

Spatial Analysis of Healthcare Facilities in Hawul Local Government Area, Borno State, Nigeria

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Abstract. This study spatially analysed healthcare facilities in Hawul local government area of Borno state, Nigeria. Ballot method of random sampling technique was used to choose wards for the study. The wards chosen were; Hizhibwala, Sakwa, Marama/Kidang, Kwaya-Bura, Shaffa, and Bilingwi, A total of 100 copies questionnaires were administered to the residents in these chosen wards to assess the importance of health care facilities. The geo-location of the healthcare facilities were collected using a hand-held Global Positioning System, analysis of data was done in the six selected ward. A spatial database of the Public Health Care Facilities using ArcGIS 10.3 software was created using the attribute data derived from the retrieved health care facility questionnaire, these were compiled in SPSS and linked with the spatial data in ArcGIS for the spatial Analysis of health care facilities in the study area. From the analyses, it was revealed that there existed inadequacies in the availabilities of health facilities and personnel within the wards. The research showed that there are only two categories of health care facilities which were primary and secondary in the study area. Kwaya - Bura has the highest percentage [64.3%] of people who patronized Government facilities, followed by Shaffa [62.5%] then Hizhibwala with 60.0%. The patronage of government facilities by Kwaya Bura and Shaffa wards could be attributed to their low level of income as private facilities are usually known to have higher service charges. There exists inadequacy in facilities distribution and health personnel in the study area, it was observed that the available healthcare facilities were not well utilized due to distance, inadequacy of health personnel, equipment, level of income, level of education amongst others. It is therefore recommended that more healthcare facilities are built in the study area and more personnel be employed to work in the HCFs.

Keyword: Healthcare Facilities, Wards, Health Personnel, ArcGIS

Introduction

A health care facility is defined as all units' owned by public and private authorities as well as voluntary organizations and which provides health care services, hospitals, health and maternity centres (Abubakar & Ibrahim, 2015). According to Medical and Dental Council of Nigeria (MDCN) Health Care facilities are also to undertake functions as health education, diagnosis and treatment of common ailments, through the use of appropriate technology, infrastructure and essential drug list Badru (2012). Improvement in health leads to improvement in life expectancy, which serves as a robust indicator of human development. Therefore, there is need for adequate and equitable distribution of Health Care Facilities in any given region or nation. Health care provision in Nigeria is the responsibility of the three tiers of government in the country, these are the Local Government, State Government and the Federal Government who handles the primary, secondary and tertiary facilities respectively. However, because Nigeria operates a mixed economy, private providers of health care also have a visible role to play in health care delivery (WHO, 2010). The Federal Government's role is mostly limited to coordinating the affairs of the University Teaching Hospitals and the Federal Medical Centres (tertiary health care) while the state government manages the various general hospitals (secondary health care) and the local government focus on dispensaries (primary health care) which are regulated by the Federal Government through the National

Primary Health Care Development Authority (NPHCDA, 2018). In Borno State, like in every other State in Nigeria, the general hospitals with road for healthcare delivery are located very far away from the LGA headquarters, most of these communities are cut-off from the basic service centres by lack of good roads or transport facilities especially in the rainy season. (Hewko, 2010). Consequently, the primary healthcare's (PHC) that are available for the inhabitants are disgusting, ill-equipped and under staffed. The primary healthcare services in Hawul LGA are under severe economic constraints and insufficient manpower resources to meet the healthcare needs of the inhabitants. It is interesting to note that most communities in Hawul LGA live in scattered farmsteads, hamlets and village settlements. The Geographic Information System is a robust suite of technical software designed to accept, analyze, store and output geo-based data and among the many tools for solving spatial locational problems, it has been acknowledged for its capability in spatial planning and management (Akpan & Njoku, 2013). Alabi (2011) studied the spatial distribution of health facilities in Borno State, Nigeria. The study made use of the GPS in acquiring the location of these facilities, employed the use of GIS tool and used the Nearest Neighbour Analysis (NNA) in establishing the distribution pattern of public and private health centers in the study area. The study came up with an indication of weak randomness in the distribution of these facilities. Though the study used GIS in assessing the distributional pattern and also used the GPS for geo-location, the study failed to come up with a database for the spatial distribution of health centers in Borno state and Hawul LGA.

Methods

Sample Size and Sampling Technique

Health Care Facilities operating in Hawul Area Council constitute the population for this research work. These are organizations charged with the responsibility of taking care of the health issues by improving the health status of the people through health intervention strategies and services (Ifeanyi, Johnbusco & Chijioke, 2012). In the case of this study, these comprises of general hospitals, primary health centers and dispensaries, Hawul LGA it is made up of twelve districts, which viz Kwajaffa, Sakwa, Kwaya-Bura, Bilingwi, Hizhibwala, Puba vidau, Pama/Whitambaya, Shaffa, Grim damchoba, Marama/ Kidang, Gwangang chata and kidda. The research work was carried out, six out of these 12 districts Wards, it was upon these six wards that generalization were made for good recommendation and better planning policies. Selected for the study using the ballot method of random sampling technique in order to give each ward an equal chance of being selected. The wards chosen were: Hizhibwala, Sakwa, Marama/Kidang, Kwaya-Bura, Shaffa, and Bilingwi. A total of 100 copies questionnaires were administered to the residents in these chosen wards to assess the importance of health care facilities.

Table 1. Selected wards and the proportion of population sampled

Selected wards for sampling	2019 projected population of selected wards	Proportion of sampled Population
Hizhibwala	4160	20
Marama	3266	18
Shaffa	2836	16
Sakwa/Hema	2860	15
Bilingwi	3020	17
Kwaya-Bura	2498	14
Total	18640	100

Source: Field survey, 2020

To map and identify the public healthcare facilities in the study area, the Global Positioning System (GPS) will be used for acquiring their locational attributes which were geo-referenced in order to give them locations on the earth surface. The localities were digitized into different wards in the Arc-Map version 10.3 environment. The coordinates of each Health Care Facilities were then overlay on the ward map shape file to show them as found located in the different wards. The location of each of the health care facilities was used to analyse general spatial distribution within the study area. Having done this, the evenness in the distribution of the facilities can be assessed.

Examine the spatial distribution of health facilities found in the study area based on road network, the category of the facilities were determined and mapped, so also the distribution pattern of the capacity of the health facilities were mapped. With the existing general spatial distribution map, each needed information for mapping were plotted on the map in the Arc-Map version 10.3 environment to show the distribution pattern as the case may be. With each facility located as point features in the ward map using their geo-locations, the attribute data of each facility which were already compiled in MS excel were linked with the spatial data in ArcGIS spatial Analyst for analysis.

Examine the available facilities and personnel in the health care centres: The shape file of Hawul Area exported from the Borno shape file, was imported into the ArcGIS 10.3 environment. The next step was the data entry about the entity "Healthcare facility", it was created using the following; facility name, location (ward), class of facility, category (Primary, Secondary and Tertiary), X and Y coordinates, number of health personnel's (Doctors, Nurses, Midwives, Laboratory Technologists) and the number of bed space. These was done in the MS excel and was linked with the spatial data in the ArcGIS environment using ARCGIS 10.3 software.

Result and Discussion

Public health care facilities in the study area have been identified, the map below shows the location of several public health care facilities, there are basically 2 General hospitals in the entire selected wards as indicated in the map, one is located at Marama/Kidang and the other at Hizhibwala all these belongs to secondary category of health care facilities. And there are four primary health care centers spread across the wards, which are in Kwaya Bura, Sakwa, Shaffa and Bilingwi.

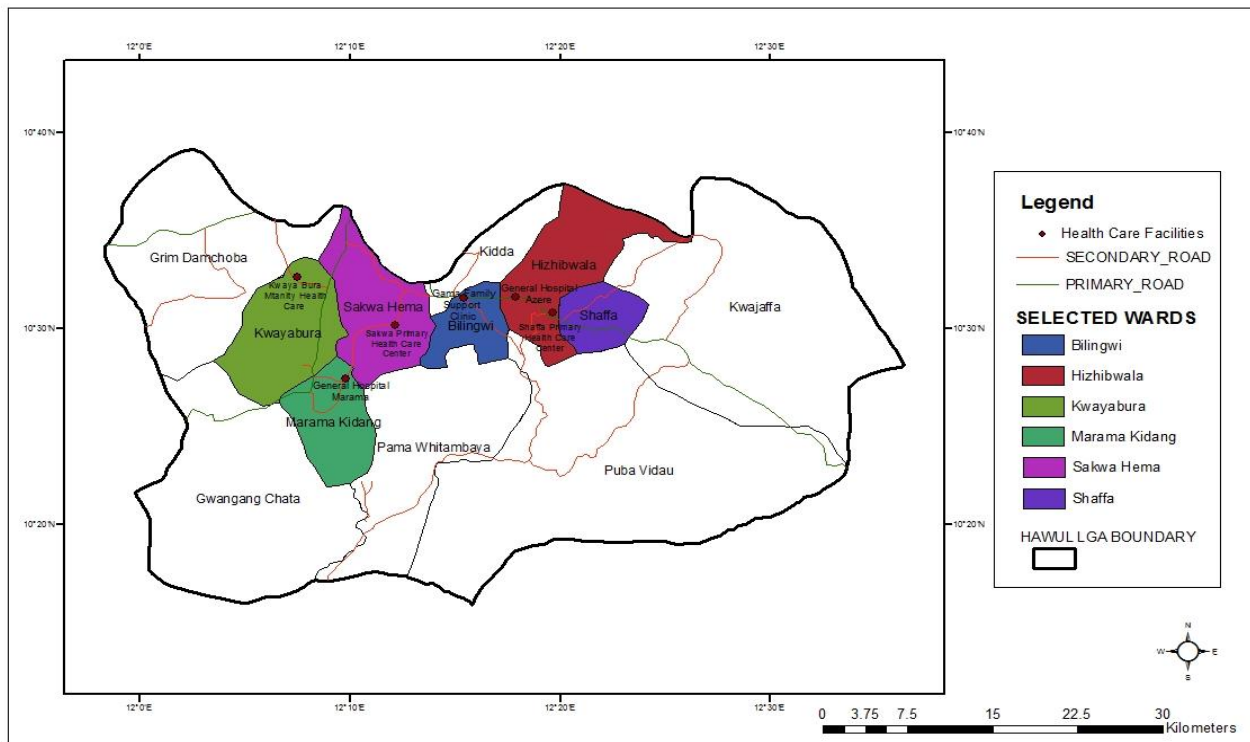


Figure 1. Public Healthcare Facilities in the study area

Source: Field Survey, 2020

The accessibility of Health Care Facilities in the study site which are the Six wards have revealed some localities are not quite accessible to health care facilities by road. There are basically three categories of health care facilities; these are primary, secondary and tertiary facilities. Two categories of health care facility exist in the study area; these are the primary and the secondary Health Care Facilities. The primary facilities were found to be predominant in the study area. There are only two (2) secondary Health Care Facilities in the study area. A total of 100 respondents were interviewed through questionnaire survey which findings revealed that there are government owned hospital in Marama/Kidang and Hizhibwala, these are the secondary health care facilities available, furthermore it was discovered that there is a primary healthcare facility in Kwaya-Bura, Sakwa and a clinic in Bilingwi. The study revealed Marama/Kidang with higher patronage of Government facilities this is attributed to the fact that they have availability of a general hospital in the ward and access to good road network.

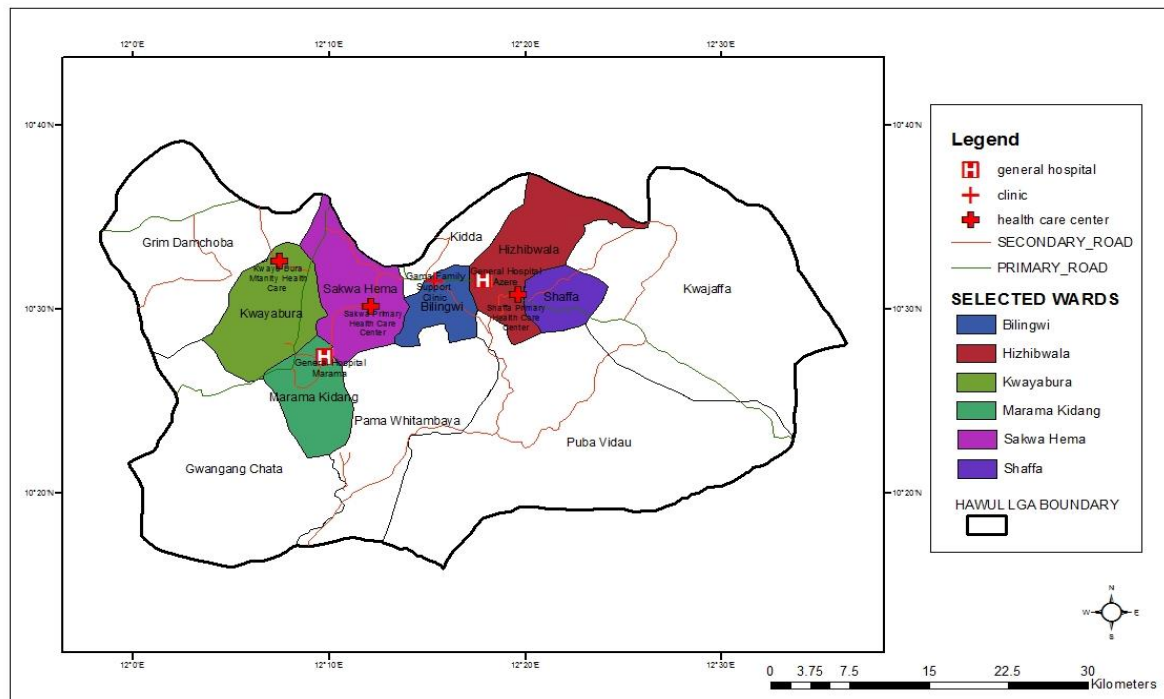


Figure 2. The category of available health care facilities in the selected wards

Source: Field Survey, 2020

To examine the available Health facilities and Health personnel on ground are doctors, nurses and midwives while the facilities found are beds, laboratory. Some of the facilities didn't have doctors to attend to people, these are; Gama Family Support clinic, primary health center Sakwa, Shaffa primary health Centre, Kwaya-Bura maternity Healthcare Centre. General Hospital Azare have one doctor, Marama general hospital have only two doctors. Apart from general hospital Azare and Marama which had doctors and can provide higher level of health services such as Surgeries, there is no other facility within the selected wards that can attend to people on such Matter.

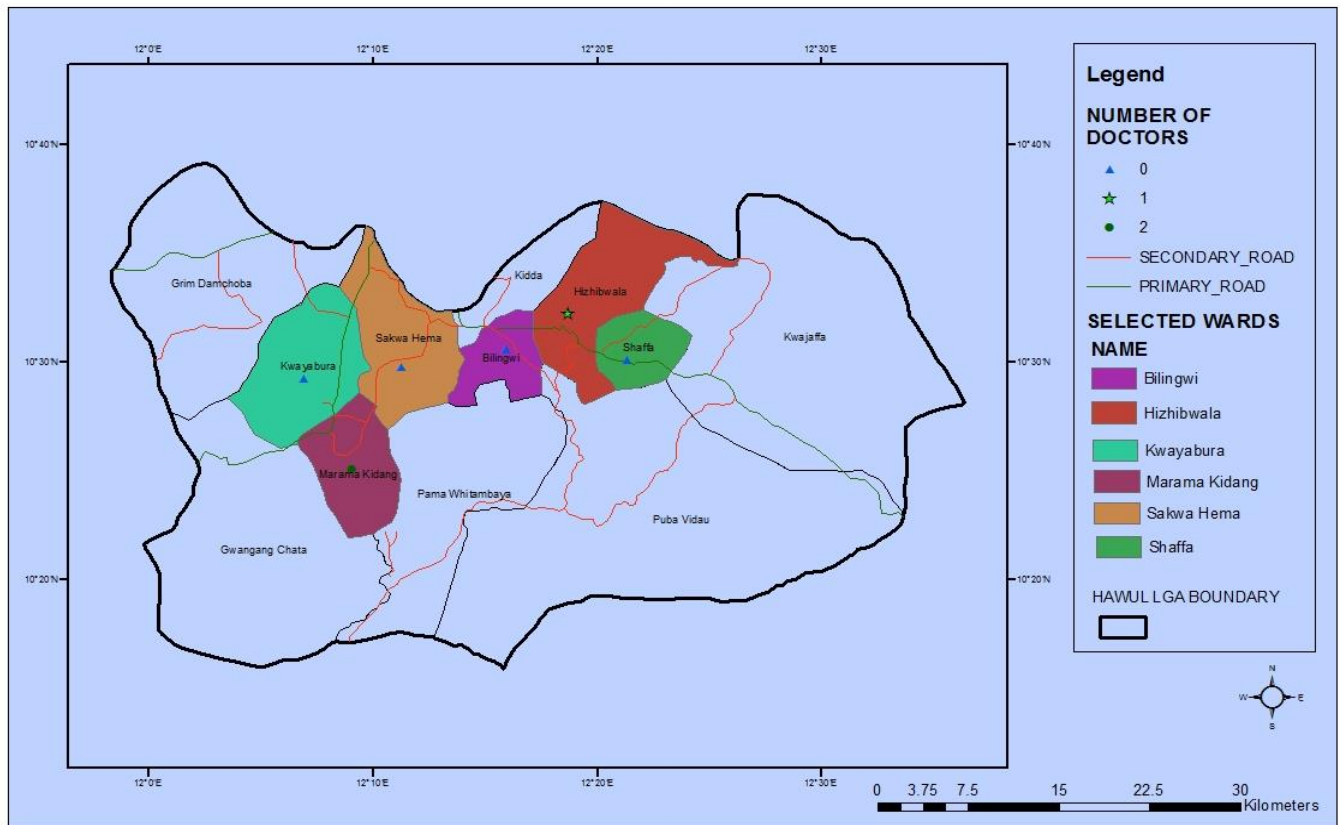


Figure 3. Number of available doctors in the study area

Source: Field Survey, 2020

Table 2. Ward distribution of healthcare facilities with doctors

WARDS	PHC NUMBER OF DOCTORS	SHC NUMBER OF DOCTORS	TOTAL	PERCENTAGE (%)
HIZHIBWALA	0	2	2	66.6%
MARAMA/KIDANG	0	1	1	33.3%
SHAFFA	0	0	0	0
SAKWA	0	0	0	0
BILINGWI	0	0	0	0
KWAYA-BURA	0	0	0	0
TOTAL	0	3	3	100%

Source: Authors Analysis, 2020

It was discovered that the HCFs in the study area only have a total of 3 doctors. The result shows that 66.6% of the wards Hizhibwala have only 2 doctors, while 33.3% Marama/Kidang general Hospital have only 1 doctor while the primary healthcare facilities do not have Doctors.

Some of the facilities does not have nurses at all, only two primary healthcare Facilities have two Nurses, Gama Family Support Clinic had one, while General Hospital Azare and General Hospital Marama, have a total number of 6 and 7 Nurses respectively.

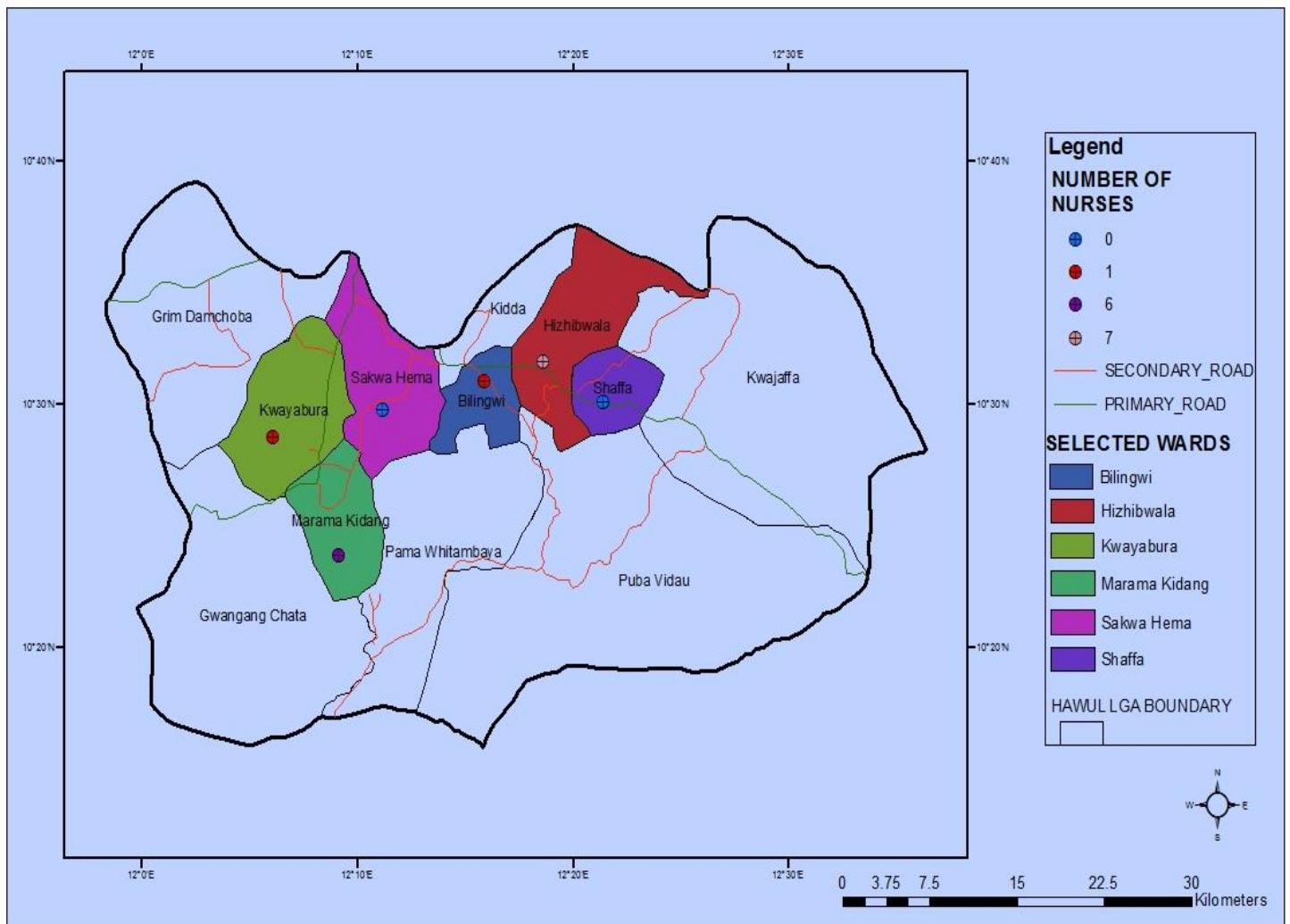


Figure 4. Number of available nurses in the health care facilities in the study area
Source: Field Survey, 2020

Table 3. Ward Distribution of Healthcare Facilities with Nurses in Hawul LGA

WARDS	PHC NUMBER OF NURSES	SHC NUMBER OF NURSES	TOTAL	PERCENTAGE (%)
HIZHIBWALA	0	7	7	46.7%
MARAMA/KIDANG	0	6	6	40.0%
SHAFFA	0	0	0	0
SAKWA	0	0	0	0
BILINGWI	1	0	1	6.7%
KWAYA-BURA	1	0	1	6.7%
TOTAL	2	13	15	100%

Sources: Authors Analysis, 2019

The distribution of nurses in the HCF across the six wards revealed that there were only 15 nurses in all the HCFs in the study area with only two healthcare having least a nurse. General hospital in Hizhibwala have 7 nurses 46.7% and general hospital Marama/Kidang have 6 nurses 40.0%, of the secondary health care facilities had at least a nurse while only two primary health care facilities have 1 nurses each, Findings revealed that most of the primary

healthcare facilities in the study area do not have nurses; Shaffa and Sakwa wards had no nurses at all. Thus, the distributions of health care personnel such as nurses were inadequate.

Midwives are those helps in the delivery of maternal healthcare service, thus their importance in HCF cannot be undermined (Atser and Akpan 2009). Marama General Hospital have more than 12 Midwives and Azare General Hospital have exactly 5 Midwives.

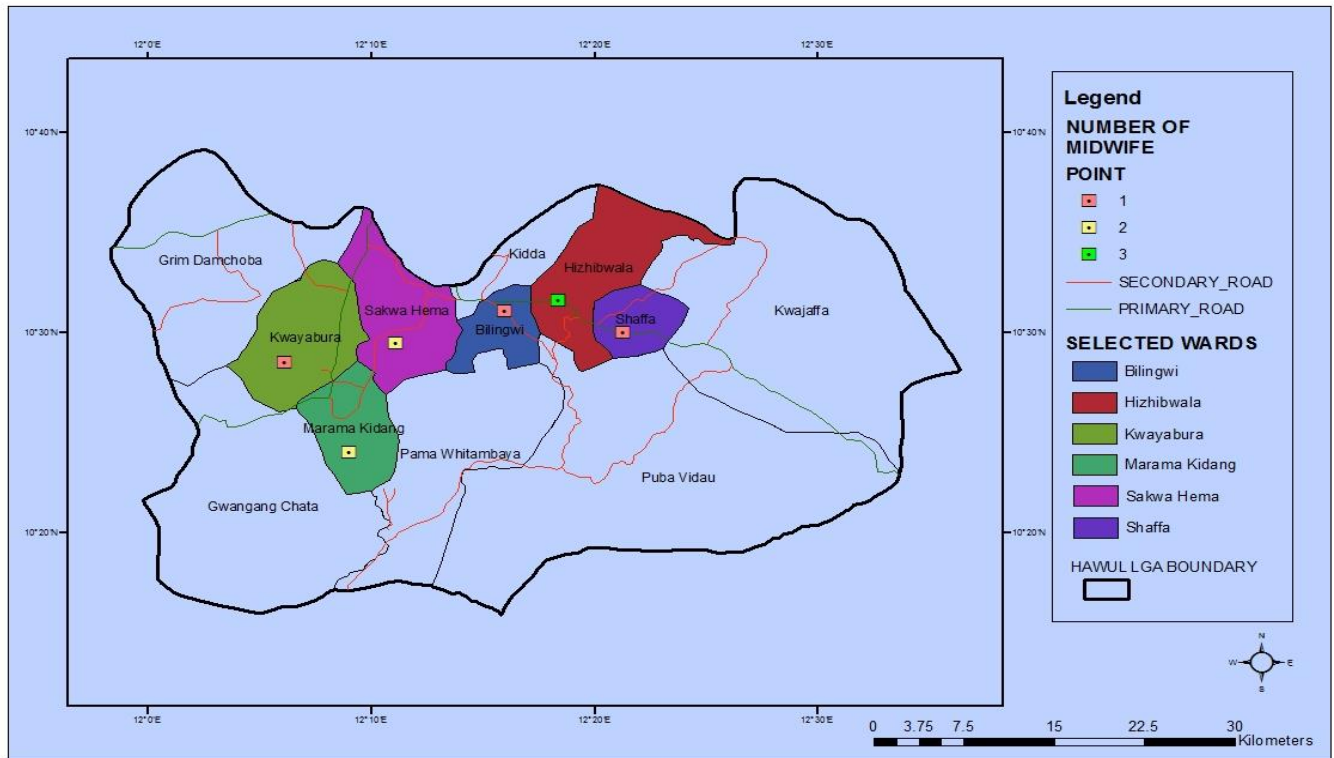


Figure 5. Number of available midwives in the study area

Source: Field Survey, 2020

Table 4. Ward Distribution of Healthcare Facilities with Midwives

WARDS	PHC NUMBER OF MIDWIVES	SHC NUMBER OF MIDWIVES	TOTAL	PERCENTAGE (%)
HIZHIBWALA	0	3	3	30.0%
MARAMA/KIDANG	0	2	2	20.0%
SHAFFA	1	0	1	10.0%
SAKWA	2	0	2	20.0%
BILINGWI	1	0	1	10.0%
KWAYA-BURA	1	0	1	10.0%
TOTAL	5	5	10	100%

Source: Authors Analysis, 2020

It was revealed that out of 6 health care facilities have at least a midwife. The result further revealed that general hospital in Hizhibwala wards 30.0%, followed by Marama/Kidang (20.0%), and Sakwa have 20.0% while Shaffa, Bilingwi, Kwaya- (each) had 10.0% of HCFs with midwives. The findings further revealed that 50.0% of the primary health care facilities had midwives; similarly, the secondary health care facilities also had 50.0% of midwives. It could be assumed that the midwives also perform the duties of the nurses in some of the health

care facilities. From the data collected, it was discovered that most of the HCFs have lesser number of bed spaces.

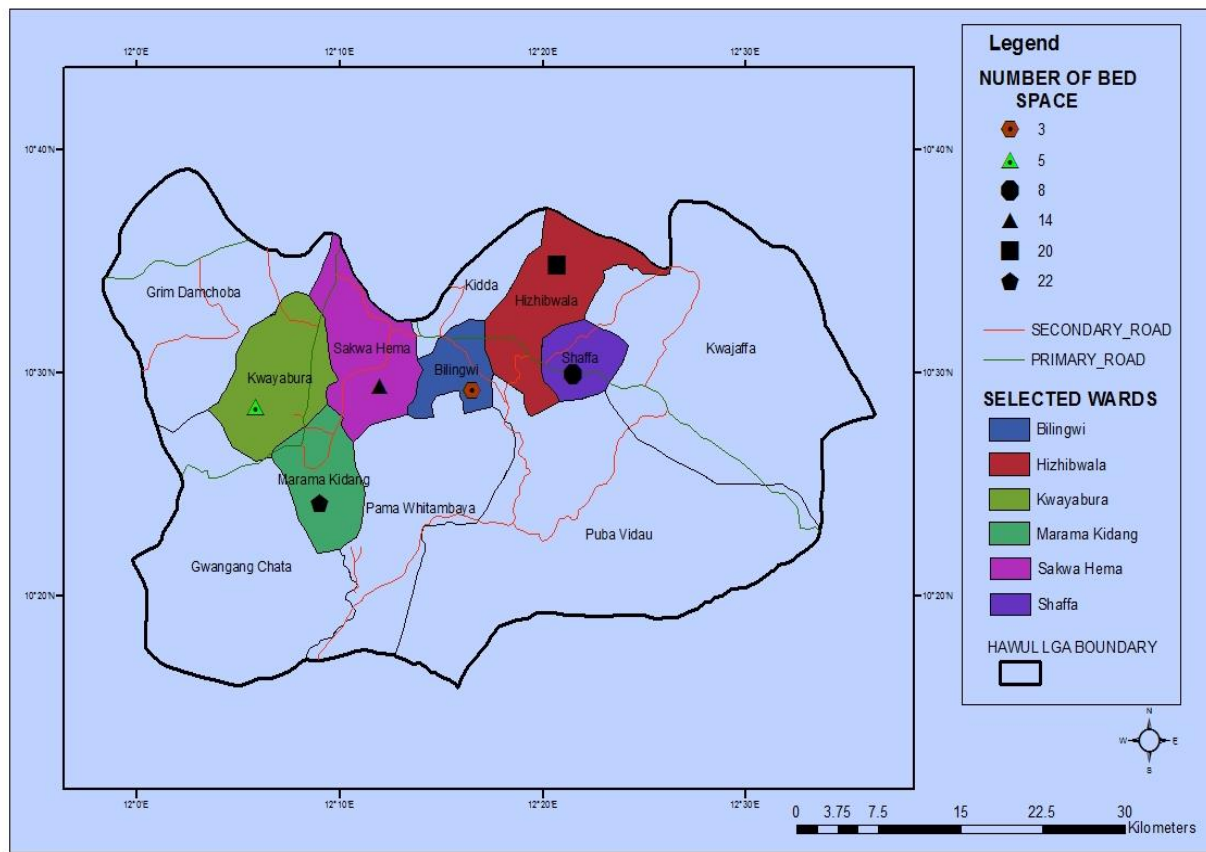


Figure 6. Number of available Bed space in the Public Healthcare Facilities in the study

Source: Field Survey, 2020

Table 5. Ward distribution of healthcare facilities with beds spaces

WARDS	PHC NUMBER OF BEDS SPACES	SHC NUMBER OF BEDS SPACES	TOTAL	PERCENTAGE (%)
HIZHIBWALA	0	20	20	27.7%
MARAMA/KIDANG	0	22	22	30.0%
SHAFFA	8	0	8	13.8%
SAKWA	14	0	14	19.4%
BILINGWI	3	0	3	4.16%
KWAYA-BURA	5	0	5	6.9%
TOTAL	30	42	72	100%

Source: Authors Analysis, 2020

Hizhibwala have 20 beds spaces (27.7%) and followed by general hospital Marama/Kidang have 22 (30.0%) beds spaces, while Bilingwi (4.16%) and kwaya-bura (6.9%) have few beds space, and the others 2 primary healthcare facilities have 8 (13.8%) and 14 (19.4%) beds spaces.

Conclusion

The research conducted shows that there are few health care facilities available in Hawul L.G.A. with only two (2) General Hospital and zero tertiary category of healthcare facilities. The major available health care facilities is the primary Healthcare facilities which is available in four (4) ward. Furthermore, the number of personnel in the location is not encouraging, and there are little facilities to serve the populace. Also the distributions of health care facilities are not equal across the six (6) wards some have to travel to get healthcare attention needed.

Recommendations

The main objective of this study is to shed light on the spatial analysis of Health Care Facilities in Hawul Local Government Area. Having carried out this research, the following recommendations have been outlined which may be useful in assisting the ministry of health and the government body at large in planning the further distribution of facilities and improving the efficiency of the already existing ones. More health workers should be employed to work in the facilities so as to give the people the best and also to save lives most especially in the primary facilities. Government should ensure that medical personnel's are been employed and posted to all the public Health Care facilities in the study area since they are easily accessed by the populace. Also, the medical personnel posted in the rural areas should be given special incentives to stay. Government and the Non-governmental organization should provide Health Care facilities in the wards that do not have HCF.

References

- Abubakar, S. B., & Ibrahim, M. (2015). Geospatial Mapping of Health Facilities in Yola, Nigeria, *Journal of Environmental Science, Toxicology and Food Technology* (IOSRJESTFT), 7(3), 79-85.
- Akpan, P.E., & Njoku, E.A. (2013). Towards a sustainable Distribution and Effective Management of School Facilities in Ikot Ekpene LGA of Akwa Ibom State: A Geographic Information System Option. *Mediterranean Journal of Social Sciences*, 4(15), 77-84.
- Alabi, M.O. (2011). Towards Sustainable Distribution of Health Centers using GIS: A case study from Nigeria. *American Journal of Tropical Medicine and Public Health*, 1(3), 130-136.
- Atser, J., & Akpan, P. A. (2009). Spatial distribution and accessibility of health facilities in Akwa Ibom State, Nigeria. *Ethiopian Journal of Environmental Studies and Management*, 2(2), 49-57.
- Badru, F.A. (2012). Sociology of Health and Illness Relations. In L. Olurode & O. Soyombo (Eds.), *Sociology for Beginners* (pp. 336-355). John West Ikeja.
- Hewko, J.N. (2010). Spatial Equity in the Urban Environment: Assessing Neighbourhood Accessibility to Public Amenities. Unpublished M.Sc. Thesis, University of Alberta.
- Ifeanyi, R., Johnbusco, C.O., & Chijioke, G.E. (2012). Accessibility analysis of healthcare delivery system within Enugu urban area, using Geographic information system. *Journal of Geographic Information System*, 4, 312-321.
- National Primary Healthcare Development Authority (NPHCDA) Publications (2018). Accessed on December 4, 2018.
- Nigeria National Population Commission NPC (2016). Nigeria Estimated Population.
- The World Health Report (2010). Health systems financing: The path to universal health coverage. Geneva: World Health Organization. Retrieved from <http://www.who.int/whr/2010/en/>