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# Availability of Health Care Centres and Its Waste Management in Akure, South-Western Nigeria

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***Authors' contributions***

*This work was carried out in collaboration between authors AT and ACF. Both authors designed the study, wrote the protocol and supervised the work. Author AT performed the statistical analysis. Author ACF managed the analyses of the study. Author AT wrote the first draft of the manuscript while author ACF managed the literature searches and edited the manuscript. Both authors read and approved the final manuscript.*

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## ABSTRACT

The proper management of medical waste is very important due to its infectious and hazardous nature which can cause undesirable effects on humans and the environment. Based on the above this study determined the spatial distribution of health care facilities, volume of waste generated, management of disposal practices and health implications on human beings in Akure, South Western Nigeria. The study adopts stratified-random technique in sampling the health care centers. Seventy-one (71) Health Care Centers was selected and investigated. The questionnaire constructed by the researchers was used to elicit information for the study. ArcGIS 9.3 was used to determine the spatial distribution of health centers while data collected was analyzed with Statistical Package for Social Science (SPSS). Findings showed that there was inequality in the spatial distribution of health care centers. With the use of measuring scale (tons), the volume of waste generated daily in the health care centers was 0.5825, and the average volume of waste generated

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per patient per day was 0.0016. Findings also showed that the waste collected was not properly managed. It was also identified that lack of waste management led to bad odour (air pollution) increase in toilet flies and mosquitoes which invariably has led to increase in malaria typhoid, cholera etc. The study recommends the establishment of Wastes Management Committee (WMC) in each health care centers in the study area also the organization of seminars, workshops, and sensitization of officers on the appropriate methods of carrying out medical waste management.

*Keywords: Medical waste; health centers; waste management; medical facilities.*

## 1. INTRODUCTION

Hospitals/health centers are establishments where ill people and victims of accident are given medical attention with medical experts. Every human being is expected to protect his or her life by visiting the health center. There is no doubt that these establishments generate wastes that are harmful to health and the environment.

Rahele & Govindan [1] noted that waste is as old as man. It is generally created by man in the following areas; at home, inform of household waste materials called domestic wastes, industry/factory wastes, institutional wastes, commercial wastes etc. that can constitute threat which can be very harmful to human health.

According to Odewunmi [2], waste generation is a day in day out part and parcel of human being which cannot be avoided but can only be managed. Waste arise as a result of man's activities right from his earliest civilization. It was more prominent during the industrial revolution. Waste generation increased with the aid of the development in technology during the twentieth century [3]. The world is increasingly generating waste, while hospitals and health centers are no exception.

According to Encarta Dictionary [4], hospital is an Institution in which sick or injured people are given medical or surgical treatment with specialized staff and equipments. All humans have the right to have access to basic health care facilities. Health-care activities are a means of protecting health, curing patients and saving lives. These health care institutions generate wastes that are harmful to health and the environment.

Emilia Asuquo Udofia, Julius N. Fobil & Gabriel Gulis. [5] Pointed out that the problems generated by these medical wastes are numerous. They produce offensive odours when not disposed of regularly and properly, degrade the environment, reduce its aesthetic value and pollute the air with smoke when the wastes are burnt because it often contains synthetic products. They also constitute health hazards when they are not timely disposed of. They become breeding places for worms and insects. They pose bad working environment for those working in the health center and their patients, due to accumulation of wastes over a period of time. Therefore medical waste can be infectious, contain toxic chemicals and pose contaminated risks to health workers, patients and the environment [6].

Medical wastes require proper disposal and management since its improper handling could be very harmful to the health of the community [7] Presently, medical waste management among the developing nations, especially Nigeria, is taken with levity. Open dump methods being as old as mankind can be observed as being the predominant means of waste disposal in developing countries [8].

If patients are to receive health care and recover in safe environment, waste must be properly disposed. Poor waste management can be detriment to the health of medical staff, patient, their families and the residents of the environment. The inappropriate disposal of these wastes may lead to environmental contamination/pollution which may be detrimental to health, hence this study.

### 1.1 Objectives

In order to identify the problems and suggest appropriate medical waste management system, the research focused on the following objectives;

i. Determine Spatial distribution of health centers,
ii. Determine the Volume of the Waste generated,
iii. Ascertain the waste management methods in place and
iv. Identify the potential impacts that medical wastes pose to both human health and the natural environment

### 1.2 Research Locale

The study was carried out at Akure, South Western Nigeria. It has an area of 331kmsq and projected population of 353,211 people. There are 142 registered medical facilities in Akure. They include Federal government, State government, Local government and privately owned health institutions located, at different areas within the town. In all, there are 113 privately owned health care facilities and 29 public owned healthcare facilities; these health institutions are majorly dominated by privately owned hospitals [9].

The primary level of care provided has the highest number of medical institutions which is 72 followed by the secondary level which has 63 medical institutions. The tertiary level has 5 medical institutions while there are just 2 rehabilitation centers in Akure.

## 2. METHODOLOGY

The study adopts stratified-random technique in sampling the health care centers. The health care centers was categorized into four level of care and each level form a stratum. A listing of the medical facilities was done according to the level of health care provided. Proportional allocation method was adopted to determine the number to be sampled per stratum, under which the sizes of the samples from the different strata are kept proportional to the sizes of the strata. In each stratum random sampling was carried out to select the required sample using the random number tables. Proportional allocation is considered most efficient and an optimal design when the cost of selecting an item is equal for each stratum [10].

Several survey visit was made to this selected health institutions for the administration of questionnaires and oral interviews.

The level of health care provided was broken down into four stratum, which is as follow:

i. **Tertiary level (Major referral hospitals):** This category of facility has the most specialized staff and technical equipment.
ii. **Secondary level:** This category of facility has fewer specialties than referral hospitals, but still has some differentiated care.
iii. **Primary level (Health centers, clinics, laboratories, Dental and Optical centers, Maternity homes):** This category of facility covers a greater variety of facilities compared to the more specialized levels.
iv. **Rehabilitation centers:** long-term care facilities.

The study adopts Method of proportional allocation, under which the sizes of the samples from the different strata are kept proportional to the sizes of the strata. That is, if *Pi* represents the proportion of population included in stratum *i*, and *n* represents the total sample size, the number of elements selected from stratum *i* is *n* x *Pi*.

Sample of size *n* = 71 (50% of the total population) was drawn from a population of size *N* = 142 which was divided into four strata of size *N*1 = 5, *N*2 = 63, *N*3 = 72 and *N4* = 2. Adopting proportional allocation,

For strata with *N*1 (Tertiary level) = 5, we have *P*1 = 5/142

Hence, *n*1 = *n* x *P*1 = 71(5/142) = 3

For strata with *N*2 (Secondary level) = 63, we have P2 = 63/142

Hence, *n*2 = n x P2 = 71(63/142) = 31

For strata with *N*3 (Primary level) = 72, we have P3 = 72/142

Hence, *n*3 = n x P3 = 71 (72/142) = 36

Similarly, for strata with *N*4 (Rehabilitation) = 2, we have P4=2/142

Hence, *n*4 = *n* x *P*4 = 71 (2/142) = 1

Therefore, the sample size for this research is 71. With the use of proportional allocation, the sample sizes for different strata are 3, 31, 36, and 1 respectively which is in proportion to the sizes of the stratum viz., 5:63:72:2.

Random-stratified sampling technique was used to sample the medical institutions. In each stratum, random sampling was used to select the required sample using the random number tables.

**Table 1. Health care facilities in Akure, South Western Nigeria**

| Level of care provided | Number of medical facilities |
|---|---|
| N1=Tertiary | 5 |
| N2=Secondary | 63 |
| N3=Primary | 72 |
| N4=Rehabilitation | 2 |
| **Total** | **142** |

*Source: Field survey, 2016*

## 2.1 Database Description

The research made use of both primary and secondary data. Oral interview and questionnaires administration was used to elicit primary data from the health care officers in various hospitals after the recognizance survey of the health care center's environment. In addition some photographs of scenery of interest were snapped by the researchers and coupled with personal observations. In analyzing the data collected; Microsoft Excel, (Statistical package for social science) SPSS and ArcGIS 9.3 was used. Responses from the questionnaires was coded and analyzed using SPSS, for descriptive and inferential analysis.

Secondary data was obtained from relevant textbooks, journals, conference and seminar papers, relevant maps, internet, and dissertation/thesis. Other areas where relevant data was derived include the office of the Ministry of Health at Akure South Local Government Council, Local Government Secretariat. The maps used for this research were from the ministry of works at Akure South Local Government Area. The average Volume of waste was gotten through actual measurement by the researchers in the visited health care centers among others.

## 3. RESULTS AND DISCUSSION

### 3.1 Objective (1): Spatial Distribution of Health Facilities

Hand-held GPS receiver was used to capture the location of health care facilities in the study area (Akure, South Western Nigeria). Health care facilities data include administrative map, and coordinates of health care facilities. All maps and spatial data were captured in the Geographical Information System (GIS) platform for geospatial analysis.

Findings shows that, the core-urban areas have higher numbers of health care facilities than the suburbs. This indicates that, the population of the suburb have to cover longer distances to access health facilities sometime more than 4 kilometers to reach the functional health facility. Personal interview revealed that the factors responsible for the low number of health facilities in the suburb is as a result of low population and it is not limited to health facilities alone. The suburb is also deprive of social infrastructural facilities such as good roads, water, and electricity. This corroborates the study carried out by World Health Organization [11]. The suburbs which are relatively new sites have not been attracting personnel in the few available institutions like primary and secondary schools, dispensaries, maternity centers etc.

The results also indicated that health establishments across the study area are imbalanced. It was noted that a greater proportion of the hospitals are privately owned by individuals and religious organizations. Across Akure, it was noted that clinics are more in number than any other type of health establishment.

Fig. 1 shows the combined buffering of 1 km and 500 m radius to the health facilities. These health facilities were buffered to know how clustered the facilities are within the buffered zones. The maps shows that, at least two health facilities are located within 1 km radius distance and at least one within 500 m radius distance in the study area. This implies a proper location of health facilities as it meets the recommended standard of 4 km from residential areas [12]. According to [12,13] a health facility must be at a distance of not more than 20 m from the road of which the health facilities in the study area falls short of this standard. Most of these health institutions are located close to the major Road and some others are hardly accessible by any road. According to [12,14], the criteria for sitting Health Center based on proximity are as follows:

i. The health center should not be more than 4 km from residential areas.
ii. The health center should be of distance not more than 20 m from the major road.
iii. There should be easy accessibility to source of water which should not be more than 250 m from health the center.
iv. An area with a population of 500 people should have access to at least 1 health center.

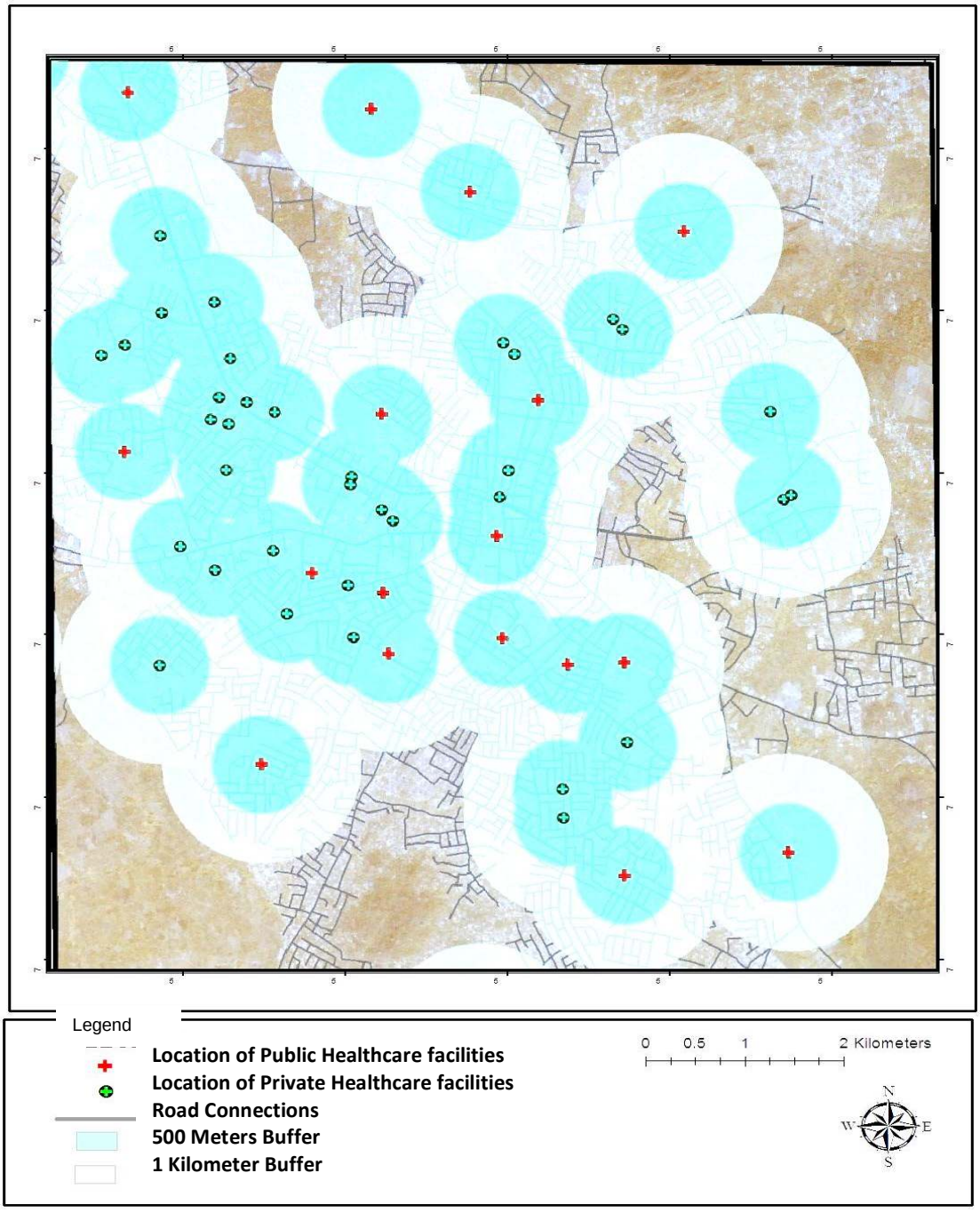


**Fig. 1. Spatial distribution & distance between health care facilities in Akure, South Western Nigeria**

*Source; Author's field work, 2016*

In terms of "status", there were problems of malfunctioning of some of the Health Care facilities. Some of them were not well maintained and some not working at all.

Based on the research findings, the study concludes that there is an inadequate spatial distribution of health facilities in Akure, South Western Nigeria, particularly at the suburb.

### 3.2 Objective (2): Volume of Waste Generated in Health Institutions in Akure, South Western Nigeria

Volume of medical waste generated in Health Care centers in Akure, South Western Nigeria was determined by the use of measuring scale (tons). The accurate measurement was gotten by subtracting the weight of the container from the measurement. Results shows that, the average medical waste generated per day was 0.5825 m3. Results reveal that clinical waste generated is proportional to the number of people who visit each healthcare facility (Table 2).

The relationship between generated waste quantities versus patient's patronage is approximately linear. The amount of clinical waste generated increases with the increase in the number of patients who visit the healthcare facility.

### 3.3 Objective (3): Existing Waste Disposal and Management Methods

The research findings revealed that medical waste in average is collected two times daily (Morning and evening) at their point of generation to temporary storage area; this confirms an important fact, that the waste is collected regularly in the hospitals concerned.

Various means were utilized to transport wastes from the point of generation to the temporary storage area; while plastic bins and trolleys constituted the major means of evacuating wastes in most facilities. Medical wastes generated in hospitals are collected on a daily basis and transported to a temporary storage center within the hospital. Such wastes are collected and transported by the means of plastic bins, bags, cardboard boxes etc. Data from this study revealed that 69% of hospitals uses plastic bins, 29% bags and 6% cardboard boxes.

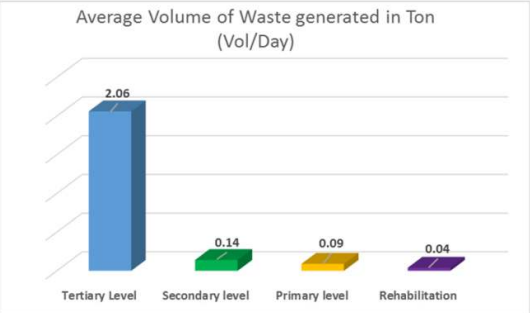


**Fig. 2. Volume of waste generated in tons per day**

*Source; Author's Field work, 2016*

**Plate 1. Smelling open dump site within Akure State's specialist hospital premises**

*Source: Author's field work, 2016*

According to the World Health Organizations [11] different trolleys should be used in transporting the different categories of wastes, this requirement is not adhered to in most hospitals that were surveyed but instead they are used as the temporary storage site. Indeed, all the wastes generated are carried with the same trolley and this could also lead to cross-contamination. Cleaners, health workers, hospital maids etc. are responsible for internal collection of the segregated medical wastes from the wards to the temporary storage center in the surveyed hospitals. As important as protective equipment are to anybody who handles medical wastes, the hospitals surveyed use only heavy duty gloves and this is not consistent with the recommended standard of WHO which requires the use of heavy duty gloves, boots and apron.

**Table 2. Volume of medical waste generated in Akure, South Western Nigeria**

| Level of care | Average volume of waste generated in ton (vol /day) | Average number of patients per day | Generation rate vol/patient/day |
|---|---|---|---|
| Tertiary level | 2.06 | 400 | 0.0015 |
| Secondary level | 0.14 | 100 | 0.0014 |
| Primary level | 0.09 | 50 | 0.0018 |
| Rehabilitation | 0.04 | 20 | 0.002 |
| Total | 2.33 | 570 | 0.0067 |
| **Total average** | **0.5825** | **142.5** | **0.00168** |

*Source: Author's field work, 2016*

### 3.4 Objective (4): Impact of Medical Waste on Human Health and the Environment

Reports from respondents and personal Observation shows that the problem posed by medical waste is many and this is not good for human health and the environment. They invite host of problems like increasing numbers of insect vectors like flies, mosquitoes, etc., scavengers such as stray dogs which spread dangerous diseases. Residents testified to the foul odour the waste generates. This odour becomes worse when evacuation from the temporary site is being delayed.

In some of the health facilities, particularly some maternity homes located close to the road, their waste temporary site is usually being sorted through illegal scavengers or by the goat and the dogs which are likely to disperse the waste on the street thereby putting the community at risk and also the environment. Findings shows that the residence complained of increase in toilet flies and mosquitoes which invariably has led to increase in malaria typhoid and cholera.

## 4. CONCLUSION

The motive behind this study arises from the concern for the proper management of Medical wastes and accessibility to medical facilities in Akure, South Western Nigeria. The major findings revealed that there is an imbalance and an inadequate spatial distribution of health establishments in Akure South Local Government. The health facilities in the local government recognized the hazardous nature of medical wastes as they are by-products of materials used in the treatment of infectious diseases but there is a lukewarm attitude given by some of them to the segregation techniques of wastes disposal, some health establishments subject their wastes to treatment but others do not subject medical wastes generated by them to treatment before disposal. Findings shows that management of medical wastes in the study area by some management agencies exist but with little management capabilities as a result of poor equipment and lack of competent personnel. If the recommended suggestions are adopted, it will correct the observed problems in the management of medical wastes and help in building better planning techniques in our towns and cities.

## 5. RECOMMENDATIONS

- With reference to the existing waste management condition in the health centers in the study area, coupled with the ever increasing number of population, there is need for health policy planners to examine the current situation with a view to address the inequality in the distribution of health care facilities and manpower in the area.
- There is need to establish a Wastes Management Committee (WMC) in each medical institution in the region. Such committee shall be headed by a Management Officer whose responsibilities shall be the planning, collection, treatment, disposal and overall management of wastes in such establishments.
- There is need for sensitization of officers on the most proper and appropriate methods of collection, disposal, segregation, treatment, transportation and final dislodgement of health care wastes. This can be achieved through seminars, workshops, and periodic waste management meetings.
- Specially designed and constructed wastes collection trucks should be provided for the larger hospitals like the General Hospital that generates highly infectious wastes. In addition, autoclave machine should be provided for the treatment of its wastes. Safety equipment for the handling of medical wastes should be provided in the form of face masks, hand gloves, caps, booths and protective clothing.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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