little to no attention. Waste is a necessary component of healthcare waste management (Mathanjan & Gupta, 2018). Emphasizing the use of personal protective equipment (PPE) while managing garbage and bringing attention to the potential risks associated with improper healthcare waste management are also crucial (Guzder, 2020).

Sufficient preparation, funding, and the proactive participation of skilled personnel are all necessary for efficient waste management in the healthcare industry. There was proof that medical facilities were not providing funds for clinical waste management. Facilities need to budget for color-coded bags and training healthcare waste producers on effective waste sorting and disposal methods if they want healthcare waste to be sustainable. The purpose of this study is to assess how a medical institution in Anambra State handles its medical waste (World Health Organization, 2018). To help midwives and nurses follow WHO guidelines for medical waste management, the study's conclusions will identify any areas in which they may need further support or education. It would also be advantageous to teach nurses and midwives the importance of proper waste management practices for preserving the environment and public health. Carelessly placing untreated hospital waste in public trash cans increases the possibility that dangerous germs would flourish and evolve there, raising the possibility of disease outbreaks and a rise in the frequency of communicable illnesses in the community. Additionally connected to the prevalence of infectious illnesses including cholera, measles, hepatitis B and C, AIDS, TB, chickenpox, and others is the incorrect segregation and disposal of hospital waste. Patients, medical staff, the environment, and the general public are all seriously endangered since the

constituted authority is not supplying the supplies required for the separation and disposal of these hospital wastes. Recently, hospitalizations for infectious infections connected to healthcare waste pollution have occurred among health personnel. Consequently, a number of these healthcare professionals have experienced early deaths (Fagbocyibo, Ojo, Sridhar, & Kannan, 2019). Hospital trash was also disposed of carelessly with residential rubbish, making it easily accessible to the community's residents. Upon visiting these medical facilities, it becomes apparent that they are devoid of waste management equipment such as incinerators, microwaves, and autoclaves. This practice is most likely to happen as the dumping of medical waste at municipal places may lead to infectious disease outbreaks. The aforementioned problems piqued the researcher's interest in assessing healthcare waste management practices among medical practitioners in Anambra State. Thus, the main objective of this study is to assess the management strategies used by nurses and midwives at the Nnamdi Azikiwe Teaching Hospital in Nnewi.

Aim and Objectives of the Study

The aim of this study is to investigate compliance waste management practice to W.H.O. guidelines among Midwives/Nurses in Nnamdi Azikiwe University Teaching Hospital, Nnewi. The specific objectives are to;

Specific Objectives

- 1 Assess the level of compliance of Maternity Healthcare Waste Management Practice to W.H.O Guidelines among Midwives in Nnamdi Azikiwe University Teaching Hospital.
- 2 Ascertain the factors militating against compliance of Maternity Healthcare Waste Management Practice to W.H.O Guidelines Among Midwives In Nnamdi Azikiwe University Teaching Hospital

Hypotheses

The following hypotheses were stated and will be tested at 0.05 level of significance.

H₀₁: There is no significant difference between the mean rating scores of midwives and nurses on their compliance with WHO guidelines for waste management.

METHODOLOGY

The study's research design was cross-sectional descriptive. The midwives and nurses who work in the maternity sector of NAUTH - Nnewi's wards and clinics make up the survey's target group. Seventy midwives and nurses who work in the maternity department of the Nnamdi Azikiwe University Teaching Hospital Nnewi make up the study's population. The research used the census sample approach, which included using all members of the population. The researcher used this approach because, after asking about the total number of midwives and nurses in the maternity ward, she considered that 70 was a feasible number for the study given the time and resources available (Akunneh-Warriso and Nwokoro, 2023). The research used convenience sampling with

non-probability quota sampling proportionate to size. Choosing one participant for the research from each cadre allowed for a fair representation of all cadres. As long as a response satisfied the inclusion requirements, they may all take part (Gizalew et al, 2018). A well-structured questionnaire written in an easy-to-understand language served as the data gathering tool. "Compliance of Maternity Healthcare Waste Management Practice to WHO Guidelines among Midwives (CMHWMPWGM)" was the name of the instrument. There are four parts to it (A, B, C, D). Sections B, C, and D collected data related to the study aims, whereas Section A deals with social demographic data. The participant gave the questionnaires to the proper number of nurses and midwives at the clinic and wards, and the responders returned them. Survey (site inspection): Through direct observation (site visiting) and the use of questionnaires, the types of trash created at different maternity units and clinics were determined. The approach for analyzing the data was descriptive statistics. Therefore, the study topics were addressed using basic percentages, charts, and measures of central tendency statistics (mean), while the t-test was used to assess the null hypothesis at the 0.05 level of significance.

4.1 Results

Section A: Demographic data

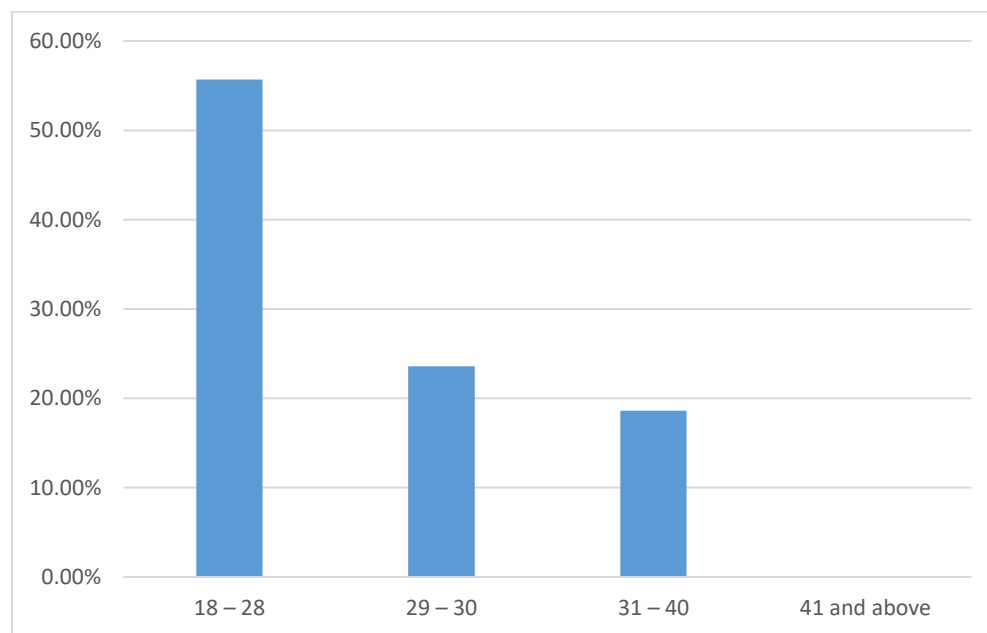


Fig 1: Showing age distribution of the respondents.

Table 1 shows that out of 70 respondents, 55.7% were between the age of 18-28years, 25.71% of them were between 29 – 39 years while 18.6% within the range of 40 – 50 and none falls within 51years and above.

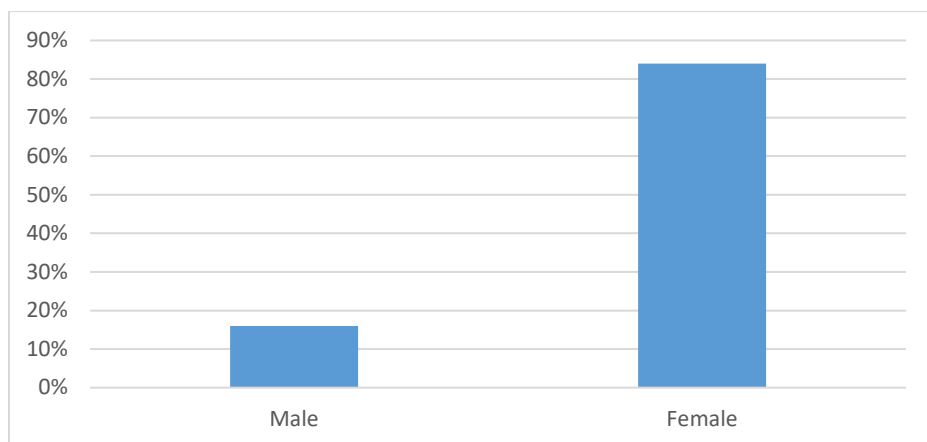


Fig. 2 Showing sex distribution of the respondents.

The result in fig. 2 shows that 16% of the respondents were male and 84% were female.

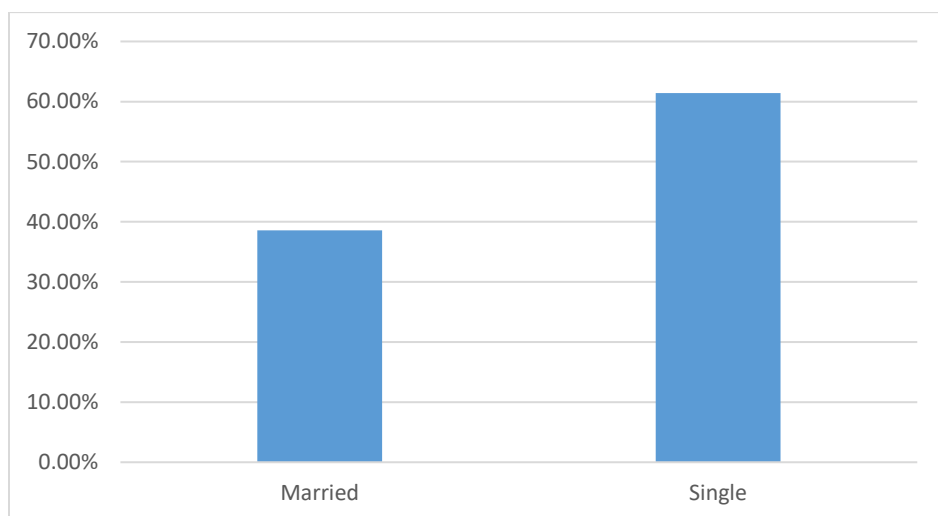


Fig. 3: Showing marital status of the respondents.

The result shows that 38.6% of the respondents were married, 61.4% were single.

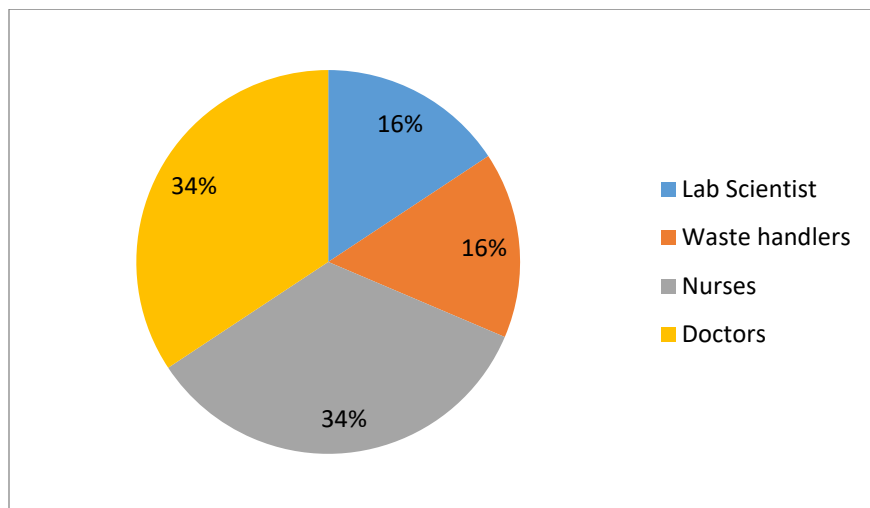


Fig 4: Above is showing the designation of the midwives/Nurses.

Fig. 4 shows that doctors were 34%, nurses were 34%, waste handlers were 16% while lab scientist were 16%.

Table 1: level of compliance of Maternity Healthcare Waste Management Practice to W.H.O Guidelines among Midwives in Nnamdi Azikiwe University Teaching Hospital.

Variable	Categorization status	Frequency	Percentage (%)
Level of respondents compliance on HCW disposal	Low	15	21.4
	High	55	78.6

Table 1 revealed that majority (78.6%) of the respondents reported high compliance on HCW disposal while only few (21.4%) of them reported low compliance on it.

Table 4.5 mean and standard deviation of factors militating against proper waste disposal

Variables	N	Min	Max	Mean	Std. Deviation
Inconsistent correct labeling of the waste bins using the colour coding schedule	70	3.00	4.00	2.6	.48972
Inaccessibility to / poor supply of the colour coding schedule and waste bins	70	2.00	4.00	2.5	.57745
The wastes not removed when available ones are filled	70	2.00	4.00	2.6	.63134
Lack of regular conduction of seminars / workshops on health care waste management	70	1.00	4.00	2.7	.81272
Lack of a well constituted supervisory / monitory nurses' group on HCW management	70	1.00	4.00	3.3	.96587
Lack of materials to maintain and sustain colour coding schedule HCW management	70	1.00	4.00	2.8	.84144
Lack of sufficient facts / information regards the best practice in the health care waste management interferes with proper management	70	1.00	4.00	2.9	.83684
High priority is not given to the issues of HCW management by the health institutions / stakeholders' facilities.	70	1.00	4.00	2.7	.74945
Poor regulations/enforcement of health care waste management.	70	3.00	4.00	2.8	.48972
Lack of financial and human resources as regards HCW management activities	70	2.00	4.00	3.0	.57745
Patients' relatives involvement in the waste disposal hinders proper health care waste management	70	2.00	4.00	3.8	.63134
Poor nature of waste management and disposal systems	70	1.00	4.00	2.8	.81272
Poor post signs designation of HCW disposal	70	1.00	4.00	2.87	.072

Table 2 which revealed the analysis result of the factors militating against proper waste disposal in Nnamdi Azikiwe University Teaching Hospital. The result showed a mean value range of 2.7 to 3.6 with an average mean value of 2.87. Using 2.5 as our criterion mean; all the items shows a mean level higher than the criterion mean. This means that factors militating against proper waste disposal in Nnamdi Azikiwe University Teaching Hospital are poor post signs designation of HCW disposal, Lack of a well constituted supervisory / monitory nurses' group on HCW management amongst others.

Table 3 t-test Analysis of significant difference between the mean rating scores of midwives and nurses on their compliance with WHO guidelines for waste management.

Respondents	N	\bar{x}	SD	Df	p	Decision
Midwives	40	2.60	0.64	68	0.58	Accepted
Nurses	30	2.95	0.71			

Table 3 shows that the t-test analysis of the variation in the mean rating scores of midwives and Nurses on their compliance with WHO guidelines for waste management. The t-test statistics shows a $p = 0.095$ at $p < 0.05$ confidence limit. Consequently, the null hypothesis—which holds there is no significant difference between the mean rating scores of midwives and Nurses on their compliance with WHO guidelines for waste management is accepted.

Discussion

The research found that midwives and nurses adhered to the WHO standard for disposing of medical waste at high rates. Ensuring infection control, environmental sustainability, and occupational safety in healthcare settings heavily depends on midwives and nurses adhering to WHO rules for healthcare waste disposal. Numerous investigations have shown the extent of adherence to waste management protocols by healthcare personnel. Research has shown that healthcare personnel, such as nurses and midwives, have differing degrees of compliance with healthcare waste disposal recommendations (Wassie et al., 2022; Berdida, 2022; Morikane et al., 2021; Salubi et al., 2022; Njue et al., 2015). While some studies (Wassie et al., 2022; Agyekum & Ansah, 2022) have found high levels of compliance with waste management practices, other studies (Berdida, 2022; Morikane et al., 2021; Salubi et al., 2022; Njue et al., 2015) have found suboptimal compliance rates, indicating room for improvement. Training, awareness, resources, and organizational support are some of the factors that affect compliance levels (Salubi et al., 2022). There are obstacles to following waste disposal regulations, including insufficient procedures for collection, segregation, storage, transportation, treatment, and disposal (Wassie et al., 2022). Furthermore, obstacles to the best possible adherence to waste management standards have been identified, including problems with environmental concerns, occupational health and safety difficulties, and a lack of enforcement mechanisms (Etim et al., 2021). Targeted measures, such as continuing education programs, sufficient funding, and efficient monitoring and enforcement systems, are necessary to improve adherence to hospital waste disposal regulations (Etim et al., 2021). Improving the knowledge, attitudes, and behaviors of nurses and midwives about waste management is crucial in order to foster a secure and long-lasting healthcare setting (Akkajit et al., 2020). The findings showed that, among other things, a lack of a well-constituted supervisory/monitoring nurses' group on HCW management and inadequate post-sign designation of HCW disposal are factors working against safe waste disposal at Nnamdi Azikiwe University Teaching Hospital. Maintaining public health, workplace safety, and environmental sustainability all depend on the appropriate disposal of healthcare waste. A lack of knowledge among healthcare personnel about

suitable waste management techniques is one of the many reasons impeding adequate waste disposal practices in healthcare settings (Yazie et al. 2019; Hina et al., 2021). Inadequate awareness on the potential health risks linked to biological waste and the appropriate techniques for managing healthcare waste may result in inappropriate disposal procedures (Hina et al., 2021). Substandard disposal of trash is a result of inadequate training, a lack of knowledge of standard operating procedures, and a lack of awareness of waste management rules (Hina et al., 2021). Awodele et al. (2016) have identified many health dangers and causes of environmental pollution associated with the treatment of medical waste, in addition to awareness problems. These include poor behavior and unsuitable management and disposal techniques. According to Awodele et al. (2016), improper management and disposal of medical waste may put patients, healthcare staff, and the community at risk due to its contagious nature and offensive odor. According to reports, obstacles to effective hospital waste management include a lack of funding and personnel, inadequate waste management utilities, and lax enforcement by regulatory agencies (Oyekale & Oyekale, 2017; Alani et al., 2019). The difficulties involved in disposing of medical waste are made worse by the lack of a waste management strategy, lax legislation, and unclear roles for waste processing and disposal (Alani et al., 2019). In addition, ineffective treatment methods, hospital capacity constraints, and inappropriate waste disposal practices in underdeveloped nations are some of the elements that exacerbate healthcare waste management issues (El-Ramady et al., 2021). The absence of appropriate waste disposal techniques, inadequate finance, and lax enforcement of national waste management regulations are all prevalent problems in developing countries (Ogundare, 2003)...

Recommendations

Recommendations for improving compliance of maternity healthcare waste management practices to WHO guidelines among midwives:

1. **Policy Formulation:** Develop and enforce clear policies and guidelines on healthcare waste management in maternity settings. These policies should outline standard procedures, responsibilities, and best practices for waste disposal.
2. **Supervision and Monitoring:** Implement regular supervision and monitoring mechanisms to ensure adherence to waste management protocols. Supervisory visits and audits can help identify areas for improvement and provide feedback to enhance compliance.
3. **Promote Awareness:** Conduct awareness campaigns and educational sessions to increase knowledge and understanding of the importance of proper healthcare waste management practices among midwives. Emphasize the potential health risks associated with improper waste disposal.
4. **Collaboration with Healthcare Providers:** Foster collaboration between midwives, healthcare providers, and waste management experts to exchange knowledge, share best practices, and address challenges related to waste disposal in maternity care
5. **Continuous Quality Improvement:** Establish a system for continuous quality improvement in waste management practices. Encourage feedback from midwives, monitor outcomes, and implement corrective measures to enhance compliance with guidelines.

REFERENCES

- Abah, S. O. & Ohimain, I. E. (2021). Healthcare waste management in Nigeria: A case study, *Journal of Public Health and Epidemiology*, 3(3), 99 -110
- Abayomi, S. A. & Oyekale, T. O. (2017). Healthcare management practices and safety indicators in Nigeria, *BMC Public Health*, 2 – 13, Doi10 1186/s12889-0174794-6,
- Amin, R., Gul, R., & Mehrab, A. (2019). Hospital waste management practices in different hospitals of Distt. Peshawar, *Professional Medical Journal*, 20(6), 988 – 994
- ANON (2016). Guidelines for management of Health-care wastes as per biomedical waste management rule, 2016, care activities, *World Health Organization (WHO)*, Geneva (Under-going modification)
- Awodele, O., Adewoye, A., & Oparah, A. (2016). Assessment of medical waste management in seven hospitals in lagos, nigeria. *BMC Public Health*, 16(1). <https://doi.org/10.1186/s12889-016-2916-1>
- Babatola, J. O. (nd). A Study of Hospital Waste Generation and Management Practice in Akure, Nigeria, Retrieved 21/11/22, 292 – 305
- Berdida, D. (2022). Nursing staff compliance and adherence to standard precautions during the covid-19 pandemic: a cross-sectional study. *Nursing and Health Sciences*, 25(1), 108-119. <https://doi.org/10.1111/nhs.12998>
- Centre for Disease Control and prevention (CDC), (2019). Safe management of hazardous drugs in health care settings. <https://www.cdc.gov/niosh/topics/hazdrugs/default.html>.
- Charter, Y., Emmanuel, J., Pieper, U., Pruss, A., Rushbrook, P., Stringer, R., Twonend, W., Wilburn, S., Zghondi, R. (editors).(2018). Safe management of waste from health-care activities, with WHO, 2nd edition, Geneva, Switzerland.
- Guzder, K. (2020). What are the different types of healthcare wastes and why are they important?. Available at www.highspeedtraining.co.uk, Retrieved on 14/09/2022
- Jonathan, A. (2022). Assessment of healthcare waste management strategies in selected hospitals in abuja, nigeria. *Texila International Journal of Public Health*, 166-178. <https://doi.org/10.21522/tijph.2013.10.04.art016>
- Pruss, A. Giroult, E. & Rushbrook, P (2022, Ed.). Safe management of wastes from health,
- Ravitch, S. M., & Riggan, M. (2017). *Reason & rigor: How conceptual frameworks guide research* (2nd ed.). Thompson Oaks, CA: SAGE
- Rutayisire, E., Nsabimana, J., & Habtu, M. (2019). Knowledge and practice for bio-medical waste management among healthcare personnel at kabgayi district hospital, rwanda. *Journal of Public Health International*, 1(4), 36-44. <https://doi.org/10.14302/issn.2641-4538.jphi-19-3005>
- Salubi, L., Maitanmi, J., Olowolafe, A., & Ademola, S. (2022). Knowledge, attitude, and factors influencing health care (hew) waste management among nurses in selected hospitals

- in abeokuta, ogun state. *International Journal of Advance Research in Medical Surgical Nursing*, 4(2), 46-57.
<https://doi.org/10.33545/surgicalnursing.2022.v4.i2a.98>
- United Nations Environment programme (UNEP), (2018). Global waste management outlook. <https://www.unenvironment.org/resoruces/report/global-waste-management>.
- USAID (2014). Sector environmental guidelines healthcare waste, WHO (2014). Safe management of wastes from health-care activities. http://www.who.int/water_sanitation_health/publications/wastemanag/en/ Retrieved 19 October, 2022
- Wassie, B., Gintamo, B., Mekuria, Z., & Gizaw, Z. (2022). Healthcare waste management practices and associated factors in private clinics in addis ababa, ethiopia. *Environmental Health Insights*, 16, 117863022110733.
<https://doi.org/10.1177/11786302211073383>
- WHO (2020). *Technical Brief: Sustainable Healthcare Waste Management*, Geneva, Switzerland, The Global Fund
- WHO, (2nd edition) (2014). *Safe management of wastes from health-care activities*, ISBN 978 92 4 154856 4, Available at (www.who.int)
- Yazie, T., Tebeje, M., & Chufa, K. (2019). Healthcare waste management current status and potential challenges in ethiopia: a systematic review. *BMC Research Notes*, 12(1).
<https://doi.org/10.1186/s13104-019-4316-y>
- Ziqubu, L., Sokhela, D., & Gabela, S. (2023). Knowledge, attitudes and practices of sharps waste disposal by diabetic patients in rural south africa. *South African Family Practice*, 65(1).
<https://doi.org/10.4102/safp.v65i1.5538>