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Accessibility and Spatial Distribution of Health Care Facilities in Kware, Sokoto State, Nigeria

Abdullahi Usman Budah[1], Shehu Abdullahi[2] and Amina Musa Gwiokura[3]
[1]Department of Geography
[2]Department of Integrated Science, Shehu Shagari College of Education, Sokoto
[3]Department of Occupational Safety and Health (OSH), Ministry of Labour and Employment, Ikoyi-Lagos
Corresponding author Email: au_budah2000@yahoo.com

ABSTRACT

The study examine Accessibility and Spatial Distribution of health care facilities in Kware Local Government Area of Sokoto State, with the objective to identify and map the distribution of healthcare facilities and determine the spatial accessibility of healthcare facilities in the study area. The data used for the study include Administrative map of the area, GPS coordinates of the healthcare facilities as the primary data, while GIS software and Microsoft Excel were used in analyzing the data. Quantitative techniques was applied using purposive sampling for this study. The result showed that there are thirty six health care facilities in the study area; 94.4% were primary health care (PHC) while 2.8% are secondary health care (SHC) and tertiary health care (THC).The distribution showed that Tsaki and Tunga wards had the highest percentage (13.8%) of HCFs. The Nearest Neighbor Analysis (NNA) showed critical value of (0.723620) at 0.469 significance level indicating the distribution pattern of HCFs in the study area to be random. The 4km Euclidean buffer has series of overlapping buffer on the HCFs in the LGA, leaving three settlements out of reach. The study concluded that the wards in the study area have fairly physical access to HCFs. The study therefore recommends that new facilities should be provided to improve access to HCFs in the study area.

Keywords: Accessibility, Spatial Distribution, Healthcare Facilities, Kware.

INTRODUCTION

Access to healthcare services is an important factor determining economic development and prosperity. Thus, accessibility to healthcare facilities has generally been identified as a major indicator of development, and the existing spatial pattern of distribution of healthcare facilities play a significant role in gauging the level of efficiency or otherwise of the existing level of provision of these facilities within any region (Abbas *et al*, 2012). Health Care accessibility is multidimensional concept and can be defined as the ability of a population to access healthcare services.

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Measuring accessibility to HCFs will therefore aid countries to understand the performance of their health systems, which in turn will facilitates the development of evidence based health policies (Adetunji and Adeyinka, 2013). Globally the provision of quality, accessible and affordable healthcare remains an important issue. While those Nigeria healthcare indexes are very poor, and that people are suffering as the healthcare policies and programmes in the country are implemented in a way that those at socio-economic level of society more especially rural populace suffers exclusion (Kamorudeen, 2013). However, improved health and quality of life depends on a great extent the availability of, and accessibility to health care facilities at affordable cost (Muhammad *et al*, 2014). Hence, the need to study the accessibility and spatial distribution of health care facilities in kware Local Government Area of Sokoto State.

The application of Geographic Information System in this study includes geodatabase creation for relevant queries; explore spatial pattern and the spatial dimensions of access. Mapping and visualization of health disparities and their relationship to the geographical location of Health Care services can allow for better resources allocations to contesting and underserved populations (Onamade, 2014). In 2004 the World health organization has describes the used of GIS tools as excellent in analyzing epidemiological data, revealing trends, dependencies and interrelationships that would using traditional tabular approach would be more difficult to discover. World Health Organization (2006), has specified the criteria for developing countries health care planning which indicated that each service area should cover a 4km catchment area with a population of 60,000 for primary health care to be adequate and equity of access to health centers.

The rural people in Nigeria has very low access to healthcare facilities when compared with their urban counterparts, and they constitute 51.4% of the population (Central Intelligence Agency (CIA, 2015). Abbas et al (2012) investigated the Spatial Distribution of Health Care Centers in Chikun Local Government Area of Kaduna State, Nigeria. The study reveals some of challenges are the health care facilities are located far away from the communities and they have travel long distance before they access healthcare. Musa and Abdulhamed (2012) explain how accessibility problem affect utilization of healthcare facilities in Jigawa state, Nigeria. Findings reveal that healthcare facilities are unevenly distributed and are mostly located in the urban areas due to political policy. Therefore, the aim of the study is to assess the spatial distribution and accessibility of residents to health care facilities in Kware Local government area of Sokoto state, Nigeria and

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to identify the spatial pattern of distributions of health care facilities and determine the spatial accessibility of healthcare facilities in the study area.

MATERIALS AND METHODS

Study Area

Kware local government Area of Sokoto state is located between Longitude $5^0\,08^1$ East to $5^0\,28^1$ East of the Greenwich Meridian and Latitudes $13^0\,00^1$ and $13^0\,20^1$ North of the Equator. It occupies a total landmass area of $554km^2$ with population of 234,150 (NPC, 2006). The landmass resembles the lower case letter I although it is nearly circular in the north, columnar in the Centre and rectangular in the south. Kware LGA headquarters is 15 Kilometers from Sokoto State Capital. Kware LGA is hemmed in by the eight LGAs which are: Gwadabawa in the north, Tangaza in the north-west, Wammako in the west, Sokoto north and south in the south-west, Dange-Shuni to the south, and Rabah and Wurno to the east (figure 1). The people of the area are predominantly hausa, Fulani and Zabarmawa.

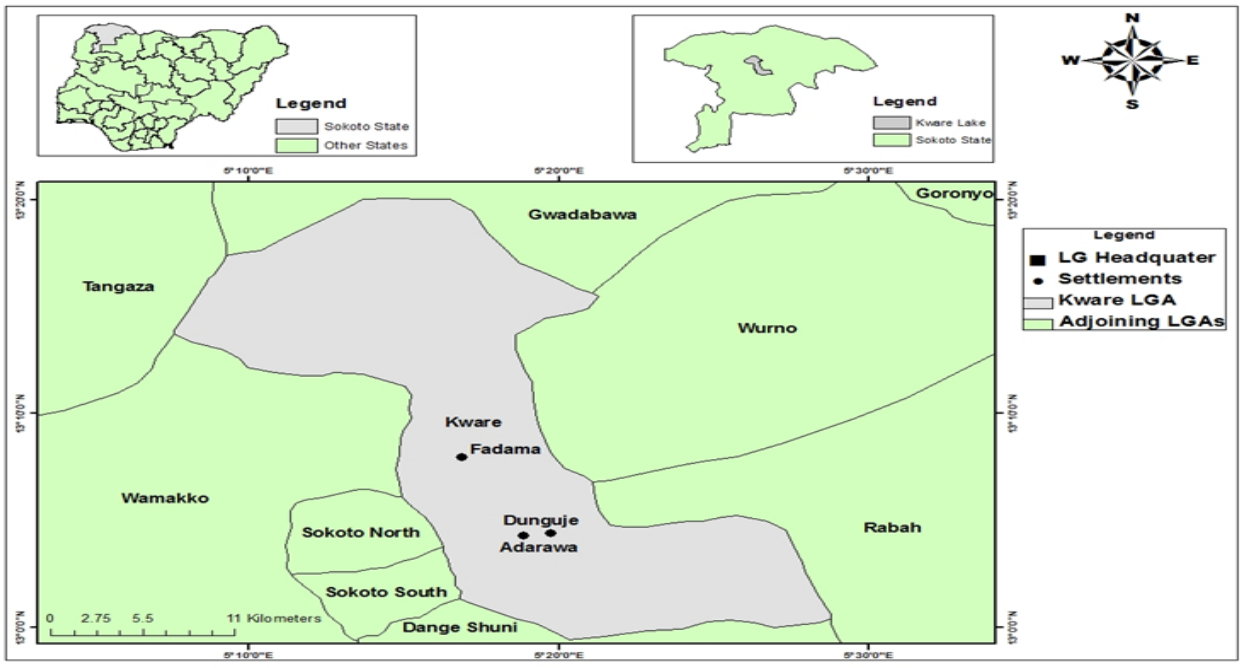

Fig. 1. Kware Local Government Area of Sokoto State

Data Collections

The Primary data for this study was collected through a hand-held Global Positioning System (GPS) (Model: Garmin GPSmap 76CS receiver) to capture the geographic coordinates of the HCFs.

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Also, a checklist were used to obtain the attribute data of identified healthcare facilities from the various health facility management. Furthermore, health care facilities data include administrative map, HCF address, electoral ward, and category of healthcare e.g. dispensary, clinic, maternity among others., and other relevant information such as ownership i.e. public or private, year of establishment, availability of pharmacy, bed capacity et cetera were used for creation of geodatabase for the study.

Data Analysis

The maps and spatial data were captured in the GIS environment for geospatial analysis. The administrative map of the study area was scanned and imported into GIS environment for georeferencing. The georeferenced map was digitized under the following themes: the Local government area and the political ward as polygon, LGA and ward boundary as lines, and road network as also lines. The attribute data for the health care facilities obtained from the various health care management through inventory using the checklist were typed in Microsoft excel and saved as CSV (comma deliminated) format for the analysis.

Analyses were conducted in the GIS environment to obtain the Nearest Neighborhood analysis and the spatial inequalities of Health care facilities. Geospatial analyses performed on the geo databases include spatial concentrations analysis and the use of nearest neighbor geo-statistical analysis to test the significance of the result of spatial concentrations of health care Centre's in the wards. Buffer analysis was used in defining the physical access to the health facilities. Areas that are in the buffer zone are considered accessible to the health facility, while those outside the buffer zone are assumed be inaccessible to the health facilities. While those areas that has overlapping buffers are considered to have high access to health facilities.

Spatial Distribution and Accessibility of Health Care Facilities

The average Nearest Neighbor analysis and Manhattan distance method were used to ascertain the spatial distribution of healthcare facilities and buffer analysis was used to evaluate the spatial accessibility of health care facilities in the study area

RESULTS AND DISCUSSION

Health Care Facilities in Kware

The result of the data set for the health care facilities within the study area where displayed in Table 1; Table 2 and Figure 2 respectively. The Table and Figure show numerical and spatial distribution

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of the health facilities in Kware.

Categories of Physical Health Care Facilities

There are three main categories of healthcare facilities in Kware, i.e. primary, secondary and tertiary healthcare facilities based on the type of services they offer (Table 1).

Table 1. Categories of Physical Health Care Facilities

Categories of HCFs	frequency	percentage %
Primary	34	94.4
Secondary	1	2.8
Tertiary	1	2.8
Total	36	100.0

Source: Authors Analysis 2019

The study found three categories of physical HCFs (Table 1) the primary, secondary and tertiary HCFs. The primary health care (PHC) facilities are mostly provided by the state and local government has the highest percentage (94.4%) within the study, and the Secondary Health Centre has 2.8% in the study, while the tertiary health Centre also constitutes 2.8% of the HCFs in the study. This shows that primary health care facilities constitute the majority in the study area, and this can be attributed as being the first point of contact to obtain health care services. However, it could also be that it requires little funding, and that the community provide the house to be used with staff accommodation of two (Muhammad *et al*, 2014).

The Primary Health Care by policy arrangements is within the purview of Local Government, based on the residual operation of local government authority. PHCs are the first points of call for the sick and injured persons. They undertake mild healthcare cases like treatment for malaria, fever, cold, nutrition disorder, among others. They are for milder health challenges and health education. They handle infant, maternal and pregnancy matters. Other health issues in their care are family planning and immunization (Onamade, 2014). They are also involved in record keeping, case reporting and patients referral to higher tiers. PHCs are known within the system by content of health Centre, maternity home/clinic and dispensaries. Secondary health Centre's are involved with prevention all treatments and management of minimal complex cases. Though, more complicated cases are referred to the tertiary and specialist hospital. Examples of secondary types are comprehensive health Centre's and General Hospitals. The comprehensive health Centre's are mostly owned by private individuals or group of individuals (Onamade, 2014). A tertiary health institution, also called specialist/teaching hospitals, handles complex health problems/cases either

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as referrals from general hospitals or on direct admission to its own. It has several units which are equipped with the necessary facilities and staffed by skilled personnel.

Moreover, the distribution of HCFs in Kware shows 16.7% are located in Sabon birni ward. Similarly 13.8% are located in Tsaki and Tunga wards each, while Bankanu ward has 11.1% of the HCFs. Gandu and Hamma Ali wards have 8.3% each. Basansan, Durbawa, Gidan Rugga, Kabanga and Kware wards has 5.5% of the HCFs each (Table 2 and Fig 2). Therefore, this scenery suggests that, the number of the facilities in the Kware LGA wards were not equally distributed. A high percentage is recorded in Sabon birni ward, followed by Tsaki, Tunga and Bankanu wards. While a low percentage of the facilities are found in Gandu, Hamma Ali, Basansan, Durbawa, Gidan Rugga, Kabanga and Kware wards. This difference in distribution of HCFs in the LGA could be due to population distribution or rather randomly

Table 2 Distribution of Health Care Facilities (HCF) in Kware LGA.

S/N	Name of Heath Facility	No of Doctors	No of Bed	Type of Facility	Ward of Facility
1	Chida Disp	0	0	Dispensery	Tsaki
2	PHC Sabon Birni	0	14	Primary health care	Sabon birni
3	MPHC Balkori	1	12	Primary health care	Sabon birni
4	PHC Zamau	0	14	Primary health care	Tsaki
5	PHC Tsaki	0	1	Primary health care	Tsaki
6	Walaka Disp	0	0	Dispensery	Tsaki
7	Mallamawa Disp	0	1	Dispensery	Tunga
8	Yar barade Disp	0	0	Dispensery	Tunga
9	Gebawa Disp	0	0	Dispensery	Tunga
10	PHC Gidan Basakkare	0	14	Primary health care	Tunga
11	Tunga Health Post	0	6	Health Post	Tunga
12	Lambo Health Post	0	0	Health Post	Tsaki
13	More Health Post	0	0	Health Post	Gidan Rugga
14	Ruggar Liman Health Post	0	2	Health Post	Gidan Rugga
15	PHC Umaruma	0	0	Primary health care	Gandu
16	Malamawa Health Post	0	0	Primary health care	Gandu
17	karande Disp	0	0	Dispensery	Hamma Ali
18	PHC Gandu	0	14	Primary health care	Gandu
19	PHC Hammaali	1	26	Primary health care	Hamma Ali
20	PHC Gidan Gero	0	14	Primary health care	Durbawa
21	PHC Durbawa	0	0	Primary health care	Durbawa
22	Lemi Disp	0	1	Dispensery	Basansan

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23	Basansa PHC	0	14	Primary health care	Basansan
24	Kaskada PHC	0	14	Primary health care	Bankanu
25	CHC Bankanu	2	65	Comprehensve health care	Bankanu
26	Kalalawa PHC Post	0	1	Health Post	Bankanu
27	Tutuba PHC	0	0	Primary health care	Bankanu
28	Geben Damu Disp	0	0	Dispensery	Kabanga
29	PHC Kware	0	0	Primary health care	Kware
30	Kabanga Disp	0	2	Dispensery	Kabanga
31	Federal Neuro Psychiatric Hospital	18	155	Tertiary	Kware
32	PHC Gundunga	0	14	Primary health care	Sabon birni
33	PHC tungar galadima	0	14	Primary health care	Sabon birni
34	Marabawa Health Post	0	6	Health Post	Hamma Ali
35	Doba Health Post	0	0	Health Post	Sabon birni
36	Ihi Health Post	0	0	Health Post	Sabon birni

Source: Authors Analysis 2019

The distribution shows 16.7% are located in Sabon birni ward. Similarly 13.8% are located in Tsaki and Tunga wards each, while Bankanu ward has 11.1% of the HCFs. Gandu and Hamma Ali wards have 8.3% each. Basansan, Durbawa, Gidan Rugga, Kabanga and Kware wards has 5.5% of the HCFs each. Therefore, this scenery suggests that, the number of the facilities in the Kware LGA wards were not equally distributed. A high percentage is recorded in Sabon birni ward, followed by Tsaki, Tunga and Bankanu wards. While a low percentage of the facilities are found in Gandu, Hamma Ali, Basansan, Durbawa, Gidan Rugga, Kabanga and Kware wards. This difference in distribution of HCFs in the LGA could be due to population distribution or rather randomly.

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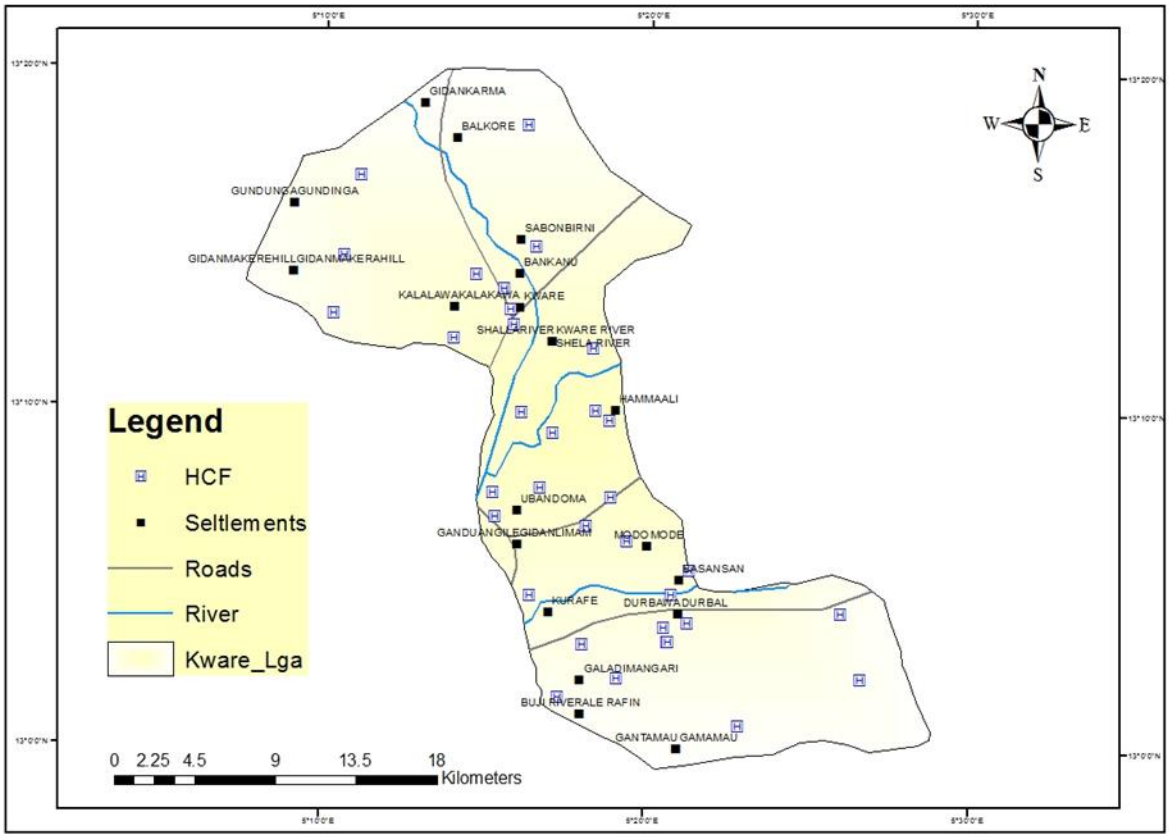

Fig. 2: Spatial Distribution of Healthcare facilities in Kware LGA
Source: Authors analysis 2019

Spatial Pattern of Health Care Facilities in Kware LGA

The distribution pattern of health care facilities in the study area was determined using the average nearest neighbor in ArcGIS environment (Figure 2). The average nearest neighbor statistics is shown in Table 3. Random pattern of health care facilities was identified and z-score is 0.72 which is less than the standard critical value of 2.58 as measured by Getis and Ord (1998), then the pattern is significantly disperse with less than 1% (0.01 level of significance) (Table 3). This shows that the locational pattern of Health Care facilities in the study area is statistically random, and it shows there is no proper planning by policy makers in distribution of HCFs in the study area. The result also implies the healthcare facilities are not uniformly distributed, some areas will have more HCFs than others in the study, which result to more travel time and in accessibility of HCFs to some residents in the study.

However, the findings are in contrary with research findings of Kibon and Ahmed (2012) who discovered the pattern of 62 health care facilities in Kano metropolis, Kano State of Nigeria where

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clustered and haphazardly distributed. Also, Umar (2016) in his study; spatial distribution of health care facilities in Kano South senatorial zone revealed that the locational pattern of primary health care facilities in the area was dispersed, and Abbas et al (2012) investigated the Spatial Distribution of Health Care Centers in Chikun Local Government Area of Kaduna State, Nigeria. The study reveals the uneven pattern of distribution of the Heath Care Centers within the study area.

Table: 3. Summary of Average nearest Neighbor Statistics

Observed Mean Distance:	5653.3546 Meters
Expected Mean Distance:	5318.0925 Meters
Nearest Neighbor Ratio:	1.063042
z-score:	0.723620
p-value:	0.469299

Source: Authors analysis 2019

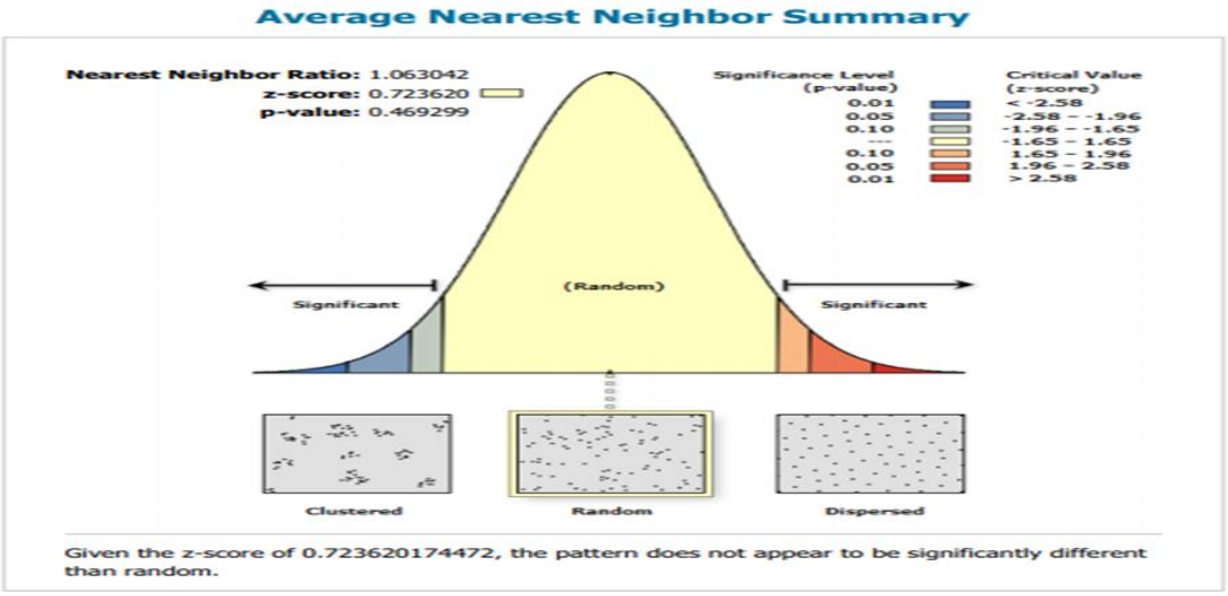

Fig. 3. Pattern of Health Care Distribution in Kware LGA
Source: Authors analysis 2019

Spatial Accessibility to Health Care Facilities in Kware L.G.A

The study applied buffer analysis to define the proximity to health care facilities. Buffers were created around all of the healthcare facilities in the study area by using the WHO primary healthcare facility standard of 4 kilometer catchment area for health care centres (Figure 4). The results show that some areas in Kware are located outside of the 4 kilometer accessibility zones,

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especially in the northern and western parts of kware. In addition, it is clear that those areas outside the 4km buffer have to travel more than the 4km to access healthcare. Based on this output, different parts of the study area were determined to have low health care accessibility. Health care planners can use this model to make decisions regarding where to build new health facility. For example, areas beyond the 4km accessibility zones can be used as a reference for determining potential locations for additional health care facility in kware.

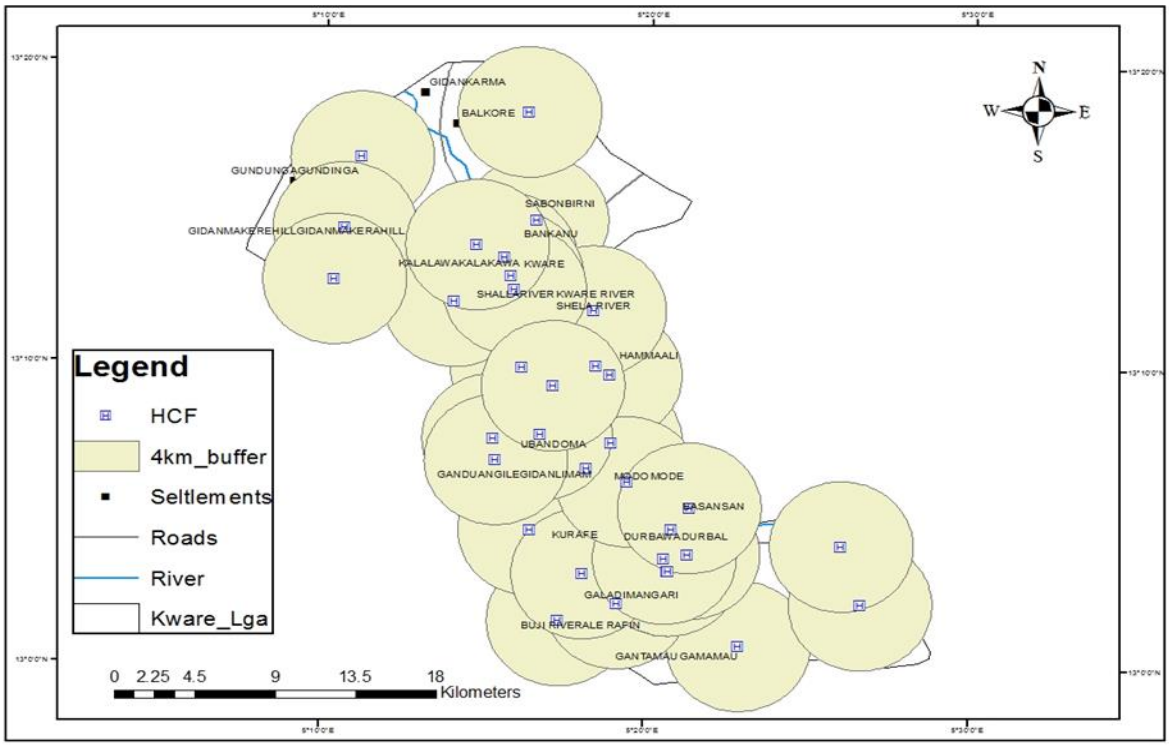

Figure 4: Euclidian buffer on HCFs in Kware LGA
Source: Authors analysis 2019

CONCLUSSION

The study area is fairly provided with primary Health Care facilities. However, it was randomly distributed living some areas without access to Health Care facilities. Thus, this disparity in the distribution of health facilities has generated different accessibility level to Health Care facilities within the area. This therefore calls for the concerted effort by the various stakeholders in the

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health sector towards the provision of Health Care facilities in order to improve access to the Health Care by the people. Moreover, there is the need for new facilities at Gundunga, Gidan Karma and Balkore as it would further improve access to health care facilities across the area.

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