

Biomedical waste handling and knowledge of its health hazards among waste handlers in a tertiary hospital in Sokoto, Nigeria

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Background: Biomedical wastes have negative effects on human health and environment; therefore all persons exposed to the waste are potentially at risk, especially waste collectors that handle poorly segregated and containerized waste. The study aim was to describe the pattern of biomedical waste handling and assess knowledge of its health hazards among handlers in a Tertiary Hospital in Sokoto, Nigeria. **Materials and Method:** A descriptive cross-sectional study design was used. A total of 180 waste handlers were selected using a simple random sampling method and close-ended interviewer-administered questionnaires were used to collect data. Data was analyzed using SPSS version 23.0 and result presented in table. **Results:** Nearly half of the respondents were aged between 25-29 years and majority (81%) of the waste handlers are private employees while the public employees accounted for 19%. Wastes from different unit of the hospital were poorly segregated and commonly collected using inappropriate containers without lining. **Conclusion:** Biomedical wastes from different units were poorly segregated and collected using inappropriate containers. Nearly all the respondents had good knowledge of its health hazards but only few (11%) had received training on biomedical waste handling. Waste should be properly segregated into appropriate containers, PPE to be made readily availability and ensure compliance to their use.

Keywords: Biomedical waste, Handling, Knowledge, Risk perception

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Introduction

Biomedical wastes are generated during the diagnosis, treatment, or immunization of human beings or in research activities pertaining to testing of biological sample [1]. Although all individuals exposed to hazardous health care waste are potentially at risk, the principal group at risk include health care providers, waste handlers, patients, visitors to healthcare facilities, workers in support service including laundry, and scavengers [2-4].

Hazards from infectious waste and sharps may spread Human immuno deficiency virus (HIV), hepatitis B and C virus, and other blood-borne pathogens. WHO estimated that each year there are about 8 to 16 million new cases of hepatitis B Virus (HBV), 2.3 to 4.7 million cases of hepatitis C Virus (HCV) and 80,000 to 160,000 cases of HIV due to unsafe injection and mostly due to poor healthcare waste management system [5,6]. Lassa fever and Ebola virus, endemic in West Africa, have also joined the league of blood borne pathogens.

Health facilities in Nigeria, have become source of dissemination of disease-causing materials, through the enormous quantities of improperly managed health care wastes being generated in the course of providing health services [7]. A study carried out in Jos, Nigeria showed that waste handling practice fell below waste management practices prescribed by WHO and other regulatory authorities as wastes were not segregated and were in appropriately disposed [8]. Proper waste handling helps to ensure appropriate hospital hygiene and safety of health care waste handlers, healthcare providers and communities at large [9]. The best practice is to segregate at source into colour coded containers for proper disposal as the waste poses high risk to the group [10].

All categories of health workers are exposed to the hazards of biomedical waste however, the level of exposure varies from one category of health workers to another and from one health facility to another within the same country. Of these categories, the waste handlers are the least educated as such their knowledge and risk perception of biomedical waste varies and such may affect their ability to use personal protective equipment as at when necessary. Characteristically, wastes are rarely segregated at the point of generation and inappropriately packaged and ultimately the waste handlers are expected to dispose this waste.

Because also of a desire to improve service delivery and productivity, waste handling and disposal is outsourced to private companies who in turn had to employ readily available manpower to provide the cleaning services.

It is on this background that the study is carried out to describe the pattern of biomedical waste handling and assess knowledge of its health hazards among handlers in a Tertiary Hospital in Sokoto, Nigeria. The outcome is expected to help the hospital management and managers of cleaning companies to make an informed decision about infection prevention and control.

Materials and Methods

Place of Study: The study was conducted in a tertiary hospital in Sokoto and study population comprised of all the biomedical waste handlers in the hospital both the public and private.

Type of Study: A descriptive cross-sectional study design was used and a required sample size was determined using formula for descriptive epidemiological study design for population less than ten thousand [11]. A sample size of 180 was obtained and all the number were enrolled into the study.

Sampling Method: A simple random sampling method (balloting technique) was used to select the study respondents. A 'yes' or 'No' option were written on pieces of papers and folded. This was rolled and a respondent asked to pick a paper from the pool. Any one that picked a piece of paper labelled 'yes' and having met the other inclusion criteria was enrolled into the study. This process continued until the required sample size of 180 respondents was selected.

Sample/ Data Collection: Field data was collected using questionnaire. The questionnaire was structured and contained close-ended questions. The questionnaire was pretested among waste handlers in different hospital that was not part of main study. Trained research assistants used face-to-face interview methods to collect the data.

Inclusion Criteria: Waste handlers involved in handling medical wastes generated during the process of diagnosis and patient/ client treatment including hospital environment; willing to participate in the study and present at the time of field data collection.

Exclusion Criteria: Newly recruited waste handlers with less than a month waste handling experience were excluded.

Statistical Methods: The questionnaires were manually sorted out for completeness daily. Those questionnaires that were accurately filled and suitable for analysis were entered into computer and analyzed using statistical package for social science (SPSS) version 23.0.

Continuous data (respondents' age) was summarized using median and interquartile range while categorical data expressed in frequencies and percentage. Result was presented in simple tables for clarity.

Scoring and grading of responses on respondent' knowledge: Each correct response of knowledge question was scored 1 mark while zero (0) was awarded to wrong answers and or no-response. The respondents' knowledge was graded as either good or poor knowledge. Knowledge score of less than 50% and equal to or greater than 50% was adjudged poor and good knowledge respectively.

At the end of scoring, the proportion of respondents with good and poor knowledge was determined. Continuous data were summarized using mean and standard deviation while the categorical and grouped data expressed in frequencies and percentages.

Ethical clearance was sought and obtained from the Usmanu Danfodiyo University Teaching Hospital (UDUTH) Research Ethics Committee. In addition, individual consent was also obtained from the respondent before the questionnaire was administered.

Results

Table 1 result showed that the median age of respondents was 35 years, Interquartile range (IQR) of 28 - 44. There were more males, 54.4% compared to females, 45.6% and a significant proportion (39.4%) had only Qur'anic education, followed by those that had secondary education (35.6%). Majority (81%) of waste handlers were private employee while the remaining proportion (18.9%) were public employees. With respect to trainings, only 20 out of 34 public employee received training about five years ago while none of the private employee have been formally trained.

Table-1: Socio and demographic characteristics of the waste handlers.

Variables	Number	Percentage
Age Group (Years)		
18 - 19	6	3.4
20 - 24	18	10.0
25 - 39	86	47.8
40 - 64	70	38.9
Sex		
Male	98	54.4
Female	82	45.6
Marital Status		
Married	119	66.1
Single	32	17.8
Divorcee	11	6.1
Widow	18	10.0
Educational Level		
Qur'anic	71	39.4
Primary	37	20.6
Secondary	64	35.6
Tertiary	8	4.4
Employment Status		
Public	34	18.9
Private	146	81.1
Training		
Have you had any training on medical waste handling since working in this facility?	20	11.1
How long ago did you receive your last training?		5 years
Number of public employee trained	20	59
Number of private employee trained	0	0

Table-2: Knowledge of some aspects of biomedical waste Health hazards.

Variables	Frequency	Percentage
Knowledge of biomedical waste hazards		
Good knowledge	178	98.9
Poor knowledge	2	1.1
Knowledge of some aspects of Healthcare waste hazard		
Biomedical waste are generated while treating sick persons		
Yes	168	93.3
No	12	6.7
Biomedical waste include:		
Used needle syringe		
Yes	173	96.1
No	7	3.9
Used cotton wool		
Yes	176	97.8
No	4	2.2
Used injection bottles		
Yes	175	97.2
No	5	2.8

Dead tissue from a wound		
Yes	151	83.9
No	29	16.1
Expired drugs		
Yes	145	80.6
No	35	19.4
Used I.V line/blood giving set		
Yes	177	98.3
No	3	1.7
A person can get infected if in physical contact with these waste		
Yes	163	90.6
No	17	9.5
Some diseases contacted through infected waste include:		
Hepatitis B		
Yes	105	58.3
No	19	10.6
Don't Know	56	31.1
HIV infection		
Yes	132	73.3
No	18	10.0
Don't Know	30	16.7
Ebola Virus Disease		
Yes	112	62.2
No	31	17.2
Don't Know	37	20.6
Lassa fever		
Yes	69	38.3
No	32	17.8
Don't Know	79	43.9
Use of PPE reduce chance of contacting infection from waste		
Yes	177	98.3
No	3	1.7
PPE appropriate for use by waste handlers includes		
Face mask	180	100
Eye goggles	122	67.8
Hand gloves	177	98.3
Rubber boots	173	96.1
Plastic apron/uniform	171	95.0
What part of body does each of these PPE protect?		
Face mask: is to protect face (mouth and nose)	179	99.4
Rubber boot is to protect the foot	163	90.6
Hand gloves are to protect hands	178	98.9
Eye goggle is to protect eyes	34	18.9
Apron is to protect the body	127	70.6

Result in table 2 revealed that very large proportion (90%) of the respondents knew that biomedical wastes are generated when treating sick person and also different form of waste while 91% reported a person can get infected if in direct physical contact with infected waste.

Although a good number do not know whether some of the diseases conditions listed can be contacted from infected waste, nearly all of the respondents reported that use of personal protective equipment (PPE) may reduce the chance of coming in direct physical contact with the waste and contracting diseases.

Majority of respondents identified the appropriate PPE for use by waste handlers and also different part of body they protect.

Table 3 result showed that nearly all the respondents (99%) feel it's very necessary to use personal protective equipment while handling hospital waste and 88% are willing to buy PPE on their own for personal use if not provided by the employer. Majority (98.3%) also reported that it is good to wash hands with soap and water at the end of the day work.

Table-3: Waste handlers' attitude to waste handling and risk perception of the waste hazards.

Variables	Frequency	Percentage
Attitude to waste handling		
It is necessary to use personal protective equipment while handling hospital waste		
Yes	178	98.9
No	2	1.1
Will you advise your colleagues to always wear their PPE while working in the hospital		
Yes	176	97.8
No	4	2.2
Are you willing to buy PPE with your own money for your personal use if not provided by your employer		
Yes	159	88.3
No	21	11.7
It is good to wash hands with soap and water at the end of the day work		
Yes	177	98.3
No	3	1.7
Risk perception of the waste hazards		
Waste handlers are at increased risk of injuries and infections from the healthcare waste	172	95.6
Poorly disposed infected waste can be a source of diseases outbreak	179	99.4
Proper segregation at the point of waste production, help reduce the risk of exposure to contaminated materials	170	94.4
Sharp biomedical waste like used needles & syringes, broken bottles, used surgical blades carry more risk of injury	175	97.2

Materials contaminated with patient body fluid like blood, urine should be considered infectious regardless of patient diagnosis?	175	97.2
Waste handlers if not properly protected, can be infected and also transfer infectious agent to their family members at home	173	96.1
Hospital acquired infectious agent are usually drug resistance and their infection could be fatal	143	79.4

Respondents' perception of risk is high as 96% perceived that the handlers are at increased risk of injuries and infections from the contaminated waste and that sharp biomedical waste like used needles & syringes, broken bottles, used surgical blades carry more risk of injury and infection (97%).

Proper segregation of waste at the point of production is perceived by majority of respondents' (94%) to help reduce the risk of exposure to contaminated materials and that if handlers are not properly protected, can be infected and also transfer infectious agent to their family members at home.

Table 4 results revealed that all the respondents reported the use of PPE while handling biomedical waste but only 19% of them were found to use appropriate PPE during work through inspection aspect of the survey. Most reported PPE to be used always was facemask by 73% of respondents followed by hand gloves (65%), and 56% wear their uniform while none had ever used plastic apron.

Table-4: Practice of occupational safety by biomedical waste handlers

Variables	Frequency	Percentage
Do you wear Personal protective equipment while handling waste in the hospital		
Yes	180	100
No	0	0
If yes, how often do you use these Personal protective equipment:		
Face mask		
Always	132	73.3
Most times	41	22.8
Occasionally	7	3.9
Eye goggles		
Always	8	4.4
Most times	16	8.9
Occasionally	156	86.7
Hand gloves		
Always	117	65.0
Most times	31	17.2
Occasionally	32	17.8
Rubber boots		
Always	81	45.0

Most times	29	16.1
Occasionally	69	38.3
Uniform		
Always	101	56.4
Most times	13	7.3
Occasionally	65	36.3
Waste handler practice of occupational safety		
Use appropriate Personal protective equipment (PPE) always	35	19.4
Use PPEs most times or occasionally	145	80.6

Findings from work through inspection at different areas of the hospital revealed that appropriate receptacles for different categories of waste collection were not available and largely improvised particularly for the sharps. Wastes were poorly segregated, as mixture of all kind of waste in one receptacle is a common finding.

Loose sharps inside and outside the wards, clinics including overflowing sharp box are seen during the work through inspection of different units in the hospital. Waste is transported from these service points to temporary dumpsites commonly with plastic containers without cover while few uses wheeler bins.

Discussion

Biomedical waste (BMW) carries a high potential of infection and injury than any other type of waste and it is important that waste handlers should have proper knowledge and practice of handling and disposal of these wastes [12]. Almost all the respondents in the study had overall good knowledge of biomedical waste hazards.

Although a good proportion of the waste handlers had only quar'anic level of education, they still exhibited good knowledge. This very likely to be attributed to their interaction with trained health worker who informally provide them with some information on best practices about health care waste.

This is unlike studies in India that showed inadequate knowledge of biomedical waste among the waste handlers [12 - 13]. The study demonstrated that majority of the respondents knew the sources of BMW. This is in tandem with studies carried out in Agartala and in Central India, which found that most of the respondents answered correctly about the sources of BMW [14-15].

In this study, most of the respondents did not have the knowledge that exposure to BMW, there were chances of transmission of HIV, hepatitis,

Lassa fever and Ebola virus disease. This is not surprising, as most of the respondents had not been trained on biomedical waste handling and so, this deficiency in knowledge is expected.

Their lack of knowledge could predispose them to increased risk of these blood - borne infectious diseases which could be potentially life threatening. This finding concurs with similar studies in India that demonstrated that only few sanitary workers had knowledge regarding the potential transmission of disease on exposure to BMW [12, 16].

Regarding attitude towards BMW, most of the respondents felt that proper segregation at the point of waste production could help reduce the risk of exposure to contaminated materials. This same perception was shared by participants in similar studies in India [13,14]. Segregation of BMW at the point of generation has been described as one of the first five steps in proper healthcare waste management [17].

All the respondents attested to wearing Personal protective equipment (PPE) while handling waste in the hospital although only very few used the appropriate PPE always. This finding is disheartening as one of the requirements for avoiding the prevalence of workplace hazards is the use of protective equipment to avoid direct contamination [18].

Though most of the respondents in this study knew the PPE appropriate for use by waste handlers, it is evident that their knowledge did not translate to practice as only few used the appropriate PPE always.

However, non-availability of PPE / insufficient PPE in the hospital could be the reason why the respondents did not utilize appropriate PPE always. A study carried out in Karnataka, India reported that only about a third of the waste handlers used PPE [13] and in another similar study in Bangladesh, respondents identified insufficient PPE in the hospital as a possible barrier to biomedical waste management

Every worker deserves protection from hazardous wastes to live a healthy life, therefore, biomedical health facility must provide or purchase PPE and also educate their employees on the importance of always using PPE while handling BMW [20].

Conclusion

Although significantly large proportion of respondents demonstrated good knowledge of the health hazard of biomedical waste, equally very large number of them does not use this personal protective equipment as revealed by work through survey. These have serious implication for the control of nosocomial infection and prevention of spread nosocomial microorganism through person to person.

All these on a background of lack of appropriate receptacles for different categories of waste collection in different areas of the hospital and were largely improvised particularly for the sharps. Wastes were also poorly segregated, as mixture of all kind of waste in one receptacle is a common finding.

Contribution to knowledge: This study was able to document the actual situation of waste handling and collection and serious implication for potential nosocomial infection in the health facility. In spite of the global and national efforts toward sanitary health care waste management and tertiary nature of the hospital with respect to service delivery, rudimentary methods of waste handling and collections are still in practice and health workers exposed to the danger of physical contact with biomedical waste.

Authors Contribution

Aminu Umar Kaoje: Conceptualized the study and developed the study proposal including questionnaires

Salihu Jega Garba: Contributed significantly in the proposal development and filed data collection coordination

Nneka Christina Okafoagu: Wrote the entire discussion and conclusion sections of the article

Mansur Olayinka Raji: Conducted the data analysis and description of the finding (result section)

Yahaya Mohammed: Harmonized the entire document and also coordinated field data collection

Umar Mohammed Ango: Coordination of field data collection and report writing

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