

EVALUATION OF HEALTHCARE WASTE ADMINISTRATION ROUTINES AMONG HEALTH WORKERS

BY

***Thompson Salvation Chinezom & **Professor Innime Righteous**

School of Public Health, University of Port Harcourt

ABSTRACT

The collection, storage, transport, treatment and disposal of medical wastes are of growing environmental problem in Nigeria, which needs immediate attention before it goes out of hand. In the studied government HCEs medical wastes are not properly managed. Most of the HCEs do not have any budgetary provision to manage their generated waste systematically. Medical waste Administration is an integral part of health care. Because of the communicable diseases such as the AIDS/HIV and hepatitis B and C viruses, people are increasingly concerned over the disposal of medical waste. Many of the workers are injured by the sharp, infectious, chemical and radioactive wastes. Moreover, some of respondents were facing stink and afraid of containing diseases from the infectious waste. From percolation of hospital waste ground water is polluted from leachate and aquatic life system is totally disturbed as it restricts sun light to enter in to the bottom level of water body. Again it disturbs the pH level of water body.

Keywords: Medical Waste Management, Healthcare Waste, Waste Disposal, Environmental Pollution, Occupational Health Risks, Hospital Waste Management

INTRODUCTION

Healthcare waste threatens the public health due to its contagious nature. Most healthcare facilities are located in the heart of the cities and therefore, healthcare waste that are not correctly managed can cause dangerous infection and pose potential threat to the nearby environment, health workers, patients and to the public (WHO, 2014). Dehghani, Azam, Changani and Fard (2008) noted that Healthcare Waste (HCW) if not appropriately managed can be a serious threat to human health due to their infectious attributes. Nigeria, one of developing countries, has health issues that are competing for limited resources; it is not amazing that healthcare waste Administration receives less attention and precedence than it merits (Stephen, & Elijah, 2011). Therefore, there is a serious challenge in developing countries, where there are no Institutional provisions for healthcare waste Administration. Clinical wastes are disposed openly in the dumpsite along with municipal waste and the practice make the members of the community gain access to it which may lead to outbreak of infectious diseases (Alagoz, Kocasay, Abah, & Ohimain, 2010).

Cheng, Sung, Yang, Lo, Chung and Li (2009) noted that as small as healthcare waste is in proportion to the total community waste, its Administration is considered an important issue worldwide. World Health Organization (2014) reported that 15% of total waste generated in the healthcare facility is hazardous and must be properly segregated at the point of generation to prevent the whole healthcare waste becoming 100% hazardous. The World Health Organization estimates 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 human immune deficiency virus (HIV) due to unsafe injections disposal and mostly due to very poor waste Administration systems.

Across the globe, the risk associated with Healthcare Waste (HCW) and its Administration has gained tremendous attention from health practitioners and non practitioners. If healthcare facilities know the types and quantities of clinical waste generated, it will help them in planning, budgeting adequate revenue for the Administration of hazardous waste (Bongayi, 2013). A

study conducted by Olubukola (2009) in two General hospitals at Lagos reported that due to lack of quantification of healthcare waste, there was no waste reduction plan in the hospitals.

This lack of plan for healthcare waste Administration eventually leads to inadequate waste segregation at point of use, collection, storage and final disposal. This poor healthcare waste Administration practice creates health hazards for health workers, patients and the environment. Identified gaps like lack of colour code bags for segregation of healthcare waste at point of use, lack of guidelines on segregation and disposal for health workers lead to poor healthcare waste Administration in hospitals. The mis Administration of healthcare waste by healthcare facilities does not pose health hazard to health workers and patients alone but also to patients' visitors and the community where they are improperly disposed by contaminating the soil, air and water. Healthcare facilities are supposed to protect the health of people in their environment, not to be a creator of potential health hazard for them.

Furthermore, increase in patient turned-out has increase the generation of healthcare waste. Mboguwe, Mimereki and Magashula(2008) also reported that increase in population results to increase in healthcare facilities that lead to increased healthcare waste generation. It is expected that because of this increase, more attention should be paid to and priority given to proper healthcare waste Administration in Ahoada East South Local Government (ASLG). Administration of healthcare waste continues to present an array of challenges especially as economic situation of the country deepen daily therefore, healthcare waste Administration has become a concern.

So many studies have been conducted on healthcare waste Administration but little or no work has been done concerning segregation of clinical waste which is a vital aspect in healthcare waste Administration (Coker, Sangodoyin, Sridhar, Booth, Olomolaiye, 2009). Segregation of waste is crucial in healthcare waste Administration because it is the first step in clinical waste Administration. Segregation of healthcare waste helps in reduction of the quantity of waste that is hazardous. Once healthcare waste are segregated, collection will be easy, proper storage will be done and disposal of infectious waste carried out in the way that it will not pose any harm to health

workers, patients and the environment (WHO, 2014). Proper Administration of healthcare waste depends on good organization, sufficient funding and active participation of trained personnel. It was observed that healthcare facilities were not spending resources on clinical waste Administration Healthcare facility must allocate resources for colour coded bags and training of generator of healthcare waste for proper segregation and disposal for its sustainability. The intention of this study is to assess healthcare waste Administration routines at health facilities in Ahoada East South Local Government.

Survey design and data collection planning

These clinics and diagnostics centers are growing with plan. The clinics are growing in both the residential areas and the commercial areas. So it is difficult to manage the hospital wastes and the present situation is very dangerous from the point of view of environment and health.

Preliminary Field Investigations

General information was collected about the study area by preliminary field investigation. During the period of primary field investigation the aim, scope and objectives of the study were maintained carefully. Infrastructure of the HCEs, dustbin condition and facilities, municipal dustbin condition, drainage system, land use pattern, communication system, building arraying etc. were observed at a glance to make an idea about the study area. This investigation helped to select the sampling size, sampling technique and also the preparation of questionnaire.

Assessing the Relevant Existing information

In this stage various books, journals, reports on medical waste Administration and its health hazard both in national and international context were reviewed to achieve the necessary information that was helpful to develop a research design, it also made aware about the context of the questionnaire.

Draft Questionnaire Preparation

Draft questionnaire was prepared with a list of questions which were simple and easy to understand for the respondent, comparatively short in size, uncontroversial, less technical terms and vague and in a logical sequence to test applicability of them in the study area.

Pre-testing and Finalization of Questionnaire

The prepared draft questionnaire had done pre-test in the field before going to take final interview from the respondent. The errors of draft questionnaire were corrected, faults and failures also modified and altered and extra questions were excluded to prepare a final questionnaire according to study objectives. Final questionnaires were then free from omissions and commissions and ready for final interview to the respondents in the study area.

Data collection

Data were collected from the two main types of sources- primary data sources and secondary data sources.

Primary Data Collection

Primary data were collected through direct interview of the respondent in every HCEs at selected ward. Final questionnaire was asked to respondents and their answers were written to the definite place in the questionnaire sheet.

Secondary Data Collection

Apart from primary data, secondary data were collected from the official records of KCC, BBS, NGOs (Prodiyon, Prism), some books, journals, reports, internet sources etc. which are enlisted on the reference.

Sample Size and Sampling Procedure

Sampling is an important task in case of field survey. For the simplicity of the study, a random sampling procedure was chosen. By using a random sampling procedure a survey was conducted on 23 health care establishments out of the total of 70 HCEs in the study area, which is about 32.85% of the total HCEs in the study area. Few of the HCEs have diagnostic centers. So, randomly selected HCEs represent the hospital waste Administration system of the Ahoada East.

Development of Survey Schedule

The field survey for this study was based on the objectives. A number of formal and informal approaches were adopted in order to gather data.

Entering into HCE it was done schedule with the concerned authority of each HCE. After getting a green signal from different HCE, it was started questionnaire to each respondent which first began. This strategy provided quantitative data with the extensive questionnaire survey providing breadth of coverage, while the interviews with nurses, technicians, patients, doctors and administrators of HCEs and in depth interviews with different respondents allow a greater depth of understanding of the waste Administration system within the HCEs. The health hazard information was collected mainly from the nurses, ayah cleaners (who are directly related to waste collection from patient bed, gather them in a bowl of bin and dispose them in secondary disposal pot such as drum in each HCE) while gathering other waste related information.

Waste Generation

Hospital wastes generated from the daily activities of patients, cleaners, sweepers, nurses, doctors, and administrators etc. that are discarded as useless. Number of beds and outdoor patients were counted that represent the waste generation sources.

Collection of Waste

Generated wastes are collected from bed to bed collection system that is stored in bin. The size and shape of bins or bowls were different from HCE to HCE. The total waste was stored in bin according to its type generating from a specific ward (private hospital). Separate types of waste were weighted and multiplied it with the total patients. But, this is not the situation of all the HCEs. In some cases there was no such facility. So the wastes were estimated by the doctors, nurses or cleaners.

Data analysis

The collected data for this study with the questionnaire were analyzed following different statistical techniques: mean. In addition a number of graphs in terms of pie diagram, bar chart, etc, were used to clearly focus the situation. MS. Excel and SPSS were employed in this research to analyze the information to address the aims and objectives.

Table 1. Respondents' Knowledge of Waste Administration

Waste Administration Knowledge items	Doctors N=10(100%)	Nurses	Pharmacists N=8(100%)	Lab technicians N=6(100%)	Health attendant N=36
--------------------------------------	-----------------------	--------	--------------------------	------------------------------	--------------------------

		14(70)			
Waste Segregation Segregation at source	9(90) 8(80)		7(87.5) 4(50)	5(83.3) 5(83.3)	21(58.3) 2(5.6)
Waste separation Sharps Infectious waste Chemical waste Woods Plastics	(35.7) (23.5) (26.5) (7.2) (7.1)	53.4 24 11.6 6 5	60 24.5 3.3 10 2.2	50 33 6 3 8	50 14.3 14.3 14.3 14.3
Knowledge of colour coded bags	6(60)	16(80)	6(75)	5(90)	25(69.4)
Waste Storage Hospital dumpsite At site of collection No idea	10(100)	18(90) 2(10)	3(37.5) 2(25) 3(37.5)	3(50) 3(50)	18(50) 7(19.4) 11(30.6)
Best waste disposal method Sanitary Landfill Incineration Buried on hospital ground Open burning	80 85 ---- ---	60 50 20 ----	40 20 ---- 10	60 50 --- ----	30 20 50 60
Best container for waste collection and disposal Plastic bin Bags Cardboard boxes Trolleys/Wheel barrows	8 (80) 2 (20)	7 (35) 6 (30) 4 (20) 3 (15)	4 (50) 4 (50)	5 (83.3) 1 (16.7)	25 (69.4) (11.1)2 (5.6) (13.9)

Whereas all the doctor respondents knew about injury resulting from poor waste Administration, only 35% of health care attendants possessed the same knowledge. Table 1 shows that 35.7%, 53.4%, and 50% of doctors, nurses, and healthcare attendants knew sharps should be separated from other wastes. The table showed that 6(60%) of doctors, 16(80%) of nurses, 6(75%) of pharmacists, 5(90%) of laboratory technicians, and 25(69.4%) of healthcare workers knew about colour coded bags. Also 10(100%) of doctors, 18(90%) of nurses, 3(37.5%) of pharmacists and 18(50%) of healthcare attendants went for dumpsite as site for temporary storage of waste. Table 2 shows that the

proportion of doctors, nurses, pharmacists, laboratory technicians and healthcare attendants that displayed positive attitude to containment of sharps were 40%, 30%, 50%, 33.3%, and 38.9% respectively. The table showed that 80%, 90%, 75%, 16.7% and 83.3% of doctors, nurses, pharmacists, laboratory technicians and healthcare attendants showed positive attitude. On the respondents' general practice of waste Administration, 64(80%) of them always disposed their waste into appropriate receptacle, while 70(87.5%) of the respondents cover the waste bin after disposal.

TABLE 2. Respondents' Attitude towards medical waste Administration

Attitude Items	Doctors N=10	Nurses N=20	Pharmacist N=8	Laboratory technician N=6	Healthcare attendants N=36
Waste separation reduces injury risk to handlers	10 (100)	20 (100)	6 (75)	4(66.7)	35 (97.2)
Must occupational safety of waste handlers be ensured?	8 (80)	18 (90)	6 (75)	1(16.7)	30 (83.3)
Puncture proof containers are most appropriate for sharps	4(40)	6(30)	4(50)	2(33.3)	14(38.9)

TABLE 3. Respondent' General Practice of Waste Administration

Where should segregation take place Doctors Nurses Pharmacist Laboratory technicians Healthcare attendant

N=10 (%) N=20(%) N=8(%) N=6(%)

N=36(%)

Segregation at production site	8(80)	14(70)	4(50)	5(90)	2(5.6)
Segregation at site of	2(20)	2(10)	2(25)	1(10)	6(16.7)
Collection Segregation at disposal site		4(20)	2(25)		28(77.7)
Uses of colour-coded bags					
Separate waste	4 (40)	5 (25)	3 (37.5)	3 (50)	9 (25)
Store waste	6 (60)	2 (10)	1 (12.5)	3 (50)	20 (55.6)
Transport waste		13 (65)	4 (50)		7 (19.4)

Furthermore, 80%, 60%, 40% 60% and 30% of doctors, nurses, pharmacists, laboratory technicians and healthcare attendants respectively know about the waste disposed in the landfill, while 85%, 50%, 20%, 50%, and 20% of doctors, nurses, pharmacists, laboratory technicians and healthcare attendants respectively know about the waste disposed using incinerator. Moreover, 2(20%) of the doctors, 3(15%) of the nurses, 4(50%) of the pharmacists, 1(16.7) of the laboratory technicians and 5(13.9%) of the healthcare attendants went for trolley, wheel barrow as a means of internal waste collection and transport.

Also, 17% of the respondents said they always wear protective clothing when handling waste, 45% said they do so sometimes while 38% rarely wear protective clothing. Table 3 shows that 8 (80%) of doctors, 14(70%) of nurses, 4(50%) of pharmacists, 5(90%) of laboratory technicians and 2(5.6%) of

healthcare attendants went for segregation at source as the best method. The table showed that 6(60%) of doctors, 13(65%) of nurses, 3(37.5%) of pharmacists, 5(90%) of laboratory attendants and 20(55.6%) of healthcare attendants said that the major use of colour coded bags was for separation of wastes.

Table 4 shows that there is a significant difference between the cadres of health workers in the knowledge waste Administration (specifically segregation) $p=0.02$. Also there was a significant difference between the cadres of health workers on the practice of waste Administration; $p=0.000$. Concerning training on waste Administration, 8(80%) of the doctors, 12(60%) of the nurses, 1(12.5%) of the pharmacists, 4(66.7%) of Laboratory technicians and 19(52.7%) of healthcare attendants had received such training. Table 5 indicates that male health workers are significantly more

Table 4. Relationship between waste Administration items and cadre of health worker respondents

Factors	Doctors N=10(%)	Nurses N=20(%)	Pharmacist N=8(%)	Laboratory technician N=6(%)	Healthcare attendants N=36(%)	X2	P value
Should waste be segregated	9 (90)	18(90)	7(87.5)	5(83.3)	21(58.3)	11.7	0.002
Knowledge of colour coded bags	6(60)	13(65)	3(37.5)	5(83.3)	20(55.6)	3.47	0.48
Practice of waste Administration	8(80)	14(70)	4(50)	5(83.3)	2(5.6)	36.6	0.0000
Received training on waste Administration	8(80)	12(60)	1(12.5)	4(66.7)	19(52.8)	6.03	0.28

Table 5. Relationship between gender and waste Administration

Factors	Number of Males		Number of Females		X2	P value
	YES	NO	YES	NO		
Should waste be segregated	17	3	50	10	0.031	0.86
Knowledge about color-coded bags	14	6	39	21	0.168	0.68

Practice of waste Administration	9	11	17	43	1.899	0.168
Training on waste Administration	12	8	21	39	3.868	0.049

likely to be sent for training on waste Administration than their female counterparts; $p=0.49$

DISCUSSION

In this study, recruited healthcare workers were assessed about their knowledge, attitude and practice of healthcare waste Administration. Concerning their knowledge of waste segregation, 90% of doctors and nurses each and 87.5%, 83.5% and 58.5% of pharmacists, laboratory technician and healthcare attendants respectively knew about waste segregation. This showed that the respondents had a fair knowledge. The high knowledge recorded in this study may be attributed to training received by the nurses and healthcare attendants recently before the study. There was however a significant difference ($P<0.05$) in this knowledge between the more educated healthcare worker (doctors, nurses, pharmacist, laboratory attendants) and the healthcare attendants. This trend is similar to the findings of Saini *et al* who measured the knowledge regarding biomedical waste Administration. Their result showed that consultants, residents, and scientists respectively have 85%, 81%, and 86% knowledge about the biomedical waste Administration while nurses, sanitary staff, operation theatre and laboratory staff have 60%, 14%, 14%, and 12% awareness of the subject respectively (Saini *et al.*, 2005). This is an indication that the people with higher education tend to have greater awareness about waste Administration issues than their less educated counterparts. Therefore the difference in knowledge may be due to the difference in educational level of doctors and other paramedical workers and thus exposes the need to fill this gap in knowledge through regular informal education of the paramedical workers.

Segregation of medical waste at source is the golden rule of healthcare waste Administration. Knowledge of this strategy was displayed by 80%, 70%, 50%, 90%, and 5.6% of doctors, nurses, pharmacists, laboratory technicians, and healthcare attendants respectively. This is strikingly similar to the finding of another study by Yadavannavar *et al* which recorded that majority of their staff knew about segregation of healthcare waste at source (Yadavannavar *et al.*, 2010). In a similar vein, Deo *et al.* found that 90% of paramedical and 80.6% of medical staff were aware of this (Deo *et al.*, 2006).

Use of different color-coding bags for segregation is one of the most important parts of healthcare waste Administration rule, yet low proportions of the participants especially, nurses, pharmacist, laboratory technician and health attendant were positively disposed towards putting them to correct use. Comparable low knowledge was equally reported by some other studies. Deo *et al.* showed that only 28.62% of paramedical and 20.23% of medical staff knew about this issue, whereas 74% of Puducherry study participants did not know about color coding of the healthcare waste bags (Deo *et al.*, 2006). However very high knowledge was shown among doctors and nurses in a study at Johannesburg Hospital by Ramokate *et al* who reported greater than 90% knowledge of various types of bins among them (Ramokate *et al.*, 2009). On assessing the attitude about different health problems due to healthcare waste, it was seen that all the doctors and nurses, and 75%, 66.7%, 35% of pharmacists, laboratory technicians and healthcare attendants had good perception about the risk of diseases transmitted by healthcare wastes. This result was similar to some other studies including a study by Pandit *et al.* and Saraf *et al.* which showed that all the doctors were aware that improper Administration of healthcare waste causes different health hazards like infections (HIV/AIDS, Hepatitis B and C), injuries, and environmental pollutions (Pandit *et al.*, 2005; Saraf *et al.*, 2006). A study by Araoye showed that 82% of the study population agreed that contact with infective waste could lead to infectious diseases such as HIV/AIDS, 88% Hepatitis B, and 76% Hepatitis C (Araoye *et al.*, 2003). A need to periodically acquaint the participants with the updated healthcare waste Administration and handling rules was felt (WHO, 2002).

Conclusion

The collection, storage, transport, treatment and disposal of medical wastes are of growing environmental problem in Nigeria, which needs immediate attention before it goes out of hand. In the

studied government HCEs medical wastes are not properly managed. Most of the HCEs do not have any budgetary provision to manage their generated waste systematically. Medical waste Administration is an integral part of health care. Because of the communicable diseases such as the AIDS/HIV and hepatitis B and C viruses, people are increasingly concerned over the disposal of medical waste. Many of the workers are injured by the sharp, infectious, chemical and radioactive wastes. Moreover, some of respondents were facing stink and afraid of containing diseases from the infectious waste.

From percolation of hospital waste ground water is polluted from leachate and aquatic life system is totally disturbed as it restricts sun light to enter in to the bottom level of water body. Again it disturbs the pH level of water body.

It can be concluded that the existing system of medical waste Administration of the studied HCEs is neither satisfactory nor adequate. Insufficient vehicle, lack of

manpower, technology and complex maintenance procedures obstruct systematic medical waste Administration. An environment friendly Administration system for the proper Administration of medical wastes has to be developed. In this respect, an eco-design of the proper Administration of the medical wastes have been proposed.

In many countries the safe disposal of medical waste is considered very important and handled in a very professional manner. They have effective systems of tracking waste generators, and follow specified regulations for segregation, collection, treatment and disposal of medical waste.

Recommendations

In Ahoada East, medical waste is generally disposed in the same way as ordinary domestic waste. In order to arrange a proper and systematic medical waste Administration, the following observation should be considered:

1. Medical wastes are needed to be segregated separated, according to its characteristics, at the point of generation. All the HCEs should use the WHO permitted color-coded, high-density polyethylene bags for easy identification and segregation of hospital solid wastes could be used in HCEs

2. Modern techniques and technological devices such as moving dustbins, crane, separate collection system bins, etc. could be used in the hospital Administration system.
3. 3R principles (reuse, recycle and reduce) of waste generation could be followed through composting and following other process.
4. Non-hazardous wastes were finally dumped as sanitary landfill system and the hazardous wastes could be disinfected prior to dispose.
5. Human resources development with other logistic support could be ensured.
6. To avoid the risk of health effect from the wastes, on-site incineration of the entire hospital waste with appropriate air pollution controls, is the best available means of processing prior to disposal. A strong monitoring system should be developed for the whole Administration system.

REFERENCES

- Aisien, A.O. and Shobowale, M.O. 2005. Healthcare Worker's knowledge, precaution and Attitude towards Occupational Safety. *Nigerian Journal of Clinical Practice*, 8(2): 74-82
- Almuneef, M. and Memish, Z.A. 2003. Effective medical waste Administration: it can be done. *American Journal of Infection Control*, 31(3):188-192.
- Araoye, N.O. 2003. Research methodology with Statistics for health and social sciences. *Journal of tropical biology*, 51(1): 285-288.
- Askarian, M., Vakili, M. and Kabir, G. 2004. Results of a hospital waste survey in private hospitals in Fars province, Iran. *Waste Administration*, 24:347-352.
- Becher, S. and Lichtnecker, H. 2002. Immunological aspects and affections of rubbish collectors caused by Bioaerosols. *Journal of Occupational Health*, 44(3):125130.

- Blenkharn, J.I. 2006. Standards of clinical waste Administration in UK hospitals. *The Journal of Hospital Infection*, 62(3):300-303.
- Coronel, B., Durosellet, P., Behrt, H., Moskovtchenko, J.F. and Freney, J. 2002. In situ decontamination of medical wastes using oxidative agents: a 16-month study in a polyvalent intensive care unit. *The Journal of Hospital Infection*, 50(3):207-212.
- Deo, D., Tak, S.R. and Munde, S.S. 2006. A Study of Knowledge Regarding Biomedical Waste Administration among Employees of a Tertiary Hospital in Rural Area. *J Indian Soc Hosp Waste Manage*, 5(1): 12-16.
- Geradu, J. 1995. Spatial planning and the environment. *Global journal of science and frontier* 5(4): 20-24.
- Hebel-Ulrich, Maja and Danish 2005. Committee for Aid to Afghan Refugees (DACAAR) Retrieved April 12 from www.dacaar.org.
- Isu, B. A. 2013. The pains of waste. A Paper presented at the workshop organized by committee on vital Environmental Resources for Teachers/ Students, Eghosa Anglican Grammar School, Benin City, 1-6pp.
- Kofoworola, O.F. 2007. Recovery and recycling routines in municipal solid waste Administration in Lagos, Nigeria. *Waste Administration*, 27(9):1139-1143.
- Massrouje H.T.N. 2001. Medical waste and health workers in Gaza governorates. *Eastern Mediterranean Health Journal*, 7(6):1017-1024.
- Mato, R.R.A.M. and Kaseva, M.E. 1999 Critical review of industrial and medical waste routines in Dares Salaam City. *Resources, Conservation and Recycling*, 25:271-287.
- Muhlich, M., Scherrer, M., Daschner, F.D. 2003. Comparison of infectious waste Administration in European hospitals. *The Journal of Hospital Infection* 55(4):260-268.
- Nkonge, N.A., Mayabi, O.A., Kithinji, J., Magambo, K. 2012. knowledge, attitude and practice of healthcare waste Administration and associated risk. *Journal of Community Health*, 37(6):1172-7
- Orl, A., Akgill, M. 2004. An optimisation approach for locating a hazardous waste disposal facility in Istanbul province. *Waste Administration Research Journal*, 12(6): 495-506.
- Pandit, N.B., Mehta, H.K., Kartha, G.P. and Choudhary, S.K. 2005. Administration of biomedical waste: Awareness and View publication stats pp.833-838, December routines in a district of Gujarat. *Indian J. Public Health*, 4(9): 245-24
- Prüss, A., Giroult, E. and Rushbrook, D. 2009. Safe Administration of Wastes from Health-care Activities. World Health Organization: Geneva;
- Ramokate, T. and Basu, D. 2009. Health care waste Administration at an academic hospital: Knowledge and routines of doctors and nurses. *South Afric Medical Journal*, 9(9): 444-445
- Ray, M.R., Roychoudhury, S., Mukherjee, G., Roy, S. and Lahiri, T. 2005 Respiratory and general health impairments of workers employed in a municipal solid waste disposal at an open landfill site in Delhi. *International Journal of Hygiene and Environmental Health* 208(4):255-262.
- Saini, S., Nagarajan, S.S., Sharma, R.A. 2005. knowledge and awareness regarding biomedical waste Administration among employees of a tertiary care hospital. *Journal of the Academy of the Hospital Administration*, 17(2): 1-12
- Saraf Y, Shinde M, Tiwari SC: Study of Awareness Status about Hospital Waste Administration among Personnel and Quantification. *Indian JOURNAL of Community Medicine* 2006; 3(1): 111-112.
- Sigsgaard, T., Malmros, P., Nersting, L., Petersen, C. 2004. Respiratory disorders and atopy in

- Danish refuse workers. *American Journal of Respiratory and Critical Care Medicine*, 149(6):1407-1412.
- Stephen, O.A. and Elijah, I.O. 2011. Waste Administration in Nigeria. *Journal of public Health and Epidemiology* 13(3): 99-110.
- Tamplin, S.A., Davidson, D., Powis, B. and O'Leary, Z. 2005. Issues and options for the safe destruction and disposal of used injection materials. *Waste Administration*, 25(6):655665.
- UNCED. 2008. Report of United Nations Conference on Environment and Development Rio Journal of Brazil 26 (1): 151.
- United state Environmental Protection Agency: 2008. Inventory of Sources of Dioxin in the United States, National Center for Environmental evaluation, USEPA Retrieved from <http://www.epa.gov/dioxin>
- United state Environmental Protection Agency: Mercury Study
- Report to Congress, Executive summary 1997. Retrieved February 30 from <http://www.epa.gov/..../volume2>
- Uwaegbulam, C. 2004. World is meeting goals of safe drinking water but falling behind on sanitation, says UN. *The Guardian*, Monday, August 30, P. 50.
- WHO, 2002. Basic Steps in the Preparation of Health Care Waste Administration Plans for Health Care Establishments Amman Retrieved march 23 from <http://www.who.int/guidmanual/>
- World Health Organization April 2014: Healthcare waste Administration. To reduce the burden of disease, healthcare waste needs sound Administration, including alternatives to incineration. Retrieved April 10 from <http://www.who.int/mediacentre/factsheets>
- Yadavannavar, M.C., Berad, A.S. and Jagirdar, P.B. 2010. Bio-medical Waste Administration: A study of Knowledge, Attitude and routines in a Tertiary Health Care Institution in Bijapur. *Indian J. Community Med.*, 3(5): 170-171.
- Farida Isyaku (2015): evaluation Of Medical Waste Administration routines In Ahmadu Bello University Teaching Hospital And Ahmadu Bello University Health Services, Zaria, Nigeria.
- Clementina Ukamaka Uwa (2014) evaluation of Healthcare Waste Administration routines in Enugu Metropolis, Nigeria