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Assessment of Biomedical Waste Management Among Primary Healthcare Workers in Gwadabawa Local Government of Sokoto State, Nigeria

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Abstract

The aim of the study "Assessment Of Biomedical Waste Management Among Primary Healthcare Workers In Gwadabawa Local Government Of Sokoto State" was to assess Biomedical Waste Management Among Primary Healthcare Workers In Gwadabawa Local Government Of Sokoto State. The type of design utilized in this study was descriptive survey type. Therein, it revealed the use of personal protection among healthcare workers in the course of waste management in Gwadabawa local government, Sokoto state. Most of the participants (30.0%) submitted that they wear protective glasses sometimes, then always (13.3%), very few (1.6%). 18.3% uses protective foot wears sometimes, 13.3% frequently, and 3.3% of the respondents do not used protective foot wears. Most of them 26.7% always wash their hands, 15.0% wash hands frequently, and 8.3% wash their hands sometimes. 28.3% wear labsuit sometimes and 16.0% wear labsuits always. On the question "Have you ever been vaccinated against microbes which could arise from waste?" Only 6.7 submitted that they are always vaccinated. When asked "When do you receive training on waste management?" only 3.3 % received training always. Relating to sorting or segregation of waste, 16.7% said they practiced it always, 10.0% practiced it sometimes. 3.3% said they never practice sorting.10.0% have 3 boxes, and 11.7% have 4 boxes for waste segregation. 20.0% of the respondents said always there is storage after collection, while 1.6% said there is none. The waste storage place are incineration (16.7%) open dumping (6.7%), dig trench (1.6%), and well-equipped and maintained (3.3%). Types of waste treatment reported are: incineration (11.7%), disinfection (11.7%), chemical (6.7%), and autoclaving (3.3%). The challenges or constraints as experienced by respondents are: absence of plans(20.0%), lack of monitoring and evaluation (20.0%), poor hygiene in collection, storage, transportation, and treatment (16.7%),poor/lack of waste segregation facility(16.7%), lack of personal protective equipment (13.3%), lack of training (10.0%), lack of post-exposure drugs (10.0%). The workers are not fully practicing personal protective measures. There is also lack of adequate training of workers on biomedical waste in healthcare in Gwadabawa.

Keywords

Biomedical Waste, Hygiene, Monitoring, Personal Protective Equipment, Primary Healthcare.

INTRODUCTION

Background of the Study

Biomedical waste can be dubbed as a waste generated during the diagnosis, testing, treatment research or production of biological products for humans or animals [4][8]. It includes syringes, live vaccines, laboratory samples, body parts, bodily fluids, waste, sharp needles, cultures and lancets. Biomedical waste can be non-hazardous or bio-hazardous [4]. Circa 75- 90% of the biomedical wastes are non-hazardous and as harmless like any other municipal waste. The remaining 10-25% is hazardous and can be injurious to humans or animals and deleterious to environment [1]. Waste which is biological in nature is a potential source of infection transmission, especially hepatitis B and C, HIV, and tetanus [6][8].

Biomedical wastes management is of great importance due to its potential environmental hazards and health problems. The waste produced in the course of primary health care activities carries a higher potential for infection and injury than any other type of waste. The management biomedical waste in the hospital requires its segregation and removal from the health care establishments in such a way that it will not serve as a source of health hazards to those who are directly or indirectly related to the hospital [4]. According to world health organization (2014), biomedical waste was classified in ten categories (10): (1) Human Anatomical Waste, (2) Animal Waste, (3) Microbiology and Biotechnology Waste, (4) Waste sharps, (5)Discarded Medicines and Cytotoxic drugs, (6) Soiled Waste, (7) Solid Waste, (8) Liquid Waste, (9) Incineration Ash, (10)Chemical waste [14].

The improper management of biomedical waste is a major challenge for our cities and towns which should be managed so that it does not endanger human health, harm the environment, pose risks to air, water, soil, plants or animals, be a nuisance through odours or noise, or adversely affect places of special interest. Nigerian development policies

have been poorly coordinated and, are highly dominated by economic objectives making environmental protection low in ranking. Furthermore, available funding rests in the public sector hampering medical waste management primarily by the high rate of corruption and low private sector participation. Consequently, private sector contribution to medical waste management is low [16].

All the specific procedures of biomedical waste, segregation, packaging and labelling should be explained to the medical and ancillary staff and displayed in each department on charts located on the walls nearby the Medical waste containers that should be specifically suited for each category of waste [4]. Biomedical waste has to be transported to the treatment or disposal facility site in a safe manner. The vehicle should have certain specifications it should be covered and secured against accidental opening of door[4]. According to the different categories of waste generated from primary health care activities, waste treatment methods are as follows: (a) Incineration, (b) Autoclave treatment, (c) Hydroclave treatment, (d) Microwave treatment,(e) Mechanical/Chemical Disinfecting, (f) Sanitary and secured Land filling[4].

Primary health care (PHC) is a medical facility that delivers medical care to outpatients and on occasion may participate in large scale immunization programs. PHCs generally produce limited quantities of waste. So, biomedical waste management is also important for primary care physicians. According to Manar *et al*. (2014), it was found that the processes of biomedical waste management were poor and unacceptable across the levels of health facilities, and it was poorest in primary care settings as compared to secondary and tertiary care settings [14]. Woefully biomedical waste is yet to received adequate attention worldover. A survey in Brazil in 2004 found that, the overall waste management was without recycling method and collection was through the general municipal waste management system. In Africa, the situation is more critical as reports from various regions of the continent show poor management of biomedical waste. A study by Manyele (2003) as reported by [8] described the management of biomedical waste in Tanzania as being poor and the handlers lacks proper awareness of waste treatment. The situation of poor biomedical waste management was also similar from South Africa, Kenya, Mozambique, and Swaziland[8]. Thus, there is utmost importance in asessment of biomedical waste management among primary healthcare workers in Gwadabawa local government of Sokoto state.

Statement of the Problem

At the global level, 18-64% of health care facilities are reported to have unsatisfactory biomedical waste management; predictors include lack of awareness, Africa is estimated to have 67,740 health facilities and produce approximately 282,447 tons of medical waste yearly [11]. The management of biomedical waste is a major challenge for our primary health care facilities and present environmental sustainability. The waste should be managed so that it does not endanger human health, harm the environment, pose risks to air, water, soil, plants or animals, be a nuisance through odours or noise, or adversely affect places of special interest[4].

A major issue related to of present biomedical waste management in many primary health care facilities is that, the implementation of biomedical waste regulation is unsatisfactory as some hospitals are disposing of waste in a haphazard, lack of recycling, improper segregation practices, inadequate training of primary health care staffs, insufficient resources and poor disposal[8]. Also, biomedical waste scattered in and around hospitals invites flies, insects, rodents, cats and dogs that are responsible for spread of communicable diseases like cholera, plague and rabies[4]. Additionally, the health sector in the country is still receiving low allocation of resources and funding, which in turn cause lack of enough funding to properly manage biomedical waste in the healthcare facilities. Therefore, it is pertinent to carry out this study to analyze the current status of biomedical waste management in Gwadabawa healthcare facilities.The aim of this research study is to assess the biomedical waste management in some primary health workers in Gwadabawa Local Government, Sokoto State.

MATERIALS AND METHODS

Study Design

The type of design utilized in this study was descriptive survey type. It involves collection of data at a certain time.

Study Area

Gwadabawa is a Local Government Area in Sokoto State, Nigeria. Its headquarters are in the town of Gwadabawa on the A1 highway. It comprises Gwadabawa, Salame, Chimmola and Asara districts. It has an area of 991 km2 and a population of 231,358 at the 2006 census. The postal code of the area is 843.

Sampling Method and Sample Collection Instrument

The method of sampling was through convenience sampling using questionnaire designed from past literature guidance. The samples in qualitative study are usually smaller than that of quantitative one. Thus, the sample size consisted of sixty participants from different healthcare facilities in Gwadabawa local government. The samples are drawn from Gwadabawa town, Salame, Tambagarka, and Mammande PHCs.

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Figure 1: A typical Primary healthcare in Gwadabawa where data was collected; Source: Field work

Figure 2: An open biomedical waste dumping site in Gwadabawa; Source: Field work

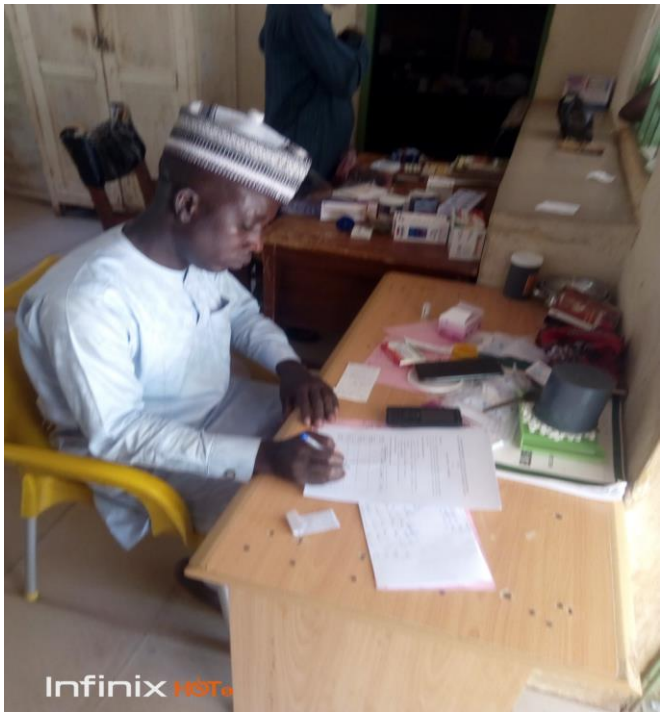

Figure 3: A respondent filling the questionnaire of the study, Source: Fieldwork

Data Management

The data was managed using Microsoft excel software to calculate descriptive statistics of frequency and percentage.

RESULTS AND DISCUSSION

Results

The results for this study of Assessment Of Biomedical Waste Management Among Primary Healthcare Workers In Gwadabawa Local Government Of Sokoto State" were displayed in tables 1-3.

Table 1: Demographic properties of respondents

Items	Frequency	Parameters
1.What is your sex?		
Male	50	83.3
Female	10	16.7
2. What is your religion?		
Islam	60	100
3. What is your age ?		
15-25	20	33.3
26-35	40	66.7
4. What is your level of education?		
Secondary	10	16.7
Tertiary	50	83.3
4b. What is your occupation?		
Staff	30	50.0
Student	20	33.3
Labourer	10	16.7

The table 1 shows the demographic of the respondents. The education is either secondary or tertiary level. They are all Muslims and age range between 15-35 years.

Personal protection

Table 2: Responses on use of personal protections use during Biomedical Waste Management among primary healthcare workers in Gwadabawa local Government of Sokoto State

Question(s)	Frequency(n:60)	Percentage
5. When do you use goggle or facemasks?		
a. None	4	1.6
b. Sometimes	36	30.0
c. Frequently	6	5.0
d. Always	16	13.3
6. When do you use protective foot wears?		
a. None	4	3.3
b. Sometimes	22	18.3
c. Frequently	16	13.3
d. Always	16	13.3
7. When do you wash your hands?		
a. None	**0**	**0.0**
b. Sometimes	10	8.3
c. Frequently	32	15.0
d. Always	**57**	26.7
When do you use protective labsuits?		
a. None	6	5.0
b. Sometimes	34	28.3
c. Frequently	4	3.3
d. Always	20	16.7
8. Have you ever been vaccinated against microbes which could arise from waste?		
a. None	14	4.2
b. Sometimes	6	5.0
c. Frequently	2	1.6
d. Always	8	6.7
9. When do you receive training on waste management?		
a. None	10	8.3
b. Sometimes	10	8.3
c. Frequently	4	3.3
d. Always	4	3.3

Biomedical waste management

Table 3: Biomedical Waste Management Among Primary Healthcare Workers In Gwadabawa Local Government Of Sokoto State

Items	Frequency	Percentage
10. Is there sorting/segregation of waste into its types in different containers?		
None	4	3.3
Sometimes	12	10.0
Frequently	20	16.7
Always	**0**	**0.0**
11. How many segregation boxes are there?		
3	12	10.0
4	14	11.7
12. Name the purposes of the boxes		
To prevent widespread of germs	14	11.7
Safety box	16	15.0
General waste disposal	2	1.6

13. Is there an arrangement for storage in the facility apart from the initial collection place?		
None	2	1.6
Sometimes	8	6.7
Frequently	24	20.0
Always	**0**	**0.0**
14. Describe the nature of the storage place		
Incineration	20	16.7
Open dumping	8	6.7
Well-equipped and maintained	4	3.3
Dig-trench	2	1.6
15. Name the type of treatment of waste		
Incineration	14	11.7
Chemical	8	6.7
disinfection	14	11.7
Autoclaving	4	1.6
16. Select the biomedical waste constraint in your facility		
Absence of plans	24	20.0
Poor/ lack of waste segregation facility	20	16.7
Lack of personal protective equipment	16	13.3
Absence of post exposure drugs	12	10.0
Absence of pre-exposure drugs	20	16.7
Indiscriminate dumping of waste	12	10.0
Poor hygiene in collection, storage, transportation, and treatment	20	16.7
Lack of monitoring and evaluation	12	10.0
Lack of training `	12	10.0

Discussion

Health facility is a source of hazardous waste. 80% of the waste in healthcare facilities is general waste, whereas the remaining 20% is hazardous. This necessitates proper design and policies to curtail spread of infection or hazardous to the public [10]. Large and small healthcare facilities like, rural health posts, immunization posts, clinics, provides useful services to the individuals and communities. They are front line of defense against epidemics such as malaria, HIV, cholera etc. In Africa, there is little or management of healthcare waste. Commonly, it is dispose off along with general waste (with little or no treatment), in dug pits or buried .In some places it is incinerated (sometimes improperly), some are dumped in sanitary outlets such as sewage system, latrine or septic tank. Thus, the waste from the facilities can pose great harm to the public. Biomedical wastes are generated during the diagnosis, treatment, or immunization of humans or in research activities pertaining to testing of biological sample. Although all individuals exposed to hazardous health care waste are potentially at risk, the principal group at risk includes health care providers, waste handlers, patients, visitors to healthcare facilities, workers in support service including laundry, and scavengers. Hazards from infectious waste and sharps may spread Human immunodeficiency 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. 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. 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. Proper waste handling helps to ensure appropriate hospital hygiene and safety of healthcare waste handlers, healthcare providers and communities at large. The best practice is to segregate at source into color coded containers for proper disposal as the waste poses high risk to the group. 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[7][8]. Table 2 displays the use of personal protection among healthcare workers in the course of waste management in Gwadabawa local government, Sokoto state. Most of the participants (30.0%) submitted that they wear protective glasses sometimes, then always (13.3%), very few

(1.6%). 18.3% uses protective foot wears sometimes, 13.3% frequently, and 3.3% of the respondents do not used protective foot wears. Most of them 26.7 always wash their hands, 15.0 wash hands frequently, and 8.3 wash their hands sometimes. 28.3% wear labsuit sometimes and 16.0% wear labsuits always. [7][8] reports the use of Personal Protective equipment by all respondents in a study in the Sokoto Hospital. This is in contrary to the findings in this study. On the question "Have you ever been vaccinated against microbes which could arise from waste?" Only 6.7 submitted that they are always vaccinated. When asked "When do you receive training on waste management?" only 3.3 % received training always.

Biomedical waste management among primary healthcare workers in Gwadabawa local government of Sokoto state was shown in table 3. In terms of sorting or segregation of waste, 16.7% said they practiced it always, 10.0% practiced it sometimes. 3.3% said they never practice sorting.10.0% have 3 boxes, and 11.7% have 4 boxes for waste segregation. 20.0% of the respondents said always there is storage after collection, while 1.6% said there is none. The waste storage place are incineration (16.7%) open dumping (6.7%), dig trench (1.6%), and well-equipped and maintained (3.3%). Types of waste treatment reported are: incineration (11.7%), disinfection (11.7%), chemical (6.7%), and autoclaving (3.3%). The challenges or constraints as experienced by respondents are: absence of plans(20.0%), lack of monitoring and evaluation (20.0%), poor hygiene in collection, storage, transportation, and treatment (16.7%),poor/lack of waste segregation facility(16.7%), lack of personal protective equipment (13.3%), lack of training (10.0%), lack of post-exposure drugs (10.0%).

This study explored the practices of personal protection use during waste management in Gwadabawa. It reveals that respondents uses labcoat, glasses, protective footwear in some proportions. The practice responses are not up to 50%, hence much need to be done. The finding is similar to that of [1][13]. A similar study from Sudan reported inefficient management of healthcare waste[5]. The trend of responses might be due to poor understanding of biomedical waste treatment in healthcare by the staff, which is attributed to poor training. Proper training will eventually lead to positive attitudes and practices[1]. Hand washing reduces the incidence of diarrheal diseases by more than 40% .Water contaminated with stool can pose greater risk to health and spread diseases like ,acute water diarrhea, cholera, typhoid, bacillary and amoebic dysentery ,poliomyelitis, and so on. It then must be treated and protected against sources of contamination. Environmental hygiene is also required[10].

In the table 2, the respondents have revealed that, only few of them received training always. Lack of training of staff on healthcare waste management is widespread phenomenon in the resources-limited countries like Nigeria as reported by studies such as [13]. Government ministries in health, and environment agencies and relations should provide more training to healthcare staff that are directly involved in medical waste management and should disseminate information, which helps the workers to understand the issue and carry their work properly in accordance with laws and regulations[2][3].

Table 3 shows management of biomedical waste in the study area. There are segregation and sorting of waste in some cases, but the proportions are not much. 3 or 4 boxes are used for safety box, general waste or to prevent the spread of microbes. Similarly, in few facilities there is storage of waste after collection. These portray an inappropriate or inefficient waste handling in most of the cases in the area of the study. This finding is similar to past studies[2]. Abdullahi et al., (2017); [1][13]. The treatments of methods in order of decreasing frequency are incineration, chemical, disinfection, and autoclaving. Incineration/burning of plastics or waste lead to release of hazardous substances. Hazardous air pollutants are pollutants suspected to cause cancer, reproductive and birth defects, or other serious adverse human and environmental effects. Plastic production results in the release of many of those substances. 60 % of all plastic ever produced had been discarded. Of that waste, 60 % entered the environment, 12 % was incinerated, and only 9 % was recovered for recycling. The incineration/burning of waste turn one form of waste into other forms of waste, including toxic emissions and toxic ash. Emissions from waste incineration include metals (mercury, lead, and cadmium, etc), organic compounds (dioxins like polychlorinated dibenzo-p-dioxins, PCDD) and furans, PAHs, VOCs, and other POPs, including polychlorinated dibenzofurans (PCDF), PCBs, and hexachlorobenzene (HCB), acid gases (such as SO2 and HCl), particulates (dust and grit), nitrogen oxides, carbon monoxide, and carbon dioxide (CO2). Smoke and particulates emitted can spur respiratory health problems, particularly among children, the elderly, people with asthma, and those with chronic heart or lung disease, while PCDF and PCBs are known carcinogens and emitted metals are known neurotoxics. The toxins from emissions, fly ash, and bottom ash travel long distances and deposit in the environment, ultimately entering human bodies after being accumulated in the tissues of plants and animals. The air around us contains microplastics. Exposure to low levels of airborne microplastics is usual outdoors and higher levels are found indoors due to more immediate sources of microplastics, such as carpets and furniture textiles, and the lack of wind and other dispersal mechanisms. Indoor air exposure is more significant because people spend predominant of their time indoors. The airborne plastic particles accumulate on the skin, food, resulting in dermal and gastrointestinal exposure. Studies postulate that a person's lungs could be exposed to 26–130 airborne microplastics per day. Other sources of airborne plastic include plastic and films used in agricultural processes that have degraded, fibers released from clothing dryers, plastics from wears of tires, and sea salt aerosol. Airborne plastic can also be dispersed on global air currents. Once inhaled, most fibers are likely to get trapped by the lung lining fluid.

Particles >1μm passing through the upper airway, where the lung lining is thick, can bypass the lung lining allowing for uptake across the bronchial epithelium. The thinner plastics may penetrate the thinner lung lining fluid and contact the epithelium, then translocate throughout the body[15]. In table 3, the biomedical waste constraint in health facilities are: Absence of plan, Poor/ lack of waste segregation facility, Poor hygiene in collection, storage, transportation, and treatment, Absence of pre-exposure drugs, Lack of personal protective equipment, Lack of monitoring and evaluation, Indiscriminate dumping of waste, Absence of post exposure drugs.

CONCLUSION

The workers are not fully practicing personal protective measures. There is also lack of adequate training of workers on biomedical waste in healthcare in Gwadabawa.

RECOMMENDATIONS

Based on the findings of this study the following recommendations can be stated:

- The government and related agencies should provide all the necessary tools, equipments, and personal protective equipments required for effective biomedical waste treatment in various healthcare agencies in the state.
- There should be proper, routine training and mobilization/ sensitization of healthcare workers on effective and efficient biomedical waste treatment in various healthcare agencies in the state.

REFERENCES

[1] Abah, R.C. (2020). Assessment of healthcare facilities location and medical waste generation and handling in Nigeria. Journal of Public Health and Epidemiology, 12(1):50-62.

[2] Abdullahi, Z., Awosan, K.J., Ibrahim, M.T.O., Yahaya, M., Mohammed A.M.(2017). Knowledge, risk perception, protective practices and pattern of accidental exposures to hazards of healthcare wastes among workers in primary healthcare centres in Sokoto. Nigeria Journal of Advances in Medicine and Medical Research,23(9):1-11.

[3] Akkajit, P., Romin H., and Assawadithalerd, M.(2020). Assessment of knowledge, attitude , and practice in respect of medical waste management among healthcare workers in clinics. Hindawi Journal of Environmental and Public Health, 8745472:1-12.

[4] Federal Ministry of Health (2018). Healthcare waste management plan for Nigeria polio eradication support project additional financing 3. Draft Report. Ewdsata.rightsindevelopment.org.

[5] Hassan, A.A., Tudor, T., and Vacarri M., (2018). Healthcare waste management: A case study from Sudan. Environments, 5(89):1-16.

[6] International Committee of the Red Cross (2011). Medical waste management. Geneva, Switzerland. www.icrc.org.

[7] Kaoje, U., Garba, J., Christina O.N., Olayinka, R.M., Mohammed, Y., and Mohammed A.U. (2018). Biomedical waste handling and knowledge of it's health hazards among waste handlers in a tertiary hospital in Sokoto, Nigeria. Public Health Review- International Journal of Public Health Review,5(1):26-32.

[8] Longe, E.O. and Williiams, A. (2006). A preliminary study of medical waste management in Lagos Metropolis, Nigeria. Iran Journal of Environmental Health Science Engineering, 3(2):133-139.

[9] Mahendra, R.R.R. (2017). Biomedical waste management: An overview. Journal of Indian Acdemy of oral Medicine and Radiology,2(3):139-142.

[10] Ngwuluka,N, Ochekpe N, Odumosu, P and John S.A (2009). Waste management in healthcare establishments within Jos metropolis, Nigeria .African J. of Environment Science and Technology 3(2):459-465.

[11] Nigeria Health Watch (2021). Assessment of water, sanitation and hygiene services in PHCs in FCT and Niger State.

[12] Omoleke, S.A., and Ashiru, M.M. (2021). Medical waste management at the primary healthcare centers in a north western Nigerian state: Findings from a low-resource setting. Public Health in Practice, 2:1-10.

[13] Oyekale, A.S., and Oyekale, T.O. (2017). Healthcare waste management practices and safety indicators in Nigeria. BMC Public Health, 17(740):1-13.

[14] Sambo, S.S.(2020). Asessment of Biomedical waste management among primary healthcare workers: A case study in Bauchi LG of Bauchi satte. An Undegraduate project submitted at Kwara State University, Kwara state.

[15] Sarkingobir, Y., Bello, M.M., Yabo H.M. (2021). Harmful effects of plastics on air quality. Academia Letters, Article 2967.https://doi.org/10.20935/AL2967

[16] World Health Organization and the United Nations Chldren's Fund (2019). WASH in healthcare facilities: Global baseline Report 2019, WHO and UNICEF Geneva.